CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

CNWRA
CONTROLLED
COPY 526

210-522-6085

Attachment to CNWRA Scientific
Notebook 526. CLD, 06/07/04

Title: Collection of Permeability Data from the Nonwelded Bishop Tuff, Bishop, CA ~ An analog for the Paintbrush Tuff of Yucca Mountain, NV.

Names of participating individuals:

Cynthia L. Dinwiddie
Randall W. Fedors (RF)
David A. Ferrill
Donald R. Bannon
Kelly K. Bradbury
Ronald McGinnis (CLD, 09/24/02)
Richard Heermance (CLD, 09/24)

Contract No: NRC-02-97-009; Project: USFIC 20.01402.861

Task Objectives: Testing will focus on the variations of matrix permeability in and around fault zones, as compared with permeabilities of the parent, non-faulted rock. The proposed approach is one of coupling the Temco, Inc. Mini-Permeameter with the small drill-hole minipermeameter probe (Dinwiddie, 2001). Temco's Mini-Permeameter contains a pressure transducer, three flowmeters (0-50 cc/min, 0-500 cc/min, and 0-2000 cc/min), and an RTD temperature meter. The probe is nominally 5/8" in diameter, + is inserted into a hole drilled into the outcrop to a depth of 4".

CLD, 05/31/02

At present, the scale of depositional heterogeneity is best resolved by use of a minipermeameter device, which allows investigation of permeability heterogeneity at much greater (and statistically significant) densities, an on much smaller scales than is possible with other conventional techniques (Dinwiddie, 2001). To overcome surface weathering phenomenon associated with outcrops, the new small drillhole minipermeameter probe was developed (Dinwiddie et al., 1999). Drilling a 5/8" diameter hole, 4" deep into the outcrop, is followed by drillhole vacuuming, probe insertion, seal expansion, and in situ calculation of matrix permeability, as follows: (1) nitrogen gas is released into the porous medium through a tip-seal injection area; (2) the steady-state gas flow rate is measured (by one of the ~~(3)~~ CLD 05/31/02 three flowmeters in the Mini-Permeameter instrument supplied by Temco, Inc.) at a given injection pressure (measured by the Temco, Inc Mini-permeameter pressure transducer); and (3) knowledge of gas flow rate and injection pressure are used along with CLD, 05/31/02 a geometrical factor (based on the drillhole geometry, see Dinwiddie, 2001) in the standard inverse solution for minipermeameter-derived permeability.

$$k_g = \frac{2\mu_g q_1 P_1}{a G_o (P_1^2 - P_o^2)} \frac{T_{actual}}{T_{reference}} \qquad \text{Equation 1}$$

Where $\mu_g \equiv$ gas viscosity (cp; 1 cp = 1×10^{-3} N·s·m^{-2}), $P_1 \equiv$ injection pressure, $P_o \equiv$ atmospheric pressure (atm; 1 atm = 101,325 N·m^{-2}), $q_1 \equiv$ volumetric flow rate at injection pressure (cm^3·s^{-1}; 1 cm^3 s^{-1} = 1×10^{-6} m^3·s^{-1}), ~~L = core plug length (cm; 1cm = 1x10^{-2} m), and A =~~ CLD, 05/31/02 a = characteristic length (cm; 1 cm = 1×10^{-2} m), and $G_o \equiv$ dimensionless geometrical factor, which accounts for the complex multidimensional flow

pattern throughout the medium. The geometrical factors associated with the variations of the small drillhole minipermeameter probe and outcrop geometry are reported in Dinwiddie (2001). Matrix gas permeability, k_g, is reported in units of Darcies or millidarcies, where 1 D = 0.986923×10^{-12} m^2). The Temco, Inc. Mini-Permeameter system is housed in a black ABS plastic case, and its electronics are powered either by a battery or AC. During warm summer days, the system can become quite hot, thus heating the nitrogen gas above ambient temperatures. To account for this temperature difference, the standard permeability inverse solution is modified by the temperature ratio (T_{actual}/ T_{ref}).

Ambient, local atmospheric pressure will be measured by the Paroscientific 740-45A Digiquartz Portable Standard Pressure Meter, serial number 60999, Asset Number 003972, Calibration Work Order Number 444048707, dated 24 May 2002 by SwRI metrology lab. This reading becomes P_o of Eq. 1.

Ambient air temperature will be measured by the Vaisala HM34C Humidity/Temperature meter, serial number X2020010, Asset Number 009456, Calibration Work Order Number 444048797, dated 31 May 2002 by SwRI metrology lab. This reading becomes $T_{reference}$ of Equation 1.

Original SwRI Calibration certificates for above meters are located in SwRI Building 51, CNWRA.

At present, the scale of depositional heterogeneity is best resolved by use of a minipermeameter device, which allows investigation of permeability heterogeneity at much greater (and statistically significant) densities, an on much smaller scales than is possible with other conventional techniques (Dinwiddie, 2001). To overcome surface weathering phenomenon associated with outcrops, the new small drillhole minipermeameter probe was developed (Dinwiddie et al, 1999). Drilling a 5/8" diameter hole, 4" deep into the outcrop, is followed by drillhole vacuuming, probe insertion, seal expansion, and in situ calculation of matrix permeability, as follows: (1) nitrogen gas is released into the porous medium through a tip-seal injection area; (2) the steady-state gas flow rate is measured (by one of the ~~(3)~~ CLD 05/31/02 three flowmeters in the Mini-Permeameter instrument supplied by Temco, Inc.) at a given injection pressure (measured by the Temco, Inc Mini-permeameter pressure transducer); and (3) knowledge of gas flow rate and injection pressure are used along with CLD, 05/31/02 a geometrical factor (based on the drillhole geometry, see Dinwiddie, 2001) in the standard inverse solution for minipermeameter-derived permeability.

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CLD, 05/31/02

pattern throughout the medium. The geometrical factors associated with the variations of the small drillhole minipermeameter probe and outcrop geometry are reported in Dinwiddie (2001). Matrix gas permeability, k_g, is reported in units of Darcies or millidarcies, where 1 D = 0.986923×10^{-12} m^2). The Temco, Inc. Mini-Permeameter system is housed in a black ABS plastic case, and its electronics are powered either by a battery or AC. During warm summer days, the system can become quite hot, thus heating the nitrogen gas above ambient temperatures. To account for this temperature difference, the standard permeability inverse solution is modified by the temperature ratio (T_{actual}/ T_{ref}).

Ambient, local atmospheric pressure will be measured by the Paroscientific 740-45A Digiquartz Portable Standard Pressure Meter, serial number 60999, Asset Number 003972, Calibration Work Order Number 444048707, dated 24 May 2002 by SwRI metrology lab. This reading becomes P_o of Eq. 1.

Ambient air temperature will be measured by the Vaisala HM34C Humidity/Temperature meter, serial number X2020010, Asset Number 009456, Calibration Work Order Number 444048797, dated 31 May 2002 by SwRI metrology lab. This reading becomes $T_{reference}$ of Equation 1.

Original SwRI Calibration certificates for above meters are located in SwRI Building 51, CNWRA.

CLD, 05/31/02

Southwest Research Institute
6220 Culebra Road
San Antonio, TX 78238
(210) 522-5215
Department of Quality Assurance
Calibration Laboratory

Certificate of Calibration

24 May 2002

Issued to: TROY MAXWELL DIV20 B57
Manufacturer/Model: PAROSCIENTIFIC 740-45A
Description: DIGIQUARTZ PORTABLE STANDARD
Serial Number: 60999
Asset Number: 003972
Work Order Number: 444048707

This certifies the above item was calibrated in compliance with MIL-STD-45662A and ANSI/NCSL Z540-1-1994. Standards used in this calibration, described in the referenced calibration procedure with associated uncertainties or tolerances, are traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to traceability is on file and is available for examination upon request. This certificate is not to be reproduced, except in full, without the written approval of the Southwest Research Institute Department of Quality Assurance Calibration Laboratory.

The uncertainty of the calibration was sufficient to determine that the item met the manufacturer's published specifications unless stated otherwise below.

Ambient Conditions: Temperature: 68.0 Degrees Fahrenheit Humidity: 39 % RH

Calibration Date: 24 May 02 **Calibration Procedure:** CLCP-PI-001 6/99

Condition as Received: IN TOLERANCE

Condition as Returned: IN TOLERANCE

Remarks:

Approved by:
Walt Hill, Metrology Group Leader
Institute Calibration Laboratory

Measurements performed by:
Mack Wood, Technician

m:\nona2la.rpt Rev date 8 Jan 01

CLD, 05/31/02

SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY

Calibration Data Sheet

Work Order	444048707	Mfr	Paroscientific	Technician	C. M. Wood
Asset No.	3972	Model	740-45A	Procedure	CLCP-PI-001 6/99
Serial No.	60999	Type	AS FOUND	Cal Date	5/24/02

Remarks: The uncertainty listed below is expanded by a coverage factor of 2 and represents a confidence level of approximately 95%.

Parameter: Pressure				
Applied Pressure	Indicated Pressure	Error	+/-Tolerance	+/-Uncertainty
PSIA	PSIA	PSIA	PSIA	PSIA
0	0.0001	0.0001	0.004	0.0001
10	9.9982	-0.0018	0.004	0.0004
20	19.9982	-0.0018	0.004	0.0008
30	29.9986	-0.0014	0.004	0.0012
40	39.9999	-0.0001	0.004	0.0016
30	30.0000	0.0000	0.004	0.0012
20	20.0006	0.0006	0.004	0.0008
10	10.0005	0.0005	0.004	0.0004
0	0.0001	0.0001	0.004	0.0001

CLD/05/31/02

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San Antonio, TX 78238
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Department of Quality Assurance
Calibration Laboratory

Certificate of Calibration

31 May 2002

Issued to: CYNTHIA DINWIDDIE DIV20 B189
Manufacturer/Model: VAISALA HM34C
Description: HUMIDTY/ TEMPERATURE METER
Serial Number: X2020010
Asset Number: 009456
Work Order Number: 444048797

This certifies the above item was calibrated in compliance with MIL-STD-45662A and ANSI/NCSL Z540-1-1994. Standards used in this calibration, described in the referenced calibration procedure with associated uncertainties or tolerances, are traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to traceability is on file and is available for examination upon request. This certificate is not to be reproduced, except in full, without the written approval of the Southwest Research Institute Department of Quality Assurance Calibration Laboratory.

The uncertainty of the calibration was sufficient to determine that the item met the manufacturer's published specifications unless stated otherwise below.

Ambient Conditions: Temperature: 75.0 Degrees Fahrenheit Humidity: 53 % RH

Calibration Date: 31 May 02 **Calibration Procedure:** CL-13, 5/99

Condition as Received: IN TOLERANCE

Condition as Returned: IN TOLERANCE

Remarks:

Approved by:
Walt Hill, Metrology Group Leader
Institute Calibration Laboratory

Measurements performed by:
Roger Dykstra, Technician

m:\nona2la.rpt Rev date 8 Jan 01

CLD, 05/31/02

Southwest Research Institute
Calibration laboratory
Calibration Sheet.

Work Order:	444048797	**Mfr.**	Vaisala	**Technician**	R Dykstra
Asset No.	009456	**Model**	HM34	**Procedure**	CL-13, 5/99
Serial No.	X2020010	**Type.**	Humidity / Temp meter	**Cal Date.**	5/31/02

Remarks: The reported uncertainty is based on a standard uncertainty multiplied by a coverage Factor of k=2, which provides a level of confidence of approximately 95 %. The test limits are specified in the Manual. The Difference is equal to TI reading - Std reading.

The results can be Pass. Fail, or if blank "not determinable". If "not determinable" it is up to the end user to determine if results meet their needs.

Test Point %RH	TI Reading %RH	Difference %RH	Tolerance %RH	Uncertainty %RH	Results
35.0	35.5	0.5	2	0.5	Pass
50.0	50.0	0.0	2	0.5	Pass
79.9	79.4	-0.5	2	0.5	Pass

Test Point Degree C	TI Reading Degree C	Difference Degree C	Tolerance Degree C	Uncertainty Degree C	Results
21.6	21.6	0.0	2	0.2	Pass
15.7	15.6	-0.1	2	0.2	Pass
24.6	24.8	0.2	2	0.2	Pass

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Certificate report nr. H06-02200010

CALIBRATION CERTIFICATE

Instrument	HM34C Humidity and temperature meter
Serial number	X2020010
Manufacturer	Vaisala Oyj, Finland
Calibration date	15th May 2002
Test procedure	Doc210426-A

The above instrument was calibrated by comparing the relative humidity and temperature readings to two HMP233 factory working standards. At the time of shipment, the instrument described above met its operating specifications.

The relative humidity readings of the two HMP233 factory working standards have been calibrated at the Vaisala factory by using Hygro M-3 dewpoint meter. Hygro M-3 dewpoint meter has been calibrated at the NIST laboratories by using the NIST primary standard. The temperature readings of the two HMP233 factory working standards have been calibrated at Vaisala Measurement Standards Laboratory (MSL) by using the MSL working standard traceable to the NIST. MSL has been accredited by the FINAS according to the ISO/IEC 17025 (K008).

Calibration results

Reference humidity* % RH	Observed humidity % RH	Difference %RH	Permissible difference %RH
0.9	0.9	0.0	± 2.0
41.4	41.5	+ 0.1	± 2.0
69.9	69.9	0.0	± 2.0
Reference temperature* °C	**Observed temperature °C**	**Difference °C**	**Permissible difference °C**
+ 23.40	+ 23.50	+ 0.10	± 0.2

*Average of two references.

Equipment used in calibration

Type	Serial number	Calibration date	Certificate number
HMP233 / RH	623075	2002-04-10	H06-02150045
HMP233 / RH	P1740019	2002-04-10	H06-02150046
HMP233 / T	623075	2002-01-29	K008-K01291
HMP233 / T	P1740019	2002-01-29	K008-K01294
HYGRO M-3	0351095	2001-12-07	266299-02

Uncertainties (95 % confidence level, k=2)
Humidity ±1.0%RH @ 0...15%RH, ±1.5%RH @ 15...78%RH
Temperature ± 0.13 °C

Ambient conditions / Humidity 40 ± 5%RH, Temperature 23 ± 1 °C, Pressure 1009 ± 1 hPa.

For Vaisala Oyj

Hannele Jäppinen

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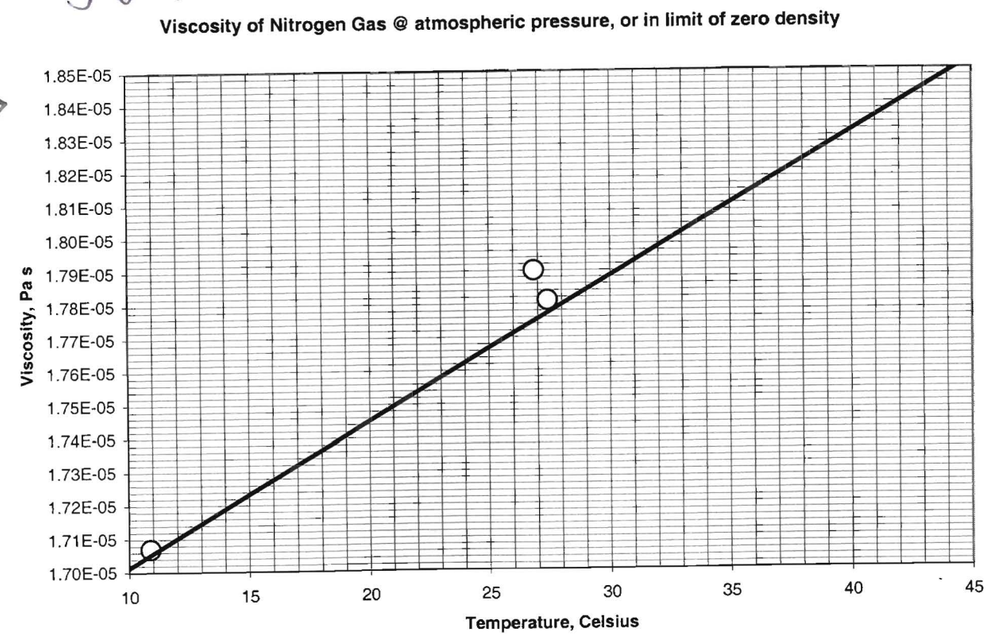
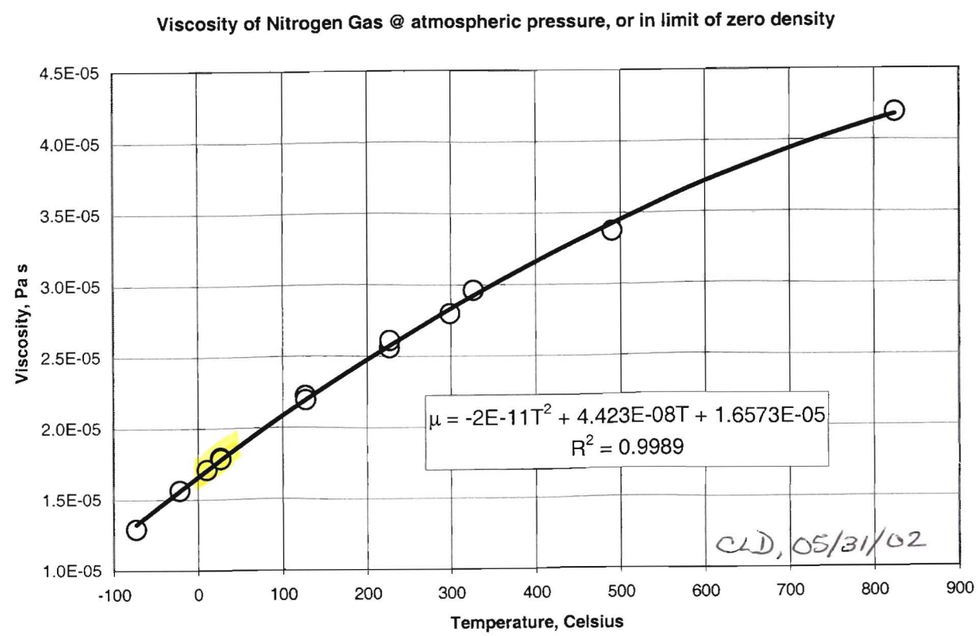
Vaisala Oyj CLD, 05/31/02
Vanha Nurmijärventie 21
FIN-01670 Vantaa, Finland
Tel. (+ 358 9) 8949 2658
Fax (+ 358 9) 8949 2295
http://www.vaisala.com
Domicile Vantaa, Finland
Trade Reg. No. 96.607

The Characteristic length, a, in Eq. 1 is taken to be the diameter that a 5/8" carbide drill bit cuts into an outcrop: 0.7 inch. G_0 was calculated with this assumption.

The gas viscosity, μ_g, in Equation 1 is given in the following graph as a function of Temperature —

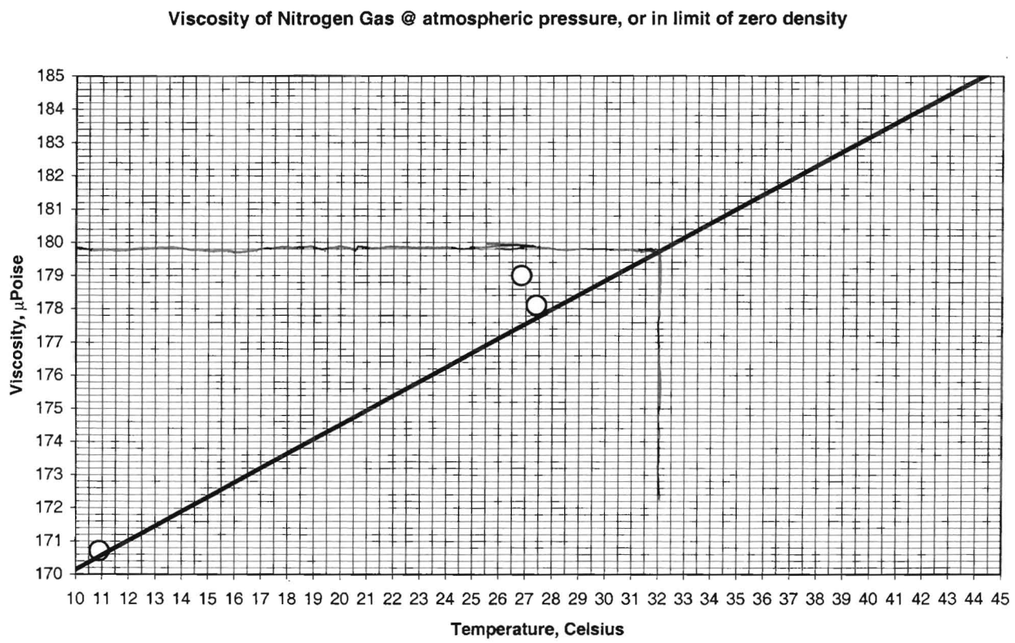
Ambient Temp range amplified from below





Likewise, Nitrogen Gas Viscosity provided below in micropoise. These data arise from CRC Handbooks of Chemistry & Physics. In particular, data collected in limit of zero density for nitrogen is from following fundamental source:

W.A. Cole and W.A. Wakeham, The visosity of nitrogen, oxygen, and their binary mixtures in the limit of zero density, J. Phys. Chem. Ref. Data, 14, 209, 1985.



This data in the ambient Temp range, and the regression curve, are obtained from the following chart simply by "blowing-up" the pertinent region of interest for expected environmental field conditions. Given the nitrogen temperature, as detected by the RTD contained within the Temco, Inc mini-perm system, one will simply read-off the associated viscosity from the regression curve; then, input into software.

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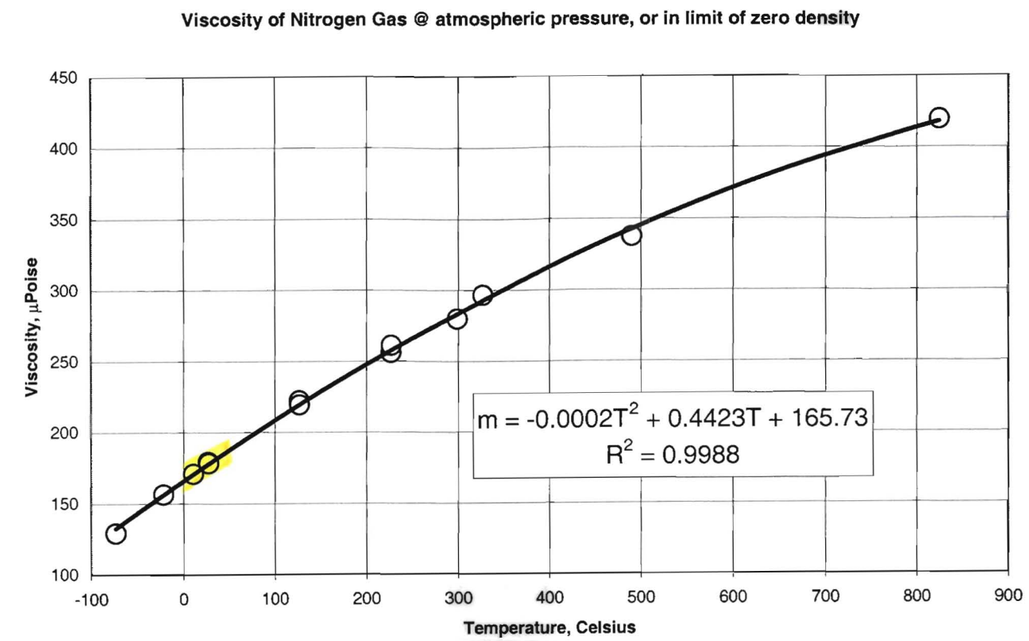

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The Small-Drillhole Minipermeameter Probe.

To overcome seal-quality problems with conventional surface-sealing probes, and outcrop weathering problems, the small drillhole probe was developed. A cylindrical tip seal in the shape of an annulus undergoes axial compression, causing the seal to expand like a packer against the sides of a small (~7/10" ϕ, 4" deep) drillhole. It is used to seal the probe in the bottom of the drill hole, while isolating the injection zone from the ejection zone. Pressure within the sealed-off region is maintained above that of the atmosphere, such that gas enters the porous medium, flows around the tip seal, and exits to the rock surface either in the drillhole or at the outcrop face (both are at atmospheric pressure). Advantages of this in situ approach are (1) elimination of the influence of weathering on permeability; (2) elimination of the need to correct lab samples for lack of overburden; (3) provision of a superior sealing mechanism around the air-injection zone (with which it is a simple matter to

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consistently apply the necessary force for a seal, while maintaining a geometrical factor that is independent of the operator); and (4) the potential for data collection at multiple depths below the outcrop surface. CLD 06/03/02 (Dinwiddie, 2001)

Design of the Probe

The small-drillhole minipermeameter probe is designed for application in cylindrical holes drilled with a standard 5/8" ϕ masonry drill bit. This drill bit cuts a hole of approximately 7/10" ϕ. The current design may be utilized to measure permeability at depths less than 4". The reader should note that the applicable geometrical factor changes with depth of probe insertion. Geometrical factors applicable to various probe/porous medium geometries were determined + reported in Dinwiddie (2001).

The tip-seal is composed of smooth-finish pure gum rubber tubing with a 3/16" I.D., 9/16" O.D., + 3/16" wallthickness [McMaster-Carr Supply Co.]. This resilient, heavy-wall tubing was selected because of its low durometer (i.e. 40, which is soft), and excellent abrasion resistance + flexibility. Its temperature range is within ambient limits; tensile strength is 1900 psi, + elongation is 500%. Rather than deteriorating over time, previous field tests suggested that the performance characteristics of the seal improved with use (Dinwiddie, 2001).

Information potentially subjected to copyright protection was redacted from this location.
The redacted material is a collecting Ph.D Thesis
C.L. Dinwiddie (2001)

Pages 12 through 29

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Calibration Report for press. trans. of MP-401 Minipermeameter by Temco, Inc. - a RENTAL unit

Southwest Research Institute
6220 Culebra Road
San Antonio, TX 78238
(210) 522-5215
Department of Quality Assurance
Calibration Laboratory

Certificate of Calibration

10 June 2002

Issued to: CYNTHIA DINWIDDIE DIV20 B189
Manufacturer/Model: VIATRAN 245
Description: PRESSURE TRANSDUCER
Serial Number: 296929
Asset Number: 009477
Work Order Number: 444048979

This certifies the above item was calibrated in compliance with MIL-STD-45662A and ANSI/NCSL Z540-1-1994. Standards used in this calibration, described in the referenced calibration procedure with associated uncertainties or tolerances, are traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to traceability is on file and is available for examination upon request. This certificate is not to be reproduced, except in full, without the written approval of the Southwest Research Institute Department of Quality Assurance Calibration Laboratory.

The uncertainty of the calibration was sufficient to determine that the item met the manufacturer's published specifications unless stated otherwise below.

Ambient Conditions: Temperature: 68.0 Degrees Fahrenheit Humidity: 39 % RH

Calibration Date: 10 Jun 02 **Calibration Procedure:** CLCP-PI-001 6/99

Condition as Received: IN TOLERANCE

Condition as Returned: IN TOLERANCE

Remarks:

Approved by:
Walt Hill, Metrology Group Leader
Institute Calibration Laboratory

Measurements performed by:
Mack Wood, Technician

m:\nona2la.rpt Rev date 8 Jan 01

CLD, 06/12/02

SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY

Calibration Data Sheet

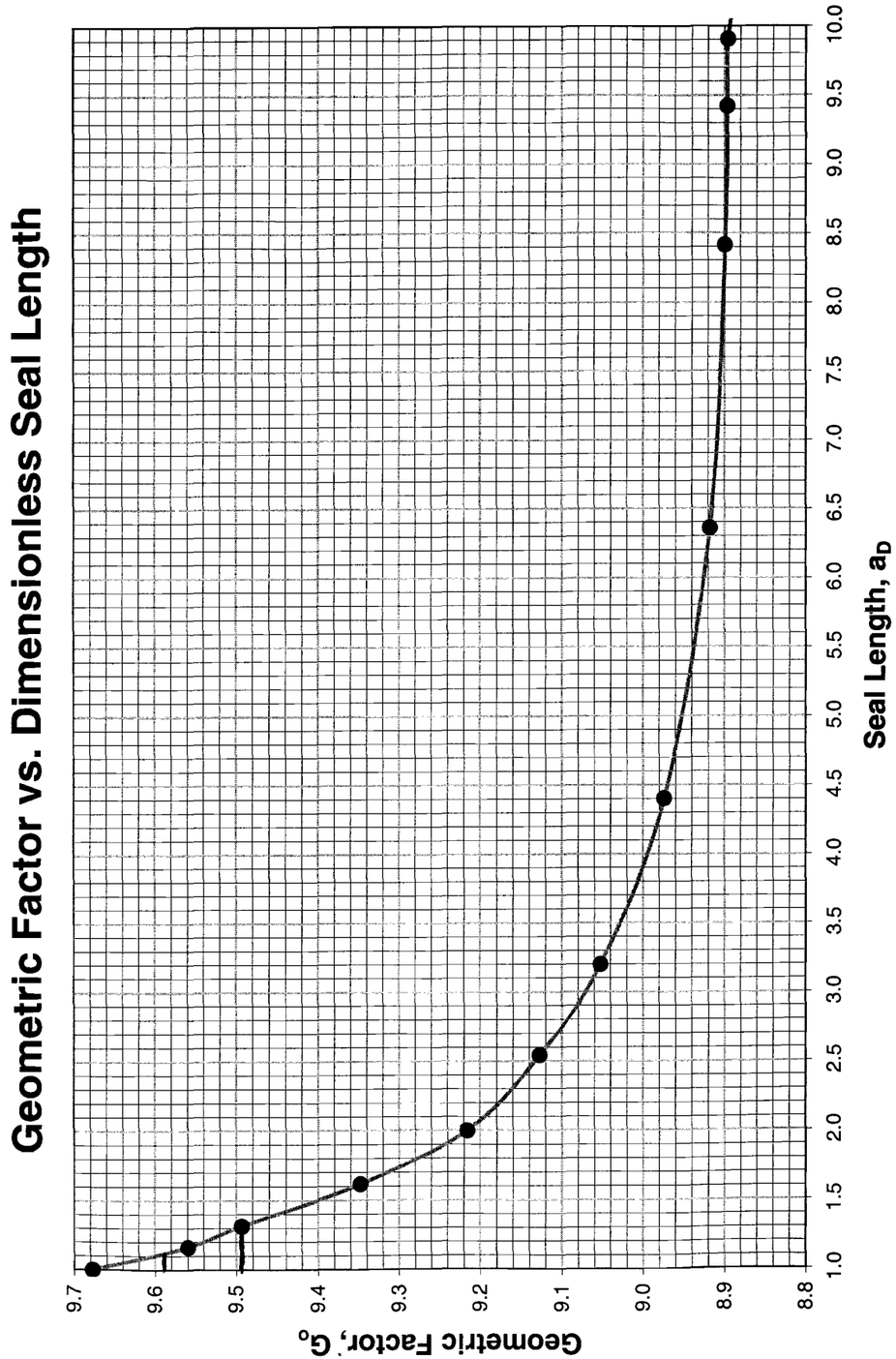
Work Order	444048979	Mfr	Viatran	Technician	C. M. Wood
Asset No.	9477	Model	245	Procedure	CLCP-PI-001 6/99
Serial No.	296929	Type	AS FOUND	Cal Date	6/11/02

Remarks: The uncertainty listed below is expanded by a coverage factor of 2 and represents a confidence level of approximately 95%.

Parameter: Pressure				
Applied Pressure	Indicated Pressure	Error	+/-Tolerance	+/-Uncertainty
PSIA	PSIA	PSIA	PSIA	PSIA
0	0.00	0.00	0.05	0.012
12.5	12.50	0.00	0.05	0.012
25	25.00	0.00	0.05	0.012
37.5	37.50	0.00	0.05	0.012
50	50.00	0.00	0.05	0.012
37.5	37.50	0.00	0.05	0.012
25	24.99	-0.01	0.05	0.012
12.5	12.49	-0.01	0.05	0.012
0	0.00	0.00	0.05	0.012

CLD, 06/12/02

Same as Figure 3.11 on page 24, but w/ better resolution.



CLD, 06/12/02

SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY
MEMORANDUM

June 13, 2002

To: CYNTHIA DINWIDDIE DIV20 B189

From: Walt Hill, Metrology Group Leader
Institute Calibration Laboratory

Subject: Status of Calibration Supplier

Manufacturer/Model: AALBORG INSTRUMENTS GFM173
Description: FLOW METER
Serial Number: G19418
Asset Number: 009476
Work Order Number: 444048980
Date Calibrated: June 11, 2002
Supplier: RULE PRODUCTS, ROUND ROCK, TX
Remarks: Rule Products Cert # C-543

( ) Supplier is on the Approved Suppliers List (ASL) and is accredited.

(✓) Supplier is on the Approved Suppliers List (ASL) but is not accredited.

( ) There is no known accredited supplier at this time.

( ) Supplier is not on the Approved Suppliers List (ASL). Please contact Don Dunavant at ext. 2942 if you wish to add the supplier to the ASL.

Please notify the Institute Calibration Laboratory, extension 5215, of any discrepancies with the item or calibration documentation.

Attachment(s) 1

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RULE PRODUCTS

CALIBRATION REPORT

C-543

Date: 6/11/02
Customer Information:
Southwest Research

Device Type:
MFM

Rated Accuracy
2% Full Scale

Model #	Serial #
GF 173	G19418

Std. Temp.: 70 F
Std. Pressure: 29.92
Gas: Air
Ref. Gas: Air K factor 1
Range: 2 SLPM
Inlet Pressure: AS REQUIRED
Ambient Pressure: 29.035
%RH: 32%
Ambient Temp.: 68 F
Cal. STD.: PRIMARY TUBES
Model #: B924
Serial #: 680
Cal. Method #: 103

CALIBRATION DATA

READ	ACT.	TOL(SLPM)
0.0	0.0	0.00
0.49	0.49	0.04
1.02	1.03	0.04
1.48	1.47	0.04
1.81	1.80	0.04

Recived in spec. N/A
Out of spec. N/A

Cal. performed by:
Title: CAL. TECH.

NOTES:

All Calibrations are NIST traceable.
Uncertainty is .2 %
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06/13/02, CLD

1100 N. Industrial Blvd., Bldg. 3 · Round Rock, TX 78681 · 512-218-4701 · FAX 512-218-9867

SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY
MEMORANDUM

June 13, 2002

To: CYNTHIA DINWIDDIE DIV20 B189

From: Walt Hill, Metrology Group Leader
Institute Calibration Laboratory

Subject: Status of Calibration Supplier

Manufacturer/Model: AALBORG INSTRUMENTS GFM173
Description: FLOW METER
Serial Number: G58717-1
Asset Number: 009474
Work Order Number: 444048982
Date Calibrated: June 11, 2002
Supplier: RULE PRODUCTS, ROUND ROCK, TX
Remarks: Rule Products Cert # C543-1

( ) Supplier is on the Approved Suppliers List (ASL) and is accredited.

(✓) Supplier is on the Approved Suppliers List (ASL) but is not accredited.

( ) There is no known accredited supplier at this time.

( ) Supplier is not on the Approved Suppliers List (ASL). Please contact Don Dunavant at ext. 2942 if you wish to add the supplier to the ASL.

Please notify the Institute Calibration Laboratory, extension 5215, of any discrepancies with the item or calibration documentation.

Attachment(s) 1

m:\nonasl2.rpt Rev 7 Dec 01

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RULE PRODUCTS

CALIBRATION REPORT

C-543-1

Date: 6/11/02
Customer Information:
Southwest Research

Device Type:
MFM

Rated Accuracy
2% Full Scale
Model # Serial #
G58717-1

Std. Temp.: 70 F
Std. Pressure: 29.92
Gas: Air
Ref. Gas: Air K factor 1
Range: 50 SCCM
Inlet Pressure: AS REQUIRED
Ambient Pressure: 29.035
%RH: 32%
Ambient Temp.: 68 F
Cal. STD.: PRIMARY TUBES
Model #: B924
Serial #: 680
Cal. Method #: 103

CALIBRATION DATA

READ	ACT.	TOL(SCCM)
0.0	0.0	0.00
13.00	13.20	1.00
25.70	25.30	1.00
33.50	33.20	1.00
50.20	50.00	1.00

Recived in spec. N/A
Out of spec. N/A

Cal. performed by: PV
Title: CAL. TECH.

NOTES:

All Calibrations are NIST traceable.
Uncertainty is .2 %
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Page 1 of 1

CLD, 06/13/02

1100 N. Industrial Blvd., Bldg. 3 · Round Rock, TX 78681 · 512-218-4701 · FAX 512-218-9867

SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY
MEMORANDUM

June 13, 2002

To: CYNTHIA DINWIDDIE DIV20 B189

From: Walt Hill, Metrology Group Leader
Institute Calibration Laboratory

Subject: Status of Calibration Supplier

Manufacturer/Model: AALBORG INSTRUMENTS GFM173
Description: FLOW METER
Serial Number: G19416
Asset Number: 009475
Work Order Number: 444048981
Date Calibrated: June 11, 2002
Supplier: RULE PRODUCTS, ROUND ROCK, TX
Remarks: Rule Products Cert # C543-2

( ) Supplier is on the Approved Suppliers List (ASL) and is accredited.

(✓) Supplier is on the Approved Suppliers List (ASL) but is not accredited.

( ) There is no known accredited supplier at this time.

( ) Supplier is not on the Approved Suppliers List (ASL). Please contact Don Dunavant at ext. 2942 if you wish to add the supplier to the ASL.

Please notify the Institute Calibration Laboratory, extension 5215, of any discrepancies with the item or calibration documentation.

Attachment(s) 1

m:\nonasl2.rpt Rev 7 Dec 01

CLD, 06/13/02

RULE PRODUCTS

CALIBRATION REPORT

C-543-2

Date: 6/11/02
Customer Information:
Southwest Research

Device Type:
MFM

Rated Accuracy
2% Full Scale

Model #	Serial #
GFM173	G19416

Std. Temp.: 70 F
Std. Pressure: 29.92
Gas: Air
Ref. Gas: Air K factor 1
Range: 500 SCCM
Inlet Pressure: AS REQUIRED
Ambient Pressure: 29.035
%RH: 32%
Ambient Temp.: 68 F
Cal. STD.: PRIMARY TUBES
Model #: B924
Serial #: 680
Cal. Method #: 103

CALIBRATION DATA

READ	ACT.	TOL(SCCM)
0.0	0.0	0.00
128.00	123.00	10.00
269.00	275.00	10.00
360.00	382.00	10.00
480.00	478.00	10.00

Recived in spec. N/A
Out of spec. N/A

Cal. performed by: PV
Title: CAL. TECH.

