MACTEC
engineering and constructing a better tomorrow

North Anna COL Project
Hydraulic Conductivity (K) Calculation Worksheet
MACTEC Job Number: 6468-06-1472

Well: OW-945
Test Date: 11/13/2006
Test Type: Recovery (slug out)
Test Name: OW-945-out

Conducted by: Grimes and Charles-Smith
Entered/date: [illegible] 11-7-06
Checked/date: JCP by [illegible] with permission
12/12/06

WELL DATA

| | | |
|---|---|---|
| SWL = | 12.37 | (ft BTOC) |
| WD = | 56.50 | (ft BTOC) |
| WD = | 54.50 | (ft BGS) |
| DTSP = | 37.33 | (ft BGS) |
| rc = | 0.08 | (ft) |
| n = | 0.30 | |
| rw = | 0.35 | (ft) |
| rc (adjusted) = | 0.08 | (ft) |
| Le = | 10 | (ft) |
| Lw = | 41.13 | (ft) |
| Le/rw = | 28.57 | |
| H = | 49.13 | (ft) |

H is depth from SWL to top of bedrock as listed on boring logs

CALCULATION OF K

K = [(rc^2 ln(Re/rw))/2Le]*(1/t)ln(yo/yt)

| | | |
|---|---|---|
| yo = | 2.52 | (ft) from plot |
| yt = | 0.74 | (ft) from plot |
| t = | 0.42 | (minutes) from plot |
| ln(Re/rw) = | 2.86 | |
| K = | 3.8E+00 | (ft/day) |
| K = | 1.4E-03 | (cm/sec) |

Calculation of ln(Re/rw)

Where: Lw < H;

ln(Re/rw) = [{1.1/(ln(Lw/rw))}+{A+Bln((H-Lw)/rw)}/(Le/rw)]^-1= 2.86

Where: Lw = H;

ln(Re/rw) = [{1.1/(ln(Lw/rw))}+{C/(Le/rw)}]^-1 = 3.33

Calculation of Coefficients

Value range for Le/rw from Table of Coefficients

| Le/rw | A | B | C |
|---|---|---|---|
| 25 | 2.4 | 0.31 | 1.9 |
| 30 | 2.5 | 0.35 | 2.1 |

Interpolated values of A, B and C for Le/rw

| | | | |
|---|---|---|---|
| 28.57 | 2.47 | 0.34 | 2.04 |

Coefficients Table

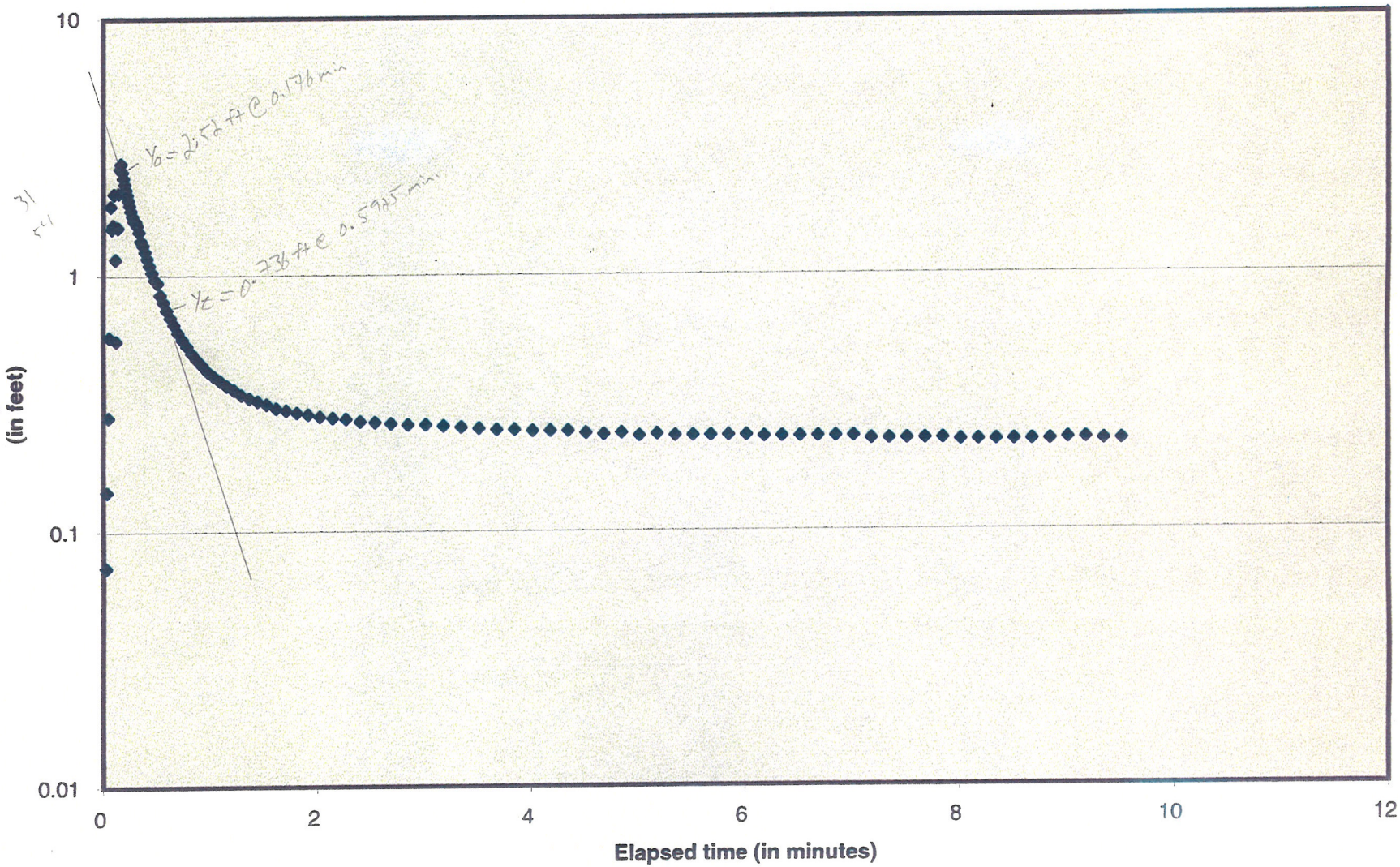
| Le/rw | A | Le/rw | B | Le/rw | C |
|---|---|---|---|---|---|
| 4 | 1.75 | 4 | 0.25 | 4 | 0.75 |
| 5 | 1.76 | 5 | 0.25 | 5 | 0.85 |
| 6 | 1.77 | 6 | 0.25 | 6 | 0.90 |
| 7 | 1.80 | 7 | 0.25 | 7 | 1.00 |
| 8 | 1.83 | 8 | 0.25 | 8 | 1.10 |
| 9 | 1.90 | 9 | 0.25 | 9 | 1.20 |
| 10 | 1.95 | 10 | 0.25 | 10 | 1.30 |
| 15 | 2.10 | 15 | 0.27 | 15 | 1.50 |
| 20 | 2.23 | 20 | 0.29 | 20 | 1.75 |
| 25 | 2.40 | 25 | 0.31 | 25 | 1.90 |
| 30 | 2.50 | 30 | 0.35 | 30 | 2.10 |
| 40 | 2.75 | 40 | 0.45 | 40 | 2.45 |
| 50 | 3.00 | 50 | 0.50 | 50 | 2.70 |
| 60 | 3.45 | 60 | 0.52 | 60 | 3.00 |
| 70 | 3.70 | 70 | 0.60 | 70 | 3.40 |
| 80 | 3.90 | 80 | 0.65 | 80 | 3.60 |
| 90 | 4.20 | 90 | 0.70 | 90 | 3.85 |
| 100 | 4.50 | 100 | 0.75 | 100 | 4.20 |
| 150 | 5.45 | 150 | 0.98 | 150 | 5.70 |
| 200 | 6.10 | 200 | 1.20 | 200 | 7.00 |
| 250 | 6.70 | 250 | 1.30 | 250 | 8.00 |
| 300 | 7.10 | 300 | 1.50 | 300 | 8.80 |
| 400 | 7.75 | 400 | 1.90 | 400 | 9.90 |
| 500 | 8.20 | 500 | 2.20 | 500 | 10.60 |
| 600 | 8.50 | 600 | 2.33 | 600 | 11.10 |
| 700 | 8.70 | 700 | 2.50 | 700 | 11.50 |
| 800 | 8.90 | 800 | 2.70 | 800 | 11.80 |
| 900 | 9.00 | 900 | 2.75 | 900 | 12.00 |
| 1000 | 9.20 | 1000 | 2.83 | 1000 | 12.40 |
| 1500 | 9.50 | 1500 | 3.18 | 1500 | 12.90 |

