# ATTACHMENT A

# SLUG TESTS LOCATIONS AND DATA ANALYSIS

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*Environmental and Engineering Consultants*

# TECHNICAL MEMORANDUM

**DATE:** February 27, 2002 **SMI # 180734**

**TO:** Toby Wright

**FROM:** Paul Sorek

**SUBJECT:** Sequoyah Slug Testing

**COPY:** Micheal Gard

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The purpose of this memo is to document the field procedures and analytical methodology relating to the supplemental slug testing at the Sequoyah Fuels Facility (Facility). Slug tests were performed at 7 wells on February 12, 2002. These wells include MW010, MW010A, MW059A, MW093A, MW095A, MW097, and MW097A. MW093A, MW095A, and MW097A are screened in Unit 4 Shale. MW010A and MW059A are both dually completed in Unit 2 Shale/3 Shale and Unit 3 Shale/4 Shale, respectively. MW097 is screened in alluvium, and MW010 is screened in gravel backfill material. The well locations are presented in Figure 1.

For each test, a 10 psi pressure transducer connected to an Insitu Hermit 3K datalogger was placed at the appropriate depth in the well, and a reference head was determined with and electronic water level indicator. The wells were then allowed to re-equilibrate to static conditions for approximately 1 hour before the slug test was conducted, at which point a 1-inch diameter PVC slug was submerged in the well. The length of the slug varied between wells depending on the column of water in the well. The datalogger collected falling pressure head data at logrhythmic intervals until the water level returned to 95% of the static level, or a maximum of 1 hour. The slug was then removed from the well, and the datalogger collected rising head data. Static water level data are presented in Table 1. The time-drawdown data from the slug tests are attached to this memorandum.

Two methods were utilized to analyze the data. Data from wells under unconfined conditions were analyzed with the Bouwer and Rice (1976) method, which models unsteady, unconfined flow from a partially penetrating well in a homogeneous and isotropic aquifer. These wells include MW059A, MW093A, and MW097. MW010A was tested under confined conditions, and the data were analyzed with Cooper, et. al. (1967) method for unsteady radial flow under confined conditions in a homogeneous and isotropic aquifer. Static water level data at MW010, MW095A, and MW097A suggest that these tests were conducted under confined conditions. However, the time-drawdown data can not be accurately fitted with the Cooper method type


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curves, indicating that this is not the correct model for these data. It is possible that the hydrogeology at these locations is more accurately described as semi-confined or partially confined. Field observations from a trench located near MW010 support this assumption. Therefore, the Bouwer and Rice method is considered to be the most appropriate solution, and was used to analyze the data from these tests.

For all wells except MW010 and MW097, the rising head data were used in the analyses. Falling head data were analyzed for MW010 and MW097 because sufficient rising head data were not collected. Well construction and borehole lithology data required for the solutions were obtained from well completion reports presented in SFC, 1997. Solution plots for tests are presented in Figures 2 through 8. Table 2 summarizes the input parameters and results for each analysis.

Table 3 presents other estimates of hydraulic conductivity for each unit, including statistics from previous slug tests and values from the SMI flow model (SMI, 2001). It should be noted that the previous test results only include data from wells that are screened in a single hydrologic unit. Overall, hydraulic conductivity values calculated from these tests are greater than average values from previous tests. The results from MW093A, MW095A, and MW097A, all screened in Unit 4 Shale, are significantly greater than the log mean of the previous tests, and are the same order of magnitude as the previously observed maximum. MW010A is dually completed in Unit 2 Shale and 3 Shale. This location also has a hydraulic conductivity greater than the log mean of either shale unit from previous tests, and is consistent with the maximum observed conductivity value for Shale Unit 2 from previous tests (Table 3). The result of the MW097 test, 39.00 ft/day, is significantly greater than previously observed values in the alluvium, but is consistent with the modeled value of 50 ft/day. MW059A is dually completed in Unit 3 Shale and 4 Shale, and has an estimated hydraulic conductivity of 21.38 ft/day. This value is greater than any observed conductivity for the shale units, and is 1-2 orders of magnitude greater than the modeled shale values. MW010 is completed in backfill and the results of this test are therefore not appropriate for comparison with the naturally occurring units.

## REFERENCES

Bouwer, H. and R.C. Rice, 1976, A slug test for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells, Water Resources Research, v. 12, p. 423-428.

Cooper, H.H., J.D. Bredehoeft, and I.S. Papadopulos, 1967, Response of a finite-diameter well to an instantaneous charge of water, Water Resources Research, v.3, no. 1, p. 263-2

Sequoyah Fuels Corporation (SFC), 1997. "Final RCRA Facility Investigation of the Sequoyah Fuels Uranium Conversion Industrial Facility."

SMI, 2001, Final Hydrogeological and geochemical site characterization report, consultants report, Shepherd Miller, Inc. Fort Collins, Colorado.

**Table 1 Static Water Level Data**

| Well Location | Easting (ft) | Northing (ft) | Measuring Point Elevation (ft msl) | Depth to Groundwater 2/12/02 (ft bmp) | Groundwater Elevation 2/12/02 (ft msl) |
|---|---|---|---|---|---|
| MW010 | 2837016 | 195508 | 565.17 | 11.09 | 554.08 |
| MW010A | 2837011 | 195509 | 563.72 | 10.79 | 552.93 |
| MW059A | 2835336 | 195016 | 529.31 | 19.36 | 509.95 |
| MW093A | 2834987 | 194911 | 521.18 | 25.95 | 495.23 |
| MW095A | 2834517 | 195032 | 488.71 | 11.76 | 476.95 |
| MW097 | 2834491 | 195382 | 488.88 | 11.61 | 477.27 |
| MW097A | 2834493 | 195387 | 488.93 | 15.50 | 473.43 |

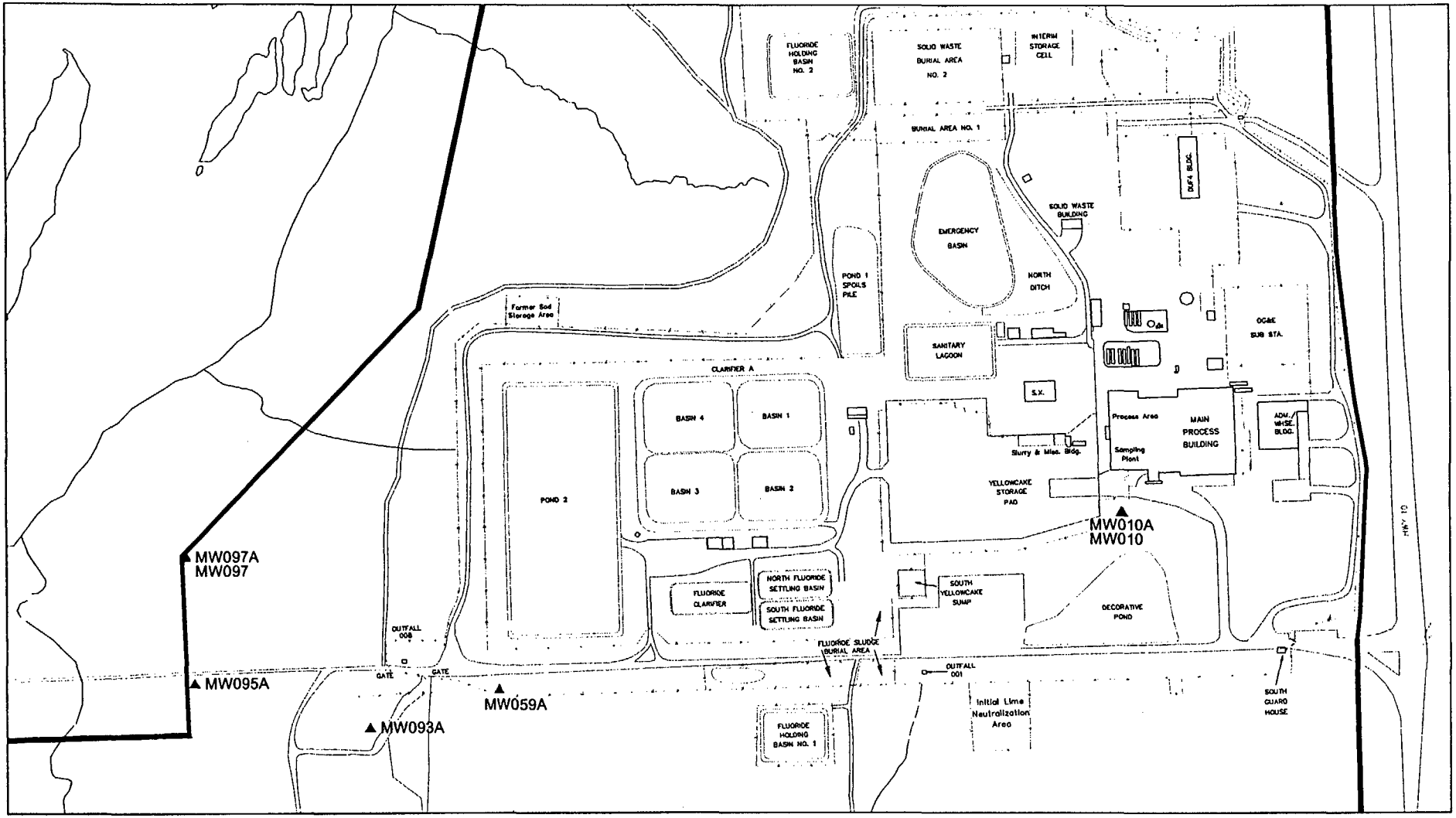
**Table 2 Well Data and Results**

| Well Location | Hydrologic Unit | Hydrologic Condition | Borehole Diameter (ft) | Screen Length (ft) | Saturated Thickness (ft) | Hydraulic Conductivity (ft/day) | Storage Coefficient | Analysis Method |
|---|---|---|---|---|---|---|---|---|
| MW010 | Gravel Backfill | Confined | 0.615 | ~3 | ~3 | 72.63 | na | Bouwer and Rice (1976) |
| MW010A | 2SH/3SH | Confined | 0.500 | 13.50 | 14.00 | 1.52 | 6.25E-03 | Cooper, et. al. (1967) |
| MW059A | 3SH/4SH | Unconfined | 0.500 | 4.71 | 5.43 | 21.38 | na | Bouwer and Rice (1976) |
| MW093A | 4SH | Unconfined | 0.615 | 16.57 | 17.09 | 2.51 | na | Bouwer and Rice (1976) |
| MW095A | 4SH | Confined | 0.615 | 5.50 | 5.50 | 4.73 | na | Bouwer and Rice (1976) |
| MW097 | Colluvium | Unconfined | 0.615 | 0.90 | 1.55 | 39.00 | na | Bouwer and Rice (1976) |
| MW097A | 4SH | Confined | 0.615 | 17.00 | 17.00 | 0.93 | na | Bouwer and Rice (1976) |

na – data not derived from this test

**Table 3 Other Estimates of Hydraulic Conductivity**

| Hydrologic Unit | Previous Slug Tests (ft/day) | | | | Modeled Value (ft/day) |
|---|---|---|---|---|---|
| | no. tests | log mean | max | min | |
| Alluvium | 2 | 0.334 | 5.01 | 0.0223 | 50.0 |
| shale 1 | 13 | 0.0246 | 0.261 | 0.00416 | 0.800 |
| shale 2 | 4 | 0.138 | 1.35 | 0.0118 | 1.200 |
| shale 3 | 3 | 0.0478 | 0.488 | 0.0103 | 0.100 |
| shale 4 | 5 | 0.0314 | 1.3 | 0.00466 | 0.500 |

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# FIGURE 1
# SLUG TEST LOCATIONS

| | |
|---|---|
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| Project: | P:\100734/HYDROGE |
| File: | SLUG TESTS.ppt |

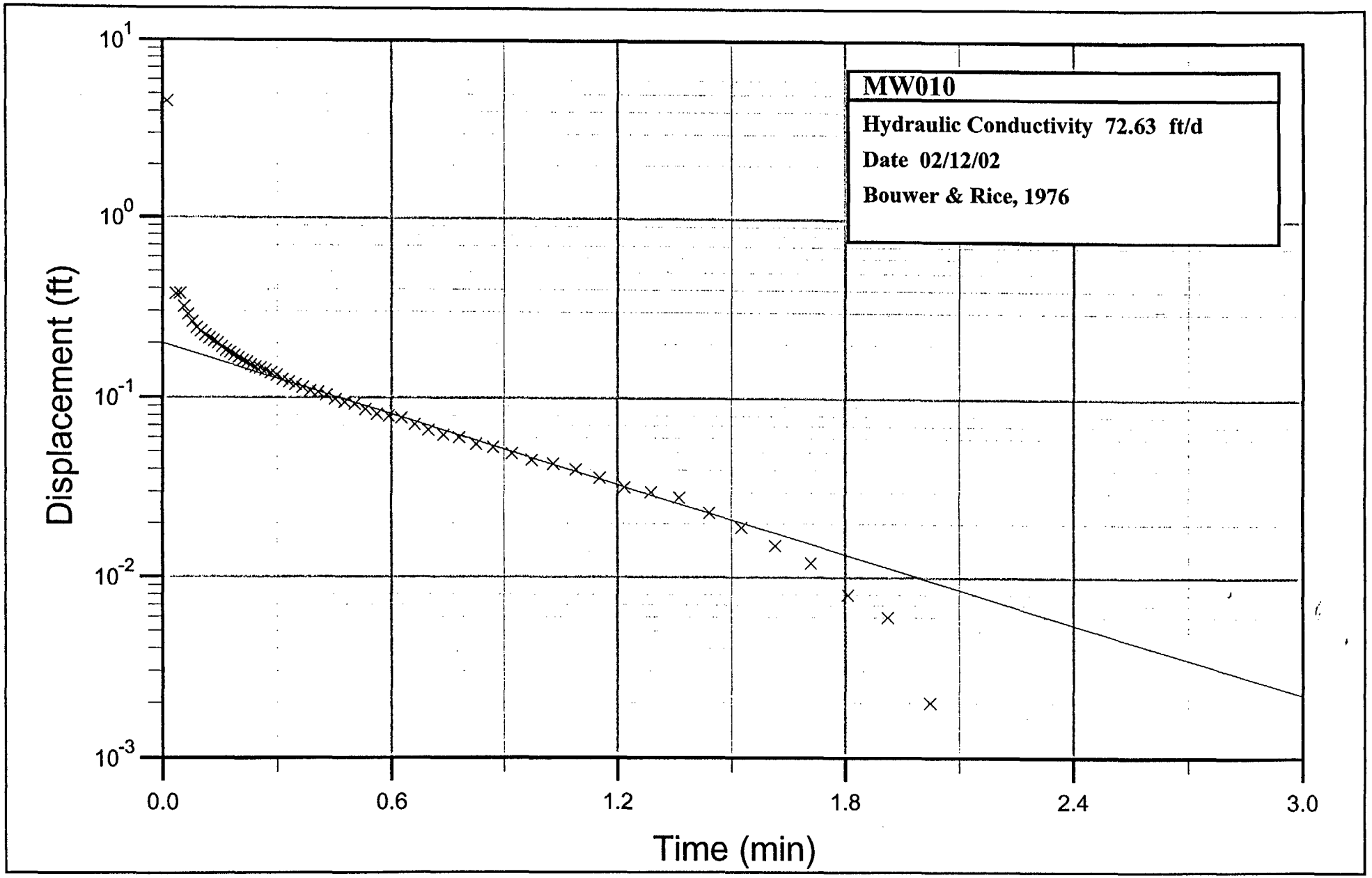


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FIGURE 2
MW010 SLUG TEST RESULTS

| | |
|---|---|
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| File: | SLUG TESTS.ppt |

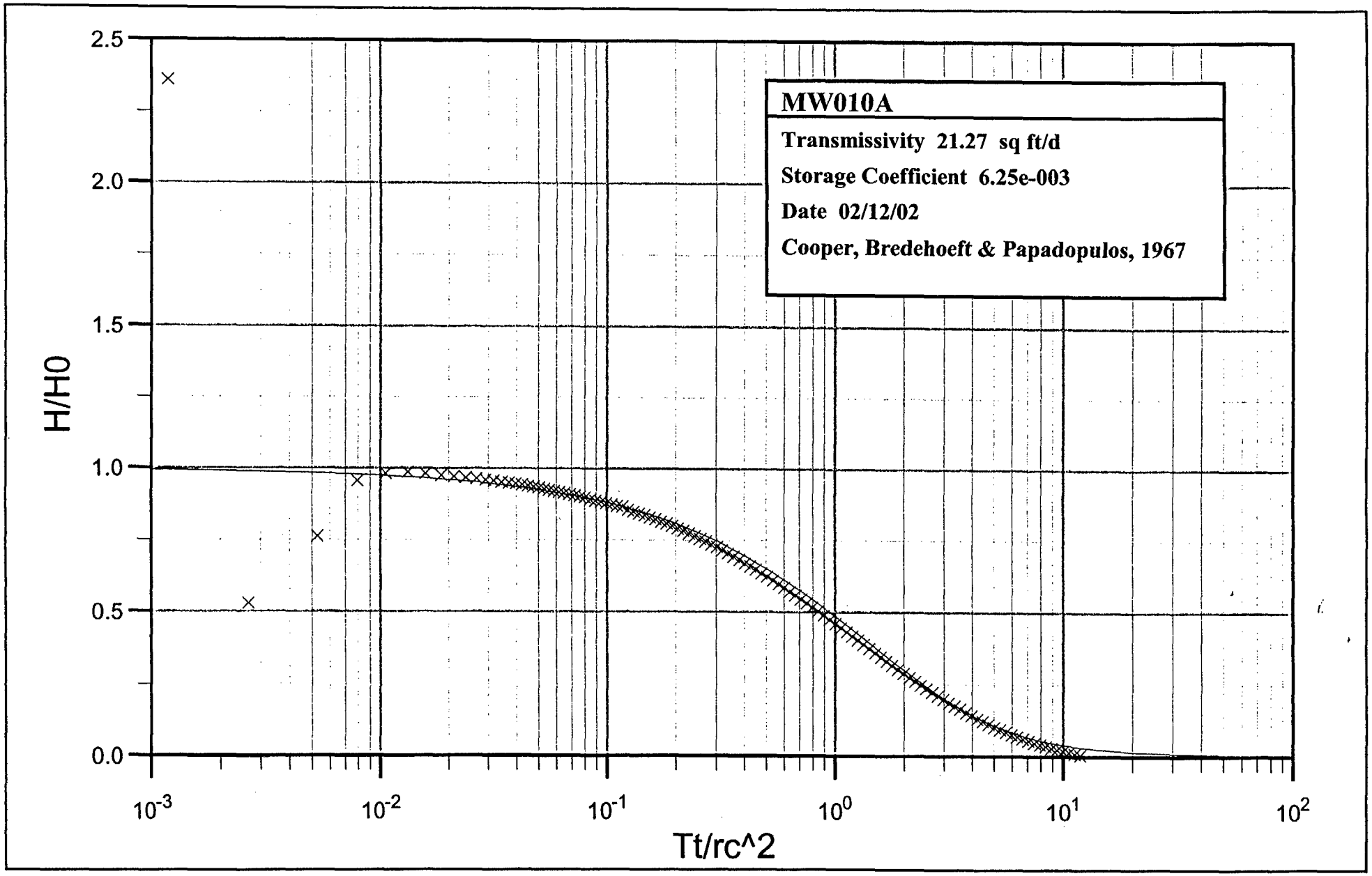


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FIGURE 3
MW010A SLUG TEST RESULTS

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| File: | SLUG TESTS.ppt |

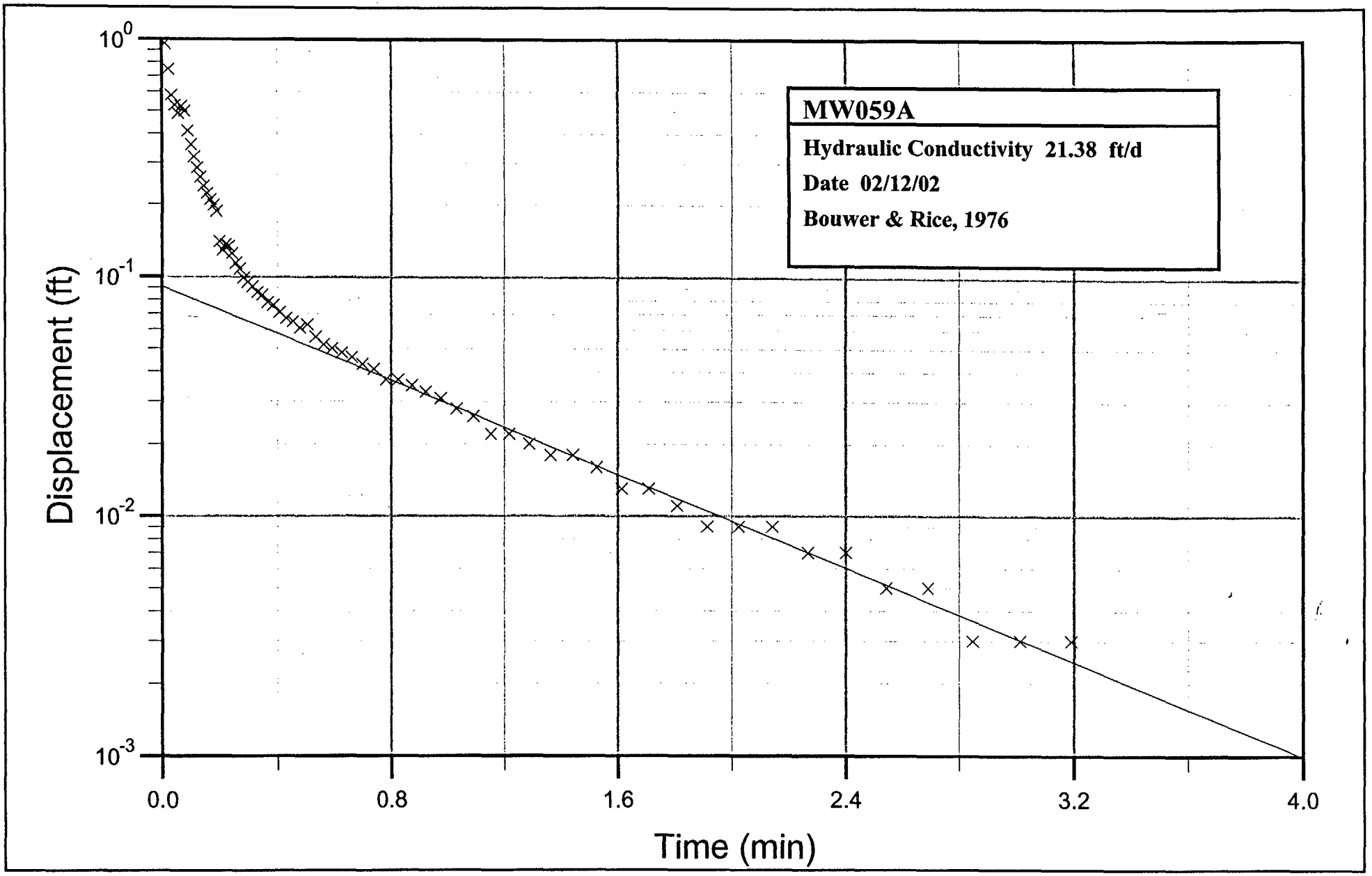


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FIGURE 4
MW059A SLUG TEST RESULTS

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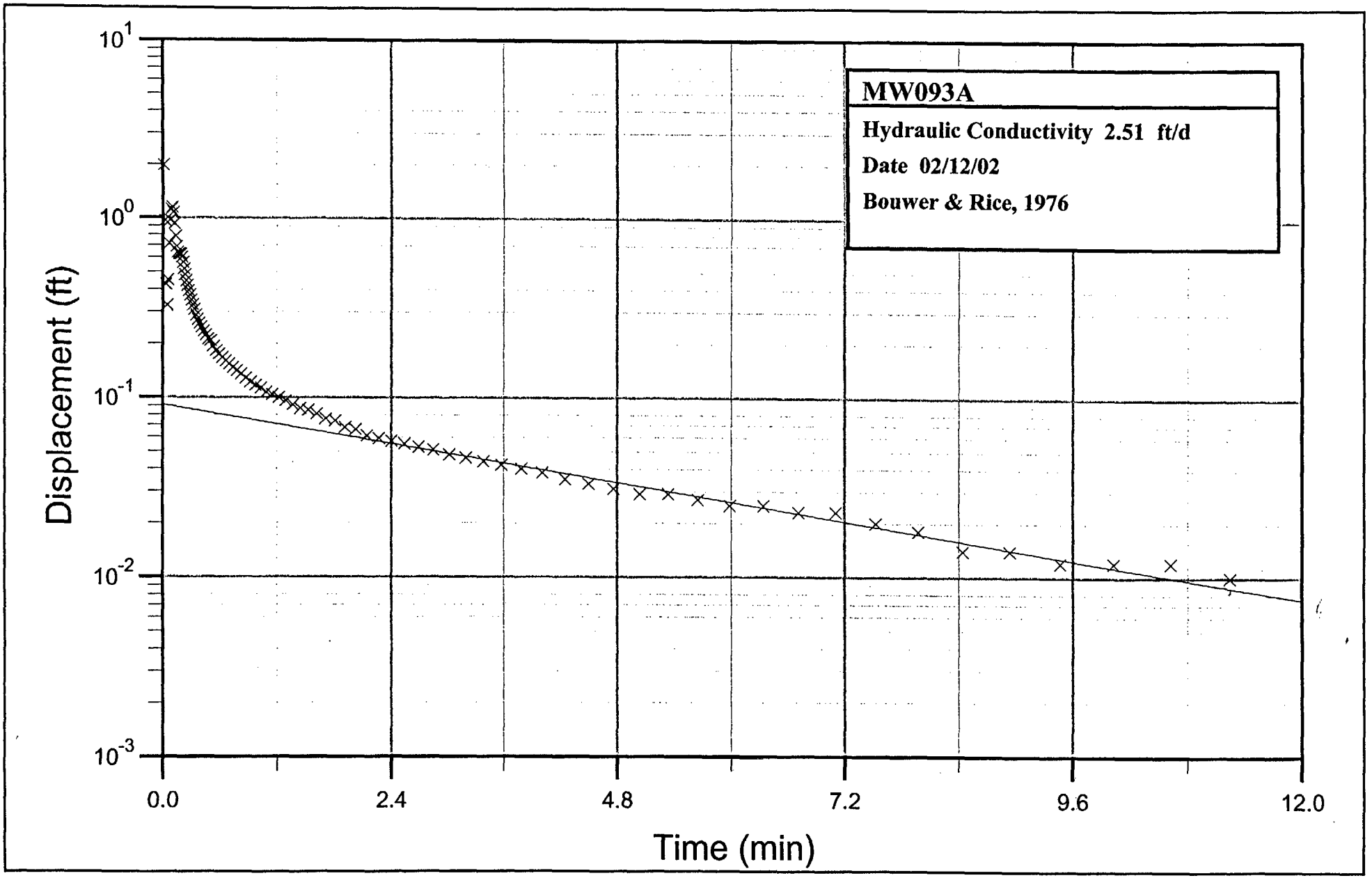


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FIGURE 5
MW093A SLUG TEST RESULTS

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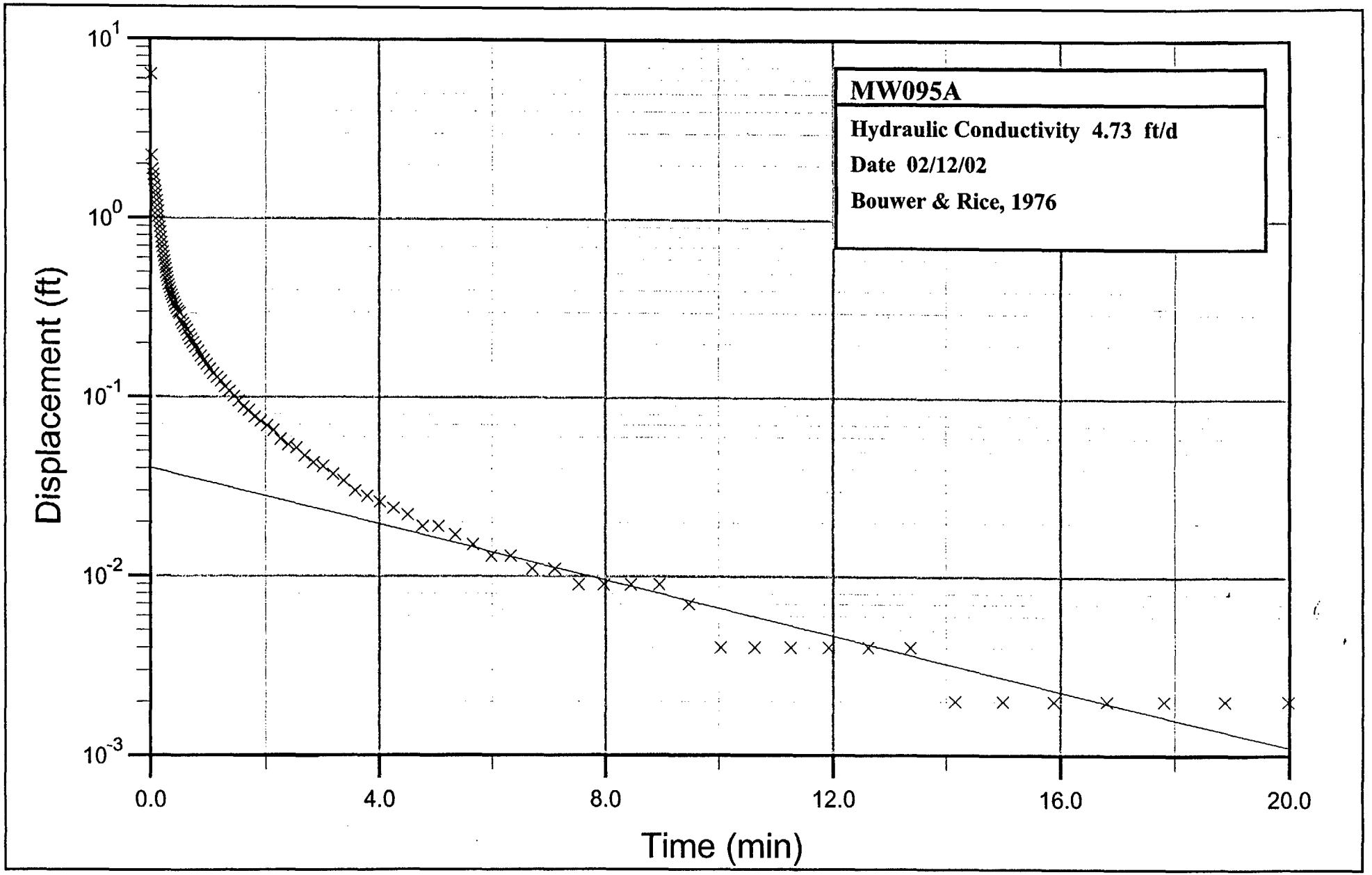


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FIGURE 6
MW095A SLUG TEST RESULTS

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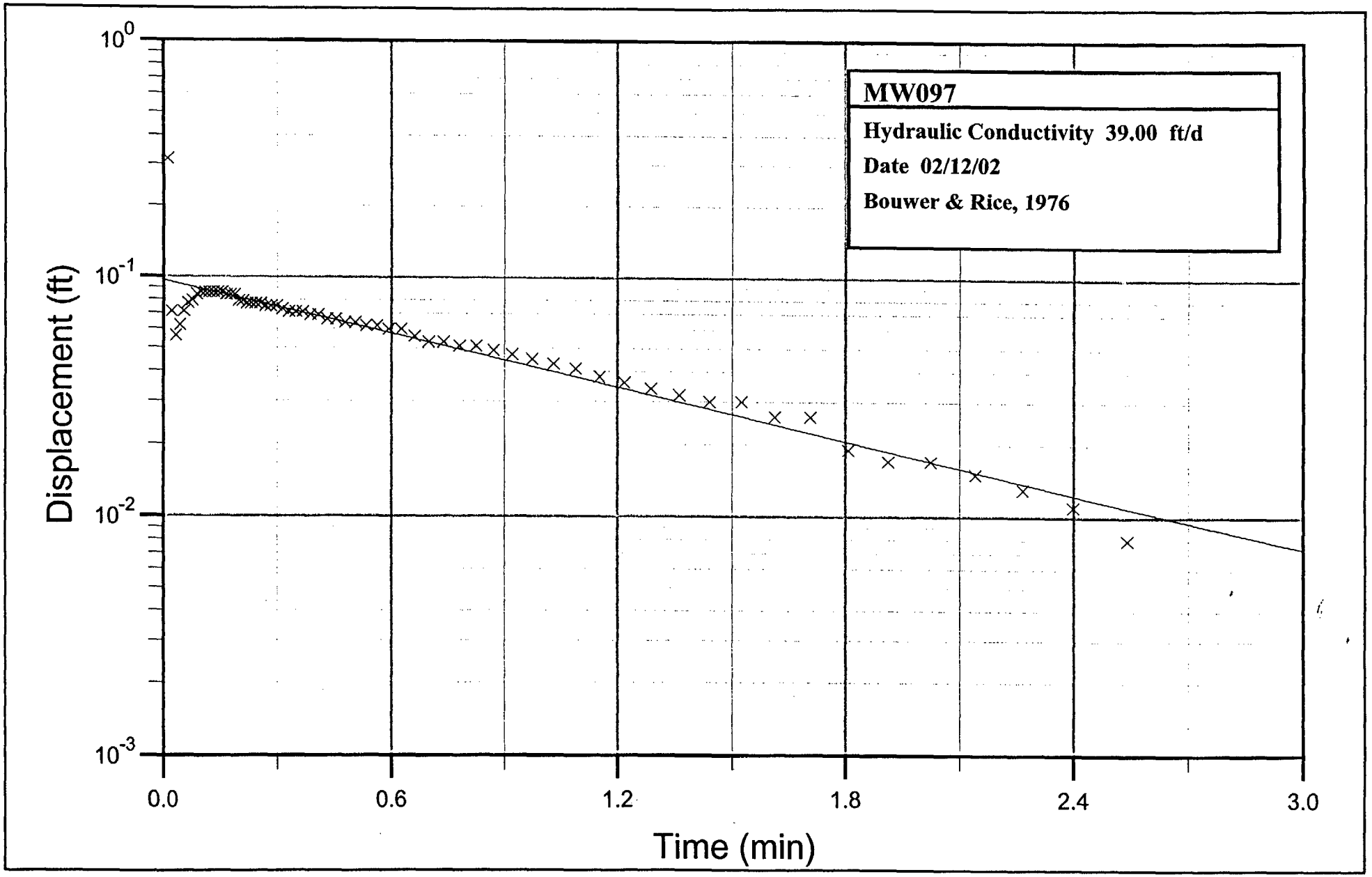


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FIGURE 7
MW097 SLUG TEST RESULTS

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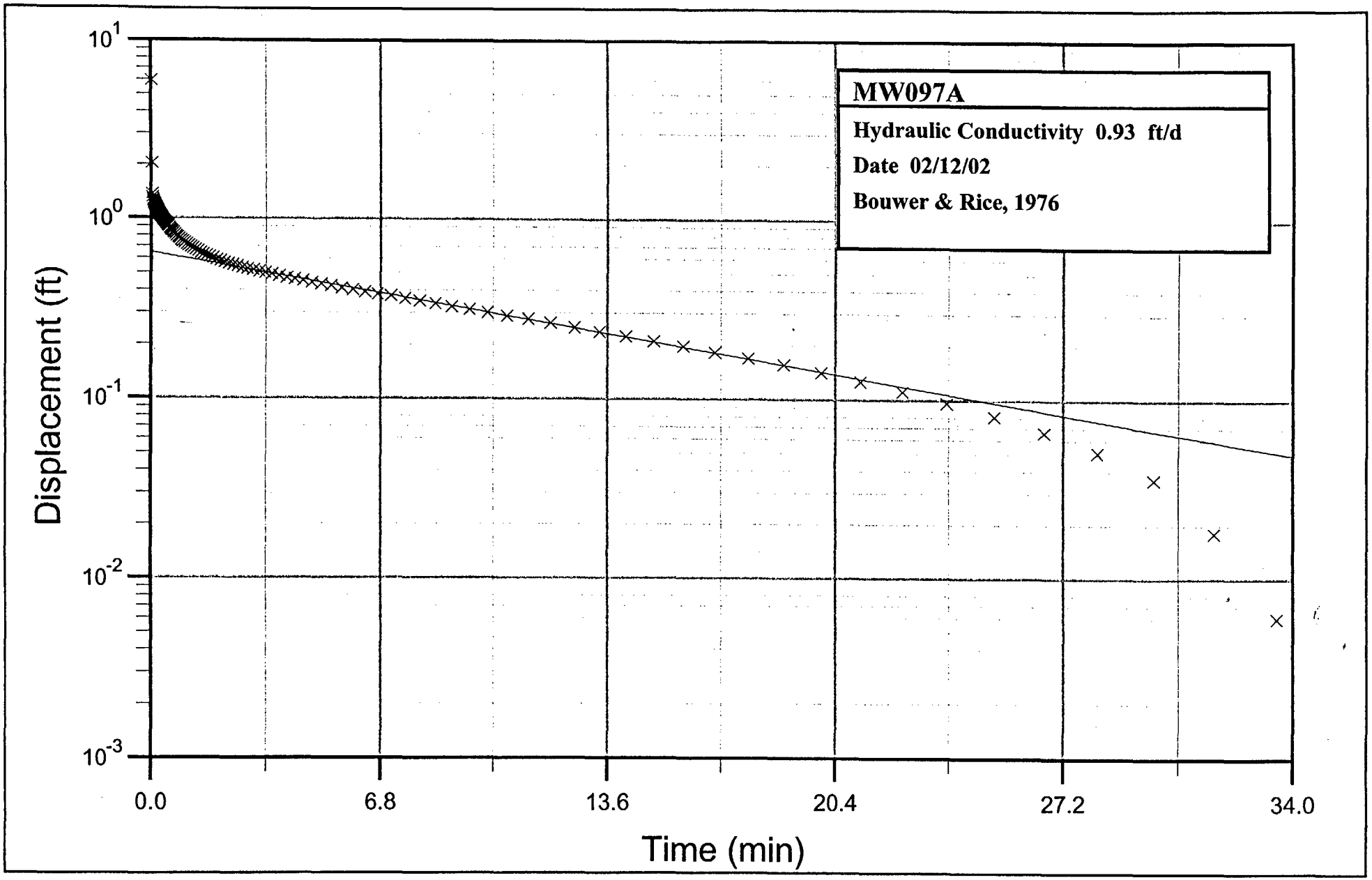


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FIGURE 8
MW097A SLUG TEST RESULTS

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| Date: | February 2002 |
| Project: | P:\100734/HYDROGE |
| File: | SLUG TESTS.ppt |