NOTES:

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Page 1 of 1

6/18/02, CLD

$B = \cancel{0.7}$ 0.35" CLD, 06/18/02 when $a = 0.39"$ (for first seal). We may cut a longer seal, but for now:

$$a_D = \frac{a}{B} = \frac{0.39"}{\cancel{0.70"}\ 0.35"} = \cancel{0.56}\ 1.11$$

CLD, 06/18/02 CLD, 06/18/02 Now see fig on page 32....

diameter = 0.7", so B = 0.35", while a = 0.39"

$$a_D = \frac{a}{B} = \frac{0.39"}{0.35"} = 1.11" \Rightarrow \text{see page } 32 \Rightarrow \boxed{G_o = 9.59}$$

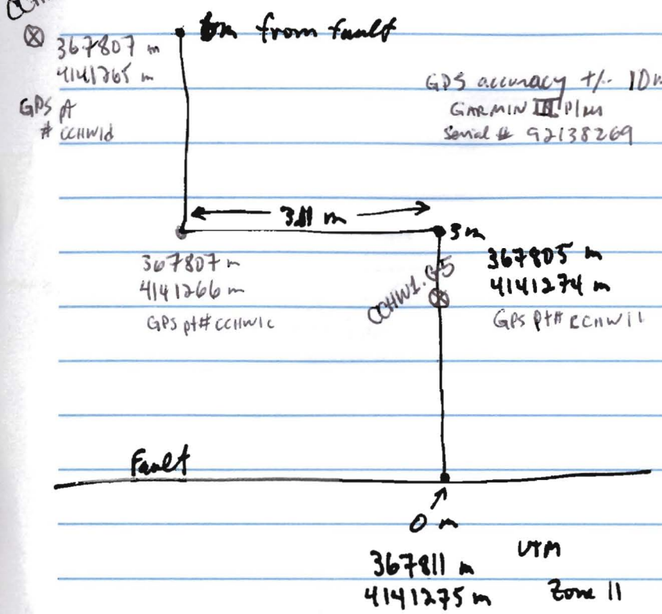
CLD, 06/18/02

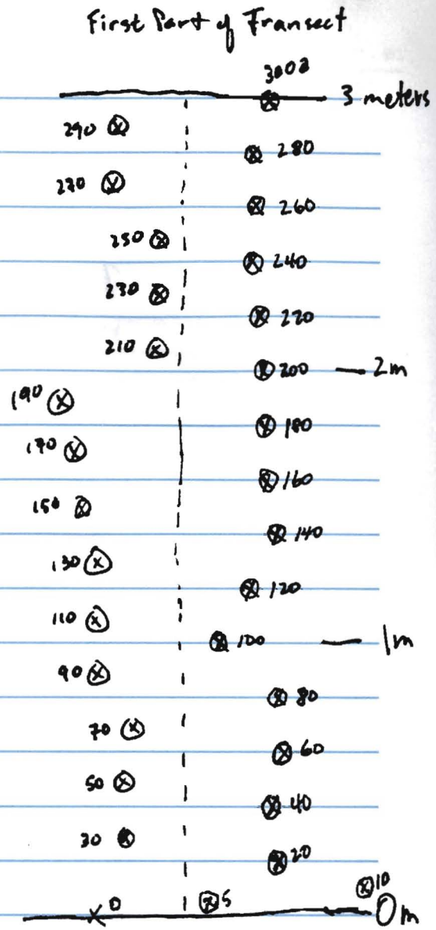
 RF 6/18/02

Chalk Cove CCHW-1 RF 6/18/02

Hanging Wall transect

"0" position is at fault





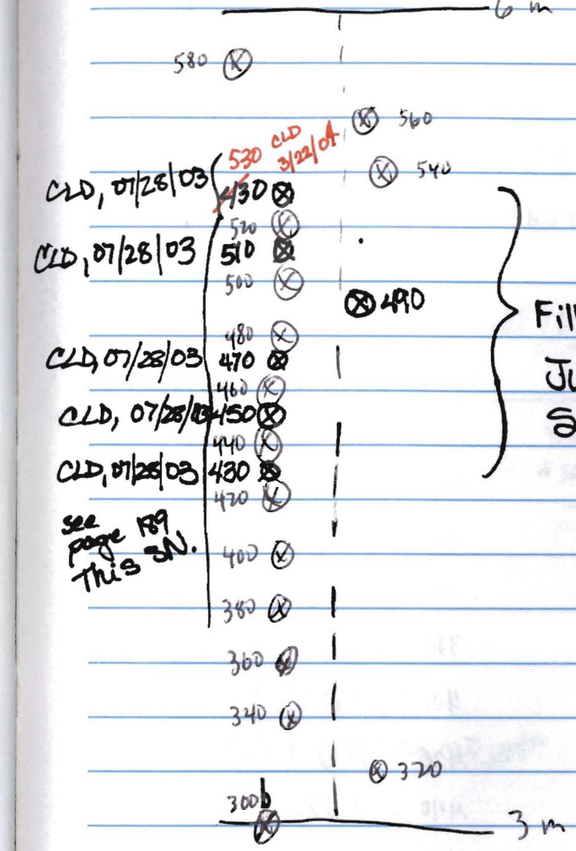
All holes drilled at 45° dip (to west), collar location noted above

Measurement Location Naming Scheme

CCHW1.xxx where cc= chalk Cove
Hw= Hanging Wall
1 = 1st transect at Chalk Cove
xxx = position from fault in cm

2nd (upper) part of transect (3 to 6 m from fault)

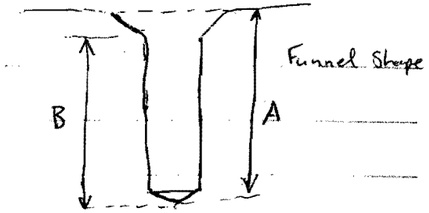
20 cm spacings (CCHW1.xxx)



Filling-in at 10 cm/spacings on July 28, 2003. CLD See page 189 This SN.

6/19/02 RF

Hole Depths



	A (in.)	B (inches)
CCHW1.000	4.	3.5
.005 RF 6/19/02		
~~.050~~	4.	3.8
.010	4.2	3.8
.020	4.4	3.8
.030	4.0	3.6
.040	3.9	3.8
.050	4.	3.7
.060	~~4.1~~ 4.2	~~3.7~~ 4.0
.070	4.1	3.8
.080	4.	3.7
.090	4.1	3.8
.100	3.9	3.8
.110	3.8	3.7
.120	4.	3.8
.130	4.2	3.9
.140	4.4	3.8
.150	4.1	3.9
.160	3.9	3.8
.170	4.0	3.9
.180	4.0	3.8
.190		
.200	~~4.0~~ 4.3 CLD, 06/20/02	~~3.7~~ 3.9
.210	4.2	4.0
.220	3.9	3.5
.230	4.2	3.6
.240	4.2	4.0
.250	4.3	3.9
.260	4.0	3.8

new hole cut RF 6/19/02

	A (in.)	B (in.)
CCHW1.270	4.3	3.7
.280	4.3	3.7
.290	4.2	3.6
.300a	4.1	3.8
	A(mm)	B(mm)
.300b	110	100
.320	100	95
.340	101	96
.360	102	89
.380	101	93
.400	102	92
.420	101	96
.440	102	93
.460	100	93
.480	95	91
.500	100	94
.520	98	92
.540	97	90
.560	101	95
.580	103	95

jog in transect switch to 20 cm spacing

calipers "broke", so now using millimeters

within 20 cm of Jason's permeameter measurement of July 2001 (had to shift 580 site to avoid permeameter platform

CLD, 06/23/02

Changed the seal length as follows (12:20 PDT p.m.):

$\beta = 0.35$, $a = 0.45$

$$a_D = \frac{a}{B} = \frac{0.45}{0.35} = 1.29 \Rightarrow G_0 = 9.49$$

CLD, 06/23/02

CC2 (Chalk Cove Foot Wall/Fault/Hanging Wall

	A(mm)	B(mm)
CC2.000	105	93
.050	110	91
.100	105	88
.150	104	95
.250	106	88
.200	100	80 →
.300	102	91
.350	~~102~~ 106 CLD 06/24/02	~~95~~ 90 CLD, 06/24/02 (new hole drilled)
.500	110	95
.450	100	95
.550	104	93

~~CC~~. CLD, 06/24/02 ~~105~~. CLD, 06/24/02 ~~79~~ CLD, 06/24/02

	A(mm)	B(mm)
CCGauge.~~180~~ CLD, 06/24/02 ~~190~~	105	79

= CCGauge.~~180~~ 200 CLD, 06/24/02

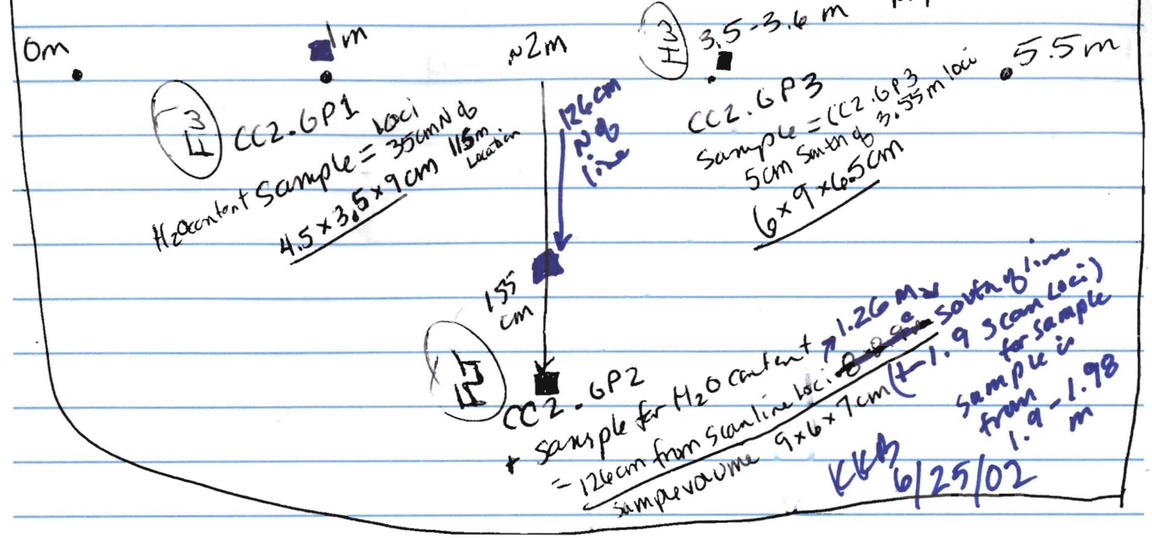
Forget the above, we couldn't figure out what to call this data location: Now, the following is accurate:

	A(mm)	B(mm)
CCGauge.200	105	79

CLD, 06/24/02

Guelph Permeameter Tests on Upper portion of Chalk Cave Fault

CC2 - Scan - Sketch by KKB 6/24/02 - ~~Air~~perm test Guelph Location



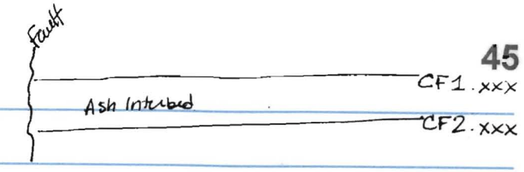
~~CC2~~ CLD, 07/09/02

CCGouge.200 air permeability data was also collected at the same location as CC2.GP2. This air permeability data is reported here, and on page 96.

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCGouge.200	CC2	CCGouge.200	3.6 inches	0.7 inch		CLD		
Note: This air permeability data was taken in the same location as CC2.GP2; See Page 44.								
Tip OD	Tip ID	Geom. Fact.	Ref. Temp.	Ref. Press.	Viscosity			
(in.)	(in.)		(°C)	(atm.)	(cp)			
0.7	0.7	9.49	38.5	1	0.0182			
Date	Time	Flow Press	Atm. Press	Flow Rate	Temp.	Perm.	Sample	Reading
		(psia)	(psia)	(cc/min)	(°C)	(md)		
6/24/02	4:03:02 PM	13.34	12.55	496.7	45.25	385.3212	1	1
6/24/02	4:04:04 PM	13.14	12.55	396.2	45.14	414.6065	1	2
6/24/02	4:05:35 PM	12.94	12.55	302.2	44.97	481.9098	1	3

CLD, 07/09/02

Crossing Faults (Crucifix Site)



Hole Depths for minipermeametry

A (mm)	B (mm)	Hole Name
110	90	~~93~~ CLD, 06/25/02 CF1.-010.x/5 → could not seal ∴ no data
95	90	CF2.000 → sealed properly - got data!
99	86	CF1.025 → could not seal ∴ no data
103	88	CF2.050 → seal achieved, but high k out of range.
109	100	CF1.075 → fractures visibly opening when drilling & 'sealing'.... no data; also, only 2" material above drillhole. (now 072 see p3 48)
		~~CF2.100~~ → CLD, 06/25/02
101	80	CF2.108 → seal achieved, but high k out of range
106	101	CF1.129 → seal achieved, but high k out of range
104	95	CF2.150 - got data!
103	93	CF1.175 - (now 170; see p48) less friable, more ~~welded~~ consolidated than previous today. 02/23/06
104	99	CF2.207 - minor fault 6" away; fill material highly friable - high k, poor seal
100	91	(now 205; see page 48) CF1.225 - got data! Very near base of white bed of interest. Pot. for pumice-rich layer.
103	99	CF2.250 - got data! (now 230; see page 48)
102	97	CF1.297 seal achieved, but high k out of range
100	100	CF2.325 - got data! (now 300, see page 48)
98	95	CF2.275 - got data! (now 250; see page 48)
105	95	CF1.355 " (now 325; see page 48)
100	95	CF2.375 " (now 350; see page 48)
103	98	CF1.399 " (now 365; see page 48)
		1 ~~5.32~~ CLD, 04/25/02
111	99	CF2.432 - got data! → CF1.432 CLD 5/2/06
		CLD. 5/2/06 ~~CF1.451~~ CLD, 04/25/02
104	99	CF2.485 - Fault Core Ash Deposit - got data

CLD, 04/26/06

We could not collect data from either the upper or lower bed of interest in the fault core. Instead, the only material that would hang together in the core was the ash deposits of the interbed layer between the 2 transects

CLD, 06/25/02

A (mm)	B (mm)	
106	103	CF2.525 - got data!
101	96	CF1.556 - lots of fractures - no data
99	87	CF2.575 - got data!
102	98	CF1.610 - got data!

Ashes, the dog's signature!

CLD, 06/25/02

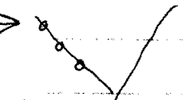
06/26/02 - New numbering scheme per KKB; will adjust numbering scheme of above data later today/tomorrow. Example: CF1.610 old = CF1.570 new

100	95	CF2.585 (would have been CF2.625 yesterday w/ old numbering scheme)
100	99	CF1.610a - consistency of mortar per DRB - very low K
98	93	CF2.627 - got data!
99	95	CF1.650 - got data!
99	96	CF2.675 - got data!
102	97	CF1.700 - got data!
100	98	CF2.725 - got data!
99	96	CF1.750 - got data!
102	102	CF2.775 - got data!
100	98	CF1.803 - got data!
99	99	CF2.824 - got data!
CLD 06/26/02 ~~90~~ 97	97	CF1.850 - got data!
101	99	CF2.875 - got data!
103	99	CF1.900 - got data!
99	95	CF2.925 - got data!
100	100	CF1.948 - got data!
102	88	CF2.975 - got data!
102	100	CF1.1000 - got data!
103	95	CF2.1030 - got data!
98	98	CF1.1050 - got data!

A (mm)	B (mm)	
108	100	CF2.970 - small fault core
105	99	CF2.955 - left of small fault core
CLD, 06/25/02 ~~104~~	~~98~~	~~CF1.960 - right of small fault core~~
102	93	CF1.~~972~~ 961 - small fault core CLD, 06/26/02
102	93	CF1.961 - small fault zone
104	98	CF1.971 - right of small fault core

Small fault has 10 cm offset. CF1.971 in hanging wall - fractured. Seal achieved, but K is high + out of range - could be several darcies permeability. Would have had hard data if D-A convertor for 2000 cc/min flowmeter was not malfunctioning.

Short vertical profile up crossing fault (left-most). All considered in transect 1.



A (mm)	B (mm)		
114	95	CF1.384	high K? - no seal - no data
107	86	CF1.382	high K - out of range; seal achieved; several darcies
106	90 got data!	CF1.377 (most like CF1 material)	

.257

A (mm)	B (mm)		
106	98	CF3.-012	very tough to drill; may be smearing; moderately perm.
		same as	
106	98	CF1.-012	got data!
103	99	CF3.190	no data - splitting fracs, no seal
117	101	CF3.205	got data!
115	101	CF3.215	no data - see 221 instead.
100	97	CF3.257	got data!
102	91	CF3.221	got data!

221 215 205 190

CLD, 06/26/02

CF1	Old Station	New Station
	.075	.072
	.175	.170
	.225	.205
	.297	.270
	.355	.325
	.399	.365

CF2	Old Station	New Station
	.207	.195
	.250	.230
	.275	.250
	.325	.300
	.375	.350

per KKB, 06/27/02. ~Cynthia L. Dinwiddie

Data from Chalk Cove Hanging Wall Transect 1 (i.e. CCHW1):

All times were recorded as Central Daylight Savings Time, though data was actually collected in the Pacific Time Zone. The difference is two hours: Data reportedly collected at 12:47:57 PM CDT, was actually collected at 10:47:57 AM PDT, and so on. CLD, 07/02/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.000	CC	CCHW1.000	4.0 inch	0.7 inch dia.		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.59	32	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/19/02	12:47:57 PM	13.37	12.54	408.5	44.49	299.5568	1	1
6/19/02	12:53:21 PM	13.23	12.54	303.9	45.42	270.3147	1	2
6/19/02	1:04:24 PM	12.98	12.54	178.8	47.07	253.1516	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.005	CC	CCHW1.005	3.9 inch	0.7 inch dia.		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.59	33	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/19/02	1:20:46 PM	12.94	12.54	449.5	49.72	706.9628	1	1
6/19/02	1:21:49 PM	12.91	12.54	334.6	49.85	569.8198	1	2
6/19/02	1:29:15 PM	12.85	12.54	259.6	50.59	530.1215	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.010	CC	CCHW1.010	4.0 inch	0.7 inch dia.		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.59	33	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/19/02	1:42:02 PM	12.9	12.54	492	51.65	866.2844	1	1
6/19/02	1:44:09 PM	12.88	12.54	358.2	51.82	668.6724	1	2
6/19/02	1:50:56 PM	12.9	12.54	441.1	52.48	778.6477	1	3

CLD, 07/02/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.020	CC	CCHW1.020	4.1 inch	0.7 inch dia.		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.59	33	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/19/02	2:21:57 PM	13.18	12.52	498.8	54.19	477.4475	1	1
6/19/02	2:24:11 PM	13.18	12.52	407.4	54.27	390.0555	1	2
6/19/02	2:26:42 PM	13.07	12.52	293.8	54.24	338.9701	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.030	CC	CCHW1.030	3.8 inch	0.7 inch dia.		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.59	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/19/02	2:32:49 PM	13.05	12.52	291.1	54.33	348.8973	1	1
6/19/02	2:36:22 PM	13.29	12.52	400.9	54.52	327.8470	1	2
6/19/02	2:39:56 PM	13.58	12.52	494.8	54.84	290.9519	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.040	CC	CCHW1.040		0.7 inch dia.		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.59	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/19/02						314.6983	1	1
6/19/02	This data was written over, but the perms were safe in the chart file.					260.6324	1	2
6/19/02						234.5439	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.050	CC	CCHW1.050	3.85 inch	0.7 inch dia.		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.59	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/19/02	3:09:49 PM	13.2	12.52	306.9	55.7	286.215	1	1
6/19/02	3:12:26 PM	13.38	12.52	406.1	55.91	297.5688	1	2
6/19/02	3:14:49 PM	13.6	12.52	491.8	56.18	284.7741	1	3

CLD, 07/02/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.060	CC	CCHW1.060	3.9 inch	0.7 inch dia.		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.59	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/19/02	7:18:38 PM	13.39	12.47	490.3	38.64	318.6997	1	1
6/19/02	7:20:57 PM	13.34	12.47	396.7	38.5	273.0838	1	2
6/19/02	7:25:20 PM	13.14	12.47	304.9	38.29	274.4867	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.070	CC	CCHW1.070	3.95 inch	0.7 inch dia.		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.59	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/19/02	6:16:08 PM	13.32	12.48	490.2	46.97	359.1392	1	1
6/19/02	6:19:47 PM	13.1	12.48	398.3	46.33	397.9581	1	2
6/19/02	6:22:40 PM	12.97	12.48	306.7	45.84	389.119	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.080	CC	CCHW1.080	3.85 inch	0.7 inch dia.		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.59	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/19/02	7:04:11 PM	13.30	12.47	484.8	39.86	351.8864	1	1
6/19/02	7:07:47 PM	13.15	12.47	402.7	39.49	358.4365	1	2
6/19/02	7:11:05 PM	12.98	12.47	301.8	39.24	360.2736	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.090	CC	CCHW1.090	3.95 inch	0.7 inch dia.		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.59	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/19/02	7:31:32 PM	13.59	12.47	505.0	37.95	266.9763	1	1
6/19/02	7:32:44 PM	13.56	12.47	401.8	37.89	218.4737	1	2
6/19/02	7:35:50 PM	13.30	12.47	288.4	37.72	207.9004	1	3

CLD, 07/02/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.100	CC	CCHW1.100	3.85 inch	0.7 inch dia.		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.59	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/19/02	7:43:31 PM	13.46	12.47	505.8	37.35	304.7332	1	1
6/19/02	7:44:21 PM	13.45	12.47	411.6	37.28	250.5503	1	2
6/19/02	7:46:27 PM	13.30	12.47	314.0	37.19	226.9300	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.110	CC	CCHW1.110	3.75 inch	0.7 inch dia.		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.59	32	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/19/02	8:10:10 PM	13.67	12.47	448.1	35.71	219.7690	1	1
6/19/02	8:12:38 PM	13.35	12.47	337.6	35.62	228.5153	1	2
6/19/02	8:13:55 PM	13.19	12.47	201.0	35.56	167.2916	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.120	CC	CCHW1.120	3.9 inch	0.7 inch dia.		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.59	32	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/19/02	8:18:05 PM	12.87	12.47	199.6	35.40	302.6468	1	1
6/19/02	8:20:30 PM	13.02	12.47	407.5	35.29	446.5626	1	2
6/19/02	8:22:30 PM	13.01	12.47	301.6	35.20	336.6655	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.130	CC	CCHW1.130	4.05	0.7 inch dia.		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.59	31	1	0.0179			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/19/02	8:38:51 PM	13	12.47	493.5	34.51	558.954	1	1
6/19/02	8:40:22 PM	12.9	12.47	388.6	34.46	544.549	1	2
6/19/02	8:42:14 PM	12.8	12.47	284.6	34.4	521.6198	1	3

CLD, 07/02/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.140	CC	CCHW1.140	3.95	0.7 inch dia.		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.59	31	1	0.0179			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected								
No Data Collected								
No Data Collected								

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.150	CC	CCHW1.150	3.85 inch	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.59	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/20/02	1:33:36 PM	13.17	12.49	474.3	41.74	424.5423	1	1
6/20/02	1:35:28 PM	13.03	12.49	398.6	41.79	451.8198	1	2
6/20/02	1:37:05 PM	12.96	12.49	306.0	41.76	399.5736	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.160	CC	CCHW1.160	3.85 inches	0.7 inch dia.		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.59	31	1	0.0179			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/19/02	9:05:28 PM	12.98	12.47	497.3	33.51	583.9022	1	1
6/19/02	9:07:32 PM	12.93	12.47	398.7	33.45	519.9353	1	2
6/19/02	9:09:53 PM	12.8	12.47	298.5	33.38	545.2813	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.170	CC	CCHW1.170	3.95 inch	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.59	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected								
No Data Collected								
No Data Collected								

CLD, 07/02/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.180	CC	CCHW1.180	3.9 inches	0.7 inch dia.		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.59	31	1	0.0179			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected								
No Data Collected								
No Data Collected								

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.190	CC	CCHW1.190	3.65 inch	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.59	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected								
No Data Collected								
No Data Collected								

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.200	CC	CCHW1.200		0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.59	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected								
No Data Collected								
No Data Collected								

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.210	CC	CCHW1.210	4.1 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	34	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/22/02	6:04:42 PM	12.65	12.56	553	54.94	3998.88	1	1

Data from this well is non-QA. D-to-A convertor for 2000 cc/min flowmeter was malfunctioning, and this location would have likely required the use of this DAC unit. Qualitative data (soft data) only.

CLD, 07/02/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.220	CC	CCHW1.220	4.1 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	34	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected								
No Data Collected								
No Data Collected								

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.230	CC	CCHW1.230	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	34	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected								
No Data Collected								
No Data Collected								

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.240	CC	CCHW1.240	4.1 inch	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	36	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected								
No Data Collected								
No Data Collected								

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.250	CC	CCHW1.250	4.1 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	34	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/22/02	5:53:23 PM	12.63	12.56	553.1	53.77	5128.074	1	1

Data from this well is non-QA. D-to-A convertor for 2000 cc/min flowmeter was malfunctioning, and this location would have likely required the use of this DAC unit. Qualitative data (soft data) only.

CLD, 07/02/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.260	CC	CCHW1.260	3.9 inch	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	37	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected								
No Data Collected								
No Data Collected								

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.270	CC	CCHW1.270	4.0 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	34	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/22/02	5:23:51 PM	14.48	12.56	499.7	51.32	156.1747	1	1
6/22/02	5:25:00 PM	14.04	12.56	397.5	51.32	163.8337	1	2
6/22/02	5:26:37 PM	13.62	12.56	297.7	51.32	174.0655	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.280	CC	CCHW1.280	4.0 inch	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	37	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/22/02	2:11:20 PM	13.92	12.58	496.6	41.73	220.5011	1	1
6/22/02	2:12:49 PM	13.62	12.58	399.5	41.71	231.1582	1	2
6/22/02	2:14:30 PM	13.32	12.58	299.6	41.68	246.4315	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.290	CC	CCHW1.290	3.9 inch	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	34	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/22/02	5:10:19 PM	13.23	12.56	286.3	53.17	270.3797	1	1
6/22/02	5:11:39 PM	13.57	12.56	405.5	52.90	250.5240	1	2
6/22/02	5:14:19 PM	13.85	12.56	501.2	52.39	239.4927	1	3

07/02/02, CLD

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.300a	CC	CCHW1.300a	3.95	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	37	1	0.0176			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/21/02	10:26:09 PM	12.83	12.52	289.5	22.58	553.0373	1	1
6/21/02	10:28:07 PM	12.83	12.52	422.5	22.58	807.1097	1	2
6/21/02	10:30:22 PM	12.83	12.52	504.7	22.57	964.1053	1	3

Above CCHW1.300a data is non-QA: capillary tube for measuring static pressure of injection zone is clogged with silt. Note that ref temp for above non-QA data taken on 06/21/02 was 27 degrees C.

Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/22/02	1:55:25 PM	13.18	12.58	494.0	40.97	502.7302	1	1
6/22/02	1:57:21 PM	13.04	12.58	399.9	41.03	533.8295	1	2
6/22/02	1:58:51 PM	12.91	12.58	300.0	41.10	561.2060	1	3

Above CCHW1.300a data is QA: capillary tube removed from probe. Capillary tube deemed unnecessary, after observation that the same pressures and perms were found for same flowrates in the first hole tested (CCHW1.000) during this fieldwork, regardless of whether or not capillary was installed (capillary tube was free from dust/clogging in first hole tested on the very first day). Affect of capillary's presence on accurate reporting of pressure was negligible. In fact, the standard probe provided by Temco, Inc. has no such capillary. C. Dinwiddie will relay this finding to other new small drillhole minipermeameter probe patent authors such that it can be eliminated from future probe designs. Note that ref temp for above QA data taken on 06/22/02 was 37 degrees C.

See pages 40 and 41 this SN for relative positions holes .300a & .300b

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.300b	CC	CCHW1.300b	4.1 inches	0.7 inch		CLD	CLD, 07/02/02	
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	34	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected								
No Data Collected								
No Data Collected								

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.320	CC	CCHW1.320	3.8 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected								
No Data Collected								
No Data Collected								

07/02/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.340	CC	CCHW1.340	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/23/02	3:55:58 PM	13.08	12.55	498.0	44.26	580.8146	1	1
6/23/02	3:57:06 PM	12.96	12.55	402.8	44.24	610.0991	1	2
6/23/02	3:58:11 PM	12.84	12.55	304.7	44.24	655.5669	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.360	CC	CCHW1.360	3.8 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/23/02	3:48:54 PM	13.77	12.55	497.5	44.10	245.3358	1	1
6/23/02	3:49:47 PM	13.49	12.55	401.5	44.14	259.7677	1	2
6/23/02	3:50:51 PM	13.21	12.55	300.1	44.15	279.5492	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.380	CC	CCHW1.380	3.8 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/23/02	3:40:36 PM	14.11	12.55	496.2	43.81	188.7506	1	1
6/23/02	3:42:06 PM	13.74	12.55	395.0	43.89	199.7954	1	2
6/23/02	3:42:59 PM	13.43	12.55	305.7	43.90	211.5989	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.400	CC	CCHW1.400	3.8 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/23/02	3:33:18 PM	13.53	12.55	497.6	43.73	307.9310	1	1
6/23/02	3:34:15 PM	13.30	12.55	397.7	43.73	324.4446	1	2
6/23/02	3:35:35 PM	13.07	12.55	296.8	43.70	352.3279	1	3

CLD, 07/02/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.420	CC	CCHW1.420	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/23/02	3:24:46 PM	14.82	12.55	496.1	43.30	126.1204	1	1
6/23/02	3:25:24 PM	14.28	12.55	391.7	43.35	133.3129	1	2
6/23/02	3:27:13 PM	13.82	12.55	298.7	43.43	140.9343	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.440	CC	CCHW1.440	3.8 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/23/02	1:45:02 PM	15.05	12.57	499.3	42.99	115.0211	1	1
6/23/02	3:18:33 PM	14.83	12.55	397.9	42.85	100.5320	1	2
6/23/02	3:19:27 PM	14.21	12.55	302.2	42.90	107.3168	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.460	CC	CCHW1.460	3.8 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/23/02	1:25:34 PM	15.51	12.58	497.2	40.66	95.0179	1	1
6/23/02	1:26:50 PM	14.85	12.58	396.7	40.80	100.2531	1	2
6/23/02	1:27:42 PM	14.23	12.58	298.8	40.94	106.3361	1	3

CLD, 07/02/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.480	CC	CCHW1.480	3.7 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
~~6/23/02~~	~~1:15:35 PM~~	~~15.35~~	~~12.58~~	~~511.3~~	~~40.32~~	~~103.8359~~	~~1~~	~~1~~
The above data point will not be reported, as it was inadvertently taken at a flowrate above 500 cc/min w/o the DAC unit								
6/23/02	1:16:39 PM	15.43	12.58	495.4	40.35	97.51294	1	2
6/23/02	1:18:09 PM	14.82	12.58	399.1	40.37	102.1822	1	3
6/23/02	1:20:08 PM	14.19	12.58	298.8	40.39	108.9497	1	4

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.500	CC	CCHW1.500	3.8 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/23/02	1:10:07 PM	15.39	12.58	497.1	40.26	99.3538	1	1
6/23/02	1:10:56 PM	14.78	12.58	399.5	40.28	104.2666	1	2
6/23/02	1:12:03 PM	14.19	12.58	302.7	40.28	110.3330	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.520	CC	CCHW1.520	3.7 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/23/02	1:00:58 PM	15.23	12.58	493.2	40.26	105.1273	1	1
6/23/02	1:01:47 PM	14.69	12.58	402.2	40.25	109.7994	1	2
6/23/02	1:03:04 PM	14.08	12.58	298.1	40.22	117.0832	1	3

CLD, 07/02/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.540	CC	CCHW1.540	3.7 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/23/02	12:52:06 PM	15.22	12.58	496.4	40.43	106.3061	1	1
6/23/02	12:53:13 PM	14.65	12.58	400.4	40.43	111.6480	1	2
6/23/02	12:54:17 PM	14.08	12.58	299.9	40.39	117.8541	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.560	CC	CCHW1.560	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/23/02	12:41:25 PM	14.48	12.58	500.3	40.2	152.8289	1	1
6/23/02	12:42:19 PM	14.03	12.58	397.7	40.2	161.8822	1	2
6/23/02	12:43:23 PM	13.66	12.58	307.4	40.2	170.3620	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCHW1.580	CC	CCHW1.580	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	34	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/23/02	12:30:44 PM	14.69	12.58	497.4	40.02	135.6891	1	1
6/23/02	12:32:04 PM	14.24	12.58	403.8	40.03	142.3705	1	2
6/23/02	12:32:57 PM	13.76	12.58	297.8	40.06	150.4143	1	3

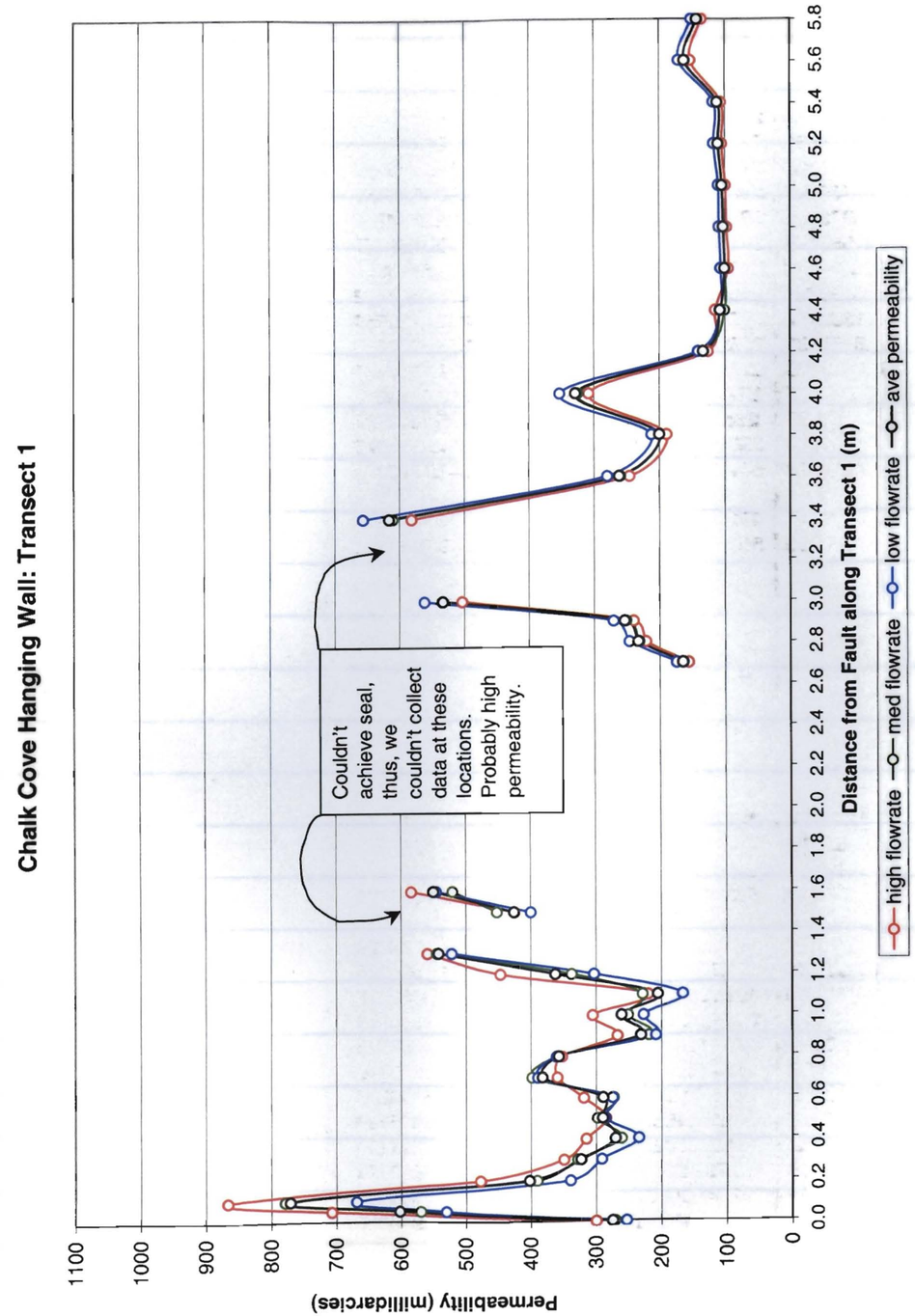
This ends data collected from CCHW1. CLD, 07/02/02

CCHW1 data for plot on page 63 of this SN:

location (m)	high flowrate	med flowrate	low flowrate	ave permeability
0.0	299.5568217	270.3147457	253.1515805	274.3410493
0.1	706.9627861	569.8198237	530.1214965	602.3013687
0.1	866.2844006	778.6477054	668.6724067	771.2015042
0.2	477.4475425	390.0554806	338.9701335	402.1577189
0.3	348.8973061	327.8470444	290.9519358	322.5654288
0.4	314.6982548	260.6324186	234.5438597	269.9581777
0.5	284.7741011	297.568813	286.2149803	289.5192981
0.6	318.6996722	273.0837969	274.4866615	288.7567102
0.7	359.1392117	397.9580723	389.1190021	382.0720954
0.8	351.8863931	358.4364871	360.2735832	356.8654878
0.9	266.9762878	218.4737338	207.9003601	231.1167939
1.0	304.7331767	250.5503324	226.9299815	260.7378302
1.1	219.7689996	228.515285	167.2916336	205.1919727
1.2	446.5625882	336.6655198	302.6467849	361.9582976
1.3	558.9539978	544.5490444	521.6198485	541.7076302
1.4				
1.5	424.5423347	451.8198153	399.5736247	425.3119249
1.6	583.9021659	519.9352741	545.2812536	549.7062312
1.7				
1.8				
1.9				
2.0				
2.1	No data	collected	here	
2.2				
2.3				
2.4				
2.5				
2.6				
2.7	156.1747432	163.8336655	174.0654969	164.6913019
2.8	220.5011366	231.1582259	246.4314523	232.6969383
2.9	239.4927376	250.5240490	270.3797071	253.4654979
3.0	502.7301996	533.8294654	561.2060449	532.5885700
3.2				
3.4	580.8145533	610.099121	655.5668858	615.4935200
3.6	245.3358324	259.7676663	279.5492087	261.5509025
3.8	188.7506237	199.7954278	211.598857	200.0483028
4.0	307.9310208	324.4445721	352.3279005	328.2344978
4.2	126.1204416	133.3129477	140.9342942	133.4558945
4.4	115.0210699	100.532028	107.3168165	107.6233048
4.6	95.01786586	100.2530944	106.3361026	100.5356876
4.8	97.51293822	102.1821569	108.9496835	102.8815929
5.0	99.35379729	104.2666022	110.3329893	104.6511296
5.2	105.1273456	109.7994354	117.0832111	110.6699974
5.4	106.3060760	111.6480442	117.8540981	111.9360727
5.6	152.8288832	161.8821800	170.3619517	161.6910050
5.8	135.6890904	142.3705183	150.4143028	142.8246371

Nonsurficial zones of iron stained banding. Possible deformation banding. Difficult/impossible to retrieve hand samples here, as it instantly pulverizes. Pressure of miniperm seal against drillhole walls causes grains to compress, and leakage nearly inevitably occurs. Many fractures in this zone run parallel to fault. Same is true for locations 1.4, 3.0b, and 3.2 m from fault.

CLD, 07/02/02



34 data locations; triplicate measurements

CLD, 07/02/02

Data from Chalk Cove Transect 2 (i.e. CC2)

All times were recorded as Central Daylight Savings Time, though data was actually collected in the Pacific Time Zone. The difference is two hours: Data reportedly collected at 12:28:55 PM CDT, was actually collected at 10:28:55 AM PDT, and so on. CLD, 07/02/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC2.000	CC	CC2.000	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/24/02	12:28:55 PM	13.72	12.56	497.4	37.84	253.2675	1	1
6/24/02	12:30:45 PM	13.46	12.56	394.2	38.33	261.7024	1	2
6/24/02	12:31:33 PM	13.25	12.56	306.1	38.53	267.3905	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC2.050	CC	CC2.050	4.0 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/24/02	12:45:11 PM	13	12.56	500.4	43.21	702.5822	1	1
6/24/02	12:46:59 PM	12.91	12.56	399.2	43.64	708.0711	1	2
6/24/02	12:49:44 PM	12.82	12.56	300.3	44.24	720.9342	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC2.100	CC	CC2.100	3.8 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/24/02	1:03:56 PM	13.53	12.56	500.4	48.31	317.2571	1	1
6/24/02	1:05:14 PM	13.32	12.56	400.6	48.58	327.0676	1	2
6/24/02	1:07:10 PM	13.11	12.56	296.2	48.92	337.2561	1	3

CLD, 07/02/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC2.150	CC	CC2.150	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/24/02	1:16:22 PM	13.30	12.56	497.9	50.82	420.7267	1	1
6/24/02	1:17:57 PM	13.14	12.56	397.5	50.92	431.3485	1	2
6/24/02	1:19:37 PM	12.98	12.56	295.2	50.99	445.2380	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC2.200	CC	CC2.200	3.5 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/24/02	2:06:11 PM	13.01	12.56	498.7	56.19	712.4512	1	1
6/24/02	2:07:43 PM	12.94	12.56	399.9	56.28	678.5866	1	2
6/24/02	2:09:12 PM	12.87	12.56	307.2	56.33	640.8505	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC2.250	CC	CC2.250	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/24/02	1:34:18 PM	12.87	12.56	500.5	52.72	1032.653	1	1
6/24/02	1:37:07 PM	12.87	12.56	495.4	53.00	1023.008	1	2
6/24/02	1:38:49 PM	12.87	12.56	484.5	53.17	1001.021	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC2.300	CC	CC2.300	3.8 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38.5	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/24/02	2:28:03 PM	13.03	12.55	500.2	56.36	668.9407	1	1
6/24/02	2:29:50 PM	12.92	12.55	407.4	56.38	709.9086	1	2
6/24/02	2:31:19 PM	12.8	12.55	297.5	56.39	770.8932	1	3

CLD, 07/02/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC2.350	CC	CC2.350	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38.5	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data collected								
No Data collected								
No Data collected								

Nonsurficial zones of iron stained banding. Possible deformation banding. Difficult/impossible to retrieve hand samples here, as it instantly pulverizes. Pressure of miniperm seal against drillhole walls causes grains to compress, and leakage nearly inevitably occurs. Many fractures in this zone run parallel to fault.