Reference: Bouwer(1989), Bouwer and Rice(1976)

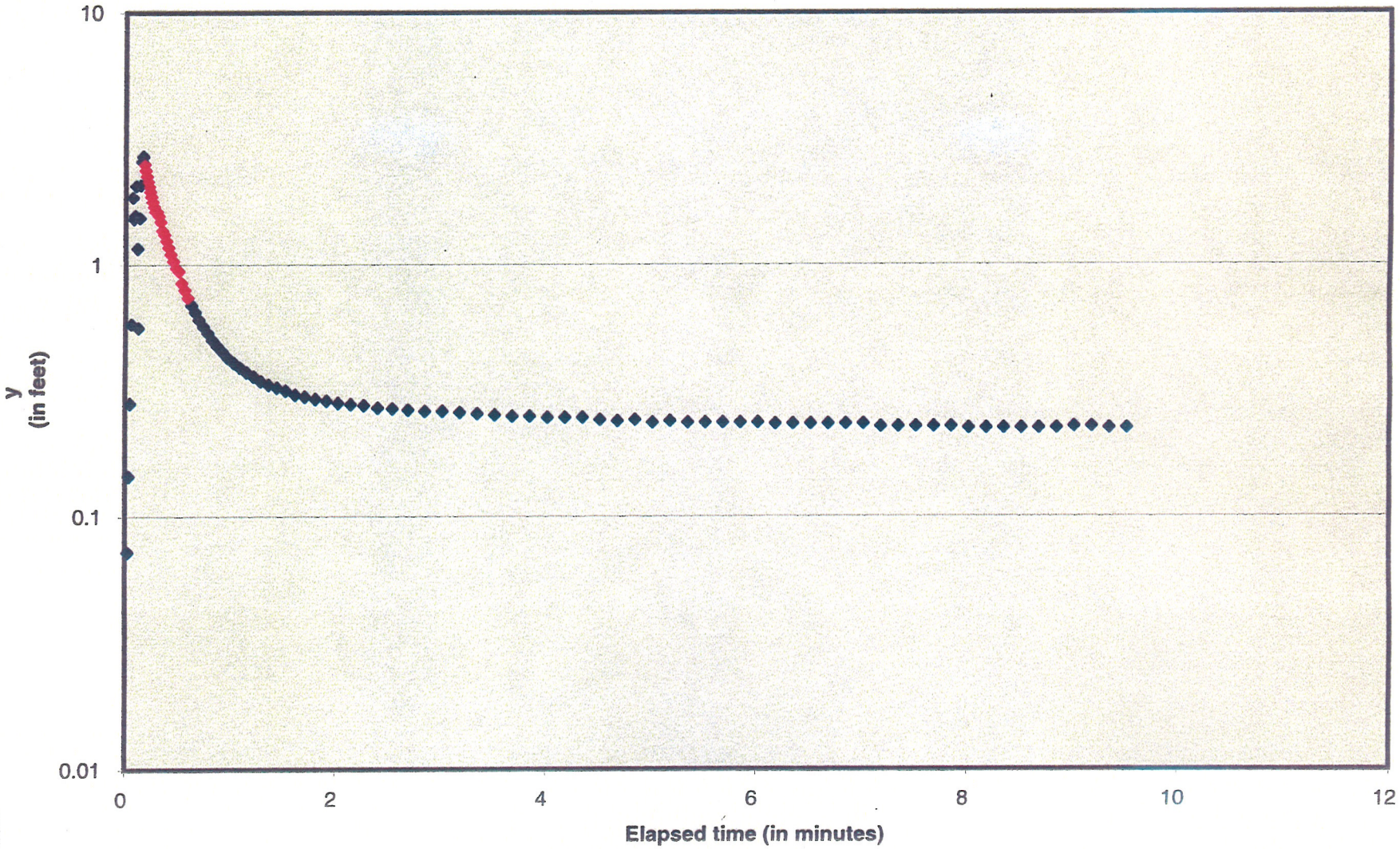
TEST DATA

| | Elapsed time (min) | Log y | y (ft) | WL (ft BTOC) |
|---|---|---|---|---|
| | 0 | #NUM! | 0 | 12.37 |
| | 0.011 | #NUM! | 0 | 12.37 |
| | 0.022 | -1.14 | 0.072 | 12.44 |
| | 0.033 | -0.84 | 0.144 | 12.51 |
| | 0.044 | -0.55 | 0.282 | 12.65 |
| | 0.055 | -0.24 | 0.581 | 12.95 |
| | 0.066 | 0.27 | 1.858 | 14.23 |
| | 0.077 | 0.18 | 1.522 | 13.89 |
| | 0.088 | 0.20 | 1.568 | 13.94 |
| | 0.099 | 0.32 | 2.071 | 14.44 |
| | 0.11 | 0.06 | 1.159 | 13.53 |
| | 0.121 | -0.25 | 0.561 | 12.93 |
| | 0.132 | 0.19 | 1.536 | 13.91 |
| | 0.143 | 0.32 | 2.083 | 14.45 |
| | 0.154 | 0.41 | 2.592 | 14.96 |
| | 0.165 | 0.43 | 2.71 | 15.08 |
| Test initialization | 0.176 | 0.40 | 2.52 | 14.89 |
| | 0.187 | 0.38 | 2.387 | 14.76 |
| | 0.198 | 0.35 | 2.258 | 14.63 |
| | 0.209 | 0.33 | 2.152 | 14.52 |
| | 0.22 | 0.31 | 2.054 | 14.42 |
| | 0.231 | 0.29 | 1.959 | 14.33 |
| | 0.2427 | 0.27 | 1.87 | 14.24 |
| | 0.2552 | 0.25 | 1.783 | 14.15 |
| | 0.2683 | 0.23 | 1.703 | 14.07 |
| | 0.2823 | 0.21 | 1.628 | 14.00 |
| | 0.2972 | 0.21 | 1.625 | 14.00 |
| | 0.3128 | 0.19 | 1.565 | 13.94 |
| | 0.3295 | 0.17 | 1.478 | 13.85 |
| | 0.3472 | 0.13 | 1.363 | 13.73 |
| | 0.3658 | 0.12 | 1.315 | 13.69 |
| | 0.3857 | 0.09 | 1.24 | 13.61 |
| | 0.4067 | 0.07 | 1.168 | 13.54 |
| | 0.4288 | 0.04 | 1.096 | 13.47 |
| | 0.4523 | 0.01 | 1.03 | 13.40 |
| | 0.4772 | -0.02 | 0.966 | 13.34 |
| | 0.5035 | -0.03 | 0.938 | 13.31 |
| | 0.5315 | -0.07 | 0.843 | 13.21 |
| | 0.5612 | -0.10 | 0.791 | 13.16 |
| Test completion | 0.5925 | -0.13 | 0.736 | 13.11 |
| | 0.6257 | -0.16 | 0.69 | 13.06 |
| | 0.6608 | -0.19 | 0.647 | 13.02 |
| | 0.6982 | -0.22 | 0.604 | 12.97 |
| | 0.7377 | -0.25 | 0.567 | 12.94 |
| | 0.7795 | -0.27 | 0.535 | 12.91 |
| | 0.8238 | -0.30 | 0.501 | 12.87 |
| | 0.8708 | -0.32 | 0.475 | 12.85 |
| | 0.9207 | -0.34 | 0.452 | 12.82 |
| | 0.9733 | -0.37 | 0.426 | 12.80 |
| | 1.0292 | -0.39 | 0.408 | 12.78 |
| | 1.0883 | -0.41 | 0.391 | 12.76 |
| | 1.151 | -0.43 | 0.374 | 12.74 |
| | 1.2173 | -0.44 | 0.36 | 12.73 |
| | 1.2877 | -0.46 | 0.345 | 12.72 |
| | 1.3622 | -0.48 | 0.334 | 12.70 |
| | 1.4412 | -0.49 | 0.325 | 12.70 |
| | 1.5248 | -0.50 | 0.316 | 12.69 |
| | 1.6133 | -0.52 | 0.305 | 12.68 |
| | 1.7072 | -0.52 | 0.299 | 12.67 |
| | 1.8065 | -0.53 | 0.293 | 12.66 |
| | 1.9118 | -0.54 | 0.288 | 12.66 |
| | 2.0233 | -0.55 | 0.282 | 12.65 |
| | 2.1415 | -0.55 | 0.279 | 12.65 |
| | 2.2667 | -0.56 | 0.276 | 12.65 |
| 90% recovery | 2.3992 | -0.57 | 0.27 | 12.64 |
| | 2.5397 | -0.57 | 0.268 | 12.64 |
| | 2.6885 | -0.58 | 0.265 | 12.64 |
| | 2.846 | -0.58 | 0.262 | 12.63 |
| | 3.0127 | -0.58 | 0.262 | 12.63 |
| | 3.1793 | -0.59 | 0.259 | 12.63 |
| | 3.346 | -0.59 | 0.256 | 12.63 |
| | 3.5127 | -0.60 | 0.253 | 12.62 |
| | 3.6793 | -0.60 | 0.25 | 12.62 |
| | 3.846 | -0.60 | 0.25 | 12.62 |
| | 4.0127 | -0.61 | 0.247 | 12.62 |
| | 4.1793 | -0.61 | 0.247 | 12.62 |
| | 4.346 | -0.61 | 0.247 | 12.62 |
| | 4.5127 | -0.62 | 0.242 | 12.61 |
| | 4.6793 | -0.62 | 0.239 | 12.61 |
| | 4.846 | -0.62 | 0.242 | 12.61 |

## OW-945 (slug-out) Recovery vs. Time



## OW-945 (slug-out) Recovery vs. Time



MACTEC

MACTEC Engineering and Consulting
3301 Atlantic Avenue
Raleigh, North Carolina