# SMI Supplemental Slug Test Data 2/12/02

| MW010 (falling head) | | MW010A (rising head) | | MW059A (rising head) | | MW093A (rising head) | | MW095A (rising head) | | MW097 (falling head) | | MW097A (rising head) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Time (min) | Drawdown (feet) | Time (min) | Drawdown (feet) | Time (min) | Drawdown (feet) | Time (min) | Drawdown (feet) | Time (min) | Drawdown (feet) | Time (min) | Drawdown (feet) | Time (min) | Drawdown (feet) |
| 0.011 | 4.538 | 0.005 | 4.481 | 0.011 | 0.957 | 0.011 | 1.970 | 0.011 | 6.348 | 0.011 | 0.316 | 0.011 | 5.931 |
| 0.022 | -0.059 | 0.011 | 1.005 | 0.022 | 0.746 | 0.022 | 0.960 | 0.022 | 2.232 | 0.022 | 0.071 | 0.022 | 2.032 |
| 0.033 | 0.374 | 0.022 | 1.449 | 0.033 | 0.579 | 0.033 | 0.425 | 0.033 | 1.869 | 0.033 | 0.056 | 0.033 | 1.360 |
| 0.044 | 0.376 | 0.034 | 1.815 | 0.044 | 0.527 | 0.044 | 0.326 | 0.044 | 1.738 | 0.044 | 0.062 | 0.044 | 1.304 |
| 0.055 | 0.318 | 0.045 | 1.864 | 0.055 | 0.486 | 0.055 | 0.449 | 0.055 | 1.626 | 0.055 | 0.071 | 0.055 | 1.269 |
| 0.066 | 0.288 | 0.056 | 1.873 | 0.066 | 0.521 | 0.066 | 0.714 | 0.066 | 1.503 | 0.066 | 0.077 | 0.066 | 1.241 |
| 0.077 | 0.262 | 0.067 | 1.864 | 0.077 | 0.497 | 0.077 | 0.968 | 0.077 | 1.396 | 0.077 | 0.079 | 0.077 | 1.213 |
| 0.088 | 0.243 | 0.078 | 1.853 | 0.088 | 0.411 | 0.088 | 1.112 | 0.088 | 1.327 | 0.088 | 0.084 | 0.088 | 1.198 |
| 0.099 | 0.232 | 0.089 | 1.845 | 0.099 | 0.359 | 0.099 | 1.143 | 0.099 | 1.243 | 0.099 | 0.086 | 0.099 | 1.192 |
| 0.110 | 0.221 | 0.101 | 1.838 | 0.110 | 0.319 | 0.110 | 1.067 | 0.110 | 1.163 | 0.110 | 0.086 | 0.110 | 1.175 |
| 0.121 | 0.213 | 0.112 | 1.832 | 0.121 | 0.286 | 0.121 | 0.927 | 0.121 | 1.088 | 0.121 | 0.086 | 0.121 | 1.157 |
| 0.132 | 0.206 | 0.123 | 1.823 | 0.132 | 0.261 | 0.132 | 0.789 | 0.132 | 1.015 | 0.132 | 0.086 | 0.132 | 1.147 |
| 0.143 | 0.200 | 0.134 | 1.817 | 0.143 | 0.239 | 0.143 | 0.688 | 0.143 | 0.948 | 0.143 | 0.086 | 0.143 | 1.136 |
| 0.154 | 0.191 | 0.145 | 1.808 | 0.154 | 0.222 | 0.154 | 0.639 | 0.154 | 0.886 | 0.154 | 0.086 | 0.154 | 1.125 |
| 0.165 | 0.182 | 0.156 | 1.804 | 0.165 | 0.209 | 0.165 | 0.626 | 0.165 | 0.830 | 0.165 | 0.084 | 0.165 | 1.117 |
| 0.176 | 0.178 | 0.168 | 1.797 | 0.176 | 0.198 | 0.176 | 0.628 | 0.176 | 0.776 | 0.176 | 0.084 | 0.176 | 1.104 |
| 0.187 | 0.172 | 0.179 | 1.791 | 0.187 | 0.187 | 0.187 | 0.624 | 0.187 | 0.729 | 0.187 | 0.084 | 0.187 | 1.095 |
| 0.198 | 0.167 | 0.190 | 1.784 | 0.198 | 0.140 | 0.198 | 0.602 | 0.198 | 0.686 | 0.198 | 0.079 | 0.198 | 1.084 |
| 0.209 | 0.161 | 0.201 | 1.778 | 0.209 | 0.129 | 0.209 | 0.563 | 0.209 | 0.645 | 0.209 | 0.079 | 0.209 | 1.076 |
| 0.220 | 0.157 | 0.212 | 1.772 | 0.220 | 0.136 | 0.220 | 0.518 | 0.220 | 0.609 | 0.220 | 0.077 | 0.220 | 1.067 |
| 0.231 | 0.152 | 0.223 | 1.763 | 0.231 | 0.134 | 0.231 | 0.481 | 0.231 | 0.576 | 0.231 | 0.077 | 0.231 | 1.058 |
| 0.243 | 0.148 | 0.235 | 1.756 | 0.243 | 0.125 | 0.243 | 0.445 | 0.243 | 0.546 | 0.243 | 0.077 | 0.243 | 1.048 |
| 0.255 | 0.146 | 0.248 | 1.748 | 0.255 | 0.114 | 0.255 | 0.419 | 0.255 | 0.523 | 0.255 | 0.077 | 0.255 | 1.039 |
| 0.268 | 0.142 | 0.261 | 1.741 | 0.268 | 0.108 | 0.268 | 0.393 | 0.268 | 0.495 | 0.268 | 0.075 | 0.268 | 1.030 |
| 0.282 | 0.137 | 0.275 | 1.735 | 0.282 | 0.099 | 0.282 | 0.371 | 0.282 | 0.471 | 0.282 | 0.075 | 0.282 | 1.022 |
| 0.297 | 0.133 | 0.290 | 1.726 | 0.297 | 0.095 | 0.297 | 0.348 | 0.297 | 0.447 | 0.297 | 0.075 | 0.297 | 1.013 |
| 0.313 | 0.126 | 0.305 | 1.720 | 0.313 | 0.091 | 0.313 | 0.328 | 0.313 | 0.426 | 0.313 | 0.073 | 0.313 | 1.002 |
| 0.330 | 0.122 | 0.322 | 1.711 | 0.330 | 0.086 | 0.330 | 0.309 | 0.330 | 0.407 | 0.330 | 0.071 | 0.330 | 0.990 |
| 0.347 | 0.118 | 0.340 | 1.705 | 0.347 | 0.084 | 0.347 | 0.287 | 0.347 | 0.387 | 0.347 | 0.071 | 0.347 | 0.979 |
| 0.366 | 0.114 | 0.358 | 1.692 | 0.366 | 0.078 | 0.366 | 0.272 | 0.366 | 0.372 | 0.366 | 0.071 | 0.366 | 0.968 |
| 0.386 | 0.109 | 0.378 | 1.685 | 0.386 | 0.076 | 0.386 | 0.259 | 0.386 | 0.357 | 0.386 | 0.069 | 0.386 | 0.957 |
| 0.407 | 0.107 | 0.399 | 1.677 | 0.407 | 0.071 | 0.407 | 0.247 | 0.407 | 0.340 | 0.407 | 0.069 | 0.407 | 0.946 |
| 0.429 | 0.103 | 0.421 | 1.668 | 0.429 | 0.067 | 0.429 | 0.234 | 0.429 | 0.327 | 0.429 | 0.066 | 0.429 | 0.931 |
| 0.452 | 0.098 | 0.445 | 1.660 | 0.452 | 0.065 | 0.452 | 0.223 | 0.452 | 0.312 | 0.452 | 0.066 | 0.452 | 0.921 |
| 0.477 | 0.094 | 0.470 | 1.649 | 0.477 | 0.061 | 0.477 | 0.212 | 0.477 | 0.301 | 0.477 | 0.064 | 0.477 | 0.908 |
| 0.504 | 0.092 | 0.496 | 1.645 | 0.504 | 0.063 | 0.504 | 0.208 | 0.504 | 0.295 | 0.504 | 0.064 | 0.504 | 0.903 |
| 0.532 | 0.086 | 0.524 | 1.623 | 0.532 | 0.056 | 0.532 | 0.193 | 0.532 | 0.271 | 0.532 | 0.062 | 0.532 | 0.882 |
| 0.561 | 0.081 | 0.554 | 1.612 | 0.561 | 0.052 | 0.561 | 0.182 | 0.561 | 0.258 | 0.561 | 0.062 | 0.561 | 0.865 |
| 0.593 | 0.079 | 0.585 | 1.599 | 0.593 | 0.050 | 0.593 | 0.175 | 0.593 | 0.247 | 0.593 | 0.060 | 0.593 | 0.854 |
| 0.626 | 0.077 | 0.618 | 1.589 | 0.626 | 0.048 | 0.626 | 0.167 | 0.626 | 0.237 | 0.626 | 0.060 | 0.626 | 0.841 |
| 0.661 | 0.071 | 0.653 | 1.573 | 0.661 | 0.046 | 0.661 | 0.160 | 0.661 | 0.222 | 0.661 | 0.056 | 0.661 | 0.828 |
| 0.698 | 0.066 | 0.691 | 1.561 | 0.698 | 0.043 | 0.698 | 0.154 | 0.698 | 0.211 | 0.698 | 0.053 | 0.698 | 0.813 |
| 0.738 | 0.062 | 0.730 | 1.546 | 0.738 | 0.041 | 0.738 | 0.147 | 0.738 | 0.202 | 0.738 | 0.053 | 0.738 | 0.798 |

# SMI Supplemental Slug Test Data 2/12/02

| MW010 (falling head) | | MW010A (rising head) | | MW059A (rising head) | | MW093A (rising head) | | MW095A (rising head) | | MW097 (falling head) | | MW097A (rising head) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Time (min) | Drawdown (feet) | Time (min) | Drawdown (feet) | Time (min) | Drawdown (feet) | Time (min) | Drawdown (feet) | Time (min) | Drawdown (feet) | Time (min) | Drawdown (feet) | Time (min) | Drawdown (feet) |
| 0.780 | 0.060 | 0.772 | 1.533 | 0.780 | 0.037 | 0.780 | 0.141 | 0.780 | 0.191 | 0.780 | 0.051 | 0.780 | 0.785 |
| 0.824 | 0.055 | 0.816 | 1.518 | 0.824 | 0.037 | 0.824 | 0.135 | 0.824 | 0.181 | 0.824 | 0.051 | 0.824 | 0.772 |
| 0.871 | 0.053 | 0.863 | 1.502 | 0.871 | 0.035 | 0.871 | 0.128 | 0.871 | 0.170 | 0.871 | 0.049 | 0.871 | 0.757 |
| 0.921 | 0.049 | 0.913 | 1.487 | 0.921 | 0.033 | 0.921 | 0.122 | 0.921 | 0.161 | 0.921 | 0.047 | 0.921 | 0.744 |
| 0.973 | 0.045 | 0.966 | 1.470 | 0.973 | 0.031 | 0.973 | 0.117 | 0.973 | 0.153 | 0.973 | 0.045 | 0.973 | 0.731 |
| 1.029 | 0.043 | 1.022 | 1.451 | 1.029 | 0.028 | 1.029 | 0.113 | 1.029 | 0.144 | 1.029 | 0.043 | 1.029 | 0.718 |
| 1.088 | 0.040 | 1.081 | 1.434 | 1.088 | 0.026 | 1.088 | 0.107 | 1.088 | 0.136 | 1.088 | 0.041 | 1.088 | 0.705 |
| 1.151 | 0.036 | 1.143 | 1.418 | 1.151 | 0.022 | 1.151 | 0.104 | 1.151 | 0.129 | 1.151 | 0.038 | 1.151 | 0.692 |
| 1.217 | 0.032 | 1.210 | 1.397 | 1.217 | 0.022 | 1.217 | 0.100 | 1.217 | 0.123 | 1.217 | 0.036 | 1.217 | 0.682 |
| 1.288 | 0.030 | 1.280 | 1.380 | 1.288 | 0.020 | 1.288 | 0.096 | 1.288 | 0.114 | 1.288 | 0.034 | 1.288 | 0.669 |
| 1.362 | 0.028 | 1.355 | 1.360 | 1.362 | 0.018 | 1.362 | 0.091 | 1.362 | 0.108 | 1.362 | 0.032 | 1.362 | 0.658 |
| 1.441 | 0.023 | 1.434 | 1.339 | 1.441 | 0.018 | 1.441 | 0.087 | 1.441 | 0.101 | 1.441 | 0.030 | 1.441 | 0.643 |
| 1.525 | 0.019 | 1.517 | 1.319 | 1.525 | 0.016 | 1.525 | 0.085 | 1.525 | 0.095 | 1.525 | 0.030 | 1.525 | 0.632 |
| 1.613 | 0.015 | 1.606 | 1.298 | 1.613 | 0.013 | 1.613 | 0.081 | 1.613 | 0.088 | 1.613 | 0.026 | 1.613 | 0.621 |
| 1.707 | 0.012 | 1.700 | 1.274 | 1.707 | 0.013 | 1.707 | 0.076 | 1.707 | 0.084 | 1.707 | 0.026 | 1.707 | 0.611 |
| 1.807 | 0.008 | 1.799 | 1.255 | 1.807 | 0.011 | 1.807 | 0.074 | 1.807 | 0.077 | 1.807 | 0.019 | 1.807 | 0.602 |
| 1.912 | 0.006 | 1.904 | 1.233 | 1.912 | 0.009 | 1.912 | 0.068 | 1.912 | 0.073 | 1.912 | 0.017 | 1.912 | 0.589 |
| 2.023 | 0.002 | 2.016 | 1.207 | 2.023 | 0.009 | 2.023 | 0.066 | 2.023 | 0.069 | 2.023 | 0.017 | 2.023 | 0.580 |
| | | 2.134 | 1.186 | 2.142 | 0.009 | 2.142 | 0.061 | 2.142 | 0.065 | 2.142 | 0.015 | 2.142 | 0.570 |
| | | 2.259 | 1.160 | 2.267 | 0.007 | 2.267 | 0.059 | 2.267 | 0.058 | 2.267 | 0.013 | 2.267 | 0.561 |
| | | 2.392 | 1.136 | 2.399 | 0.007 | 2.399 | 0.057 | 2.399 | 0.054 | 2.399 | 0.011 | 2.399 | 0.552 |
| | | 2.532 | 1.113 | 2.540 | 0.005 | 2.540 | 0.055 | 2.540 | 0.052 | 2.540 | 0.008 | 2.540 | 0.544 |
| | | 2.681 | 1.085 | 2.689 | 0.005 | 2.689 | 0.053 | 2.689 | 0.047 | | | 2.689 | 0.533 |
| | | 2.838 | 1.061 | 2.846 | 0.003 | 2.846 | 0.051 | 2.846 | 0.043 | | | 2.846 | 0.524 |
| | | 3.005 | 1.035 | 3.013 | 0.003 | 3.013 | 0.048 | 3.013 | 0.041 | | | 3.013 | 0.516 |
| | | 3.182 | 1.009 | 3.190 | 0.003 | 3.190 | 0.046 | 3.190 | 0.037 | | | 3.190 | 0.507 |
| | | 3.369 | 0.981 | 3.377 | 0.000 | 3.377 | 0.044 | 3.377 | 0.034 | | | 3.377 | 0.499 |
| | | 3.568 | 0.956 | 3.575 | 0.000 | 3.575 | 0.042 | 3.575 | 0.030 | | | 3.575 | 0.490 |
| | | 3.778 | 0.928 | 3.786 | 0.000 | 3.786 | 0.040 | 3.786 | 0.028 | | | 3.786 | 0.479 |
| | | 4.001 | 0.900 | | | 4.008 | 0.038 | 4.008 | 0.026 | | | 4.008 | 0.468 |
| | | 4.236 | 0.872 | | | 4.244 | 0.035 | 4.244 | 0.024 | | | 4.244 | 0.460 |
| | | 4.486 | 0.846 | | | 4.494 | 0.033 | 4.494 | 0.022 | | | 4.494 | 0.451 |
| | | 4.751 | 0.818 | | | 4.759 | 0.031 | 4.759 | 0.019 | | | 4.759 | 0.440 |
| | | 5.031 | 0.790 | | | 5.039 | 0.029 | 5.039 | 0.019 | | | 5.039 | 0.432 |
| | | 5.328 | 0.764 | | | 5.336 | 0.029 | 5.336 | 0.017 | | | 5.336 | 0.423 |
| | | 5.643 | 0.736 | | | 5.650 | 0.027 | 5.650 | 0.015 | | | 5.650 | 0.410 |
| | | 5.976 | 0.708 | | | 5.983 | 0.025 | 5.983 | 0.013 | | | 5.983 | 0.402 |
| | | 6.329 | 0.680 | | | 6.336 | 0.025 | 6.336 | 0.013 | | | 6.336 | 0.391 |
| | | 6.702 | 0.654 | | | 6.710 | 0.023 | 6.710 | 0.011 | | | 6.710 | 0.380 |
| | | 7.098 | 0.626 | | | 7.106 | 0.023 | 7.106 | 0.011 | | | 7.106 | 0.372 |
| | | 7.518 | 0.598 | | | 7.525 | 0.020 | 7.525 | 0.009 | | | 7.525 | 0.359 |
| | | 7.962 | 0.572 | | | 7.970 | 0.018 | 7.970 | 0.009 | | | 7.970 | 0.348 |
| | | 8.433 | 0.546 | | | 8.440 | 0.014 | 8.440 | 0.009 | | | 8.440 | 0.337 |

# SMI Supplemental Slug Test Data 2/12/02

| MW010 (falling head) | | MW010A (rising head) | | MW059A (rising head) | | MW093A (rising head) | | MW095A (rising head) | | MW097 (falling head) | | MW097A (rising head) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Time (min) | Drawdown (feet) | Time (min) | Drawdown (feet) | Time (min) | Drawdown (feet) | Time (min) | Drawdown (feet) | Time (min) | Drawdown (feet) | Time (min) | Drawdown (feet) | Time (min) | Drawdown (feet) |
| | | 8.931 | 0.518 | | | 8.939 | 0.014 | 8.939 | 0.009 | | | 8.939 | 0.324 |
| | | 9.459 | 0.495 | | | 9.467 | 0.012 | 9.467 | 0.007 | | | 9.467 | 0.313 |
| | | 10.019 | 0.469 | | | 10.026 | 0.012 | 10.026 | 0.004 | | | 10.026 | 0.301 |
| | | 10.611 | 0.445 | | | 10.619 | 0.012 | 10.619 | 0.004 | | | 10.619 | 0.288 |
| | | 11.239 | 0.422 | | | 11.246 | 0.010 | 11.246 | 0.004 | | | 11.246 | 0.277 |
| | | 11.903 | 0.398 | | | | | 11.911 | 0.004 | | | 11.911 | 0.264 |
| | | 12.608 | 0.374 | | | | | 12.615 | 0.004 | | | 12.615 | 0.249 |
| | | 13.353 | 0.351 | | | | | 13.361 | 0.004 | | | 13.361 | 0.236 |
| | | 14.143 | 0.329 | | | | | 14.151 | 0.002 | | | 14.151 | 0.223 |
| | | 14.980 | 0.310 | | | | | 14.988 | 0.002 | | | 14.988 | 0.210 |
| | | 15.867 | 0.286 | | | | | 15.874 | 0.002 | | | 15.874 | 0.197 |
| | | 16.806 | 0.267 | | | | | 16.813 | 0.002 | | | 16.813 | 0.182 |
| | | 17.800 | 0.245 | | | | | 17.808 | 0.002 | | | 17.808 | 0.169 |
| | | 18.854 | 0.230 | | | | | 18.862 | 0.002 | | | 18.862 | 0.156 |
| | | 19.970 | 0.211 | | | | | 19.978 | 0.002 | | | 19.978 | 0.141 |
| | | 21.152 | 0.191 | | | | | | | | | 21.160 | 0.126 |
| | | 22.404 | 0.176 | | | | | | | | | 22.412 | 0.111 |
| | | 23.731 | 0.159 | | | | | | | | | 23.739 | 0.096 |
| | | 25.136 | 0.142 | | | | | | | | | 25.144 | 0.081 |
| | | 26.624 | 0.129 | | | | | | | | | 26.632 | 0.066 |
| | | 28.201 | 0.116 | | | | | | | | | 28.208 | 0.051 |
| | | 29.871 | 0.103 | | | | | | | | | 29.878 | 0.036 |
| | | 31.639 | 0.088 | | | | | | | | | 31.647 | 0.018 |
| | | 33.513 | 0.077 | | | | | | | | | 33.521 | 0.006 |
| | | 35.498 | 0.066 | | | | | | | | | | |
| | | 37.600 | 0.053 | | | | | | | | | | |
| | | 39.827 | 0.043 | | | | | | | | | | |
| | | 42.186 | 0.034 | | | | | | | | | | |
| | | 44.684 | 0.025 | | | | | | | | | | |
| | | 47.331 | 0.015 | | | | | | | | | | |
| | | 50.135 | 0.008 | | | | | | | | | | |

# APPENDIX C

# BORING LOGS AND WELL INSTALLATION DIAGRAMS

# BORING LOG

SHEPHERD MILLER
INCORPORATED

BORING NO.
BH327

PROJECT: SEQUOYAH FUELS PAGE: 1 of 2
PROJECT NO.: 100734 DATE: 5/15/01
NORTHING: 194737.5 EASTING: 2838430.0 GROUND ELEVATION: 549.5
DRILLING COMPANY: PETERSON DRILLING METHOD: HSA SPLIT SPOON -CORE
DRILLER: TROY LUCAS LOGGED BY: E. MULLER

| DEPTH (FT) | GEOLOGY UNIT | TIME | (FT) RECOVERY | LITHOLOGY GRAPHIC | DESCRIPTION / NOTES |
|---|---|---|---|---|---|
| 0 | COLLUVIUM | 10:45 | 0 | | BLIND DRILED -NO RECOVERY. |
| 2 | | 11:00 | 2 | | SC-SM CLAYEY, SILTY SAND WITH 50 % VERY FINE SAND, 5 % MED. TO COARSE SAND, AND 45 % SILT AND CLAY. SAND SUBRND. TO RND. QTZ. INTERVAL SLIGHTLY COHESIVE, DRY TO SLIGHTLY MOIST, VERY PALE BROWN (10YR, 8/3). ROOTS ABUNDANT THROUGHOUT. |
| 4 | | | | | |
| 5 | | 11:10 | 2.5 | | SC - CLAYEY SAND WITH 70 % VERY FINE SAND, 30 % CLAY, AND AN OCCASIONAL FINE TO MEDIUM GRAVEL. SAND SUBRND. TO RND. QTZ., GRAVEL SUBRND. SS. INTERVAL DRY TO SLIGHTLY MOIST, SLIGHTLY COHESIVE, VERY PALE BROWN (10YR, 8/3). |
| 6 | | | | | |
| | | 11:20 | 2.0 | | MC - SANDY CLAY WITH ABOUT 80 % CLAY AND 20 % VERY FINE, RND. TO SUBRND. QTZ. SAND. INTERVAL SLIGHTLY MOIST, MEDIUM PLASTIC, VERY PALE BROWN (10YR, 8/3) WITH ABUNDANT YELLOWISH BROWN IRON OXIDE STAINING. |
| 7.5 | | | | | |
| 8 | 1 SH | 11:31 | 1.8 | | SHALE - COMPLETELLY WEATHERED. VERY FINE SILT WITH WEAK, SUBPARALLEL, THIN (0.1MM) PARTINGS. INTERVAL SOFT, DRY, FRIABLE, VERY PALE BROWN TO YELLOWISH BROWN (10YR, 8/3) TO (10YR, 5/6). |
| 10 | | | | | SAME AS 7.5'-8'. REFUSAL AT 10'. |
| | 1 SS | | | | SANDSTONE - VERY HARD, MASSIVE, CONSISTS OF VERY FINE TO FINE, SUBRND. TO RND. QTZ., SUCROSIC. PALE YELLOWISH BROWN (10YR, 6/2) FROM 10.0' TO 10.4' WITH ABUNDANT IRON OXIDE MINERALS. LIGHT GRAY (N7) WITH MEDIUM DARK GRAY (N4) MOTTLING FROM 10.4' TO 14.8'. REACTS SLIGHTLY IN HCL. |
| 14.8 | | | | | |
| 15 | 2 SH | 13:00 | 10.2 | | SHALE - SANDY SHALE WITH ABOUT 20 % VERY FINE RND. QTZ. SAND. INTERVAL VERY THINNLY LAMINATED, VERY SOFT, CRUMBLES EASILY, DARK GRAY (N3) TO GRAYISH BLACK (N2). |
| 15.7 | 2 SS | | | | SANDSTONE - MED. HARD, CONSISTING OF VERY FINE, RND. TO SUBRND. QTZ. LIGHT GRAY (N7) WITH MED. DARK GRAY (N4) MOTTLING. REACTS SLIGHTLY IN HCL. |
| 16.7 | 3 SH | | | | SHALE - SOFT, VERY THINNLY LAMINATED, GRAYISH BLACK (N2). CRUMBLY FROM 16.7' TO 17.1'. |
| 18.9 | | | | | SANDSTONE - MED. HARD, LIGHT GRAY (N7) WITH MED. DARK GRAY (N4) MOTTLING. CONSISTS OF VERY FINE TO FINE, RND. QTZ. |
| 20 | 3 SS | 17:20 | 9.9 | | SANDSTONE - HARD, MED. DARK GRAY (N4), MASSIVE, CONSISTS OF FINE GRAINED, RND. QTZ. |
| 24.2 | | | | | |
| 25 | 4 SH | | | | SHALE - BLACK (N1), VERY SOFT, FISSILE. |
| 30 | | | | | SEE ABOVE. |

100734/BH-327.dwg

# BORING LOG

SHEPHERD MILLER
INCORPORATED

BORING NO.
BH327

PROJECT: SEQUOYAH FUELS PAGE: 2 of 2
PROJECT NO.: 100734 DATE: 5/15/01
NORTHING: 194737.5 EASTING: 2838430.0 GROUND ELEVATION: 549.5
DRILLING COMPANY: PETERSON DRILLING METHOD: HSA SPLIT SPOON -CORE
DRILLER: TROY LUCAS LOGGED BY: E. MULLER

| DEPTH (FT) | GEOLOGY UNIT | TIME | (FT) RECOVERY | LITHOLOGY GRAPHIC | DESCRIPTION / NOTES |
|---|---|---|---|---|---|
| 30 | | | | | SHALE - SEE ABOVE. |
| 35 | 4 SH | 18:30 | 10.0 | | |
| 40 | | | | | |
| 40.6 | | | | | |
| 45 | 4 SS | 8:55 5/16/01 | 8.1 | | SANDSTONE - SHALEY SANDSTONE, SLIGHTLY HARD, BLACK (N1) FROM 40.6' TO 42.3', GRADING TO HARD, MED. LIGHT GRAY (N6) SANDSTONE WITH DARK GRAY (N4), MM THICK PLANAR LAMINATIONS FROM 47.2' TO 47.8'. CONSISTS OF V. FINE, RND. TO SUBRND. QTZ. REACTS SLIGHTLY IN HCL. |
| 50 | | | | | TD |
| 55 | | | | | |
| 60 | | | | | |

# BORING LOG

SHEPHERD MILLER INCORPORATED

BORING NO. BH328

PROJECT: SEQUOYAH FUELS PAGE: 1 of 2

PROJECT NO.: 100734 DATE: 5/16/01

NORTHING: 193658.4 EASTING: 2833793.9 GROUND ELEVATION: 479.9

DRILLING COMPANY: PETERSON DRILLING METHOD: HSA SPLIT SPOON -CORE

DRILLER: TROY LUCAS LOGGED BY: E. MULLER, J. REED

| DEPTH (FT) | GEOLOGY UNIT | TIME | (FT) RECOVERY | LITHOLOGY GRAPHIC | DESCRIPTION / NOTES |
|---|---|---|---|---|---|
| 0 | | 12:00 | 0 | | BLIND DRILED -NO RECOVERY. |
| 2 | | 12:15 | 2.0 | | CL - SILTY CLAY WITH LESS THAN 5 % FINE SAND. VERY DARK GRAYISH BROWN (10YR, 3/2), DRY TO VERY SLIGHTLY MOIST, COHESIVE, SLIGHTLY PLASTIC, SOFT, ROOTS ABUNDANT THROUGHOUT. |
| 4 | | | | | |
| 5 | A | 12:27 | 2.0 | | CL - SILTY CLAY WITH LESS THAN 5 % FINE SAND. DARK YELLOW BROWN (10YR, 4/4), INCREASING MOISTURE WITH DEPTH, SLIGHTLY MOIST AT BOTTOM, COHESIVE, SLIGHTLY PLASTIC, SOFT, OCCASIONAL ROOTS. |
| 6 | L | 12:34 | 2.0 | | SM - SC - SILTY, CLAYEY SAND TO CLAYEY SANDY SILT. SAND VERY FINE QTZ. INTERVAL YELLOW BROWN (10YR, 5/4), SLIGHTLY MOIST - INCREASING WITH DEPTH, SLIGHTLY COHESIVE, LOOSE. |
| 8 | L | | | | |
| | U | 12:39 | 2.0 | | SM - SILTY SAND WITH ABOUT 85 % VERY FINE TO FINE SAND, 5 % COURSE AND, 5-10 % SILT. YELLOW BROWN (10YR, 5/6), SLIGHTLY MOIST TO MOIST, VERY COHESIVE. |
| 10 | V | 12:49 | 1.6 | | SEE ABOVE, INCREASING CLAY WITH DEPTH WITH COHESIVE, PLASTIC, CLAY (CL) WITH SILT AND SAND, MOIST TO SLIGHTLY MOIST AT BOTTOM. |
| 12 | I | | | | |
| | U | 12:52 | 2.0 | | CL - SILTY CLAY, DARK YELLOW BROWN (10YR, 4/6), SLIGHTLY MOIST, COHESIVE, PLASTIC, SOFT. |
| 14 | M | | | | |
| 15 | | 13:00 | 2.0 | | SEE ABOVE, INCREASING FINE TO MED. SAND WITH 5-10 % SAND AT BOTTOM. |
| 16 | | 13:54 | 1.6 | | SEE ABOVE WITH SILTY, CLAYEY GRAVEL AT BOTTOM. WET COHESIVE, PLASTIC TO LOOSE, GRAVEL RND. TO ANGULAR. |
| 18 | | 14:00 | .8 | | GC - CLAYEY GRAVEL WITH 60 % RND TO ANGULAR GRAVEL, 30 % FINE TO MED. SAND. INTERVAL DARK YELLOW BROWN (10YR, 4/6), WET, COHESIVE, PLASTIC TO LOOSE, SOME WHITE QTZ. REFUSAL AT 20'. |
| 20 | | 15:29 | 0 | | NO RECOVERY. |
| 25 | | | | | |
| 26 | 4 SH | 08:50 | 9.0 | | SHALE - BLACK (N1), VERY SOFT, VERY THINNLY LAMINATED TO FISSILE. |
| 30 | | | | | |

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# BORING LOG

SHEPHERD MILLER
INCORPORATED

BORING NO.
BH328

PROJECT: SEQUOYAH FUELS PAGE: 2 of 2
PROJECT NO.: 100734 DATE: 5/17/01
NORTHING: 193658.4 EASTING: 2833793.9 GROUND ELEVATION: 479.9
DRILLING COMPANY: PETERSON DRILLING METHOD: HSA SPLIT SPOON -CORE
DRILLER: TROY LUCAS LOGGED BY: E. MULLER

| DEPTH (FT) | GEOLOGY UNIT | TIME | (FT) RECOVERY | LITHOLOGY GRAPHIC | DESCRIPTION / NOTES |
|---|---|---|---|---|---|
| 30 | | | | | |
| | 4 SH | 08:50 | 9.0 | | |
| 35 | | | | | |
| 37 | | | | | SHALE - SEE ABOVE. |
| 39.3 | | | | | |
| 40 | | | | | SANDSTONE - HARD, LIGHT GRAY (N6) WITH MED. DARK GRAY (N4) MOTTLING. CONSISTS OF VERY FINE, RND. TO SUBRND. QTZ. VERY WIDELY SPACED, THIN FRACTURES. FRACTURES FILLED WITH CALCITE. |
| | 4 SS | 10:04 | 8.5 | | |
| 45 | | | | | |
| | | | | | TD |
| 50 | | | | | |
| 55 | | | | | |
| 60 | | | | | |

# BORING LOG

SHEPHERD MILLER
INCORPORATED

BORING NO.
BH329

PROJECT: SEQUOYAH FUELS PAGE: 1 of 2
PROJECT NO.: 100734 DATE: 5/17/01
NORTHING: 192596.3 EASTING: 2833765.8 GROUND ELEVATION: 482.5
DRILLING COMPANY: PETERSON DRILLING METHOD: HSA SPLIT SPOON -CORE
DRILLER: TROY LUCAS LOGGED BY: J. REED

| DEPTH (FT) | GEOLOGY UNIT | TIME | (FT) RECOVERY | LITHOLOGY GRAPHIC | DESCRIPTION / NOTES |
|---|---|---|---|---|---|
| 0 | | 12:26 | 0 | | BLIND DRILED -NO RECOVERY. |
| 2 | | 12:30 | 1.8 | | SM - ML SILTY SAND TO SANDY SILT WITH SOME CLAY. SAND FINE GRAINED, INTERVAL YELLOW BROWN (10YR, 5/4), DRY, SLIGHTLY COHESIVE TO LOOSE, CONTAINS LESS THAN 5 % COARSE SAND. OCCASIONAL ROOTS THROUGHOUT. |
| 4 | A | | | | |
| 5 | L | 12:36 | 2.0 | | SEE ABOVE, NO COARSE SAND, MOTTLED FE STAINING (BROWN YELLOW 10YR, 6/8) PROMINENT. |
| 6 | L U | 12:42 | 2.0 | | SEE ABOVE TO SLIGHTLY MOIST AT BOTTOM. VERY FEW ROOTS. |
| 8 | V I | 12:47 | 2.0 | | ML/CL - CLAYEY SILT WITH 5-10 % VERY FINE AND LESS THAN 5 % COARSE, RND. SAND. INTERVAL GRAY (10YR, 6/1) TO YELLOW BROWN (10YR, 5/8), DRY TO SLIGHTLY MOIST, COHESIVE, PLASTIC, SOFT, PLATEY APPEARANCE, NO ROOTS. |
| 10 | U M | 13:50 | 2.0 | | SEE ABOVE. |
| 12 | | 13:53 | 1.9 | | GC-GM - CLAYEY SILTY GRAVEL WITH ABOUT 50-60 % FINE TO MED. ANGULAR TO RND. QTZ., INTERVAL SLIGHTLY MOIST TO DRY, COHESIVE, PLASTIC, SOFT TO DENSE, GRAY (10YR, 6/1) TO YELLOW BROWN (10YR, 5/8) (FE STAIN). |
| 14 | | | | | |
| 15 | | 14:02 | 1.7 | | SEE ABOVE. |
| 15.2 | | | | | SHALE - BLACK (N1), SOFT, FISSILE, DRY, WEATHERED, TO YELLOW BROWN (10YR, 5/8, FE STAIN) ALONG PARTININGS. |
| 16 | | 14:09 | 2.0 | | SEE ABOVE, HIGHLY WEATHERED TO YELLOW BROWN (10YR, 5/8) FROM 16.3'-16.4' AND 17.3'-17.35'. |
| 18 | | 14:16 | 2.0 | | SHALE - HIGHLY WEATHERED, YELLOW BROWN (10YR, 5/8), SOFT, DRY. |
| 20 | | 14:28 | 1.9 | | SEE ABOVE, HARD AT BOTTOM, VERY SLIGHTLY MOIST AT 22.0'. |
| 22 | 4 SH | 14:39 | | | SEE ABOVE. REFUSAL AT 23'. |
| 23 | | | | | SHALE - BLACK (N1), SOFT, FISSILE. |
| 25 | | 16:40 | 10.0 | | |
| 30 | | | | | |
| 31 | | | | | SEE ABOVE. |

# BORING LOG

SHEPHERD MILLER
INCORPORATED

BORING NO.
BH329

PROJECT: SEQUOYAH FUELS PAGE: 2 of 2
PROJECT NO.: 100734 DATE: 5/17/01
NORTHING: 192596.3 EASTING: 2833765.8 GROUND ELEVATION: 482.5
DRILLING COMPANY: PETERSON DRILLING METHOD: HSA SPLIT SPOON -CORE
DRILLER: TROY LUCAS LOGGED BY: E. MULLER

| DEPTH (FT) | GEOLOGY UNIT | TIME | (FT) RECOVERY | LITHOLOGY GRAPHIC | DESCRIPTION / NOTES |
|---|---|---|---|---|---|
| 30 | | | | | |
| 31 | 4 SH | | | | SEE ABOVE. |
| 33 | | | | | |
| 35 | 4 SS | 19:15 | 8.7 | | SANDSTONE - MED. LIGHT GRAY (N4) WITH DARK GRAY (N7) MOTTLING. HARD, THIN, VERTICAL, WIDELY SPACED FRACTURES, CALCITE CEMENTED. SHALE, BLACK (N1), SOFT, FISSLE, INTERBEDDED BETWEEN 33.6'-34.1' AND 35.9' TO 37.0'. |
| 39.9 | | | | | |
| 40 | 5 SH | | | | SHALE - BLACK (N1), SOFT, FISSLE. |
| 41 | | | | | TD |
| 45 | | | | | |
| 50 | | | | | |
| 55 | | | | | |
| 60 | | | | | |

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# BORING LOG

SHEPHERD MILLER INCORPORATED

BORING NO.
BH330

PROJECT: SEQUOYAH FUELS PAGE: 1 of 2
PROJECT NO.: 100734 DATE: 5/18/01
NORTHING: 195232.2 EASTING: 2835268.0 GROUND ELEVATION: 538.6
DRILLING COMPANY: PETERSON DRILLING METHOD: HSA SPLIT SPOON -CORE
DRILLER: TROY LUCAS LOGGED BY: E. MULLER

| DEPTH (FT) | GEOLOGY UNIT | TIME | (FT) RECOVERY | LITHOLOGY GRAPHIC | DESCRIPTION / NOTES |
|---|---|---|---|---|---|
| 0 | | 12:09 | 0 | | NO RECOVERY - BLIND DRILLING. CLAYEY SILTY GRAVEL, BROWN (7.5YR, 5/4) WITH ABOUT 50 % GRAVEL, 50% FINES IN AUGER CUTTINGS. |
| 2 | | 13:12 | 1.7 | | ML - GRAVELLY CLAY WITH ABOUT 30 % GRAVEL, 70% CLAY. BROWN (7.5YR, 4/4) SLIGHTLY MOIST, S. PLASTIC, COHESIVE. GRAVEL RND. TO SUBRND., FINE TO MED. GRAINED SAND. FROM 2'-3', BECOMES RED (2.5YR, 5/6) WITH DECREASING GRAVEL FROM 3'-3.5'. |
| 3.5 | C | | | | |
| 4 | O | | | | SM - SILTY SAND WITH ABOUT 50 % VERY FINE, RND. QTZ. SAND, ABOUT 50 % SILT, AND OCCASIONAL, FINE, RND., QTZ. SS GRAVEL. INTERVAL LOOSE, SLIGHTLY MOIST, DARK BROWN (7.5YR, 3/3). |
| 5 | L | 13:15 | 2.0 | | |
| 6 | L | | | | ML - SANDY SILTY CLAY, LIGHT BROWN TO REDDISH YELLOW (7.5YR, 6/4 TO 7.5YR, 7/6) WITH SOME GRAY MOTTLING. SLIGHTLY MOIST, MED. PLASTIC, MED. COHESIVE. CONSISTS OF 60 % CLAY, 20% SILT, 20% VERY FINE, RND. TO SUBRND. QTZ. |
| | U | 13:20 | 2.0 | | |
| 8 | V | | | | ML - SILTY CLAY, REDDISH BROWN TO GRAY (7.5YR, 5/6 TO 7/6) SLIGHTLY MOIST, SLIGHTLY COHESIVE TO LOOSE, SLIGHTLY PLASTIC. |
| | I | 13:25 | 2.0 | | ML - SANDY SILTY CLAY, REDDISH YELLOW (7.5YR, 7/6) WITH GRAY (7/6) MOTTLING. SLIGHLTY PLASTIC, SLIGHTLY COHESIVE, SLIGHTLY MOIST. CONSISTS OF ABOUT 70 % CLAY, 20% SILT, 10% V. FINE TO COARSE, RND. TO SUBRND. QTZ. |
| 10 | U | | | | |
| | M | 13:30 | 2.0 | | SEE ABOVE. |
| 12 | | 13:34 | 1.0 | | SEE ABOVE. REFUSAL AT 13'. |
| 13 | | | | | SANDSTONE - MED. HARD, TAN WITH GRAY MOTTLING (10YR, 6/4 TO N2), VERY FINE, RND. QTZ. LITTLE TO NO MOTTLING FROM 13'-15.7', INCREASING MOTTLING TO BOTTOM, 0.10" THICK CLAY PARTINGS OCCUR. BETWEEN 19' AND BOTTOM. WET BELOW 19'. CLOSELY SPACED FRACTURING, FRACTURES ARE WIDE WITH VERTICAL FRACTURES UP TO 5MM LONG. |
| 15 | 2 SS | 16:00 | 8.4 | | |
| 20 | | | | | |
| 20.4 | 3 SH | | | | SHALE - DARK GRAY (N3), VERY SOFT, CRUMBLY. INTERBEDDED WITH SOFT, FINE GRAINED SANDSTONE FROM 20.4'-21.3'. |
| 23 | | | | | SANDSTONE - MED. HARD, LIGHT TO DARK GRAY (N7 TO N3), VERY FINE , RND. QTZ. MM THICK SHALE INTERVALS COMMON, SHALE PROMINENT FROM 23.7' TO 24.1'. |
| 25 | 3 SS | 17:50 | 9.7 | | |
| 29.7 | | | | | |
| 30 | | | | | SHALE - BLACK (N1), VERY SOFT, FISSILE. |

# BORING LOG

SHEPHERD MILLER
INCORPORATED

BORING NO.
BH330

PROJECT: SEQUOYAH FUELS PAGE: 2 of 2
PROJECT NO.: 100734 DATE: 5/18/01
NORTHING: 195232.2 EASTING: 2835268.0 GROUND ELEVATION: 538.6
DRILLING COMPANY: PETERSON DRILLING METHOD: HSA SPLIT SPOON -CORE
DRILLER: TROY LUCAS LOGGED BY: E. MULLER

| DEPTH (FT) | GEOLOGY UNIT | TIME | (FT) RECOVERY | LITHOLOGY GRAPHIC | DESCRIPTION / NOTES |
|---|---|---|---|---|---|
| 30 | | | | | SHALE - BLACK (N1), VERY SOFT, FISSLE. |
| 33 | | | | | SEE ABOVE. |
| 35 | | | | | |
| | | 09:43 5/19/01 | 10.0 | | |
| 40 | 4 SH | | | | |
| | | | | | SEE ABOVE. |
| 45 | | | | | |
| 46.1 | | | | | SANDSTONE - HARD, MED. LIGHT GRAY WITH GRAYISH BLACK MOTTLING (N6-N2). VERY FINE GRAINED, RND. QTZ. OCCASIONAL, WIDELY SPACED, THICK FRACTURES. |
| | | 12:27 | 2.0 | | |
| 50 | 4 SS | | | | |
| 53.5 | | | | | TD |
| 55 | | | | | |
| 60 | | | | | |

# BORING LOG

SHEPHERD MILLER INCORPORATED

BORING NO. BH331

PROJECT: SEQUOYAH FUELS PAGE: 1 of 2

PROJECT NO.: 100734 DATE: 5/20/01

NORTHING: 192778.6 EASTING: 2836051.1 GROUND ELEVATION: 501.0

DRILLING COMPANY: PETERSON DRILLING METHOD: HSA SPLIT SPOON -CORE

DRILLER: TROY LUCAS LOGGED BY: E. MULLER

| DEPTH (FT) | GEOLOGY UNIT | TIME | (FT) RECOVERY | LITHOLOGY GRAPHIC | DESCRIPTION / NOTES |
|---|---|---|---|---|---|
| 0 | | 14:10 | 0 | | BLIND DRILED -NO RECOVERY. |
| 2 | C O L L U V I U M | 14:21 | 2.0 | | CL - CLAY, MED. TO HIGH PLASTICITY, LIGHT YELLOW BROWN (10YR, 6/4), SOFT, SLIGHTLY MOIST, COHESIVE. |
| 4 | | 14:25 | 2.5 | | CL - CLAY WITH MINOR GRAVEL. MED. TO HIGH PLASTICITY, YELLOW BROWN TO LIGHT GRAY (10YR, 5/8 TO 5Y, 7/1), SOFT, SLIGHTLY MOIST, COHESIVE. LESS THAN 5 % FINE TO MED. COARSE, SUBANGULAR GRAVELY, MOSTLY BLACK SHALE. NO STRATIFICATION VISIBLE IN INTERVAL. |
| 5 | | 14:31 | 2.0 | | SEE ABOVE. |
| 8 | | 14:34 | 1.8 | | ML - GRAVELLY CLAY, WITH ABOUT 15 % FINE TO COARSE, SUBANGULAR GRAVEL, MOSTLY BLACK SHALE. YELLOW BROWN TO LIGHT (10YR, 5/8 TO 5Y, 7/1), LOOSE, SOFT, SLIGHTLY MOIST, MED. PLASTIC. NO STRATIFICATION VISIBLE THROUGHOUT INTERVAL. |
| 10 | | 12:27 | 2.0 | | SEE ABOVE, EXCEPT ABOUT 25 % GRAVEL. REFUSAL AT 11'. |
| 11 | 3 SS | 12:27 | 2.0 | | SANDSTONE - HARD, VERY FINE, RND. TO SUBRND QTZ. DARK YELLOWISH BROWN (10YR, 4/2), WITH OCCASIONAL PLANAR GRAY BANDING FROM 11'-12'. LIGHT GRAY (N7) WITH DARK GRAY (N3) MOTTLED FROM 12'-19.6'. GRADES TO SHALEY SANDSTONE, GRAYISH BLACK (N2) FROM 18.8'-19.0'. THINNLY SPACED. TIGHT CALCITE CEMENTED FRACTURES FROM 13'-15', OCCASIONAL TIGHT FRACTURES IN REST OF INTERVAL. |
| 15 | | | | | |
| 19 | | | | | SHALE - BLACK (N1), VERY SOFT, THINNLY LAMINATED TO FISSILE. |
| 20 | 4 SH | 12:27 | 2.0 | | SEE ABOVE. |
| 25 | | | | | |
| 30 | | | | | |