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC2.400	CC	CC2.400		0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38.5	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data collected								
No Data collected								
No Data collected								

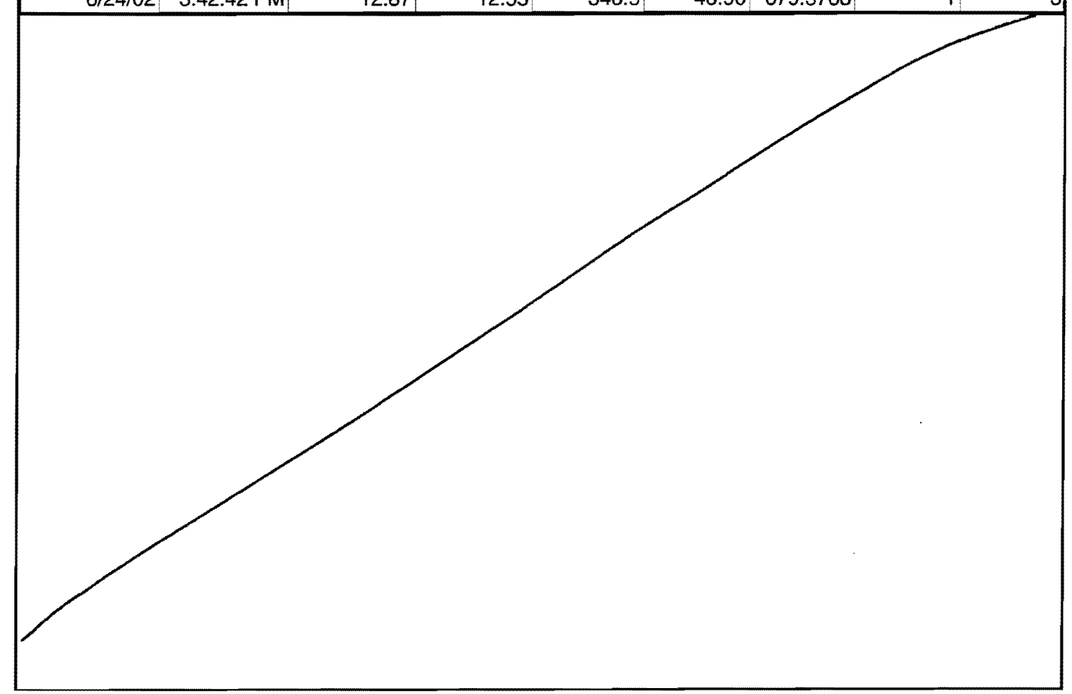
Nonsurficial zones of iron stained banding. Possible deformation banding. Difficult/impossible to retrieve hand samples here, as it instantly pulverizes. Many fractures in this zone run parallel to fault. A seal was achieved at this hole, but no measurement could be taken w/o the 2000 cc/min flowmeter. Software indicates k = 1500 md when q = 556 cc/min, but this is not accurate, given that the A-to-D convertor for the 0-2000 cc/min flowmeter is not working. When it says q = 556 cc/min, the flow control valve is maxed-out, thus, q probably equals about 2000 cc/min--just can't register that as there is no A-to-D convertor. Thus, the actual magnitude is probably more on the order of 5000-6000+ millidarcies, once corrected for high-velocity (non-Darcian) flow effects. The increase flowrate message was indicated at all flowrates below about "556 cc/min" (which is really about 2000 cc/min, but that particular A-to-D convertor was not communicating).

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC2.450	CC	CC2.450	3.8 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38.5	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/24/02	3:28:31 PM	13.10	12.55	496.8	48.44	564.3513	1	1
6/24/02	3:29:24 PM	12.95	12.55	397.4	48.34	624.1811	1	2
6/24/02	3:31:10 PM	12.86	12.55	335.3	48.14	681.5219	1	3

CLD, 07/02/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC2.500	CC	CC2.500	4.0 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38.5	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/24/02	3:14:53 PM	13.11	12.55	498.7	50.42	559.6014	1	1
6/24/02	3:15:48 PM	12.96	12.55	398.8	50.25	614.4927	1	2
6/24/02	3:17:03 PM	12.85	12.55	322.5	50.05	681.6507	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC2.550	CC	CC2.550	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38.5	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/24/02	3:40:33 PM	13.11	12.55	499.8	47.15	555.1671	1	1
6/24/02	3:41:29 PM	12.96	12.55	408.0	47.06	622.4664	1	2
6/24/02	3:42:42 PM	12.87	12.55	346.5	46.90	679.3768	1	3



CLD, 07/02/02

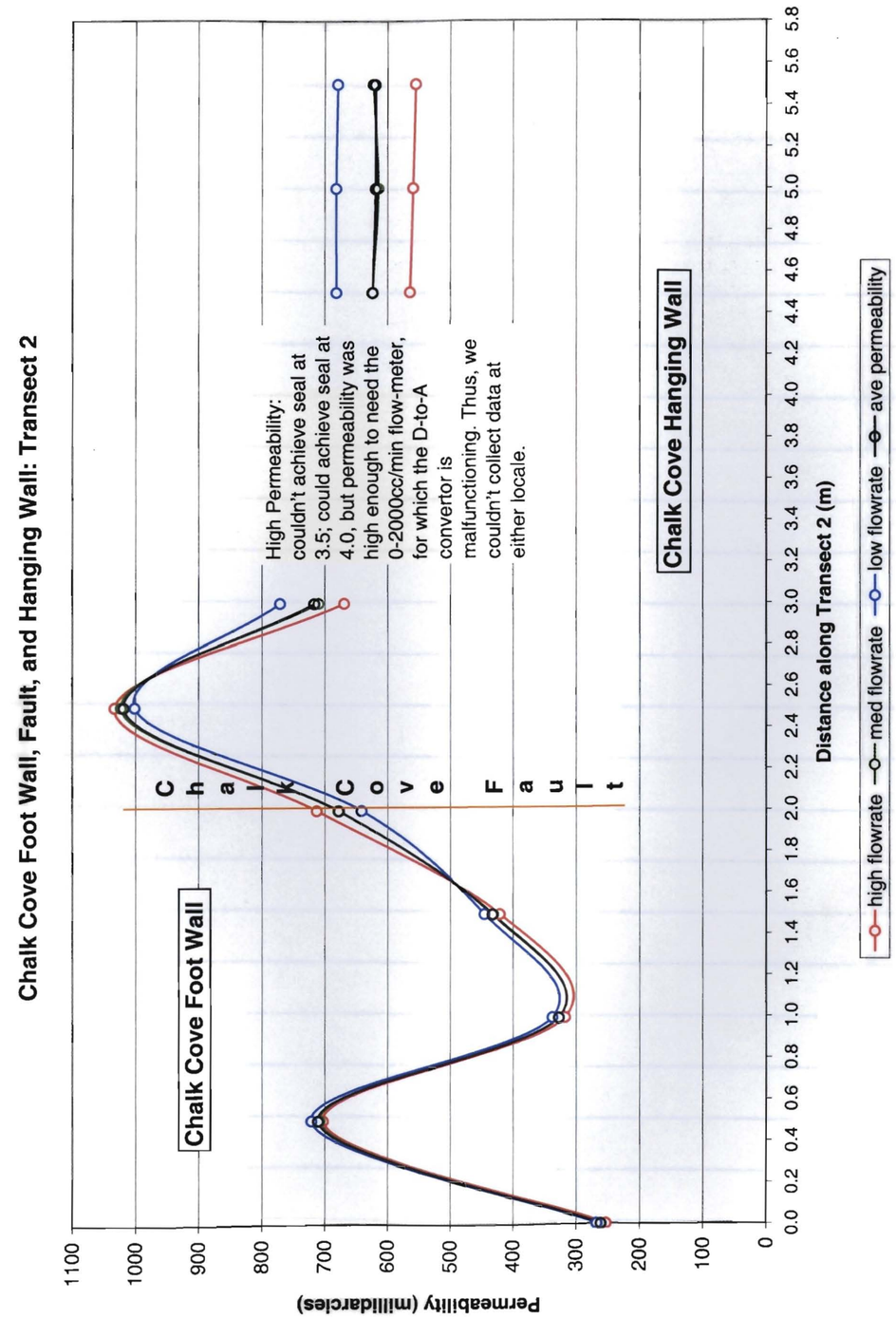
 CC2 data for plot

Location (m)	high flowrate	med flowrate	low flowrate	ave permeability
0.00	253.2674982	261.7023964	267.3904729	260.7867892
0.50	702.5821836	708.0711360	720.9341850	710.5291682
1.00	317.2570691	327.0676392	337.2560716	327.1935933
1.50	420.7267108	431.3484772	445.2380131	432.4377337
2.00	712.4511698	678.5866129	640.8505169	677.2960999
2.50	1032.652504	1023.008359	1001.021270	1018.894044
3.00	668.9406709	709.9085560	770.8932332	716.5808200
3.50				
4.00				
4.50	564.3513043	624.1810909	681.5218894	623.3514282
5.00	559.6014364	614.4926563	681.6507319	618.5816082
5.50	555.1670838	622.4664040	679.3767658	619.0034179

No Data Collected Here

CC2 data for plot on page 69 of this SN.

CLD, 07/02/02



10 data locations; triplicate measurements

CLD, 07/02/02

Data from Crossing Faults/Crucifix Site - Transect 1

All times were recorded as Central Daylight Savings Time, though data was actually collected in the Pacific Time Zone. The difference is two hours: Data reportedly collected at 7:51:40 PM CDT, was actually collected at 5:51:40 PM PDT, and so on.

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.-010	CF	CF1.-010	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected								
No Data Collected								
No Data Collected								

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.-012	CF	CF1.-012	inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	34	1	0.0181			
Note: Same location as CF3.-012 (see page 90) CLD, 07/09/02								
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/26/02	7:51:40 PM	13.40	12.6	500.3	45.31	385.1782	1	1
6/26/02	7:53:20 PM	13.22	12.6	402.1	45.28	402.1978	1	2
6/26/02	7:54:49 PM	13.04	12.6	301.7	45.25	428.1710	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.025.xls	CF	CF1.025		0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected								
No Data Collected								
No Data Collected								

CLD, 07/03/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.072	CF	CF1.072	4.1 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected								
No Data Collected								
No Data Collected								

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.129	CF	CF1.129	4.1 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected								
No Data Collected								
No Data Collected								

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.170	CF	CF1.170	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/25/02	3:32:27 PM	13.12	12.63	500.4	38.36	616.6329	1	1
6/25/02	3:34:10 PM	13.01	12.63	398.3	38.53	635.9579	1	2
6/25/02	3:37:11 PM	12.93	12.63	334.6	38.83	679.4874	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.205	CF	CF1.205	3.8 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/25/02	4:03:16 PM	13.96	12.63	500.2	41.16	221.8928	1	1
6/25/02	4:04:07 PM	13.66	12.63	402.0	41.22	232.9436	1	2
6/25/02	4:06:34 PM	13.37	12.63	299.7	41.37	244.5352	1	3

CLD, 07/03/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.270	CF	CF1.270	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected								
No Data Collected	Had been CF1.297 before tape was re-draped. See pages							
No Data Collected	45 and 48 of this SN -CLD, 05/26/06							

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.325	CF	CF1.325	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/25/02	5:14:17 PM	13.40	12.63	501.2	43.69	395.4559	1	1
6/25/02	5:14:59 PM	13.22	12.63	401.0	43.69	415.7993	1	2
6/25/02	5:16:08 PM	13.05	12.63	297.0	43.67	435.4483	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.365	CF	CF1.365	4.0 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/25/02	5:36:23 PM	13.49	12.63	500.1	43.35	351.6987	1	1
6/25/02	5:38:19 PM	13.28	12.63	397.4	43.33	372.7393	1	2
6/25/02	5:39:42 PM	13.11	12.63	304.4	43.32	389.1699	1	3

CLD, 07/03/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.377	CF1 left crossing fault	CF1.377	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	34	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/26/02	7:33:43 PM	12.94	12.6	499.5	45.22	920.8893	1	1
6/26/02	7:35:07 PM	12.91	12.6	458.4	45.25	928.0794	1	2
6/26/02	7:36:07 PM	12.93	12.6	479.5	45.26	911.2765	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.382	CF1 left crossing fault	CF1.382	3.8 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	34	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected								
No Data Collected								
No Data Collected								

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.384	CF1 left crossing fault	CF1.384	4.1 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	34	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected								
No Data Collected								
No Data Collected								

CLD, 07/03/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.556	CF	CF1.556	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected-Very Fractured								
No Data Collected-Very Fractured								
No Data Collected-Very Fractured								

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.570	CF	CF1.570	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/25/02	7:53:06 PM	13.47	12.61	497.0	49.06	357.8639	1	1
6/25/02	7:53:48 PM	13.29	12.61	400.9	49.07	367.6279	1	2
6/25/02	7:55:17 PM	13.10	12.61	296.9	49.09	380.6449	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.610	CF	CF1.610	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	29	1	0.0179			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/26/02	12:22:14 PM	39.65	12.64	499.7	32.62	5.468917	1	1
6/26/02	12:25:56 PM	34.86	12.64	398.5	32.89	5.841297	1	2
6/26/02	12:29:22 PM	30.22	12.64	300.6	33.08	6.175983	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.650	CF	CF1.650.xls	3.8 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	29	1	0.0179			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/26/02	12:53:47 PM	14.51	12.64	498.0	34.09	152.3479	1	1
6/26/02	12:54:42 PM	14.11	12.64	401.9	34.15	158.7743	1	2
6/26/02	12:55:44 PM	13.71	12.64	297.8	34.18	164.0990	1	3

CLD, 07/03/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.700	CF	CF1.700	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	32	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/26/02	1:24:22 PM	14.56	12.64	499.1	35.42	148.4363	1	1
6/26/02	1:25:30 PM	14.13	12.64	400.6	35.49	156.0262	1	2
6/26/02	1:26:34 PM	13.73	12.64	299.4	35.54	161.8478	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.750	CF	CF1.750	3.8 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	32	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/26/02	1:41:40 PM	18.84	12.64	499.9	36.5	39.9206	1	1
6/26/02	1:43:09 PM	17.54	12.64	400.8	36.56	42.25099	1	2
6/26/02	1:44:28 PM	16.25	12.64	298.8	36.6	44.66902	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.803	CF	CF1.803	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	32	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/26/02	2:06:50 PM	14.49	12.64	500.6	37.16	155.7882	1	1
6/26/02	2:08:33 PM	14.07	12.64	399.9	37.16	163.5335	1	2
6/26/02	2:11:06 PM	13.68	12.64	300	37.15	171.1801	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.850	CF	CF1.850	3.8 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	32	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/26/02	2:26:13 PM	15.19	12.64	497.7	37.25	109.5735	1	1
6/26/02	2:28:04 PM	14.63	12.64	397.7	37.27	114.5082	1	2
6/26/02	2:30:17 PM	14.09	12.64	297.9	37.28	120.0982	1	3

CLD, 07/03/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.900	CF	CF1.900	4.0 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	32	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/26/02	2:50:04 PM	14.70	12.64	499.6	37.76	138.8228	1	1
6/26/02	2:52:20 PM	14.24	12.64	398.5	37.82	145.0331	1	2
6/26/02	2:53:34 PM	13.80	12.64	300.3	37.84	153.2681	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.948	CF	CF1.948	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	32	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/26/02	3:10:32 PM	14.07	12.64	498.2	38.52	204.6249	1	1
6/26/02	3:11:32 PM	13.75	12.64	399.9	38.52	214.1676	1	2
6/26/02	3:13:15 PM	13.44	12.64	299.4	38.53	225.1297	1	3

CLD, 02/21/06 – See page 47 to corroborate

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.961	~~CF2~~ 1 small fault core	~~CF2~~ 1.961	3.8 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	34	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/26/02	5:27:48 PM	19.52	12.61	501.7	40.23	35.60944	1	1
6/26/02	5:29:13 PM	18.02	12.61	400.2	40.15	38.04799	1	2
6/26/02	5:31:21 PM	16.55	12.61	297.8	40.09	40.82786	1	3

CLD, 02/21/06 – see page 47 to corroborate

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.971	~~CF2~~ 1 small fault core	~~CF2~~ 1.971	4.0 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	34	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	~~Position~~ Reading
No Data Collected								CLD, 07/09/02
No Data Collected								
No Data Collected								

high - out of range due to A-D converter

CLD, 07/03/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.1000	CF	CF1.1000	4.0 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	32	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/26/02	3:39:10 PM	13.52	12.64	500.0	39.18	341.4547	1	1
6/26/02	3:40:48 PM	13.32	12.64	400.1	39.21	356.3528	1	2
6/26/02	3:42:15 PM	13.13	12.64	300.4	39.24	374.0730	1	3

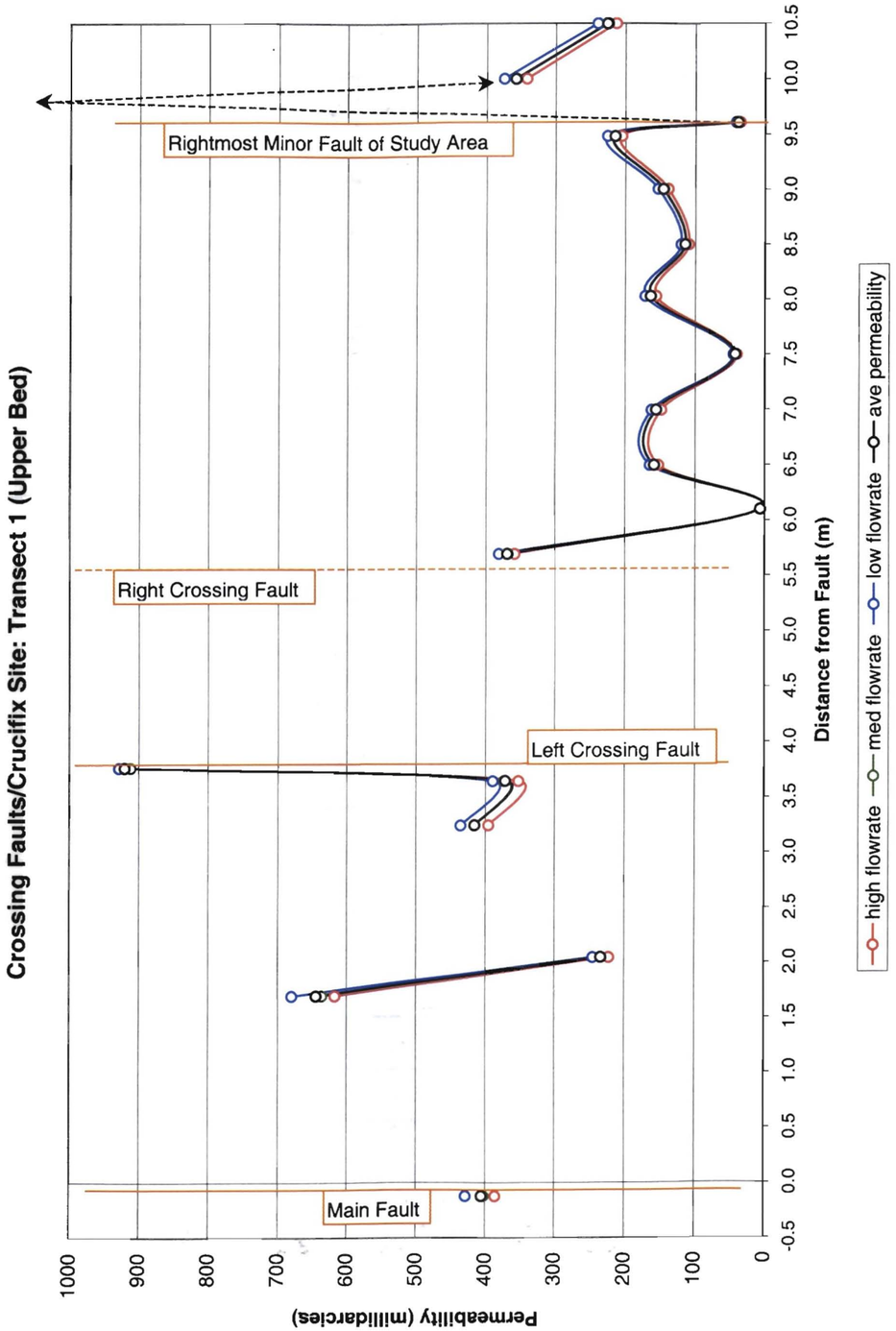
Location (m)	high flowrate	med flowrate	low flowrate	ave permeability
-0.12	385.17818605	402.19784657	428.17103425	405.18235562
0.25				
0.72				
1.29				
1.70	616.63291385	635.95792547	679.48740805	644.02608246
2.05	221.89282053	232.94355199	244.53517078	233.12384777
2.70				
3.25	395.45590813	415.79926070	435.44832013	415.56782965
3.65	351.69870247	372.73929525	389.16988829	371.20262867
3.77	920.88929744	911.27649775	928.07938847	920.08172789
5.56				
5.70	357.86390947	367.62785613	380.64491529	368.71222696
6.10	5.46891708	5.84129661	6.17598342	5.82873237
6.50	152.34785378	158.77427592	164.09900756	158.40704575
7.00	148.43629843	156.02619221	161.84777544	155.43675536
7.50	39.92059738	42.25098740	44.66901858	42.28020112
8.03	155.78816691	163.53345895	171.18006092	163.50056226
8.50	109.57345598	114.50816860	120.09823556	114.72662005
9.00	138.82283133	145.03308791	153.26812423	145.70801449
9.48	204.62489845	214.16757257	225.12972330	214.64073144
9.61	35.60943834	38.04799001	40.82786364	38.16176400
9.71				
10.00	341.45471900	356.35281744	374.07302499	357.29352048
10.50	212.84406421	224.13706774	239.40272263	225.46128486

Crossing Fault, Transect 1 Data: For plot on page 78 of this SN. That is: CF1 data.

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.1050	CF	CF1.1050	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	32	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/26/02	4:05:33 PM	14.03	12.64	501.0	39.74	212.8441	1	1
6/26/02	4:07:49 PM	13.71	12.64	401.2	39.78	224.1371	1	2
6/26/02	4:17:29 PM	13.40	12.64	300.6	39.98	239.4027	1	1

The above is an authorized entry to this SN 526, made by me, CLD, on 07/10/02.

CLD, 07/08/02



Solid orange lines are meant to be centered on nearest points - Blame microsoft. CLD, 07/08/02

CLD, 07/08/02

Data from Crossing Faults / Crucifix Site - Transect 2.

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.000	CF	CF2.000	3.6 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/25/02	2:19:06 PM	13.40	12.64	499.8	34.88	389.9062	1	1
6/25/02	2:20:33 PM	13.23	12.64	401.8	34.86	406.3982	1	2
6/25/02	2:22:04 PM	13.06	12.64	299.0	34.85	427.6268	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.050	CF	CF2.050		0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected								
No Data Collected		Seal achieved, but high k was out of range of 500 cc/min flowmeter						
No Data Collected								

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.108	CF	CF2.108	3.6 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected								
No Data Collected		Seal achieved, but high k was out of range of 500 cc/min flowmeter						
No Data Collected								

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.150	CF	CF2.150	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/25/02	3:19:11 PM	13.18	12.63	496.8	37.35	542.3792	1	1
6/25/02	3:21:20 PM	13.05	12.63	401.5	37.50	577.1958	1	2
6/25/02	3:22:47 PM	12.92	12.63	297.7	37.59	623.1572	1	3

CLD, 07/08/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.195	CF	CF2.195		0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected								
No Data Collected		Minor fault 6 inches away; fill material highly friable--high k, poor seal						
No Data Collected								

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.230	CF	CF2.230	4.0 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/25/02	4:14:10 PM	14.37	12.63	500.2	41.91	167.4308	1	1
6/25/02	4:16:45 PM	13.95	12.63	394.5	42.08	176.9120	1	2
6/25/02	4:17:43 PM	13.59	12.63	299.8	42.13	187.4285	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.250	CF	CF2.250	3.8 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/25/02	5:04:56 PM	13.18	12.63	497.7	43.81	554.6683	1	1
6/25/02	5:06:10 PM	13.05	12.63	399.8	43.81	586.4282	1	2
6/25/02	5:07:13 PM	12.93	12.63	298.6	43.78	616.0032	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.300	CF	CF2.300	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/25/02	4:37:59 PM	12.97	12.63	500.0	43.12	906.8196	1	1
6/25/02	4:39:10 PM	12.95	12.63	469.9	43.18	906.3733	1	2
6/25/02	4:40:20 PM	12.93	12.63	445.5	43.21	917.4005	1	3

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Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.350	CF	CF2.350	3.8 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	38	1	0.0182			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/25/02	5:23:10 PM	27.86	12.63	500.6	43.61	12.83469	1	1
6/25/02	5:25:38 PM	24.52	12.63	399.7	43.56	14.30432	1	2
6/25/02	5:28:19 PM	21.12	12.63	297.0	43.53	16.38353	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.432	CF Fault Core	CF2.432	4.1 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/25/02	6:12:51 PM	14.28	12.61	498.7	42.75	175.8365	1	1
6/25/02	6:13:57 PM	13.90	12.61	398.7	42.73	184.5849	1	2
6/25/02	6:17:05 PM	13.54	12.61	298.0	42.67	193.9673	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.485	CF Fault Core Ash Deposit	CF2.485	4.1 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/25/02	6:53:48 PM	13.94	12.61	497.7	44.38	224.3178	1	1
6/25/02	6:54:41 PM	13.64	12.61	400.8	44.52	236.0288	1	2
6/25/02	6:55:52 PM	13.33	12.61	298.5	44.68	254.6035	1	3

We could not collect data from either the upper or lower bed of interest within the fault core. Instead, the only material that would hang together within the core were the ash deposits of the interbed layer between the upper and lower transects (i.e. Transect 1 and 2). These data are considered within Transect 2 based upon their position, rather than based upon the type of material.

CLD, 07/08/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.525	CF	CF2.525	4.1 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/25/02	7:17:39 PM	13.22	12.61	498.3	46.78	507.1304	1	1
6/25/02	7:19:11 PM	13.09	12.61	394.4	46.95	512.9515	1	2
6/25/02	7:21:03 PM	12.96	12.61	299.4	47.12	537.0286	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.556	CF	CF2.556		0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected								
No Data Collected		Lots of fractures						
No Data Collected								

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.575	CF	CF2.575	3.7 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	35	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/25/02	7:45:15 PM	13.78	12.61	497.9	48.98	260.3614	1	1
6/25/02	7:46:19 PM	13.51	12.61	401.9	49.01	276.0594	1	2
6/25/02	7:47:38 PM	13.26	12.61	300.8	49.01	288.8472	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.585	CF	CF2.585	3.8 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	29	1	0.0179			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/26/02	11:47:22 AM	13.45	12.64	500.2	29.49	362.1183	1	1
6/26/02	11:48:59 AM	13.27	12.64	400.0	29.71	375.1748	1	2
6/26/02	11:51:04 AM	13.11	12.64	301.3	29.95	381.4606	1	3

CLD, 07/08/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.627	CF	CF2.627	3.8 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	29	1	0.0179			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/26/02	12:42:14 PM	16.26	12.64	499.6	33.68	74.07206	1	1
6/26/02	12:44:49 PM	15.49	12.64	400.5	33.77	77.50928	1	2
6/26/02	12:47:19 PM	14.75	12.64	299.6	33.85	80.45376	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.675	CF	CF2.675	3.8 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	32	1	0.0180			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/26/02	1:13:28 PM	13.43	12.64	500.1	34.86	376.4631	1	1
6/26/02	1:15:02 PM	13.25	12.64	401.3	34.92	394.0266	1	2
6/26/02	1:16:16 PM	13.09	12.64	298.8	35.00	400.2758	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.725	CF	CF2.725	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	32	1	0.0180			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/26/02	1:31:20 PM	15.68	12.64	498.5	35.82	90.0500	1	1
6/26/02	1:33:41 PM	15.02	12.64	400.5	35.96	94.6576	1	2
6/26/02	1:35:19 PM	14.38	12.64	299.0	36.06	98.9827	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.775	CF	CF2.775	4.0 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	32	1	0.0180			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/26/02	1:52:48 PM	13.33	12.64	500.3	37.04	435.9198	1	1
6/26/02	1:54:57 PM	13.18	12.64	399.0	37.05	446.8215	1	2
6/26/02	1:57:33 PM	13.03	12.64	300.7	37.07	469.0100	1	3

CLD, 07/08/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.824	CF	CF2.824	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	32	1	0.0180			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/26/02	2:16:21 PM	15.61	12.64	499.3	37.16	92.9505	1	1
6/26/02	2:18:07 PM	14.96	12.64	398.6	37.16	97.2311	1	2
6/26/02	2:20:01 PM	14.34	12.64	299.6	37.18	102.0338	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.875	CF	CF2.875	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	32	1	0.0180			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/26/02	2:39:58 PM	14.13	12.64	498.9	37.47	195.5590	1	1
6/26/02	2:41:51 PM	13.79	12.64	398.9	37.50	205.2153	1	2
6/26/02	2:42:46 PM	13.47	12.64	299.8	37.52	216.3293	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.925	CF	CF2.925	3.8 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	32	1	0.0180			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/26/02	2:59:23 PM	14.16	12.64	499.0	38.01	191.8560	1	1
6/26/02	3:00:20 PM	13.81	12.64	399.2	38.01	202.0377	1	2
6/26/02	3:01:16 PM	13.49	12.64	301.6	38.06	212.7004	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.955	CF2 left of small fault	CF2.955	4.0 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	34	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/26/02	5:16:11 PM	15.70	12.61	500.7	40.62	90.3086	1	1
6/26/02	5:17:36 PM	15.03	12.61	400.3	40.59	94.4149	1	2
6/26/02	5:19:05 PM	14.38	12.61	301.8	40.52	99.6575	1	3

CLD, 07/08/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.970	CF2 small fault core	CF2.970	4.1 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	34	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/26/02	5:07:22 PM	16.98	12.61	499.2	40.68	60.9230	1	1
6/26/02	5:09:05 PM	16.03	12.61	399.5	40.68	64.3651	1	2
6/26/02	5:10:12 PM	15.13	12.61	302.4	40.66	68.2622	1	3

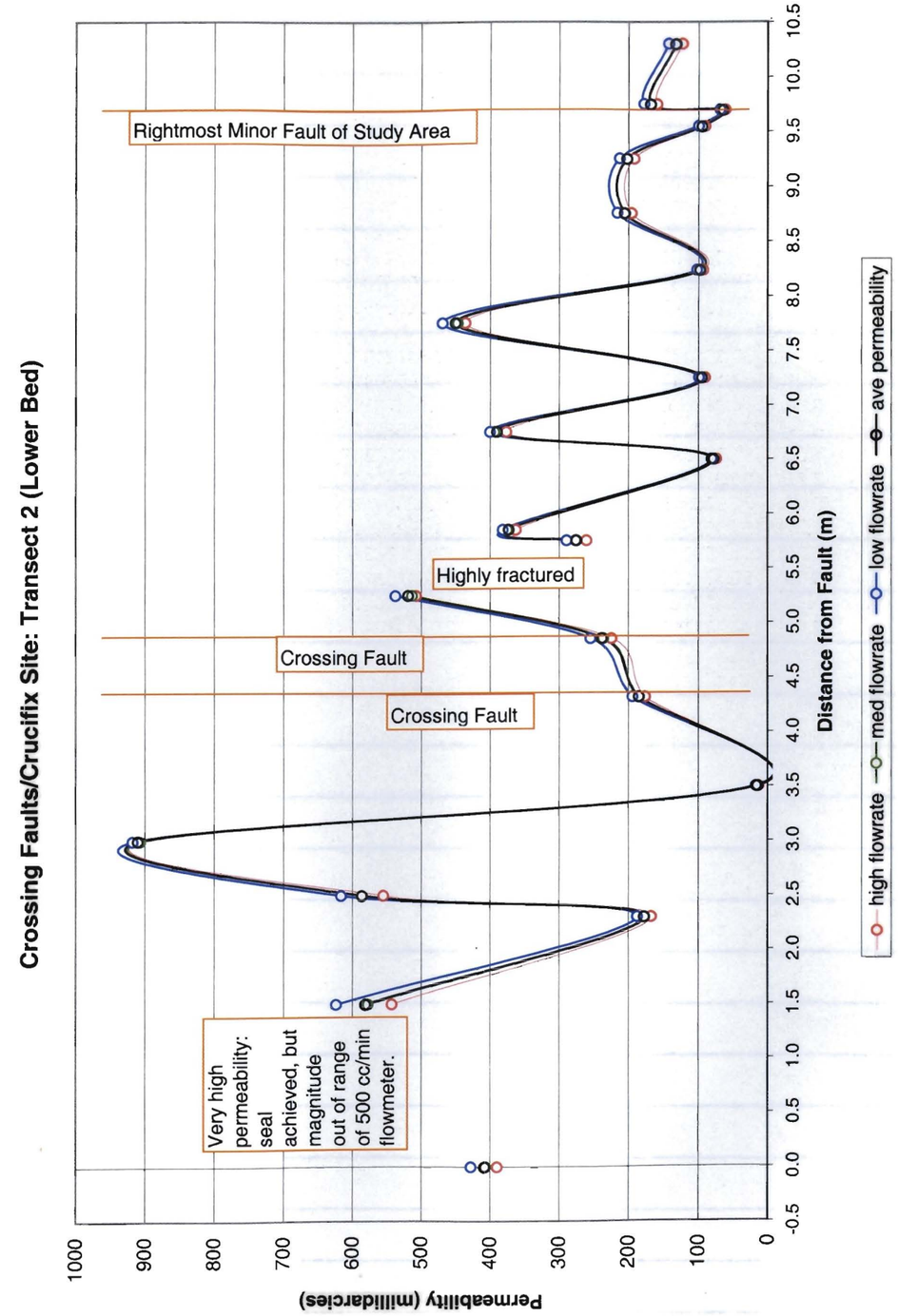
Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.975	CF	CF2.975	3.7 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	32	1	0.0180			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/26/02	3:28:27 PM	14.45	12.64	498.2	38.86	159.5712	1	1
6/26/02	3:31:17 PM	14.04	12.64	400.0	38.92	168.2162	1	2
6/26/02	3:32:57 PM	13.65	12.64	300.3	38.98	177.6841	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.1030	CF	CF2.1030	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	32	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/26/02	3:52:55 PM	14.96	12.64	499.7	39.68	122.8827	1	1
6/26/02	3:54:32 PM	14.40	12.64	398.1	39.68	131.7198	1	2
6/26/02	3:55:54 PM	13.89	12.64	300.4	39.68	142.6366	1	3

CLD, 07/08/02

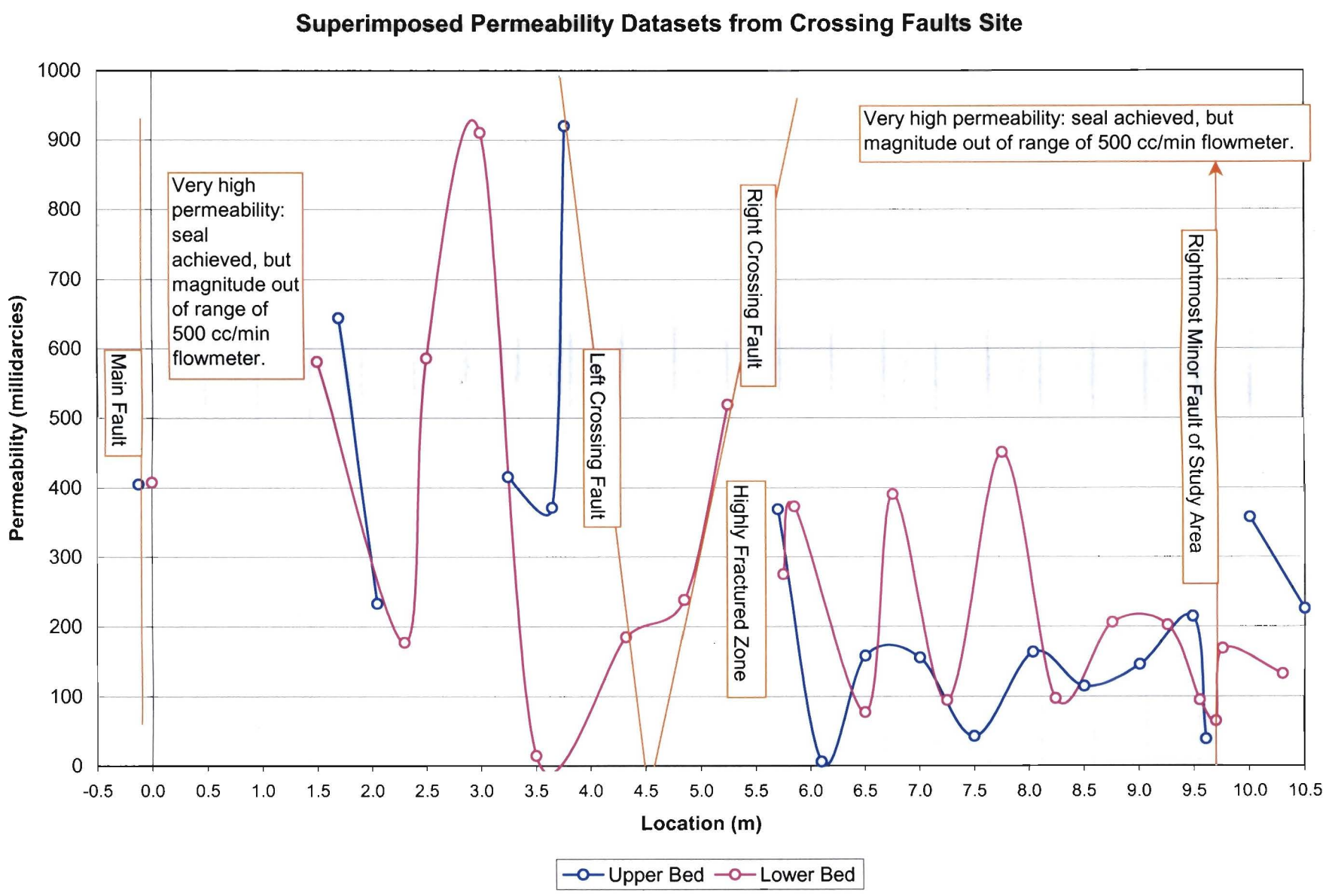
Location (m)	high flowrate	med flowrate	low flowrate	ave permeability	
0.00	389.90618942	406.39816474	427.62680275	407.97705230	
0.50					High k, out of range
1.08					
1.50	542.37915815	577.19575256	623.15723655	580.91071575	
2.30	167.43083804	176.91195683	187.42852414	177.25710634	
2.50	554.66827368	586.42821676	616.00319390	585.69989478	
3.00	906.81958595	906.37327594	917.40047716	910.19777968	
3.50	12.83468980	14.30431675	16.38352990	14.50751215	
4.32	175.83645162	184.58487550	193.96725710	184.79619474	
4.85	224.31782276	236.02877743	254.60349617	238.31669879	
5.25	507.13042708	512.95150943	537.02859597	519.03684416	
5.56					Highly fractured
5.75	260.36138126	276.05935377	288.84721825	275.08931776	
5.85	362.11834343	375.17475386	381.46060470	372.91790066	
6.50	74.07206014	77.50928412	80.45375588	77.34503338	
6.75	376.46308687	394.02660502	400.27581219	390.25516803	
7.25	90.04999896	94.65761196	98.98268947	94.56343346	
7.75	435.91980539	446.82147654	469.00999542	450.58375912	
8.24	92.95051678	97.23113861	102.03380466	97.40515335	
8.75	195.55896151	205.21534882	216.32934514	205.70121849	
9.25	191.85604630	202.03765601	212.70035026	202.19801752	
9.55	90.30863247	94.41493023	99.65751176	94.79369149	
9.70	60.92299568	64.36514316	68.26218454	64.51677446	
9.75	159.57116322	168.21623905	177.68414038	168.49051422	
10.30	122.88266281	131.71982764	142.63660607	132.41303217	

CLD, 07/08/02

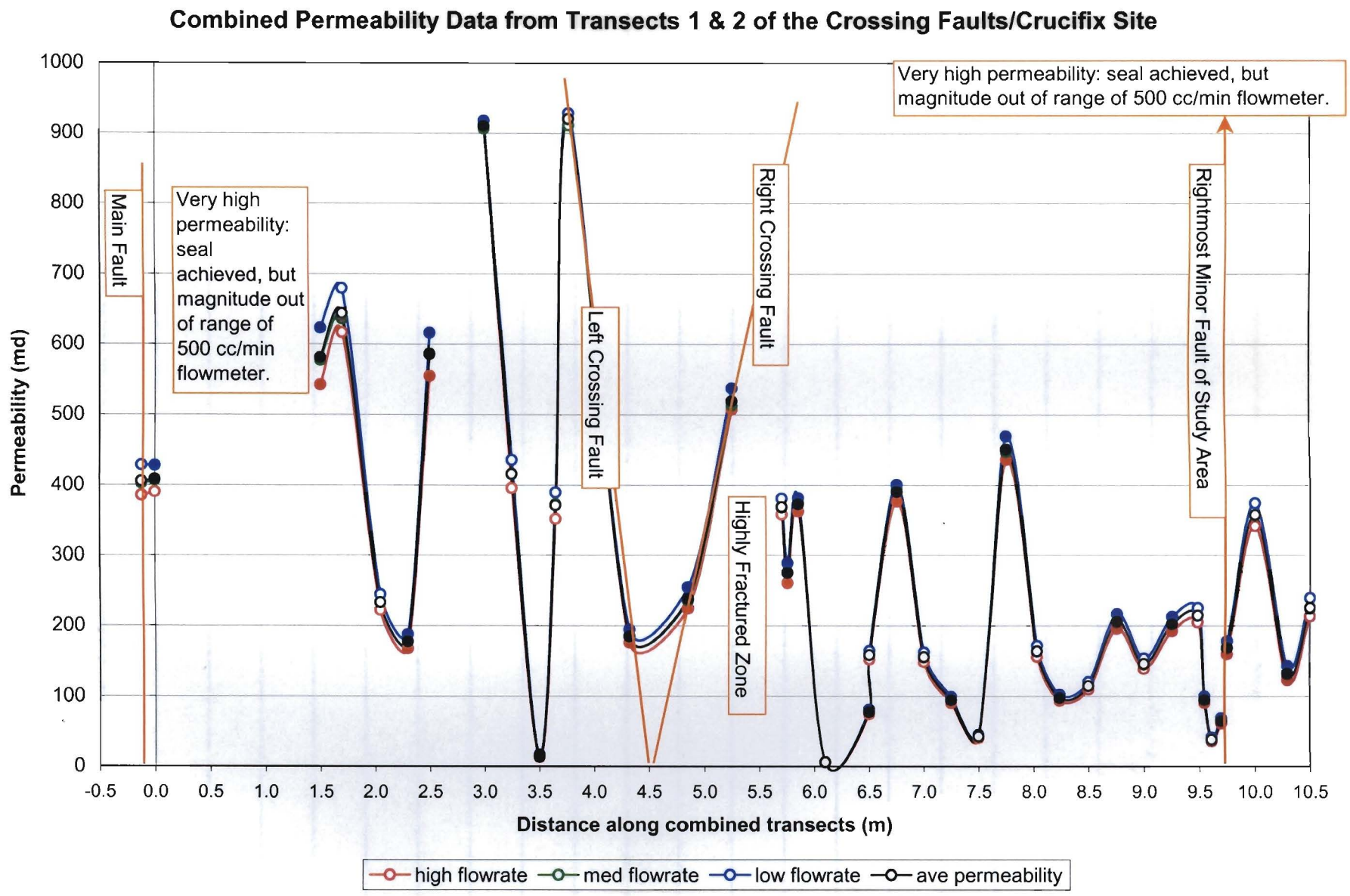


Orange lines are meant to be centered on nearest points - blame microsoft. CLD, 07/08/02

CLD, 07/08/02



CLD, 07/08/02



Open Circles indicate Upper bed (CF1), while Filled Circles indicate Lower Bed (CF2)
CLD, 07/08/02

Data from Crossing Faults / Concidix Site - CF3 ~ a vertical profile

All times were recorded as Central Daylight Savings Time, though data was actually collected in the Pacific Time Zone. The difference is two hours: Data reportedly collected at 7:51:40 PM CDT, was actually collected at 5:51:40 PM PDT, and so on.