**Slug Test Data Sheet**

| | |
|---|---|
| **MACTEC Job Name:** North Anna COL | **MACTEC Job Number:** 6468-06-1472 |
| **Date:** 11-13-06 **Time:** 1328 | **Observation Well No.:** OW945out |
| **Weather Conditions:** Cloudy Approx 52°F | |
| **Method of Slug Withdrawl (circle one):** water, mechanical, or pressure | **Test Method:** Rising Head or Falling Head (circle) |
| **Diameter of Screen:** 2 in. | **Diameter of Casing:** 2 in. |
| **Total Well Depth:** 54.5 ft below reference point | **Reference Point:** Permanent mark on top of casing |
| **Length of Screened Section:** 10 ft | **Depth interval of screened portion:** 45-55.5 ft |
| **Depth to Groundwater:** 12.37 ft below reference point | |

**Groundwater Measurements Collected Prior to Slug Test**

| Depth to Groundwater | Date |
|---|---|
| 12.43 | 11-9-06 |
| ~~12.37~~ 12.40 | 11-13-06 |
| 12.37 | 11-13-06 |

OW945 IN = Key 11-13-06

**Comments/Remarks**

USED Transducer SN 200513
Hermit 3000
Set Transducer 30' below TOC
Transducer read 17.632 vs. 17.63
Final data = 0.224 = 91% recovery
(Hermit)
90% = 0.271

NOTE: Transducer slightly raised due to tangly during removal of slug.

In-Situ Inc. Hermit 3000

Report generated: 12/11/06 17:39:14
Report from file: P:\6468\2006 Projects\1472 North Anna COL\Slug Test Data\Raw data logger fil
DataMgr Version 3.71

' ial number: 00045369
. nware Version 7.08
Unit name: HERMIT 3000

Test name: OW945out PAGE 1 OF 3

Test defined on: 11/13/06 14:26:20
Test started on: 11/13/06 14:38:49
Test stopped on: 11/13/06 14:48:24
Test extracted on: 11/13/06 18:01:41

Data gathered using Logarithmic testing
Maximum time between data points: 0.1667 Minutes.
Number of data samples: 108

TOTAL DATA SAMPLES 108

Channel number [1]
Measurement type: Pressure
Channel name: D00513
Linearity: 0.0212000
Scale: 19.9368000
Offset: 0.1304000
Warmup: 50
Specific gravity: 1.000
Mode: TOC
User-defined reference: 0.000 Feet H2O
'eferenced on: test start
ressure head at reference: 17.631 Feet H2O

Channel number [0]
Measurement type: Barometric Pressure
Channel name: Barometric
Linearity: 0.0000000
Scale: 0.0000000
Offset: 0.0000000
Warmup: 50

| Date | Time | ET (min) | Chan[1] Feet H2O | Chan[0] Inches Hg |
|---|---|---|---|---|
| 11/13/06 | 14:38:49 | 0.0000 | 0.000 | 29.736 |
| 11/13/06 | 14:38:49 | 0.0110 | 0.000 | 29.736 |
| 11/13/06 | 14:38:50 | 0.0220 | 0.072 | 29.734 |
| 11/13/06 | 14:38:50 | 0.0330 | 0.144 | 29.736 |
| 11/13/06 | 14:38:51 | 0.0440 | 0.282 | 29.734 |
| 11/13/06 | 14:38:52 | 0.0550 | 0.581 | 29.734 |
| 11/13/06 | 14:38:52 | 0.0660 | 1.858 | 29.736 |
| 11/13/06 | 14:38:53 | 0.0770 | 1.522 | 29.736 |
| 11/13/06 | 14:38:54 | 0.0880 | 1.568 | 29.738 |
| 11/13/06 | 14:38:54 | 0.0990 | 2.071 | 29.736 |
| 11/13/06 | 14:38:55 | 0.1100 | 1.159 | 29.734 |
| 11/13/06 | 14:38:56 | 0.1210 | 0.561 | 29.738 |
| 11/13/06 | 14:38:56 | 0.1320 | 1.536 | 29.736 |
| 11/13/06 | 14:38:57 | 0.1430 | 2.083 | 29.734 |
| 13/06 | 14:38:58 | 0.1540 | 2.592 | 29.736 |
| /13/06 | 14:38:58 | 0.1650 | 2.710 | 29.732 |
| 11/13/06 | 14:38:59 | 0.1760 | 2.520 | 29.736 |
| 11/13/06 | 14:39:00 | 0.1870 | 2.387 | 29.734 |
| 11/13/06 | 14:39:00 | 0.1980 | 2.258 | 29.736 |
| 11/13/06 | 14:39:01 | 0.2090 | 2.152 | 29.734 |
| 11/13/06 | 14:39:02 | 0.2200 | 2.054 | 29.734 |