100734/BH-331.dwg

# BORING LOG

SHEPHERD MILLER
INCORPORATED

BORING NO.
BH331

PROJECT: SEQUOYAH FUELS PAGE: 2 of 2
PROJECT NO.: 100734 DATE: 5/20/01
NORTHING: 192778.6 EASTING: 2836051.1 GROUND ELEVATION: 501.0
DRILLING COMPANY: PETERSON DRILLING METHOD: HSA SPLIT SPOON -CORE
DRILLER: TROY LUCAS LOGGED BY: E. MULLER

| DEPTH (FT) | GEOLOGY UNIT | TIME | (FT) RECOVERY | LITHOLOGY GRAPHIC | DESCRIPTION / NOTES |
|---|---|---|---|---|---|
| 30 | | | | | |
| | | 12:15 | 2.0 | | SEE ABOVE. |
| 35 | | | | | |
| 36.5 | | | | | |
| | | 12:15 | 2.0 | | PYRITIZED SHALE FROM 36.5' TO 36.7', ABOUT 50 % BLACK (N1), HARD, THINNLY LAMINATED SHALE WITH ABOUT 50% PYRITE. FROM 36.7' TO 38.7', SHALE, BLACK, HARD, THINNLY LAMINATED, BRITTLE. FROM 38.7' TO 42', SHALE, BLACK (N1), VERY SOFT, FISSILE. |
| 40 | | | | | |
| 42 | | | | | TD |
| 45 | | | | | |
| 50 | | | | | |
| 55 | | | | | |
| 60 | | | | | |

# BORING LOG

SHEPHERD MILLER
INCORPORATED

BORING NO.
BH332

PROJECT: SEQUOYAH FUELS PAGE: 1 of 1
PROJECT NO.: 100734 DATE: 5/21/01
NORTHING: 196421.5 EASTING: 2836778.8 GROUND ELEVATION: 559.4
DRILLING COMPANY: PETERSON DRILLING METHOD: HSA - SPLIT SPOON
DRILLER: TROY LUCAS LOGGED BY: E. MULLER

| DEPTH (FT) | GEOLOGY UNIT | TIME | (FT) RECOVERY | LITHOLOGY GRAPHIC | DESCRIPTION / NOTES |
|---|---|---|---|---|---|
| 0 | | 12:45 | 0 | | BLIND DRILED -NO RECOVERY. |
| 2 | T E | 12:55 | 2.0 | | ML - SILTY CLAY WITH LESS THAN 5 % GRAVEL. DRY TO SLIGHTLY MOIST, SLIGHTLY PLASTIC, LOOSE, REDDISH YELLOW (7.5YR, 6/6). GRAVEL FINE TO MED. GRAINED, SUBROUNDED SANDSTONE. CHARRED WOOD AND ASH IN TOP 5". |
| 4 | R R A | 13:10 | 2.0 | | CL - GRAVELLY CLAY WITH ABOUT 5 % GRAVEL. SLIGHTLY MOIST, SLIGHTLY PLASTIC, SLIGHTLY COHESIVE, REDDISH BROWN (5YR, 5/4) WITH LIGHT GRAY MOTTLING. GRAVEL FINE TO MED. GRAINED, SUBANG. TO SUBRND. SS AND SHALE. |
| 6 | C | 13:17 | 1.0 | | ML - SILTY CLAY WITH ABOUT 5 % GRAVEL. SLIGHTLY MOIST, SLIGHTLY PLASTIC, COHESIVE, BROWNISH YELLOW (10YR, 6/6). GRAVEL FINE TO MED GRAINED, SUBANG. TO SUBRND. SS. |
| 7 | E | 14:10 | 2.0 | | ML - SILTY CLAY WITH LESS THAN 5 % GRAVEL. DRY TO SLIGHTLY MOIST, SLIGHTLY PLASTIC, LOOSE, |
| 9 | | 14:15 | 1.0 | | ML - GRAVELLY, SILTY CLAY WITH ABOUT 30 % GRAVEL. SLIGHTLY MOIST, SLIGHTLY PLASTIC, COHESIVE, YELLOW BROWN (10YR, 5/4) WITH LIGHT GRAY MOTTLING. GRAVEL FINE TO VERY COARSE GRAINED, SUBANGULAR TO SUBRND. SS. |
| 10 | | 14:35 | 2.0 | | ML - GRAVELLY CLAY WITH ABOUT 40 % GRAVEL. YELLOW BROWN (10YR, 5/4) WITH LIGHT GRAY MOTTLING, SLIGHTLY MOIST, SLIGHTLY PLASTIC, SLIGHTLY COHESIVE. GRAVEL FINE TO V. COARSE GRAINED WITH OCCASIONAL SMALL COBBLE, SUBANG. TO SUBRND., BLEACHED WHITE QTZ SS. |
| 12 | 1 SH | 17:40 | 2.0 | | SHALE - HIGHLY WEATHERED, MOSTLY CLAY WITH STRINGERS OF SHALE. CLAY BROWN YELLOW (10YR, 6/6), DRY TO SLIGHTLY MOIST, SLIGHTLY COHESIVE TO LOOSE, SLIGHTLY PLASTIC. SHALE GRAYISH BLACK (N2), SOFT, FISSLE. SHALE ABUNDANCE INCREASES WITH DEPTH. |
| 14 | | | | | SEE ABOVE, SHALE WITH ABOUT 80 % CLAY, 20% GRAY SHALE. |
| 15 | | 17:45 | 2.0 | | SEE ABOVE. |
| 16 | | | | | REFUSAL AT 16'. TD |
| 20 | | | | | |
| 25 | | | | | |
| 30 | | | | | |

# BORING LOG

SHEPHERD MILLER
INCORPORATED

BORING NO.
BH333

PROJECT: SEQUOYAH FUELS PAGE: 1 of 1
PROJECT NO.: 100734 DATE: 5/20/01
NORTHING: 195906.4 EASTING: 2836846.6 GROUND ELEVATION: 564.9
DRILLING COMPANY: PETERSON DRILLING METHOD: HSA SPLIT SPOON -CORE
DRILLER: TROY LUCAS LOGGED BY: E. MULLER

| DEPTH (FT) | GEOLOGY UNIT | TIME | (FT) RECOVERY | LITHOLOGY GRAPHIC | DESCRIPTION / NOTES |
|---|---|---|---|---|---|
| 0 | TERRACE | 17:11 | 0 | | BLIND DRILED -NO RECOVERY. |
| 2 | | 17:20 | 1.6 | | FILL - GRAVELLY CLAY (GP) WITH ABOUT 50 % GRAVEL AND 50% CLAY. CLAY SLIGHTLY MOIST, SLIGHTLY COHESIVE. GRAVEL FINE TO VERY COARSE, WITH SOME SMALL COBBLES, ANGULAR, QTZ. SS. |
| 4 | | | | | |
| 4.4 | | | | | SEE ABOVE TO 4.4'. |
| 5 | | 17:23 | 1.7 | | SHALE - HIGHLY WEATHERED, FROM 4.4' TO 6.0'. ABOUT 20 % FRESH SHALE, GRAY (5Y, 6/1), VERY SOFT, FISSILE, ABOUT 80 % CLAY, BROWNISH YELLOW (10YR, 6/6), SOFT, DRY, LOOSE. |
| 6 | | 17:30 | 2.0 | | SEE ABOVE. |
| 8 | | 17:54 | 2.0 | | SEE ABOVE. GRADING TO SLIGHLY WEATHERED SHALE AT 8.5'. SHALE GRAYISH BLACK (N3), VERY SOFT, FISSILE, WEATHERS TO BROWNISH YELLOW (10YR, 6/6) ALONG PARTING SURFACES. |
| 10 | | 18:00 | 2.0 | | SEE ABOVE. |
| 12 | 1 SH | 18:03 | 2.0 | | SEE ABOVE. |
| 14 | | | | | |
| 15 | | 07:50 5/22/01 | 2.0 | | SHALE - HIGHLY WEATHERED, MOSTLY BROWNISH YELLOW (10YR, 6/8), VERY SOFT, VERY THIN LAMINATIONS WITH ABOUT 20 % GRAY, VERY SOFT, FISSILE SHALE FROM 14'-14.8'. SLIGHTLY WEATHERED SHALE, GRAYISH BLACK (N3) VERY SOFT, FISSILE, WITH BROWNISH YELLOW (10YR, 6/6) WEATHERING ALONG PARTING SURTACES FROM 14.8' TO BOTTOM. |
| 16 | | 07:57 | 2.0 | | SHALE - SLIGHTLY WEATHERED, GRAYISH BLACK (N3) VERY SOFT, FISSILE, WITH BROWNISH YELLOW (10YR, 6/6) WEATHERING ALONG PARTING SURFACES. |
| 18 | | 13:10 | 0.8 | | SHALE - SEE ABOVE TO 18.5', BECOMES HIGHLY WEATHERED, SILTY, DARK YELLOWISH BROWN (10YR, 4/4) V. SOFT, THINNLY LAMINATED, CRUMBLY TO BOTTOM. REFUSAL AT 19'. |
| 19 | | | | | |
| 20 | | 16:30 | 0 | | NO RECOVERY. |
| 24 | | | | | |
| 25 | 1 SS | | | | SANDSTONE - MODERATELY WEATHERED, OLIVE GRAY (5Y, 4/1), WEATHERS TO MED. YELLOW BROWN (10YR, 5/4). MEDIUM HARD TO 25', BECOMES SOFT WITH INCREASING SHALE TO 25.8'. VERY CLOSE, NARROW FRACTURES WITH NO VISIBLE FILLING MATERIAL. |
| 25.8 | 2 SH | 16:30 | 5.0 | | SHALE - HIGHLY WEATHERED, MED. YELLOW BROWN (10YR, 5/4), SLIGHTLY PLASTIC, SOFT CLAY WITH ABOUT 20% MED. DARK GRAY (N4), VERY SOFT, FISSILE SHALE. |
| 27.1 | 2 SS | | | | SANDSTONE - MED. HARD, OLIVE GRAY (5Y, 4/1) WITH GRAYISH BLACK (N2) MOTTLING. VERY FINE, SUBRND. QTZ. SOFT, CRUMBLY. SHALE - RICH FROM 27.3'-27.7'. CLOSELY SPACED, VERY NARROW FRACTURES, UP TO 1" LONG VERTICAL, SS WEATHERS TO YELLOW BROWN (10YR, 5/4) ALONG FRACTURE SURFACES. |
| 28 | | | | | TD |
| 30 | | | | | |

# BORING LOG

SHEPHERD MILLER
INCORPORATED

BORING NO.
BH334

PROJECT: SEQUOYAH FUELS PAGE: 1 of 1
PROJECT NO.: 100734 DATE: 5/23/01
NORTHING: 195890.1 EASTING: 2836847.9 GROUND ELEVATION: 565.4
DRILLING COMPANY: PETERSON DRILLING METHOD: HSA SPLIT SPOON -CORE
DRILLER: TROY LUCAS LOGGED BY: E. MULLER

| DEPTH (FT) | GEOLOGY UNIT | TIME | (FT) RECOVERY | LITHOLOGY GRAPHIC | DESCRIPTION / NOTES |
|---|---|---|---|---|---|
| 0 | | | | | BLIND DRILED -NO RECOVERY. |
| 5 | | | | | |
| 10 | | 10:56 | 0 | | |
| 15 | | | | | |
| 20 | | | | | |
| 21 | 1 SS | 14:35 | 2.5 | | SANDSTONE - MODERATELY HARD, VERY FINE SUBRND. QTZ., MED. DARK GRAY (N4) WITH PLANAR LIGHT GRAY BANDING (N7), GRADES TO HIGHLY WEATHERED SHALE, YELLOWISH BROWN (10YR, 5/4), VERY SOFT, THINNLY LAMINATED, WITH ABOUT 20 % FRESH, MED. DARK GRAY SHALE. |
| 23.5 | | | | | DRIVE SPLIT SPOONS - 4" AT 150 BLOWS - REFUSAL AT 23.8'. |
| 25 | | | | | |
| 30 | | | | | |

# BORING LOG

SHEPHERD MILLER
INCORPORATED

BORING NO.
BH335

PROJECT: SEQUOYAH FUELS PAGE: 1 of 1
PROJECT NO.: 100734 DATE: 5/31/01
NORTHING: 194835.1 EASTING: 2835602.8 GROUND ELEVATION: 525.6
DRILLING COMPANY: PETERSON DRILLING METHOD: HSA -CORE
DRILLER: TROY LUCAS LOGGED BY: E. MULLER

| DEPTH (FT) | GEOLOGY UNIT | TIME | (FT) RECOVERY | LITHOLOGY GRAPHIC | DESCRIPTION / NOTES |
|---|---|---|---|---|---|
| 0 | COLLU-VIUM | 12:15 | 2.0 | | BLIND DRILLED - NO RECOVERY. TOPSOIL WITH ANGULAR V. FINE QTZ. SS GRAVEL IN CUTTINGS. |
| 2 | 2 SS | 11:45 | 7.8 | | SANDSTONE - MODERATELY HARD, MED. YELLOW BROWN (10YR, 5/4) CONSISTING OF VERY FINE, SUBRND. TO RND. QTZ. CLOSELY SPACED, NARROW TO VERY WIDE FRACTURING. FRACTURES FILLED WITH OLIVE GRAY TO PALE BLUE GREEN CLAY. UNFILLED FRACTURE ZONES WEATHERS TO GRAYISH BLACK (N2). |
| 5 | | | | | |
| 5.9 | | | | | SHALEY SANDSTONE - MODERATELY TO HIGHLY WEATHERED. MED. WEATHERED INTERVALS MED. YELLOWISH BROWN (10YR, 5/4), HIGHLY WEATHERED INTERVALS MED. YELLOWISH BROWN (10YR, 2/2). INTERVAL MODERATEY HARD, WITH VERY FINE, RND. TO SUBRND. QTZ. CLOSELY SPACED NARROW TO WIDE FRACTURES, FRACTURES TYPICALLY FILLED WITH PALE BLUE GREEN CLAY. HIGHLY TO COMPLETELY WEATHERED INTERVAL, FROM 5.9'-6.5' AND 7.9'-9'. HIGHLY WEATHERED INTERVALS ARE A DARK YELLOWISH ORANGE (10YR, 6/6), VERY SOFT, SLIGHTLY PLASTIC, SANDY SILTY CLAY WITH OCCASIONAL ANGULAR SS FRAGMENTS. FRACTURE ZONES STILL EVIDENT IN HIGHLY WEATHERED INTERVALS, AND CONTAIN PALE GREEN (10G, 6/2) TO PALE BLUE GREEN (5BG, 7/2) CLAY. INTERVAL DRY TO SLIGHTLY MOIST. |
| 9 | | | | | |
| 10 | 3 SH | | | | |
| 12.9 | | | | | SEE ABOVE, WITH A GRAY BLACK (N2), SOFT, FISSLE, MED. WEATHERED SHALE AT 12.9'-13'. |
| 13 | | 14:45 | 7.0 | | SHALE - GRAY BLACK (N2), SOFT, FISSILE, MED. WEATHERED. |
| 15 | 3 SS | | | | SANDSTONE - MED. HARD, GREENISH BLACK (5G, 2/1), WITH VERY FINE, RND. QTZ., GRADES TO SHALELY SS AT BOTTOM. |
| 16.5 | 4 SH | | | | SHALE - GRAYISH BLACK (N2), SOFT, THINNLY LAMINATED, HIGHLY WEATHERED, WEATHERS TO LIGHT BROWN (5YR, 5/6) SILTY CLAY, FRIABLE, DRY. |
| 18 | | | | | TD |
| 20 | | | | | |
| 25 | | | | | |
| 30 | | | | | |

100734/BH-335.dwg

# BORING LOG

SHEPHERD MILLER
INCORPORATED

BORING NO.
BH336

PROJECT: SEQUOYAH FUELS PAGE: 1 of 1
PROJECT NO.: 100734 DATE: 5/31/01
NORTHING: 194456.4 EASTING: 2837511.6 GROUND ELEVATION: 539.4
DRILLING COMPANY: PETERSON DRILLING METHOD: HSA SPLIT SPOON -CORE
DRILLER: TROY LUCAS LOGGED BY: E. MULLER

| DEPTH (FT) | GEOLOGY UNIT | TIME | (FT) RECOVERY | LITHOLOGY GRAPHIC | DESCRIPTION / NOTES |
|---|---|---|---|---|---|
| 0 | COLLUVIUM | 16:50 | 0 | | BLIND DRILED -NO RECOVERY. |
| 2 | | 17:15 | .7 | | CL - CLAY, BROWNISH YELLOW (10YR, 6/6) TO LIGHT GRAY (2.5Y, 7/1), MED. PLASTIC, SOFT, COHESIVE, SLIGHTLY MOIST, GRADES TO A GRAVELLY, SANDY CLAY WITH ABOUT 20 % VERY FINE RND. QTZ. AND LESS THAN 5% VERY COARSE SAND SIZE TO FINE GRAVEL SIZE SS. |
| 4 | | | | | |
| 5 | | 17:20 | 2.0 | | SEE ABOVE TO 4.9'. GC - CLAYEY SILTY GRAVEL FROM 4.9' TO 6', WITH ABOUT 70 % GRAVEL AND 30% FINES. GRAVEL FINE TO VERY COARSE, MOSTLY RND., BLEACHED WHITE QTZ. SS. CLAY YELLOW BROWN (10YR, 5/8), LOOSE, LOW PLASTIC, DRY. |
| 6 | 1 SS | | | | REFUSAL AT 6'. |
| 7.5 | 2 SH | 8:50 6/1/01 | 1.8 | | SANDSTONE - VERY HARD, MED. YELLOW BROWN (10YR, 5/4), VERY FINE, RND. TO SUBRND. QTZ. FROM 6.0' TO 6.5', GRADES TO A SHALELY SS, MED. YELLOW BROWN TO LIGHT BROWN (10YR, 5/4) TO (5YR, 5/6), MODERATELY HARD TO SOFT, THINNLY BEDDED WITH CLAY INTERBEDDED TO 7.5'. CLAY SOFT, MOIST, MED. PLASTIC. |
| 10 | | | | | SHALE - HIGHLY WEATHERED WITH ABOUT 10 % FRESH SHALE. FRESH SHALE DARK GRAY (N3), SOFT, FISSILE. WEATHERS TO DARK YELLOW ORANGE (10YR, 6/6) TO VERY PALE ORANGE (10YR,8/2) CLAY. CLAY SITLY, SLIGHTLY PLASTIC, SLIGHTLY MOIST. |
| 11 | 2 SS | 11:47 | 9.5 | | SANDSTONE - VERY HARD, PALE YELLOW BROWN (10YR, 6/2), WITH VERY FINE, RND. TO SUBRND. QTZ. PLANAR LAMINAR FROM 11'-12.6', VERY LIGHT GRAY (N8) WITH MED. DARK GRAY (N4) MOTTLING TO BOTTOM. |
| 15 | | | | | |
| 18.3 | 3 SH | | | | SHALE - DARK GRAY (N3), SOFT, CRUMBLY, DRY. |
| 20 20.2 | | | | | TD |
| 25 | | | | | |
| 30 | | | | | |

100734/BH-336.dwg

# BORING LOG

SHEPHERD MILLER INCORPORATED

BORING NO.
BH337

PROJECT: SEQUOYAH FUELS PAGE: 1 of 1
PROJECT NO.: 100734 DATE: 6/1/01
NORTHING: 194784.2 EASTING: 2836948.6 GROUND ELEVATION: 543.2
DRILLING COMPANY: PETERSON DRILLING METHOD: HSA SPLIT SPOON -CORE
DRILLER: TROY LUCAS LOGGED BY: E. MULLER

| DEPTH (FT) | GEOLOGY UNIT | TIME | (FT) RECOVERY | LITHOLOGY GRAPHIC | DESCRIPTION / NOTES |
|---|---|---|---|---|---|
| 0 | COLLUVIUM | 16:36 | 0 | | BLIND DRILLED - NO RECOVERY. FINE TO V. COARSE, RD. TO SUBRND. BLEACHED WHITE QTZ. SS GRAVEL IN CUTTINGS. |
| 3 | COLLUVIUM | 16:45 | 2.0 | | GC - CLAYEY GRAVEL WITH ABOUT 60 % GRAVEL TO 3.2'. GRAVEL FINE TO COARSE, RND. TO SUBRND., BLEACHED WHITE QTZ. SS. CLAY SLIGHTLY PLASTIC, SLIGHTLY MOIST, YELLOW RED (5YR, 5/6) |
| 5 | 1 SS | | | | ML - GRAVELLY SILTY CLAY TO 5', GRAVEL FINE TO COARSE, RND. TO SUBRND. QTZ. SS. CLAY LOW PLASTIC, STIFF, SLIGHTLY MOIST. |
| 7 | 2 SH | | | | SANDSTONE - MODERATELY TO HIGHLY WEATHERED. 60 % HARD TO SOFT, VERY FINE, RND TO SUBRND. QTZ. SS WITH ABOUT 40 % FRIABLE, DRY SILTY CLAY. GRAYISH ORANGE (10YR, 7/4) TO MED. REDDISH ORANGE (10YR, 6/6). CONTAINS CLOSELY SPACED, NARROW FRACTURES. CLAY BECOMES INCREASINGLY ABUNDANT TOWARDS BOTTOM, AND BREAKS ALONG VERY THIN PARTINGS. |
| 10 | 2 SS | 18:27 | 6.5 | | SHALE - HIGHLY WEATHERED, WITH ABOUT 10 % SLIGHTLY WEATHERED, MED. DARK GRAY (N5) SOFT, FISSILE SHALE. WEATHERS TO A MED. YELLOW BROWN (10YR, 5/4), SILTY CLAY, LOW PLASTICITY, LOOSE, DRY. OCCASIONAL STRIGNERS OF MED. LIGHT GRAY (N6) CLAY FOUND THROUGHOUT. INTERVAL THINNLY LAMINATED. |
| 14 | | | | | SANDSTONE - HARD, GRAYISH ORANGE (10YR, 7/4), PLANAR LAMINAR FROM 10'-12', LIGHT GRAY (N7) WITH DARK GRAY (N3) MOTTLING FROM 12'-14'. CONSISTS OF VERY FINE, RND. TO SUBRND. QTZ. INTERVAL SHOWS WIDELY SPACED, VERY NARROW UNFILLED FRACTURES. TD |
| 15 | | | | | |
| 20 | | | | | |
| 25 | | | | | |
| 30 | | | | | |

# BORING LOG

SHEPHERD MILLER
INCORPORATED

BORING NO.
BH338

PROJECT: SEQUOYAH FUELS PAGE: 1 of 1
PROJECT NO.: 100734 DATE: 6/2/01
NORTHING: 193949.3 EASTING: 2834874.4 GROUND ELEVATION: 484.7
DRILLING COMPANY: PETERSON DRILLING METHOD: HSA - SPLIT SPOON
DRILLER: TROY LUCAS LOGGED BY: E. MULLER

| DEPTH (FT) | GEOLOGY UNIT | TIME | (FT) RECOVERY | LITHOLOGY GRAPHIC | DESCRIPTION / NOTES |
|---|---|---|---|---|---|
| 0 | COLLUVIUM | 10:49 | 0 | | BLIND DRILED -NO RECOVERY. |
| 2 | | 10:55 | 2.0 | | ML - SANDY SILTY CLAY WITH ABOUT 30 % SAND AND 70% FINES. SAND VERY FINE, RND. TO SUBRND. QTZ. CLAY SLIGHTLY PLASTIC, SLIGHTLY MOIST, SLIGHTLY COHESIVE. STRONG BROWN (7.5YR, 4/6). CARBONIZED WOOD CHIPS ABUNDANT. |
| 4 | | | | | |
| 5 | | 11:02 | 2.0 | | SC - SW - CLAYEY SAND WITH ABOUT 20 % CLAY GRADINGTO WELL GRADED SAND. SC VERY SLIGHTLY PLASTIC, VERY SLIGHTLY COHESIVE. SAND VERY FINE TO FINE, RND. TO SUBANGULAR, MOSTLY QTZ. WITH MINOR BLACK OPAQUE MINERALS. PINKISH WHITE (7.5YR, 8/2) TO STRONG BROWN (7.5YR, 5/6). INTERVAL MOIST. |
| 6 | | | | | ABANDONING HOLE AT 6'. |
| 10 | | | | | |
| 15 | | | | | |
| 20 | | | | | |
| 25 | | | | | |
| 30 | | | | | |

# BORING LOG

SHEPHERD MILLER INCORPORATED

BORING NO. BH339

PROJECT: SEQUOYAH FUELS PAGE: 1 of 2

PROJECT NO.: 100734 DATE: 6/2/01

NORTHING: 195204.3 EASTING: 2836453.1 GROUND ELEVATION: 549.7

DRILLING COMPANY: PETERSON DRILLING METHOD: HSA - SPLIT SPOON/CORE

DRILLER: TROY LUCAS LOGGED BY: E. MULLER

| DEPTH (FT) | GEOLOGY UNIT | TIME | (FT) RECOVERY | LITHOLOGY GRAPHIC | DESCRIPTION / NOTES |
|---|---|---|---|---|---|
| 0 | C | 16:30 | 1.5 | | OL - ORGANIC SILTY CLAY, MED. PLASTIC, COHESIVE, SLIGHTLY MOIST, SOFT, DARK BROWN (7.5YR, 3/3), WOOD FRAGMENTS ABUNDANT. BECOMES GRAVELLY BETWEEN 1.5'-2', WITH ABOUT 30 % FINE TO COARSE, SUBRND. TO SUBANG. SS GRAVEL. 50 BLOW COUNTS WITH SPLIT SPOON. |
| 2 | OLLUVIUM | 16:35 | 1.8 | | ML - OL - SILTY, GRAVELLY ORGANIC CLAY WITH ABOUT 30 % GRAVEL. MED. TO LOW PLASTIC, SLIGHTLY COHESIVE, SLIGHTLY MOIST, SOFT. WOOD FRAGMENTS ABUNDANT TO 3'. DARK BROWN (7.5YR, 3/3). GRAVEL VERY FINE TO VERY COARSE, WITH OCCASIONAL SMALL COBBLES, SUBRND. TO SUBANG. QTZ. SS. 50 BLOW COUNTS WITH SPLIT SPOON. |
| 4 | | | | | |
| 5 | | 16:40 | 2.0 | | ML - GRAVELLY CLAY OF LOW PLASTICITY, LOW COHESIVENESS TO 5.7', VERY SOFT, VERY MOIST WITH ABOUT 30% SUBANGULAR FINE TO VERY COARSE QTZ. SS GRAVEL. DARK BROWN (7.5YR, 3/3). CL - GRAVELLY CLAY OF HIGH PLASTICITY FROM 5.7'-6'. FIRM, SLIGHTLY MOIST WITH ABOUT 10 % FINE TO MED., RND. TO SUBRND. QTZ. SS GRAVEL. LIGHT YELLOW BROWN (2.5Y, 6/4). 50 BLOW COUNTS WITH SPLIT SPOON. |
| 6 | | 16:45 | 1.6 | | |
| 8 | MUD | 16:50 | 0 | | SEE ABOVE TO 7.6', VERY WET. GC - CLAYEY GRAVEL FROM 7.6'-8', WITH ABOUT 75 % FINE TO VERY COARSE GRAVEL, WITH OCCASIONAL SMALL COBBLE. GRAVEL SUBRND. TO SUBANGULAR QTZ. SS. CLAY SILTY, LOW PLASTIC, SLIGHTLY MOIST, FIRM, DARK BROWN (7.5YR, 3/3) TO LIGHT YELLOW BROWN (2.5Y, 6/4). 50 BLOW COUNTS WITH SPLIT SPOON. |
| 10 | | 16:55 | 0 | | NO SAMPLE. 50 BLOW COUNTS WITH SPLIT SPOON. |
| 11 | 1 SS | | | | REFUSAL AT 11'. 50 BLOW COUNTS WITH SPLIT SPOON. |
| 12.5 | 2 SH | 19:20 | 1.8 | | SANDSTONE - MODERATELY HARD, OLIVE GRAY (5Y, 4/1), VERY FINE, RND., QTZ. PLANAR LAMINATIONS. CLOSELY SPACED, NARROW TO WIDE FRACTURES. SHALE - SILTY WITH MINOR CLAY. HIGHLY WEATHERED, WITH ABOUT 10 % FRESH, GRAYISH BLACK (N3), SOFT, FISSLE SHALE. MOSTLY A SILTY CLAY, SLIGHTLY PLASTIC, SLIGHTLY COHESIVE, SLIGHTLY MOIST, GRAYISH ORANGE (10YR, 7/4), DISPLAYS FINE LAMINATIONS. |
| 15 | | | | | |
| 20 | | | | | |
| 21 | 2 SS | 09:30 6/3/01 | 8.0 | | SANDSTONE - VERY HARD, MED. LIGHT GRAY (N6) WITH GRAYISH BLACK (N2) MOTTLING. VERY FINE, RND. TO SUBRND. QTZ. SLIGHT REACTION TO HCL. VERY CLOSELY SPACED, VERY NARROW, CALCITE FILLED FRACTURES, FRACTURES UP TO 20 CM LONG. GREENISH BLK. (5G, 2/1), SOFT, WITH THIN SHALEY PARTINGS FROM 25.1'-25.3'. |
| 25 | | | | | |
| 26.9 | 3 SH | | | | SHALE - GREENISH BLACK (5G, 2/1) BECOMING MED. DARK GREY (N4) AT BOTTOM. SOFT, VERY THINNLY LAMINATED. SLIGHTLY SANDY NEAR TOP OF INTERVAL, WITH ABOUT 30 % VERY FINE, RND. QTZ. |
| 29 | | | | | SHALE - HIGHLY WEATHERED TO CLAY, FROM 25'-30'. SLIGHTLY PLASTIC, SLIGHTLY MOIST WITH ABOUT 40% MED. TO COARSE SAND SIZED GRAY BLACK SHALE FRAGMENTS. SHALE SOFT, CRUMBLY. |
| 30 | 3 SS | 10:58 | 10.4 | | SANDSTONE - MODERATELY HARD, BLACK (N1), VERY FINE GRAINED QTZ., THINNLY LAMINATED. |

# BORING LOG

SHEPHERD MILLER
INCORPORATED

BORING NO.
BH-339

PROJECT: SEQUOYCH FUELS PAGE: 2 of 2
PROJECT NO.: 100734 DATE: 6/3/01
NORTHING: 195204.3 EASTING: 2836450.1 GROUND ELEVATION: 549.7
DRILLING COMPANY: PETERSON DRILLING METHOD: HSA /CORE
DRILLER: TROY LUCAS LOGGED BY: E. MULLER

| DEPTH (FT) | TIME | BLOW COUNTS | (FT) RECOVERY | DESCRIPTION / NOTES |
|---|---|---|---|---|
| 10 | 16:55 | 50 | 0 | NO SAMPLE.<br>REFUSAL AT 11'. |
| | | | | SANDSTONE - MODERATELY HARD, OLIVE GRAY (5Y, 4/1), VERY FINE, RND., QTZ. PLANAR LEMINATIONS. CLOSELY SPACED, NARROW TO WIDE FRACTURES. |
| 15 | 19:20 | | 1.8 | SHALE - SILTY WITH MINOR CLAY. HIGHLY WEATHERED, WITH ABOUT 10 % FRESH, GRAYISH BLACK (N3), SOFT, FISSLE SHALE. MOSTLY A SILTY CLAY, SLIGHTLY PLASTIC, SLIGHTLY COHESIVE, SLIGHTLY MOIST, GRAYISH ORANGE (10YR, 7/4), DISPLAYS FINE LEMINATIONS. |
| 20 | | | | |
| 25 | 09:30<br>6/3/01 | | 8.0 | SANDSTONE - VERY HARD, MED. LIGHT GRAY (N6) WITH GRAYISH BLACK (N2) MOTTLING. VERY FINE, RND. TO SUBRND. QTZ. SLIGHT REACTION TO HCL. VERY CLOSELY SPACED, VERY NARROW, CALCITES FILLED FRACTURES, FRACTURES UP TO 20CM LONG. GREENISH BLK. (5G, 2/1), SOFT, WITH THIN SHALEY PARTINGS FROM 25.1'-25.3'. |
| | | | | SHALE - GREENISH BLACK (5G, 2/1) BECOMING MED. DARK GREY (N4) AT BOTTOM. SOFT, VERY THINNLY LEMINATED. SLIGHT SAND NEAR TOP OF INTERVAL, WITH ABOUT 30 % VERY FINE, RND. QTZ. |
| 30 | | | | SHALE - HIGHLY WEATHERED TO CLAY, FROM 25'-30'. SLIGHTLY PLASTIC, SLIGHTLY MOIST WITH ABOUT 40% MED. TO COARSE SAND SIZED GRAY BLACK SHALE FRAGMENTS. SHALE SOFT, CRUMBLY. |
| 35 | 10:58 | | 10.4 | SANDSTONE - MODERATELY HARD, BLACK (N1), VERY FINE GRAINED QTZ., THINNLY LEMINATED. |
| | | | | SHALE - BLACK (N1), VERY SOFT, FISSLE. |
| 40 | 12:30 | | 10.0 | SEE ABOVE.<br>TD AT 49'. |

100734/BH-339.dwg

# BORING LOG

SHEPHERD MILLER
INCORPORATED

BORING NO.
BH340

PROJECT: SEQUOYAH FUELS PAGE: 1 of 1
PROJECT NO.: 100734 DATE: 6/3/01
NORTHING: 195204.3 EASTING: 2836450.1 GROUND ELEVATION: 549.7
DRILLING COMPANY: PETERSON DRILLING METHOD: HSA /CORE
DRILLER: TROY LUCAS LOGGED BY: E. MULLER

| DEPTH (FT) | GEOLOGY UNIT | TIME | (FT) RECOVERY | LITHOLOGY GRAPHIC | DESCRIPTION / NOTES |
|---|---|---|---|---|---|
| 0 | | | | | BLIND DRILED -NO RECOVERY. |
| 5 | | 14:29 | 0 | | |
| 10 | | | | | |
| 12 | 1 SS | 15:30 | 0.5 | | SANDSTONE - VERY HARD, VERY FINE, RND. TO SUBRND. QTZ. YELLOW BROWN (10YR, 5/4) WITH MED. DARK GRAY (N4) MOTTLING. YELLOW BROWN (10YR, 5/4) CLAY (CL), MED. PLASTIC, COHESIVE, SLIGHLTY MOIST FROM 13.95' TO 14'. |
| 14 | | | | | |
| 15 | | 15:50 | 0.5 | | CLAY AND GRAVEL, WET, PROBABLY SLUFF. ABANDONED HOLE. |
| 15.5 | | | | | TD |
| 20 | | | | | |
| 25 | | | | | |
| 30 | | | | | |

100734/BH-340.dwg

# BORING LOG

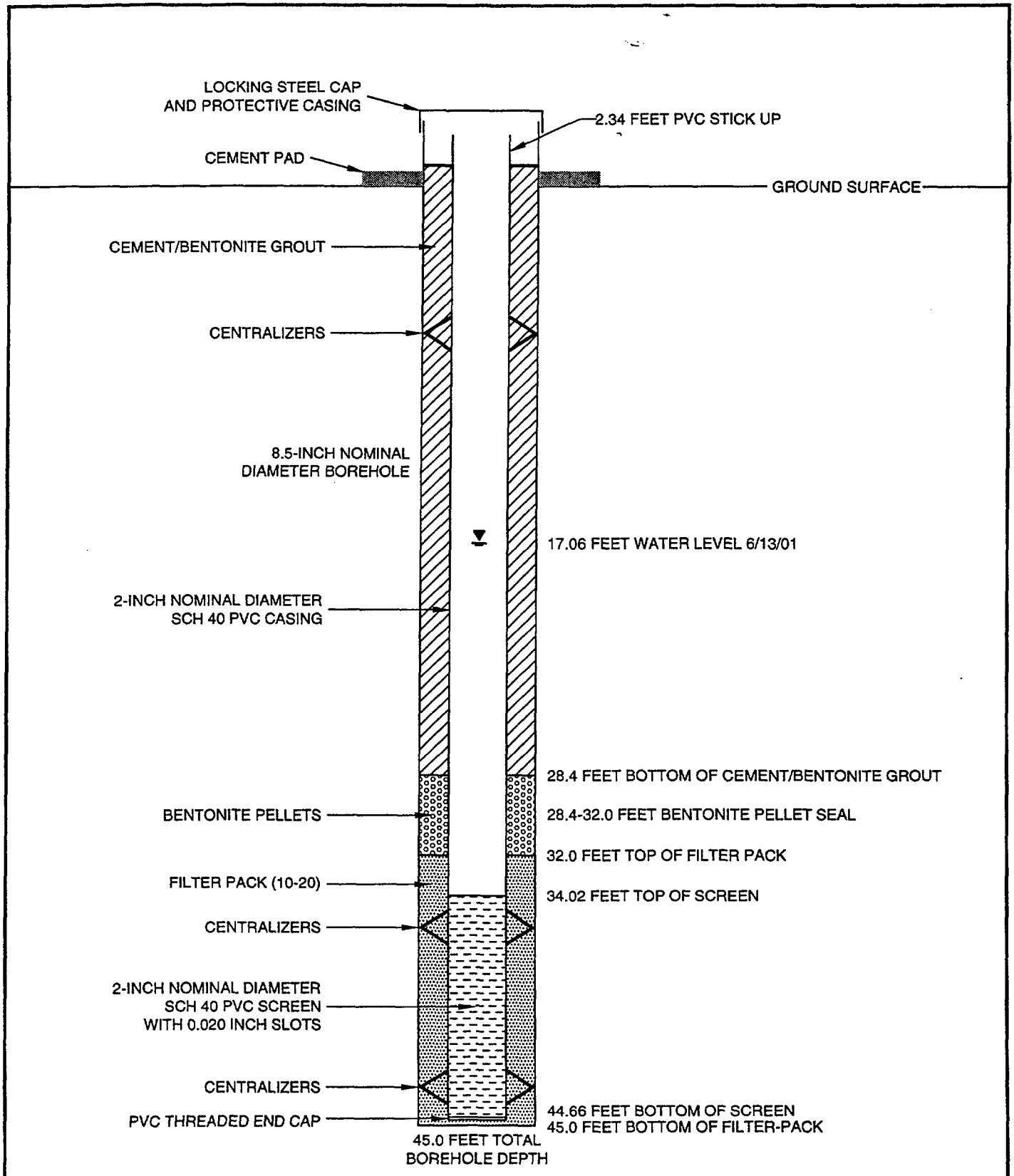
SHEPHERD MILLER
INCORPORATED

BORING NO.
MW117

PROJECT: SEQUOYAH FUELS PAGE: 1 of 1
PROJECT NO.: 100734 DATE: 6/2/01
NORTHING: 194357.3 EASTING: 2834786.1 GROUND ELEVATION: 491.2
DRILLING COMPANY: PETERSON DRILLING METHOD: HSA -SPLIT SPOON
DRILLER: TROY LUCAS LOGGED BY: E. MULLER

| DEPTH (FT) | GEOLOGY UNIT | TIME | (FT) RECOVERY | LITHOLOGY GRAPHIC | DESCRIPTION / NOTES |
|---|---|---|---|---|---|
| 0 | | 11:30 | 0 | | BLIND DRILED -NO RECOVERY. |
| 2 | | 12:50 | 2.0 | | OH - ORGANIC CLAY, MED. PLASTIC, SLIGHTLY SILTY, SLIGHTLY MOIST, DARK BROWN (10YR, 3/2). ROOTS, WOOD CHIPS ABUNDANT. |
| 4 | | | | | |
| 5 | C | 12:55 | 2.0 | | SEE ABOVE. COHESIVE AND SOFT. |
| 6 | O | | | | |
| | L | 12:59 | | | ML - SILTY CLAY, LOW TO MED. PLASTIC, COHESIVE, SOFT, SLIGHTLY MOIST, GRAY (5Y, 5/1) TO BROWNISH YELLOW (10YR, 6/8). |
| 8 | L | | | | |
| | U | 14:21 | | | CL - SILTY CLAY, MED. PLASTIC, COHESIVE, SOFT, SLIGHTLY MOIST, GRAY (10YR, 5/1). NON-STRATIFIED. 50 BLOW COUNTS WITH SPLIT SPOON. |
| 10 | V | | | | |
| | I | 14:24 | | | SEE ABOVE. 50 BLOW COUNTS WITH SPLIT SPOON. |
| 12 | U | | | | |
| | M | 14:33 | | | CL - SILTY CLAY GRADING TO ML GRAVELLY SILTY CLAY. CLAY MED. PLASTIC, SOFT, COHESIVE, SLIGHTLY MOIST. GRAVEL FINE TO VERY COARSE, SUBRND. TO SUBANGULAR BLEACHED WHITE SS. UP TO 30% GRAVEL. 50 BLOW COUNTS WITH SPLIT SPOON. |
| 14 | | | | | |
| | | 14:40 | | | SEE ABOVE, MOIST TO 15.0'. |
| 15 | | | | | SHALE, MODERATELY WEATHERED, FRESH SHALE GRAYISH BLACK (N2), SOFT, FISSILE, WEATHERS TO YELLOW BROWN (10YR, 5/6). SHALE FROM 15.0' TO BOTTOM. |
| 15.5 | 4 SH | | | | REFUSAL AT 15.5'. 50 BLOW COUNTS WITH SPLIT SPOON. TD |
| 20 | | | | | |
| 25 | | | | | |
| 30 | | | | | |