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF3.-012	CF3 vertical profile major fault	CF3.-012	inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	34	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/26/02	7:51:40 PM	13.40	12.6	500.3	45.31	385.1782	1	1
6/26/02	7:53:20 PM	13.22	12.6	402.1	45.28	402.1978	1	2
6/26/02	7:54:49 PM	13.04	12.6	301.7	45.25	428.1710	1	3

Note that the above data are also that of CF1.-012. CLD, 07/09/02 (pg 70)

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF3.190	CF3 vertical profile major fault	CF3.190	4.0 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	34	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected								
No Data Collected								
No Data Collected								

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF3.205	CF3 vertical profile major fault	CF3.205	4.3 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	34	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
6/26/02	8:19:53 PM	12.94	12.6	500.4	44.46	920.3459	1	1
6/26/02	8:23:07 PM	12.92	12.6	479.7	44.23	937.4714	1	2
6/26/02	8:29:08 PM	12.93	12.6	491.7	43.77	930.0888	1	3

CLD, 07/09/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF3.215	CF3 vertical profile major fault	CF3.215	4.3 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	34	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected								
No Data Collected								
No Data Collected								

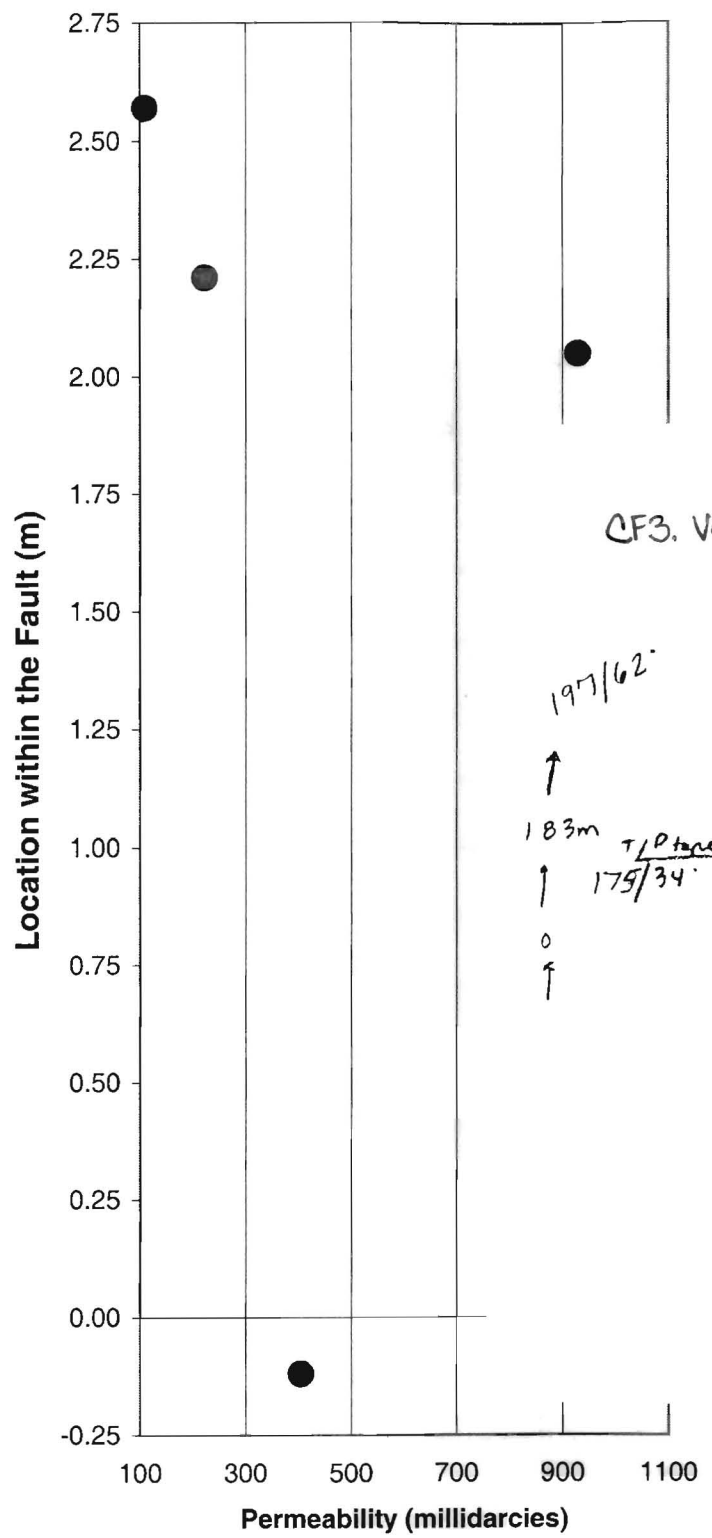
Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF3.221	CF3 vertical profile major fault	CF3.221	3.8 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	34	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	~~Position~~ Reading CLD, 07/09/02
6/26/02	8:46:19 PM	14.02	12.6	499.7	42.45	209.7920	1	1
6/26/02	8:48:14 PM	13.69	12.6	400.9	42.30	221.9159	1	2
6/26/02	8:49:19 PM	13.38	12.6	301.4	42.24	235.8829	1	3

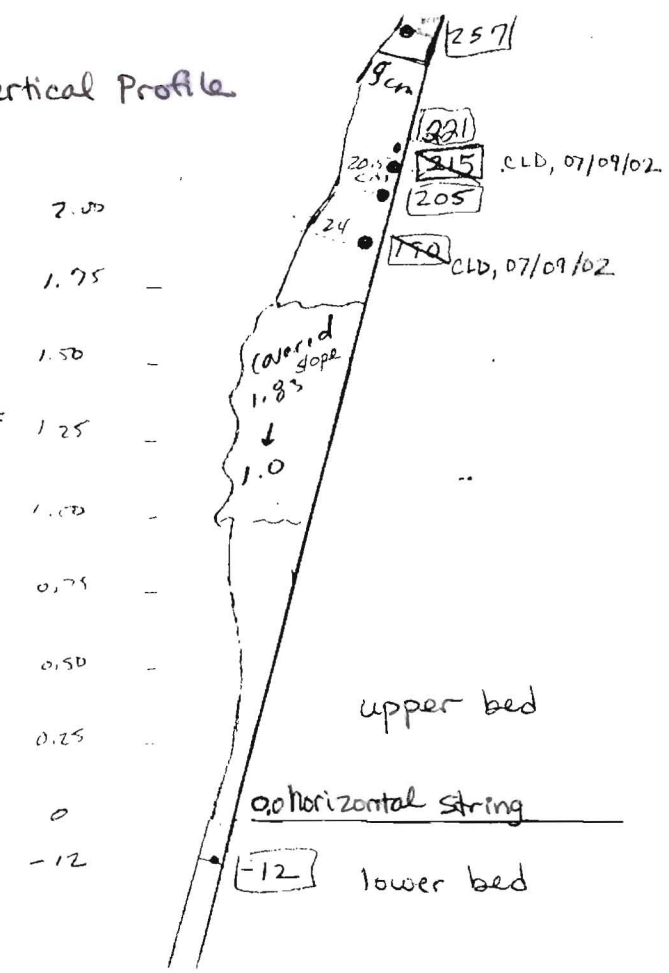
Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF3.257	CF3 vertical profile major fault	CF3.257	3.9 inches	0.7 inch		CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	34	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	~~Position~~ Reading CLD, 07/09/02
6/26/02	8:56:13 PM	15.37	12.6	498.8	41.71	101.9320	1	1
6/26/02	8:57:23 PM	14.75	12.6	402.5	41.62	108.3433	1	2
6/26/02	8:58:41 PM	14.14	12.6	302.8	41.54	116.3578	1	3

CLD, 07/09/02

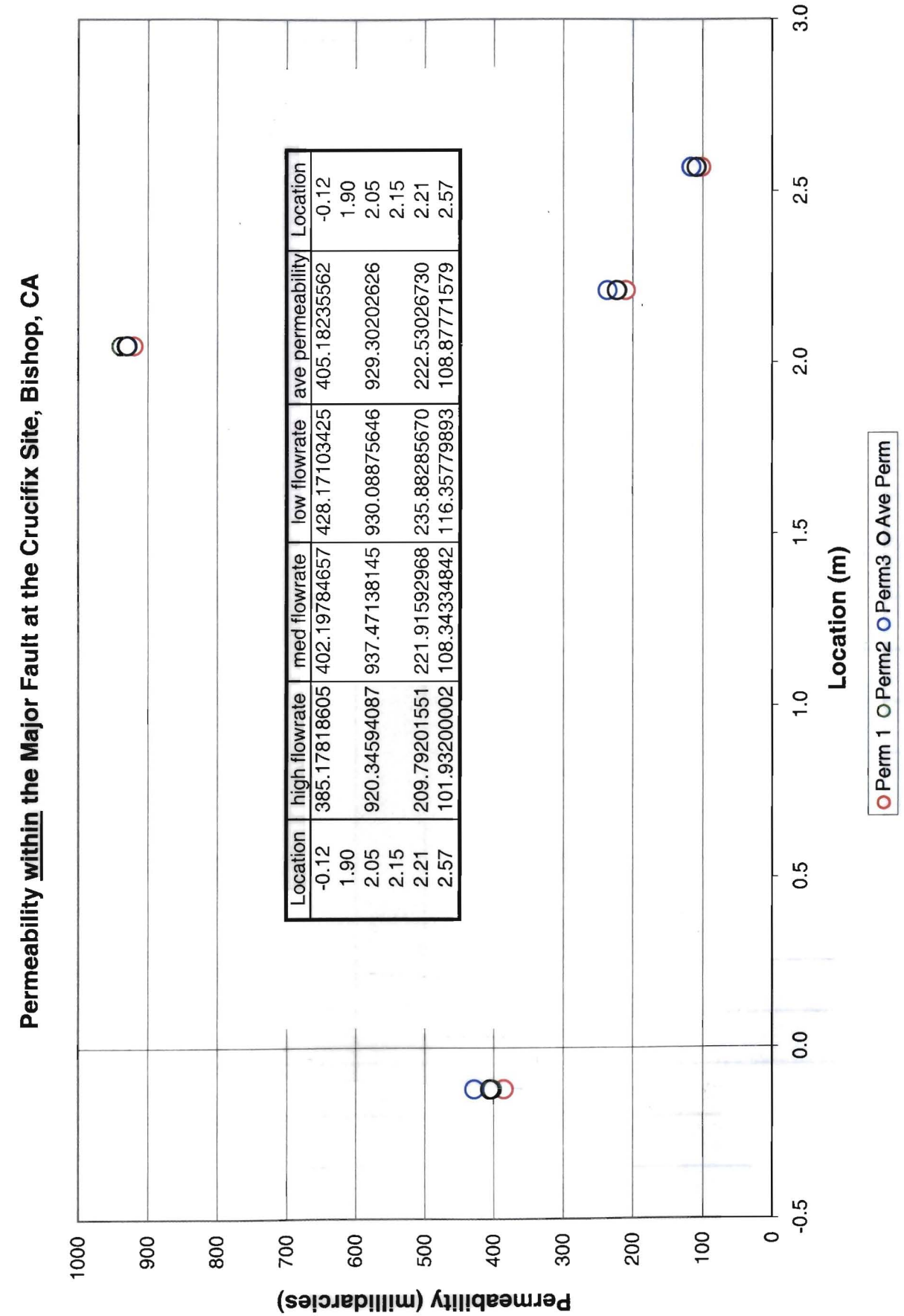
Average

Permeability in Major Fault at the Crucifix Site, Bishop, CA





CLD, 07/09/02



Location	high flowrate	med flowrate	low flowrate	ave permeability	Location
-0.12	385.17818605	402.19784657	428.17103425	405.18235562	-0.12
1.90					1.90
2.05	920.34594087	937.47138145	930.08875646	929.30202626	2.05
2.15					2.15
2.21	209.79201551	221.91592968	235.88285670	222.53026730	2.21
2.57	101.93200002	108.34334842	116.35779893	108.87771579	2.57

07/09/02

Hydraulic Conductivity data were collected at the Chalk Cove Transect 2 (CC2) site on June ~~26~~ 24, 2002, using a Guelph Permeameter device. Three locations were tested on June 24 at this site: CC2.GP1, CC2.GP2, and CC2.GP3. With respect to the CC2 transect, these are located at 1.00 m (footwall), 2.00 m (fault gouge), & 3.55 m (hanging wall). GPS coordinates are also provided.

CLD, 07/09/02

Positions from Garmin GPS, Bishop, CA June 2002 UTM Zone 11 NAD83				
Unit: Garmin GPS III Plus s/n 92138269				
These positions are only as accurate as the Garmin allows.				
Chalk Cove Hanging Wall (CCHW1)				
	Easting	**Northing**	**Transect Location**	
CCHW1.000	367811	4141275	0.00 m	see page 40
CCHW1.300a	367805	4141274	3.00a m	
CCHW1.300b	367806	4141260	3.00b m	
CCHW1.580	367808	4141263	5.80 m	
Guelph Points near CCHW1				
	Easting	**Northing**	**Transect Location**	
Pt. 1 (CCHW1.G1)	367811	4141269	1.70 m	see page 98
Pt. 2 (CCHW1.G2)	367811	4141269	1.50 m	
Pt. 3 (CCHW1.G3)	367808	4141270	1.00 m	
Pt. 4 (CCHW1.G4)	367802	4141271	5.80 m	see page 40
Pt. 5 (CCHW1.G5)	367802	4141266	2.10 m	
Cliff Above Chalk Cove (Incl. Guelph Pts.)				
	Easting	**Northing**	**Transect Location**	
CC2.GP1	367818	4141282	1.00 m	see page 44
CC2.GP2	367819	4141280	2.00 m	
CC2.GP3	367815	4141280	3.55 m	
Crossing Fault Transects & Vertical Profile				
	Easting	**Northing**	**Transect Location**	
CF2.000	373683	4142223	~0.00 m	see page 92
CF1.1050	373694	4142221	10.50 m	
CF3.257	373681	4142223	2.57 m	CLD, 07/09/02

The following Guelph Permeameter data were collected at CC2:

CLD 10/04/02

See SN by Randall W. Fedors for this info.

CLD, 06/07/04

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CCGouge.200	CC2	CCGouge.200	3.6 inches	0.7 inch		CLD		
Note: This air permeability data was taken in the same location as CC2.GP2; See Page 44.								
Tip OD	Tip ID	Geom. Fact.	Ref. Temp.	Ref. Press.	Viscosity			
(in.)	(in.)		(°C)	(atm.)	(cp)			
0.7	0.7	9.49	38.5	1	0.0182			
Date	Time	Flow Press	Atm. Press	Flow Rate	Temp.	Perm.	Sample	Reading
		(psia)	(psia)	(cc/min)	(°C)	(md)		
6/24/02	4:03:02 PM	13.34	12.55	496.7	45.25	385.3212	1	1
6/24/02	4:04:04 PM	13.14	12.55	396.2	45.14	414.6065	1	2
6/24/02	4:05:35 PM	12.94	12.55	302.2	44.97	481.9098	1	3

CCGouge.200 should be compared with CC2.GP2; CC2.200 is a less relevant comparison for CC2.GP2 when comparing air permeability to water permeability.

CLD, 10/04/02

Reserved for Guelph Permeameter Data

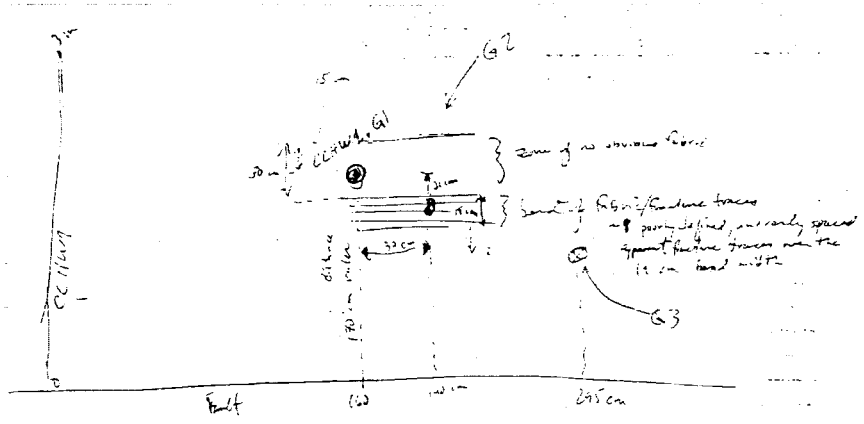
CLD, 10/04/02

CLD, 06/07/04

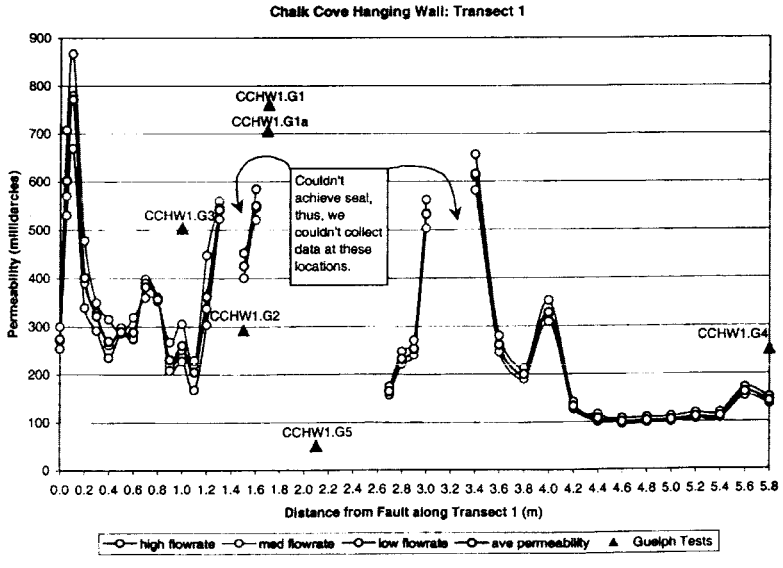
Reserved for Guelph Permeameter Data: CLD, 10/04/02

see notebook by Randall W. Fedors.

-CLD, 06/07/04



Map of Guelph Permeameter Test Locations at the CCHW1 site.



CLD, 08/05/02

Information potentially subjected to copyright protection was redacted from this location.
The redacted material is a collecting Ph.D Thesis
C.L. Dinwiddie (2001)

Page 99

97% of measured permeability value is obtained from a cylinder with the following non-dimensionalized "dimension".

$L_D = \cancel{17.80} - \cancel{2.75} = \cancel{15.05}$ 18.40 − 2.60 = 15.8 ? CLD, 07/09/02 $\Rightarrow L = L_D \times B = 15.8 \times 0.35 = 5.5''$

$R_D = 8.0 \Rightarrow R = R_D \times B = 8 \times 0.35 = 2.8''$

Measured Volume (97%) $= \pi R^2 L = \pi (2.8)^2 (5.5) = 135.4\ in^3$

Measured Surf. Area Projection $= \pi R^2 = 24.62\ in^2$ CLD, 07/09/02

If measured surface area is approximated by a square centered on the drillhole for the fracture analysis, let the square ~~by~~ CLD, 07/09/02 be 6" x 6" (i.e. 2.8 x 2 = 5.6 ≈ 6.0)

94% of measured permeability value is obtained from a cylinder with the following non-dimensionalized "dimensions":

$L_D = 15.5 - 5.5 = 10.0 \Rightarrow L = L_D \times B = 10.0 \times 0.35 = 3.5''$

$R_D = 4.4 \Rightarrow R = R_D \times B = 4.4 \times 0.35 = 1.5$

Measured Volume (94%) $= \pi R^2 L = \pi (1.5)^2 (3.5) = 24.7\ in^3$

Measured Surf. Area Projection $= \pi R^2 = \pi (1.5)^2 = 7.1\ in^2$

If measured surface area is approximated by a square that is centered on the drillhole for the fracture analysis, let the square be 3" x 3" (i.e. 1.5 x 2 = 3.0)

CLD, 08/05/02

Southwest Research Institute
6220 Culebra Road
San Antonio, TX 78238
(210) 522-5215
Department of Quality Assurance
Calibration Laboratory

Certificate of Calibration

2 July 2002

Issued to:	CYNTHIA DINWIDDIE DIV20 B189
Manufacturer/Model:	VIATRAN 245
Description:	PRESSURE TRANSDUCER
Serial Number:	296929
Asset Number:	009477
Work Order Number:	444049266

This certifies the above item was calibrated in compliance with MIL-STD-45662A and ANSI/NCSL Z540-1-1994. Standards used in this calibration, described in the referenced calibration procedure with associated uncertainties or tolerances, are traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to traceability is on file and is available for examination upon request. This certificate is not to be reproduced, except in full, without the written approval of the Southwest Research Institute Department of Quality Assurance Calibration Laboratory.

The uncertainty of the calibration was sufficient to determine that the item met the manufacturer's published specifications unless stated otherwise below.

Ambient Conditions: Temperature: 68.0 Degrees Fahrenheit Humidity: 39 % RH

Calibration Date: 2 Jul 02 **Calibration Procedure:** CLCP-PI-001 6/99

Condition as Received: OUT OF TOLERANCE

Condition as Returned: OUT OF TOLERANCE

Remarks: DOES NOT MEET MFR'S TOLERANCE OF 0.1%, BUT DOES MEET A TOLERANCE OF 0.25%

Approved by:

Walt Hill, Metrology Group Leader
Institute Calibration Laboratory

Measurements performed by:

Mack Wood, Technician

m:\nona2la.rpt Rev date 8 Jan 01

Previous Cert may be found on page 30 of this SN.

CLD, 08/05/02

SOUTHWEST RESEARCH INSTITUTE

6220 CULEBRA ROAD • POST OFFICE DRAWER 28510 • SAN ANTONIO, TEXAS, 78228-0510 • TEL (210) 522-5215 • FAX (210) 522-3692

OUT OF TOLERANCE

To: Cynthia Dinwiddie, Div 20, B189

From: Walt Hill, Metrology Group Leader
Institute Calibration Laboratory

Date: Jul. 02, 2002

OUT OF TOLERANCE

Subject: Out-of-tolerance Notice

The purpose of this notice is to alert you of a condition, which may have caused erroneous measurements affecting safety or the quality of products or services your organization provides. The attached as-found readings are provided for your evaluation to determine if the instrument listed below had an impact and if further action is required.

When the as-found results are near the specification limit, +/- a margin less than the measurement uncertainty, it is not possible to state in-tolerance or out-of-tolerance with a 95% level of confidence. It is the Institute Calibration Laboratory policy that the client is made aware of this situation because the end-user is taking some of the risk that the instrument listed below may not meet the end-user measurement requirements.

Your review/evaluation should be conducted in accordance with your organizational quality policy and procedural requirements. If we can be of further assistance, please contact the Calibration Laboratory at 522-5215.

Manufacturer: Viatran **Model:** 245

Description: Pressure Transducer **Serial Number:** 296929

Asset Number: 9477 **User ID Number:**

Last Calibration: Jun 11, 2002

Date Received for Service: Jul. 02, 2002 Work Order Number: 444049266

Service Requested: Scheduled calibration

Remarks: Does not meet the manufacturer's tolerance of +/-0.1%, but does meet a tolerance of +/- 0.25%.

OUT OF TOLERANCE

CLD, 08/05/02

SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY

Calibration Data Sheet

Work Order	444048979	Mfr	Viatran	Technician	C. M. Wood
Asset No.	9477	Model	245	Procedure	CLCP-PI-001 6/99
Serial No.	296929	Type	AS FOUND	Cal Date	6/11/02

Remarks: The uncertainty listed below is expanded by a coverage factor of 2 and represents a confidence level of approximately 95%.

This Cal Data also appears on page 31 of this SN

Parameter: Pressure				
Applied Pressure	Indicated Pressure	Error	+/-Tolerance	+/-Uncertainty
PSIA	PSIA	PSIA	PSIA	PSIA
0	0.00	0.00	0.05	0.012
12.5	12.50	0.00	0.05	0.012
25	25.00	0.00	0.05	0.012
37.5	37.50	0.00	0.05	0.012
50	50.00	0.00	0.05	0.012
37.5	37.50	0.00	0.05	0.012
25	24.99	-0.01	0.05	0.012
12.5	12.49	-0.01	0.05	0.012
0	0.00	0.00	0.05	0.012

SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY

Calibration Data Sheet

Work Order	444049266	Mfr	Viatran	Technician	C. M. Wood
Asset No.	9477	Model	245	Procedure	CLCP-PI-001 6/99
Serial No.	296929	Type	AS FOUND	Cal Date	7/2/02

Remarks: The uncertainty listed below is expanded by a coverage factor of 2 and represents a confidence level of approximately 95%.

Parameter: Pressure				
Applied Pressure	Indicated Pressure	Error	+/-Tolerance	+/-Uncertainty
PSIA	PSIA	PSIA	PSIA	PSIA
0	0.02	0.02	0.05	0.012
12.5	12.54	0.04	0.05	0.012
25	25.06	0.06	0.05	0.012
37.5	37.59	0.09	0.05	0.012
50	50.11	0.11	0.05	0.012
37.5	37.60	0.10	0.05	0.012
25	25.07	0.07	0.05	0.012
12.5	12.55	0.05	0.05	0.012
0	0.00	0.00	0.05	0.012

CLD, 08/05/02

Discussion of Drift in Viatran Pressure Transducer & Field Correction

The Viatran pressure transducer is an absolute pressure transducer with a 50-psia full scale, and accuracy of +/- 0.1% of fullscale. It is housed within the Temco MP-401 Mini-Permeameter system, and is known to be prone to drift (personal communication with Mack Wood of SWRI metrology lab). Thus, it is not surprising that upon return from the Bishop, CA fieldwork, it was found to be out of tolerance (page 102 this SN). The amount of acceptable error is best evaluated by the user, and in this particular case, without the field correction, CLD, 08/06/02 soon to be discussed, the transducer did meet a tolerance of +/- 0.25%. Nevertheless, the data collected herein is not in any way in doubt, because of field corrections that were employed. Note the Paroscientific Digital Pressure Gauge 740-45A (Cert & Cal Data on pages 112 & 113 this SN) used to measure absolute pressure (atmospheric) for this fieldwork. This is an entirely seperate instrument from that contained within the Temco system. It operates with a delicate helical quartz crystal and is very sensitive to pressure change. It returned from Bishop, CA and was found to be within the manufacturer's tolerance. This instrument was used daily in the field to calibrate the Viatran Pressure transducer for atmospheric pressure. Thus, when the indicated atmos. press. of the Viatran did not agree with the Paroscientific, the Offset value (see discussion next page) was adjusted until the two measured values did agree, giving a correct, calibrated value prior to the permeability-measurement process. This field-employed correction thus ensured that the Viatran-measured injection pressure was also correctly calibrated. For further discussion, please see page 114 of this SN.

CLD, 08/06/02

Information potentially subjected to copyright protection was redacted from this location.
The redacted material is from
Instruction Manual for Mini-Permeameter
Model MP-401, Page 17
Temco, Inc.

Reference: Instruction Manual for Mini-Permeameter Model MP-401, Temco, Inc. CLD, 08/06/02

SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY
MEMORANDUM

July 12, 2002

To: CYNTHIA DINWIDDIE DIV20 B189

From: Walt Hill, Metrology Group Leader
Institute Calibration Laboratory

Subject: Status of Calibration Supplier

Manufacturer/Model: AALBORG INSTRUMENTS GFM173
Description: FLOW METER
Serial Number: G19416
Asset Number: 009475
Work Order Number: 444049393
Date Calibrated: July 10, 2002
Supplier: RULE PRODUCTS, ROUND ROCK, TX
Remarks: Rule Cert # C-547-2

( ) Supplier is on the Approved Suppliers List (ASL) and is accredited.

( ) Supplier is on the Approved Suppliers List (ASL) but is not accredited.

( ) There is no known accredited supplier at this time.

( ) Supplier is not on the Approved Suppliers List (ASL). Please contact Don Dunavant at ext. 2942 if you wish to add the supplier to the ASL.

Please notify the Institute Calibration Laboratory, extension 5215, of any discrepancies with the item or calibration documentation.

Attachment(s) 1

m:\nonasl2.rpt Rev 7 Dec 01

CLD, 08/05/02

RULE PRODUCTS

CALIBRATION REPORT

C-547-2

Date: 7/10/02
Customer Information:
Southwest Research

Device Type:
MFM

Rated Accuracy
2% Full Scale

Model #	Serial #
GFM173	G19416

Std. Temp.: 70 F
Std. Pressure: 29.92
Gas: Air
Ref. Gas: Air K factor 1
Range: 500 SCCM
Inlet Pressure: AS REQUIRED
Ambient Pressure: 29.035
%RH: 32%
Ambient Temp.: 68 F
Cal. STD.: PRIMARY TUBES
Model #: B924
Serial #: 680
Cal. Method #: 103

CALIBRATION DATA

READ	ACT.	TOL(SCCM)
0.0	0.0	0.00
127.00	118.00	10.00
271.00	277.00	10.00
382.00	374.00	10.00
489.00	481.00	10.00

Recived in spec. x
Out of spec.

Cal. performed by:
Title: CAL. TECH.

NOTES:

All Calibrations are NIST traceable.
Uncertainty is .2 %
This report shall not be reproduced except in full without written approval by Rule.

Page 1 of 1

Previous Cal Report located on page 38 of this SN, dated 06/11/02.

1100 N. INDUSTRIAL BLVD., BLDG. 3 · ROUND ROCK, TX 78681 · 512-218-4701 · FAX 512-218-9867

CLD 08/05/02

SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY
MEMORANDUM

July 12, 2002

To: CYNTHIA DINWIDDIE DIV20 B189

From: Walt Hill, Metrology Group Leader
Institute Calibration Laboratory

Subject: Status of Calibration Supplier

Manufacturer/Model: AALBORG INSTRUMENTS GFM173
Description: FLOW METER
Serial Number: G19418
Asset Number: 009476
Work Order Number: 444049392
Date Calibrated: July 10, 2002
Supplier: RULE PRODUCTS, ROUND ROCK, TX
Remarks: Rule Cert # C-547-2

( ) Supplier is on the Approved Suppliers List (ASL) and is accredited.

(✓) Supplier is on the Approved Suppliers List (ASL) but is not accredited.

( ) There is no known accredited supplier at this time.

( ) Supplier is not on the Approved Suppliers List (ASL). Please contact Don Dunavant at ext. 2942 if you wish to add the supplier to the ASL.

Please notify the Institute Calibration Laboratory, extension 5215, of any discrepancies with the item or calibration documentation.

Attachment(s) 1

m:\nonasl2.rpt Rev 7 Dec 01

CLD, 08/05/02

RULE PRODUCTS

CALIBRATION REPORT

C-547

Date: 7/10/02
Customer Information:
Southwest Research

Device Type:
MFM

Rated Accuracy
2% Full Scale

Model #	Serial #
GF 173	G19418

Std. Temp.: 70 F
Std. Pressure: 29.92
Gas: Air
Ref. Gas: Air K factor 1
Range: 2 SLPM
Inlet Pressure: AS REQUIRED
Ambient Pressure: 29.035
%RH: 32%
Ambient Temp.: 68 F
Cal. STD.: PRIMARY TUBES
Model #: B924
Serial #: 680
Cal. Method #: 103

CALIBRATION DATA

READ	ACT.	TOL(SLPM)
0.000	0.000	0.000
0.512	0.510	0.040
0.998	1.019	0.040
1.640	1.604	0.040
1.889	1.860	0.040

Recived in spec. x
Out of spec.

Cal. performed by:
Title: CAL. TECH.

NOTES:

All Calibrations are NIST traceable.
Uncertainty is .2 %
This report shall not be reproduced except in full without written approval by Rule.

Page 1 of 1

Previous Cal Report located on page 34 of this SN, dated 06/11/02.

CLD, 08/05/02

SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY
MEMORANDUM

July 12, 2002

To: CYNTHIA DINWIDDIE DIV20 B189

From: Walt Hill, Metrology Group Leader
Institute Calibration Laboratory

Subject: Status of Calibration Supplier

Manufacturer/Model: AALBORG INSTRUMENTS GFM173
Description: FLOW METER
Serial Number: G58717-1
Asset Number: 009474
Work Order Number: 444049391
Date Calibrated: July 10, 2002
Supplier: RULE PRODUCTS, ROUND ROCK, TX
Remarks: Rule Products Cert #C-547-2

( ) Supplier is on the Approved Suppliers List (ASL) and is accredited.

(✓) Supplier is on the Approved Suppliers List (ASL) but is not accredited.

( ) There is no known accredited supplier at this time.

( ) Supplier is not on the Approved Suppliers List (ASL). Please contact Don Dunavant at ext. 2942 if you wish to add the supplier to the ASL.

Please notify the Institute Calibration Laboratory, extension 5215, of any discrepancies with the item or calibration documentation.

Attachment(s) 1

m:\nonasl2.rpt Rev 7 Dec 01

CLD, 08/05/02

RULE PRODUCTS

CALIBRATION REPORT

C-547-1

Date: 7/10/02
Customer Information:
Southwest Research

Device Type:
MFM

Rated Accuracy
2% Full Scale

Model #	Serial #
	G58717-1

Std. Temp.: 70 F
Std. Pressure: 29.92
Gas: Air
Ref. Gas: Air K factor 1
Range: 50 SCCM
Inlet Pressure: AS REQUIRED
Ambient Pressure: 29.035
%RH: 32%
Ambient Temp.: 68 F
Cal. STD.: PRIMARY TUBES
Model #: B924
Serial #: 680
Cal. Method #: 103

CALIBRATION DATA

READ	ACT.	TOL(SCCM)
0.0	0.0	0.0
12.4	12.8	1.0
23.1	23.5	1.0
35.8	35.6	1.0
48.1	47.6	1.0

Recived in spec. x
Out of spec.

Cal. performed by:
Title: CAL. TECH.

NOTES:

All Calibrations are NIST traceable.
Uncertainty is .2 %
This report shall not be reproduced except in full without written approval by Rule.

Page 1 of 1

Previous Cal Report located on page 36 of this SN, dated 06/11/02.

Previous Cert may be found on page 4 of this SN.

Southwest Research Institute
6220 Culebra Road
San Antonio, TX 78238
(210) 522-5215
Department of Quality Assurance
Calibration Laboratory

Certificate of Calibration

18 July 2002

Issued to: TROY MAXWELL DIV20 B57
Manufacturer/Model: PAROSCIENTIFIC 740-45A
Description: PRESSURE GAUGE, DIGITAL
Serial Number: 60999
Asset Number: 003972
Work Order Number: 444049372

This certifies the above item was calibrated in compliance with MIL-STD-45662A and ANSI/NCSL Z540-1-1994. Standards used in this calibration, described in the referenced calibration procedure with associated uncertainties or tolerances, are traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to traceability is on file and is available for examination upon request. This certificate is not to be reproduced, except in full, without the written approval of the Southwest Research Institute Department of Quality Assurance Calibration Laboratory.

The uncertainty of the calibration was sufficient to determine that the item met the manufacturer's published specifications unless stated otherwise below.

Ambient Conditions: Temperature: 68.0 Degrees Fahrenheit Humidity: 39 % RH

Calibration Date: 18 Jul 02 **Calibration Procedure:** CLCP-PI-001 6/99

Condition as Received: IN TOLERANCE

Condition as Returned: IN TOLERANCE

Remarks:

Approved by:
Walt Hill, Metrology Group Leader
Institute Calibration Laboratory

Measurements performed by:
Mack Wood, Technician

m:\nona2la.rpt Rev date 8 Jan 01

08/06/02, CLD

Prior Cal Data may be found on page 5 of this SN.

SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY

Calibration Data Sheet

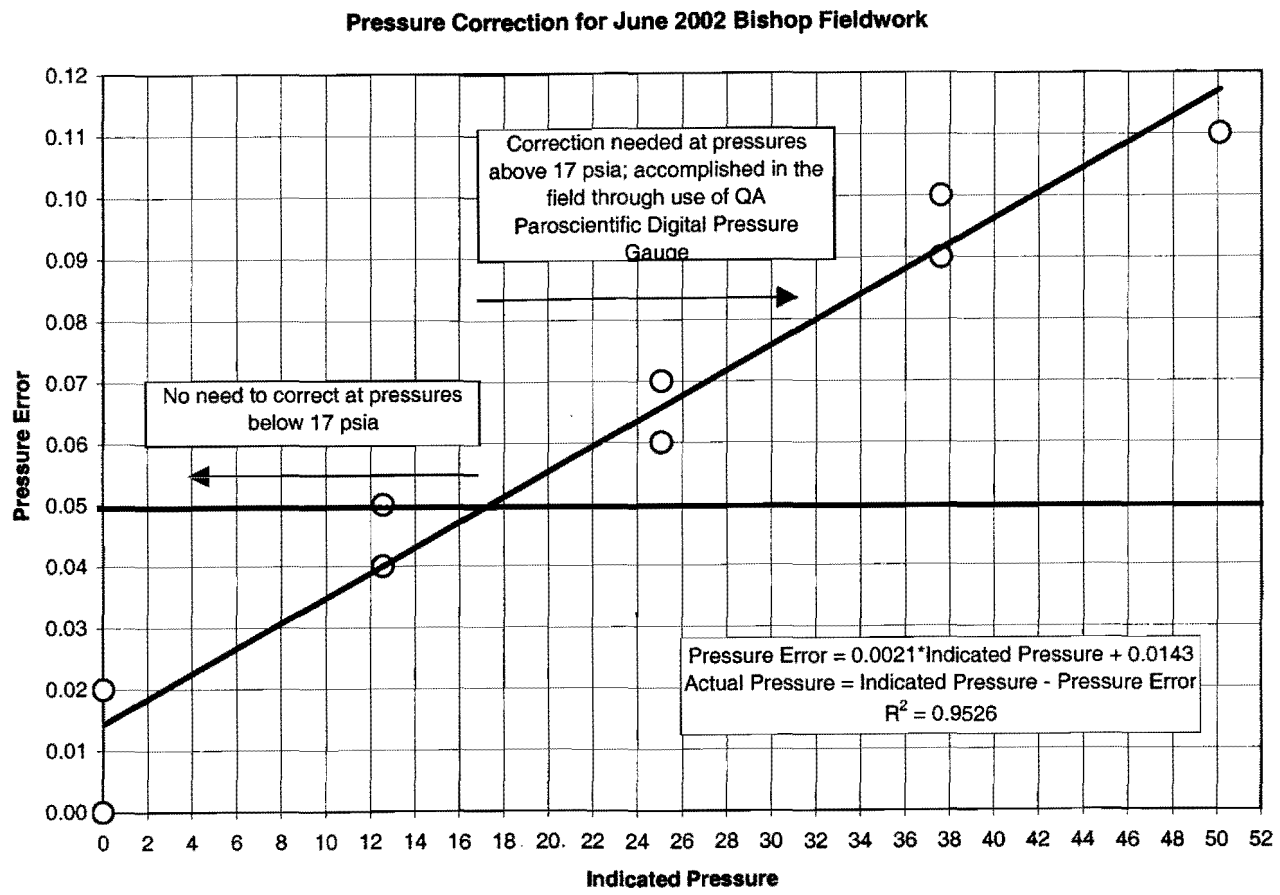
Work Order	444049372	Mfr	Paroscientific	Technician	C. M. Wood
Asset No.	3972	Model	740-45A	Procedure	CLCP-PI-001 6/99
Serial No.	60999	Type		Cal Date	7/18/02

Remarks: The uncertainty listed below is expanded by a coverage factor of 2 and represents a confidence level of approximately 95%.