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| | | | | |
|---|---|---|---|---|
| 11/13/06 | 14:39:02 | 0.2310 | 1.959 | 29.738 |
| 11/13/06 | 14:39:03 | 0.2427 | 1.870 | 29.732 |
| 11/13/06 | 14:39:04 | 0.2552 | 1.783 | 29.734 |
| 11/13/06 | 14:39:05 | 0.2683 | 1.703 | 29.738 |
| 11/13/06 | 14:39:05 | 0.2823 | 1.628 | 29.738 |
| 11/13/06 | 14:39:06 | 0.2972 | 1.625 | 29.736 |
| 13/06 | 14:39:07 | 0.3128 | 1.565 | 29.736 |
| 13/06 | 14:39:08 | 0.3295 | 1.478 | 29.736 |
| 11/13/06 | 14:39:09 | 0.3472 | 1.363 | 29.738 |
| 11/13/06 | 14:39:10 | 0.3658 | 1.315 | 29.734 |
| 11/13/06 | 14:39:12 | 0.3857 | 1.240 | 29.734 |
| 11/13/06 | 14:39:13 | 0.4067 | 1.168 | 29.734 |
| 11/13/06 | 14:39:14 | 0.4288 | 1.096 | 29.734 |
| 11/13/06 | 14:39:16 | 0.4523 | 1.030 | 29.732 |
| 11/13/06 | 14:39:17 | 0.4772 | 0.966 | 29.734 |
| 11/13/06 | 14:39:19 | 0.5035 | 0.938 | 29.734 |
| 11/13/06 | 14:39:20 | 0.5315 | 0.843 | 29.734 |
| 11/13/06 | 14:39:22 | 0.5612 | 0.791 | 29.736 |
| 11/13/06 | 14:39:24 | 0.5925 | 0.736 | 29.734 |
| 11/13/06 | 14:39:26 | 0.6257 | 0.690 | 29.736 |
| 11/13/06 | 14:39:28 | 0.6608 | 0.647 | 29.734 |
| 11/13/06 | 14:39:30 | 0.6982 | 0.604 | 29.736 |
| 11/13/06 | 14:39:33 | 0.7377 | 0.567 | 29.736 |
| 11/13/06 | 14:39:35 | 0.7795 | 0.535 | 29.734 |
| 11/13/06 | 14:39:38 | 0.8238 | 0.501 | 29.734 |
| 11/13/06 | 14:39:41 | 0.8708 | 0.475 | 29.738 |
| 11/13/06 | 14:39:44 | 0.9207 | 0.452 | 29.736 |
| 11/13/06 | 14:39:47 | 0.9733 | 0.426 | 29.738 |
| 11/13/06 | 14:39:50 | 1.0292 | 0.408 | 29.736 |
| 11/13/06 | 14:39:54 | 1.0883 | 0.391 | 29.736 |
| 11/13/06 | 14:39:58 | 1.1510 | 0.374 | 29.736 |
| 11/13/06 | 14:40:02 | 1.2173 | 0.360 | 29.738 |
| 11/13/06 | 14:40:06 | 1.2877 | 0.345 | 29.736 |
| 11/13/06 | 14:40:10 | 1.3622 | 0.334 | 29.740 |
| 13/06 | 14:40:15 | 1.4412 | 0.325 | 29.738 |
| 13/06 | 14:40:20 | 1.5248 | 0.316 | 29.736 |
| 11/13/06 | 14:40:25 | 1.6133 | 0.305 | 29.736 |
| 11/13/06 | 14:40:31 | 1.7072 | 0.299 | 29.738 |
| 11/13/06 | 14:40:37 | 1.8065 | 0.293 | 29.736 |
| 11/13/06 | 14:40:43 | 1.9118 | 0.288 | 29.734 |
| 11/13/06 | 14:40:50 | 2.0233 | 0.282 | 29.738 |
| 11/13/06 | 14:40:57 | 2.1415 | 0.279 | 29.736 |
| 11/13/06 | 14:41:05 | 2.2667 | 0.276 | 29.738 |
| 11/13/06 | 14:41:12 | 2.3992 | 0.270 | 29.740 |
| 11/13/06 | 14:41:21 | 2.5397 | 0.268 | 29.738 |
| 11/13/06 | 14:41:30 | 2.6885 | 0.265 | 29.738 |
| 11/13/06 | 14:41:39 | 2.8460 | 0.262 | 29.740 |
| 11/13/06 | 14:41:49 | 3.0127 | 0.262 | 29.742 |
| 11/13/06 | 14:41:59 | 3.1793 | 0.259 | 29.742 |
| 11/13/06 | 14:42:09 | 3.3460 | 0.256 | 29.738 |
| 11/13/06 | 14:42:19 | 3.5127 | 0.253 | 29.736 |
| 11/13/06 | 14:42:29 | 3.6793 | 0.250 | 29.738 |
| 11/13/06 | 14:42:39 | 3.8460 | 0.250 | 29.738 |
| 11/13/06 | 14:42:49 | 4.0127 | 0.247 | 29.740 |
| 11/13/06 | 14:42:59 | 4.1793 | 0.247 | 29.740 |
| 11/13/06 | 14:43:09 | 4.3460 | 0.247 | 29.740 |
| 11/13/06 | 14:43:19 | 4.5127 | 0.242 | 29.738 |
| 11/13/06 | 14:43:29 | 4.6793 | 0.239 | 29.736 |
| 11/13/06 | 14:43:39 | 4.8460 | 0.242 | 29.738 |
| 11/13/06 | 14:43:49 | 5.0127 | 0.236 | 29.736 |
| 11/13/06 | 14:43:59 | 5.1793 | 0.239 | 29.738 |
| 11/13/06 | 14:44:09 | 5.3460 | 0.236 | 29.742 |
| 13/06 | 14:44:19 | 5.5127 | 0.236 | 29.736 |
| 13/06 | 14:44:29 | 5.6793 | 0.236 | 29.740 |
| 11/13/06 | 14:44:39 | 5.8460 | 0.236 | 29.738 |
| 11/13/06 | 14:44:49 | 6.0127 | 0.236 | 29.736 |
| 11/13/06 | 14:44:59 | 6.1793 | 0.233 | 29.740 |
| 11/13/06 | 14:45:09 | 6.3460 | 0.233 | 29.738 |
| 11/13/06 | 14:45:19 | 6.5127 | 0.233 | 29.736 |
| 11/13/06 | 14:45:29 | 6.6793 | 0.233 | 29.738 |

| | | | | |
|---|---|---|---|---|
| 11/13/06 | 14:45:39 | 6.8460 | 0.233 | 29.734 |
| 11/13/06 | 14:45:49 | 7.0127 | 0.233 | 29.738 |
| 11/13/06 | 14:45:59 | 7.1793 | 0.227 | 29.695 |
| 11/13/06 | 14:46:09 | 7.3460 | 0.227 | 29.691 |
| 11/13/06 | 14:46:19 | 7.5127 | 0.227 | 29.687 |
| 11/13/06 | 14:46:29 | 7.6793 | 0.227 | 29.687 |
| 13/06 | 14:46:39 | 7.8460 | 0.227 | 29.689 |
| 13/06 | 14:46:49 | 8.0127 | 0.224 | 29.687 |
| 11/13/06 | 14:46:59 | 8.1793 | 0.224 | 29.687 |
| 11/13/06 | 14:47:09 | 8.3460 | 0.224 | 29.713 |
| 11/13/06 | 14:47:19 | 8.5127 | 0.224 | 29.719 |
| 11/13/06 | 14:47:29 | 8.6793 | 0.224 | 29.724 |
| 11/13/06 | 14:47:39 | 8.8460 | 0.224 | 29.724 |
| 11/13/06 | 14:47:49 | 9.0127 | 0.227 | 29.722 |
| 11/13/06 | 14:47:59 | 9.1793 | 0.227 | 29.726 |
| 11/13/06 | 14:48:09 | 9.3460 | 0.224 | 29.728 |
| 11/13/06 | 14:48:19 | 9.5127 | 0.224 | 29.732 |