100734/MW-117.dwg

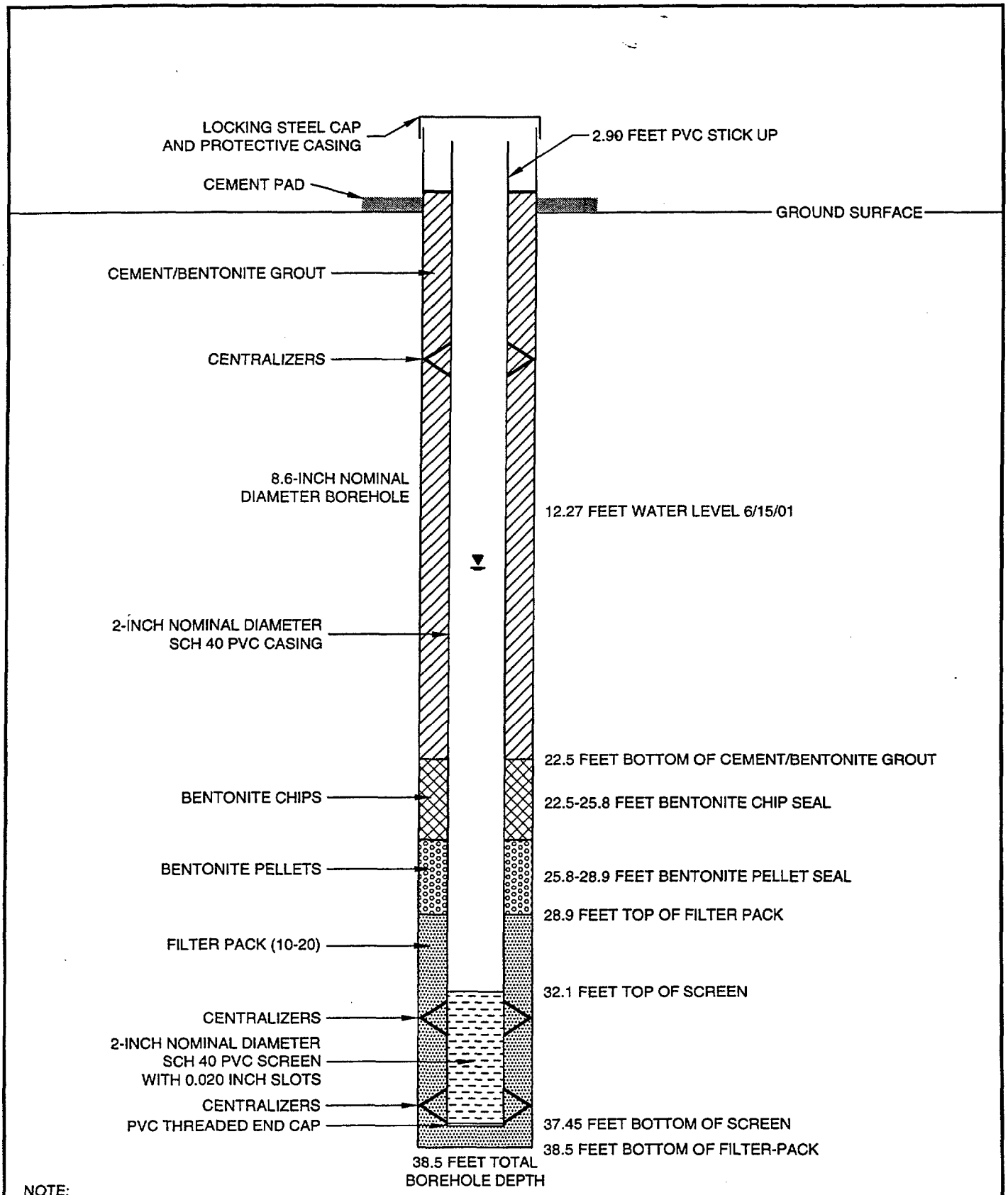



NOTE:
NOT TO SCALE
ALL DEPTHS ARE BELOW GROUND SURFACE

SHEPHERD MILLER
INCORPORATED

MW-110

| | |
|---|---|
| Date: | JUNE 2001 |
| Project: | 100734 |
| File: | WC-MW |

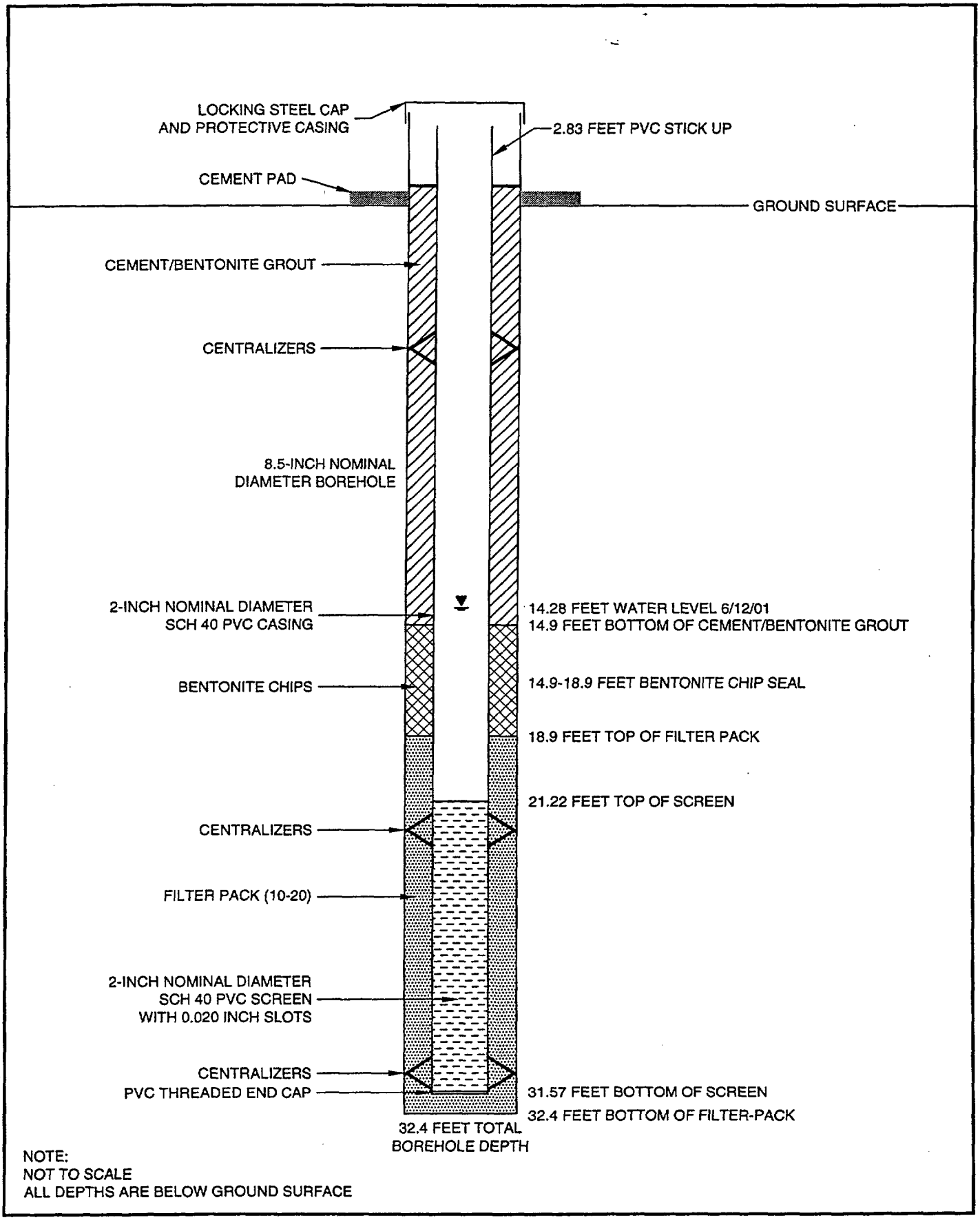



NOTE:
NOT TO SCALE
ALL DEPTHS ARE BELOW GROUND SURFACE

SHEPHERD MILLER
INCORPORATED

MW-111

| | |
|---|---|
| Date: | JUNE 2001 |
| Project: | 100734 |
| File: | WC-MW |

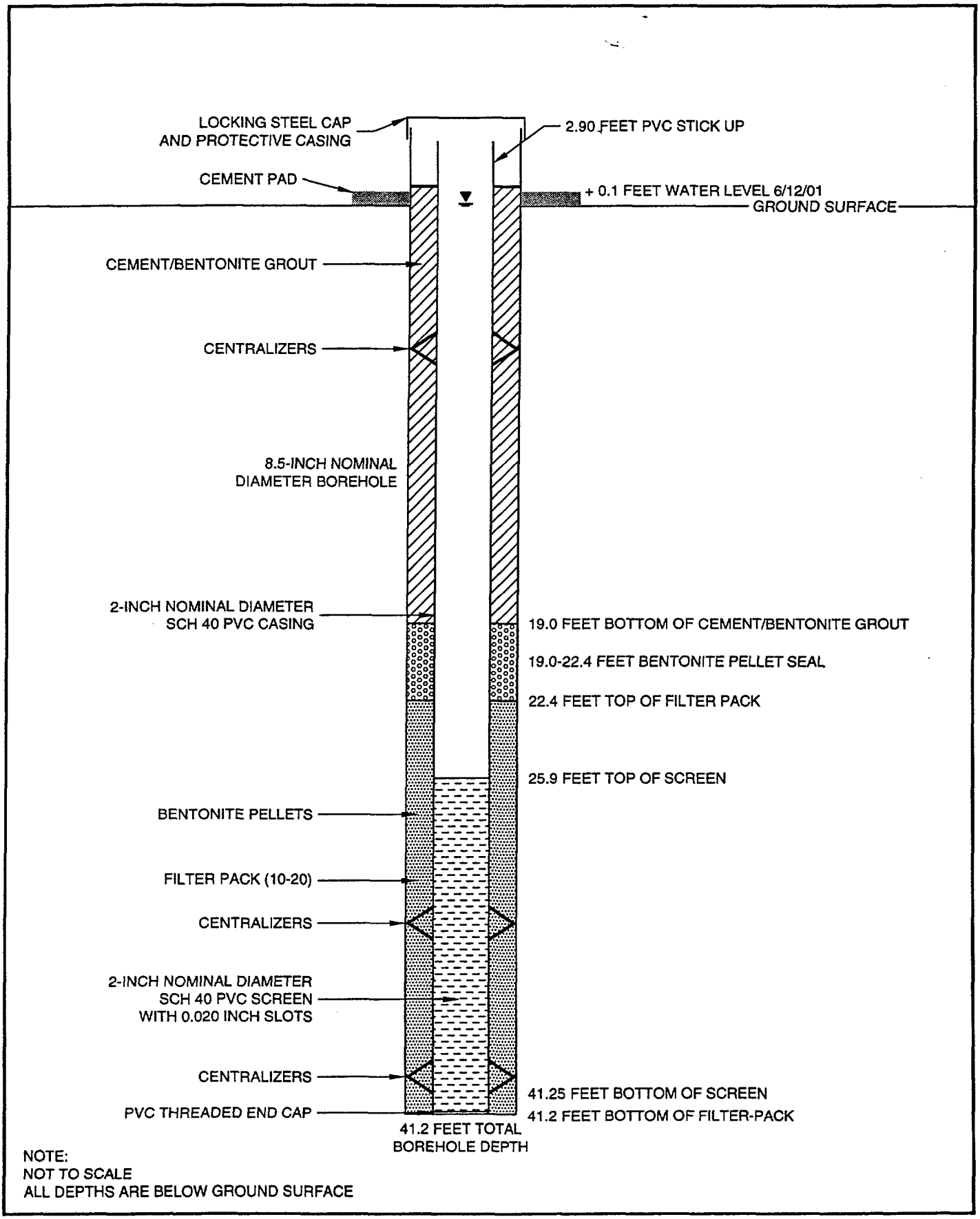



NOTE:
NOT TO SCALE
ALL DEPTHS ARE BELOW GROUND SURFACE

SHEPHERD MILLER
INCORPORATED

MW-112

| | |
|---|---|
| Date: | JUNE 2001 |
| Project: | 100734 |
| File: | WC-MW |

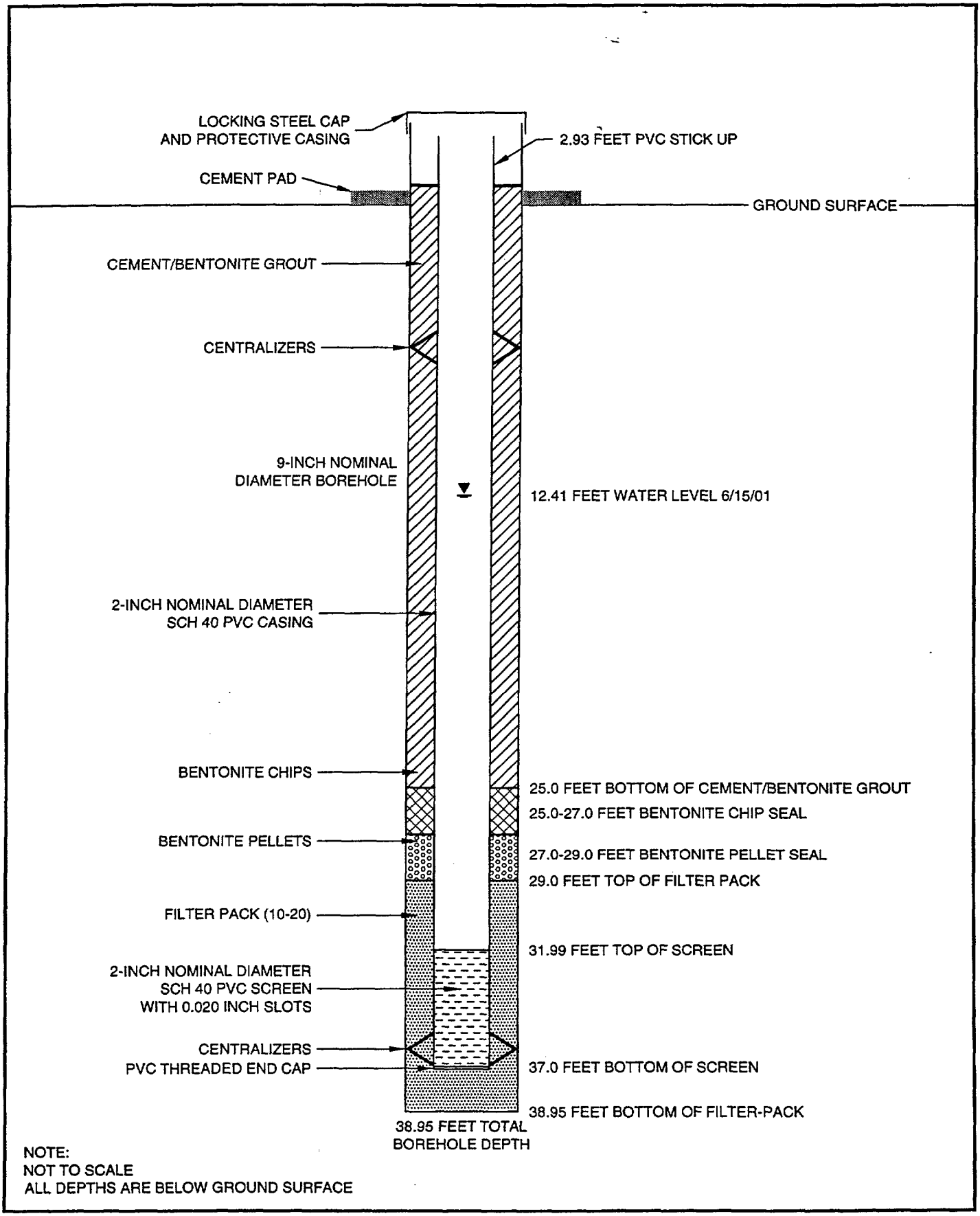



NOTE:
NOT TO SCALE
ALL DEPTHS ARE BELOW GROUND SURFACE

SHEPHERD MILLER
INCORPORATED

MW-113

| | |
|---|---|
| Date: | JUNE 2001 |
| Project: | 100734 |
| File: | WC-MW |




NOTE:
NOT TO SCALE
ALL DEPTHS ARE BELOW GROUND SURFACE

SHEPHERD MILLER
INCORPORATED

MW-114

| | |
|---|---|
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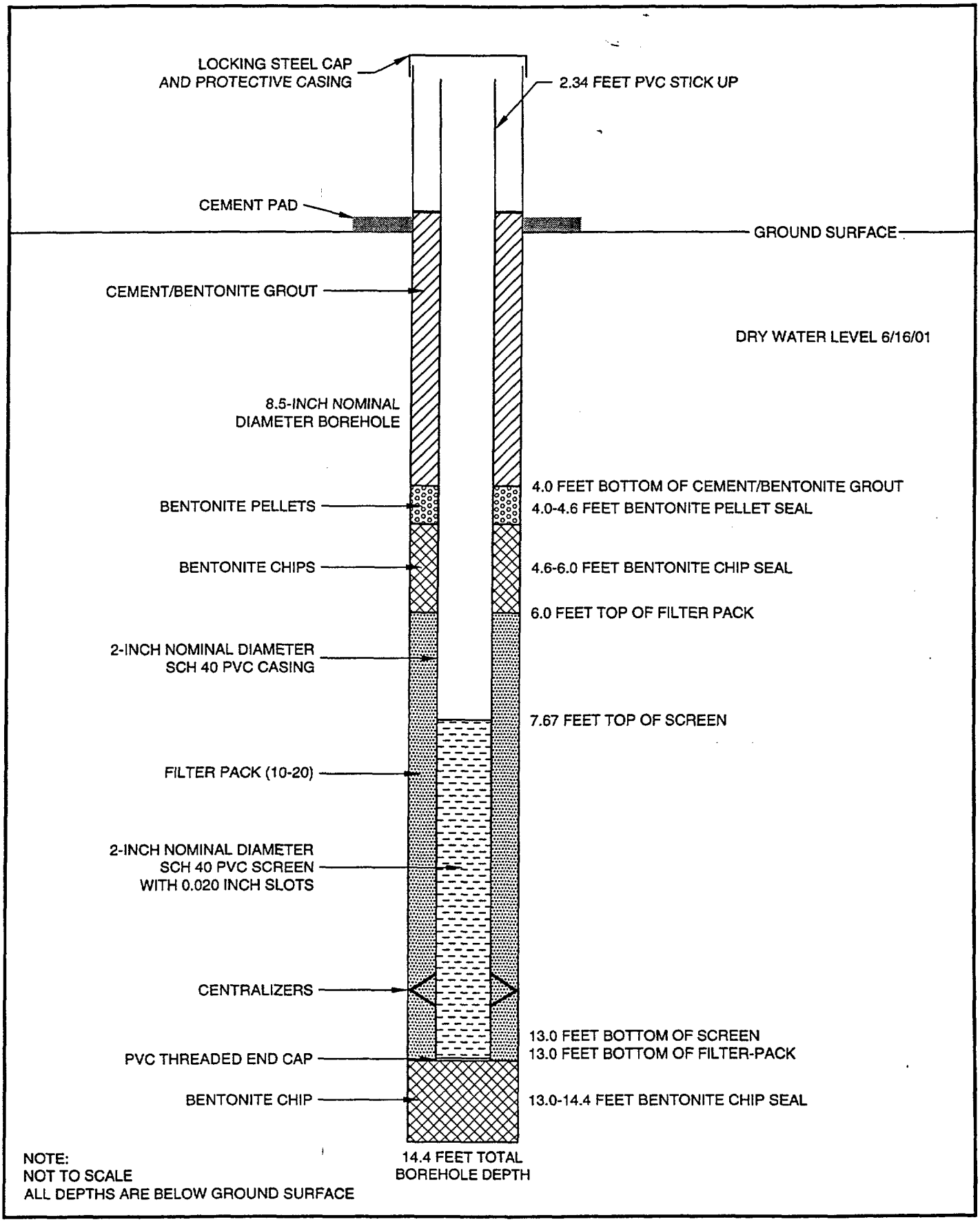
| Project: | 100734 |
| File: | WC-MW |




NOTE:
NOT TO SCALE
ALL DEPTHS ARE BELOW GROUND SURFACE

SHEPHERD MILLER
INCORPORATED

MW-115

| | |
|---|---|
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| Project: | 100734 |
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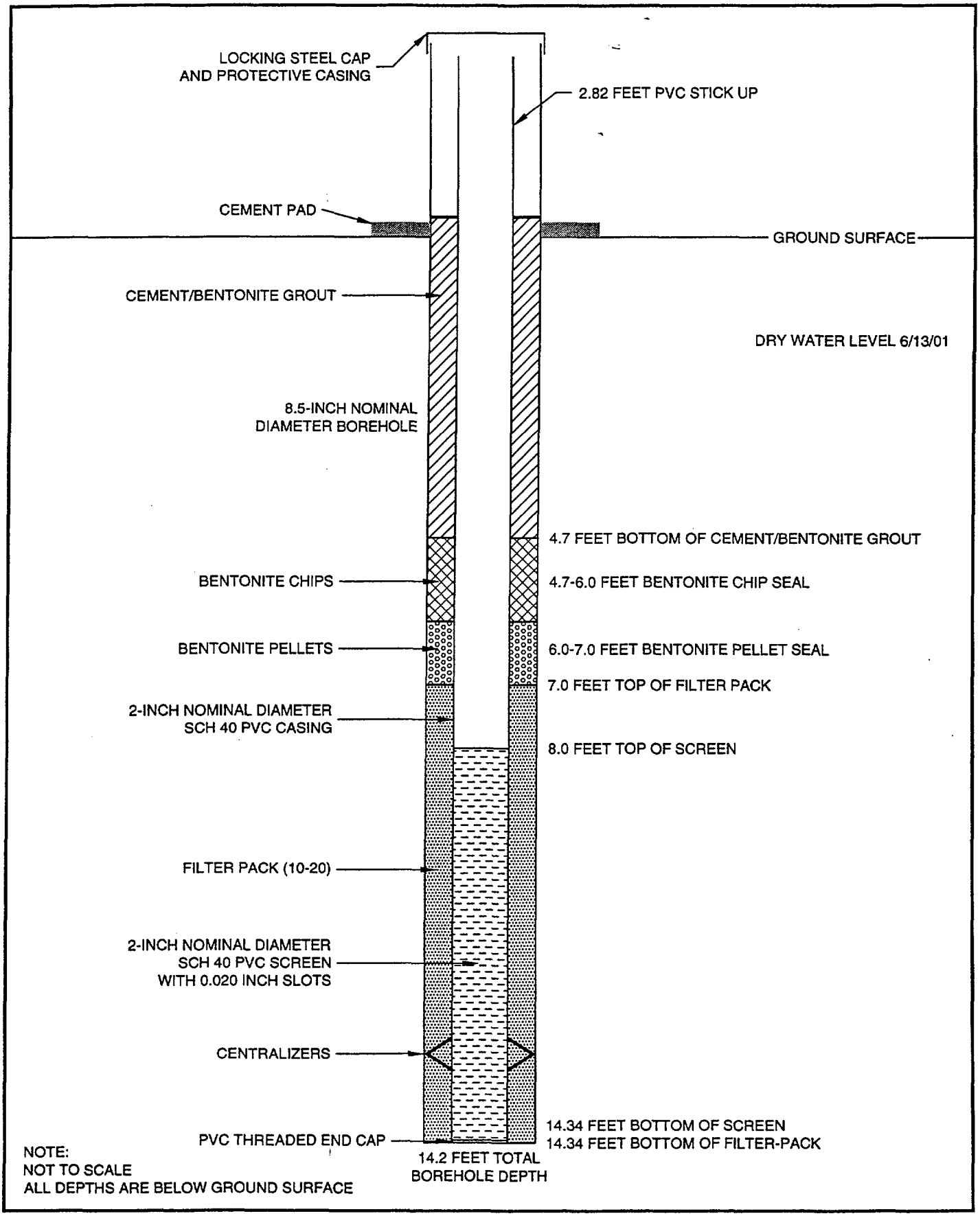


SHEPHERD MILLER
INCORPORATED

MW-116

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|---|---|
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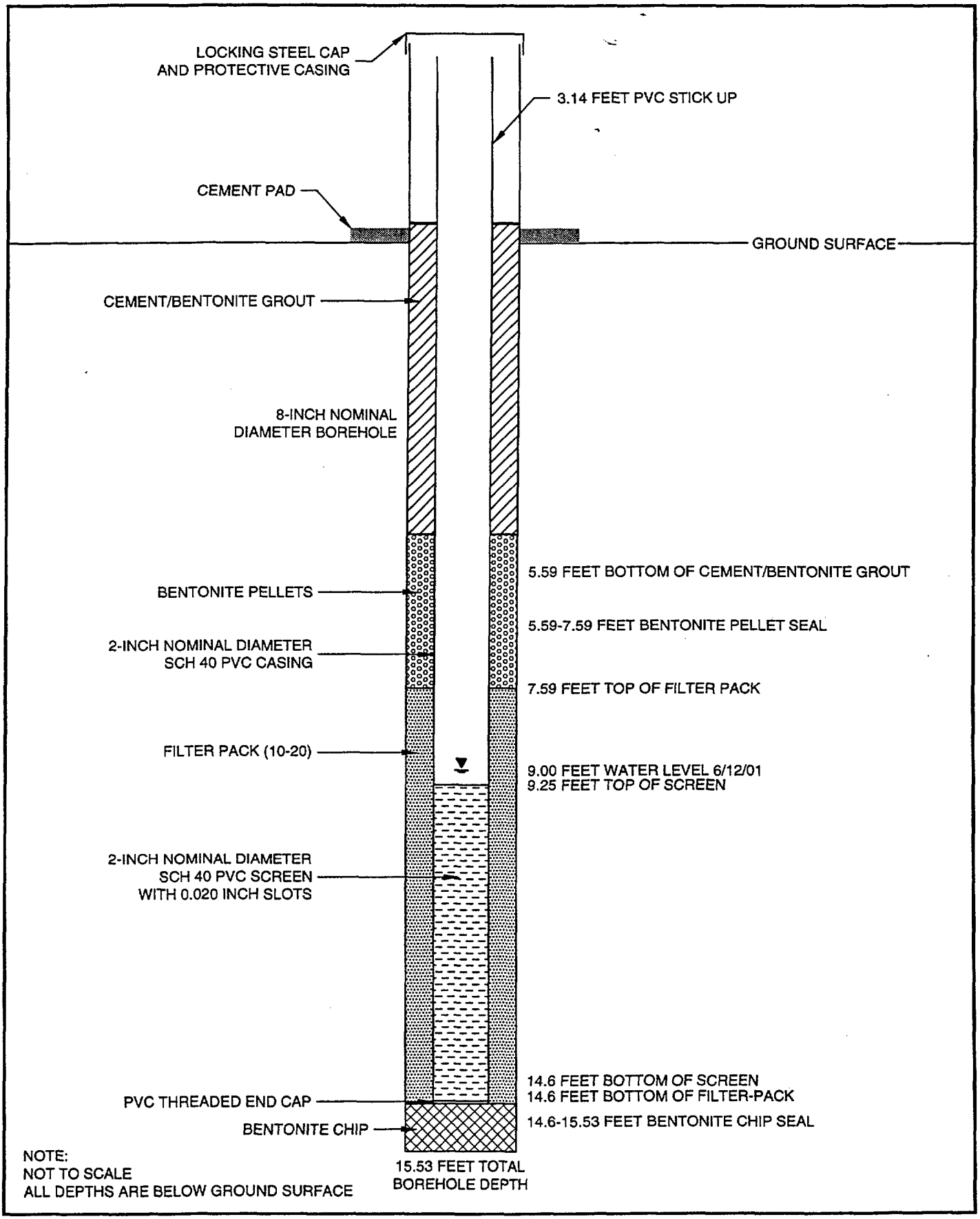


NOTE:
NOT TO SCALE
ALL DEPTHS ARE BELOW GROUND SURFACE

SHEPHERD MILLER
INCORPORATED

MW-117

| | |
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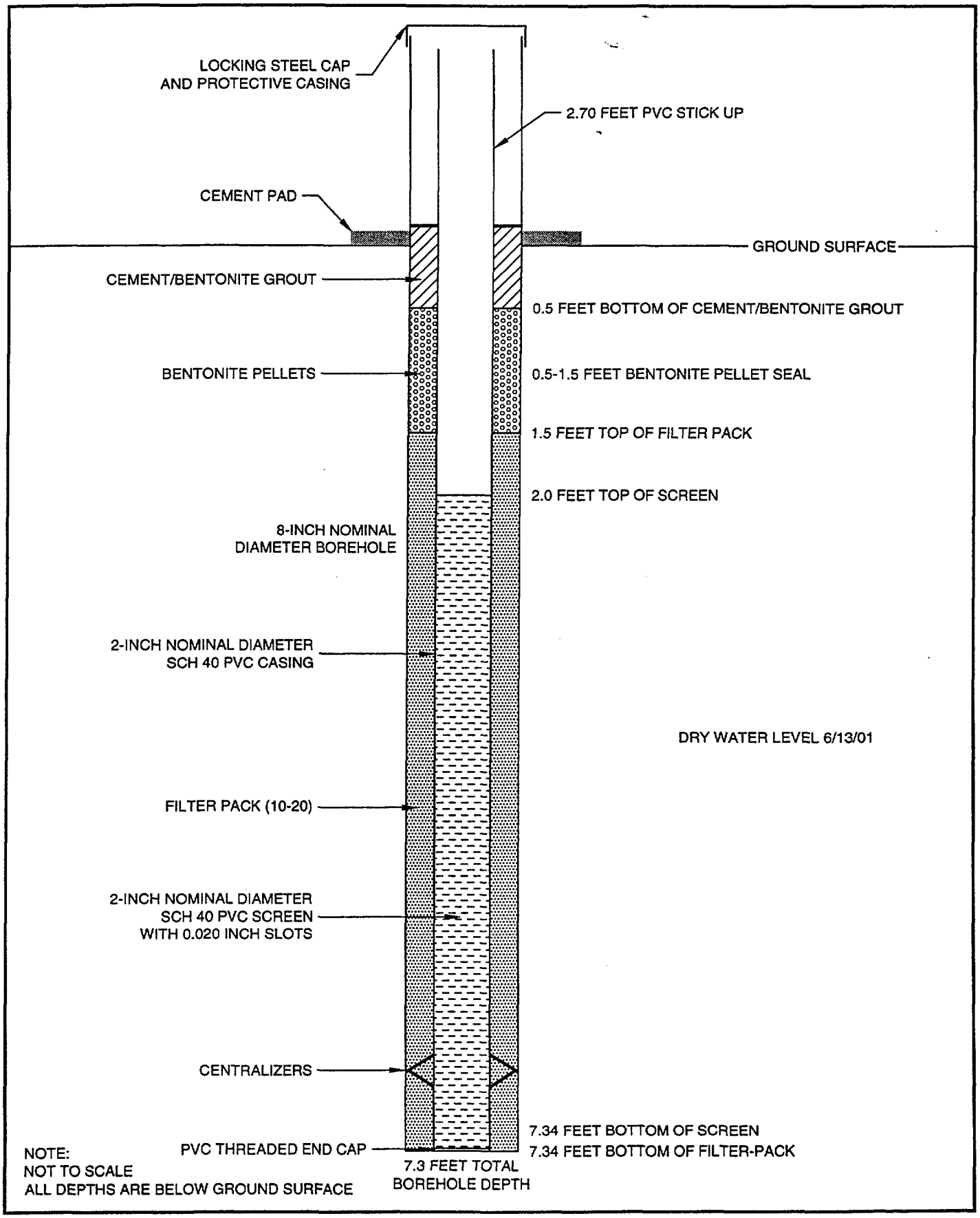


SHEPHERD MILLER
INCORPORATED

MW-118

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| Project: | 100734 |
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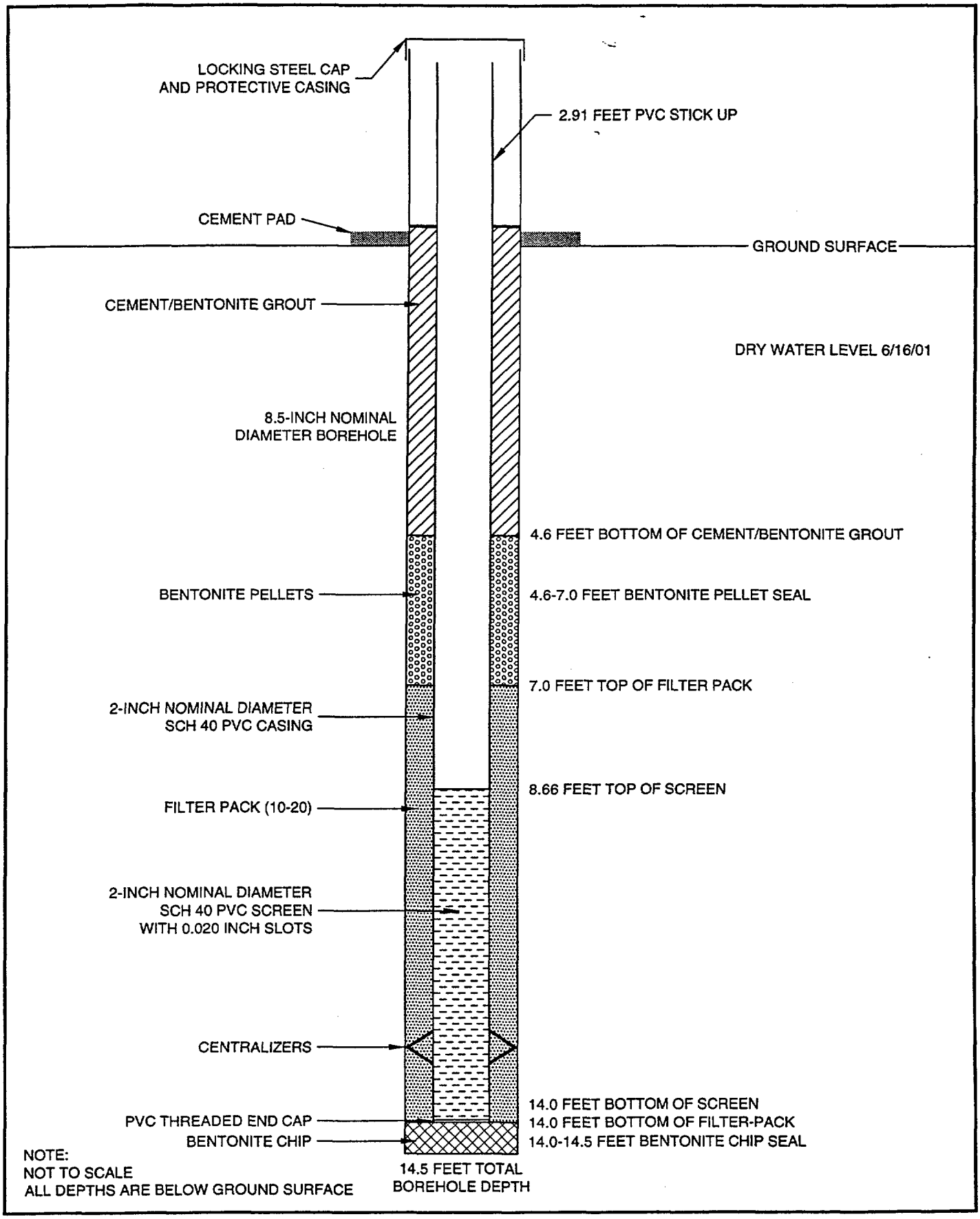
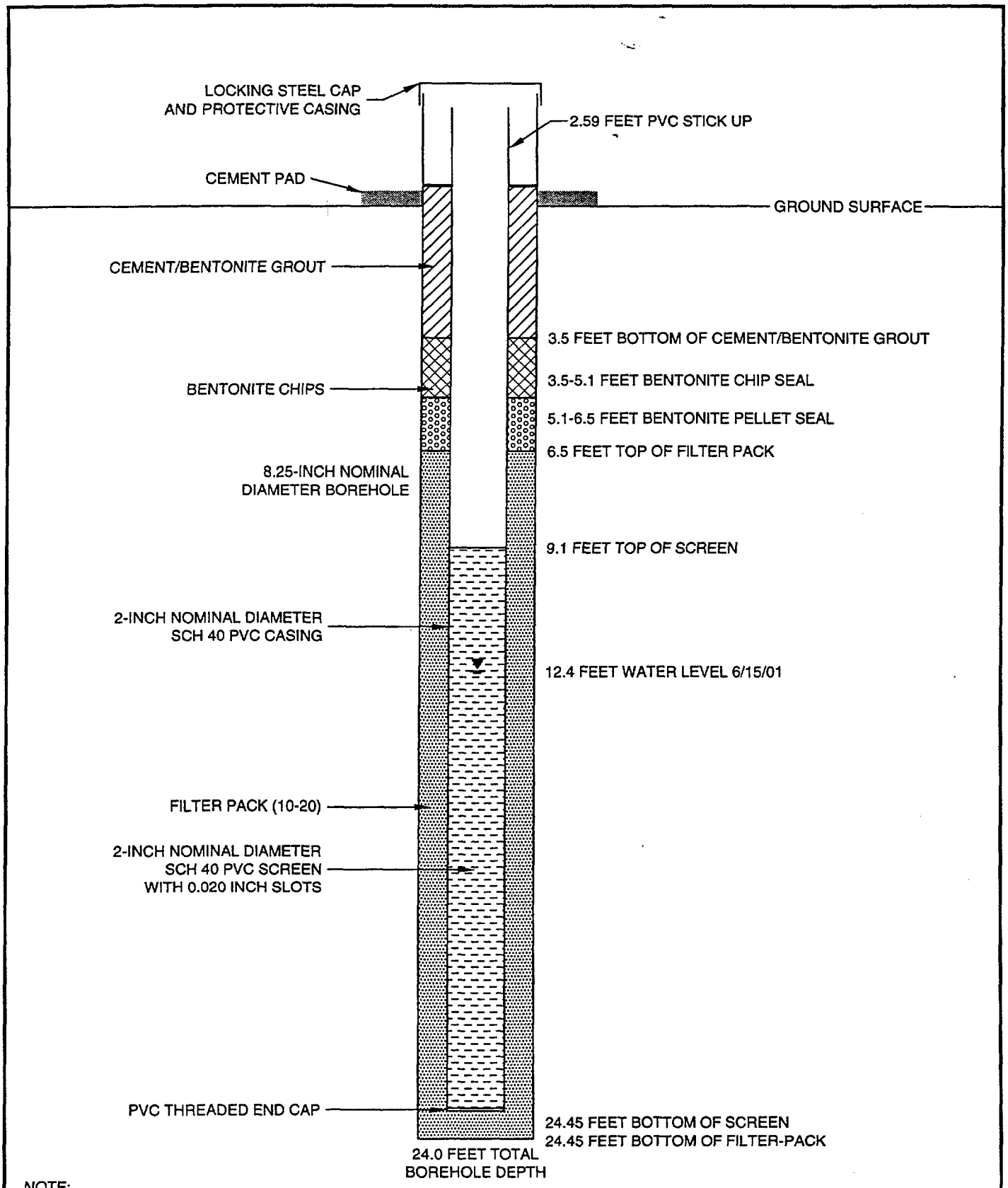



SHEPHERD MILLER
INCORPORATED

MW-119

| | |
|---|---|
| Date: | JUNE 2001 |
| Project: | 100734 |
| File: | WC-MW |




NOTE:
NOT TO SCALE
ALL DEPTHS ARE BELOW GROUND SURFACE

SHEPHERD MILLER
INCORPORATED

MW-120

| | |
|---|---|
| Date: | JUNE 2001 |
| Project: | 100734 |
| File: | WC-MW |

# APPENDIX D

# ELECTRICAL RESISTIVITY SURVEY

Hasbrouck Geophysics, Inc.
*Mining, Groundwater, Environmental & Engineering*

# *Final Report*

# Sequoyah Fuels Electrical Resistivity Survey

for

Shepherd Miller Incorporated
Ft. Collins, Colorado


James C. Hasbrouck
5/10/01

May 10, 2001

2307 James Street
Montrose, Colorado 81401-5287 USA
970-252-8768 (Telephone and Fax)
jim@hasgeo.com (E-Mail)
http://www.hasgeo.com (Homepage)

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**Figures**

## Introduction

This report presents the results of an electrical resistivity survey conducted at the Sequoyah Fuels facility near Gore, Oklahoma under contract to Shepherd Miller Incorporated to aid in locating possible paleochannels and to map general geologic lithology to approximate depths of 20 to 30 feet, or greater. The paleochannels are suspected to contain arsenic and uranium in the groundwater as determined from previous activities on the facility. The geology of the survey area generally consists of alluvium overburden (almost a loess) with alternating sand and shale bedrock. The bedrock sand is well cemented and the shale is somewhat clayey and relatively soft near the top and becomes harder with depth. The bedrock dips at approximately 10° and the paleochannel may cross both the sand and shale units. Given this geologic framework, it is expected that the overburden will be relatively high resistivity, the cemented sand will have a lower but still relatively high resistivity, and the shale will be much lower resistivity, thus electrical property contrasts should exist between the overburden and bedrock suitable for mapping with the resistivity method.

## Data Acquisition

Profile resistivity data were acquired with a leased 56-electrode Advanced Geosciences, Inc. *Sting/Swift* resistivity system in the dipole-dipole electrode configuration along six lines for a total of approximately 3110 linear feet of survey coverage (see Line Location Map). Several electrode locations were surveyed along each line with a Magellan Model 315 GPS receiver using North American Datum of 1983 (NAD83) UTM Zone 15 (meters) to an estimated accuracy of ±3 to 10 feet horizontally (the number of satellites that the receiver located generally dropped from 8 in the morning to 4 or less is the afternoon thus impacting the accuracy of the surveyed positions). The field recorded values were converted to NAD83 Oklahoma North (feet) by Scott Munson of Sequoyah Fuels. Electrodes were located 10 feet apart and dipole lengths ("a" spacings) ranged from 10 to 60 feet with values recorded out six potential electrode pairs ("n" of 6). The general rule-of-thumb for dipole-dipole electrical resistivity surveys is that the "a" spacing is approximately equal to the depth of investigation, therefore this survey was designed to investigate to approximately 60 feet depth. Both the current and potential electrodes were stainless steel stakes driven into the ground at least 6 inches and periodically watered with salt water to lower contact resistances. Lines 1 and 2 utilized all 56 electrodes, line 3 consisted of 56 electrodes plus and additional "roll" of 14 electrodes, and the remaining lines had 48, 49 and 39 electrodes (lines 4, 5 and 6, respectively) because of logistical concerns.