Parameter: Pressure				
Applied Pressure	Indicated Pressure	Error	+/-Tolerance	+/-Uncertainty
PSIA	PSIA	PSIA	PSIA	PSIA
0	-0.0017	-0.0017	0.004	0.0001
10	9.9983	-0.0017	0.004	0.0004
20	19.9992	-0.0008	0.004	0.0008
30	29.9990	-0.0010	0.004	0.0012
40	40.0005	0.0005	0.004	0.0016
30	30.0013	0.0013	0.004	0.0012
20	20.0021	0.0021	0.004	0.0008
10	10.0021	0.0021	0.004	0.0004
0	0.0013	0.0013	0.004	0.0001

CLD, 08/06/02

Further discussion concerning corrections pertaining to Viatran:
Given the Cal Data on page 103 of this SN (dated 07/02/02), it can be seen in the following figure that for pressures less than 17 psia, no corrections needed to be made to meet a tolerance of +/- 0.1% (i.e., 0.05 psia). Nevertheless, even at these pressures the Offset was adjusted according to the reading of the Paroscientific, which has a much smaller tolerance (0.004 psia?)
⇒ The data meets QA requirements.



CLD, 08/06/02

The CNWRA scientific notebook containing related structural geology research is SN 509, released to Kelly K. Bradbury.
CLD, 08/07/02

UPDATE: Also SN no. 515, 583, & 620.
CLD, 06/07/04

Sample Name	Field	Well	Depth	Diameter	Length	Operator
Berea Sst checksource	AMST Quarry	NA	unknown	NA	12"	Thomas Torres

Outside Diam. (in)	Inside Diam. (in)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)
0.25	0.125	5.1	21.00	1	0.0177

Date	Time	Flow Press (psia)	ATM. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Position	Context
6/3/02	4:05:35 PM	21.8914	14.2038	460.5	20.09	260.3801	1	1	with grain
6/3/02	4:06:34 PM	20.7682	14.2038	451.6	20.15	308.7095	1	2	against grain
6/3/02	4:07:40 PM	19.4079	14.2038	447.7	20.20	401.7307	1	3	with grain
6/5/02	9:38:19 AM	23.1589	14.1729	438.2	24.22	207.8347	1	4	with grain
6/5/02	9:42:40 AM	21.4483	14.1729	433.3	24.51	266.2813	1	5	against grain
6/5/02	9:47:57 AM	22.3242	14.1832	430.3	24.82	230.8236	1	6	with grain

drying time
2 weeks

method
air dry

The 12x12x12" Berea Sst from which this data was collected (by AMST Quarries) will be used as a laboratory check-source. We will make our own measurements at the locations indicated by black permanent marker on the rock surface, as well as internally w/ our drillhole probe.

CLD, 09/06/02

SOUTHWEST RESEARCH INSTITUTE™

6220 Culebra Road, P.O. Drawer 28510
Institute Quality Systems
Institute Calibration Laboratory
Phone: 210-522-5215 Fax 210-522-3692

Certificate of Calibration

Submitted By:	DIV20	**Work Order:**	444050159
Address:	B189	**Date Issued:**	Sep 5, 2002
Contact:	CYNTHIA DINWIDDIE	**Calibration Date:**	Sep 5, 2002
Manufacturer Model:	VIATRAN 245	****Calibration Due:**	
Description:	PRESSURE TRANSDUCER	**Calibration Location:**	N/A
Serial No:	288713	**Environment:**	Temp. 68.0°F Hum. 38 %RH
Asset No:	009671	***As Found:**	IN TOLERANCE
Procedure:	CLCP-PI-001 6/99	***As Left:**	IN TOLERANCE

This certificate documents traceability to the National Institute of Standards and Technology (NIST) and the International System of Units (SI). The Laboratory quality system conforms to ISO/IEC 17025, 1999 and ANSI/NCSL Z540-1-1994 which are equivalent to relevant requirements of the ISO 9000-1994 series of standards. This certificate may not be reproduced, except in full, without the written approval of the Southwest Research Institute Calibration Laboratory. The results of this calibration relate only to the individual instrument described above. This certificate shall not be used to claim product endorsement by the American Association for Laboratory Accreditation (A2LA) or any agency of the U. S. Government.

Uncertainty evaluation includes the item under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor of k=2 to approximate a 95% confidence level. The calibration process provides a Test Uncertainty Ratio (TUR) of less than or equal to 25% (4:1) of the test limit unless otherwise stated in remarks or an attachment.

*The client has sole responsibility for determination of in/out of tolerance or compliance/noncompliance. An in/out of tolerance opinion is provided for your convenience based only on the Test Instrument (TI) reading(s) and limits as reported. The reported uncertainty relates only to the results at the time of calibration and does not imply any short or long term stability of the TI.

**Calibration interval is determined by the client and does not assure the instrument will remain within tolerance until this date. Any number of factors may cause the instrument to be out of tolerance before the next calibration date.

Remarks: None

Standards Used

Asset	Manufacturer	Model	Description	Cal Due
002079	RUSKA	6200	PRESSURE GAUGE	Mar 21, 03

Approved by: Walt Hill
Metrology Group Leader
m:\Nona2la1.rpt Rev date 15, August 02

Measurements by: Mack Wood
Metrology Technician

CLD, 09/06/02

SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY

Calibration Data Sheet

Work Order	444050159	Mfr	Viatran	Technician	C. M. Wood
Asset No.	9671	Model	245	Procedure	CLCP-PI-001 6/99
Serial No.	288713	Type	AS FOUND-LEFT	Cal Date	9/5/02

Remarks:

Parameter: Pressure

Applied Pressure	Indicated Pressure	Error	+/-Tolerance	+/-Uncertainty
PSIA	PSIA	PSIA	PSIA	PSIA
0	0.00	0.00	0.015	0.012
3.75	3.74	-0.01	0.015	0.012
7.5	7.49	-0.01	0.015	0.012
11.25	11.24	-0.01	0.015	0.012
15	15.00	0.00	0.015	0.012
11.25	11.24	-0.01	0.015	0.012
7.5	7.49	-0.01	0.015	0.012
3.75	3.74	-0.01	0.015	0.012
0	0.00	0.00	0.015	0.012

CLD, 09/06/02

SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY
MEMORANDUM

September 10, 2002

To: CYNTHIA DINWIDDIE DIV20 B189

From: Walt Hill, Metrology Group Leader
Institute Calibration Laboratory

Subject: Status of Calibration Supplier

Manufacturer/Model: AALBORG INSTRUMENTS GFM-17
Description: FLOW METER
Serial Number: 58717-1
Asset Number: 009670
Work Order Number: 444050160
Date Calibrated: September 3, 2002
Supplier: RULE PRODUCTS, ROUND ROCK, TX
Remarks: Rule Cert # C556

( ) Supplier is on the Approved Suppliers List (ASL).

( ) Supplier is not on the Approved Suppliers List.

( ) Calibration is ISO 17025 accredited.

( ) Calibration is not ISO 17025 accredited.

( ) There is no known supplier to meet ISO 17025 accreditation at this time.

Please notify the Institute Calibration Laboratory, extension 5215, of any discrepancies with the item or calibration documentation.

Attachment(s) 1

Note: the fact that the flowmeters (certs on pages 118-123 this SN) of this rental unit were out of tolerance pre-cal is entirely irrelevant. They were within tolerances @ the conclusion of the last data collection (see pages 106-111 of this SN).

m:\nonasl2.rpt Rev 7 Dec 01

OUT OF TOLERANCE CLD, 09/10/02

RULE PRODUCTS

CALIBRATION REPORT

C-556

Date: 9/3/02
Customer Information:
Southwest Research
San Antonio, TX

Device Type:
MFM

Rated Accuracy
2% of Full Scale

Model #	Serial #
GF Series	G58717-1

Std. Temp.: 70 F
Std. Pressure: 29.92
Gas: N2
Ref. Gas: N2 K factor 1
Range: 50 SCCM
Inlet Pressure: 30 PSIG
Ambient Pressure: 29.15
%RH: N/A
Ambient Temp.: 68 F
Cal. STD.: Primary Tubes
Model #: B924
Serial #: 410
Cal. Method #: 102

AS RECEIVED

READ	ACT	TOL(SCCM)
0.0	0.0	0.0
12.3	13.5	1.0
24.2	24.0	1.0
37.3	35.4	1.0
49.1	48.3	1.0

CALIBRATION DATA

READ	ACT.	TOL(SCCM)
0.0	0.0	0.0
13.3	13.6	1.0
22.4	22.6	1.0
33.3	33.2	1.0
46.6	46.8	1.0

IN SPEC
OUT OF SPEC X

Cal. performed by:
Title: CAL. TECH.

NOTES:

All Calibrations are NIST traceable.
Uncertainty is .2 %
This report shall not be reproduced except in full without written approval by Rule.

Page 1 of 1

CLD, 09/10/02

SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY
MEMORANDUM

September 10, 2002

To: CYNTHIA DINWIDDIE DIV20 B189

From: Walt Hill, Metrology Group Leader
Institute Calibration Laboratory

Subject: Status of Calibration Supplier

Manufacturer/Model: AALBORG INSTRUMENTS GFM-17
Description: FLOW METER
Serial Number: G20791
Asset Number: 009669
Work Order Number: 444050161
Date Calibrated: September 3, 2002
Supplier: RULE PRODUCTS, ROUND ROCK, TX
Remarks: Rule Cert # C566-2

( ) Supplier is on the Approved Suppliers List (ASL).

( ) Supplier is not on the Approved Suppliers List.

( ) Calibration is ISO 17025 accredited.

( ) Calibration is not ISO 17025 accredited.

( ) There is no known supplier to meet ISO 17025 accreditation at this time.

Please notify the Institute Calibration Laboratory, extension 5215, of any discrepancies with the item or calibration documentation.

Attachment(s) 1

m:\nonasl2.rpt Rev 7 Dec 01

CLD, 09/10/02

OUT OF TOLERANCE

RULE PRODUCTS

CALIBRATION REPORT

C-556-2

Date: 9/3/02
Customer Information:
Southwest Research
San Antonio, TX

Device Type:
MFM

Rated Accuracy
2% of Full Scale
Model # GF Series
Serial # G20791

Std. Temp.: 70 F
Std. Pressure: 29.92
Gas: N2
Ref. Gas: N2 K factor 1
Range: 500 SCCM
Inlet Pressure: 30 PSIG
Ambient Pressure: 29.15
%RH: N/A
Ambient Temp.: 68 F
Cal. STD.: Primary Tubes
Model #: B824
Serial #: 410
Cal. Method #: 102

AS RECEIVED

READ	ACT	TOL(SCCM)
0	0	0
128	118	10
259	245	10
327	373	10
489	440	10

CALIBRATION DATA

READ	ACT.	TOL(SCCM)
0	0	0
132	128	10
267	270	10
371	389	10
491	493	10

IN SPEC
OUT OF SPEC X

Cal. performed by:
Title: CAL. TECH.

NOTES:

All Calibrations are NIST traceable.
Uncertainty is .2 %
This report shall not be reproduced except in full without written approval by Rule.

Page 1 of 1

CLD, 09/10/02

SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY
MEMORANDUM

September 10, 2002

To: CYNTHIA DINWIDDIE DIV20 B189

From: Walt Hill, Metrology Group Leader
Institute Calibration Laboratory

Subject: Status of Calibration Supplier

Manufacturer/Model: AALBORG INSTRUMENTS GFM-17
Description: FLOW METER
Serial Number: G20793
Asset Number: 009668
Work Order Number: 444050162
Date Calibrated: September 3, 2002
Supplier: RULE PRODUCTS, ROUND ROCK, TX
Remarks: Rule Cert # C556-1

( ) Supplier is on the Approved Suppliers List (ASL).

( ) Supplier is not on the Approved Suppliers List.

( ) Calibration is ISO 17025 accredited.

( ) Calibration is not ISO 17025 accredited.

( ) There is no known supplier to meet ISO 17025 accreditation at this time.

Please notify the Institute Calibration Laboratory, extension 5215, of any discrepancies with the item or calibration documentation.

Attachment(s) 1

m:\nonasl2.rpt Rev 7 Dec 01

CLD, 09/10/02

OUT OF TOLERANCE

RULE PRODUCTS

CALIBRATION REPORT

C-556-1

Date: 9/3/02
Customer Information:
Southwest Research
San Antonio, TX

Device Type:
MFM

Rated Accuracy
2% of Full Scale
Model # GF Series
Serial # G20793

Std. Temp.: 70 F
Std. Pressure: 29.92
Gas: N2
Ref. Gas: N2 K factor 1
Range: 2000 SCCM
Inlet Pressure: 30 PSIG
Ambient Pressure: 29.15
%RH: N/A
Ambient Temp.: 68 F
Cal. STD.: Primary Tubes
Model #: B924
Serial #: 410
Cal. Method #: 102

AS RECEIVED

READ	ACT	TOL(SCCM)
0	0	0
501	440	40
1040	972	40
1528	1374	40
1983	1794	40

CALIBRATION DATA

READ	ACT.	TOL(SCCM)
0	0	0
502	510	40
1072	1060	40
1494	1502	40
1972	1979	40

IN SPEC
OUT OF SPEC X

Cal. performed by:
Title: CAL. TECH.

NOTES:

All Calibrations are NIST traceable.
Uncertainty is .2 %
This report shall not be reproduced except in full without written approval by Rule.

CLD, 09/10/02

Page 1 of 1

1100 N. INDUSTRIAL BLVD., BLDG. 3 · ROUND ROCK, TX 78681 · 512-218-4701 · FAX 512-218-9867

Sample Name	Field	Well	Depth	Diameter	Length	Operator
Berea Sst Test	AMST Quarry	AMST Quarry	unknown	NA	12 inches	RM

Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)
0.25	0.125	5.1	24.9	1	0.0177

Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/10/02	9:57:29 AM	24.72	14.27	515.2	24.70	198.8621	3	1
9/10/02	9:58:52 AM	23.26	14.27	407.0	24.74	189.7533	3	2
9/10/02	10:00:42 AM	20.78	14.27	300.8	24.81	207.4168	3	3
9/10/02	10:03:42 AM	19.04	14.27	203.0	24.91	200.6061	3	4
9/10/02	10:06:09 AM	16.18	14.27	97.3	24.97	263.3665	3	5
9/10/02	10:08:15 AM	15.32	14.27	52.5	25.04	266.2307	3	6

Sample Name	Field	Well	Depth	Diameter	Length	Operator
Berea Sst Test	AMST Quarry	AMST Quarry	unknown	NA	12 inches	RM

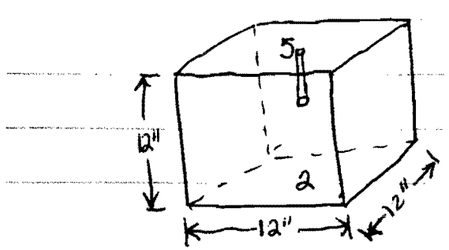
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)
0.25	0.125	5.1	24.90	1	0.0177

Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/10/02	10:22:34 AM	37.29	14.27	510.0	25.57	67.7788	1	1
9/10/02	10:25:04 AM	33.64	14.27	409.9	25.65	69.6916	1	2
9/10/02	10:28:27 AM	29.17	14.27	303.9	25.76	74.1093	1	3
9/10/02	10:30:10 AM	25.20	14.27	199.7	25.82	73.0796	1	4
9/10/02	10:32:47 AM	19.69	14.27	99.0	25.88	84.9299	1	5
9/10/02	10:35:03 AM	17.03	14.27	52.9	25.94	96.6757	1	6

Sample Name	Field	Well	Depth	Diameter	Length	Operator
Berea Sst Test	AMST Quarry	AMST Quarry	unknown	NA	12 inches	RM

Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)
0.25	0.125	5.1	24.9	1	0.0177

Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/10/02	10:42:23 AM	42.50	14.27	524.8	26.16	51.4799	4	1
9/10/02	10:46:13 AM	46.70	14.27	417.3	26.28	33.1919	4	2
9/10/02	10:48:15 AM	37.22	14.27	302.9	26.32	40.3180	4	3
9/10/02	10:49:45 AM	31.12	14.27	207.1	26.34	42.5946	4	4
9/10/02	10:53:45 AM	24.20	14.27	97.3	26.43	40.0780	4	5
9/10/02	10:56:50 AM	19.49	14.27	51.5	26.48	45.9909	4	6



These are the data collected by CLD & Ron McGinnis from the Berea sst block of rock. We have no confidence in AMST's measurements of the same rock. They may

CLD, 09/10/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator
Berea Sst Test	AMST Quarry	AMST Quarry	unknown	NA	12 inches	RM

Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)
0.25	0.125	5.1	26.50	1	0.0177

Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/10/02	11:07:56 AM	49.71	14.27	355.1	26.83	24.6766	6	1
9/10/02	11:09:09 AM	43.45	14.27	290.2	26.86	27.1502	6	2
9/10/02	11:12:35 AM	35.16	14.27	206.9	26.92	31.5764	6	3
9/10/02	11:16:38 AM	20.79	14.27	49.9	26.95	34.3942	6	4

Sample Name	Field	Well	Depth	Diameter	Length	Operator
Berea Sst Test	AMST Quarry	AMST Quarry	unknown	NA	12 inches	RM

Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)
0.25	0.125	5.1	26.50	1	0.0177

Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/10/02	11:22:32 AM	30.06	14.27	510.4	27.08	114.8852	2	1
9/10/02	11:23:51 AM	27.99	14.27	399.6	27.11	108.6905	2	2
9/10/02	11:25:40 AM	24.99	14.27	311.3	27.14	116.6536	2	3
9/10/02	11:28:54 AM	21.48	14.27	201.2	27.17	123.1270	2	4
9/10/02	11:31:23 AM	17.88	14.27	102.2	27.21	138.9175	2	5
9/10/02	11:33:09 AM	15.86	14.27	52.52	27.23	172.9624	2	6

Sample Name	Field	Well	Depth	Diameter	Length	Operator
Berea Sst Test	AMST Quarry	AMST Quarry	4 inches	7/10 inch	12 inches	RM

Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)
0.25	0.125	5.1	26.50	1	0.0177

Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Position
9/10/02	11:45:06 AM	15.19	14.27	411.8	27.44	230.2017	drillhole/5	1
9/10/02	11:47:01 AM	14.95	14.27	302.8	27.46	230.9077	drillhole/5	2
9/10/02	11:51:57 AM	14.57	14.27	120.5	27.51	211.0642	drillhole/5	3
9/10/02	11:53:08 AM	14.75	14.27	198.3	27.54	215.7387	drillhole/5	4
9/10/02	11:55:21 AM	15.36	14.27	528.8	27.57	248.1619	drillhole/5	5

have input the wrong inner diameter for the tip seal into the software package. Regardless, we have obtained k-values w/ the drillhole probe that are within the range measured w/ the surface probe.

CLD, 09/10/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator
SoilMoisture Equipment Corp.	This ceramic check source standard was tested in SwRI Building 51		Nominal 2.5 inches	7/10 inch	NA	RM

Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)
0.7	0.7	9.49	26.5	1	0.0177

Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/10/02	11:58:55 AM	25.26	14.27	536.0	27.64	18.7050	ceramic	1
9/10/02	12:00:52 PM	23.60	14.27	403.5	27.67	17.3158	ceramic	2
9/10/02	12:02:48 PM	21.50	14.27	302.1	27.69	17.7132	ceramic	3
9/10/02	12:04:20 PM	19.63	14.27	203.3	27.69	16.9659	ceramic	4
9/10/02	12:06:19 PM	17.19	14.27	101.0	27.70	16.6724	ceramic	5
9/10/02	12:08:39 PM	15.85	14.27	53.2	27.74	16.9669	ceramic	6

Prior to upcoming fieldwork we are measuring the apparent 'permeability' of a small, finite, checksource (ceramic, 1 bar from SoilMoisture Equipment Corp.) This can be used as a portable field standard for system calibration in the field.

CLD, 09/10/02

$$k_w = \frac{K_w \mu_w}{g \rho_w} = \frac{K_w \mu_w}{\gamma_w} \; ; \; @\ 20°C \quad \mu_w = 0.001\ N \cdot s/m^2$$

$\rho_w = 998\ kg/m^3$

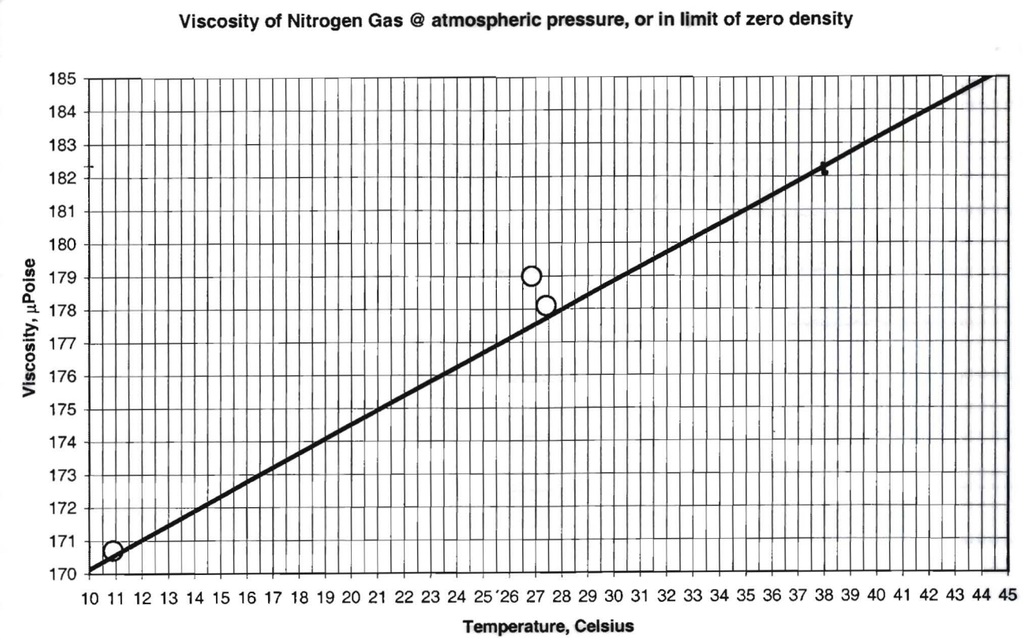
$g = 9.81\ m/s^2$

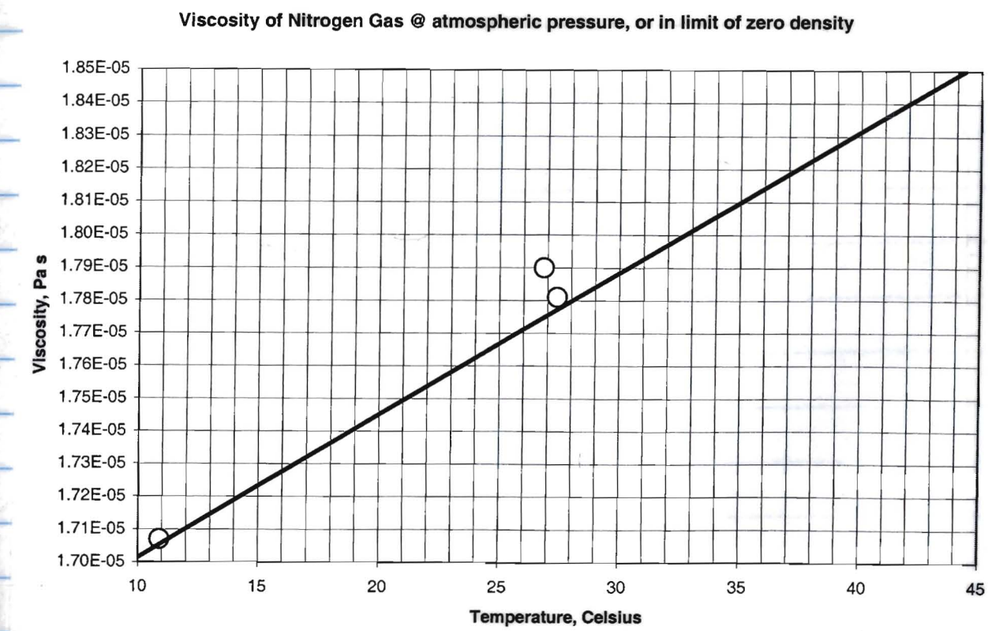
$\left.\begin{array}{l} K_w \text{ in } [m/s] \\ k_w \text{ in } [m^2] \end{array}\right\}$ CLD, 09/24/02

$1\ \text{Darcy} = 0.986923 \times 10^{-12}\ m^2$

CLD, 09/10/02

Same as before, but easier to read w/ fewer gridlines. (See pages 9 & 10, this SN).





CLD, 09/10/02

Hole Depths (inches)

(see page 42 this SN)

This data collected at higher resolution along original transect CC2 (see page 43 this SN)

CC3.030	4.58	4.05
CC3.020	4.45	4.07
CC3.010	4.3	4.2
CC3.000	4.2	3.8
CC3.040	4.3	3.95
CC3.050	4.2	3.7
CC3.060	4.15	3.95
CC3.070	~~4.45~~ → 4.3 CLD, 09/16/02	~~3.95~~ → 3.8 CLD, 09/16/02
CC3.080	4.45	4.15
CC3.090	4.35	3.95
CC3.100	4.5	4.0
CC3.110	4.4	4.05
CC3.120	4.1	3.85
CC3.130	4.2	3.95
CC3.140	~~4.35~~ → 4.0 CLD, 09/17/02	~~3.95~~ → 3.65 CLD, 09/17/02
CC3.150	4.0	3.7
CC3.160	4.2	4.0
CC3.170	4.2	4.0
CC3.180	4.1	3.8 (i.e. more a matrix measurement) drilled vertical (not ↘45°)
CC3.190	in trench – no data or host mat'l (avail).	
CC3.200	in trench – see CC2.200 from June	
CC3.210	no data; seal not possible	
CC3.220		
CC3.230		
CC3.240		
CC3.250		
CC3.550	4.0	3.7
CC3.540	4.0	3.7

CLD, 09/17/02

CC3.520	4.0	3.8
CC3.510	3.95	3.55
CC3.500	4.1	3.75
CC3.490	4.1	3.9
CC3.480	4.1	3.7
CC3.470	4.0	3.55
CC3.460	4.0	3.6
CC3.450	4.0	3.65
CC3.440	4.0	3.7
CC3.400	4.1	3.9

CC3.430 + CC3.420 + CC3.410 – no data; no seal achieved

CLD, 09/17/02

CC3.430	4.05	3.55
CC3.420	4.0	3.7
CC3.360	4.0	3.3
CC3.350	4.0	3.3
CC3.340	4.0	3.3
CC3.310	4.05	3.65
CC3.330	3.95	3.5
CC3.320	4.1	3.75
CC3.410	4.1	3.75
CC3.370	4.1	3.75
CC3.380	4.2	3.7
CC3.~~390~~ 300 CLD, 09/18/02	4.1	3.6 → this is CC3.300, not CC3.390
	(mm)	(mm)
CC3.290	103	85 ← calipers again broke, so now we are using mm rather than inches.
CC3.390	105	98
CC3.280	106	93
CC3.250	102	90

CLD, 09/18/02

	(mm)	(mm)	
CC3.230	105	85	
CC3.240	100	81	
CF1.971	4"	3"	
CF1.121	102	100	(to replace .129)
CF1.278	100	90	(to replace .270)
CF2.050	100	90	(no prior data)
CF2.108	101	69	(gash caused by grain size collection at prior hole) (depth to gash; no prior data)
CF1.102~~5~~3 CLD, 09/19/02	102	102	(new hole)
CF1.875	100	100	(new hole
CF1.824	100	100	(new hole)
CF1.775	102	102	(new hole)
CF1.725	100	100	(new hole)
CF1.676	102	102	(new hole)
CF1.590	103	93	(new hole) – tough to drill
CF1.515	107	99	(new hole), this time → normally just right of varying gash limits
CF1.500	106	103	(new hole) → same as above
CF1.382	(no data – no seal this time)		(old hole – didn't collect data in June)
CF1.343	106	92	(new)
CF1.301	107	103	(new)
CF1.243	104	100	(new)
CF1.222	135	105	(new)
CF1.175	103	92	(new) – very fractured; old 170 appears to have been ~~[illegible]~~ 170 normal
CF2.1001	100	87	(new)
CF2.900	100	89	(new)
CF2.850	104 ~~8~~ CLD, 09/19/02	104	(new)
CF2.800	100	100	(new)
CF2.749	104	104	(new)
CF2.701	101	101	(new)

flow press. is varying erratically

CLD, 09/19/02

CF2.035	102	92	– very high k, fracture runs through.
CF2.090	100	100	– seal not possible here or at .035 – no data
CF2.129	~~100~~ 102 CLD, 09/20/02	94	
CF2.168	103	90	
CF2.271	104	98	
CF2.323	103	100	
CF2.373	104	100	
CF2.403	100	100	
CF2.468	100	100	
CF2.510	100	90	

old CF2.525 now appears at CF2.535 – plot thus.

CF2.525 (new, to left of old CF2.525)	100	96		
CF2.549	103	103		
CF2.627 (old) now appears located at .621			mm	mm
CF2.575 (new) – located 10 cm left of old 585			103	103

Renumbering by KKB on 6/26 ~~through~~ threw off the scale. Now it is clear that there was no hole located at 575, though we recorded data for that location number. This will be cleared-up through use of KKB's maps. Also, it appears there is no CF2.556. CLD, 09/20/02

CF2.650	104	104
CF2.603	102	102

CLD, 09/20/02

SOUTHWEST RESEARCH INSTITUTE™

6220 Culebra Road, P.O. Drawer 28510
Institute Quality Systems
Institute Calibration Laboratory
Phone: 210-522-5215 Fax 210-522-3692

Certificate of Calibration

Submitted By:	DIV20	**Work Order:**	444050428
Address:	B189	**Date Issued:**	Sep 25, 2002
Contact:	CYNTHIA DINWIDDIE	**Calibration Date:**	Sep 25, 2002
Manufacturer Model:	VIATRAN 245	****Calibration Due:**	Sep 25, 2002
Description:	PRESSURE TRANSDUCER	**Calibration Location:**	N/A
Serial No:	288713	**Environment:**	Temp. 68.0°F Hum. 38 %RH
Asset No:	009671	***As Found:**	OUT OF TOLERANCE
Procedure:	CLCP-PI-001, 6/99	***As Left:**	OUT OF TOLERANCE

This certificate documents traceability to the National Institute of Standards and Technology (NIST) and the International System of Units (SI). The Laboratory quality system conforms to ISO/IEC 17025, 1999 and ANSI/NCSL Z540-1-1994 which are equivalent to relevant requirements of the ISO 9000-1994 series of standards. This certificate may not be reproduced, except in full, without the written approval of the Southwest Research Institute Calibration Laboratory. The results of this calibration relate only to the individual instrument described above. This certificate shall not be used to claim product endorsement by the American Association for Laboratory Accreditation (A2LA) or any agency of the U. S. Government.

Uncertainty evaluation includes the item under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor of k=2 to approximate a 95% confidence level. The calibration process provides a Test Uncertainty Ratio (TUR) of less than or equal to 25% (4:1) of the test limit unless otherwise stated in remarks or an attachment.

*The client has sole responsibility for determination of in/out of tolerance or compliance/noncompliance. An in/out of tolerance opinion is provided for your convenience based only on the Test Instrument (TI) reading(s) and limits as reported. The reported uncertainty relates only to the results at the time of calibration and does not imply any short or long term stability of the TI.

**Calibration interval is determined by the client and does not assure the instrument will remain within tolerance until this date. Any number of factors may cause the instrument to be out of tolerance before the next calibration date.

Remarks: None

Standards Used

Asset	Manufacturer	Model	Description	Cal Due
002079	RUSKA	6200	PRESSURE GAUGE	Mar 21, 03

Approved by: Walt Hill
Metrology Group Leader
m:\Nona2la1.rpt Rev date 15, August 02

CLD, 12/18/02

Measurements by: Vince Morales
Metrology Technician

The Viatran 245AHADK pressure transducer did not return from the September 2002 Bishop, CA fieldwork out-of-tolerance as CLD, 04/07/03 these certificates indicate. Please see the letter from Rob Wooten, Temco, Inc. on this SN page # 148. The SwRI cal lab (metrology) tested the transducer only within the 0-15 psia range, as the unit was incorrectly labeled. Thus, whereas the manufacturer's tolerance would be ±0.015 psia for a unit with a 0-15 psia range, the manufacturer's tolerance is ±0.05 psia for a unit with a 0-50 psia range! (see also page 31). With this knowledge, it is clear that the unit w/ serial # 288713 was in-cal upon return from the Sept. Bishop, CA trip, whereas the unit w/ serial # 296929 had drifted out-of-cal (page 103) upon return from the June trip.
CLD, 04/07/03

SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY

Calibration Data Sheet

Work Order	4440	Mfr	Viatran	Technician	V Morales
Asset No.	9671	Model	245	Procedure	CLCP-PI-001 6/99
Serial No.	288713	Type	AS FOUND-LEFT	Cal Date	9/25/02

Remarks:

Parameter: Pressure

Applied Pressure	Indicated Pressure	Error	+/-Tolerance	+/-Uncertainty
PSIA	PSIA	PSIA	PSIA	PSIA
0	0.02	0.02	0.015	0.012
3.75	3.76	0.01	0.015	0.012
7.5	7.51	0.01	0.015	0.012
11.25	11.27	0.02	0.015	0.012
15	15.00	0.00	0.015	0.012
11.25	11.27	0.02	0.015	0.012
7.5	7.52	0.02	0.015	0.012
3.75	3.76	0.01	0.015	0.012
0	0.02	0.02	0.015	0.012

CLD, 12/18/02

SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY
MEMORANDUM

September 30, 2002

To: CYNTHIA DINWIDDIE DIV20 B189

From: Walt Hill, Metrology Group Leader
Institute Calibration Laboratory

Subject: Status of Calibration Supplier

Manufacturer/Model: AALBORG INSTRUMENTS GFM-17
Description: FLOW METER
Serial Number: 58717-1
Asset Number: 009670
Work Order Number: 444050463
Date Calibrated: September 26, 2002
Supplier: RULE PRODUCTS, ROUND ROCK, TX
Remarks: Rule Cert # C-558

(✓) Supplier is on the Approved Suppliers List (ASL).

( ) Supplier is not on the Approved Suppliers List.

( ) Calibration is ISO 17025 accredited.

(✓) Calibration is not ISO 17025 accredited.

( ) There is no known supplier to meet ISO 17025 accreditation at this time.

Please notify the Institute Calibration Laboratory, extension 5215, of any discrepancies with the item or calibration documentation.

Attachment(s) 1

m:\nonasl2.rpt Rev 7 Dec 01

CLD, 12/18/02

RULE PRODUCTS

CALIBRATION REPORT

C-558

Date: 9/26/02
Customer Information:
Southwest Research
San Antonio, TX

Device Type:
MFM

Rated Accuracy
2% of Full Scale

Model #	Serial #
GF Series	G58717-1

Std. Temp.: 70 F
Std. Pressure: 29.92
Gas: N2
Ref. Gas: N2 K factor 1
Range: 50 SCCM
Inlet Pressure: As Required
Ambient Pressure: 29.05
%RH: N/A
Ambient Temp.: 68 F
Cal. STD.: Primary Tubes
Model #: B924
Serial #: 410
Cal. Method #: 102

AS RECEIVED

READ	ACT	TOL(SCCM)
0.0	0.0	0.0
12.7	13.1	1.0
24.3	24.8	1.0
36.9	36.3	1.0
47.3	47.6	1.0

CALIBRATION DATA

READ	ACT.	TOL(SCCM)
0.0	0.0	0.0
12.5	12.8	1.0
24.3	24.6	1.0
36.2	36.3	1.0
47.8	50.1	1.0

IN SPEC X
OUT OF SPEC

Cal. performed by:
Title: CAL. TECH.

NOTES:

All Calibrations are NIST traceable.
Uncertainty is .2 %
This report shall not be reproduced except in full without written approval by Rule.

Page 1 of 1

CLD, 12/18/02

1100 N. INDUSTRIAL BLVD., BLDG. 3 · ROUND ROCK, TX 78681 · 512-218-4701 · FAX 512-218-9867

SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY
MEMORANDUM

September 30, 2002

To: CYNTHIA DINWIDDIE DIV20 B189

From: Walt Hill, Metrology Group Leader
Institute Calibration Laboratory

Subject: Status of Calibration Supplier

Manufacturer/Model: AALBORG INSTRUMENTS GFM-17
Description: FLOW METER
Serial Number: G20791
Asset Number: 009669
Work Order Number: 444050464
Date Calibrated: September 26, 2002
Supplier: RULE PRODUCTS, ROUND ROCK, TX
Remarks: Rule Cert # C-558-2

(✓) Supplier is on the Approved Suppliers List (ASL).

( ) Supplier is not on the Approved Suppliers List.

( ) Calibration is ISO 17025 accredited.

(✓) Calibration is not ISO 17025 accredited.

( ) There is no known supplier to meet ISO 17025 accreditation at this time.

Please notify the Institute Calibration Laboratory, extension 5215, of any discrepancies with the item or calibration documentation.

Attachment(s) 1

m:\nonasl2.rpt Rev 7 Dec 01

CLD, 12/18/02

RULE PRODUCTS

CALIBRATION REPORT

C-558-2

Date: 9/26/02
Customer Information:
Southwest Research
San Antonio, TX

Device Type:
MFM

Rated Accuracy
2% of Full Scale
Model # GF Series
Serial # G20791

Std. Temp.: 70 F
Std. Pressure: 29.92
Gas: N2
Ref. Gas: N2 K factor 1
Range: 500 SCCM
Inlet Pressure: AS REQUIRED
Ambient Pressure: 29.05
%RH: N/A
Ambient Temp.: 68 F
Cal. STD.: Primary Tubes
Model #: BB24
Serial #: 410
Cal. Method #: 102

AS RECEIVED

READ	ACT	TOL(SCCM)
0	0	0
125	126	10
258	262	10
375	379	10
496	501	10

CALIBRATION DATA

READ	ACT.	TOL(SCCM)
0	0	0
125	128	10
258	260	10
376	378	10
495	497	10

IN SPEC X
OUT OF SPEC

Cal. performed by:
Title: CAL. TECH.

NOTES:

All Calibrations are NIST traceable.
Uncertainty is .2 %
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Page 1 of 1

CLD, 12/18/02

1100 N. Industrial Blvd., Bldg. 3 · Round Rock, TX 78681 · 512-218-4701 · FAX 512-218-9867

SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY
MEMORANDUM

September 30, 2002

To: CYNTHIA DINWIDDIE DIV20 B189

From: Walt Hill, Metrology Group Leader
Institute Calibration Laboratory

Subject: Status of Calibration Supplier

Manufacturer/Model: AALBORG INSTRUMENTS GFM-17
Description: FLOW METER
Serial Number: G20793
Asset Number: 009668
Work Order Number: 444050465
Date Calibrated: September 26, 2002
Supplier: RULE PRODUCTS, ROUND ROCK, TX
Remarks: Rule Cert # C558-1

(✓) Supplier is on the Approved Suppliers List (ASL).

( ) Supplier is not on the Approved Suppliers List.

( ) Calibration is ISO 17025 accredited.

(✓) Calibration is not ISO 17025 accredited.

( ) There is no known supplier to meet ISO 17025 accreditation at this time.

Please notify the Institute Calibration Laboratory, extension 5215, of any discrepancies with the item or calibration documentation.