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North Anna COL Project
Hydraulic Conductivity (K) Calculation Worksheet
MACTEC Job Number: 6468-06-1472

Well: OW-946
Test Date: 11/14/2006
Test Type: Recovery (slug in)
Test Name: OW-946-in

Conducted by: Charles-Smith
Entered/date: WJE 11-4-06
Checked/date: JCP by CAM with permission
12/12/06

WELL DATA

| | | |
|---|---|---|
| SWL = | 26.53 | (ft BTOC) |
| WD = | 45.90 | (ft BTOC) |
| WD = | 43.40 | (ft BGS) |
| DTSP = | 25.20 | (ft BGS) |
| rc = | 0.08 | (ft) |
| n = | 0.30 | |
| rw = | 0.35 | (ft) |
| rc (adjusted) = | 0.20 | (ft) |
| Le = | 10 | (ft) |
| Lw = | 13.87 | (ft) |
| Le/rw = | 28.57 | |
| H = | 17.77 | (ft) |

H is depth from SWL to top of bedrock as listed on boring logs

CALCULATION OF K

K = [(rc^2 ln(Re/rw))/2Le]*(1/t)ln(yo/yt)

| | | |
|---|---|---|
| yo = | 2.02 | (ft) from plot |
| yt = | 1.09 | (ft) from plot |
| t = | 0.47 | (minutes) from plot |
| ln(Re/rw) = | 2.38 | |
| K = | 9.2E+00 | (ft/day) |
| K = | 3.2E-03 | (cm/sec) |

Calculation of ln(Re/rw)

Where: Lw < H;

ln(Re/rw) = [{1.1/(ln(Lw/rw))}+{A+Bln((H-Lw)/rw)}/(Le/rw)]^-1= 2.38

Where: Lw = H;

ln(Re/rw) = [{1.1/(ln(Lw/rw))}+{C/(Le/rw)}]^-1 = 2.70

Calculation of Coefficients

Value range for Le/rw from Table of Coefficients

| Le/rw | A | B | C |
|---|---|---|---|
| 25 | 2.4 | 0.31 | 1.9 |
| 30 | 2.5 | 0.35 | 2.1 |

Interpolated values of A, B and C for Le/rw

| | | | |
|---|---|---|---|
| 28.57 | 2.47 | 0.34 | 2.04 |

Coefficients Table

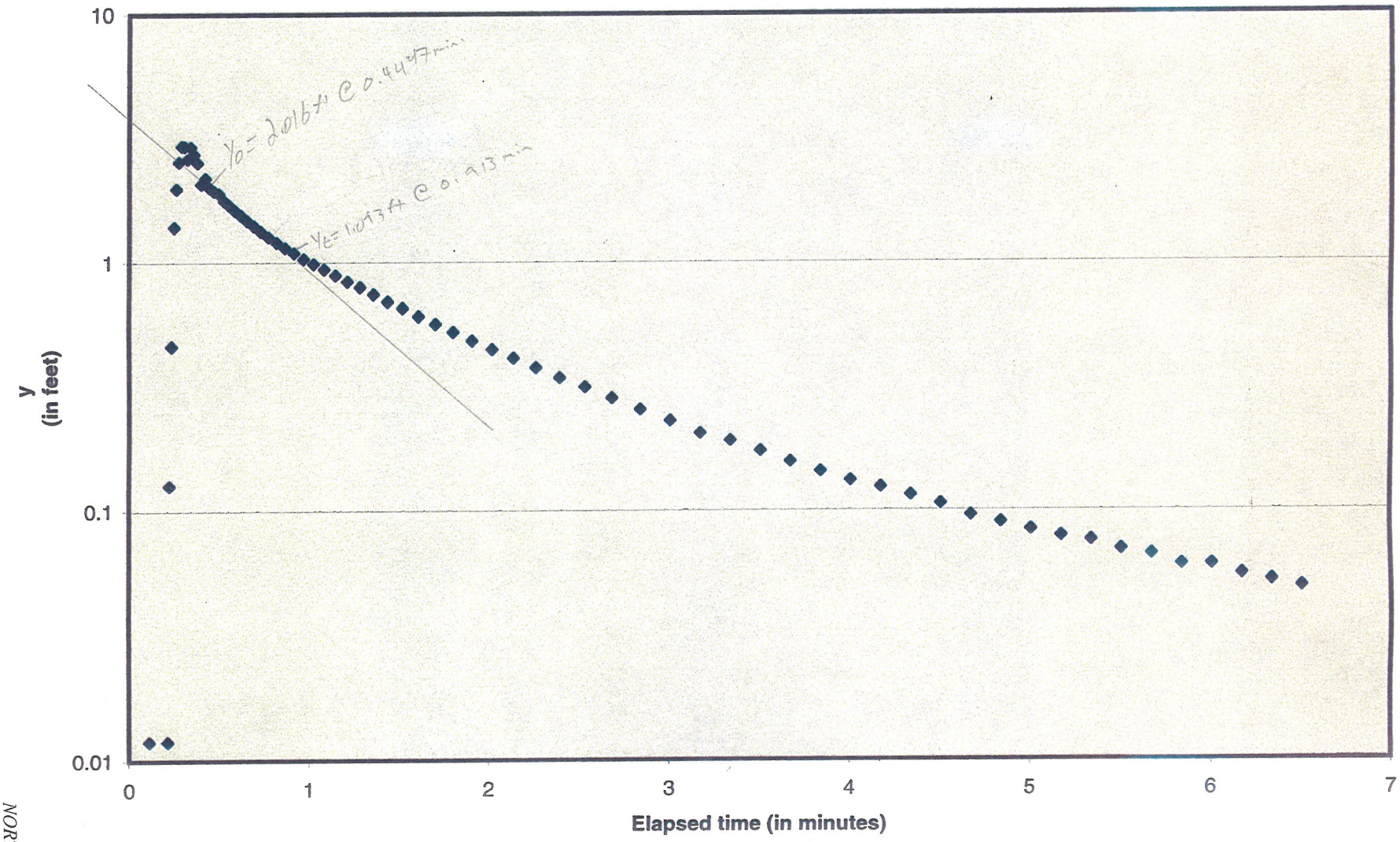
| Le/rw | A | Le/rw | B | Le/rw | C |
|---|---|---|---|---|---|
| 4 | 1.75 | 4 | 0.25 | 4 | 0.75 |
| 5 | 1.76 | 5 | 0.25 | 5 | 0.85 |
| 6 | 1.77 | 6 | 0.25 | 6 | 0.90 |
| 7 | 1.80 | 7 | 0.25 | 7 | 1.00 |
| 8 | 1.83 | 8 | 0.25 | 8 | 1.10 |
| 9 | 1.90 | 9 | 0.25 | 9 | 1.20 |
| 10 | 1.95 | 10 | 0.25 | 10 | 1.30 |
| 15 | 2.10 | 15 | 0.27 | 15 | 1.50 |
| 20 | 2.23 | 20 | 0.29 | 20 | 1.75 |
| 25 | 2.40 | 25 | 0.31 | 25 | 1.90 |
| 30 | 2.50 | 30 | 0.35 | 30 | 2.10 |
| 40 | 2.75 | 40 | 0.45 | 40 | 2.45 |
| 50 | 3.00 | 50 | 0.50 | 50 | 2.70 |
| 60 | 3.45 | 60 | 0.52 | 60 | 3.00 |
| 70 | 3.70 | 70 | 0.60 | 70 | 3.40 |
| 80 | 3.90 | 80 | 0.65 | 80 | 3.60 |
| 90 | 4.20 | 90 | 0.70 | 90 | 3.85 |
| 100 | 4.50 | 100 | 0.75 | 100 | 4.20 |
| 150 | 5.45 | 150 | 0.98 | 150 | 5.70 |
| 200 | 6.10 | 200 | 1.20 | 200 | 7.00 |
| 250 | 6.70 | 250 | 1.30 | 250 | 8.00 |
| 300 | 7.10 | 300 | 1.50 | 300 | 8.80 |
| 400 | 7.75 | 400 | 1.90 | 400 | 9.90 |
| 500 | 8.20 | 500 | 2.20 | 500 | 10.60 |
| 600 | 8.50 | 600 | 2.33 | 600 | 11.10 |
| 700 | 8.70 | 700 | 2.50 | 700 | 11.50 |
| 800 | 8.90 | 800 | 2.70 | 800 | 11.80 |
| 900 | 9.00 | 900 | 2.75 | 900 | 12.00 |
| 1000 | 9.20 | 1000 | 2.83 | 1000 | 12.40 |
| 1500 | 9.50 | 1500 | 3.18 | 1500 | 12.90 |