The locations of the lines were cooperatively selected by Jim Hasbrouck of Hasbrouck Geophysics, and Craig Harlin and Scott Munson of Sequoyah Fuels. A total of five lines were located in an area south of the Main Process Building to investigate the possibility of the presence of a paleochannel as suggested by high contaminant concentrations in some monitoring wells near the building. These lines were located such that they could intercept a possible paleochannel extending to the south and southwest from the building per thoughts of Sequoyah Fuels and Shepherd Miller personnel, and also to the southeast per the contention of the Nuclear Regulatory Agency. The remaining survey line was located in the "005 Area" to intersect the axis of another possible paleochannel. The actual field locations of the survey lines were predicated upon the presence of numerous electrical noise sources including a gas pipeline west of Highway 10, metal fences, active power lines just north of the approximate first half of line 4 and about 180 feet

north of the end of line 6, power poles with attached conduit along line 5, concrete walkways with imbedded wire mesh along lines 4 and 5, culverts near lines 5 and 6, and a deactivated power line long line 6. Additional buried electrical noise sources may have also been present particularly along line 4 where a water supply line to the "Decorative Pond" was thought to exist. To acquire noise free data, survey lines should be placed some 100 to 200 feet away from the noise sources as detailed above but that was not always possible within this survey. Underbrush and small trees were removed from about the middle to western ends of lines 1 through 3 and each of these lines began east of relatively large drainages that were present. The drainages presented two problems: 1) difficult removal of vegetation, and 2) inherent introduction of errors into the data from relatively extreme topography.

## Data Processing

The electrical resistivity data were downloaded from the *Sting/Swift* instrument immediately after completion of a line into a laptop computer using a program supplied by the manufacturer that calculated the apparent resistivity using the standard dipole-dipole formula. Only data with errors less than 2% were downloaded. The data were then initially modeled in the field using the *RES2DINV* computer program developed by Dr. M. H. Loke to assist in the location of additional survey lines.

Note that apparent resistivity is the ground resistivity calculated from the field measurements and a geometric factor derived for the case where the ground is homogeneous and isotropic. Apparent resistivity ($\rho_a$) is an Ohm's Law ratio of measured voltage (V) and applied current (I), with a geometric constant (K) which depends upon the electrode array ($\rho_a = KV/I$) and is generally expressed in ohm-meters.

Additional data processing was performed at Hasbrouck Geophysics' facility in Montrose, Colorado using the *RES2DINV* computer program. Any existing bad data points were edited out (generally data points that were obviously too large or small compared with neighboring points), topography was estimated along the line and entered into the data set, a Jacobian matrix calculation was performed for all iterations (generally 4 to 7), and then the data were least-squares inverted using the finite-element method and calculated topographic effects. An inspection of each iteration was made and what was considered best was selected for output into an XYZ format. The XYZ data were edited into a format suitable for plotting with Golden Software's *Surfer* package, and *Surfer* plots of both elevation and depth sections were then constructed for each line.

## Interpretation

Both elevation and depth sections were calculated and plotted for each line. Modeling of the topography was incorporated into each section using a finite-element grid with uniform distortion. Because the surface topography was generally relatively gentle, the topographic modeling entered little error into the sections. However, if lines 1 through 3 had begun further to the east in the drainages then modeling of the topography would distort the appearance of the sections in these areas because of introduced errors.

Overall, the area with the best boring control is between the "Decorative Pond" and the buildings to the north but it contains the most electrical noise sources and resistivity sections with little character. A few borings are just north of line 3 and it is also relatively noise free thus that section will be used as a base to tie the geology with the electrical resistivity data. Relatively high resistivities (yellow to red colors) are present at the surface for about the western half of line 3, dip coincident with the surface to the west, and are interpreted as sandstone. The western-most high resistivities may be influenced some by the presence of a drainage and consequent topographic relief. Borings 63A and 74 indicate that a weathered sandstone or sandstone unit is very shallow which matches well with the resistivity results. The eastern half of line 3 does not appear to have sandstone at the surface and is interpreted as shale with some possible sandstone stringers or possibly a silty clay or sandy shale (green color). Beneath the upper layer a shale unit is interpreted to be present with the darker green to blue colors interpreted as a fissle, organic shale (primarily present in the eastern half of the section) while the moderate to light green colors in the western half may have some silt components within the shale. Beneath this layer a sandstone to sandy shale unit is interpreted to be present with the yellow colors indicating a greater concentration of sand and the light green color indicating more of a sandy shale composition. Beneath this layer the geology is interpreted to trend from a sandy shale to a fissle, organic shale (dark green to blue colors). Given the interpreted geology from the electrical resistivity data along line 3, the sandstone unit at about 20 to 25 feet depth from approximately 75 to 240, 310 to 375 and 440 to 475 feet distance along the line may be either a stratigraphic feature with a greater sand component or perhaps a paleochannel. The possible presence of a paleochannel is somewhat speculative.

Using the interpretation basis presented above, line 2 appears to have a sandstone unit at the surface on the extreme western end (which may be influenced some by the topographic relief of a drainage) and for about the eastern third of the section. The sandstone is not present at the surface for the remaining portions of the line and instead a sandy shale unit is interpreted to be present. The fissle, organic shale unit interpreted in the eastern half of the line at about 10+ feet depth appears to trend to a more sandy shale to the west. The sandstone unit at about 20 to 25 feet depth appears somewhat more continuous than along line 3 with either a relatively cleaner sand or a sand with some gravel components near 350 feet along the line. To determine the actual composition of the unit at this point and to see if it has acted as a paleochannel, it is recommended that a test boring be drilled at approximately 350 feet distance along the line to a depth of 30 to 40 feet. Beneath this interpreted sandstone layer, the geology is interpreted to trend from a sandy shale to a fissle, organic shale as along line 3.

Line 1 is the southern-most line and is located in a relatively flat area and off the small ridge present along lines 2 and 3. Along line 1 it appears that the first two layers interpreted along lines 2 and 3 are not present and instead the sandstone unit seen at about 20 to 25 feet depth along lines 2 and 3 is present at or near the surface along portions of line 1. This interpreted sandstone layer is not present near the middle of the line and instead an interpreted fissle, organic shale layer is present with a sandy shale interpreted beneath it. Along the eastern approximate one-third of the line a thin layer of interpreted fissle, organic shale is present at the surface. The deepest layer shown on the section is interpreted as sandy to fissle, organic shale as along lines 2 and 3. A high resistivity anomaly interpreted as sandstone is present at the surface to an approximate depth of 10 feet at distances along the line from about 100 to 160 or perhaps 180 feet. This may be a

depth extension of the same high resistivity zones seen near the western ends of lines 2 and 3 (if those zones are not caused by topographic relief from the drainage) and may be indicative of a paleochannel. It is recommended that a second test boring be drilled at about 140 feet distance along line 1 to a depth of at least 20 feet.

As discussed previously, several electrical resistivity noise sources are present along both lines 4 and 5. This can have effects of introducing both noise into the sections and also inhibiting current from reaching the potential electrodes. If a grounded, metallic object is present (e.g., power poles with attached conduit, concrete walkways with metal rebar or wire mesh, metal culverts, etc.) some of the current introduced into the ground may go to these noise sources rather that the potential electrodes thus reducing the amount of signal received and decreasing the signal-to-noise ratio.

An active above-ground power line is present about 40 feet north of the western end of line 1 and crosses the line at about 120 and 180 feet along the line. This power line is probably the cause of the low resistivity values to about 180 feet distance along the line at a depth of approximately 10 feet or so. Therefore, this anomaly has no geologic significance. It is difficult to interpret much geology from the resistivity data along this line, but it appears that only interpreted silty clay or sandy shale is present. The borings within the general area indicate that layers of sandstone (ranging in thickness from 1 to 5+ feet) are present. The resistivity data does not pick up these sandstone layers because they may be too thin, have greater silty clay or shale stringer components, or the data are influenced too much by the noise sources. Consequently, the presence of paleochannels cannot be interpreted.

Line 5 appears to have a more layered appearance than line 4 but the interpreted geology from the electrical resistivity data indicates only layers of silty clay, shale, and perhaps a sandy shale at depth. The lone higher resistivity zone (yellow color) near the eastern end of the line at about 45 feet depth may be either noise related or indicative of a shale with more sand. I am hesitant to place much importance on this anomaly. The presence of a very low resistivity layer at the eastern end of the line from the surface to about 15+ feet depth is interpreted as either fissle, organic shale or a buried utility line of some type. From the data along this line, the presence of paleochannels cannot be interpreted.

Along line 6 a clay to clayey silt is interpreted to be at the surface from the south end to about 250 or 350 feet distance along the line and varies in depth from approximately 10 to 20 feet near the south end and pinches out to the north. Beneath this layer a silty clay with perhaps some shale components is present. A fissle, organic shale unit is interpreted to be present at depth for about 250 feet distance along the line (indicated by blue colors) that might have more silty components in the darker green areas. Sandstone in interpreted to be present (yellow color) at about 15 feet depth at approximately 225 feet distance along the line and may indicate a paleochannel. While electrical resistivity noise sources are present on the surface some 15 to 20 feet away from this anomaly they are not thought to be its cause. This interpreted sandstone unit may include some silt as the line progresses towards about 300 feet distance along the line and also is deeper. Beyond about 300 feet distance along the line at depths greater than 30 feet the unit may become a cleaner sandstone (yellow color) or this anomaly could be influenced by the nearby active

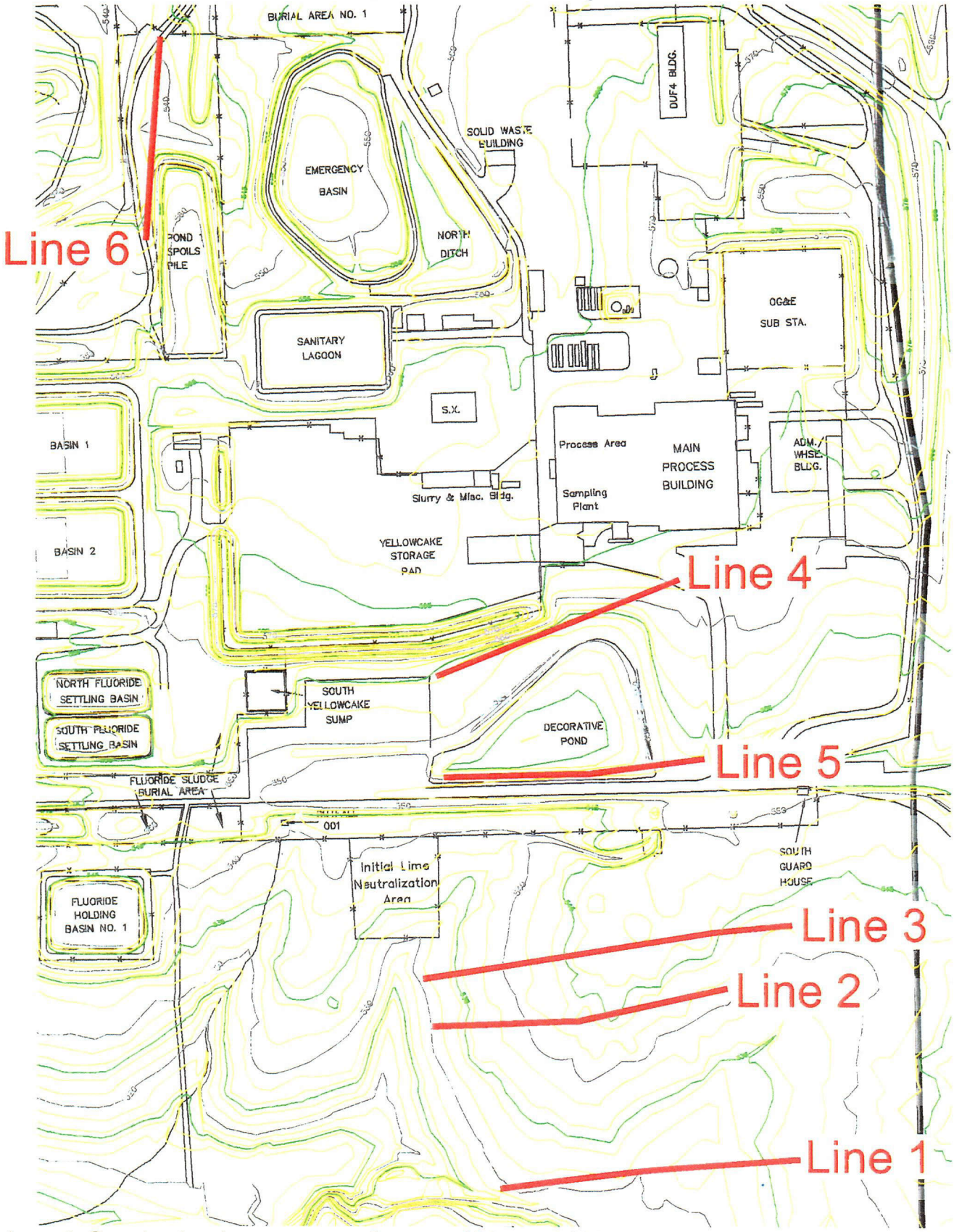
powerline to the north. It is recommended that if a third boring is included within the budget then it be located at 225 feet distance along line 6 and drilled to a depth of at least 30 feet.

**Conclusions and Recommendations**

Electrical resistivity lines 1 through 3 are located in an area relatively free of electrical noise sources and offer the best data for interpretation purposes for the suspected paleochannel originating near the Main Process Building. The lines are restricted in length to the east by a gas pipeline (electrical noise source) and to the west by dense vegetation and the presence of relatively significant topographic relief caused by drainages. The drainage relief would introduce substantial errors into the data because of difficulty in removing the topographic effect through modeling. Lines 4 and 5 are located near the facility and encounter a preponderance of electrical noise sources that adversely affect the data. Line 6 is located in the "005 Area" and contains some noise sources that probably only impact the data slightly. Overall the quality of the data is high except in areas influenced by electrical noise sources.

From interpretation of the data, possible paleochannels may be present within the areas surveyed. Along line 2 a test boring is recommended at approximately 350 feet distance along the line and should be drilled to a depth of 30 to 40 feet. This anomaly may be either a relatively cleaner sand or a sand with some gravel components. The test boring should help determine the actual composition of the unit at this location and perhaps see if it has acted as a paleochannel. A second test boring is recommended along line 1 at about 140 feet distance along the line. This boring should be drilled to at least 20 feet depth and will investigate whether a paleochannel is present and perhaps indicate if it is a depth extension of the high resistivity zones near the western ends of lines 2 and 3 or if topographic effects from the drainage are causing the anomalies along those two lines. It does not appear that paleochannels are present to the east of lines 1 through 3 as postulated by the NRC. If sufficient budget is available, a third test boring should be drilled about 225 feet distance along line 6 to a depth of at least 30 feet to investigate the possible presence of a paleochannel.

# Electrical Resistivity Survey
# Line Location Map




Hasbrouck Geophysics, Inc.
Montrose, Colorado
May 2001

0 200 400
Feet (approx.)

LineLocations.cdr

C01

# APPENDIX E

# LABORATORY CHEMICAL ANALYSIS REPORT SHEETS

## LABORATORY ANALYSIS REPORT - SHEPHERD MILLER INCORPORATED
## SEQUOYAH FUELS SEQUENTIAL LEACH STUDY

**Report Date: July 7, 2001**

| Sample ID: | MW 110 Test Water | Location 7 Shale 1 | Leach Test 1 For 7-1 | Leach Test 2 For 7-1 | Leach Test 3 For 7-1 | Leach Test 4 For 7-1 | Leach Test 5 For 7-1 | Leach Test 6 For 7-1 | Leach Test 7 For 7-1 | Post Test Residual Location 7 Shale 1 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | June 5, 2001 | May 21, 2001 | | | | | | | | |
| Received Date: | 06-06-01 | 05-26-01 | 06-14-01 | 06-15-01 | 06-16-01 | 06-17-01 | 06-18-01 | 06-19-01 | 07-25-01 | 06-25-01 |
| Sample Matrix/Units: | Water - mg/L | Soil - mg/kg | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Soil - mg/kg |
| Laboratory ID: | 01-33555-1 | 01-33555-2 | 01-33555-9 | 01-33555-16 | 01-33555-23 | 01-33555-30 | 01-33555-37 | 01-33555-44 | 01-34683-2 | 01-33555-52 |
| Initial Mass, gm: | NA | NA | 50 | NA | NA | NA | NA | NA | NA | Final Mass 48.3g |
| Added Volume, mL: | NA | NA | 100 | 100 | 100 | 100 | 100 | 100 | 100 | NA |
| Recovered Volume, mL: | NA | NA | 64 | 103 | 96 | 97 | 95 | 101 | NA | NA |

| Major Ions | Results | Results | Results | Results | Results | Results | Results | Results | Results | Results |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 110 | 3730 | 246 | 184 | 156 | 138 | 127 | 120 | | 3630 |
| Magnesium | 45.9 | 2570 | 78.8 | 59.9 | 51.4 | 46.3 | 43.7 | 42.0 | | 3140 |
| Sodium | 849 | 252 | 565 | 662 | 706 | 743 | 752 | 762 | | 2010 |
| Potassium | 2.9 | 1970 | 2.2 | 2.3 | 1.7 | 2.0 | 1.9 | 2.1 | | 3490 |
| Carbonate | < 1.0 | | | | | | | | < 1.0 | |
| Bicarbonate | 415 | | | | | | | | 366 | |
| Sulfate | 1750 | as S 45.7 | 1640 | 1710 | 1630 | 1650 | 1640 | 1630 | | 464 |
| Chloride | 9.4 | 156 | 10.2 | 6.4 | 7.9 | 7.4 | 7.3 | 9.3 | | 278 |
| Silica as $SiO_2$ | 9.1 | NA | 11.6 | 9.0 | 7.8 | 7.3 | 6.5 | 6.0 | | NA |

| Non-Metals | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| % Moisture | NA | 8.88 | | | | | | | | 72.70 |
| pH | 8.12 | NA | | | | | | | 8.30 | NA |

| Trace Metals | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | < 0.10 | 18100 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | | 12600 |
| Arsenic | 0.001 | 7.70 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | | 11.9 |
| Iron | < 0.03 | 29900 | < 0.03 | < 0.05 | < 0.05 | < 0.05 | 0.08 | < 0.05 | | 28900 |
| Phosphorus | < 1.0 | 288 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | | 419 |
| Vanadium | < 0.10 | 31.0 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | | 40.5 |
| Uranium | 0.0024 | 433 | 18.5 | 30.3 | 30.7 | 24.5 | 17.3 | 11.0 | | 88.5 |

## LABORATORY ANALYSIS REPORT - SHEPHERD MILLER INCORPORATED
## SEQUOYAH FUELS SEQUENTIAL LEACH STUDY

**Report Date:** July 7, 2001

| Sample ID: | MW 110 Test Water | Location 8 Shale 2 | Leach Test 1 For 8-2 | Leach Test 2 For 8-2 | Leach Test 3 For 8-2 | Leach Test 4 For 8-2 | Leach Test 5 For 8-2 | Leach Test 6 For 8-2 | Leach Test 7 For 8-2 | Post Test Residual Location 8 Shale 2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | June 5, 2001 | June 3, 2001 | | | | | | | | |
| Received Date: | 06-06-01 | 06-05-01 | 06-14-01 | 06-15-01 | 06-16-01 | 06-17-01 | 06-18-01 | 06-19-01 | 07-25-01 | 06-25-01 |
| Sample Matrix/Units: | Water - mg/L | Soil - mg/kg | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Soil - mg/kg |
| Laboratory ID: | 01-33555-1 | 01-33555-4 | 01-33555-11 | 01-33555-18 | 01-33555-25 | 01-33555-32 | 01-33555-39 | 01-33555-46 | 01-34683-3 | 01-33555-53 |
| Initial Mass, gm: | NA | NA | 50 | NA | NA | NA | NA | NA | NA | Final Mass 49.1 g |
| Added Volume, mL: | NA | NA | 100 | 100 | 100 | 100 | 100 | 100 | 100 | NA |
| Recovered Volume, mL: | NA | NA | 74 | 100 | 96 | 103 | 99 | 101 | NA | NA |

| Major Ions | Results | Results | Results | Results | Results | Results | Results | Results | Results | Results |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 110 | 5950 | 141 | 125 | 109 | 105 | 104 | 104 | | 8550 |
| Magnesium | 45.9 | 1610 | 54.9 | 49.0 | 43.7 | 42.1 | 42.0 | 42.2 | | 2130 |
| Sodium | 849 | 157 | 624 | 733 | 741 | 775 | 778 | 789 | | 1140 |
| Potassium | 2.9 | 1240 | 2.0 | 2.5 | 2.0 | 2.3 | 2.4 | 2.6 | | 2040 |
| Carbonate | < 1.0 | | | | | | | | 4.0 | |
| Bicarbonate | 415 | | | | | | | | 335 | |
| Sulfate | 1750 | as S 33.8 | 1580 | 1720 | 1580 | 1630 | 1640 | 1670 | | 343 |
| Chloride | 9.4 | 108 | 9.1 | 5.8 | 6.9 | 8.9 | 7.7 | 7.9 | | 270 |
| Silica as $SiO_2$ | 9.1 | NA | 11.3 | 10.4 | 8.8 | 9.0 | 8.8 | 8.4 | | NA |
| **Non-Metals** | | | | | | | | | | |
| % Moisture | NA | 9.82 | | | | | | | | 61.30 |
| pH | 8.12 | NA | | | | | | | 8.33 | NA |
| **Trace Metals** | | | | | | | | | | |
| Aluminum | < 0.10 | 11200 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | | 9150 |
| Arsenic | 0.001 | 3.75 | 0.004 | 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | | 5.65 |
| Iron | < 0.03 | 97500 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | | 95500 |
| Phosphorus | < 1.0 | 2850 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | | 3270 |
| Vanadium | < 0.10 | 42.0 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | | 48.0 |
| Uranium | 0.0024 | 2.55 | 0.015 | 0.025 | 0.024 | 0.022 | 0.020 | 0.019 | | 3.10 |

## LABORATORY ANALYSIS REPORT - SHEPHERD MILLER INCORPORATED
## SEQUOYAH FUELS SEQUENTIAL LEACH STUDY

**Report Date: July 7, 2001**

| Sample ID: | MW 110 Test Water | Location 8 Shale 3 | Leach Test 1 For 8-3 | Leach Test 2 For 8-3 | Leach Test 3 For 8-3 | Leach Test 4 For 8-3 | Leach Test 5 For 8-3 | Leach Test 6 For 8-3 | Leach Test 7 For 8-3 | Post Test Residual Location 8 Shale 3 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | June 5, 2001 | June 3, 2001 | | | | | | | | |
| Received Date: | 06-06-01 | 06-05-01 | 06-14-01 | 06-15-01 | 06-16-01 | 06-17-01 | 06-18-01 | 06-19-01 | 07-25-01 | 06-25-01 |
| Sample Matrix/Units: | Water - mg/L | Soil - mg/kg | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Soil - mg/kg |
| Laboratory ID: | 01-33555-1 | 01-33555-3 | 01-33555-10 | 01-33555-17 | 01-33555-24 | 01-33555-31 | 01-33555-38 | 01-33555-45 | 01-34683-4 | 01-33555-54 |
| Initial Mass, gm: | NA | NA | 50 | NA | NA | NA | NA | NA | NA | Final Mass 49.95g |
| Added Volume, mL: | NA | NA | 100 | 100 | 100 | 100 | 100 | 100 | 100 | NA |
| Recovered Volume, mL: | NA | NA | 74 | 99 | 93 | 102 | 97 | 101 | NA | NA |

| Major Ions | Results | Results | Results | Results | Results | Results | Results | Results | Results | Results |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 110 | 2020 | 157 | 128 | 111 | 108 | 110 | 110 | | 2450 |
| Magnesium | 45.9 | 3080 | 60.5 | 50.9 | 45.0 | 44.3 | 45.5 | 45.6 | | 3450 |
| Sodium | 849 | 228 | 714 | 771 | 755 | 777 | 788 | 797 | | 985 |
| Potassium | 2.9 | 1460 | 8.2 | 7.9 | 6.5 | 6.9 | 6.7 | 6.4 | | 2160 |
| Carbonate | < 1.0 | | | | | | | | 4.7 | |
| Bicarbonate | 415 | | | | | | | | 363 | |
| Sulfate | 1750 | as S 1890 | 1730 | 1730 | 1600 | 1650 | 1680 | 1710 | | 1940 |
| Chloride | 9.4 | 97.5 | 6.2 | 5.8 | 7.8 | 7.1 | 8.4 | 6.7 | | 298 |
| Silica as $SiO_2$ | 9.1 | NA | 5.7 | 6.1 | 5.9 | 6.5 | 6.9 | 6.9 | | NA |
| **Non-Metals** | | | | | | | | | | |
| % Moisture | NA | 2.24 | | | | | | | | 65.20 |
| pH | 8.12 | NA | | | | | | | 8.34 | NA |
| **Trace Metals** | | | | | | | | | | |
| Aluminum | < 0.10 | 12500 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | | 9700 |
| Arsenic | 0.001 | 11.1 | 0.006 | 0.005 | 0.004 | 0.004 | 0.003 | 0.003 | | 11.9 |
| Iron | < 0.03 | 21400 | < 0.03 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | 0.18 | | 18400 |
| Phosphorus | < 1.0 | 200 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | | 197 |
| Vanadium | < 0.10 | 33.0 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | | 36.0 |
| Uranium | 0.0024 | 0.450 | 0.142 | 0.104 | 0.072 | 0.054 | 0.036 | 0.016 | | 0.650 |

**LABORATORY ANALYSIS REPORT - SHEPHERD MILLER INCORPORATED**
**SEQUOYAH FUELS SEQUENTIAL LEACH STUDY**

**Report Date: July 7, 2001**

| Sample ID: | MW 110 Test Water | Location 8 Shale 4 | Leach Test 1 For 8-4 | Leach Test 2 For 8-4 | Leach Test 3 For 8-4 | Leach Test 4 For 8-4 | Leach Test 5 For 8-4 | Leach Test 6 For 8-4 | Leach Test 7 For 8-4 | Post Test Residual Location 8 Shale 4 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | June 5, 2001 | June 3, 2001 | | | | | | | | |
| Received Date: | 06-06-01 | 06-05-01 | 06-14-01 | 06-15-01 | 06-16-01 | 06-17-01 | 06-18-01 | 06-19-01 | 07-25-01 | 06-25-01 |
| Sample Matrix/Units: | Water - mg/L | Soil - mg/kg | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Soil - mg/kg |
| Laboratory ID: | 01-33555-1 | 01-33555-5 | 01-33555-12 | 01-33555-19 | 01-33555-26 | 01-33555-33 | 01-33555-40 | 01-33555-47 | 01-34683-5 | 01-33555-55 |
| Initial Mass, gm: | NA | NA | 50 | NA | NA | NA | NA | NA | NA | Final Mass 49.6 g |
| Added Volume, mL: | NA | NA | 100 | 100 | 100 | 100 | 100 | 100 | 100 | NA |
| Recovered Volume, mL: | NA | NA | 76 | 100 | 84 | 102 | 97 | 102 | NA | NA |

| Major Ions | Results | Results | Results | Results | Results | Results | Results | Results | Results | Results |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 110 | 3440 | 120 | 118 | 110 | 110 | 112 | 109 | | 3660 |
| Magnesium | 45.9 | 5660 | 46.7 | 47.1 | 44.5 | 45.0 | 46.2 | 45.5 | | 5940 |
| Sodium | 849 | 920 | 767 | 814 | 777 | 789 | 779 | 785 | | 1560 |
| Potassium | 2.9 | 3650 | 9.4 | 10.1 | 8.8 | 9.2 | 8.9 | 8.3 | | 3740 |
| Carbonate | < 1.0 | | | | | | | | 4.7 | |
| Bicarbonate | 415 | | | | | | | | 363 | |
| Sulfate | 1750 | as S 2500 | 1760 | 1820 | 1670 | 1680 | 1690 | 1690 | | 2840 |
| Chloride | 9.4 | 120 | 6.4 | 5.8 | 7.3 | 7.8 | 7.2 | 7.2 | | 358 |
| Silica as $SiO_2$ | 9.1 | NA | 4.2 | 4.7 | 4.4 | 4.9 | 8.8 | 5.0 | | NA |
| **Non-Metals** | | | | | | | | | | |
| % Moisture | NA | 4.82 | | | | | | | | 85.70 |
| pH | 8.12 | NA | | | | | | | 8.36 | NA |
| **Trace Metals** | | | | | | | | | | |
| Aluminum | < 0.10 | 34500 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | | 13300 |
| Arsenic | 0.001 | 7.30 | 0.002 | 0.002 | 0.002 | 0.001 | < 0.001 | 0.001 | | 7.35 |
| Iron | < 0.03 | 40600 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | 0.07 | | 31150 |
| Phosphorus | < 1.0 | 625 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | | 520 |
| Vanadium | < 0.10 | 60.5 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | | 52.0 |
| Uranium | 0.0024 | 0.600 | 0.031 | 0.020 | 0.013 | 0.011 | 0.009 | 0.005 | | 0.550 |

## LABORATORY ANALYSIS REPORT - SHEPHERD MILLER INCORPORATED
## SEQUOYAH FUELS SEQUENTIAL LEACH STUDY

**Report Date:** July 7, 2001

| Sample ID: | MW 110 Test Water | Location 9 Shale 3 | Leach Test 1 For 9-3 | Leach Test 2 For 9-3 | Leach Test 3 For 9-3 | Leach Test 4 For 9-3 | Leach Test 5 For 9-3 | Leach Test 6 For 9-3 | Leach Test 7 For 9-3 | Post Test Residual Location 9 Shale 3 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | June 5, 2001 | May 19, 2001 | | | | | | | | |
| Received Date: | 06-06-01 | 05-26-01 | 06-14-01 | 06-15-01 | 06-16-01 | 06-17-01 | 06-18-01 | 06-19-01 | 07-25-01 | 06-25-01 |
| Sample Matrix/Units: | Water - mg/L | Soil - mg/kg | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Soil - mg/kg |
| Laboratory ID: | 01-33555-1 | 01-33555-6 | 01-33555-13 | 01-33555-20 | 01-33555-27 | 01-33555-34 | 01-33555-41 | 01-33555-48 | 01-34683-6 | 01-33555-56 |
| Initial Mass, gm: | NA | NA | 50 | NA | NA | NA | NA | NA | NA | Final Mass 48.3 g |
| Added Volume, mL: | NA | NA | 100 | 100 | 100 | 100 | 100 | 100 | 100 | NA |
| Recovered Volume, mL: | NA | NA | 74 | 100 | 95 | 99 | 99 | 100 | NA | NA |

| Major Ions | Results | Results | Results | Results | Results | Results | Results | Results | Results | Results |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 110 | 2200 | 194 | 155 | 133 | 121 | 118 | 115 | | 1930 |
| Magnesium | 45.9 | 2260 | 56.1 | 47.0 | 42.1 | 39.2 | 40.2 | 40.1 | | 2950 |
| Sodium | 849 | 150 | 629 | 739 | 755 | 767 | 778 | 789 | | 1580 |
| Potassium | 2.9 | 1260 | 1.6 | 1.8 | 1.5 | 1.8 | 1.9 | 2.0 | | 2450 |
| Carbonate | < 1.0 | | | | | | | | 4.3 | |
| Bicarbonate | 415 | | | | | | | | 358 | |
| Sulfate | 1750 | as S 46.6 | 1660 | 1720 | 1630 | 1620 | 1660 | 1660 | | 382 |
| Chloride | 9.4 | 80.7 | 15.7 | 10.2 | 9.4 | 8.1 | 8.3 | 8.4 | | 421 |
| Silica as $SiO_2$ | 9.1 | NA | 6.8 | 6.9 | 6.4 | 6.7 | 6.7 | 6.8 | | NA |
| **Non-Metals** | | | | | | | | | | |
| % Moisture | NA | 4.70 | | | | | | | | 63.40 |
| pH | 8.12 | NA | | | | | | | 8.33 | NA |
| **Trace Metals** | | | | | | | | | | |
| Aluminum | < 0.10 | 13100 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | | 10800 |
| Arsenic | 0.001 | 7.35 | 0.018 | 0.006 | 0.002 | 0.002 | 0.001 | < 0.001 | | 9.75 |
| Iron | < 0.03 | 26100 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | | 24800 |
| Phosphorus | < 1.0 | 300 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | | 215 |
| Vanadium | < 0.10 | 37.5 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | | 45.5 |
| Uranium | 0.0024 | 0.350 | 0.012 | 0.010 | 0.009 | 0.009 | 0.007 | 0.013 | | 0.450 |

## LABORATORY ANALYSIS REPORT - SHEPHERD MILLER INCORPORATED
## SEQUOYAH FUELS SEQUENTIAL LEACH STUDY

**Report Date: July 7, 2001**

| Sample ID: | MW 110 Test Water | Location 9 Shale 4 | Leach Test 1 For 9-4 | Leach Test 2 For 9-4 | Leach Test 3 For 9-4 | Leach Test 4 For 9-4 | Leach Test 5 For 9-4 | Leach Test 6 For 9-4 | Leach Test 7 For 9-4 | Post Test Residual Location 9 Shale 4 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | June 5, 2001 | May 19, 2001 | | | | | | | | |
| Received Date: | 06-06-01 | 05-26-01 | 06-14-01 | 06-15-01 | 06-16-01 | 06-17-01 | 06-18-01 | 06-19-01 | 07-25-01 | 06-25-01 |
| Sample Matrix/Units: | Water - mg/L | Soil - mg/kg | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Soil - mg/kg |
| Laboratory ID: | 01-33555-1 | 01-33555-7 | 01-33555-14 | 01-33555-21 | 01-33555-28 | 01-33555-35 | 01-33555-42 | 01-33555-49 | 01-34683-7 | 01-33555-57 |
| Initial Mass, gm: | NA | NA | 50 | NA | NA | NA | NA | NA | NA | Final Mass 48.7 g |
| Added Volume, mL: | NA | NA | 100 | 100 | 100 | 100 | 100 | 100 | 100 | NA |
| Recovered Volume, mL: | NA | NA | 74 | 100 | 95 | 99 | 99 | 100 | NA | NA |

| Major Ions | Results | Results | Results | Results | Results | Results | Results | Results | Results | Results |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 110 | 3790 | 169 | 148 | 128 | 123 | 119 | 115 | | 3930 |
| Magnesium | 45.9 | 5010 | 56.0 | 51.3 | 45.7 | 44.8 | 44.7 | 44.1 | | 5720 |
| Sodium | 849 | 496 | 667 | 765 | 758 | 770 | 768 | 781 | | 1500 |
| Potassium | 2.9 | 2170 | 9.7 | 10.1 | 8.9 | 9.5 | 8.9 | 8.6 | | 2450 |
| Carbonate | < 1.0 | | | | | | | | < 1.0 | |
| Bicarbonate | 415 | | | | | | | | 356 | |
| Sulfate | 1750 | as S 2880 | 1720 | 1810 | 1670 | 1670 | 1680 | 1690 | | 4450 |
| Chloride | 9.4 | 164 | 5.0 | 4.9 | 7.7 | 7.6 | 7.8 | 7.2 | | 481 |
| Silica as $SiO_2$ | 9.1 | NA | 4.1 | 4.6 | 4.3 | 4.8 | 4.9 | 5.0 | | NA |
| **Non-Metals** | | | | | | | | | | |
| % Moisture | NA | 5.55 | | | | | | | | 79.90 |
| pH | 8.12 | NA | | | | | | | 8.18 | NA |
| **Trace Metals** | | | | | | | | | | |
| Aluminum | < 0.10 | 23600 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | | 13200 |
| Arsenic | 0.001 | 20.1 | 0.002 | 0.002 | 0.001 | 0.001 | 0.001 | 0.001 | | 18.0 |
| Iron | < 0.03 | 36900 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | | 31400 |
| Phosphorus | < 1.0 | 755 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | | 575 |
| Vanadium | < 0.10 | 45.5 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | | 53.0 |
| Uranium | 0.0024 | 0.550 | 0.023 | 0.015 | 0.010 | 0.008 | 0.007 | 0.008 | | 0.550 |

## LABORATORY ANALYSIS REPORT - SHEPHERD MILLER INCORPORATED
## SEQUOYAH FUELS SEQUENTIAL LEACH STUDY

**Report Date: July 7, 2001**

| Sample ID: | MW 110 Test Water | Location 10 Shale 1 | Leach Test 1 For 10-1 | Leach Test 2 For 10-1 | Leach Test 3 For 10-1 | Leach Test 4 For 10-1 | Leach Test 5 For 10-1 | Leach Test 6 For 10-1 | Leach Test 7 For 10-1 | Post Test Residual Location 10 Shale 1 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | June 5, 2001 | May 21, 2001 | | | | | | | | |
| Received Date: | 06-06-01 | 05-26-01 | 06-14-01 | 06-15-01 | 06-16-01 | 06-17-01 | 06-18-01 | 06-19-01 | 07-25-01 | 06-25-01 |
| Sample Matrix/Units: | Water - mg/L | Soil - mg/kg | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Water - mg/L | Soil - mg/kg |
| Laboratory ID: | 01-33555-1 | 01-33555-8 | 01-33555-15 | 01-33555-22 | 01-33555-29 | 01-33555-36 | 01-33555-43 | 01-33555-50 | 01-34683-8 | 01-33555-58 |
| Initial Mass, gm: | NA | NA | 50 | NA | NA | NA | NA | NA | NA | Final Mass 47.1 g |
| Added Volume, mL: | NA | NA | 100 | 100 | 100 | 100 | 100 | 100 | 100 | NA |
| Recovered Volume, mL: | NA | NA | 67 | 98 | 99 | 97 | 96 | 100 | NA | NA |

| Major Ions | Results | Results | Results | Results | Results | Results | Results | Results | Results | Results |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 110 | 4830 | 168 | 151 | 133 | 125 | 122 | 117 | | 4050 |
| Magnesium | 45.9 | 3130 | 51.2 | 47.0 | 42.3 | 40.0 | 40.0 | 39.1 | | 3330 |
| Sodium | 849 | 410 | 1160 | 728 | 718 | 746 | 762 | 775 | | 2120 |
| Potassium | 2.9 | 1950 | 2.0 | 2.1 | 1.8 | 2.0 | 1.9 | 2.1 | | 3460 |
| Carbonate | < 1.0 | | | | | | | | < 1.0 | |
| Bicarbonate | 415 | | | | | | | | 350 | |
| Sulfate | 1750 | as S na | 1690 | 1750 | 1640 | 1630 | 1650 | 1660 | | 500 |
| Chloride | 9.4 | na | 29.4 | 14.5 | 8.4 | 8.8 | 8.1 | 7.3 | | 352 |
| Silica as $SiO_2$ | 9.1 | NA | 12.5 | 9.6 | 9.5 | 7.4 | 6.8 | 6.6 | | NA |
| **Non-Metals** | | | | | | | | | | |
| % Moisture | NA | 9.24 | | | | | | | | 85.60 |
| pH | 8.12 | NA | | | | | | | 8.19 | NA |
| **Trace Metals** | | | | | | | | | | |
| Aluminum | < 0.10 | 22000 | < 0.10 | < 0.10 | 0.40 | < 0.10 | < 0.10 | < 0.10 | | 13000 |
| Arsenic | 0.001 | 11.0 | 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | | 12.0 |
| Iron | < 0.03 | 35200 | < 0.05 | < 0.05 | 0.23 | < 0.05 | < 0.05 | < 0.05 | | 29600 |
| Phosphorus | < 1.0 | 520 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | | 400 |
| Vanadium | < 0.10 | 38.0 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | | 47.0 |
| Uranium | 0.0024 | 1.25 | 0.005 | 0.007 | 0.017 | 0.013 | 0.018 | 0.022 | | 1.30 |

# QUALITY ASSURANCE REPORT
## SHEPHERD MILLER INCORPORATED

**Laboratory ID Range:** 01-33555-1-58
**Report Date:** July 9, 2001

| Major Ions | Method | $RPD_1$ | $Spike_2$ | Analyst | Date Analyzed |
|---|---|---|---|---|---|
| Calcium | EPA 200.7 | 0.7 | 95 | jal | 06-18-01 |
| Magnesium | EPA 200.7 | 0.8 | 95 | jal | 06-18-01 |
| Sodium | EPA 200.7 | 0.3 | 91 | jal | 06-18-01 |
| Potassium | EPA 200.7 | 0.6 | 92 | jal | 06-18-01 |
| Carbonate | SM 2320-B | 1.0 | - | nlm | 06-14-01 |
| Bicarbonate | SM 2320-B | 1.0 | - | nlm | 06-14-01 |
| Sulfate | EPA 200.7 | 1.6 | 93 | jal | 06-18-01 |
| Chloride | EPA 200.7 | 1.6 | 90 | jal | 06-18-01 |

| PARAMETERS with 48 hour holding time | | | | | Date/Time Analyzed |
|---|---|---|---|---|---|
| | SM 4500-H-B | 1.0 | 102 | nlm | 06-14-01 15:27 |
| **Non-Metals** | | | | | |
| Moisture | USDA No. 60/26 Mod. | - | - | rcb | 06-18-01 |
| **Trace Metals** | | | | | |
| Aluminum | EPA 200.8 | 1.1 | 90 | ts | 06-27-01 |
| Arsenic | EPA 200.8 | 2.6 | 90 | ts | 06-27-01 |
| Iron | EPA 200.7 | 1.1 | 89 | jal | 06-18-01 |
| **Radiometrics** | | | | | |
| Uranium | EPA 200.8 | 1.7 | 103 | ts | 06-27-01 |
| **Extraction** | | | | | |
| Total Metals Digest | EPA 200.2 | - | - | rcb | 06-18-01 |

NOTES:

(1) These values are an assessment of analytical precision. The acceptance range is 0-20% for sample results above 10 times the reporting limit. This range is not applicable to samples with results below 10 times the reporting limit.

(2) These values are an assessment of analytical accuracy. They are a percent recovery of the spike addition. ELI performs a matrix spike on 10 percent of all samples for each analytical method.