Attachment(s) 1

m:\nonasl2.rpt Rev 7 Dec 01

OUT OF TOLERANCE

CLD, 12/18/02

RULE PRODUCTS

CALIBRATION REPORT

C-558-1

Date: 9/28/02
Customer Information:
Southwest Research
San Antonio, TX

Device Type:
MFM

Rated Accuracy
2% of Full Scale
Model # GF Series
Serial # G20793

Std. Temp.: 70 F
Std. Pressure: 29.92
Gas: N2
Ref. Gas: N2 K factor 1
Range: 2000 SCCM
Inlet Pressure: AS REQUIRED
Ambient Pressure: 29.05
%RH: N/A
Ambient Temp.: 68 F
Cal. STD.: Primary Tubes
Model #: B924
Serial #: 410
Cal. Method #: 102

AS RECEIVED

READ	ACT	TOL(SCCM)
0	0	0
600	509	40
973	1030	40
1517	1460	40
1844	1769	40

CALIBRATION DATA

READ	ACT.	TOL(SCCM)
0	0	0
508	515	40
1083	1090	40
1510	1517	40
1810	1820	40

IN SPEC
OUT OF SPEC X

Cal. performed by:
Title: CAL. TECH.

NOTES: METER HAD INTERMITTANT PROBLEM

All Calibrations are NIST traceable.
Uncertainty is .2 %
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Page 1 of 1

CLD, 12/18/02

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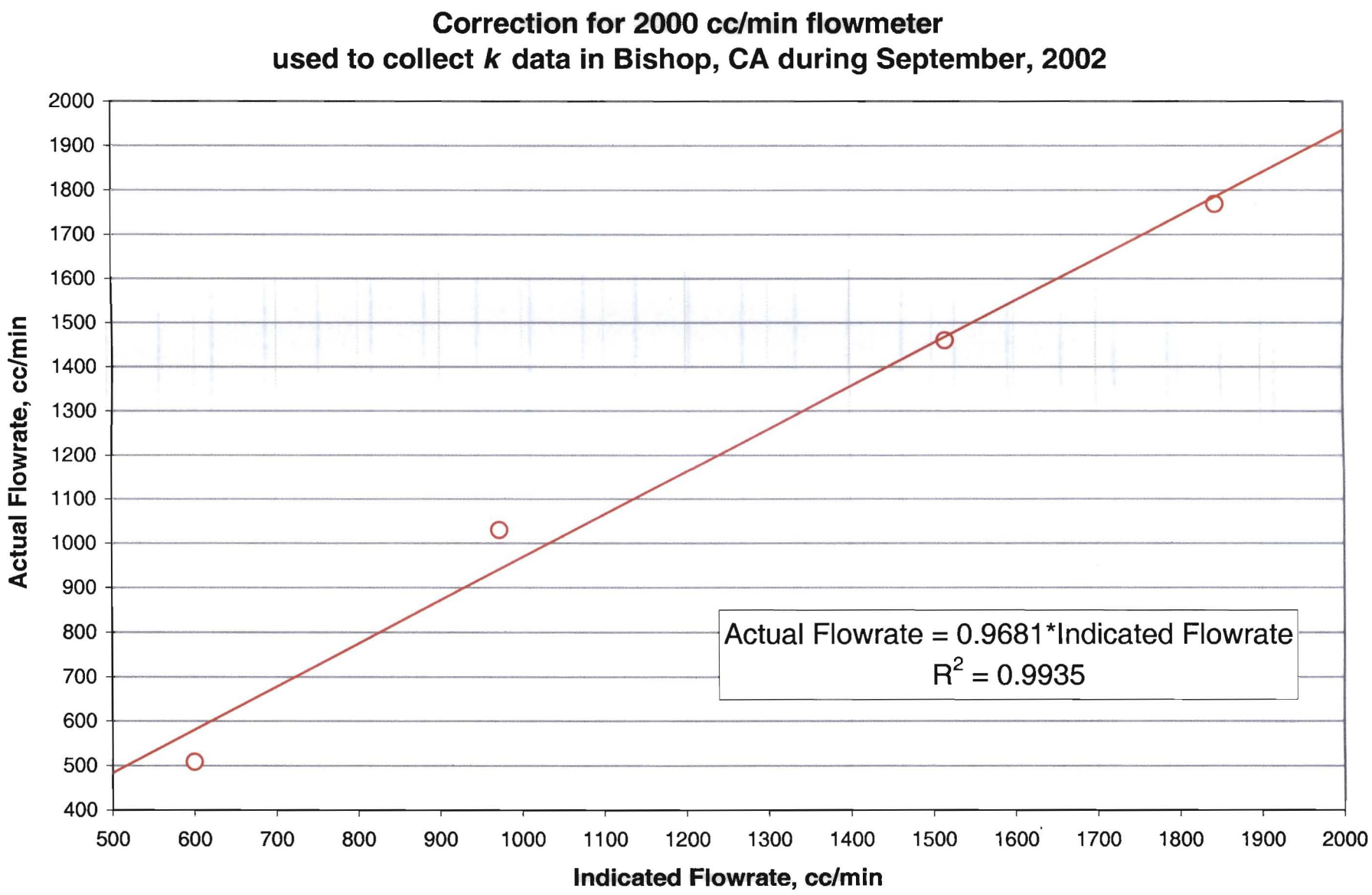
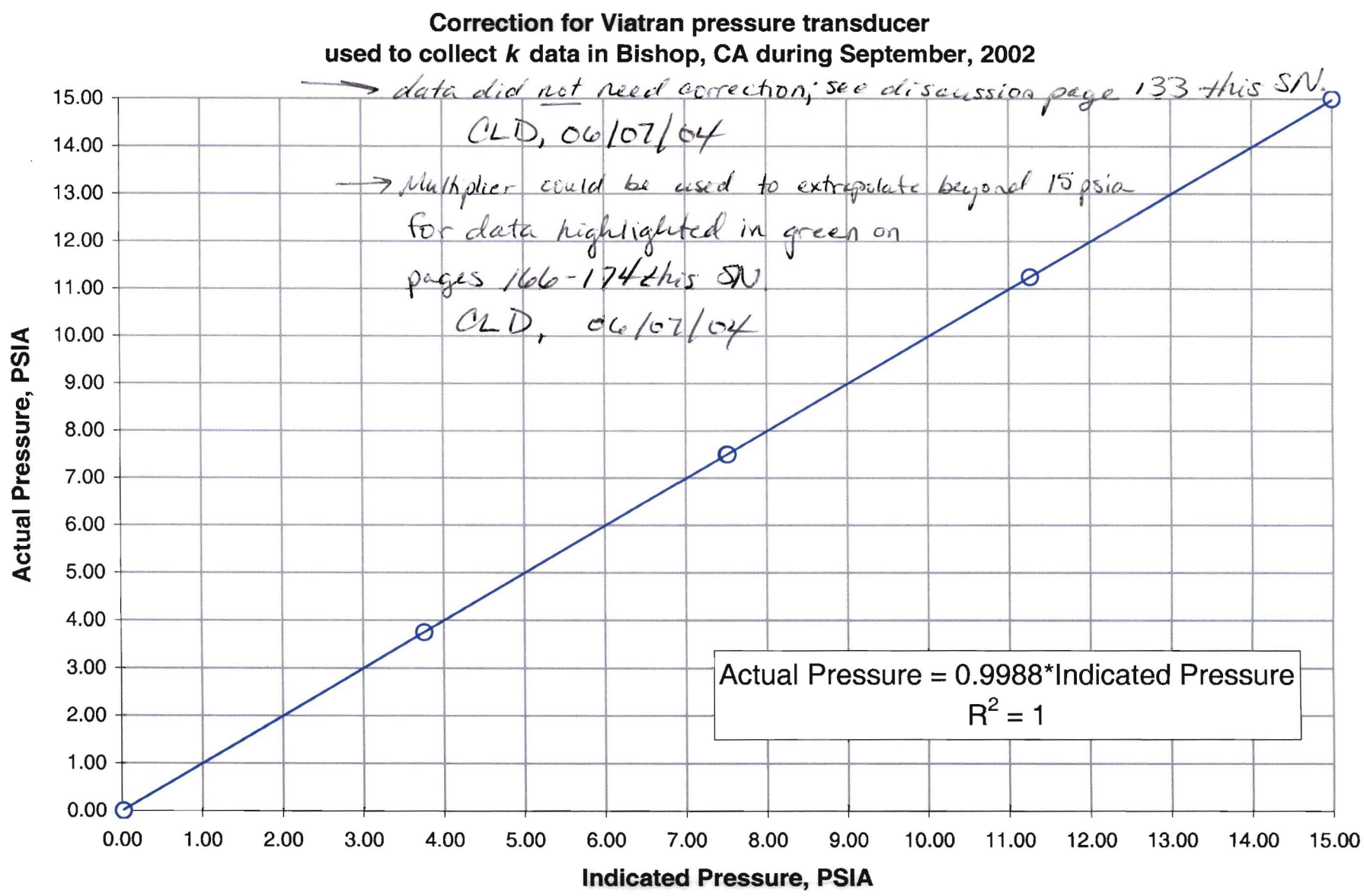
CLD, 12/18/02



CLD, 12/18/02



SOUTHWEST RESEARCH INSTITUTE™

6220 Culebra Road, P.O. Drawer 28510
Institute Quality Systems
Institute Calibration Laboratory
Phone: 210-522-5215 Fax 210-522-3692

Certificate of Calibration

Submitted By: DIV20
Address: B57
Contact: TROY MAXWELL
Manufacturer Model: PAROSCIENTIFIC 740-45A
Description: PRESSURE GAUGE, DIGITAL
Serial No: 60999
Asset No: 003972
Procedure: CLCP-PI-001, 6/99

Work Order: 444050461
Date Issued: Oct 2, 2002
Calibration Date: Oct 2, 2002
****Calibration Due:** Apr 2, 2003
Calibration Location: N/A
Environment: Temp. 68.0°F Hum. 39 %RH
***As Found:** IN TOLERANCE
***As Left:** IN TOLERANCE

This certificate documents traceability to the National Institute of Standards and Technology (NIST) and the International System of Units (SI). The Laboratory quality system conforms to ISO/IEC 17025, 1999 and ANSI/NCSL Z540-1-1994 which are equivalent to relevant requirements of the ISO 9000-1994 series of standards. This certificate may not be reproduced, except in full, without the written approval of the Southwest Research Institute Calibration Laboratory. The results of this calibration relate only to the individual instrument described above. This certificate shall not be used to claim product endorsement by the American Association for Laboratory Accreditation (A2LA) or any agency of the U. S. Government.

Uncertainty evaluation includes the item under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor of k=2 to approximate a 95% confidence level. The calibration process provides a Test Uncertainty Ratio (TUR) of less than or equal to 25% (4:1) of the test limit unless otherwise stated in remarks or an attachment.

*The client has sole responsibility for determination of in/out of tolerance or compliance/noncompliance. An in/out of tolerance opinion is provided for your convenience based only on the Test Instrument (TI) reading(s) and limits as reported. The reported uncertainty relates only to the results at the time of calibration and does not imply any short or long term stability of the TI.

**Calibration interval is determined by the client and does not assure the instrument will remain within tolerance until this date. Any number of factors may cause the instrument to be out of tolerance before the next calibration date.

Remarks: None

Standards Used

Asset	Manufacturer	Model	Description	Cal Due
003048	RUSKA	2468-758	PRESSURE CALIBRATOR	Mar 10, 05
002856	RUSKA	2468-714-69900	WEIGHT SET, CLASS N/S	Mar 10, 05
003949	TROEMNER	5MG-100G	WEIGHT SET, CLASS 1	Jan 07, 03
003216	HASTINGS	VT-6B	VACUUM CONTROLLER & GAGE TUBE	Oct 16, 02

Approved by: Walt Hill
Metrology Group Leader
m:\Nona2la1.rpt Rev date 15, August 02

CLD, 12/18/02

Measurements by: Mack Wood
Metrology Technician

SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY

Calibration Data Sheet

Work Order	444050461	Mfr	Paroscientific	Technician	C. M. Wood
Asset No.	3972	Model	740	Procedure	CLCP-PI-001 6/99
Serial No.	60999	Type	AS FOUND-LEFT	Cal Date	10/2/02

Remarks:

Parameter: Pressure

Applied Pressure	Indicated Pressure	Error	+/-Tolerance	+/-Uncertainty
PSIA	PSIA	PSIA	PSIA	PSIA
0	0.0009	0.0009	0.004	0.0001
10	10.0027	0.0027	0.004	0.0004
20	20.0031	0.0031	0.004	0.0008
30	30.0037	0.0037	0.004	0.0012
40	40.0039	0.0039	0.004	0.0016
30	30.0023	0.0023	0.004	0.0012
20	20.0009	0.0009	0.004	0.0008
10	10.0001	0.0001	0.004	0.0004
0	-0.0015	-0.0015	0.004	0.0001

CLD, 12/18/02

PRESSURE INDICATOR CALIBRATION DATA SHEET *

WORK ORDER #: 444050461 **DATE:** 10/2/02 **TECH.** C. M. Wood

UUT: **Mfr:** Paroscientific **Model:** 740 **Serial No.** 60999 Units Code

ASN: 3972 **LRP:** 0 **URP:** 40 **UNITS:** PSIA 1

RESOLUTION: 0.0001 **REPEATABILITY:** 0 **Grade** n/a

TOLERANCE +/-% : 0.01 **zero (y/n)** y **SPAN:** 40 40

Grade tol 0.01 0.01

CALIBRATION STANDARD **Setability:** 0

ASSET #: 3048 **TYPE:** dwt **tolerance** 0.004 %Rdg

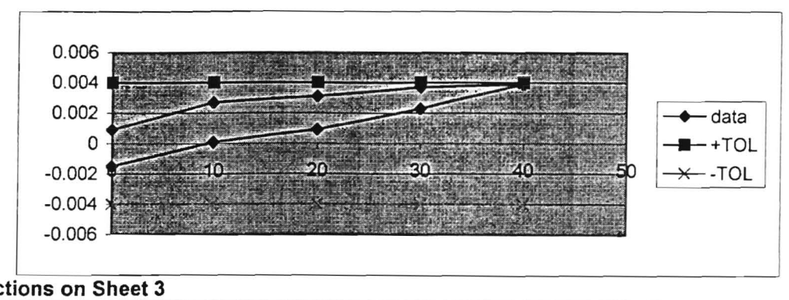
UNCERTAINTY BUDGET @ F.S.			
description	value	divisor	std unc
UUT resolution	0.0001	1.73205	5.77E-05
UUT repeatability	0	1	0
Calibration standard	0.0016	2	0.0008
Cal Std Setability	0	1.73205	0
combined uncertainty			8.0E-04
expanded uncertainty	k = 2		1.6E-03

TAR= 2.5

TUR= 2.5

DATA **tolerance** **0.004**

INPUT	READING	ERROR	Uncert	Tolerance	P/F
0	0.0009	0.0009	0.000115	0.004	P
10	10.0027	0.0027	0.000416	0.004	P
20	20.0031	0.0031	0.000808	0.004	P
30	30.0037	0.0037	0.001206	0.004	P
40	40.0039	0.0039	0.001604	0.004	P
30	30.0023	0.0023	0.001206	0.004	P
20	20.0009	0.0009	0.000808	0.004	P
10	10.0001	1E-04	0.000416	0.004	P
0	-0.0015	-0.0015	0.000115	0.004	P



*Instructions on Sheet 3

CLD, 12/18/02

SOUTHWEST RESEARCH INSTITUTE™

6220 Culebra Road, P.O. Drawer 28510
Institute Quality Systems
Institute Calibration Laboratory
Phone: 210-522-5215 Fax 210-522-3692

Certificate of Calibration

Submitted By: DIV20
Address: B189
Contact: CYNTHIA DINWIDDIE
Manufacturer Model: VAISALA HM34C
Description: HUMIDTY/ TEMPERATURE METER
Serial No: X2020010
Asset No: 009456
Procedure: CL-13, 5/99

Work Order: 444051289
Date Issued: Dec 4, 2002
Calibration Date: Dec 3, 2002
****Calibration Due:** Jun 3, 2003
Calibration Location: N/A
Environment: Temp. 80.0°F Hum. 39 %RH
***As Found:** IN TOLERANCE
***As Left:** IN TOLERANCE

This certificate documents traceability to the National Institute of Standards and Technology (NIST) and the International System of Units (SI). The Laboratory quality system conforms to ISO/IEC 17025, 1999 and ANSI/NCSL Z540-1-1994 which are equivalent to relevant requirements of the ISO 9000-1994 series of standards. This certificate may not be reproduced, except in full, without the written approval of the Southwest Research Institute Calibration Laboratory. The results of this calibration relate only to the individual instrument described above. This certificate shall not be used to claim product endorsement by the American Association for Laboratory Accreditation (A2LA) or any agency of the U. S. Government.

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**Calibration interval is determined by the client and does not assure the instrument will remain within tolerance until this date. Any number of factors may cause the instrument to be out of tolerance before the next calibration date.

Remarks: None

Standards Used

Asset	Manufacturer	Model	Description	Cal Due
006404	THUNDER SCIENTIFIC	2500	HUMIDITY GENERATOR	Jun 10, 03

Approved by: Walt Hill
Metrology Group Leader
m:\Nona2la1.rpt Rev date 15, August 02

12/18/02

Measurements by: Vince Morales
Metrology Technician

Southwest Research Institute
Calibration laboratory
Calibration Sheet.

Work Order: 444051289	Mfr. Vaisala	Technician V Morales
Asset No. 9456	Model HM34C	Procedure CL-13, 5/99
Serial No. X2020010	Type. Humidity / Temp meter	Cal Date. 03-Dec-02

Remarks:

Function/Range	Test Point	TI Reading	Difference	Tolerance	Uncertainty	Found/left
%RH	%RH	%RH	%RH	%RH	%RH	Results
	35.0	34.4	-0.6	2	0.51	Pass
	49.9	48.5	-1.4	2	0.51	Pass
	80.0	78.1	-1.9	2	0.51	Pass
Degree C	Degree C	Degree C	Degree C	Degree C	Degree C	Results
	20.2	20.1	-0.1	0.3	0.13	Pass
	16.1	16.0	-0.1	0.3	0.13	Pass
	23.4	23.4	0.0	0.3	0.13	Pass

12/18/02

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
SoilMoisture Equipment Corp.	Santa Barbara	Santa Barbara	Nominal 2.5 inches	7/10 inch	NA	RM		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	30.00	1	0.0179			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/16/02	1:47:47 PM	15.93	12.52	98.6	40.59	16.0663	1	1
9/16/02	1:49:44 PM	17.45	12.52	192.0	40.62	20.5440	1	2
9/16/02	1:51:48 PM	19.94	12.52	300.0	40.66	19.6938	1	3
9/16/02	1:53:32 PM	22.45	12.52	402.1	40.68	18.3101	1	4
9/16/02	1:55:06 PM	24.76	12.52	505.8	40.69	17.5282	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
Ceramic Sept 17	Bishop	Santa Barbara	nominally 2.5 inch	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	26.40	1	0.0177			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/17/02	9:15:00 AM	22.01	12.54	352.0	23.38	16.1954	1	1
9/17/02	9:18:51 AM	19.73	12.54	246.0	24.11	16.0001	1	2
9/17/02	9:21:24 AM	26.12	12.54	684.4	24.63	19.7071	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
SoilMoisture 1 bar ceramic	Santa Barbara	NA	2.5 nominal inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	26.70	1	0.0177			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/18/02	11:20:16 AM	25.00	12.58	455.4	35.11	15.1298	1	1
9/18/02	11:22:12 AM	19.82	12.58	256.4	35.29	16.9592	1	2

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
Soil Moisture Ceramic	Santa Barbara; Bishop	ceramic	nominal 2.5 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	25.30	1	0.0177			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	8:58:24 AM	19.47	12.68	225.1	24.08	15.5106	1	1
9/19/02	9:02:36 AM	26.78	12.68	693.6	24.92	18.9301	1	2
9/19/02	9:04:51 AM	15.97	12.68	98.8	25.28	15.9345	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
SoilMoisture Ceramic	Crossing Faults, Bishop	ceramic	nominal 2.5 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	15.7	1	0.0173			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/20/02	8:19:41 AM	22.92	12.65	433.8	15.40	17.5121	1	1
9/20/02	8:20:58 AM	21.54	12.65	344.7	15.46	16.7276	1	2
9/20/02	8:22:17 AM	20.35	12.65	266.5	15.52	15.4731	1	3

12/19/02

Temco, Inc., 4616 N. Mingo, Tulsa, OK 74117

Phone 918-834-2337 Fax 918-834-9887
E-Mail Address: sales@temco.com
Web Address: www.temco.com

Tuesday, January 14, 2003

Cynthia Dinwiddie
Southwest Research Institute
Division 20
6220 Culebra Rd.
San Antonio, TX 78235-5166

Subject: **Transducer range for Viatran transducer SN 288713**

Cynthia,

This letter is in regards to your inquiry on Wednesday, December 18, 2002 about the transducer range, SN 288713 for the Mini-Permeameter SN 4589 that Southwest Research Institute rented in September of 2002. The part number for the transducer is 245AHADK. The part number description is as follows, 245 is the model number, AH is the pressure range which is 0-50 psia, A means that the transducer is an atmospheric transducer, and DK is a shunt calibration special option.

The transducer is marked with the correct part number. However, Viatran, the transducer manufacturer, has mislabeled the range on the transducer. The range should read 0-50 psia. It is labeled 0-15 psia. I have included a copy of the Viatran test report that shows the transducer is actually a 0-50 psia range and not 0-15 psia as labeled and was calibrated from the factory as 0-50 psia. I also had my technicians run their own calibration test to confirm that the transducer is 0-50 psia.

see facing page

I have spoke with Jack Gladysek at Viatran transducers on Thursday, January 09, 2003. He also confirmed that the transducer is mislabeled. The transducer will be re-labeled to 0-50 psia to avoid problems like this in the future.

I apologize for any inconvenience that this has caused. If there is any other information that you need please let me know.

Sincerely,

Rob Wooten
Electrical Design Engineer

CLD, 04/07/03

Viatran CORPORATION

Performance Certificate

DATE	05-27-1999
PART NO.	245
SERIAL NO.	288713
REFERENCE	245AHADK
INPUT	28 VDC
OUTPUT	0 TO 5 VDC
FSPR	0 TO 50 PSIA
FULL SCALE PRESSURE RANGE	

WIRING CONNECTIONS

PIN A	+ POWER
PIN B	- POWER
PIN C	+ SIGNAL
PIN D	- SIGNAL
PIN E	CALIBRATE
PIN F	CALIBRATE

	% FSPR	STANDARD CALIBRATION RUN 1	STANDARD CALIBRATION RUN 2		SPECIAL CALIBRATION RUN 1	SPECIAL CALIBRATION RUN 2
INCREASING	0	.002				
	20	1.000				
	40	1.999				
	60	2.998				
	80	3.997				
	100	4.995				
DECREASING	80					
	60	2.998				
	40					
	20					
	0	.003				

REMARKS: FIELD CALIBRATION PRESSURE = 24.995 PSIA

CALIBRATION CIRCUIT
An advantage of Viatran strain gage pressure sensors is that the gain or span of the readout system can be set without applying a known pressure input. The system setup can be accomplished by using a calibrate circuit as explained below.

INTERNAL CIRCUIT
Most sensor models are supplied with an internal shunt calibrate circuit either as a standard or by special order. If this sensor has the circuit included, it will be noted below. Simply shorting the proper pins will produce the calibration output signal listed.

EXTERNAL CIRCUIT
If the sensor does not include the calibration circuit, the same type calibration can be accomplished by connecting a resistor of the value indicated across the proper pins. This technique is accurate for cable lengths of up to 200 ft.

[X] Transducer - Internal Calibration
Shorting pins E & F will produce a 2.498 VOLTS calibration output signal.

[ ] Transducer - External Calibration
Connecting ohms across pins & will produce a calibration output signal.

[ ] Transmitter* - Internal Calibration Circuit and Switch
Cal 1 represents with a reading of
Cal 2 represents with a reading of

NOTE: All calibrations should be performed only after the transducer has been adjusted for zero at zero pressure.

* See detailed instructions shipped with each unit.

WARRANTY

Viatran Corporation warrants that its products shall be free from defective parts and workmanship for a period of twelve (12) months from date of original shipment, provided that Viatran's obligation hereunder shall be limited to correcting any defective workmanship and/or replacing any defective material F.O.B. destination.

A repair is warranted ninety (90) days from repair date under conditions of original warranty period unless superseded by original warranty period. If inspection by the Company of such product does not disclose any defect of workmanship or material, the Company's regular charges will apply. The warranty carries no liability, either expressed or implied, beyond our obligation to replace the unit which carries the warranty. This warranty is in lieu of all other warranties of merchantability or fitness. No allowance will be made for any expense incurred for correcting any defective workmanship and/or material without written consent by Viatran. Unit must be shipped to the Company, transportation prepaid, and return tracking number must be referenced on the package to assure acceptance at our shipping dock. Prices, specifications and decisions subject to change without notice.

The Company shall not be liable for and the Purchaser assumes and agrees to indemnify and save harmless the Company in respect to any loss or damage that may arise through the use by the Purchaser, or others, of any of the Company's products.

This warranty is void if the product is subjected to misuse, accident, neglect or improper application, installation or operation. This warranty is void if prior defects in materials or workmanship repairs are made by anyone except Viatran or its authorized service agency.

REPAIR

Most Viatran sensors have been designed to be easily repaired and recalibrated if necessary. If failure occurs, the sensor should be returned to the factory for inspection and testing. If the failure is covered by our warranty policy as described above, the unit will be repaired as necessary and reshipped without delay. Sensors usually not covered by warranty can be repaired within two to three weeks (after approval) for approximately twenty to sixty per-cent of the purchase price. Simple repairs can often be made for a minimum charge. To return a unit, please contact the Technical Service Department for a Return Tracking Number at 1 (800) 688-0030, option #6, or extension 521. The unit should be sent to the attention of the Technical Service Department at 2957 Alt Blvd., Grand Island NY 14072.

QUALITY ASSURANCE

Viatran CORPORATION 300 INDUSTRIAL DRIVE GRAND ISLAND NEW YORK 14072
PHONE 716 773 1700 • FAX 716 773 2488

Part No. 98CALCARD0

CLD, 04/07/03

Data from Chalk Cove Transect 3 (i.e. CC3)

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
SoilMoisture Equipment Corp.	Santa Barbara **Ceramic Test #1**	Santa Barbara	Nominal 2.5 inches	7/10 inch	NA	RM		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	30	1	0.0179			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/16/02	1:47:47 PM	15.93	12.52	98.6	40.59	16.0663	1	1
9/16/02	1:49:44 PM	17.45	12.52	192.0	40.62	20.5440	1	2
9/16/02	1:51:48 PM	19.94	12.52	300.0	40.66	19.6938	1	3
9/16/02	1:53:32 PM	22.45	12.52	402.1	40.68	18.3101	1	4
9/16/02	1:55:06 PM	24.76	12.52	505.8	40.69	17.5282	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.000	Bishop	CC3.000	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	29	1	0.0179			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/16/02	2:57:07 PM	13.09	12.51	490.4	39.43	521.8979	1	1
9/16/02	2:58:17 PM	12.97	12.51	401.9	39.34	541.6749	1	2
9/16/02	3:00:39 PM	12.83	12.51	304.4	39.12	592.5979	1	3
9/16/02	3:04:21 PM	13.12	12.51	593.8	38.78	598.9087	1	4

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.010	Bishop	CC3.010	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	29	1	0.0179			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/16/02	2:43:17 PM	13.88	12.51	497.9	40.40	216.6178	1	1
9/16/02	2:44:17 PM	13.59	12.51	404.7	40.35	227.5352	1	2
9/16/02	2:45:20 PM	13.26	12.51	302.1	40.31	247.6847	1	3
9/16/02	2:46:44 PM	12.99	12.51	207.1	40.22	268.0391	1	4
9/16/02	2:48:08 PM	12.86	12.51	109.5	40.12	195.2929	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.020	Bishop	CC3.020	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	30	1	0.0179			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/16/02	2:25:17 PM	13.35	12.52	491.5	40.79	362.0553	1	1
9/16/02	2:26:39 PM	13.18	12.52	402.5	40.79	375.3313	1	2
9/16/02	2:28:47 PM	12.97	12.52	300.4	40.76	414.2187	1	3
9/16/02	2:30:28 PM	12.83	12.52	223.9	40.73	450.5936	1	4

Data requiring flowmeter correction are highlighted in yellow.

CLD, 04/07/03

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.030	Bishop	CC3.030	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	30	1	0.0179			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/16/02	2:11:04 PM	12.90	12.52	1331.4	40.77	2180.0948	1	1
9/16/02	2:11:57 PM	13.00	12.52	1557.0	40.85	2010.9596	1	2
9/16/02	2:12:45 PM	13.06	12.52	1691.0	40.93	1937.3604	1	3
9/16/02	2:13:22 PM	13.07	12.52	1730.6	41.02	1946.4151	1	4

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.040	Bishop	CC3.040	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	29	1	0.0179			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/16/02	3:25:32 PM	13.26	12.51	483.6	36.93	392.2164	1	1
9/16/02	3:27:18 PM	13.10	12.51	398.9	36.79	413.6389	1	2
9/16/02	3:28:21 PM	12.93	12.51	305.1	36.71	447.2832	1	3
9/16/02	3:32:08 PM	12.82	12.51	234.8	36.44	467.9822	1	4
9/16/02	3:33:22 PM	13.36	12.51	644.6	36.33	458.6155	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.050	Bishop	CC3.050	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	29	1	0.0179			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/16/02	3:44:15 PM	13.06	12.51	628.2	35.62	697.2374	1	1
9/16/02	3:45:38 PM	13.01	12.51	481.6	35.52	588.8830	1	2
9/16/02	3:48:06 PM	12.91	12.51	407.5	35.37	625.0523	1	3
9/16/02	3:49:23 PM	12.82	12.51	335.5	35.29	666.1825	1	4
9/16/02	3:50:51 PM	13.13	12.51	689.0	35.17	675.6074	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.060	Bishop	CC3.060	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	29	1	0.0179			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/16/02	3:59:26 PM	13.76	12.51	481.3	34.72	228.1151	1	1
9/16/02	4:00:38 PM	13.53	12.51	407.0	34.68	238.4542	1	2
9/16/02	4:01:58 PM	13.23	12.51	302.2	34.60	253.6835	1	3
9/16/02	4:03:06 PM	12.99	12.51	206.2	34.54	262.0363	1	4
9/16/02	4:06:04 PM	12.83	12.51	121.1	34.40	232.4168	1	5

CLD, 04/07/03

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.070	Bishop	CC3.070	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	27	1	0.0178			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/16/02	4:22:47 PM	13.55	12.51	478.8	33.60	274.2352	1	1
9/16/02	4:23:56 PM	13.36	12.51	407.3	33.54	287.4971	1	2
9/16/02	4:25:30 PM	13.11	12.51	305.5	33.49	308.3911	1	3
9/16/02	4:26:51 PM	12.89	12.51	202.6	33.45	325.6766	1	4
9/16/02	4:28:03 PM	12.82	12.51	150.3	33.38	296.9117	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.080	Bishop	CC3.080	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	27	1	0.0178			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/16/02	4:35:20 PM	13.09	12.51	478.1	33.08	497.1794	1	1
9/16/02	4:36:41 PM	12.98	12.51	405.0	33.03	521.8897	1	2
9/16/02	4:37:53 PM	12.83	12.51	304.0	32.98	578.6786	1	3
9/16/02	4:40:03 PM	13.15	12.51	610.2	32.91	573.3987	1	4

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.090	Bishop	CC3.090	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	26.4	1	0.0177			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/16/02	4:47:13 PM	13.17	12.51	1025.0	32.72	932.6573	1	1
9/16/02	4:49:03 PM	13.09	12.51	914.2	32.69	949.4717	1	2
9/16/02	4:50:15 PM	13.02	12.51	801.4	32.66	949.1239	1	3
9/16/02	4:51:24 PM	12.95	12.51	700.6	32.63	964.3290	1	4
9/16/02	4:53:17 PM	12.84	12.51	594.2	32.58	1095.0191	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.100	Bishop	CC3.100	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	26.4	1	0.0177			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/16/02	5:03:00 PM	12.99	12.51	595.4	32.32	749.2218	1	1
9/16/02	5:04:23 PM	12.95	12.51	474.0	32.29	651.6398	1	2
9/16/02	5:05:41 PM	12.86	12.51	402.7	32.25	698.3783	1	3
9/16/02	5:07:18 PM	13.11	12.51	687.4	32.22	688.5253	1	4
9/16/02	5:08:50 PM	13.20	12.51	795.0	32.20	689.9669	1	5

CLD, 04/07/03

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.110	Bishop	CC3.110	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7000	9.49	26.4	1	0.0177			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/16/02	5:16:50 PM	13.41	12.50	475.7	32.02	310.4420	1	1
9/16/02	5:19:15 PM	13.25	12.50	402.0	31.97	320.2378	1	2
9/16/02	5:20:47 PM	13.06	12.50	307.7	31.92	330.6682	1	3
9/16/02	5:22:04 PM	12.89	12.50	206.2	31.89	320.2819	1	4
9/16/02	5:23:26 PM	12.82	12.50	155.2	31.85	294.5725	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.120	Bishop	CC3.120	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7000	9.49	26.4	1	0.0177			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/16/02	5:30:53 PM	13.47	12.5	472.8	31.69	288.4828	1	1
9/16/02	5:32:05 PM	13.30	12.5	400.5	31.68	298.2490	1	2
9/16/02	5:33:43 PM	13.09	12.5	301.1	31.66	306.5010	1	3
9/16/02	5:35:11 PM	12.91	12.5	202.1	31.65	298.1113	1	4
9/16/02	5:36:29 PM	12.81	12.5	143.6	31.60	281.2280	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.130	Bishop	CC3.130	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	26.4	1	0.0177			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/16/02	5:44:16 PM	13.36	12.5	475.5	31.48	328.4055	1	1
9/16/02	5:46:08 PM	13.21	12.5	399.8	31.46	336.3882	1	2
9/16/02	5:47:20 PM	13.02	12.5	302.0	31.45	349.5160	1	3
9/16/02	5:49:53 PM	12.86	12.5	202.7	31.40	340.9375	1	4
9/16/02	5:51:18 PM	12.81	12.5	168.8	31.35	330.3088	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
SoilMoisture Equipment Corp.	Bishop **Ceramic Test #2**	Santa Barbara	nominally 2.5 inch	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.25	0.1250	5.1	26.4	1	0.0177			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/17/02	9:15:00 AM	22.01	12.54	352.0	23.38	16.1954	1	1
9/17/02	9:18:51 AM	19.73	12.54	246.0	24.11	16.0001	1	2
9/17/02	9:21:24 AM	26.12	12.54	684.4	24.63	19.7071	1	3

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Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.140	Bishop	CC3.140	4 inches	7/10 inch	NA	CLD		
Tip OD	Tip ID	Geom. Fact.	Ref. Temp.	Ref. Press.	Viscosity			
(in.)	(in.)		(°C)	(atm.)	(cp)			
0.7	0.7	9.49	21	1	0.0175			
Date	Time	Flow Press	Atm. Press	Flow Rate	Temp.	Perm.	Sample	Reading
		(psia)	(psia)	(cc/min)	(°C)	(md)		
9/17/02	9:31:09 AM	13.80	12.54	470.3	26.30	215.4232	1	1
9/17/02	9:32:44 AM	13.60	12.54	400.6	26.55	219.9712	1	2
9/17/02	9:35:11 AM	13.34	12.54	304.1	26.90	223.7284	1	3
9/17/02	9:37:14 AM	13.11	12.54	204.5	27.15	213.2388	1	4
9/17/02	9:39:05 AM	12.87	12.54	106.6	27.36	193.9444	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.150	Bishop	CC3.150	4 inches	7/10 inch	NA	CLD		
Tip OD	Tip ID	Geom. Fact.	Ref. Temp.	Ref. Press.	Viscosity			
(in.)	(in.)		(°C)	(atm.)	(cp)			
0.7	0.7	9.49	21	1	0.0175			
Date	Time	Flow Press	Atm. Press	Flow Rate	Temp.	Perm.	Sample	Reading
		(psia)	(psia)	(cc/min)	(°C)	(md)		
9/17/02	9:56:09 AM	13.38	12.54	479.4	29.46	334.9783	1	1
9/17/02	9:57:36 AM	13.23	12.54	400.9	29.66	343.1903	1	2
9/17/02	9:59:41 AM	13.06	12.54	304.1	29.88	347.9889	1	3
9/17/02	10:02:11 AM	12.90	12.54	202.7	30.12	337.4196	1	4
9/17/02	10:03:26 AM	12.85	12.54	150.5	30.25	291.6315	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.160	Bishop	CC3.160	4 inches	7/10 inch	NA	CLD		
Tip OD	Tip ID	Geom. Fact.	Ref. Temp.	Ref. Press.	Viscosity			
(in.)	(in.)		(°C)	(atm.)	(cp)			
0.7	0.7	9.49	29	1	0.0178			
Date	Time	Flow Press	Atm. Press	Flow Rate	Temp.	Perm.	Sample	Reading
		(psia)	(psia)	(cc/min)	(°C)	(md)		
9/17/02	10:31:02 AM	12.94	12.54	1789.2	33.17	2698.7588	1	1
9/17/02	10:32:14 AM	12.92	12.54	1724.4	33.45	2742.5685	1	2
9/17/02	10:33:16 AM	12.89	12.54	1608.8	33.60	2782.6691	1	3
9/17/02	10:34:27 AM	12.87	12.54	1506.4	33.77	2767.1728	1	4
9/17/02	10:35:59 AM	12.84	12.54	1414.0	33.92	2861.9586	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.170	Bishop	CC3.170	4 inches	7/10 inch	NA	CLD		
Tip OD	Tip ID	Geom. Fact.	Ref. Temp.	Ref. Press.	Viscosity			
(in.)	(in.)		(°C)	(atm.)	(cp)			
0.7	0.7000	9.49	31.2	1	0.0179			
Date	Time	Flow Press	Atm. Press	Flow Rate	Temp.	Perm.	Sample	Reading
		(psia)	(psia)	(cc/min)	(°C)	(md)		
9/17/02	10:48:02 AM	13.11	12.54	710.4	34.31	749.7541	1	1
9/17/02	10:49:06 AM	13.06	12.54	605.2	34.38	701.6695	1	2
9/17/02	10:50:06 AM	13.02	12.54	487.5	34.46	613.4265	1	3
9/17/02	10:51:11 AM	12.93	12.54	403.7	34.54	627.5786	1	4
9/17/02	10:52:36 AM	12.84	12.54	316.9	34.62	642.8940	1	5

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Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.180	vertically down due to trench	CC3.180	4 inches	7/10 inch	NA	CLD		
Tip OD	Tip ID	Geom. Fact.	Ref. Temp.	Ref. Press.	Viscosity			
(in.)	(in.)		(°C)	(atm.)	(cp)			
0.7	0.7000	9.49	31.2	1	0.0179			
Date	Time	Flow Press	Atm. Press	Flow Rate	Temp.	Perm.	Sample	Reading
		(psia)	(psia)	(cc/min)	(°C)	(md)		
9/17/02	11:01:19 AM	13.01	12.54	709.6	35.11	914.1800	1	1
9/17/02	11:02:22 AM	12.98	12.54	600.8	35.20	827.9998	1	2
9/17/02	11:03:29 AM	12.95	12.54	491.3	35.29	727.7019	1	3
9/17/02	11:04:33 AM	12.88	12.54	408.1	35.37	731.1142	1	4
9/17/02	11:06:05 AM	12.84	12.54	365.3	35.45	743.0817	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
SoilMoisture 1 bar ceramic	Santa Barbara **Ceramic Test #3**	NA	2.5 nominal inches	7/10 inch	NA	CLD		
Tip OD	Tip ID	Geom. Fact.	Ref. Temp.	Ref. Press.	Viscosity			
(in.)	(in.)		(°C)	(atm.)	(cp)			
0.25	0.1250	5.1	26.7	1	0.0177			
Date	Time	Flow Press	Atm. Press	Flow Rate	Temp.	Perm.	Sample	Reading
		(psia)	(psia)	(cc/min)	(°C)	(md)		
9/18/02	11:20:16 AM	25.00	12.58	455.4	35.11	15.1298	1	1
9/18/02	11:22:12 AM	19.82	12.58	256.4	35.29	16.9592	1	2