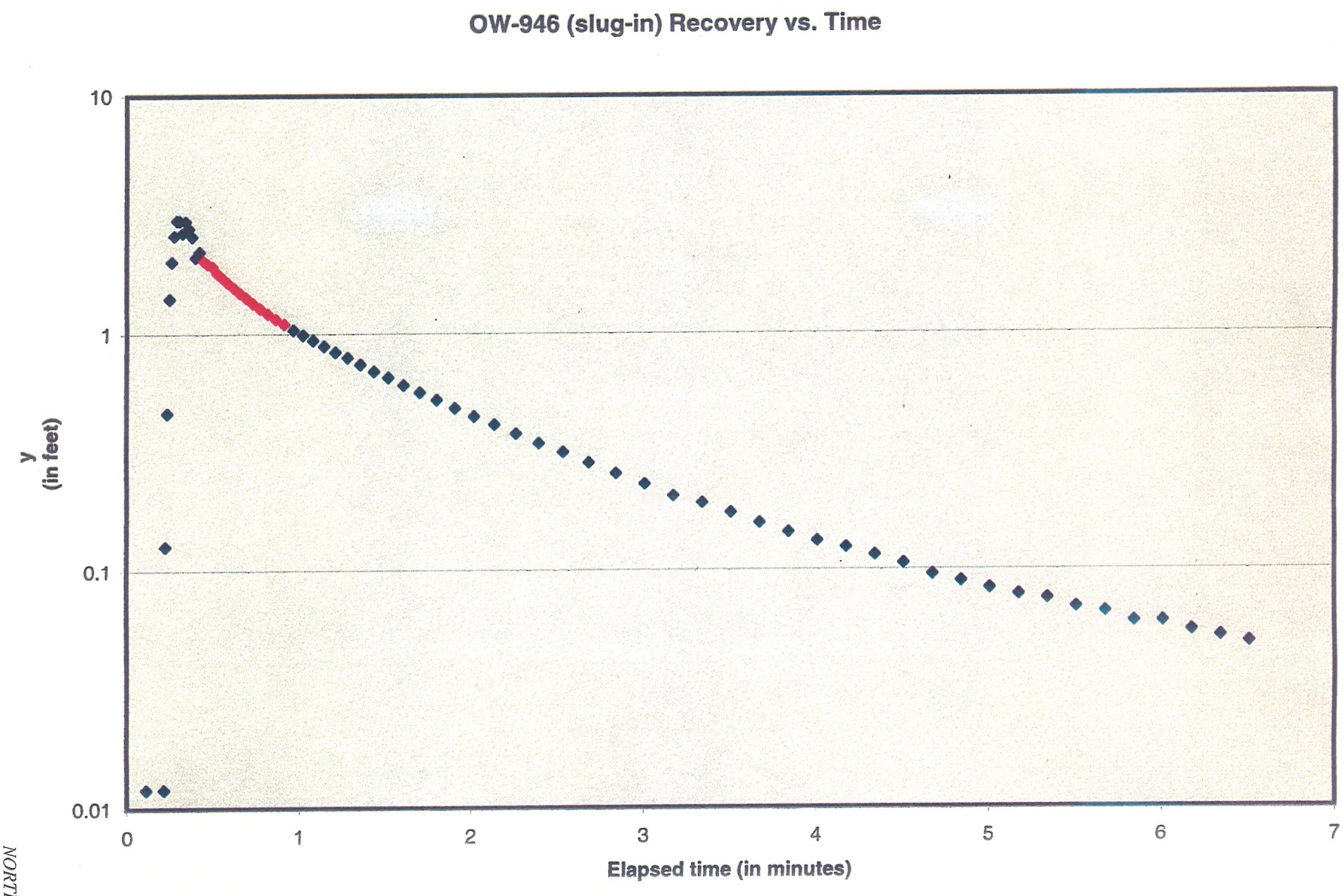
Reference: Bouwer(1989), Bouwer and Rice(1976)