# APPENDIX F

# TRANSPORT CALIBRATION CHEMOGRAPHS

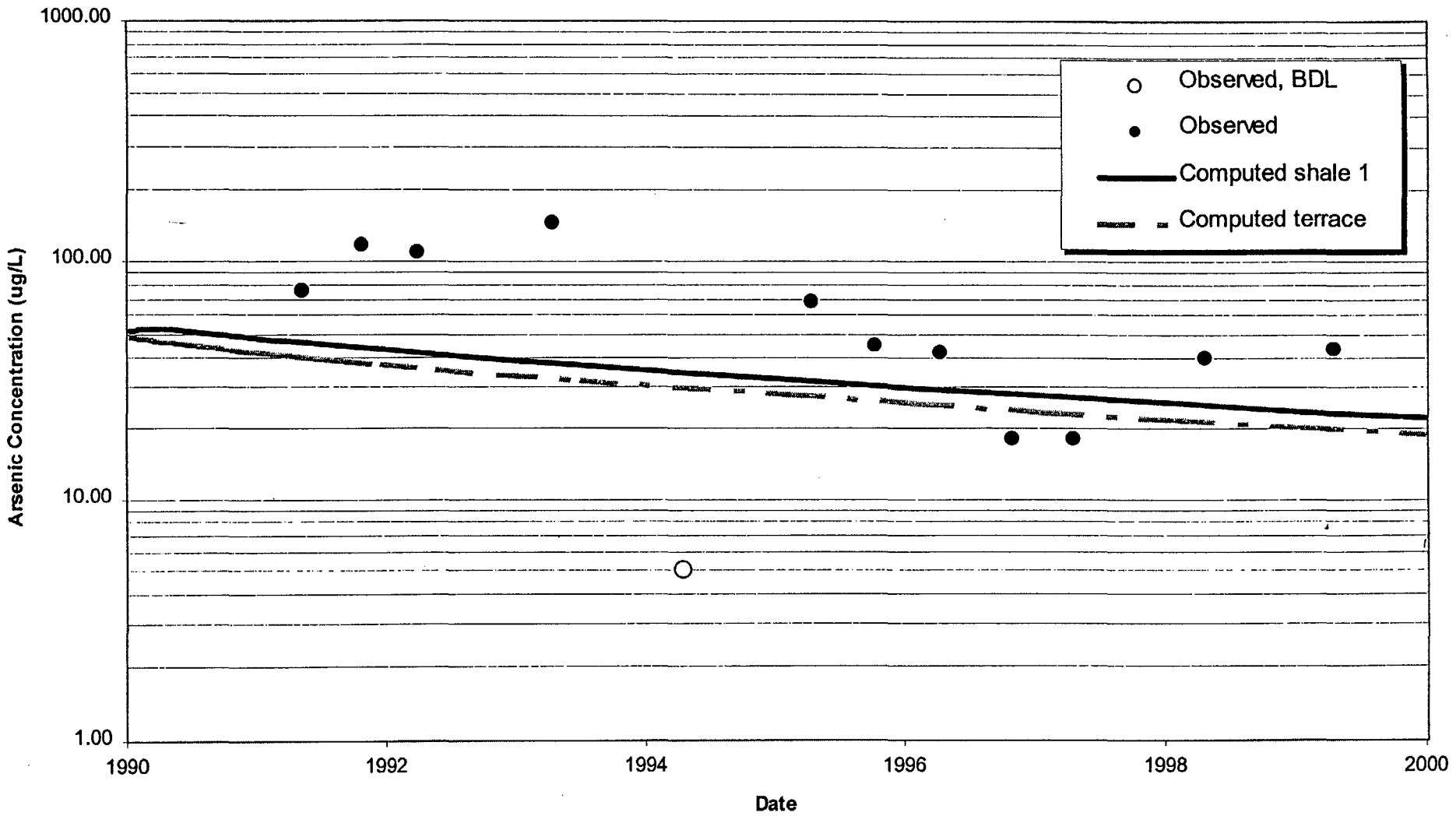



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FIGURE
ARSENIC TRANSPORT CALIBRATION FOR WELL MW010

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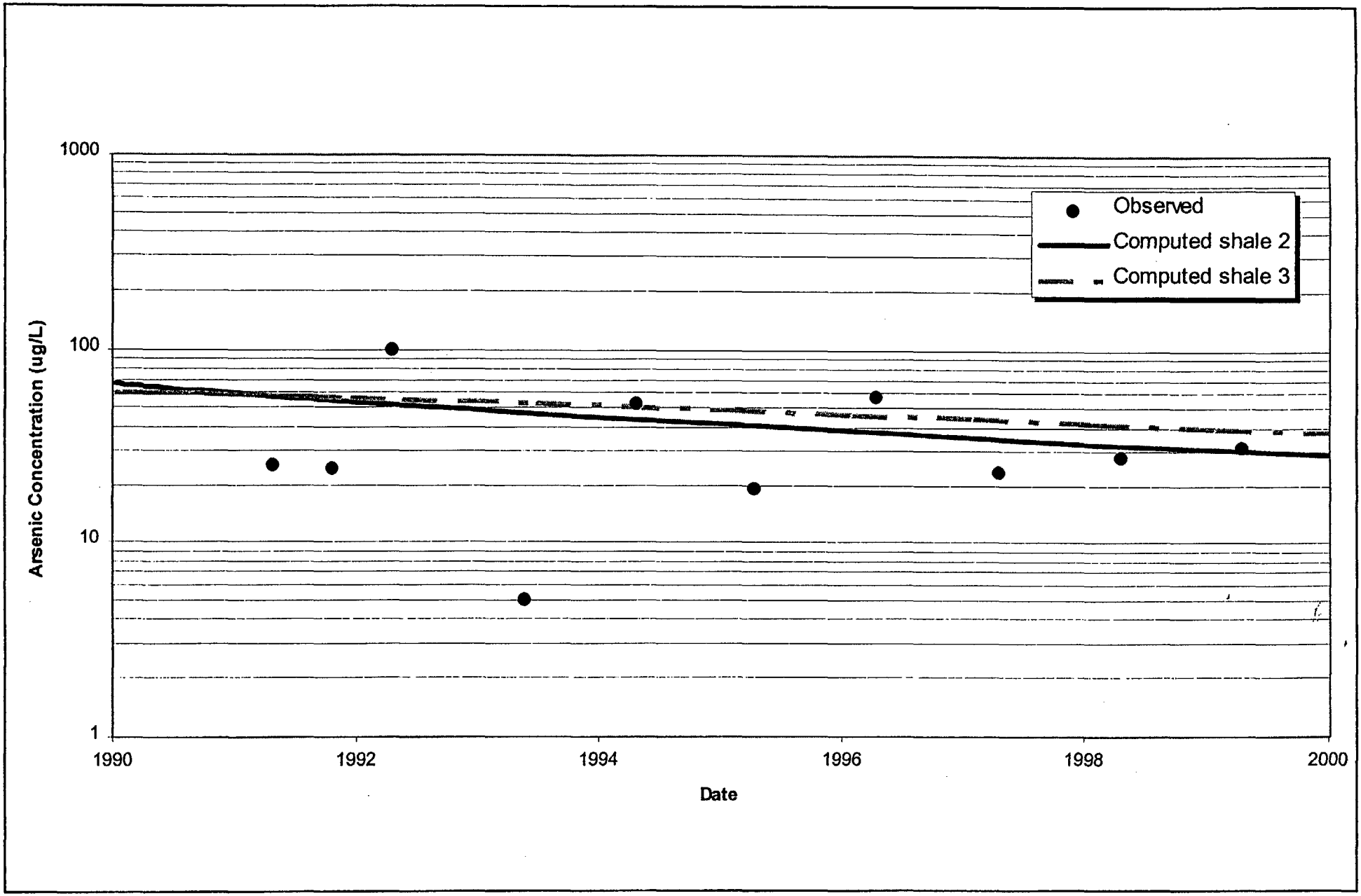


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FIGURE
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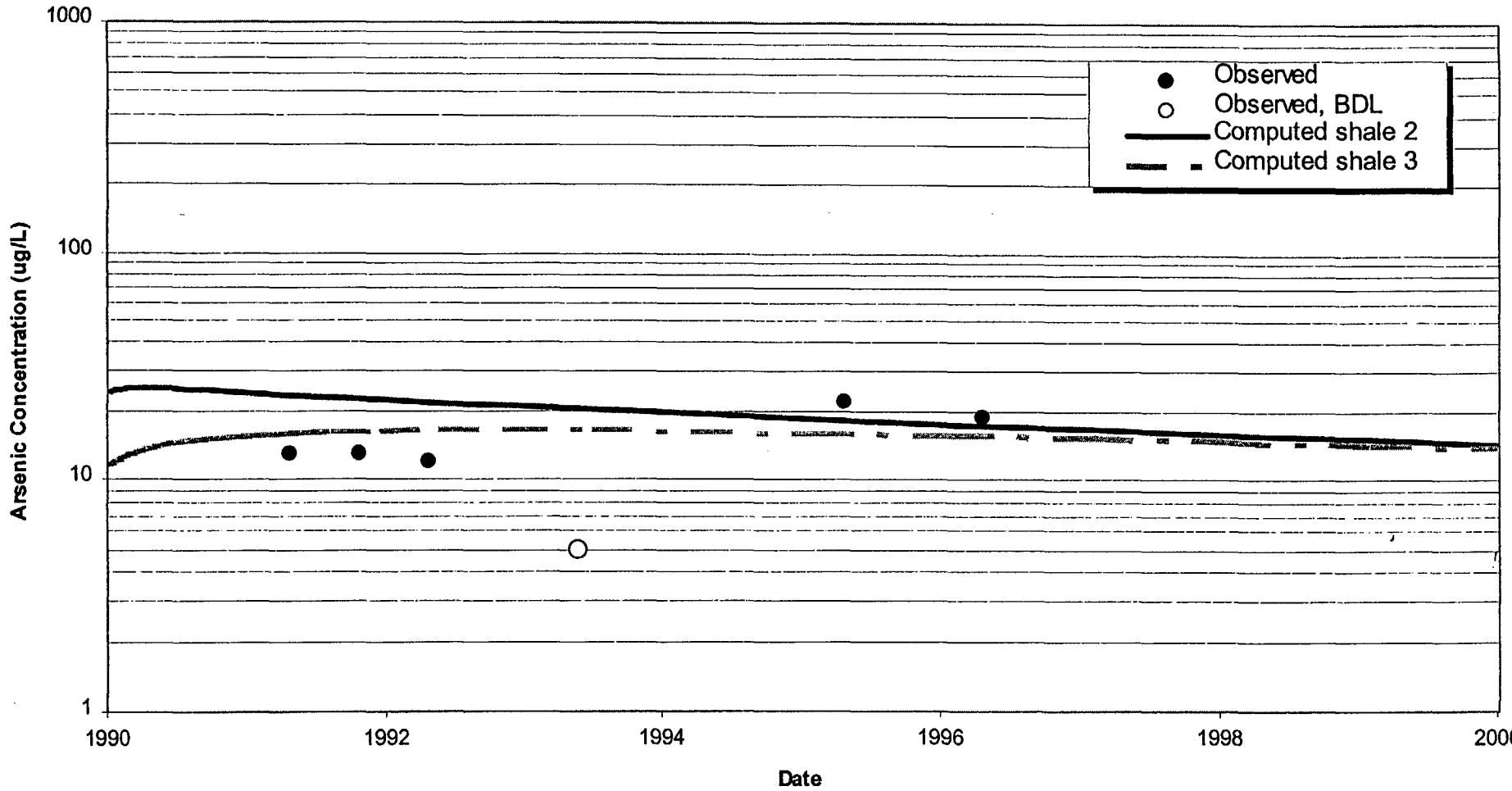


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FIGURE
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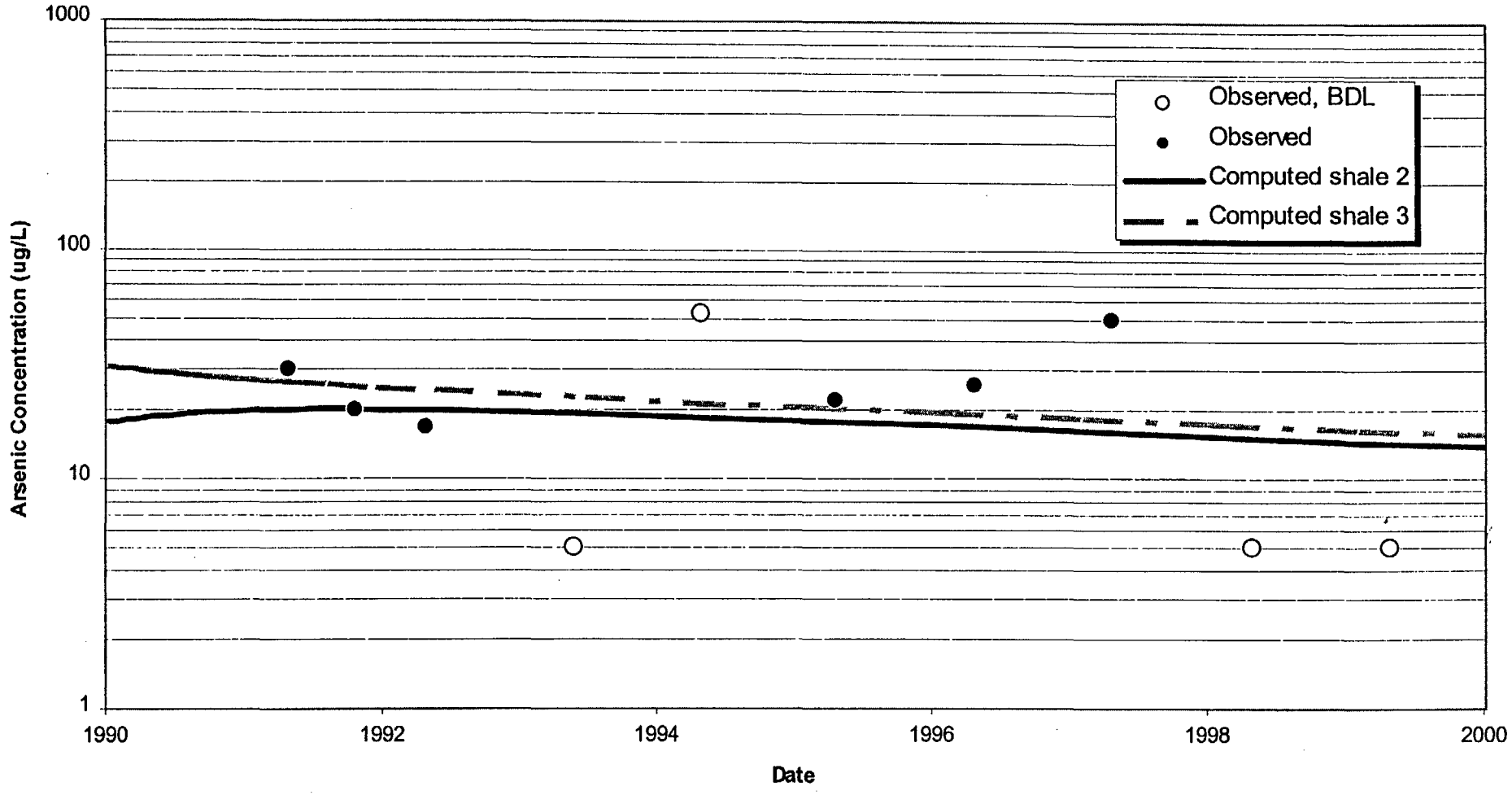


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FIGURE
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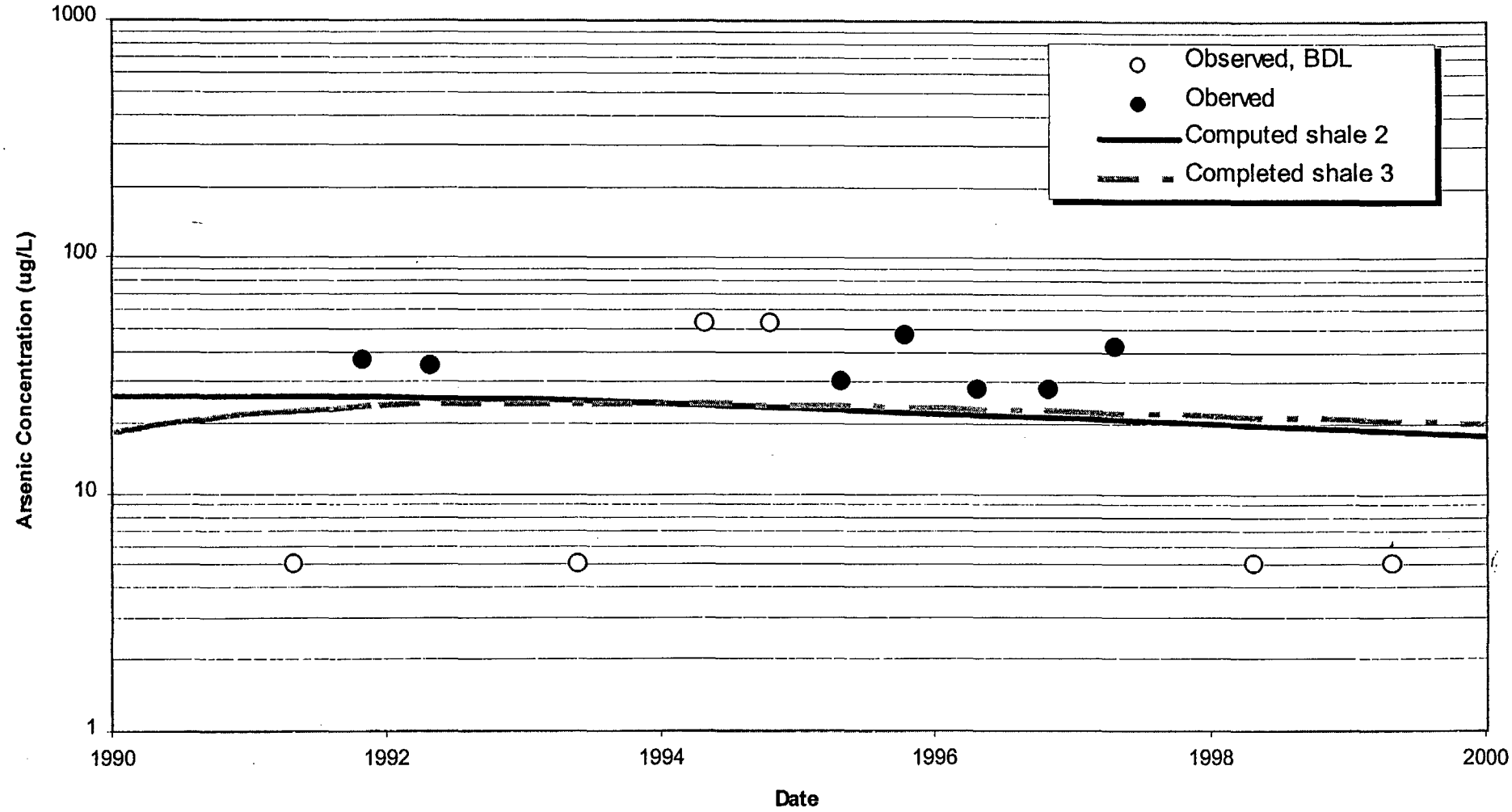


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FIGURE
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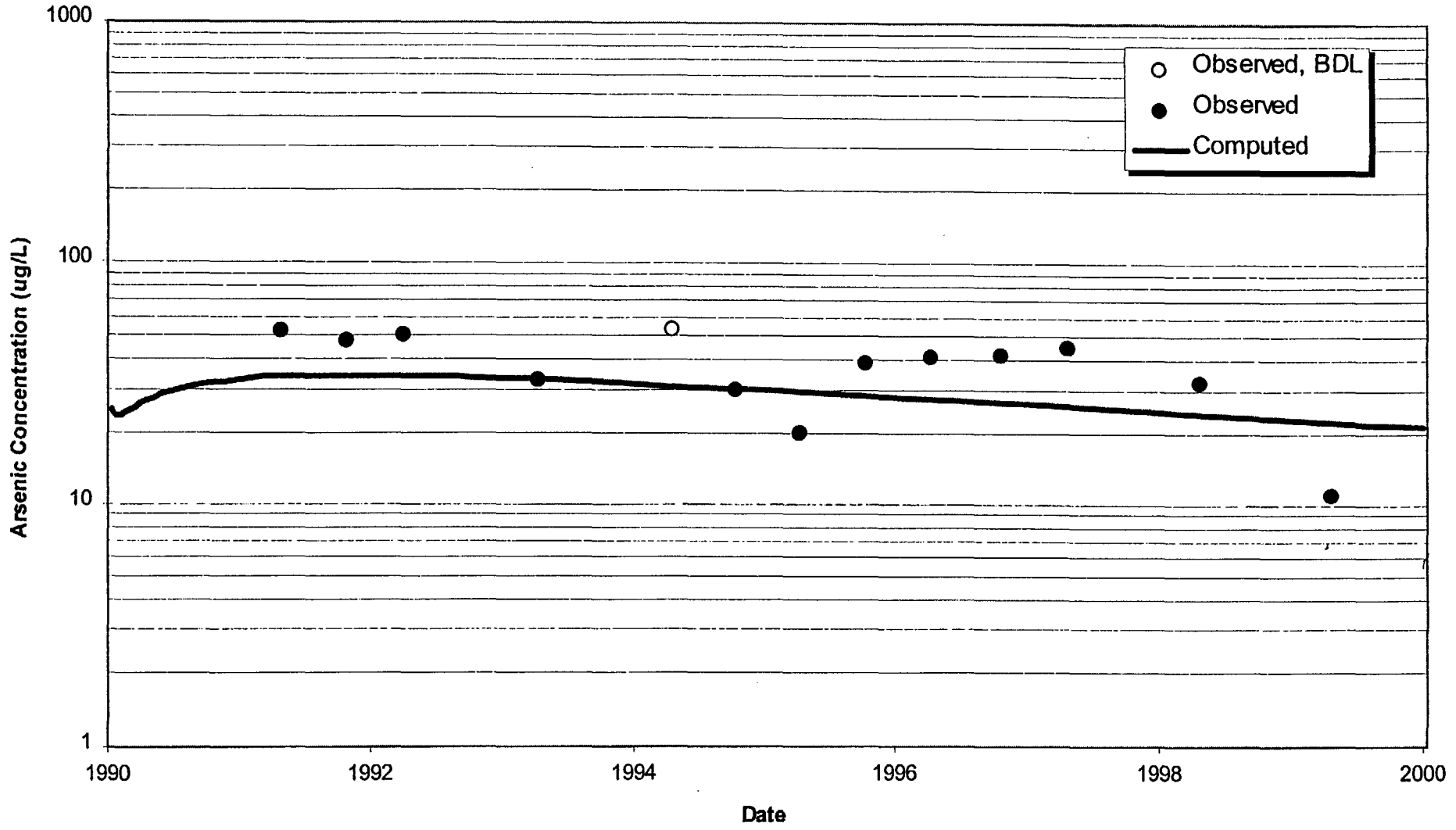


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FIGURE
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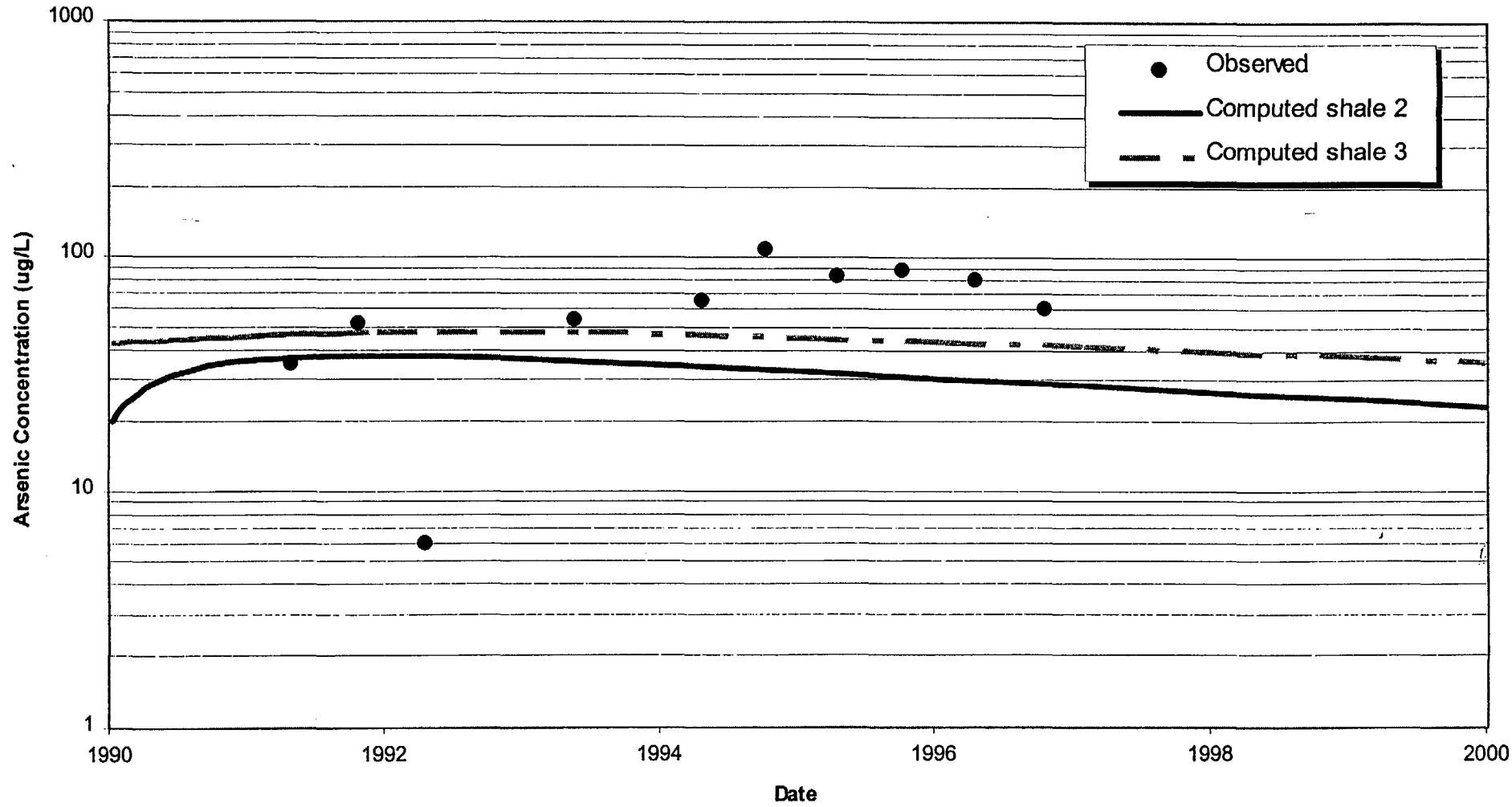


| | | |
|---|---|---|
| consulting scientists and engineers | FIGURE<br>ARSENIC TRANSPORT CALIBRATION FOR WELL MW030A | Date: AUGUST 2002<br>Project: P:\100734-2\REV CHAR RPT<br>File: AS FIGURES.ppt |

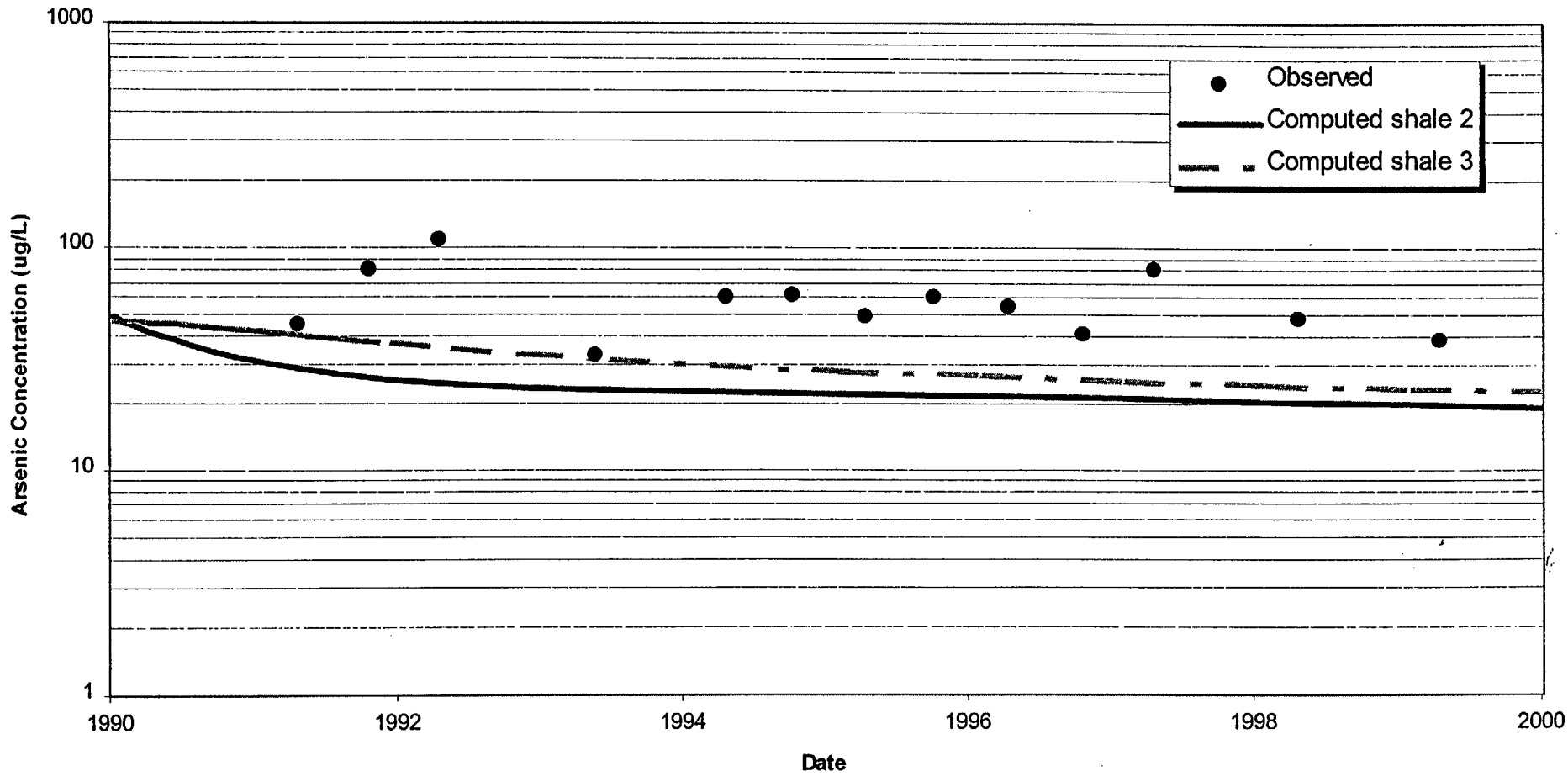


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FIGURE
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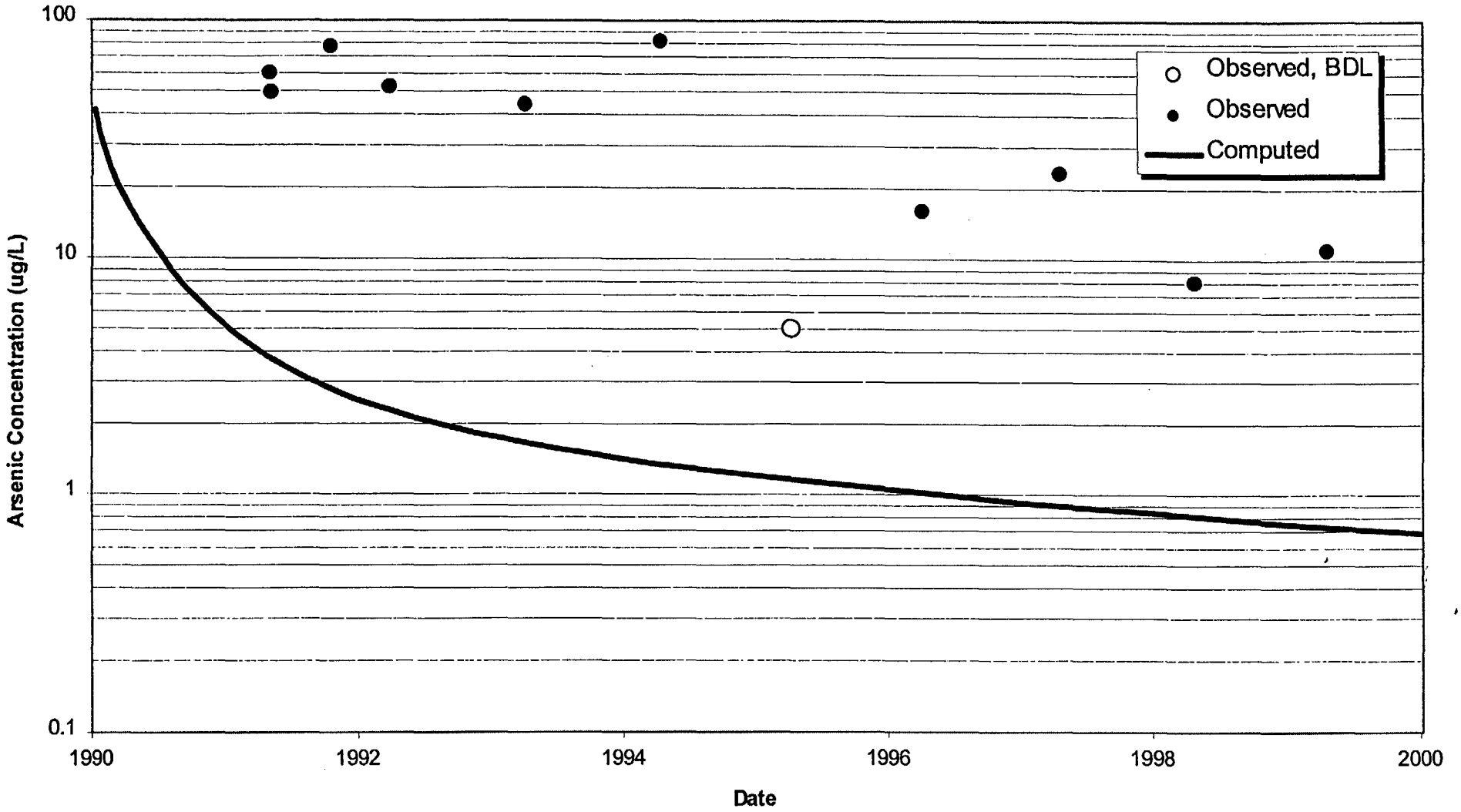


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FIGURE
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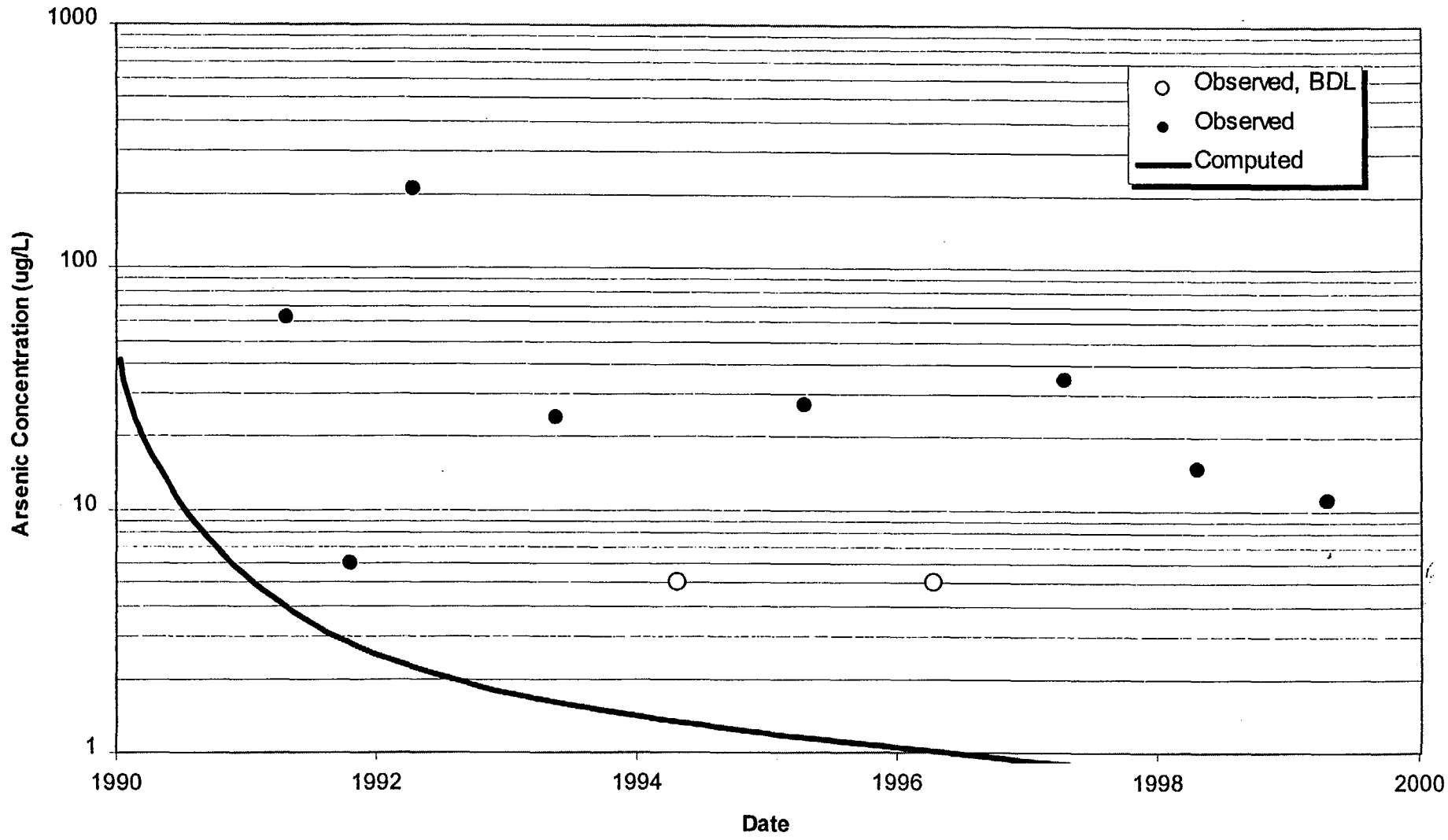


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FIGURE
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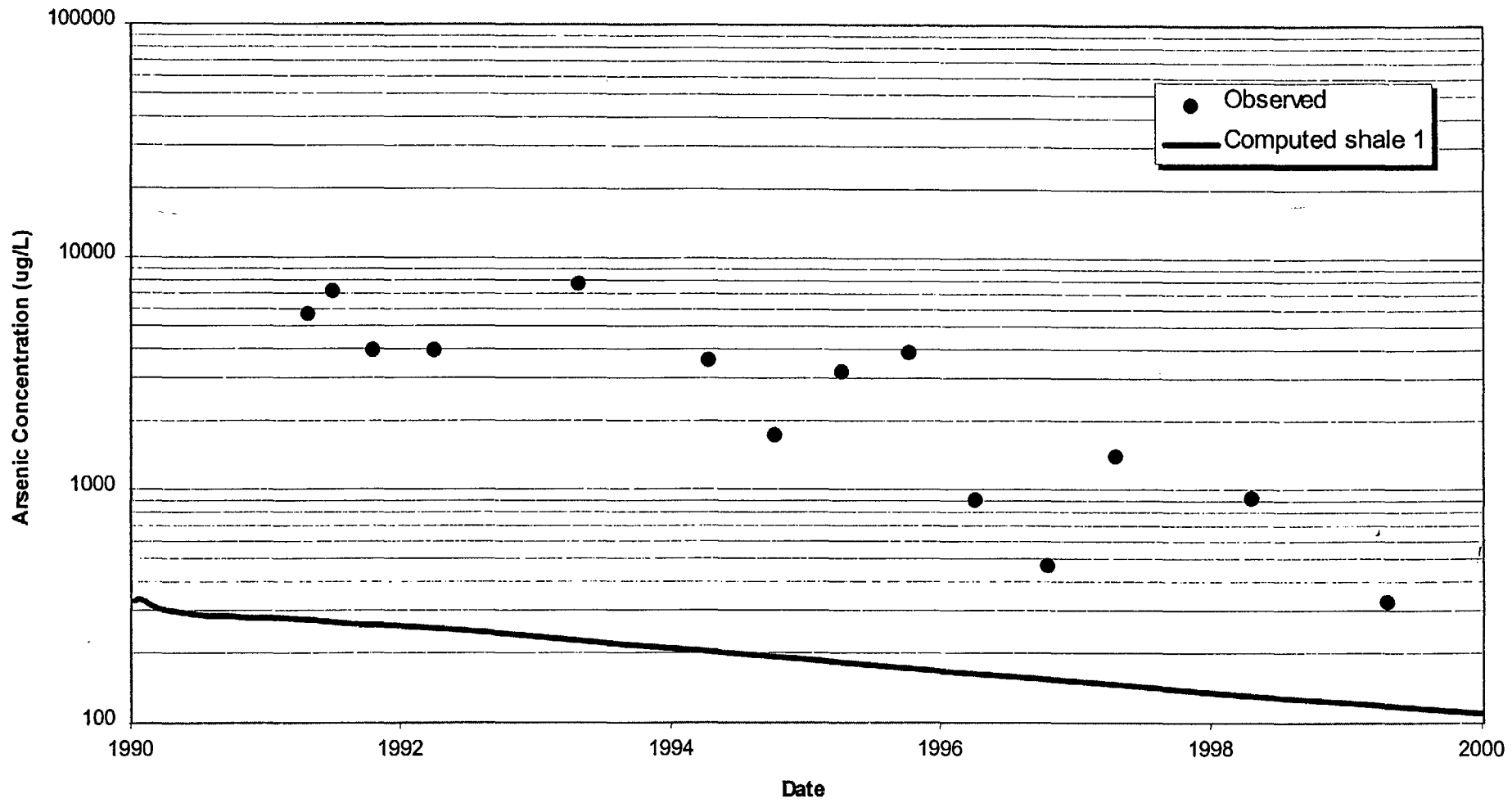