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.230	Chalk Cove, Bishop	CC3.230	4 inches	7/10 inch	NA	CLD		
Tip OD	Tip ID	Geom. Fact.	Ref. Temp.	Ref. Press.	Viscosity			
(in.)	(in.)		(°C)	(atm.)	(cp)			
0.7	0.7	9.49	26.1	1	0.0177			
Date	Time	Flow Press	Atm. Press	Flow Rate	Temp.	Perm.	Sample	Reading
		(psia)	(psia)	(cc/min)	(°C)	(md)		
9/18/02	5:28:17 PM	13.21	12.53	1062.6	32.95	937.9193	1	1
9/18/02	5:29:18 PM	13.11	12.53	888.2	32.94	922.7067	1	2
9/18/02	5:30:09 PM	13.02	12.53	733.4	32.94	905.0089	1	3
9/18/02	5:30:49 PM	12.92	12.53	584.2	32.92	909.2425	1	4
9/18/02	5:32:48 PM	12.89	12.53	511.4	32.91	863.2549	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.240	Chalk Cove, Bishop	CC3.240	4 inches	7/10 inch	NA	CLD		
Tip OD	Tip ID	Geom. Fact.	Ref. Temp.	Ref. Press.	Viscosity			
(in.)	(in.)		(°C)	(atm.)	(cp)			
0.7	0.7	9.49	25.3	1	0.0177			
Date	Time	Flow Press	Atm. Press	Flow Rate	Temp.	Perm.	Sample	Reading
		(psia)	(psia)	(cc/min)	(°C)	(md)		
9/18/02	5:48:05 PM	13.36	12.53	797.8	32.68	574.6144	1	1
9/18/02	5:48:54 PM	13.24	12.53	672.2	32.68	568.6150	1	2
9/18/02	5:50:05 PM	13.13	12.53	573.8	32.63	576.7322	1	3
9/18/02	5:50:59 PM	13.10	12.53	504.2	32.62	534.0559	1	4
9/18/02	5:52:05 PM	12.99	12.53	398.7	32.58	525.5169	1	5
9/18/02	5:52:54 PM	12.88	12.53	308.3	32.58	536.3362	1	6

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Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.250	Chalk Cove, Bishop	CC3.250	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7000	9.49	26.6	1	0.0178			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/18/02	5:12:03 PM	13.39	12.53	998.2	33.17	695.0738	1	1
9/18/02	5:13:17 PM	13.28	12.53	863.0	33.15	691.9583	1	2
9/18/02	5:14:09 PM	13.17	12.53	715.8	33.15	675.4559	1	3
9/18/02	5:15:22 PM	13.04	12.53	597.8	33.12	711.4743	1	4
9/18/02	5:16:24 PM	13.01	12.53	476.0	33.12	602.5883	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.270	Chalk Cove, Bishop	CC3.270	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	25.3	1	0.0177			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/18/02	6:01:56 PM	13.32	12.53	649.4	32.20	491.3998	1	1
9/18/02	6:03:16 PM	13.21	12.53	468.5	32.14	413.5396	1	2
9/18/02	6:04:09 PM	13.11	12.53	404.7	32.11	420.3790	1	3
9/18/02	6:05:28 PM	12.95	12.53	300.8	32.03	434.1077	1	4

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.280	Chalk Cove, Bishop	CC3.280	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	27.2	1	0.0178			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/18/02	4:51:02 PM	13.28	12.53	924.2	33.49	740.3693	1	1
9/18/02	4:52:01 PM	13.19	12.53	799.8	33.48	730.6074	1	2
9/18/02	4:53:16 PM	13.12	12.53	706.6	33.48	724.0221	1	3
9/18/02	4:55:04 PM	13.02	12.53	599.8	33.45	742.8387	1	4
9/18/02	4:56:01 PM	12.98	12.53	473.7	33.42	639.7539	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.290	Chalk Cove, Bishop	CC3.290	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	27.2	1	0.0178			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/18/02	4:21:34 PM	13.29	12.53	909.4	34.06	719.9617	1	1
9/18/02	4:22:19 PM	13.21	12.53	806.2	34.05	715.5658	1	2
9/18/02	4:23:43 PM	13.08	12.53	702.6	34.02	774.8501	1	3
9/18/02	4:25:10 PM	13.00	12.53	605.8	33.97	784.1366	1	4
9/18/02	4:26:24 PM	12.97	12.53	479.2	33.94	663.2735	1	5

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Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.300	Chalk Cove, Bishop	CC3.300	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	27.2	1	0.0178			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/18/02	3:54:47 PM	13.28	12.54	1688.2	34.85	1376.1370	1	1
9/18/02	3:55:54 PM	13.20	12.54	1543.8	34.80	1415.2135	1	2
9/18/02	3:57:12 PM	13.12	12.54	1413.8	34.77	1479.2597	1	3
9/18/02	3:58:14 PM	13.04	12.54	1243.4	34.74	1513.6975	1	4
9/18/02	3:59:31 PM	12.89	12.54	872.2	34.71	1525.6613	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.310	Chalk Cove, Bishop	CC3.310	4l inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	33.3	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/18/02	1:48:36 PM	13.38	12.56	709.6	40.76	524.8782	1	1
9/18/02	1:51:24 PM	13.35	12.56	571.2	40.85	439.1845	1	2
9/18/02	1:52:29 PM	13.31	12.56	496.6	40.88	402.8504	1	3
9/18/02	1:53:37 PM	13.15	12.56	403.2	40.90	418.3973	1	4
9/18/02	1:55:07 PM	12.98	12.56	307.9	40.91	451.8308	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.320	Chalk Cove, Bishop	CC3.320	4l inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	33.3	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/18/02	2:49:19 PM	13.40	12.55	667.2	38.55	475.3926	1	1
9/18/02	2:50:37 PM	13.31	12.55	482.9	38.46	386.0489	1	2
9/18/02	2:51:58 PM	13.16	12.55	401.5	38.33	402.0681	1	3
9/18/02	2:53:07 PM	12.99	12.55	300.9	38.23	420.4331	1	4
9/18/02	2:55:10 PM	12.87	12.55	225.5	38.07	435.0150	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.330	Chalk Cove, Bishop	CC3.330	4l inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	33.3	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/18/02	1:28:07 PM	13.77	12.56	630.0	40.35	310.7173	1	1
9/18/02	1:31:37 PM	13.69	12.56	496.1	40.46	262.8905	1	2
9/18/02	1:33:17 PM	13.45	12.56	403.8	40.49	274.2148	1	3
9/18/02	1:34:27 PM	13.20	12.56	305.3	40.49	291.1092	1	4
9/18/02	1:36:11 PM	13.00	12.56	222.6	40.52	311.1775	1	5

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Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.340	Chalk Cove, Bishop	CC3.340	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	30.3	1	0.0179			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/18/02	1:10:39 PM	13.25	12.57	691.2	40.22	620.9737	1	1
9/18/02	1:12:32 PM	13.24	12.57	598.8	40.25	546.2547	1	2
9/18/02	1:13:59 PM	13.20	12.57	495.0	40.26	480.9947	1	3
9/18/02	1:15:03 PM	13.07	12.57	409.4	40.28	503.8226	1	4
9/18/02	1:17:09 PM	12.98	12.57	349.5	40.28	526.3689	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.350	Chalk Cove, Bishop	CC3.350	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	30.3	1	0.0179			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/18/02	12:48:46 PM	13.51	12.57	495.8	39.71	318.4918	1	1
9/18/02	12:50:55 PM	13.31	12.57	403.8	39.74	332.0772	1	2
9/18/02	12:52:13 PM	13.07	12.57	298.5	39.77	366.7471	1	3
9/18/02	12:55:00 PM	12.89	12.57	199.3	39.80	385.3461	1	4
9/18/02	12:57:32 PM	13.57	12.57	598.4	39.88	360.7025	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.360	Chalk Cove, Bishop	CC3.360	4l inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	30.3	1	0.0179			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/18/02	12:36:14 PM	14.07	12.57	496.6	39.57	195.6203	1	1
9/18/02	12:37:30 PM	13.75	12.57	404.9	39.61	205.2429	1	2
9/18/02	12:39:48 PM	13.4	12.57	302.1	39.65	220.6706	1	3
9/18/02	12:41:13 PM	13.11	12.57	206.8	39.66	234.8116	1	4
9/18/02	12:43:19 PM	12.93	12.57	102.8	39.66	171.4899	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.370	Chalk Cove, Bishop	CC3.370	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	27.4	1	0.0178			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/18/02	3:24:21 PM	14.31	12.55	484	36.13	159.9204	1	1
9/18/02	3:26:18 PM	13.98	12.55	404.1	36.02	166.3176	1	2
9/18/02	3:28:22 PM	13.57	12.55	300.2	35.9	175.8699	1	3
9/18/02	3:30:54 PM	13.24	12.55	202.1	35.77	177.1892	1	4
9/18/02	3:32:01 PM	12.98	12.55	107.9	35.69	153.3067	1	5

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Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.380	Chalk Cove, Bishop	CC3.380	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	27.6	1	0.0178			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/18/02	3:41:23 PM	13.32	12.54	805.4	35.31	622.8603	1	1
9/18/02	3:42:20 PM	13.23	12.54	708.6	35.28	621.5808	1	2
9/18/02	3:43:08 PM	13.15	12.54	616.6	35.25	613.6592	1	3
9/18/02	3:44:24 PM	13.10	12.54	482.0	35.17	523.4148	1	4
9/18/02	3:45:27 PM	13.00	12.54	404.3	35.14	536.4874	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.390	Chalk Cove, Bishop	CC3.390	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	27.2	1	0.0178			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/18/02	4:32:24 PM	13.16	12.53	703.4	33.83	674.7001	1	1
9/18/02	4:33:45 PM	13.06	12.53	609.8	33.80	697.9300	1	2
9/18/02	4:35:30 PM	13.02	12.53	479.9	33.77	594.9657	1	3
9/18/02	4:40:04 PM	12.94	12.53	409.3	33.68	608.1766	1	4
9/18/02	4:41:05 PM	12.83	12.53	312.9	33.65	638.1068	1	5

This data must be corrected for incorrect use of default geometry. CLD, 3/22/04

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.400	Bishop	CC3.400	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
~~0.25~~	~~0.125~~	~~5.1~~	27.7	1	0.0178			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/17/02	6:42:00 PM	14.13	12.45	1860.4	34.48	~~6742.7252~~	1	1
9/17/02	6:44:01 PM	13.96	12.45	1715.6	34.48	~~6962.4818~~	1	2
9/17/02	6:45:18 PM	13.83	12.45	1590.8	34.43	~~7097.9660~~	1	3
9/17/02	6:46:33 PM	13.71	12.45	1480.0	34.40	~~7264.9703~~	1	4
9/17/02	6:47:48 PM	13.56	12.45	1334.4	34.35	~~7477.0880~~	1	5
9/17/02	6:49:33 PM	13.28	12.45	988.4	34.29	~~7485.8287~~	1	6

old $aG_0 = 0.0625 \times 5.1$
new $aG_0 = 0.35 \times 9.49$
CLD, 3/22/04

CLD, 04/07/03

CLD, 04/07/03

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.410	Chalk Cove, Bishop	CC3.410	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	26.4	1	0.0177			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/18/02	3:07:05 PM	13.30	12.55	1064.2	37.07	860.5692	1	1
9/18/02	3:08:51 PM	13.19	12.55	924.2	36.98	879.2974	1	2
9/18/02	3:09:47 PM	13.11	12.55	814.2	36.91	887.8645	1	3
9/18/02	3:11:11 PM	13.03	12.55	702.6	36.85	896.3973	1	4
9/18/02	3:12:52 PM	13.00	12.55	625.8	36.73	852.3936	1	5
9/18/02	3:13:47 PM	12.96	12.55	484.5	36.68	725.3330	1	6

CLD, 04/07/03

CLD, 08/13/03

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.420	Chalk Cove, Bishop	CC3.420	~~5 nominal inch~~ 4 inches ← CLD, 08/13/03	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	27.1	1	0.0177			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/18/02	12:23:49 PM	13.13	12.57	491.2	39.09	536.4172	1	1
9/18/02	12:25:03 PM	13.00	12.57	397.0	39.15	567.5973	1	2
9/18/02	12:26:09 PM	12.88	12.57	301.8	39.20	601.4344	1	3
9/18/02	12:27:34 PM	13.18	12.57	686.8	39.24	687.6050	1	4
9/18/02	12:28:57 PM	13.17	12.57	599.6	39.34	610.6427	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.430	Chalk Cove, Bishop	CC3.430	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	27.1	1	0.0177			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/18/02	11:31:02 AM	13.71	12.58	484.7	36.13	253.8384	1	1
9/18/02	11:32:15 AM	13.49	12.58	401.8	36.25	263.6023	1	2
9/18/02	11:33:33 AM	13.25	12.58	308.8	36.36	277.8141	1	3
9/18/02	11:34:44 AM	13.02	12.58	201.9	36.45	279.1555	1	4
9/18/02	11:37:47 AM	12.89	12.58	111.9	36.68	220.8627	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.440	Bishop	CC3.440	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	29.7	1	0.0179			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/17/02	5:44:43 PM	13.38	12.45	477.8	35.2	309.1233	1	1
9/17/02	5:49:36 PM	13.23	12.45	409.0	35.17	317.3105	1	2
9/17/02	5:54:30 PM	13.02	12.45	310.1	35.17	331.8994	1	3
9/17/02	5:55:36 PM	12.83	12.45	205.1	35.14	331.7519	1	4
9/17/02	5:57:23 PM	13.45	12.45	593.2	35.14	357.4186	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.450	Bishop	CC3.450	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7000	9.49	29.5	1	0.0179			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/17/02	4:42:55 PM	13.29	12.46	1006.0	34.29	729.8584	1	1
9/17/02	4:44:10 PM	13.21	12.46	906.8	34.35	730.4746	1	2
9/17/02	4:45:18 PM	13.13	12.46	802.4	34.38	725.8868	1	3
9/17/02	4:46:33 PM	13.05	12.46	703.2	34.40	724.7629	1	4
9/17/02	4:47:51 PM	12.96	12.46	616.0	34.42	751.8460	1	5
9/17/02	4:49:09 PM	12.92	12.46	480.0	34.46	637.8637	1	6

CLD, 04/07/03

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.460	Bishop	CC3.460	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7000	9.49	29.5	1	0.0179			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/17/02	4:27:16 PM	13.38	12.46	475.9	34.23	310.5514	1	1
9/17/02	4:28:26 PM	13.21	12.46	399.9	34.23	322.2273	1	2
9/17/02	4:29:34 PM	13.00	12.46	301.8	34.23	340.5377	1	3
9/17/02	4:31:02 PM	12.83	12.46	203.9	34.22	338.0264	1	4

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.470	Bishop	CC3.470	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	30	1	0.0179			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/17/02	4:17:42 PM	12.98	12.46	803.6	34.31	940.9908	1	1
9/17/02	4:18:34 PM	12.92	12.46	711.2	34.29	943.6440	1	2
9/17/02	4:20:11 PM	12.85	12.46	600.8	34.29	942.8116	1	3
9/17/02	4:21:05 PM	12.82	12.46	476.4	34.29	810.8564	1	4

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.480	Bishop	CC3.480	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7000	9.49	30.8	1	0.0179			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/17/02	4:00:15 PM	13.12	12.46	609.0	34.86	559.8134	1	1
9/17/02	4:01:11 PM	13.06	12.46	482.4	34.83	488.8338	1	2
9/17/02	4:02:06 PM	12.94	12.46	404.8	34.77	515.1208	1	3
9/17/02	4:03:16 PM	12.82	12.46	322.1	34.72	549.0149	1	4
9/17/02	4:04:33 PM	13.20	12.46	690.6	34.68	564.0982	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.490	Bishop	CC3.490	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	30.8	1	0.0179			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/17/02	3:35:10 PM	12.83	12.46	705.0	36.14	1171.0235	1	1
9/17/02	3:39:32 PM	12.95	12.46	940.2	35.96	1172.9883	1	2
9/17/02	3:41:25 PM	13.00	12.46	1033.8	35.88	1167.7399	1	3
9/17/02	3:42:42 PM	13.07	12.46	1168.2	35.82	1164.7374	1	4

CLD, 04/07/03

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.500	Bishop	CC3.500	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7000	9.49	30.8	1	0.0179			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/17/02	3:15:33 PM	12.99	12.47	703.0	36.98	827.5585	1	1
9/17/02	3:16:46 PM	12.96	12.47	638.6	36.93	798.5858	1	2
9/17/02	3:19:47 PM	12.90	12.47	478.2	36.79	682.7907	1	3
9/17/02	3:21:14 PM	12.82	12.47	400.5	36.71	704.5511	1	4
9/17/02	3:23:28 PM	13.07	12.47	805.8	36.62	818.5699	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.510	Bishop	CC3.510	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	32.3	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/17/02	2:59:29 PM	13.5	12.47	486.0	37.81	278.4761	1	1
9/17/02	3:01:12 PM	13.3	12.47	398.8	37.73	291.4728	1	2
9/17/02	3:02:29 PM	13.1	12.47	305.3	37.67	311.3912	1	3
9/17/02	3:03:43 PM	12.9	12.47	205.7	37.59	334.0618	1	4
9/17/02	3:06:10 PM	12.8	12.47	170.0	37.44	299.9592	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.520	Bishop	CC3.520	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	32.3	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/17/02	2:43:57 PM	12.93	12.47	886.6	38.43	1188.9089	1	1
9/17/02	2:45:38 PM	12.85	12.47	741.4	38.40	1207.1907	1	2
9/17/02	2:47:20 PM	12.83	12.47	653.4	38.36	1123.7531	1	3
9/17/02	2:48:28 PM	12.80	12.47	506.2	38.33	950.6794	1	4
9/17/02	2:49:47 PM	12.78	12.47	465.5	38.26	931.2622	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.530	Bishop	CC3.530	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	32.3	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/17/02	2:26:41 PM	13.14	12.47	490.1	38.53	447.6639	1	1
9/17/02	2:28:41 PM	12.99	12.47	392.0	38.55	473.3777	1	2
9/17/02	2:29:55 PM	12.85	12.47	307.8	38.58	501.4675	1	3
9/17/02	2:31:25 PM	12.79	12.47	264.6	38.58	513.0813	1	4
9/17/02	2:33:27 PM	13.21	12.47	649.8	38.58	536.0119	1	5

CLD, 04/07/03

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.540	Bishop	CC3.540	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	32.3	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/17/02	2:12:57 PM	13.28	12.48	491.2	38.61	373.6919	1	1
9/17/02	2:14:02 PM	13.11	12.48	402.8	38.58	391.6895	1	2
9/17/02	2:15:29 PM	12.92	12.48	300.8	38.58	421.9033	1	3
9/17/02	2:18:16 PM	12.85	12.48	259.3	38.52	433.6281	1	4
9/17/02	2:19:46 PM	13.34	12.48	597.4	38.53	421.6599	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CC3.550	Bishop	CC3.550	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7000	9.49	33.5	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/17/02	1:57:27 PM	13.37	12.48	491.7	38.78	335.2353	1	1
9/17/02	1:58:45 PM	13.18	12.48	399.0	38.77	348.4210	1	2
9/17/02	1:59:53 PM	12.99	12.48	307.6	38.73	371.3793	1	3
9/17/02	2:00:45 PM	12.81	12.48	209.2	38.72	393.1112	1	4
9/17/02	2:02:05 PM	12.78	12.48	168.8	38.66	349.2615	1	5

Flowrates greater than 500 cc/min were collected with the 0-2000 cc/min Flowmeter. This flowmeter was out of tolerance upon return from September fieldwork (see page 138). It can be corrected by applying the linear regression equation determined on page 140 (this SN). These data are indicated by a darker border + a yellow background on pages 150-163 (this SN). One exception to this is data from location CC3.400 (pg 159, this SN). Default geometry data were used at this location, rather than the geometry data for the small drillhole minipermeameter probe. This can be easily corrected, and will be.

CLD, 04/07/03

Sept. Data from Crossing Faults Transect 1 (i.e., CF1)

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
Soil Moisture Ceramic	Santa Barbara/bishop	**Ceramic Test #4**	nominal 2.5 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.25	0.1250	5.1	25.3	1	0.0177			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	8:58:24 AM	19.47	12.68	225.1	24.08	15.5106	1	1
9/19/02	9:02:36 AM	26.78	12.68	693.6	24.92	18.9301	1	2
9/19/02	9:04:51 AM	15.97	12.68	98.8	25.28	15.9345	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.121	Crossing Faults	CF1.121	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	24.6	1	0.0176			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	10:07:53 AM	13.21	12.68	616.0	32.22	691.4662	1	1
9/19/02	10:09:16 AM	13.19	12.68	543.2	32.34	634.3567	1	2
9/19/02	10:10:32 AM	13.12	12.68	433.6	32.42	588.7073	1	3
9/19/02	10:12:06 AM	13.01	12.68	334.8	32.51	608.8207	1	4

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.175	Crossing Faults	CF1.175	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	31.1	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	5:05:11 PM	13.43	12.60	1562.6	35.66	1141.7475	1	1
9/19/02	5:07:23 PM	13.29	12.60	1439.0	35.74	1219.8065	1	2
9/19/02	5:08:25 PM	13.21	12.60	1235.8	35.76	1224.0929	1	3
9/19/02	5:09:24 PM	13.16	12.60	1128.2	35.77	1219.6923	1	4
9/19/02	5:10:17 PM	13.00	12.60	825.4	35.77	1257.0791	1	5
9/19/02	5:11:31 PM	12.92	12.60	609.0	35.74	1200.8839	1	6

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.222	Crossing Faults	CF1.222	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	31.6	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	4:30:52 PM	13.78	12.60	652.2	36.53	327.5589	1	1
9/19/02	4:31:56 PM	13.68	12.60	511.8	36.50	281.8866	1	2
9/19/02	4:32:43 PM	13.58	12.60	451.2	36.48	274.8961	1	3
9/19/02	4:33:59 PM	13.34	12.60	356.1	36.45	289.9502	1	4
9/19/02	4:37:40 PM	13.13	12.60	267.0	36.33	305.9006	1	5
9/19/02	4:39:23 PM	13.08	12.60	239.2	36.31	309.7077	1	6

CLD, 04/07/03

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.243	Crossing Faults	CF1.243	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	31.6	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	4:18:14 PM	13.48	12.61	561.0	36.94	386.2748	1	1
9/19/02	4:20:17 PM	13.39	12.61	467.5	36.90	360.2338	1	2
~~9/19/02~~	~~4:21:19 PM~~	~~13.39~~	~~12.61~~	~~467.5~~	~~36.85~~	~~360.1757~~	~~1~~	~~3~~
9/19/02	4:22:28 PM	13.22	12.61	378.5	36.81	375.2929	1	4
9/19/02	4:23:43 PM	13.04	12.61	284.3	36.74	402.6333	1	5

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Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.278	Crossing Faults	CF1.278	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	24.6	1	0.0176			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	10:30:12 AM	13.23	12.68	865.2	33.25	941.3237	1	1
9/19/02	10:31:32 AM	13.15	12.68	727.2	33.35	929.0825	1	2
9/19/02	10:32:33 AM	13.07	12.68	580.0	33.42	896.0001	1	3
9/19/02	10:33:24 AM	13.03	12.68	464.3	33.48	800.6366	1	4

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.301	Crossing Faults	CF1.301	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	31.6	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	4:01:06 PM	13.36	12.61	812.2	37.15	652.1548	1	1
9/19/02	4:02:17 PM	13.27	12.61	716.6	37.16	656.1505	1	2
9/19/02	4:03:22 PM	13.22	12.61	631.4	37.18	626.7773	1	3
9/19/02	4:04:41 PM	13.18	12.61	524.6	37.18	558.1321	1	4
9/19/02	4:07:18 PM	13.03	12.61	393.4	37.15	571.3312	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.343	Crossing Faults	CF1.343	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	31.6	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	3:52:43 PM	14.54	12.61	467.4	37.07	139.4667	1	1
9/19/02	3:53:56 PM	14.18	12.61	401.6	37.11	149.3043	1	2
9/19/02	3:55:00 PM	13.69	12.61	303.1	37.11	166.8673	1	3
9/19/02	3:56:03 PM	13.29	12.61	204.8	37.13	181.8504	1	4
9/19/02	3:57:26 PM	13.03	12.61	102.5	37.13	148.8502	1	5

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Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.382	Crossing Faults	CF1.382	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	34.5	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected								

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.500	Crossing Faults	CF1.500 angle right of cf	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7000	9.49	34.5	1	0.0181			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	3:11:31 PM	13.53	12.62	1485.4	36.44	959.2591	1	1
9/19/02	3:12:33 PM	13.43	12.62	1364.2	36.53	1005.0497	1	2
9/19/02	3:13:58 PM	13.20	12.62	1018.2	36.57	1038.8602	1	3
9/19/02	3:15:42 PM	13.11	12.62	861.0	36.62	1062.0326	1	4
9/19/02	3:16:45 PM	12.95	12.62	468.2	36.65	862.9773	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.515	Crossing Faults	CF1.515 angle right of cf	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	33.5	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	2:57:32 PM	13.25	12.62	793.8	36.22	756.4556	1	1
9/19/02	2:59:25 PM	13.14	12.62	642.6	36.28	745.2210	1	2
9/19/02	3:00:29 PM	13.09	12.62	487.3	36.28	626.4552	1	3
9/19/02	3:01:47 PM	12.98	12.62	379.3	36.31	657.9307	1	4
9/19/02	3:02:49 PM	12.94	12.62	348.2	36.31	661.3839	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.590	Crossing Faults	CF1.590	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	33.5	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	2:04:29 PM	13.53	12.64	49.2	35.37	32.6167	1	1
9/19/02	2:06:38 PM	14.61	12.64	100.2	35.4	28.8469	1	2
9/19/02	2:09:08 PM	15.79	12.64	204.7	35.42	35.3283	1	3
9/19/02	2:11:19 PM	17.29	12.64	305.8	35.43	33.9613	1	4
9/19/02	2:12:49 PM	18.93	12.64	405.0	35.46	31.5257	1	5
9/19/02	2:15:24 PM	32.41	12.64	1782.2	35.69	30.9548	1	6

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Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.630	Crossing Faults	CF1.630	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	31.5	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	1:39:57 PM	13.44	12.64	733.0	34.86	545.5724	1	1
9/19/02	1:41:11 PM	13.25	12.64	473.6	34.89	465.7342	1	2
9/19/02	1:43:00 PM	13.14	12.64	402.6	34.92	485.1225	1	3
9/19/02	1:45:12 PM	13.06	12.64	351.0	34.97	505.1563	1	4
9/19/02	1:46:28 PM	13.00	12.64	309.9	34.98	521.5743	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.676	Crossing Faults	CF1.676	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	31.5	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	1:27:51 PM	13.44	12.64	1113.8	34.63	828.3829	1	1
9/19/02	1:29:06 PM	13.34	12.64	971.4	34.68	828.9970	1	2
9/19/02	1:30:29 PM	13.24	12.64	813.8	34.71	813.4607	1	3
9/19/02	1:31:21 PM	13.14	12.64	667.8	34.72	804.1591	1	4
9/19/02	1:33:17 PM	13.08	12.64	544.6	34.75	747.0174	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.725	Crossing Faults	CF1.725	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	33.3	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	1:12:00 PM	14.40	12.64	487.1	34.80	157.9797	1	1
9/19/02	1:13:16 PM	14.07	12.64	406.2	34.80	164.1468	1	2
9/19/02	1:15:08 PM	13.67	12.64	305.5	34.77	173.9856	1	3
9/19/02	1:16:39 PM	13.33	12.64	207.5	34.74	178.6960	1	4
9/19/02	1:17:52 PM	13.07	12.64	104.3	34.72	145.5806	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.775	Crossing Faults	CF1.775	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	33.3	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	12:57:28 PM	13.41	12.64	633.4	35.09	487.8552	1	1
9/19/02	12:58:44 PM	13.35	12.64	527.8	35.09	441.8920	1	2
9/19/02	12:59:50 PM	13.26	12.64	443.6	35.08	426.7872	1	3
9/19/02	1:01:10 PM	13.09	12.64	339.1	35.05	452.4082	1	4
9/19/02	1:03:00 PM	13.01	12.64	286.8	35.02	466.7698	1	5

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Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.824	Crossing Faults	CF1.824	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	33.3	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	12:40:44 PM	13.62	12.65	480.5	35.00	291.2367	1	1
9/19/02	12:41:44 PM	13.44	12.65	401.5	35.02	300.8826	1	2
9/19/02	12:43:10 PM	13.22	12.65	306.6	35.05	321.1854	1	3
9/19/02	12:44:17 PM	13.02	12.65	204.0	35.08	331.8179	1	4
9/19/02	12:46:20 PM	12.97	12.65	151.2	35.11	284.9458	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.875	Crossing Faults	CF1.875	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	29	1	0.0178			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	12:29:11 PM	13.82	12.65	482.9	34.92	241.4764	1	1
9/19/02	12:30:14 PM	13.61	12.65	405.7	34.92	249.2277	1	2
9/19/02	12:31:17 PM	13.34	12.65	309.0	34.92	266.8458	1	3
9/19/02	12:32:20 PM	13.11	12.65	211.3	34.95	276.1551	1	4
9/19/02	12:33:15 PM	12.99	12.65	126.0	34.92	223.8365	1	5

CF1.925 data collected on this date: 12:10 p.m. - 12:17 p.m., but left out of this list by accident. See CD attachment CLD 02/21/06

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.971	Crossing Faults	CF1.971	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	20	1	0.0175			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	9:23:52 AM	13.24	12.68	1003.2	28.59	1062.3233	1	1
9/19/02	9:26:01 AM	13.19	12.68	879.6	29.05	1016.8294	1	2
9/19/02	9:26:57 AM	13.10	12.68	714.8	29.22	1007.4560	1	3
9/19/02	9:28:08 AM	13.00	12.68	607.6	29.34	1128.9168	1	4
9/19/02	9:29:23 AM	12.99	12.68	550.8	29.49	1057.2259	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF1.1023	Crossing Faults	CF1.1023	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	27	1	0.0178			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	11:54:51 AM	13.59	12.68	473.1	34.65	308.2568	1	1
9/19/02	11:55:52 AM	13.45	12.68	407.7	34.68	315.6868	1	2
9/19/02	11:56:47 AM	13.23	12.68	303.8	34.72	332.1372	1	3
9/19/02	11:58:50 AM	13.04	12.68	204.7	34.74	342.1857	1	4
9/19/02	12:00:10 PM	13.00	12.68	156.0	34.77	293.8497	1	5

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Sample Name	Field	Well	Depth	Diameter	Length	Operator		
Soil Moisture Ceramic	Santa Barbara/bishop	Soil Moisture Ceramic	nominal 2.5 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)	**Ceramic Test #4**		
0.25	0.1250	5.1	25.3	1	0.0177			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	8:58:24 AM	19.47	12.68	225.1	24.08	15.5106	1	1
9/19/02	9:02:36 AM	26.78	12.68	693.6	24.92	18.9301	1	2
9/19/02	9:04:51 AM	15.97	12.68	98.8	25.28	15.9345	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.035	Crossing Faults, Bishop	CF2.035	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7000	9.49	15.7	1	0.0173			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected								

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.050	Crossing Faults	CF2.050	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	27	1	0.0178			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	10:52:47 AM	13.15	12.68	1142.8	33.92	1462.7756	1	1
9/19/02	10:54:04 AM	13.10	12.68	1021.6	34.02	1466.6276	1	2
9/19/02	10:55:17 AM	13.06	12.68	926.0	34.11	1472.0320	1	3
9/19/02	10:56:35 AM	13.02	12.68	818.0	34.18	1455.9237	1	4
9/19/02	10:59:00 AM	13.00	12.68	765.6	34.28	1449.4245	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.090	Crossing Faults, Bishop	CF2.090	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7000	9.49	17.8	1	0.0174			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
No Data Collected								

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.108	Crossing Faults	CF2.108	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	27	1	0.0178			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	11:13:56 AM	13.50	12.68	640.0	34.58	464.2574	1	1
9/19/02	11:14:50 AM	13.38	12.68	467.4	34.58	399.0052	1	2
9/19/02	11:15:59 AM	13.26	12.68	396.3	34.55	410.1532	1	3
9/19/02	11:17:38 AM	13.13	12.68	313.5	34.54	420.2567	1	4
9/19/02	11:18:35 AM	13.02	12.68	242.4	34.52	431.9149	1	5

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Sample Name	Field	Well	Depth	Diameter	Length	Operator		
SoilMoisture Ceramic	Crossing Faults, Bishop	Soil Moisture Ceramic	nominal 2.5 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)	**Ceramic Test #5**		
0.7	0.7000	9.49	15.7	1	0.0173			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/20/02	8:19:41 AM	22.92	12.65	433.8	15.40	17.5121	1	1
9/20/02	8:20:58 AM	21.54	12.65	344.7	15.46	16.7276	1	2
9/20/02	8:22:17 AM	20.35	12.65	266.5	15.52	15.4731	1	3

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.129	Crossing Faults, Bishop	CF2.129	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	17.8	1	0.0174			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/20/02	8:46:51 AM	13.43	12.65	1496.0	17.27	1084.33153	1	1
9/20/02	8:48:07 AM	13.30	12.65	1250.0	17.41	1093.20427	1	2
9/20/02	8:49:05 AM	13.15	12.65	955.6	17.50	1093.10776	1	3
9/20/02	8:52:58 AM	13.13	12.65	946.4	17.76	1129.57616	1	4

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.168	Crossing Faults, Bishop	CF2.168	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	22.2	1	0.0175			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/20/02	9:12:21 AM	13.91	12.65	1132.4	19.02	499.8575	1	1
9/20/02	9:13:49 AM	13.81	12.65	1040.4	19.17	500.9800	1	2
9/20/02	9:17:28 AM	13.72	12.65	951.6	19.49	499.0377	1	3
9/20/02	9:20:07 AM	13.52	12.65	840.4	19.68	546.4974	1	4
9/20/02	9:22:04 AM	13.30	12.65	745.6	19.82	654.7686	1	5
9/20/02	9:23:45 AM	13.16	12.65	634.8	19.91	714.5701	1	6

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.271	Crossing Faults, Bishop	CF2.271	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	22.2	1	0.0175			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/20/02	9:40:50 AM	14.13	12.65	876.8	20.77	328.3064	1	1
9/20/02	9:42:02 AM	13.54	12.65	702.4	20.88	447.3759	1	2
9/20/02	9:43:32 AM	13.45	12.65	608.4	21.00	432.7624	1	3
9/20/02	9:45:03 AM	13.41	12.65	526.4	21.12	394.9079	1	4
9/20/02	9:47:03 AM	13.30	12.65	398.5	21.28	351.2220	1	5

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Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.323	Crossing Faults, Bishop	CF2.323	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7000	9.49	19.6	1	0.0174			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/20/02	9:56:16 AM	15.00	12.65	461.2	21.88	105.9084	1	1
9/20/02	9:57:38 AM	14.57	12.65	373.2	21.98	106.5868	1	2
9/20/02	9:58:57 AM	14.18	12.65	283.3	22.05	103.0360	1	3
9/20/02	10:00:31 AM	13.74	12.65	183.3	22.17	95.1663	1	4
9/20/02	10:02:52 AM	13.27	12.65	111.5	22.29	103.6706	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.373	Crossing Faults, Bishop	CF2.373	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	23.8	1	0.0176			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/20/02	10:09:41 AM	13.80	12.65	1050.4	23.02	517.2269	1	1
9/20/02	10:10:53 AM	13.69	12.65	906.8	23.12	496.0076	1	2
9/20/02	10:12:14 AM	13.55	12.65	804.0	23.23	511.0924	1	3
9/20/02	10:13:28 AM	13.32	12.65	708.8	23.29	610.7339	1	4
9/20/02	10:15:32 AM	13.23	12.65	625.6	23.40	625.0873	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.403	Crossing Faults, Bishop	CF2.403	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	23.8	1	0.0176			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/20/02	10:23:25 AM	13.62	12.65	1512.4	24.14	893.5003	1	1
9/20/02	10:24:33 AM	13.53	12.65	1369.2	24.23	894.9647	1	2
9/20/02	10:26:46 AM	13.44	12.65	1211.2	24.38	885.3705	1	3
9/20/02	10:27:34 AM	13.35	12.65	1050.8	24.43	870.0256	1	4
9/20/02	10:28:43 AM	13.20	12.65	793.2	24.51	840.9295	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.468	Crossing Faults, Bishop	CF2.468	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	26.8	1	0.0178			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/20/02	10:32:50 AM	13.58	12.65	1460.8	24.75	903.3576	1	1
9/20/02	10:33:50 AM	13.52	12.65	1358.4	24.86	900.3581	1	2
9/20/02	10:35:06 AM	13.38	12.65	1125.6	24.95	894.1879	1	3
9/20/02	10:36:24 AM	13.31	12.65	969.2	25.05	854.1855	1	4
9/20/02	10:37:16 AM	13.15	12.65	752.4	25.09	880.8557	1	5

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Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.510	Crossing Faults, Bishop	CF2.510	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	28.8	1	0.0178			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/20/02	11:00:32 AM	13.82	12.65	1383.6	26.4	673.1836	1	1
9/20/02	11:01:53 AM	13.60	12.65	1115.6	26.6	674.4509	1	2
9/20/02	11:03:01 AM	13.48	12.65	942.4	26.7	655.3479	1	3
9/20/02	11:04:03 AM	13.29	12.65	742.4	26.8	674.6406	1	4
9/20/02	11:06:43 AM	13.11	12.65	557.2	26.9	709.7797	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.525 new	Crossing Faults, Bishop	(left of old525 located at 535)	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	28.8	1	0.0178			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/20/02	11:14:28 AM	13.33	12.64	647.6	27.35	545.2053	1	1
9/20/02	11:15:53 AM	13.27	12.64	511.2	27.45	472.6087	1	2
9/20/02	11:16:47 AM	13.25	12.64	460.3	27.55	439.9896	1	3
9/20/02	11:17:43 AM	13.12	12.64	373.4	27.62	455.9861	1	4
9/20/02	11:18:57 AM	12.98	12.64	262.1	27.70	454.4529	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.549 (to the right of old 525)	Crossing Faults, Bishop	CF2.549	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	32.8	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/20/02	11:22:31 AM	13.37	12.64	673.2	27.99	535.9645	1	1
9/20/02	11:24:31 AM	13.29	12.64	559.2	28.16	501.8742	1	2
9/20/02	11:25:55 AM	13.23	12.64	449.3	28.31	447.8706	1	3
9/20/02	11:27:04 AM	13.08	12.64	338.1	28.39	454.6753	1	4
9/20/02	11:27:59 AM	13.02	12.64	292.3	28.47	456.3499	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.575 (to the left of old 585)	Crossing Faults, Bishop	CF2.575	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	27.8	1	0.0178			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/20/02	11:36:37 AM	13.65	12.64	676.0	29.25	388.5542	1	1
9/20/02	11:37:40 AM	13.47	12.64	459.7	29.34	323.8438	1	2
9/20/02	11:38:27 AM	13.29	12.64	365.1	29.42	330.7935	1	3
9/20/02	11:39:55 AM	13.13	12.64	271.9	29.54	328.9515	1	4
9/20/02	11:40:49 AM	13.00	12.64	190.4	29.62	315.2060	1	5

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Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.603	Crossing Faults, Bishop	CF2.603	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	27.8	1	0.0178			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/20/02	11:54:28 AM	16.10	12.64	504.8	30.88	77.8948	1	1
9/20/02	11:55:50 AM	15.96	12.64	463.1	31.02	74.8725	1	2
9/20/02	11:56:42 AM	15.26	12.64	371.8	31.12	78.1085	1	3
9/20/02	11:58:00 AM	14.57	12.64	275.2	31.26	80.5113	1	4
9/20/02	11:58:55 AM	13.97	12.64	178.4	31.35	77.4678	1	5
9/20/02	11:59:39 AM	13.50	12.64	105.2	31.43	71.9364	1	6

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.650	Crossing Faults, Bishop	CF2.650	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	27.8	1	0.0178			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/20/02	11:45:51 AM	14.75	12.64	473.6	30.06	125.4053	1	1
9/20/02	11:46:33 AM	14.39	12.64	398.9	30.12	129.0758	1	2
9/20/02	11:47:32 AM	13.99	12.64	309.7	30.22	131.9129	1	3
9/20/02	11:48:49 AM	13.59	12.64	206.4	30.32	126.8641	1	4
9/20/02	11:49:57 AM	13.18	12.64	107.0	30.43	117.5785	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.701	Crossing Faults	CF2.701	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	28.6	1	0.0178			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	6:23:16 PM	15.78	12.60	478.4	34.22	82.0156	1	1
9/19/02	6:24:10 PM	15.03	12.60	376.7	34.22	86.8067	1	2
9/19/02	6:24:59 PM	14.35	12.60	277.0	34.20	90.8656	1	3
9/19/02	6:25:41 PM	13.81	12.60	188.0	34.18	91.0106	1	4
9/19/02	6:26:43 PM	13.37	12.60	99.5	34.17	76.9673	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.749	Crossing Faults	CF2.749	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	28.6	1	0.0178			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	6:11:25 PM	15.92	12.60	475.4	34.42	77.7267	1	1
9/19/02	6:11:34 PM	15.40	12.60	373.1	34.40	73.3846	1	2
9/19/02	6:12:27 PM	15.16	12.60	377.2	34.38	82.1642	1	3
9/19/02	6:13:45 PM	14.45	12.60	280.8	34.35	86.8533	1	4
9/19/02	6:14:26 PM	13.88	12.60	189.4	34.35	86.4929	1	5
9/19/02	6:15:30 PM	13.43	12.60	102.8	34.32	73.6494	1	6

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Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.800	Crossing Faults	CF2.800	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	28.6	1	0.0178			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	6:02:54 PM	16.22	12.60	480.3	34.55	71.3051	1	1
9/19/02	6:03:53 PM	15.37	12.60	377.5	34.54	75.4643	1	2
9/19/02	6:04:49 PM	14.63	12.60	284.2	34.52	79.6249	1	3
9/19/02	6:05:48 PM	13.98	12.60	190.1	34.51	80.2606	1	4
9/19/02	6:07:20 PM	13.50	12.60	101.8	34.48	67.1084	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.850	Crossing Faults	CF2.850	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	31.1	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	5:53:47 PM	14.43	12.60	478.3	34.77	149.8733	1	1
9/19/02	5:55:04 PM	14.10	12.60	401.1	34.77	155.2284	1	2
9/19/02	5:56:05 PM	13.70	12.60	305.4	34.74	163.6061	1	3
9/19/02	5:57:58 PM	13.35	12.60	209.7	34.71	166.9692	1	4
9/19/02	5:59:33 PM	13.06	12.60	106.0	34.65	139.1372	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.900	Crossing Faults	CF2.900	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	31.1	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	5:42:03 PM	14.41	12.60	440.6	35.00	140.2024	1	1
9/19/02	5:43:11 PM	13.97	12.60	345.8	34.98	147.7742	1	2
9/19/02	5:44:33 PM	13.55	12.60	246.9	34.97	154.5958	1	3
9/19/02	5:45:38 PM	13.26	12.60	143.8	34.92	131.0351	1	4
9/19/02	5:46:49 PM	13.02	12.60	88.6	34.89	128.0455	1	5

Sample Name	Field	Well	Depth	Diameter	Length	Operator		
CF2.1001	Crossing Faults	CF2.1001	4 inches	7/10 inch	NA	CLD		
Tip OD (in.)	Tip ID (in.)	Geom. Fact.	Ref. Temp. (°C)	Ref. Press. (atm.)	Viscosity (cp)			
0.7	0.7	9.49	31.1	1	0.018			
Date	Time	Flow Press (psia)	Atm. Press (psia)	Flow Rate (cc/min)	Temp. (°C)	Perm. (md)	Sample	Reading
9/19/02	5:31:46 PM	16.74	12.60	464.5	35.22	59.5318	1	1
9/19/02	5:33:03 PM	15.80	12.60	369.5	35.20	63.2910	1	2
9/19/02	5:35:03 PM	15.22	12.60	309.4	35.17	66.0717	1	3
9/19/02	5:36:16 PM	14.42	12.60	213.9	35.14	67.6920	1	4
9/19/02	5:37:20 PM	13.72	12.60	108.2	35.11	57.1206	1	5

CLD, 04/07/03

Data collected during September 2002 from the Crossing Faults/Crucifix Site are found on pages 164-174. The goal was to collect data from locations intermediately between data collected at the same site/same transects in June 2002. The June + September data sets combined generally provide data on 25 cm centers. As before (page 163), flowrates greater than 500 cc/min are outlined in a thicker line + are high-lighted in yellow. This data can be corrected w/ the equation shown on page 140. Additionally, because the pressure transducer was only calibrated up to 15 psia (both before + after the September fieldwork), outcrop data collected at injection pressures greater than 15 psia are also outlined in a thicker line, + are highlighted in green. The September data must undergo final quality assurance corrections, but all necessary pieces are in place right now for this to take place at any time.