TEST DATA

| | Elapsed time (min) | Log y | y (ft) | WL (ft BTOC) |
|---|---|---|---|---|
| | 0 | #NUM! | 0 | 26.53 |
| | 0.0112 | -2.52 | 0.003 | 26.53 |
| | 0.0223 | #NUM! | 0 | 26.53 |
| | 0.0335 | -2.22 | 0.006 | 26.52 |
| | 0.0447 | -2.22 | 0.006 | 26.52 |
| | 0.0558 | -2.22 | 0.006 | 26.52 |
| | 0.067 | -2.22 | 0.006 | 26.52 |
| | 0.0782 | -2.22 | 0.006 | 26.52 |
| | 0.0893 | -2.22 | 0.006 | 26.52 |
| | 0.1005 | -2.05 | 0.009 | 26.52 |
| | 0.1117 | -1.92 | 0.012 | 26.52 |
| | 0.1228 | -2.22 | 0.006 | 26.52 |
| | 0.134 | -2.22 | 0.006 | 26.52 |
| | 0.1452 | -2.22 | 0.006 | 26.52 |
| | 0.1563 | -2.05 | 0.009 | 26.52 |
| | 0.1675 | -2.05 | 0.009 | 26.52 |
| | 0.1787 | -2.05 | 0.009 | 26.52 |
| | 0.1898 | -2.05 | 0.009 | 26.52 |
| | 0.201 | -2.22 | 0.006 | 26.52 |
| | 0.2122 | -1.92 | 0.012 | 26.52 |
| | 0.2233 | -0.90 | 0.127 | 26.40 |
| | 0.235 | -0.33 | 0.469 | 26.06 |
| | 0.2475 | 0.15 | 1.397 | 25.13 |
| | 0.2607 | 0.30 | 1.998 | 24.53 |
| | 0.2747 | 0.41 | 2.576 | 23.95 |
| | 0.2895 | 0.48 | 2.991 | 23.54 |
| | 0.3052 | 0.47 | 2.982 | 23.55 |
| | 0.3218 | 0.42 | 2.645 | 23.89 |
| | 0.3395 | 0.47 | 2.959 | 23.57 |
| | 0.3582 | 0.44 | 2.769 | 23.76 |
| | 0.378 | 0.41 | 2.556 | 23.97 |
| | 0.399 | 0.32 | 2.088 | 24.44 |
| | 0.4212 | 0.34 | 2.205 | 24.33 |
| Test initialization | 0.4447 | 0.30 | 2.016 | 24.51 |
| | 0.4695 | 0.29 | 1.95 | 24.58 |
| | 0.4958 | 0.28 | 1.909 | 24.62 |
| | 0.5238 | 0.25 | 1.786 | 24.74 |
| | 0.5535 | 0.23 | 1.711 | 24.82 |
| | 0.5848 | 0.21 | 1.633 | 24.90 |
| | 0.618 | 0.19 | 1.558 | 24.97 |
| | 0.6532 | 0.17 | 1.481 | 25.05 |
| | 0.6905 | 0.15 | 1.412 | 25.12 |
| | 0.73 | 0.13 | 1.34 | 25.19 |
| | 0.7718 | 0.10 | 1.271 | 25.26 |
| | 0.8162 | 0.08 | 1.208 | 25.32 |
| | 0.8632 | 0.06 | 1.147 | 25.38 |
| Test completion | 0.913 | 0.04 | 1.093 | 25.44 |
| | 0.9657 | 0.01 | 1.035 | 25.50 |
| | 1.0215 | -0.01 | 0.986 | 25.54 |
| | 1.0807 | -0.03 | 0.937 | 25.59 |
| | 1.1433 | -0.05 | 0.886 | 25.64 |
| | 1.2097 | -0.08 | 0.837 | 25.69 |
| | 1.28 | -0.10 | 0.794 | 25.74 |
| | 1.3545 | -0.13 | 0.745 | 25.79 |
| | 1.4335 | -0.16 | 0.696 | 25.83 |
| | 1.5172 | -0.18 | 0.656 | 25.87 |
| | 1.6057 | -0.21 | 0.61 | 25.92 |
| | 1.6995 | -0.24 | 0.569 | 25.96 |
| | 1.7988 | -0.28 | 0.529 | 26.00 |
| | 1.9042 | -0.31 | 0.489 | 26.04 |
| | 2.0157 | -0.35 | 0.451 | 26.08 |
| | 2.1338 | -0.38 | 0.417 | 26.11 |
| | 2.259 | -0.42 | 0.382 | 26.15 |
| | 2.3915 | -0.46 | 0.348 | 26.18 |
| | 2.532 | -0.50 | 0.319 | 26.21 |
| 90% recovery | 2.6808 | -0.54 | 0.288 | 26.24 |
| | 2.8383 | -0.59 | 0.259 | 26.27 |
| | 3.005 | -0.63 | 0.233 | 26.30 |
| | 3.1717 | -0.68 | 0.207 | 26.32 |
| | 3.3383 | -0.71 | 0.193 | 26.34 |
| | 3.505 | -0.76 | 0.175 | 26.36 |
| | 3.6717 | -0.80 | 0.158 | 26.37 |
| | 3.8383 | -0.84 | 0.144 | 26.39 |
| | 4.005 | -0.88 | 0.132 | 26.40 |
| | 4.1717 | -0.91 | 0.124 | 26.41 |
| | 4.3383 | -0.94 | 0.115 | 26.42 |
| | 4.505 | -0.97 | 0.106 | 26.42 |
| | 4.6717 | -1.02 | 0.095 | 26.44 |
| | 4.8383 | -1.05 | 0.089 | 26.44 |
| | 5.005 | -1.08 | 0.083 | 26.45 |

## OW-946 (slug-in) Recovery vs. Time




OW-946 (slug-in) Recovery vs. Time
10
1
0.1
0.01
y
(in feet)
0
1
2
3
4
5
6
7
Elapsed time (in minutes)

# MACTEC

MACTEC Engineering and Consulting
3301 Atlantic Avenue
Raleigh, North Carolina

**Slug Test Data Sheet**

| | |
|---|---|
| **MACTEC Job Name:** North Anna COL | **MACTEC Job Number:** 6468-06-1472 |
| **Date:** 11-14-06 **Time:** 1545 | **Observation Well No.:** OW946IN |
| **Weather Conditions:** Sunny Approx 68°F | |
| **Method of Slug Withdrawl (circle one):** water, mechanical, or pressure | **Test Method:** Rising Head or Falling Head (circle) |
| **Diameter of Screen:** 2 in. | **Diameter of Casing:** 2 in. |
| **Total Well Depth:** 43.4 ft below reference point | **Reference Point:** Permanent mark on top of casing |
| **Length of Screened Section:** 10 ft | **Depth interval of screened portion:** 30.4-40.4 ft |
| **Depth to Groundwater:** 26.53 ft below reference point | |

**Groundwater Measurements Collected Prior to Slug Test**

| Depth to Groundwater | Date |
|---|---|
| 26.39 (pre-Development) | 11-14-06 |
| 26.53 (post-Development) | 11-14-06 |

**Comments/Remarks**

Used Transducer SN P00513 Heriut 3000
Set Transducer 35' below TOC
Transducer read ~~8.537~~ 26.46' RAP 11-14-06
vs. 26.53' static
offset = 2.959
= 99% Recovery

In-Situ Inc. Hermit 3000

Report generated: 12/11/06 17:40:46
Report from file: P:\6468\2006 Projects\1472 North Anna COL\Slug Test Data\Raw data logger fil
DataMgr Version 3.71

ial number: 00045369
Firmware Version 7.08
Unit name: HERMIT 3000

Test name: OW946IN PAGE 1 OF 2

Test defined on: 11/14/06 16:38:23
Test started on: 11/14/06 16:41:26
Test stopped on: 11/14/06 16:48:01
Test extracted on: 11/14/06 17:59:51

Data gathered using Logarithmic testing
Maximum time between data points: 0.1667 Minutes.
Number of data samples: 89

TOTAL DATA SAMPLES 89

Channel number [1]
Measurement type: Pressure
Channel name: D00513
Linearity: 0.0212000
Scale: 19.9368000
Offset: 0.1304000
Warmup: 50
Specific gravity: 1.000
Mode: TOC
User-defined reference: 0.000 Feet H2O
eferenced on: test start
Pressure head at reference: 8.546 Feet H2O