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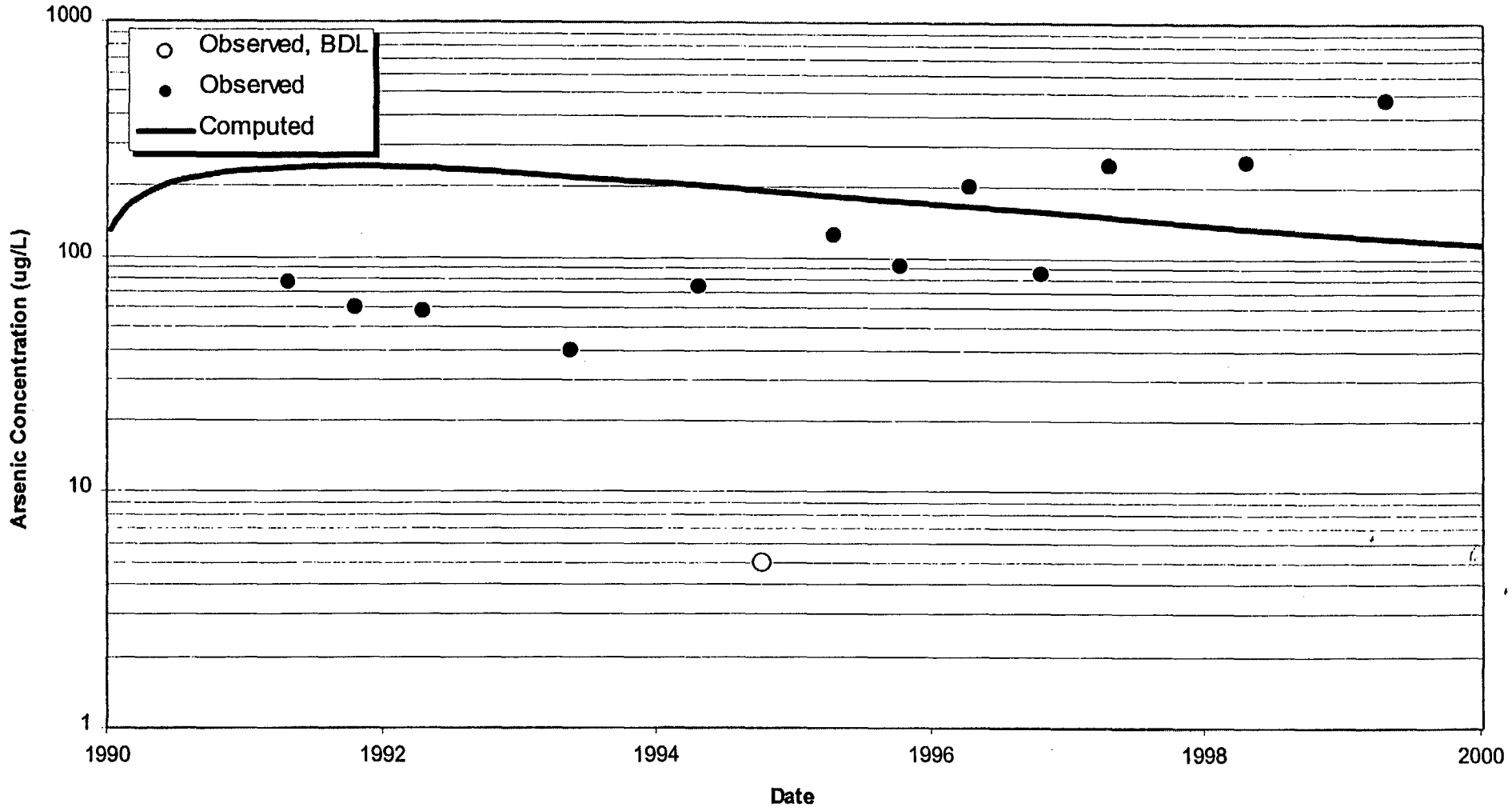


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FIGURE
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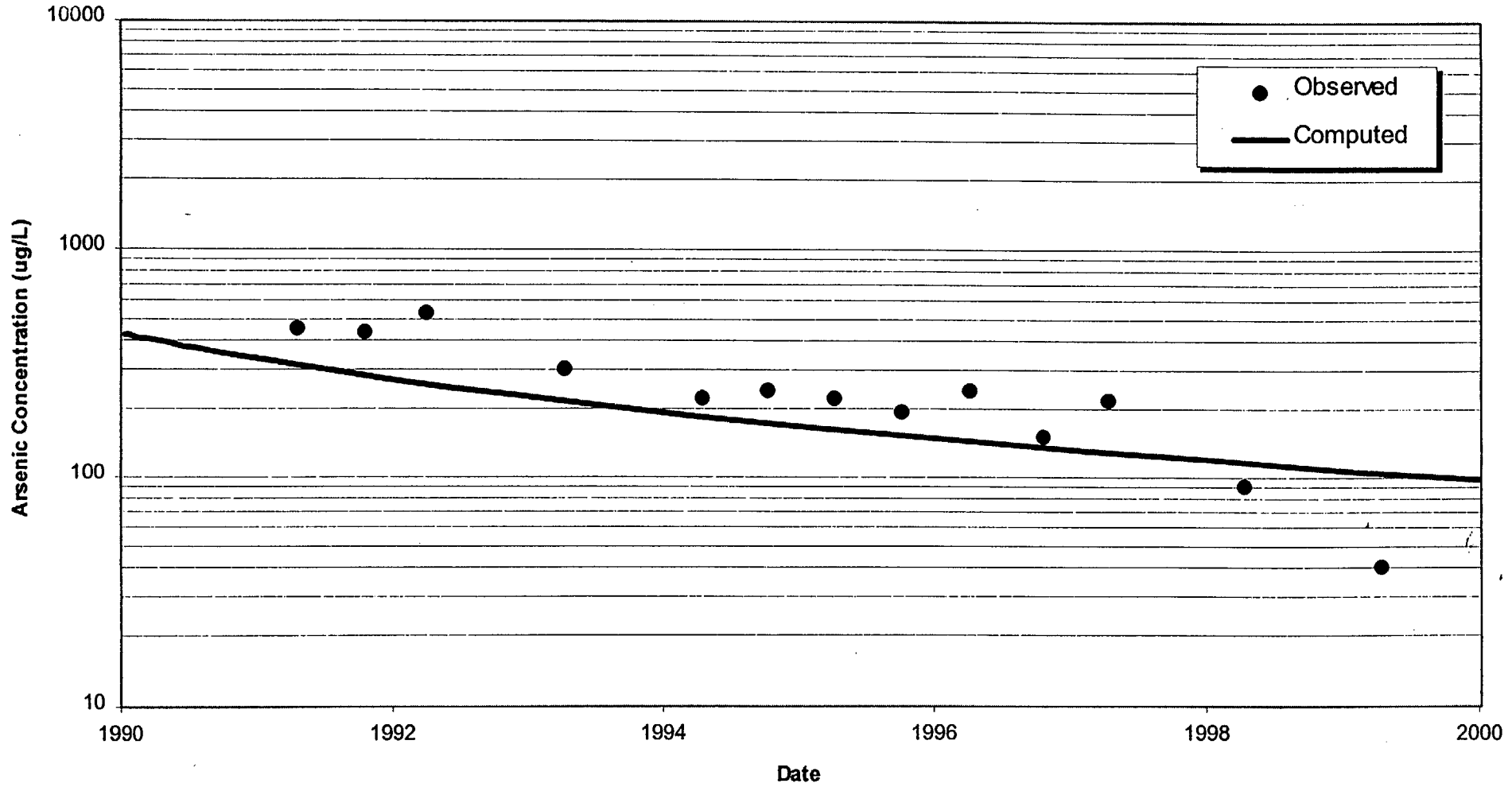


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FIGURE
ARSENIC TRANSPORT CALIBRATION FOR WELL MW043

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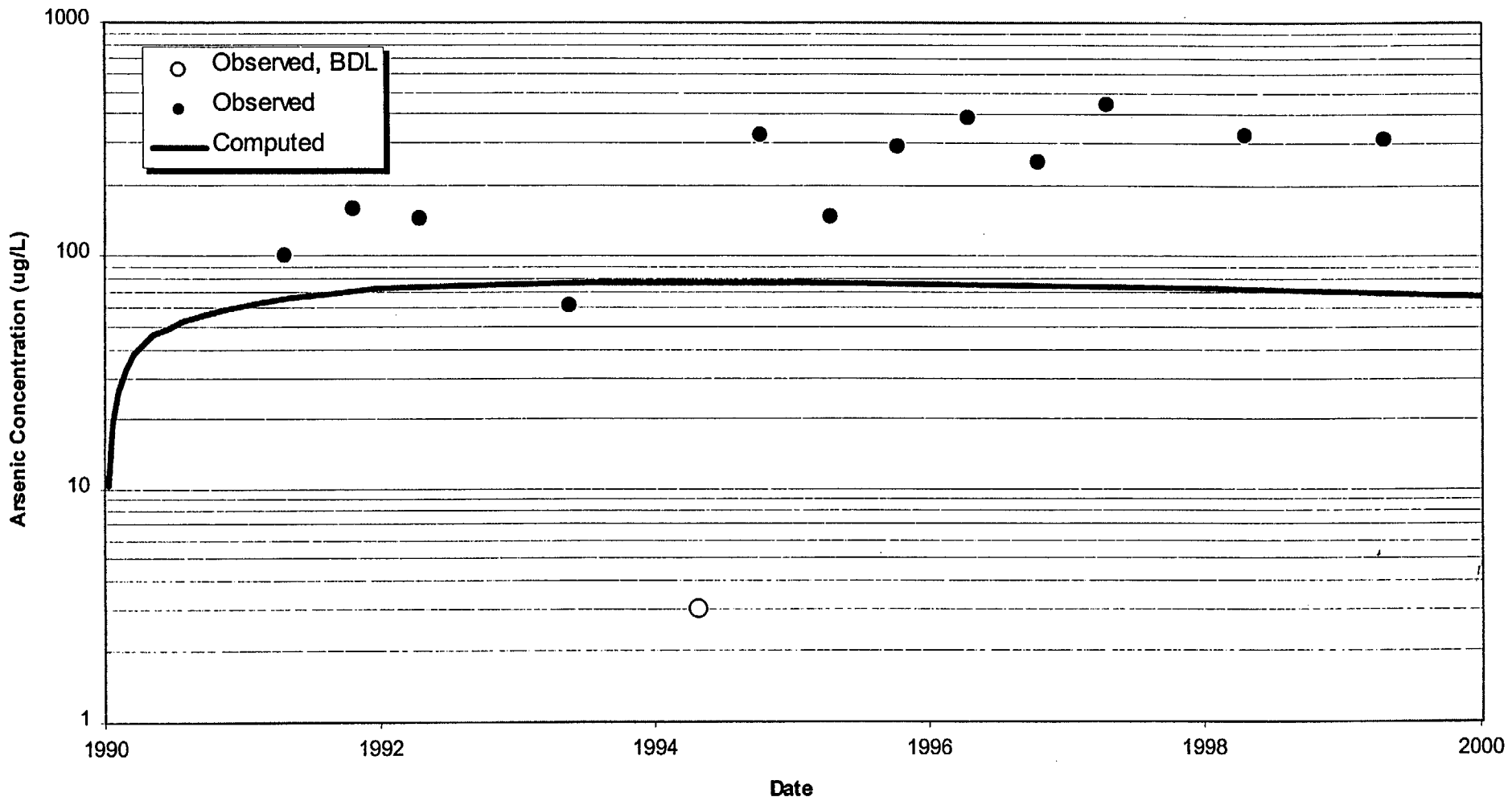


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FIGURE
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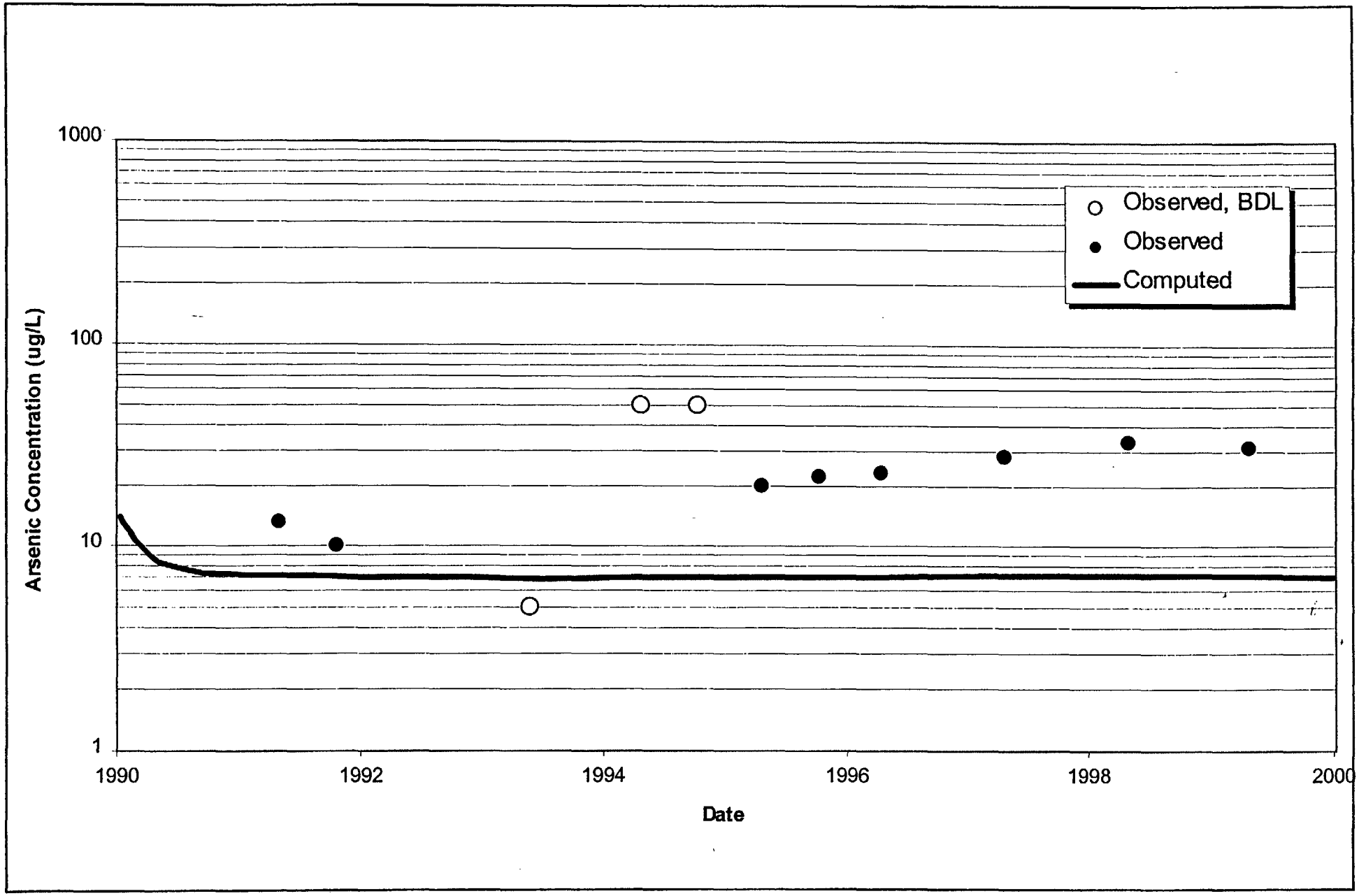


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FIGURE
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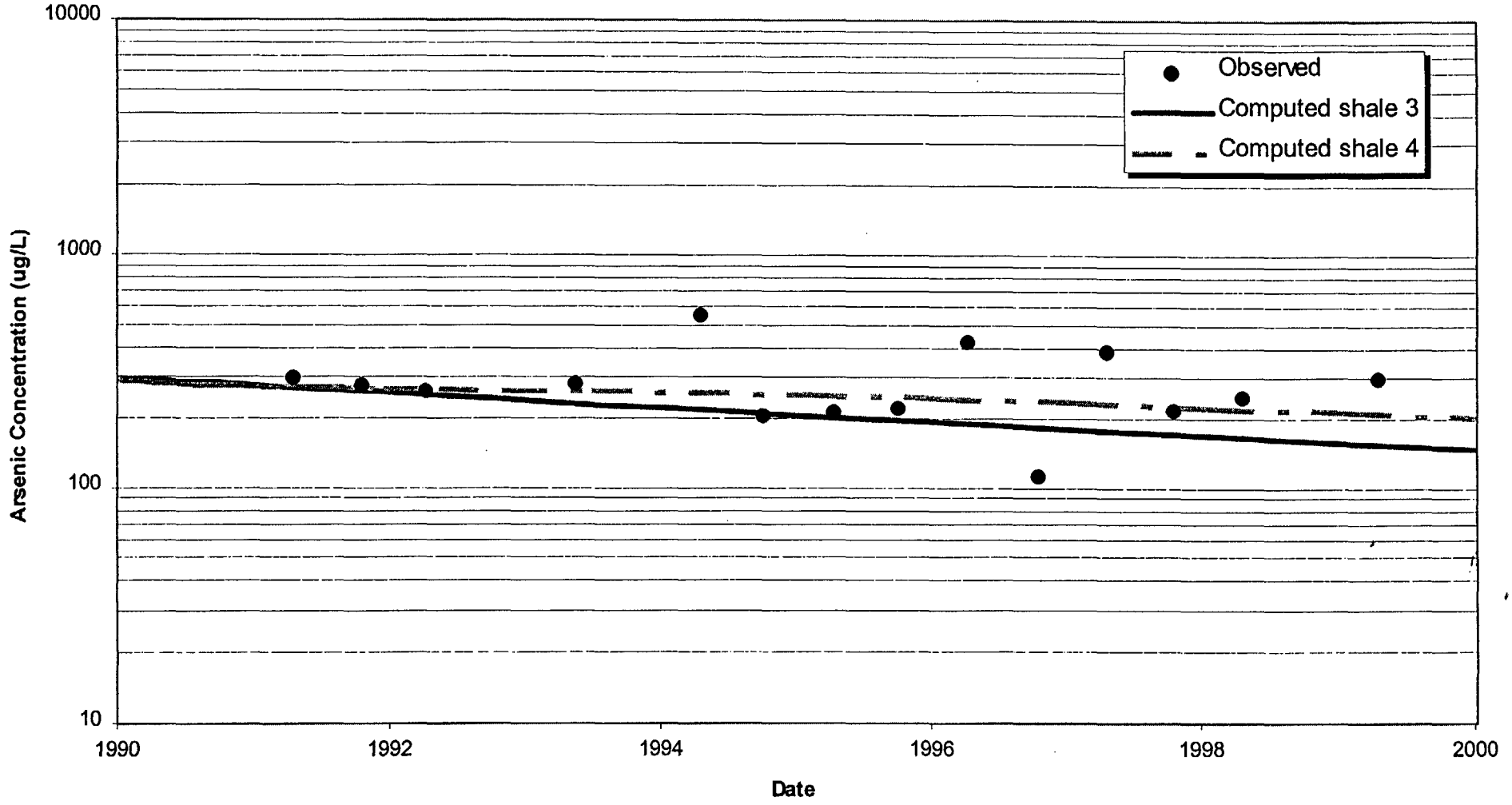


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FIGURE
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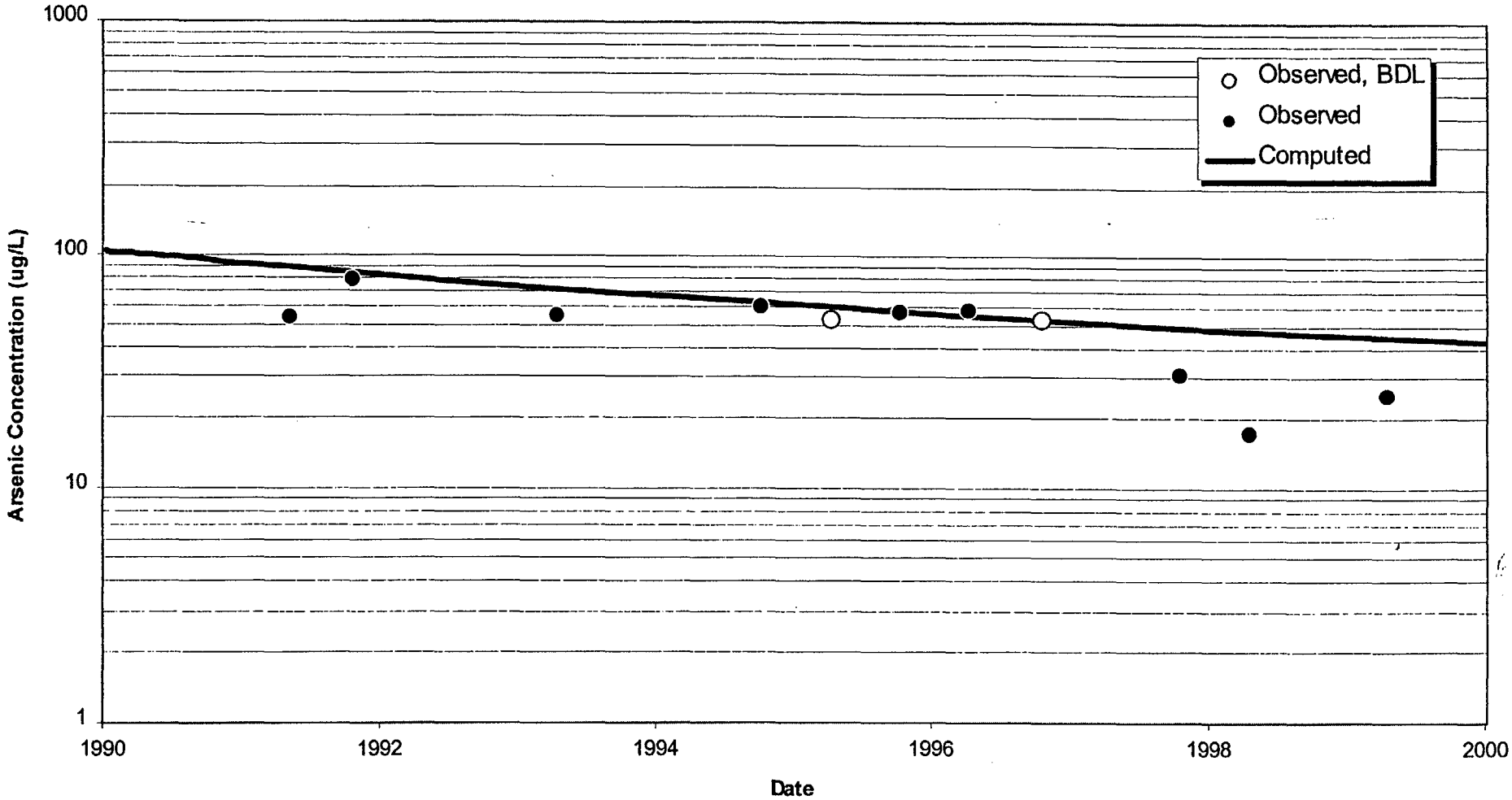


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FIGURE
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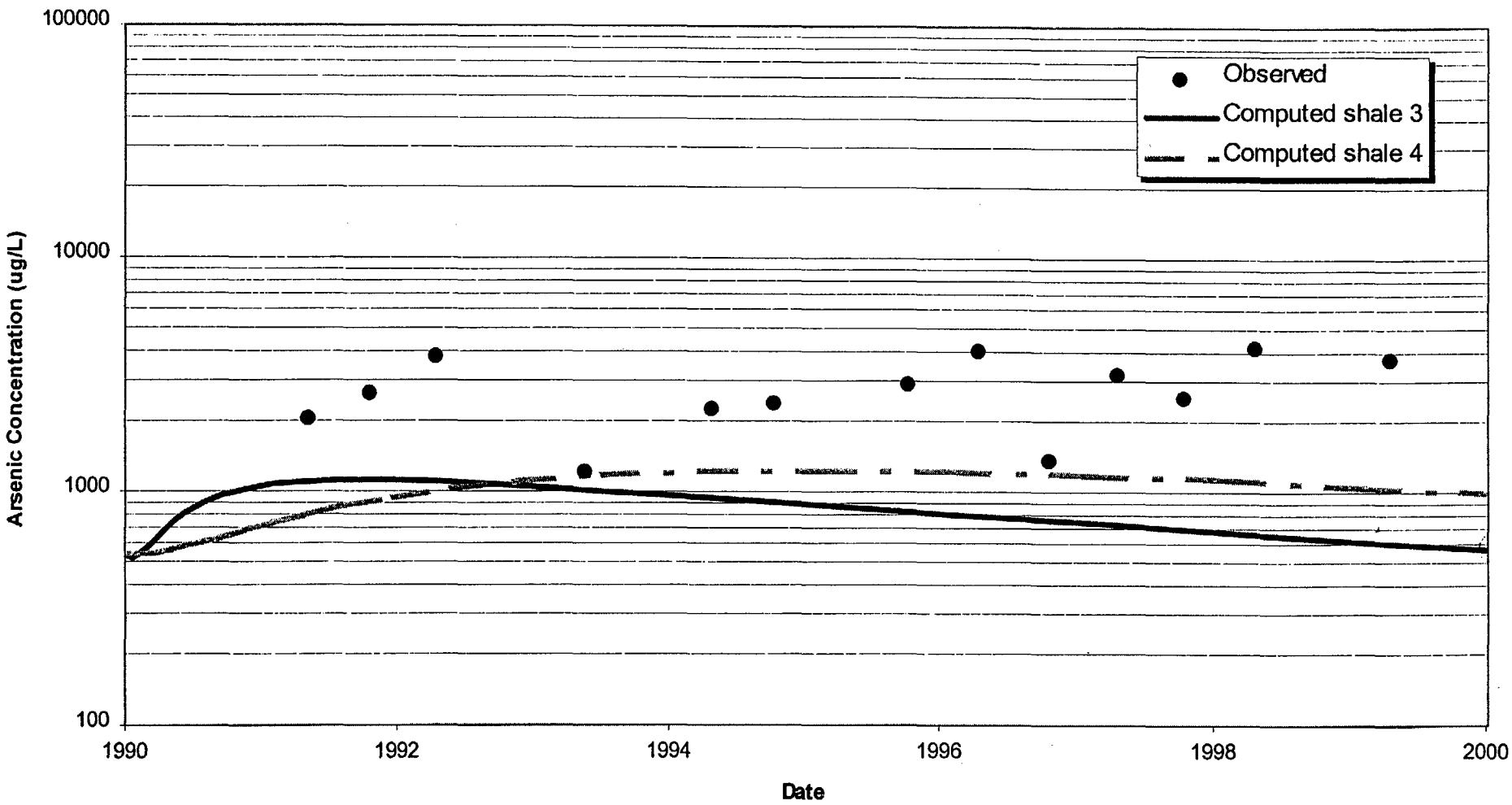


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|---|---|---|
| consulting scientists and engineers | FIGURE<br>ARSENIC TRANSPORT CALIBRATION FOR WELL MW057A | Date: AUGUST 2002<br>Project: P:\100734-2\REV CHAR RPT<br>File: AS FIGURES.ppt |

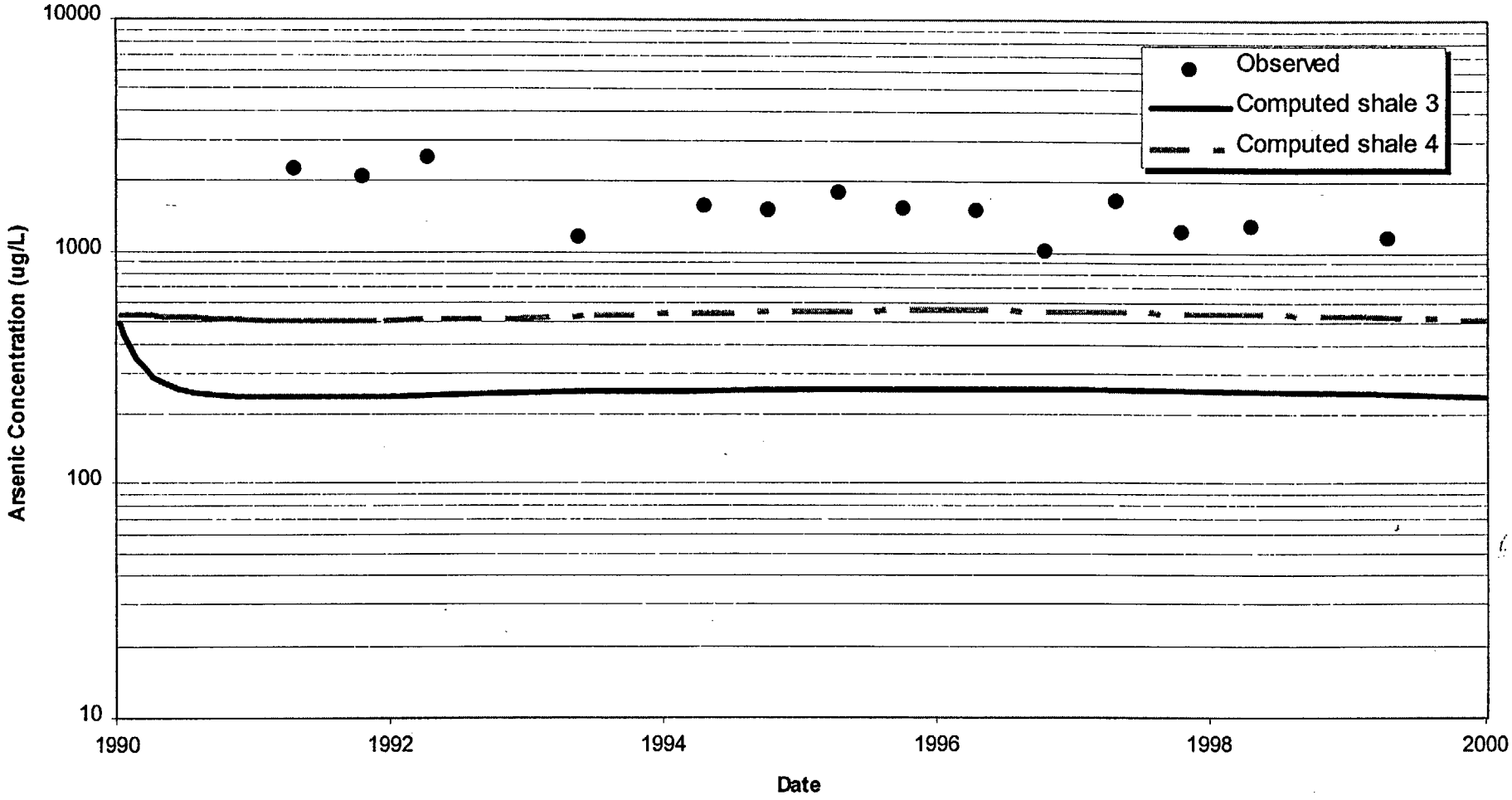


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FIGURE
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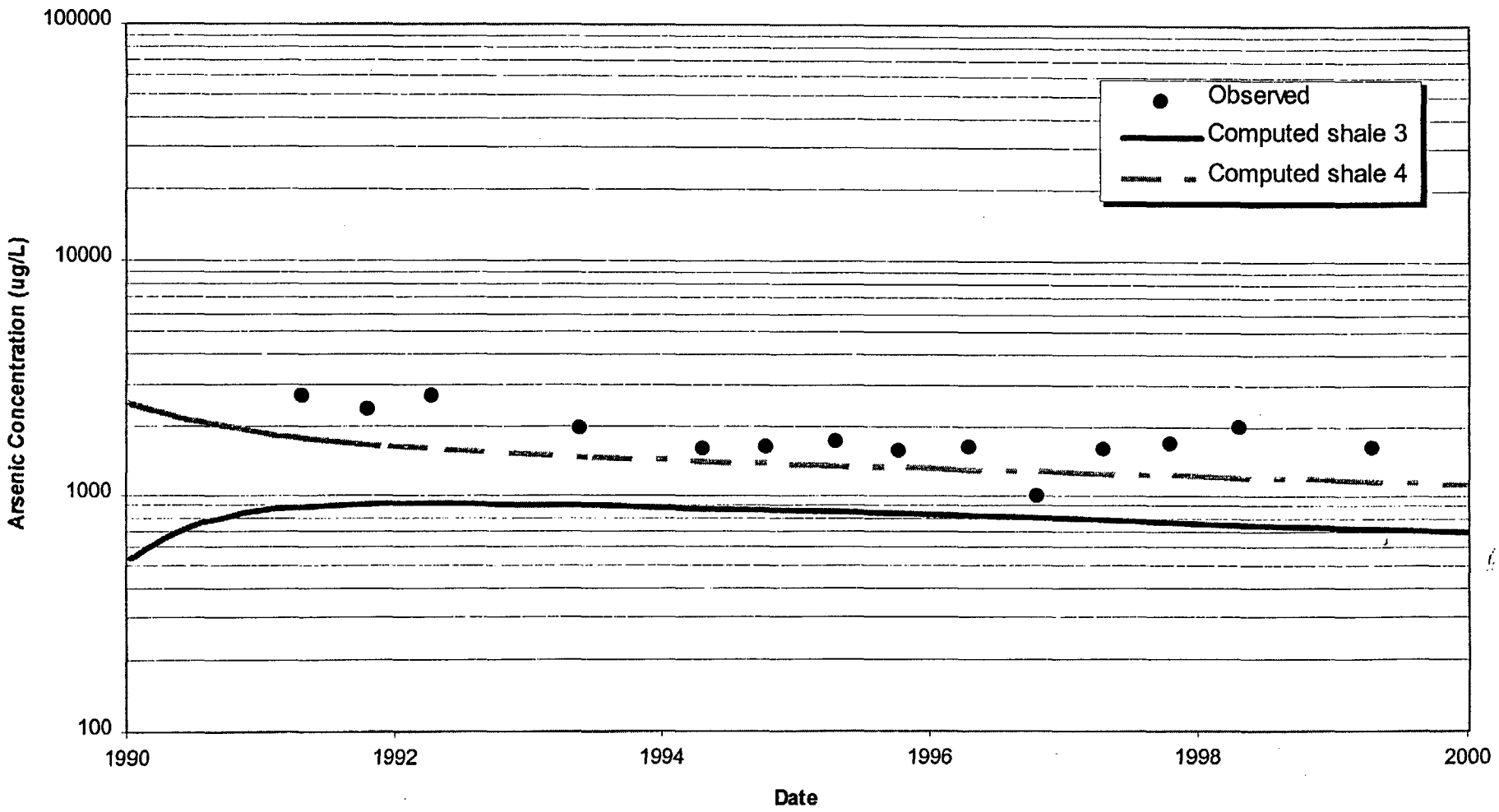


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FIGURE
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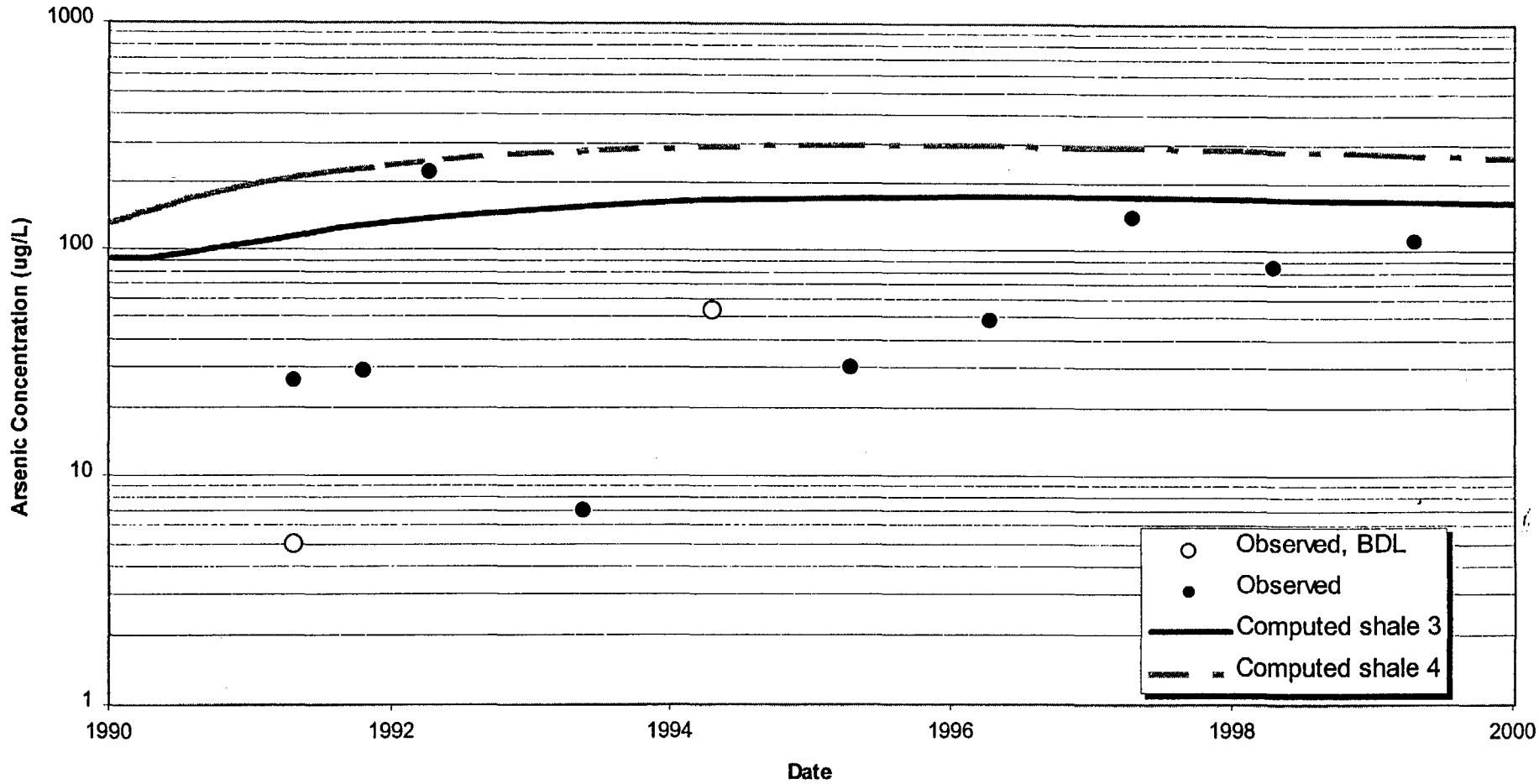


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FIGURE
ARSENIC TRANSPORT CALIBRATION FOR WELL MW060A

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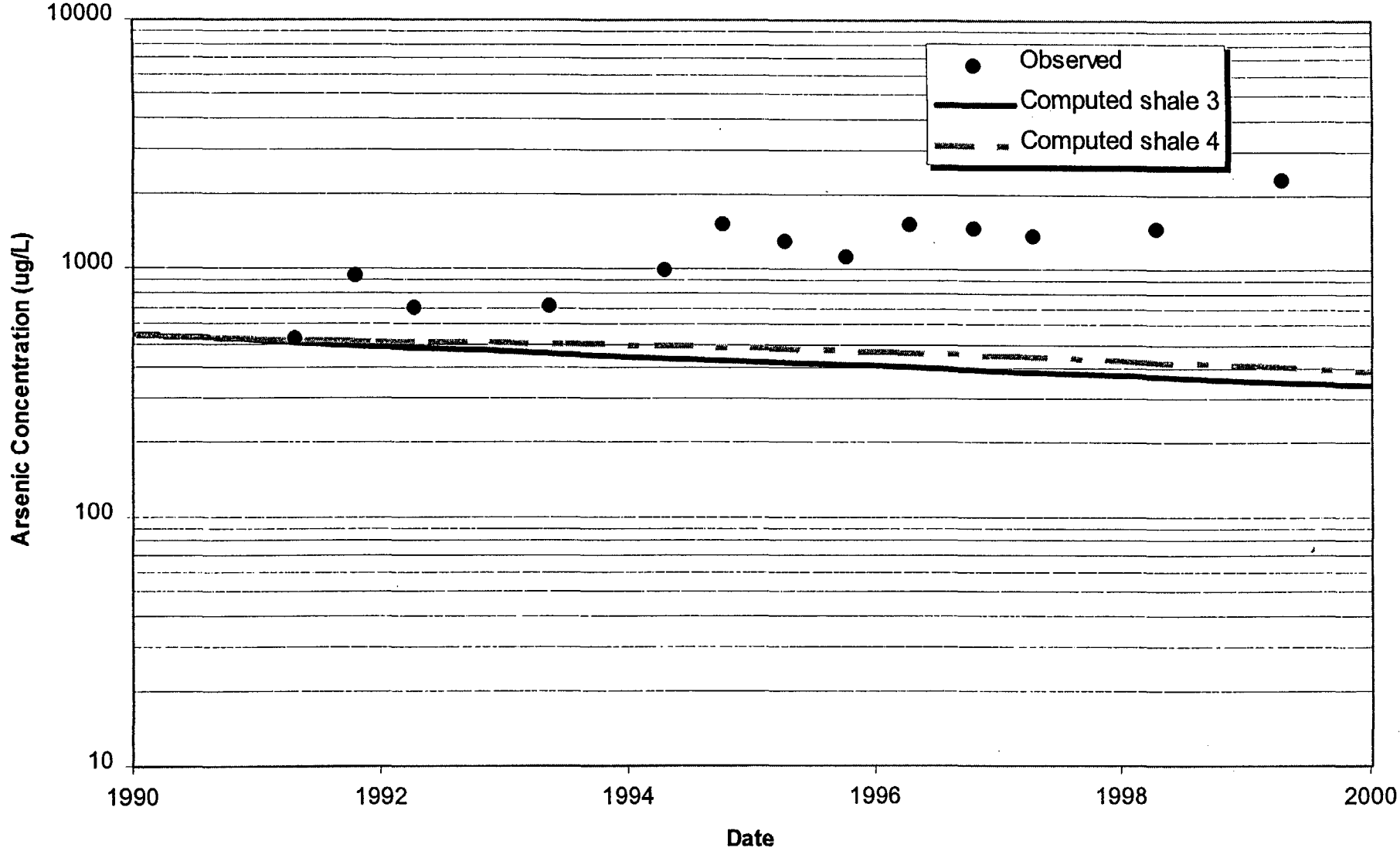