CLD, 04/07/03

SOUTHWEST RESEARCH INSTITUTE™

6220 Culebra Road, P.O. Drawer 28510
Institute Quality Systems
Institute Calibration Laboratory
Phone: 210-522-5215 Fax 210-522-3692

Certificate of Calibration

Submitted By:	DIV20	**Work Order:**	444054268
Address:	B189	**Date Issued:**	Jun 24, 2003
Contact:	CYNTHIA DINWIDDIE	**Calibration Date:**	Jun 24, 2003
Manufacturer Model:	VAISALA HM34C	****Calibration Due:**	Dec 24, 2003
Description:	HUMIDTY/ TEMPERATURE METER	**Calibration Location:**	Bldg. 64
Serial No:	X2020010	**Environment:**	Temp. 76.0°F Hum. 49 %RH
Asset No:	009456	***As Found:**	IN TOLERANCE
Procedure:	TEMPERATURE/HUMIDITY, MAR/03	***As Left:**	IN TOLERANCE

This certificate documents traceability to the National Institute of Standards and Technology (NIST) and the International System of Units (SI). The Laboratory quality system conforms to ISO/IEC 17025, 1999 and ANSI/NCSL Z540-1-1994 which are equivalent to relevant requirements of the ISO 9000-1994 series of standards. This certificate may not be reproduced, except in full, without the written approval of the Southwest Research Institute Calibration Laboratory. The results of this calibration relate only to the individual instrument described above. This certificate shall not be used to claim product endorsement by the American Association for Laboratory Accreditation (A2LA) or any agency of the U. S. Government.

Uncertainty evaluation includes the item under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor of k=2 to approximate a 95% confidence level. The calibration process provides a Test Uncertainty Ratio (TUR) of less than or equal to 25% (4:1) of the test limit unless otherwise stated in remarks or an attachment.

*The client has sole responsibility for determination of in/out of tolerance or compliance/noncompliance. An in/out of tolerance opinion is provided for your convenience based only on the Test Instrument (TI) reading(s) and limits as reported. The reported uncertainty relates only to the results at the time of calibration and does not imply any short or long term stability of the TI.

**Calibration interval is determined by the client and does not assure the instrument will remain within tolerance until this date. Any number of factors may cause the instrument to be out of tolerance before the next calibration date.

Remarks: Unit received with marginal readings. Adjusted.

Standards Used

Asset	Manufacturer	Model	Description	Cal Due
006404	THUNDER SCIENTIFIC	2500	HUMIDITY GENERATOR	Jun 10, 04

Approved by: Walt Hill
Metrology Group Leader
m:\Nona2la1.rpt Rev date 15, August 02

Measurements by: Mark Romero
Metrology Technician

1 of 1

CLD, 07/02/03

Southwest Research Institute
Calibration Laboratory
Calibration Report

Work Order:	444054268	Mfr	Vaisala	Technician	Mark Romero
Asset No.	009456	Model	HM34C		
Serial No.	X2020010	Type	Humidity / Temp meter	Cal Date	23-Jun-03

Remarks: Unit indicated marginal readings.

Temperature test is at 20 Degrees C. per manufacturer.

Function/Range	Test Point	TI Reading	Difference	+/-Limit	+/-Uncertainty	As Found
Humidity	%RH	%RH	%RH	%RH	%RH	Result
35	35.0	34.4	-0.6	2	0.51	Pass
50	50.0	48.3	-1.7	2	0.51	Pass
75	75.0	73.2	-1.8	2	0.51	Pass
Temperature	Deg. C	Deg. C	Deg. C	Deg. C	Deg. C	Results
	20.4	20.3	-0.1	0.3	0.18	Pass

END OF REPORT

CLD, 07/02/03

Southwest Research Institute
Calibration Laboratory
Calibration Report

Work Order:	444054268	Mfr	Vaisala	Technician	Mark Romero
Asset No.	009456	Model	HM34C		
Serial No.	X2020010	Type	Humidity / Temp meter	Cal Date	24-Jun-03

Remarks:

Temperature test is at 20 Degrees C. per manufacturer.

Function/Range	Test Point	TI Reading	Difference	+/-Limit	+/-Uncertainty	As Left
Humidity	%RH	%RH	%RH	%RH	%RH	Result
35	35.0	35.6	0.6	2	0.51	Pass
50	50.0	50.0	0.0	2	0.51	Pass
75	75.0	73.9	-1.1	2	0.51	Pass
Temperature	Deg. C	Deg. C	Deg. C	Deg. C	Deg. C	Results
	20.1	20.1	0.0	0.3	0.18	Pass

END OF REPORT

CLD, 07/02/03

SOUTHWEST RESEARCH INSTITUTE

6220 CULEBRA ROAD • POST OFFICE DRAWER 28510 • SAN ANTONIO, TEXAS, 78228-0510 • TEL (210) 522-5215 • FAX (210) 522-3692

OUT OF TOLERANCE

To: Cynthia Dinwiddie, Div 20, Bld 189

From: Walt Hill, Metrology Group Leader
Institute Calibration Laboratory

Date: Jul. 10, 2003

Subject: Out-of-tolerance Notice

The purpose of this notice is to alert you of a condition, which may have caused erroneous measurements affecting safety or the quality of products or services your organization provides. The attached as-found readings are provided for your evaluation to determine if the instrument listed below had an impact and if further action is required.

When the as-found results are near the specification limit, +/- a margin less than the measurement uncertainty, it is not possible to state in-tolerance or out-of-tolerance with a 95% level of confidence. It is the Institute Calibration Laboratory policy that the client is made aware of this situation because the end-user is taking some of the risk that the instrument listed below may not meet the end-user measurement requirements.

Your review/evaluation should be conducted in accordance with your organizational quality policy and procedural requirements. If we can be of further assistance, please contact the Calibration Laboratory at 522-5215.

Manufacturer: Viatran **Model:** 245

Description: Pressure Transducer **Serial Number:** 288713

Asset Number: 9671 **User ID Number:**

Last Calibration: Sep. 25, 2002

Date Received for Service: Jul. 10, 2003 Work Order Number: 444054461

Service Requested: Scheduled calibration

Remarks: Transducer exceeds manufacturers specifications of .1% . Readings indicate High across the range. Please see Calibration Report.

CLD, 07/18/03

SOUTHWEST RESEARCH INSTITUTE™

6220 Culebra Road, P.O. Drawer 28510
Institute Quality Systems
Institute Calibration Laboratory
Phone: 210-522-5215 Fax 210-522-3692

Certificate of Calibration

Submitted By:	DIV20	**Work Order:**	444054461
Address:	B189	**Date Issued:**	Jul 11, 2003
Contact:	CYNTHIA DINWIDDIE	**Calibration Date:**	Jul 11, 2003
Manufacturer Model:	VIATRAN 245	****Calibration Due:**	Oct 11, 2003
Description:	PRESSURE TRANSDUCER	**Calibration Location:**	Bldg. 64
Serial No:	288713	**Environment:**	Temp. 68.0°F Hum. 40 %RH
Asset No:	009671	***As Found:**	IN TOLERANCE
Procedure:	CLCP-PI-001, JUN/99	***As Left:**	IN TOLERANCE

This certificate documents traceability to the National Institute of Standards and Technology (NIST) and the International System of Units (SI). The Laboratory quality system conforms to ISO/IEC 17025, 1999 and ANSI/NCSL Z540-1-1994 which are equivalent to relevant requirements of the ISO 9000-1994 series of standards. This certificate may not be reproduced, except in full, without the written approval of the Southwest Research Institute Calibration Laboratory. The results of this calibration relate only to the individual instrument described above. This certificate shall not be used to claim product endorsement by the American Association for Laboratory Accreditation (A2LA) or any agency of the U. S. Government.

Uncertainty evaluation includes the item under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor of k=2 to approximate a 95% confidence level. The calibration process provides a Test Uncertainty Ratio (TUR) of less than or equal to 25% (4:1) of the test limit unless otherwise stated in remarks or an attachment.

*The client has sole responsibility for determination of in/out of tolerance or compliance/noncompliance. An in/out of tolerance opinion is provided for your convenience based only on the Test Instrument (TI) reading(s) and limits as reported. The reported uncertainty relates only to the results at the time of calibration and does not imply any short or long term stability of the TI.

**Calibration interval is determined by the client and does not assure the instrument will remain within tolerance until this date. Any number of factors may cause the instrument to be out of tolerance before the next calibration date.

Remarks: None

Standards Used

Asset	Manufacturer	Model	Description	Cal Due
004259	PHILLIPS	PM2535	MULTIMETER	Sep 27, 03
003048	RUSKA	2468-758	PRESSURE CALIBRATOR	Mar 10, 05
002856	RUSKA	2468-714-69900	WEIGHT SET, CLASS N/S	Mar 10, 05
003949	TROEMNER	5MG-100G	WEIGHT SET, CLASS 1	Jan 20, 04
003216	HASTINGS	VT-6B	VACUUM CONTROLLER & GAGE TUBE	Oct 23, 03
003220	HASTINGS	VT-6B	VACUUM CONTROLLER WITH GAGE TUBE	Oct 23, 03

Approved by: Walt Hill
Metrology Group Leader
m:\Nona2la1.rpt Rev date 15, August 02

Measurements by: Perry Carpenter
Metrology Technician

CLD, 07/18/03

Southwest Research Institute
Calibration Laboratory
Calibration Report

Work Order	444054461	Mfr	Viatran	Technician	PWC
Asset No.	009671	Model	245		
Serial No.	288713	Type	Pressure Transducer	Cal Date	10-Jul-03

Remarks:

Function/Range	Test Point	TI Reading	Difference	+/-Limit	+/-Uncertainty	Found
PSIA	Volts	Volts	Volts	Volts	Volts	Result
0.0011	0.0001	0.0008	0.0007	0.005	0.0006	Pass
12.5039	1.2504	1.2828	0.0324	0.005	0.0007	Fail
25.0039	2.5004	2.5662	0.0658	0.005	0.0008	Fail
37.5039	3.7504	3.8500	0.0996	0.005	0.0009	Fail
50.0039	5.0004	5.1327	0.1323	0.005	0.0010	Fail
37.5039	3.7504	3.8504	0.1000	0.005	0.0009	Fail
25.0039	2.5004	2.5668	0.0664	0.005	0.0008	Fail
12.5039	1.2504	1.2833	0.0329	0.005	0.0007	Fail
0.0011	0.0001	0.0010	0.0009	0.005	0.0006	Pass

END OF REPORT

Southwest Research Institute
Calibration Laboratory
Calibration Report

No data was collected w/ this instrument until after the cal lab calibrated it. -CLD, 06/08/04

Work Order	444054461	Mfr	Viatran	Technician	PWC
Asset No.	009671	Model	245		
Serial No.	288713	Type	Pressure Transducer	Cal Date	11-Jul-03

Remarks:

Function/Range	Test Point	TI Reading	Difference	+/-Limit	+/-Uncertainty	Left
PSIA	Volts	Volts	Volts	Volts	Volts	Result
0.0010	0.0001	0.0004	0.0003	0.005	0.0006	Pass
12.5039	1.2504	1.2497	-0.0007	0.005	0.0007	Pass
25.0039	2.5004	2.4998	-0.0006	0.005	0.0008	Pass
37.5039	3.7504	3.7502	-0.0002	0.005	0.0009	Pass
50.0039	5.0004	4.9996	-0.0008	0.005	0.0010	Pass
37.5039	3.7504	3.7504	0.0000	0.005	0.0009	Pass
25.0039	2.5004	2.5003	-0.0001	0.005	0.0008	Pass
12.5039	1.2504	1.2500	-0.0004	0.005	0.0007	Pass
0.0010	0.0001	0.0007	0.0006	0.005	0.0006	Pass

END OF REPORT

CLD, 07/18/03

SOUTHWEST RESEARCH INSTITUTE™

6220 Culebra Road, P.O. Drawer 28510
Institute Quality Systems
Institute Calibration Laboratory
Phone: 210-522-5215 Fax 210-522-3692

Certificate of Calibration

Submitted By:	DIV20	**Work Order:**	444054513
Address:	B189	**Date Issued:**	Jul 11, 2003
Contact:	CYNTHIA DINWIDDIE	**Calibration Date:**	Jul 11, 2003
Manufacturer Model:	TEMCO, INC Unknown	****Calibration Due:**	Oct 11, 2003
Description:	RTD	**Calibration Location:**	Bldg. 64
Serial No:	10286	**Environment:**	Temp. 68.0°F Hum. 40 %RH
Asset No:	010286	***As Found:**	IN TOLERANCE
Procedure:	TEMPERATURE/HUMIDITY, MAR/03	***As Left:**	IN TOLERANCE

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**Calibration interval is determined by the client and does not assure the instrument will remain within tolerance until this date. Any number of factors may cause the instrument to be out of tolerance before the next calibration date.

Remarks: None

Standards Used

Asset	Manufacturer	Model	Description	Cal Due
009917	HART SCIENTIFIC, INC	5612	RTD	Jul 06, 04

Southwest Research Institute
Calibration laboratory
Calibration Report

Work Order:	444054513	Mfr.	Temco Inc.	Technician	PWC
Asset No.	010286	Model	Uknown		
Serial No.	10286	Type.	THERMOMETER	Cal Date.	11-Jul-03

Remarks: Readings are without Pass or Fail determination. The user must determine if the instrument meets their measurement requirements.

Function/Range	Test Point	TI Reading	Difference	+/-Uncertainty
Temperature	Deg C	Deg C	Deg C	Deg C
20	20.17	20.90	0.73	0.12

END OF REPORT

Approved by: Walt Hill
Metrology Group Leader
m:\Nona2la1.rpt Rev date 15, August 02

Measurements by: Perry Carpenter
Metrology Technician

1 of 1

CLD, 07/18/03

SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY
MEMORANDUM

July 16, 2003

To: CYNTHIA DINWIDDIE DIV20 B189

From: Walt Hill, Metrology Group Leader
Institute Calibration Laboratory

Subject: Status of Calibration Supplier

Manufacturer/Model: AALBORG INSTRUMENTS GFM173
Description: FLOW METER
Serial Number: G58717-1
Asset Number: 009474
Work Order Number: 444054600
Date Calibrated: July 11, 2003
Supplier: Rule Products
Remarks: Rule Cert # C-604

(✓) Supplier is on the Approved Suppliers List (ASL).

( ) Supplier is not on the Approved Suppliers List.

( ) Calibration is ISO 17025 accredited.

(✓) Calibration is not ISO 17025 accredited.

( ) There is no known supplier to meet ISO 17025 accreditation at this time.

Please notify the Institute Calibration Laboratory, extension 5215, of any discrepancies with the item or calibration documentation.

Attachment(s) 1

m:\nonasl2.rpt Rev 7 Dec 01

CLD, 07/18/03

RULE PRODUCTS

CALIBRATION REPORT

C-604

Date: 7/11/03
Customer Information:
Southwest Research
San Antonio, TX

Device Type:
MFM

Rated Accuracy
2% of Full Scale

Model #	Serial #
GF Series	G58717-1

Std. Temp.: 70 F
Std. Pressure: 29.92
Gas: N2
Ref. Gas: N2 K factor 1
Range: 50 SCCM
Inlet Pressure: As Required
Ambient Pressure: 29.29
%RH: N/A
Ambient Temp.: 69 F
Cal. STD.: Primary Tubes
Model #: B924
Serial #: 410
Cal. Method #: 102

AS RECEIVED

READ	ACT	TOL(SCCM)
0.0	0.0	0.0
11.7	11.3	1.0
24.4	24.8	1.0
36.9	36.4	1.0
49.4	49.2	1.0

CALIBRATION DATA

READ	ACT.	TOL(SCCM)

REC. IN SPEC X
OUT OF SPEC

Cal. performed by:
Title: CAL. TECH.

NOTES: NO ADJUSTMENTS MADE

All Calibrations are NIST traceable.
Uncertainty is .2 %
This report shall not be reproduced except in full without written approval by Rule.

Page 1 of 1

CLD, 07/18/03

1100 N. Industrial Blvd., Bldg. 3 · Round Rock, TX 78681 · 512-218-4701 · FAX 512-218-9867

SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY
MEMORANDUM

July 16, 2003

To: CYNTHIA DINWIDDIE DIV20 B189

From: Walt Hill, Metrology Group Leader
Institute Calibration Laboratory

Subject: Status of Calibration Supplier

Manufacturer/Model: AALBORG INSTRUMENTS GFM-17
Description: FLOW METER
Serial Number: G20791
Asset Number: 009669
Work Order Number: 444054598
Date Calibrated: July 11, 2003
Supplier: Rule Products
Remarks: Rule Cert # C-604-2

( ) Supplier is on the Approved Suppliers List (ASL).

( ) Supplier is not on the Approved Suppliers List.

( ) Calibration is ISO 17025 accredited.

( ) Calibration is not ISO 17025 accredited.

( ) There is no known supplier to meet ISO 17025 accreditation at this time.

Please notify the Institute Calibration Laboratory, extension 5215, of any discrepancies with the item or calibration documentation.

Attachment(s) 1

m:\nonasl2.rpt Rev 7 Dec 01

CLD, 07/18/03

RULE PRODUCTS

CALIBRATION REPORT

C-604-2

Date: 7/11/03
Customer Information:
Southwest Research
San Antonio, TX

Device Type:
MFM

Rated Accuracy
2% of Full Scale

Model #	Serial #
GF Series	G20791

Std. Temp.: 70 F
Std. Pressure: 29.92
Gas: N2
Ref. Gas: N2 K factor 1
Range: 500 SCCM
Inlet Pressure: AS REQUIRED
Ambient Pressure: 29.29
%RH: N/A
Ambient Temp.: 69 F
Cal. STD.: Primary Tubes
Model #: B924
Serial #: 410
Cal. Method #: 102

AS RECEIVED

READ	ACT	TOL(SCCM)
0	0	0
122	124	10
257	252	10
388	392	10
497	502	10

CALIBRATION DATA

READ	ACT.	TOL(SCCM)
0	0	0
141	141	10
241	243	10
372	373	10
469	466	10

REC. IN SPEC X
OUT OF SPEC

Cal. performed by:
Title: CAL. TECH.

NOTES:

All Calibrations are NIST traceable.
Uncertainty is .2 %
This report shall not be reproduced except in full without written approval by Rule.

Page 1 of 1

CLD, 07/18/03

SOUTHWEST RESEARCH INSTITUTE
CALIBRATION LABORATORY
MEMORANDUM

July 16, 2003

To: CYNTHIA DINWIDDIE DIV20 B189

From: Walt Hill, Metrology Group Leader
Institute Calibration Laboratory

Subject: Status of Calibration Supplier

Manufacturer/Model: AALBORG INSTRUMENTS GFM-17
Description: FLOW METER
Serial Number: G20793
Asset Number: 009668
Work Order Number: 444054599
Date Calibrated: July 11, 2003
Supplier: Rule Products
Remarks: Rule Cert # C-604-1

(✓) Supplier is on the Approved Suppliers List (ASL).

( ) Supplier is not on the Approved Suppliers List.

( ) Calibration is ISO 17025 accredited.

(✓) Calibration is not ISO 17025 accredited.

( ) There is no known supplier to meet ISO 17025 accreditation at this time.

Please notify the Institute Calibration Laboratory, extension 5215, of any discrepancies with the item or calibration documentation.

Attachment(s) 1

m:\nonasl2.rpt Rev 7 Dec 01

CLD, 07/18/03

RUE PRODUCTS

CALIBRATION REPORT

C-604-1

Date: 7/11/03
Customer Information:
Southwest Research
San Antonio, TX

Device Type:
MFM

Rated Accuracy
2% of Full Scale

Model #	Serial #
GF Series	G20793

Std. Temp.: 70 F
Std. Pressure: 29.92
Gas: N2
Ref. Gas: N2 K factor 1
Range: 2000 SCCM
Inlet Pressure: AS REQUIRED
Ambient Pressure: 29.29
%RH: N/A
Ambient Temp.: 69 F
Cal. STD.: Primary Tubes
Model #: B924
Serial #: 680
Cal. Method #: 102

AS RECEIVED

READ	ACT	TOL(SCCM)
0	0	0
502	484	40
1016	1029	40
1436	1450	40
1888	1907	40

CALIBRATION DATA

READ	ACT.	TOL(SCCM)
0	0	0
484	487	40
1007	1009	40
1461	1449	40
1920	1930	40

REC. IN SPEC X
OUT OF SPEC

Cal. performed by:
Title: CAL. TECH.

NOTES:

All Calibrations are NIST traceable.
Uncertainty is .2 %
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Page 1 of 1

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CLD, 07/18/03

Monday July 28, 2003

for an expanded seal $\phi = 0.700''$, compressed seal thickness = 0.52"

$B = 0.35''$, $a = 0.52''$ 1.486 ~~1.4~~ CLD, 7/28/03 → 1.485714

$a_D = \frac{0.52}{0.35} = 0.35\overline{)0.52}$ 0.35 / 170 → $G_0 = 9.4$

see page 24 this SN. → $G_0 = 9.40$

1:50 p.m. PDT pressure (Paroscientific) = 12.6009 psia

But, Temco reads 12.69 psia: correction applied through software

Ceramic Check Source Data

CCHW1.430 Depth = 3.96
CCHW1.450 Depth = 3.90/3.95 (short side/long side)
" .470 " = 3.7/4.1
" .490 " = 3.90/3.95
" .510 " = 3.75/3.90
" .530 " = 4.0/4.15

CLD, 07/28/03

CLD, 07/29/03

July 29, Tues. 10:15 a.m.

Paroscientific Pressure = 12.69 psia
Viatran/Temco Pressure = ~~12.68~~ 12.79 psia (CLD, 07/29/03)
Correction applied in software. (offset = -0.01 psia)

CF1.1071	4.0"/4.1"	Correct for viscosity
CF2.1057	3.9/4.05	viscosity okay now
CF1.1102	3.85/4.05	— no leakage, but high R due to fractures. ✓
CF2.1100	3.90/3.95	
CF2.1075	3.95/4.05	
CF2.1123	4.02/4.02	
CF2.1152	3.85/4.02	
CF1.1131	3.96/3.96	
CF1.1150	4.05/4.05	✓
CF1.1175	4.05/4.05	✓
CF1.1200	3.97/3.97	✓
CF2.1175	~~3.90/3.90~~ 3.96/4.05	ok CLD, 07/29/03
CF2.1200	3.90/4.06	
CF2.1224	4.05/4.05	
CF2.1231	4.0/4.0	✓
CF1.1225	4.0/4.0	
CF2.1217	~~4.0/4.~~ 4.0/4.0	ok CLD, 07/29/03 ✓
CF2.1250	4.0/4.07	
CF1.1250	4.03/4.03	
CF2.1275	4.10/4.10	

CLD, 07/29/03 (pen wouldn't write)

Wed – July 30, 2003

New seal cut for probe: $B = 0.35$, $a = 0.50$ } $a_D = 0.50/0.35 = 1.43$
$G_0 = 9.44$

CF1.1275 4.1/4.1
CF1.1300 4.0/4.1
CF2.1300 3.95/4.12 ✓
CF1.1326 3.95/3.95 – fracture nearby ✓
CF2.1325 4.03/4.03
CF1.1350 3.97/4.12 – fracture may have opened due to packer? ✓
CF2.1350 4.1/4.1
CF1.1375 3.96/4.01
CF2.1375 3.87/4.03
CF1.1400 3.95/3.95 ✓
CF1.1410 3.99/3.99 – ~~leak~~ – no seal possible – dust blows out – fracture
see drillers log
CF2.1400 4.03/4.03 ✓
CF1.1422 4.02/4.02
CF2.1427(a) 4.12/4.12 – lots of fractures in drillhole
CF1.1446 4.0/4.1
CF2.1451(a) 4.05/4.05 – Fractures + erosional surfaces around drillhole B.C. ok
CF1.1474 4.0/4.0
CF2.1475(a) 4.1/4.1
CF2.1451(b) 3.96/3.96 (took off fractured face and tried again)
CF2.1475(b) 4.1/4.1 "

CLD, 07/30/03

Thu. – July 31, 2003. Check Source (ref Tamb set to yesterday's Tamb instead of 28.5°C)

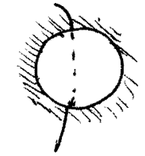
CF2.1425/4(b) – fractures in drillhole + glass clasts or obsidian.
CLD, 07/31/03 (3.97/4.04): no data possible due to too high k – out of range. Very low back-pressure is overranging flowmeters.

CF2.1415 3.93/4.03

CF2.1451(a,b) – on the lower edge of bed, so will redrill above in center of bed.

CF2.1441 → CF2.1441 3.93/3.93

CF2.1455 (to replace CF2.1451 a/b) (4.08/4.08) located in mid-bed; not edge
Fracture runs from surface to distal end of drillhole – high k – out of range



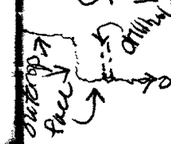
this fracture may not have a surface expression.

CF2.1449 3.81/4.0 also has a small fracture at distal end – got clatter
CF1.1326(b) 3.97/4.1 also has a fracture at distal end.

CF2.1300(b) 4.1/4.1

CF2.1400(b) 3.90/3.98 – 4 fractures; clasts; ~~no data~~, too high k
little data ↙ CLD, 07/31/03

~~CF2.1415(b)~~ CLD, 07/31/03
CF2.1395 3.99/4.08
CF1.1102(b) 3.98/4.03 → same magnitude as last time; fracture at rear of drillhole



Poor Boundary Condition on left side (not infinite)
Also poor B.C. underneath bed is like a ledge between CF1.1070 + CF1.1170 + above

CLD, 07/31/03

CF1.1116 4.0/4.1 horizontal fractures appeared post-drilling.
numerous horizontal (man-made?) fractures.

CF1.1150(b) 4.03/4.03 — same magnitude as last time.
many vertical fractures surround drillhole

CF1.1175 has a fracture running along the left side + poor B.C.

CF1.1178 4.07/4.07 (new today) - similar readings to CF1.1175 w/ fracture
CF1.1178 has improved B.C. wrt CF1.1175, which had atm B.C. above it.

no data → CF2.1224 (b) 3.93/4.05 many clasts; surface fractures + fractures @ depth

CF2.1233 4.02/4.02 no clasts; no data; k too high

CF2.1240 4.07/4.07 clasts - no data; k too high

probe positioned in bad above!

CF1.1400 3.93/3.93

CF1.1350 3.95/3.95 Note: check μ(T)

1 fracture at distal end. this one is smaller magnitude than previous drillhole

CF1.~~1500~~ 1499 3.96/4.02 fracture in wall, front to back

CF2.~~1500~~ 1498 3.9/3.9

CF2.1498 | CF1.1499

CF1.1525 3.98/4.02 some fracturing on walls

CF2.1526 4.0/4.1

End July 31, 2003

Friday, August 1, 2003; 9:00 a.m.
Chuck Source

CF1.1551 3.92/3.92
CF2.1550 4.07/4.07
CF1.1576 3.98/3.98
CF2.1577 4.1/4.1
CF1.1600 4.05/4.05
CF2.1601 4.07/4.07

CLD 08/01/03

CF1.1625 4.0/4.0 fractured
CF1.1650 4.0/4.0
CF2.1625 3.9/3.9
CF2.1650 3.9/3.9

End August 1, 2003 CLD

SOUTHWEST RESEARCH INSTITUTE™

6220 Culebra Road, P.O. Drawer 28510
Institute Quality Systems
Institute Calibration Laboratory
Phone: 210-522-5215 Fax 210-522-3692

ACCREDITED
Certificate #
0972-01

Certificate of Calibration

Submitted By:	DIV20	**Work Order:**	444054503
Address:	B57	**Date Issued:**	Jul 18, 2003
Contact:	TROY MAXWELL	**Calibration Date:**	Jul 18, 2003
Manufacturer Model:	PAROSCIENTIFIC 740-45A	****Calibration Due:**	Jan 18, 2004
Description:	PRESSURE GAUGE, DIGITAL	**Calibration Location:**	Bldg. 64
Serial No:	60999	**Environment:**	Temp. 68.0°F Hum. 40 %RH
Asset No:	003972	***As Found:**	OUT OF TOLERANCE
Procedure:	CLCP-PI-001, JUN/99	***As Left:**	LIMITED CALIBRATION

This certificate documents traceability to the National Institute of Standards and Technology (NIST) and the International System of Units (SI). The Laboratory quality system conforms to ISO/IEC 17025, 1999 and ANSI/NCSL Z540-1-1994 which are equivalent to relevant requirements of the ISO 9000-1994 series of standards. This certificate may not be reproduced, except in full, without the written approval of the Southwest Research Institute Calibration Laboratory. The results of this calibration relate only to the individual instrument described above. This certificate shall not be used to claim product endorsement by the American Association for Laboratory Accreditation (A2LA) or any agency of the U. S. Government.

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Remarks: LIMITED CALIBRATION: 20.0 PSIA AND ABOVE SUBTRACT 0.005 FROM READING ON METER.

Standards Used

Asset	Manufacturer	Model	Description	Cal Due
003048	RUSKA	2468-758	PRESSURE CALIBRATOR	Mar 10, 05
003220	HASTINGS	VT-6B	VACUUM CONTROLLER WITH GAGE TUBE	Oct 23, 03
003216	HASTINGS	VT-6B	VACUUM CONTROLLER & GAGE TUBE	Oct 23, 03
003949	TROEMNER	5MG-100G	WEIGHT SET, CLASS 1	Jan 20, 04
002856	RUSKA	2468-714-69900	WEIGHT SET, CLASS N/S	Mar 10, 05

Approved by: Walt Hill
Metrology Group Leader
m:\a2la1.rpt Rev date 15, August 02

Measurements by: Perry Carpenter
Metrology Technician

CLD, 08/11/03

Southwest Research Institute
Calibration Laboratory
Calibration Report

Work Order	444054503	Mfr	Parascientific	Technician	PWC
Asset No.	003972	Model	740-45A		
Serial No.	60999	Type	Pressure Indicator	Cal Date	16-Jul-03

Remarks: Limited Calibration: 20.0 PSIA AND ABOVE SUTRACT 0.005 FROM READING ON METER.
↳ irrelevant to our measurements of atmospheric pressure.

CLD, 08/11/03

Function/Range	Test Point	TI Reading	Difference	+/-Limit	+/-Uncertainty	Found
Pressure	PSIA	PSIA	PSIA	PSIA	PSIA	Result
	0.0011	-0.0016	-0.0027	0.0040	0.0001	Pass
	10.0029	10.0042	0.0013	0.0040	0.0004	Pass
	20.0029	20.0014	-0.0015	0.0040	0.0008	Pass
	30.0029	30.0030	0.0001	0.0040	0.0012	Pass
	40.0029	40.0053	0.0024	0.0040	0.0016	Pass
	30.0029	30.0032	0.0003	0.0040	0.0012	Pass
	20.0029	20.0018	-0.0011	0.0040	0.0008	Pass
	10.0029	10.0051	0.0022	0.0040	0.0004	Pass
	0.0011	-0.0010	-0.0021	0.0040	0.0001	Pass

END OF REPORT

CLD, 08/11/03

Temco, Inc., 4616 N. Mingo, Tulsa, OK 74117

Phone 918-834-2337 Fax 918-834-9887
E-Mail Address: sales@temco.com
Web Address: www.temco.com

Tuesday, January 14, 2003

Cynthia Dinwiddie
Southwest Research Institute
Division 20
6220 Culebra Rd.
San Antonio, TX 78235-5166

Subject: **Transducer range for Viatran transducer SN 288713**

Cynthia,

This letter is in regards to your inquiry on Wednesday, December 18, 2002 about the transducer range, SN 288713 for the Mini-Permeameter SN 4589 that Southwest Research Institute rented in September of 2002. The part number for the transducer is 245AHADK. The part number description is as follows, 245 is the model number, AH is the pressure range which is 0-50 psia, A means that the transducer is an atmospheric transducer, and DK is a shunt calibration special option.

The transducer is marked with the correct part number. However, Viatran, the transducer manufacturer, has mislabeled the range on the transducer. The range should read 0-50 psia. It is labeled 0-15 psia. I have included a copy of the Viatran test report that shows the transducer is actually a 0-50 psia range and not 0-15 psia as labeled and was calibrated from the factory as 0-50 psia. I also had my technicians run their own calibration test to confirm that the transducer is 0-50 psia.

I have spoke with Jack Gladysek at Viatran transducers on Thursday, January 09, 2003. He also confirmed that the transducer is mislabeled. The transducer will be re-labeled to 0-50 psia to avoid problems like this in the future.

I apologize for any inconvenience that this has caused. If there is any other information that you need please let me know.

Sincerely,

Rob Wooten
Electrical Design Engineer

See CNWRA-controlled SN #526 or call C.L. Dinwiddie @ x6085 for details.

RNM, 02/10/04

Information potentially subjected to copyright protection was redacted from this location.
The redacted material is from
Instruction Manual for Mini-Permeameter
Model MP-401, Page 3
Temco, Inc.

Viatran CORPORATION

Performance Certificate

[redacted]	05-27-1999
PART NO.	245
SERIAL NO.	288713
REFERENCE	245AHADK
INPUT	28 VDC
OUTPUT	0 TO 5 VDC
FSPR	0 TO 50 PSIA
FULL SCALE PRESSURE RANGE	

WIRING CONNECTIONS

PIN A	+ POWER
PIN B	- POWER
PIN C	+ SIGNAL
PIN D	- SIGNAL
PIN E	CALIBRATE
PIN F	CALIBRATE

	STANDARD CALIBRATION		SPECIAL CALIBRATION		
% FSPR	RUN 1	RUN 2		RUN 1	RUN 2
INCREASING 0	.002				
20	1.000				
40	1.999				
60	2.998				
80	3.997				
100	4.995				
DECREASING 80					
60	2.998				
40					
20					
0	.003				

[redacted]KS: FIELD CALIBRATION PRESSURE = 24.995 PSIA

CALIBRATION CIRCUIT
An advantage of Viatran strain gage pressure sensors is that the gain or span of the readout system can be set without applying a known pressure input. The system setup can be accomplished by using a calibrate circuit as explained below.

INTERNAL CIRCUIT
Most sensor models are supplied with an internal shunt calibrate circuit either as a standard or by special order. If this sensor has the circuit included, it will be noted below. Simply shorting the proper pins will produce the calibration output signal listed.

EXTERNAL CIRCUIT
If the sensor does not include the calibration circuit, the same type calibration can be accomplished by connecting a resistor of the value indicated across the proper pins. This technique is accurate for cable lengths of up to 200 ft.

[X] Transducer - Internal Calibration
Shorting pins E & F will produce a 2.498 VOLTS calibration output signal.

[ ] Transducer - External Calibration
Connecting ohms across pins & will produce a calibration output signal.

[ ] Transmitter* - Internal Calibration Circuit and Switch
Cal 1 represents with a reading of
[redacted]al 2 represents with a reading

NOTE: All calibrations should be performed only after the transducer has been adjusted for zero at zero pressure.

* See detailed instructions shipped with each unit.

WARRANTY

Viatran Corporation warrants that its products shall be free from defective parts and workmanship for a period of twelve (12) months from date of original shipment, provided that Viatran's obligation hereunder shall be limited to correcting any defective workmanship and/or replacing any defective material F.O.B. destination.

A repair is warranted ninety (90) days from repair date under conditions of original warranty period unless superseded by original warranty period. If inspection by the Company of such product does not disclose any defect of workmanship or material, the Company's regular charges will apply. The warranty carries no liability, either expressed or implied, beyond our obligation to replace the unit which carries the warranty. This warranty is in lieu of all other warranties of merchantability or fitness. No allowance will be made for any expense incurred for correcting any defective workmanship and/or material without written consent by Viatran. Unit must be shipped to the Company, transportation prepaid, and return tracking number must be referenced on the package to assure acceptance at our shipping dock. Prices, specifications and decisions subject to change without notice.

The Company shall not be liable for and the Purchaser assumes and agrees to indemnify and save harmless the Company in respect to any loss or damage that may arise through the use by the Purchaser, or others, of any of the Company's products.

This warranty is void if the product is subjected to misuse, accident, neglect or improper application, installation or operation. This warranty is void if prior defects in materials or workmanship repairs are made by anyone except Viatran or its authorized service agency.

REPAIR

Most Viatran sensors have been designed to be easily repaired and recalibrated if necessary. If failure occurs, the sensor should be returned to the factory for inspection and testing. If the failure is covered by our warranty policy as described above, the unit will be repaired as necessary and reshipped without delay. Sensors usually not covered by warranty can be repaired within two to three weeks (after approval) for approximately twenty to sixty per-cent of the purchase price. Simple repairs can often be made for a minimum charge. To return a unit, please contact the Technical Service Department for a Return Tracking Number at 1 (800) 688-0030, option #6, or extension 521. The unit should be sent to the attention of the Technical Service Department at 2957 Alt Blvd., Grand Island NY 14072

QUALITY ASSURANCE

Viatran CORPORATION 300 INDUSTRIAL DRIVE GRAND ISLAND NEW YORK 14072
PHONE 716 773 1700 • FAX 716 773 2488

Part No. 98CALCARD0

RNM, 02/10/04

ADDITIONAL INFORMATION FOR SCIENTIFIC NOTEBOOK NO. 526

Document Date:	05/31/2002
Availability:	Southwest Research Institute® Center for Nuclear Waste Regulatory Analyses 6220 Culebra Road San Antonio, Texas 78228
Contact:	Southwest Research Institute® Center for Nuclear Waste Regulatory Analyses 6220 Culebra Road San Antonio, TX 78228-5166 Attn.: Director of Administration 210.522.5054
Data Sensitivity:	■"Non-Sensitive" □ Sensitive □"Non-Sensitive - Copyright" □ Sensitive - Copyright
Date Generated:	06/07/2004
Operating System: (including version number)	Windows
Application Used: (including version number)	
Media Type: (CDs, 3 ½, 5 1/4 disks, etc.)	1 CD
File Types: (.exe, .bat, .zip, etc.)	xls, jps, .db, Word
Remarks: (computer runs, etc.)	Notebook supplemental material