Channel number [0]
Measurement type: Barometric Pressure
Channel name: Barometric
Linearity: 0.0000000
Scale: 0.0000000
Offset: 0.0000000
Warmup: 50

| Date | Time | ET (min) | Chan[1] Feet H2O | Chan[0] Inches Hg |
|---|---|---|---|---|
| 11/14/06 | 16:41:26 | 0.0000 | 0.000 | 29.555 |
| 11/14/06 | 16:41:26 | 0.0112 | -0.003 | 29.555 |
| 11/14/06 | 16:41:27 | 0.0223 | 0.000 | 29.555 |
| 11/14/06 | 16:41:28 | 0.0335 | -0.006 | 29.555 |
| 11/14/06 | 16:41:28 | 0.0447 | -0.006 | 29.555 |
| 11/14/06 | 16:41:29 | 0.0558 | -0.006 | 29.553 |
| 11/14/06 | 16:41:30 | 0.0670 | -0.006 | 29.557 |
| 11/14/06 | 16:41:30 | 0.0782 | -0.006 | 29.555 |
| 11/14/06 | 16:41:31 | 0.0893 | -0.006 | 29.557 |
| 11/14/06 | 16:41:32 | 0.1005 | -0.009 | 29.553 |
| 11/14/06 | 16:41:32 | 0.1117 | -0.012 | 29.555 |
| 11/14/06 | 16:41:33 | 0.1228 | -0.006 | 29.553 |
| 11/14/06 | 16:41:34 | 0.1340 | -0.006 | 29.557 |
| '14/06 | 16:41:34 | 0.1452 | -0.006 | 29.555 |
| 14/06 | 16:41:35 | 0.1563 | -0.009 | 29.553 |
| 11/14/06 | 16:41:36 | 0.1675 | -0.009 | 29.553 |
| 11/14/06 | 16:41:36 | 0.1787 | -0.009 | 29.551 |
| 11/14/06 | 16:41:37 | 0.1898 | -0.009 | 29.551 |
| 11/14/06 | 16:41:38 | 0.2010 | -0.006 | 29.553 |
| 11/14/06 | 16:41:38 | 0.2122 | -0.012 | 29.555 |
| 11/14/06 | 16:41:39 | 0.2233 | -0.127 | 29.557 |

OW946IN PAGE 2 OF 2

| | | | | |
|---|---|---|---|---|
| 11/14/06 | 16:41:40 | 0.2350 | -0.469 | 29.553 |
| 11/14/06 | 16:41:40 | 0.2475 | -1.397 | 29.555 |
| 11/14/06 | 16:41:41 | 0.2607 | -1.998 | 29.557 |
| 11/14/06 | 16:41:42 | 0.2747 | -2.576 | 29.553 |
| 11/14/06 | 16:41:43 | 0.2895 | -2.991 | 29.555 |
| 11/14/06 | 16:41:44 | 0.3052 | -2.982 | 29.551 |
| 11/14/06 | 16:41:45 | 0.3218 | -2.645 | 29.555 |
| 11/14/06 | 16:41:46 | 0.3395 | -2.959 | 29.555 |
| 11/14/06 | 16:41:47 | 0.3582 | -2.769 | 29.553 |
| 11/14/06 | 16:41:48 | 0.3780 | -2.556 | 29.553 |
| 11/14/06 | 16:41:49 | 0.3990 | -2.088 | 29.553 |
| 11/14/06 | 16:41:51 | 0.4212 | -2.205 | 29.557 |
| 11/14/06 | 16:41:52 | 0.4447 | -2.016 | 29.553 |
| 11/14/06 | 16:41:54 | 0.4695 | -1.950 | 29.551 |
| 11/14/06 | 16:41:55 | 0.4958 | -1.909 | 29.557 |
| 11/14/06 | 16:41:57 | 0.5238 | -1.786 | 29.553 |
| 11/14/06 | 16:41:59 | 0.5535 | -1.711 | 29.555 |
| 11/14/06 | 16:42:01 | 0.5848 | -1.633 | 29.557 |
| 11/14/06 | 16:42:03 | 0.6180 | -1.558 | 29.557 |
| 11/14/06 | 16:42:05 | 0.6532 | -1.481 | 29.557 |
| 11/14/06 | 16:42:07 | 0.6905 | -1.412 | 29.557 |
| 11/14/06 | 16:42:09 | 0.7300 | -1.340 | 29.553 |
| 11/14/06 | 16:42:12 | 0.7718 | -1.271 | 29.557 |
| 11/14/06 | 16:42:14 | 0.8162 | -1.208 | 29.557 |
| 11/14/06 | 16:42:17 | 0.8632 | -1.147 | 29.553 |
| 11/14/06 | 16:42:20 | 0.9130 | -1.093 | 29.555 |
| 11/14/06 | 16:42:23 | 0.9657 | -1.035 | 29.551 |
| 11/14/06 | 16:42:27 | 1.0215 | -0.986 | 29.553 |
| 11/14/06 | 16:42:30 | 1.0807 | -0.937 | 29.553 |
| 11/14/06 | 16:42:34 | 1.1433 | -0.886 | 29.555 |
| 11/14/06 | 16:42:38 | 1.2097 | -0.837 | 29.553 |
| 11/14/06 | 16:42:42 | 1.2800 | -0.794 | 29.553 |
| 11/14/06 | 16:42:47 | 1.3545 | -0.745 | 29.551 |
| 11/14/06 | 16:42:52 | 1.4335 | -0.696 | 29.555 |
| 11/14/06 | 16:42:57 | 1.5172 | -0.656 | 29.555 |
| 11/14/06 | 16:43:02 | 1.6057 | -0.610 | 29.555 |
| 11/14/06 | 16:43:07 | 1.6995 | -0.569 | 29.555 |
| 11/14/06 | 16:43:13 | 1.7988 | -0.529 | 29.557 |
| 11/14/06 | 16:43:20 | 1.9042 | -0.489 | 29.553 |
| 11/14/06 | 16:43:26 | 2.0157 | -0.451 | 29.553 |
| 11/14/06 | 16:43:34 | 2.1338 | -0.417 | 29.553 |
| 11/14/06 | 16:43:41 | 2.2590 | -0.382 | 29.555 |
| 11/14/06 | 16:43:49 | 2.3915 | -0.348 | 29.555 |
| 11/14/06 | 16:43:57 | 2.5320 | -0.319 | 29.555 |
| 11/14/06 | 16:44:06 | 2.6808 | -0.288 | 29.553 |
| 11/14/06 | 16:44:16 | 2.8383 | -0.259 | 29.553 |
| 11/14/06 | 16:44:26 | 3.0050 | -0.233 | 29.557 |
| 11/14/06 | 16:44:36 | 3.1717 | -0.207 | 29.555 |
| 11/14/06 | 16:44:46 | 3.3383 | -0.193 | 29.555 |
| 11/14/06 | 16:44:56 | 3.5050 | -0.175 | 29.557 |
| 11/14/06 | 16:45:06 | 3.6717 | -0.158 | 29.557 |
| 11/14/06 | 16:45:16 | 3.8383 | -0.144 | 29.553 |
| 11/14/06 | 16:45:26 | 4.0050 | -0.132 | 29.555 |
| 11/14/06 | 16:45:36 | 4.1717 | -0.124 | 29.553 |
| 11/14/06 | 16:45:46 | 4.3383 | -0.115 | 29.557 |
| 11/14/06 | 16:45:56 | 4.5050 | -0.106 | 29.557 |
| 11/14/06 | 16:46:06 | 4.6717 | -0.095 | 29.557 |
| 11/14/06 | 16:46:16 | 4.8383 | -0.089 | 29.557 |
| 11/14/06 | 16:46:26 | 5.0050 | -0.083 | 29.553 |
| 11/14/06 | 16:46:36 | 5.1717 | -0.078 | 29.561 |
| 11/14/06 | 16:46:46 | 5.3383 | -0.075 | 29.559 |
| 11/14/06 | 16:46:56 | 5.5050 | -0.069 | 29.557 |
| 11/14/06 | 16:47:06 | 5.6717 | -0.066 | 29.559 |
| 11/14/06 | 16:47:16 | 5.8383 | -0.060 | 29.559 |
| 11/14/06 | 16:47:26 | 6.0050 | -0.060 | 29.553 |
| 11/14/06 | 16:47:36 | 6.1717 | -0.055 | 29.557 |
| 11/14/06 | 16:47:46 | 6.3383 | -0.052 | 29.557 |
| 11/14/06 | 16:47:56 | 6.5050 | -0.049 | 29.557 |