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FIGURE
ARSENIC TRANSPORT CALIBRATION FOR WELL MW061A

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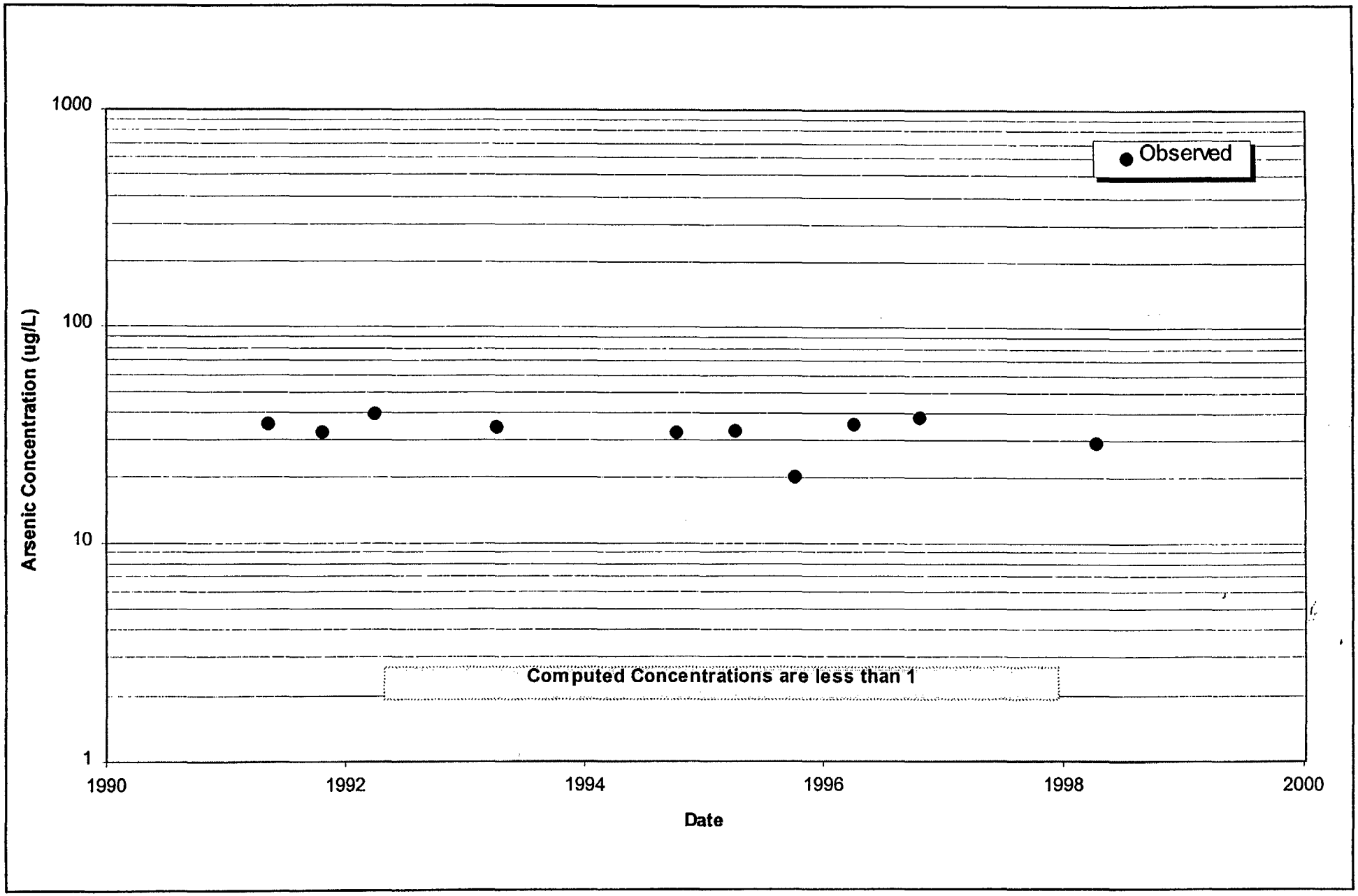


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FIGURE
ARSENIC TRANSPORT CALIBRATION FOR WELL MW062

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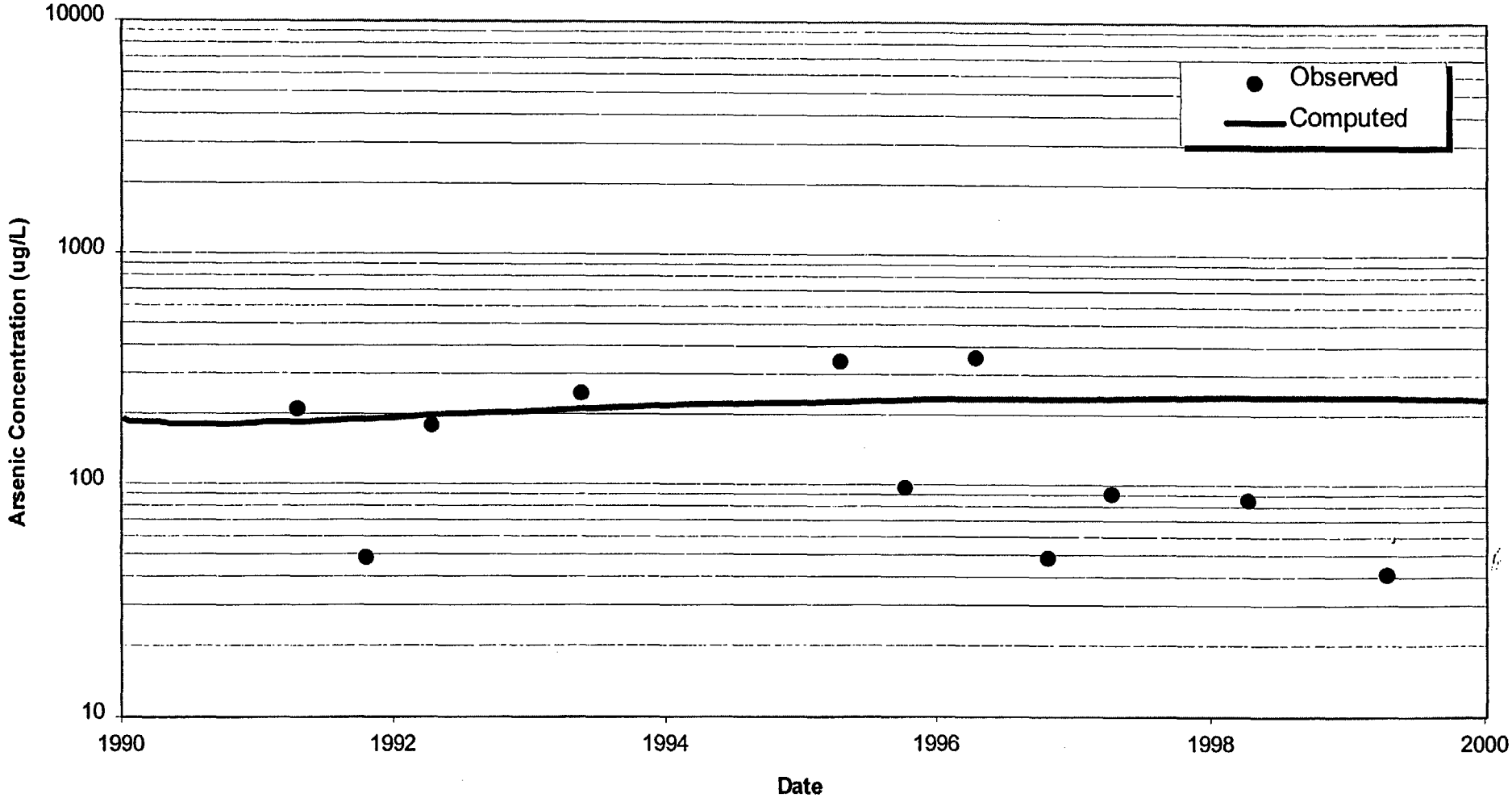


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FIGURE
ARSENIC TRANSPORT CALIBRATION FOR WELL MW062A

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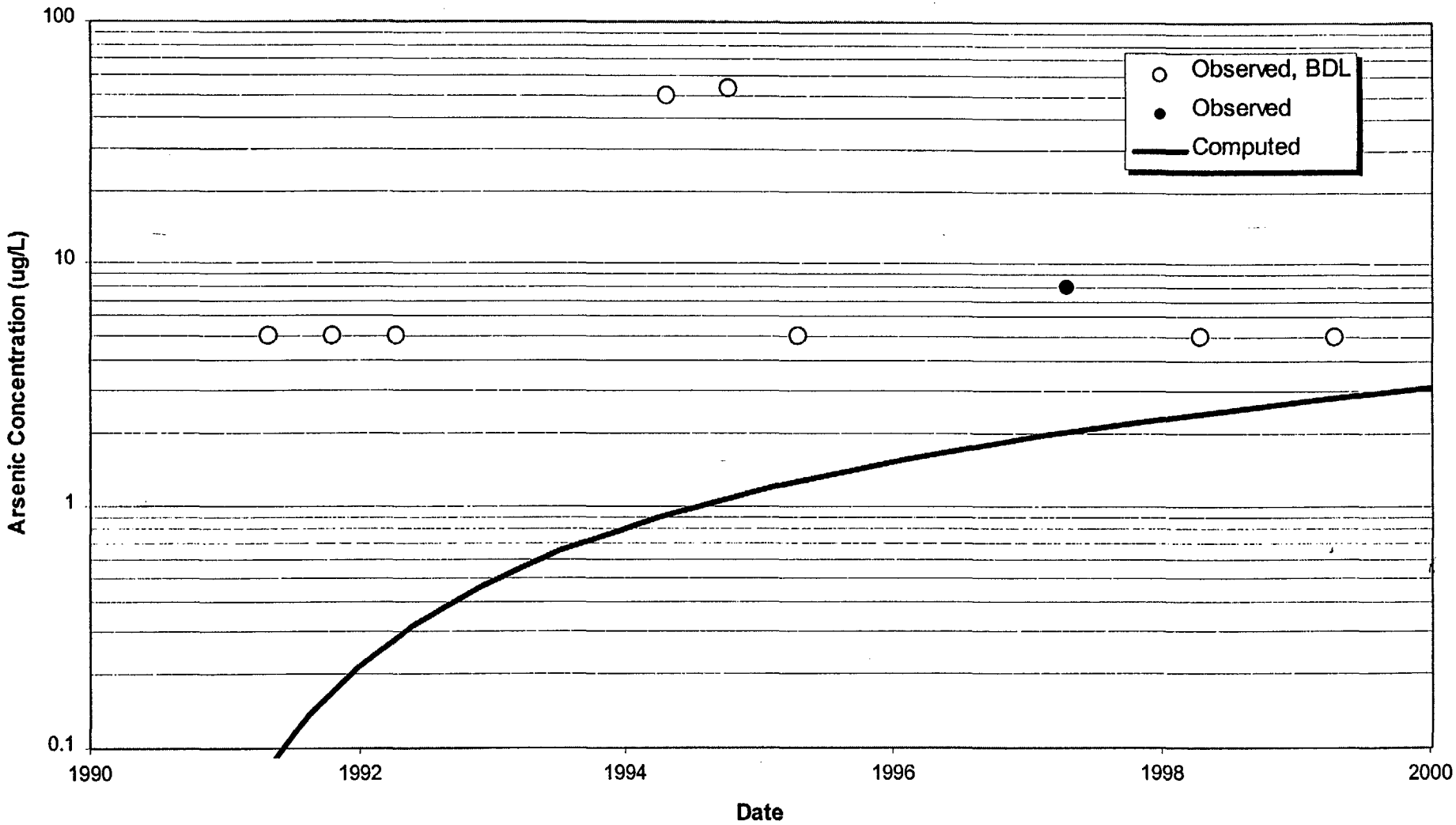


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FIGURE
ARSENIC TRANSPORT CALIBRATION FOR WELL MW063A

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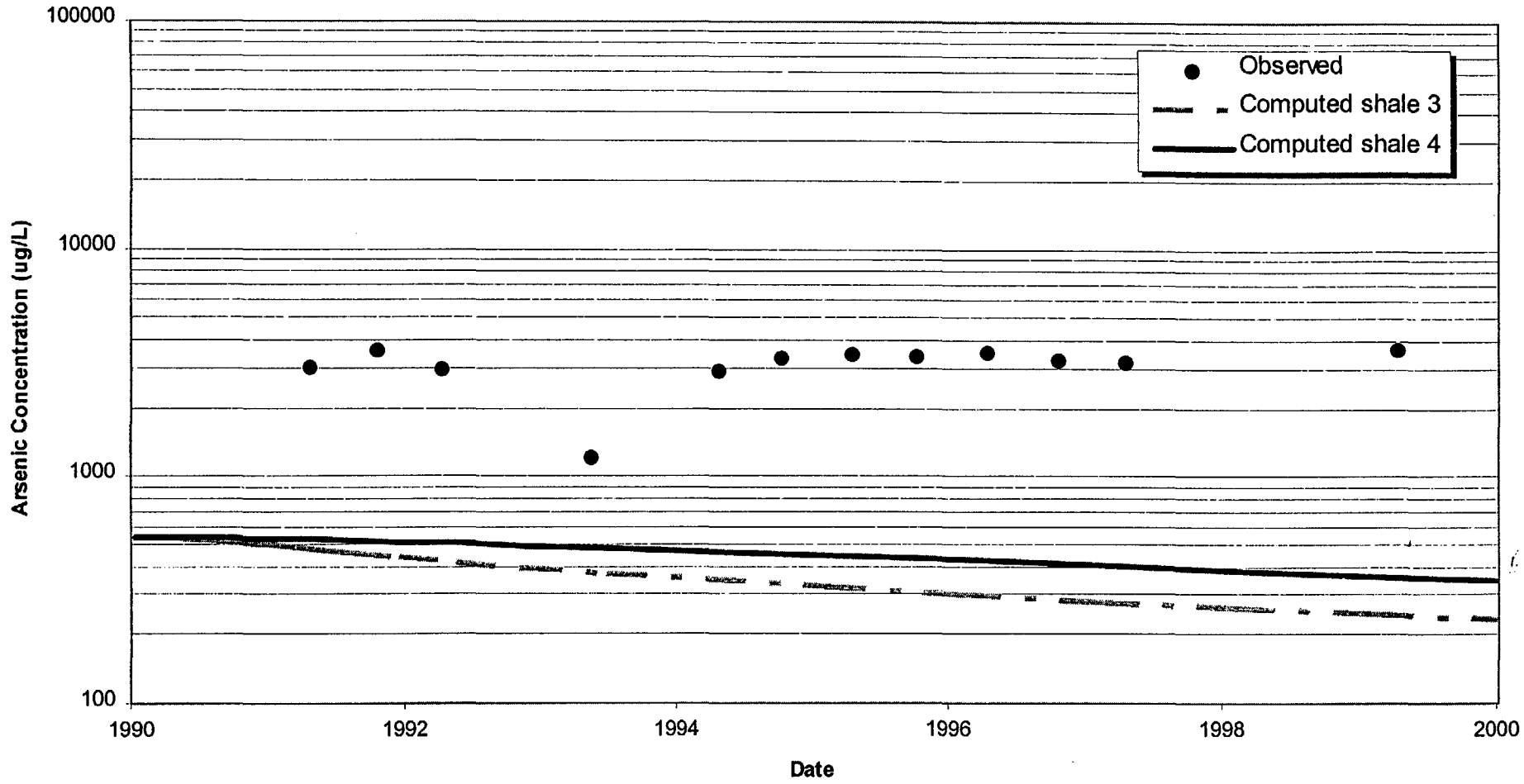


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FIGURE
ARSENIC TRANSPORT CALIBRATION FOR WELL MW064A

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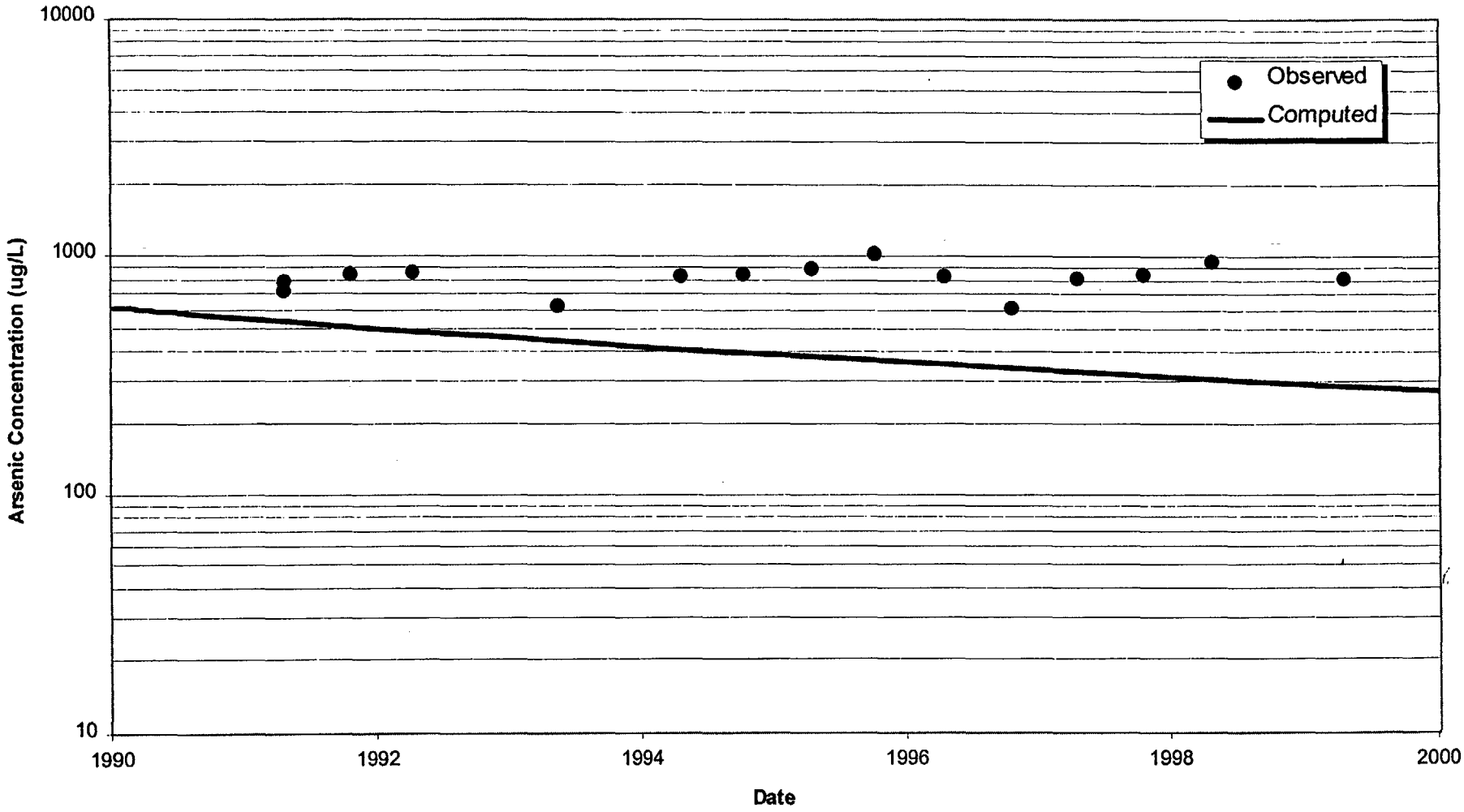


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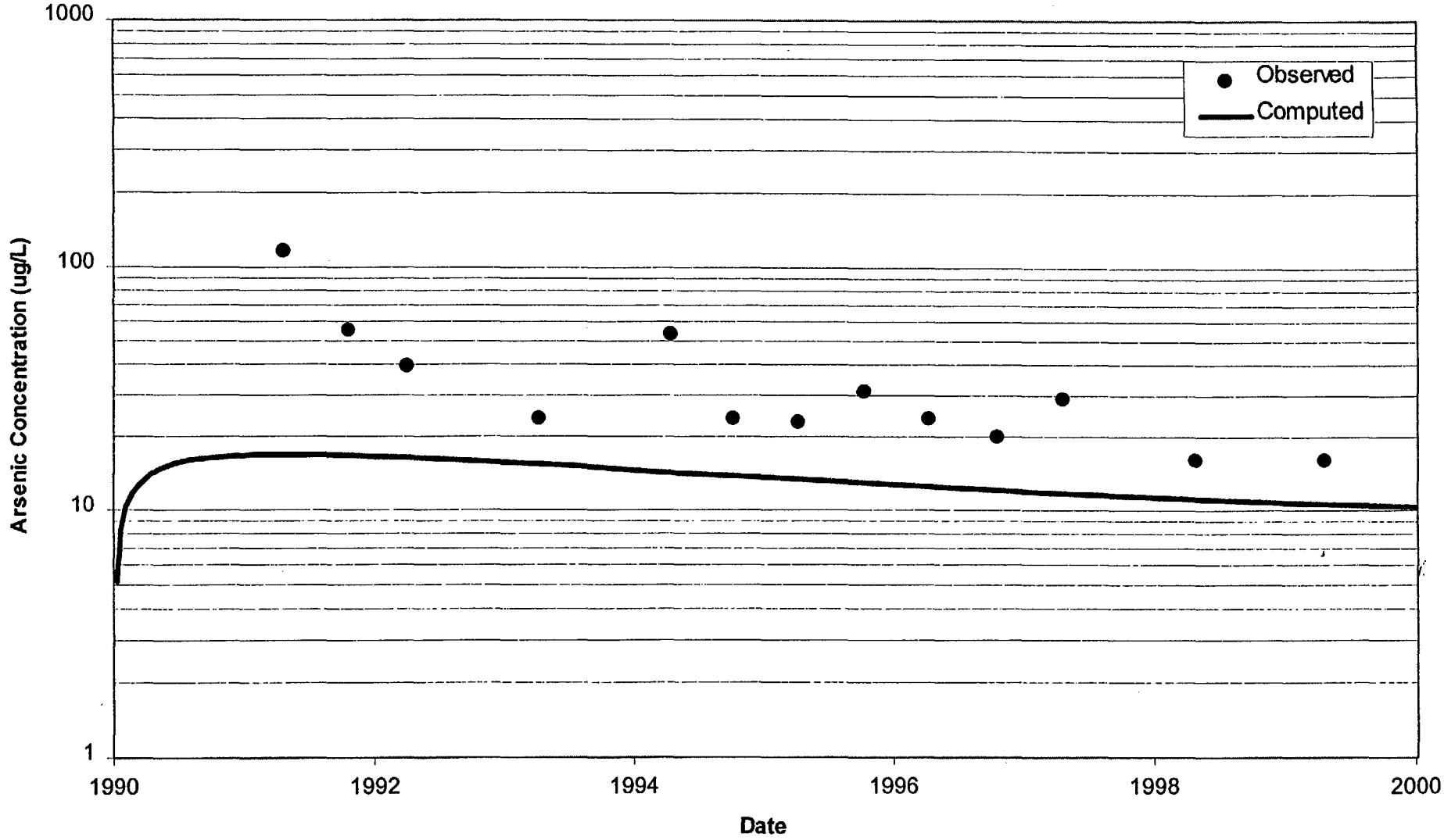
FIGURE
ARSENIC TRANSPORT CALIBRATION FOR WELL MW065A

| | |
|---|---|
| Date: | AUGUST 2002 |
| Project: | P:\100734-2\REV CHAR RPT |
| File: | AS FIGURES.ppt |




consulting scientists and engineers

FIGURE
ARSENIC TRANSPORT CALIBRATION FOR WELL MW066

| | |
|---|---|
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| Project: | P:\100734-2\REV CHAR RPT |
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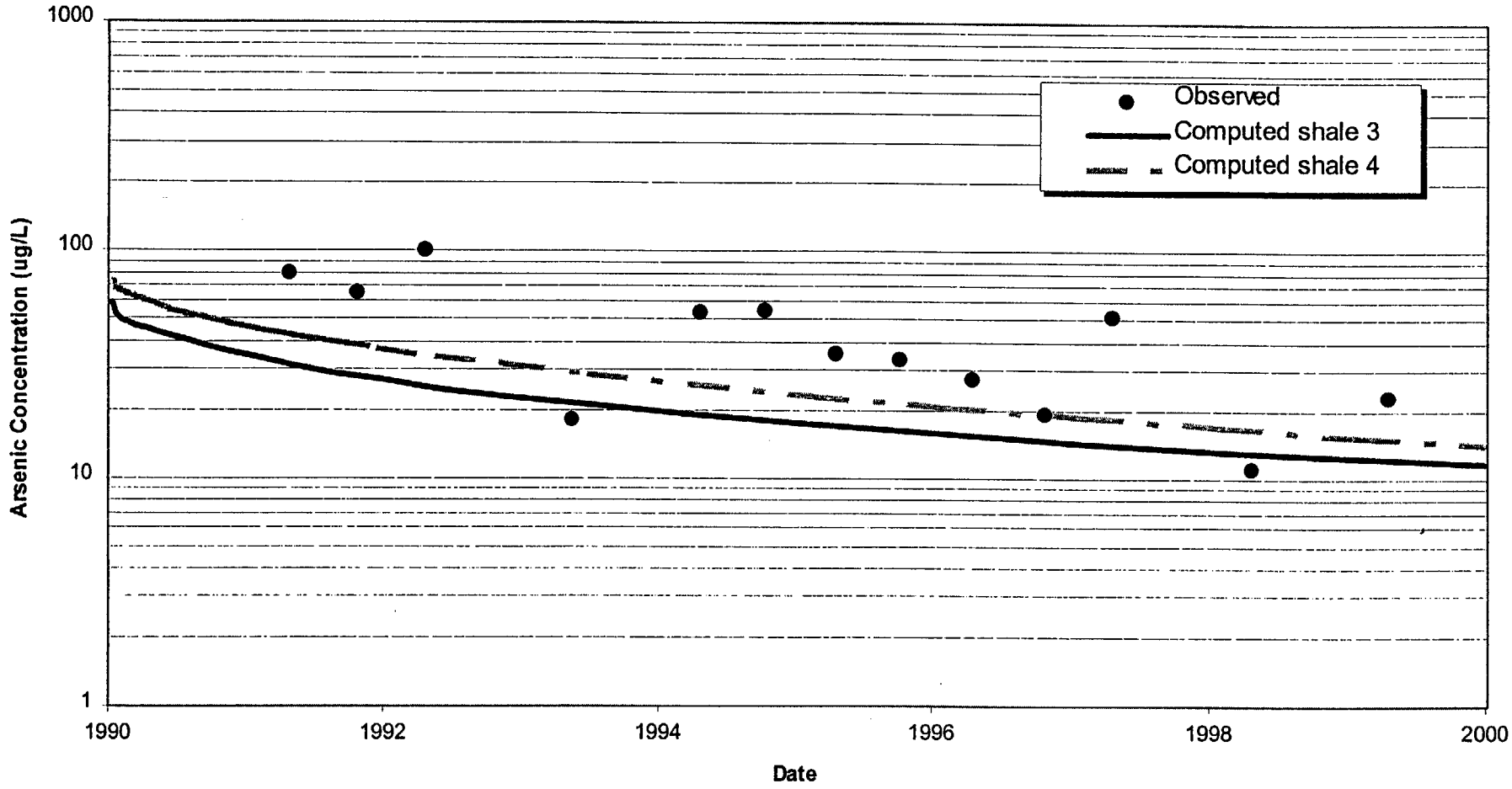


consulting scientists and engineers

FIGURE
ARSENIC TRANSPORT CALIBRATION FOR WELL MW066A

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|---|---|
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| Project: | P:\100734-2\REV CHAR RPT |
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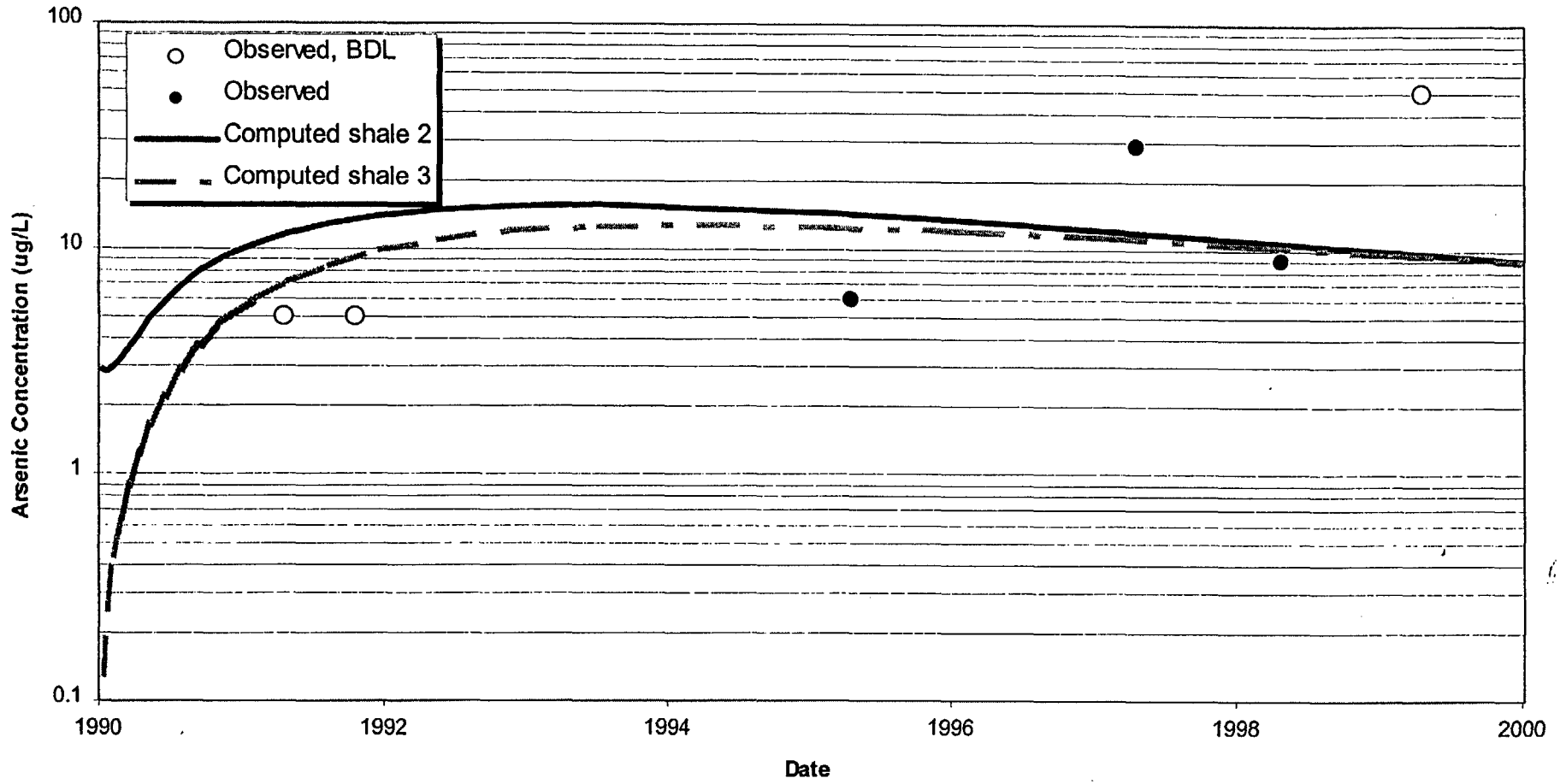


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FIGURE
ARSENIC TRANSPORT CALIBRATION FOR WELL MW067A

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|---|---|
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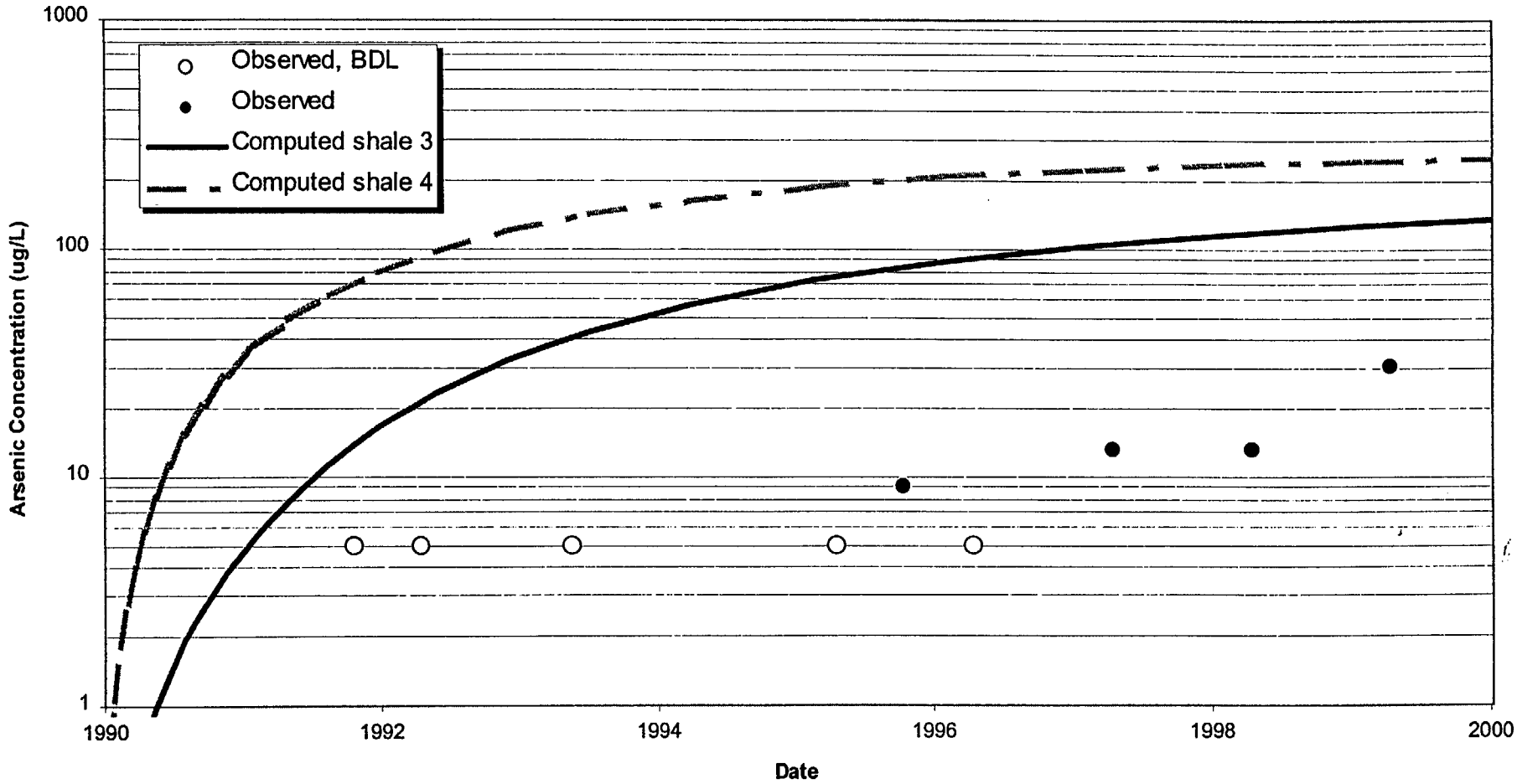


consulting scientists and engineers

FIGURE
ARSENIC TRANSPORT CALIBRATION FOR WELL MW091A

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|---|---|
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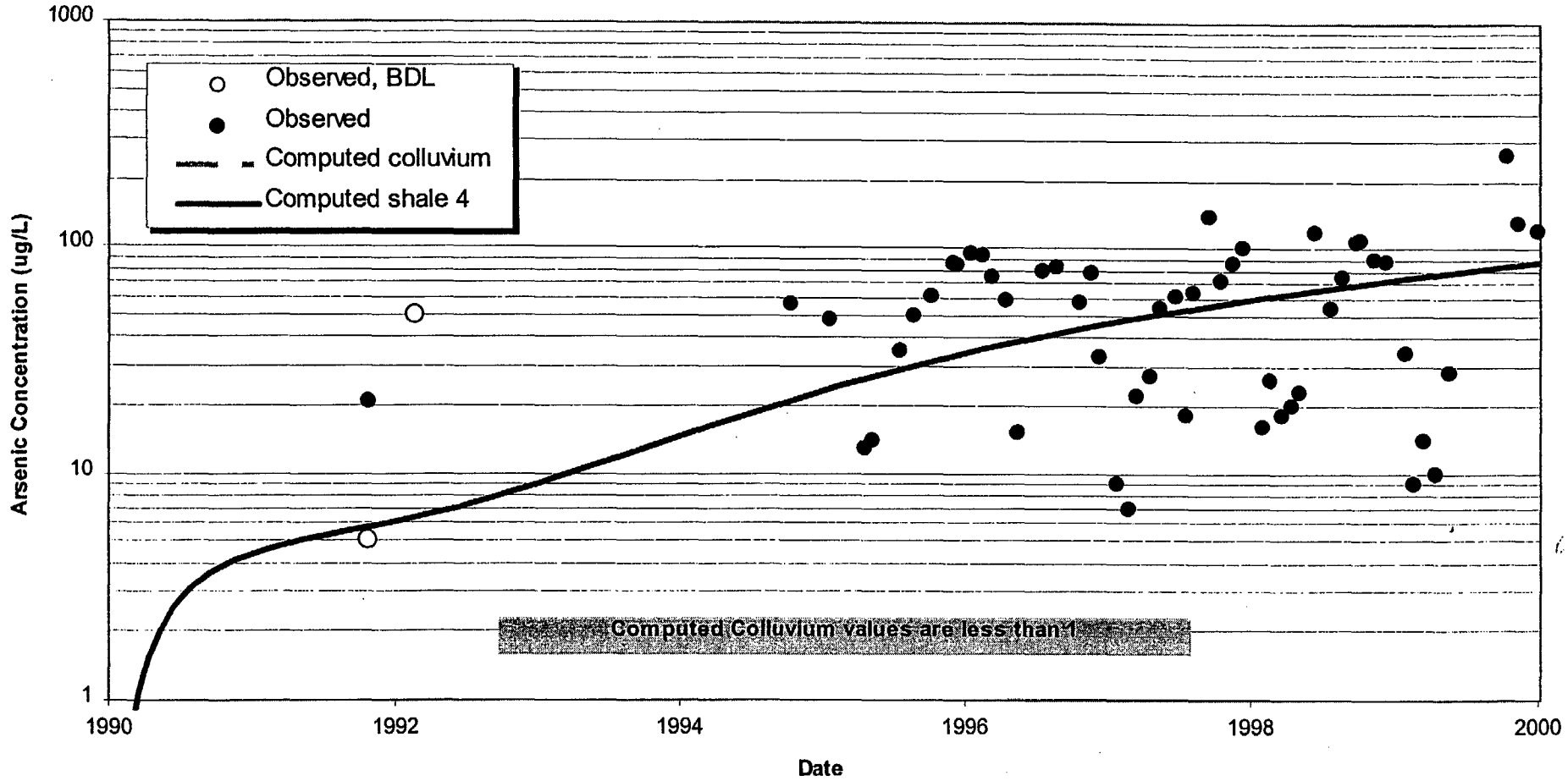


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FIGURE
ARSENIC TRANSPORT CALIBRATION FOR WELL MW095A

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|---|---|
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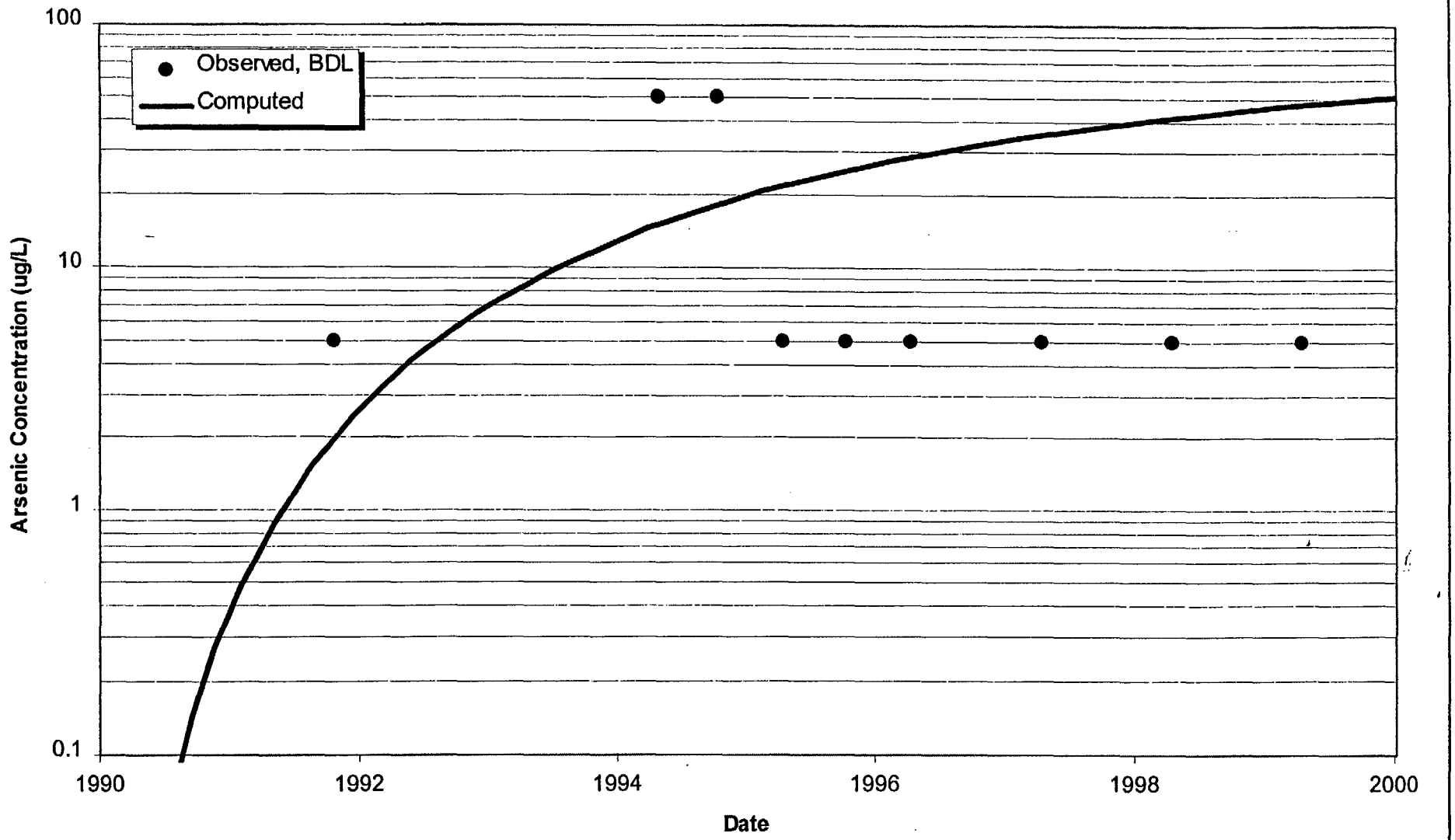


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FIGURE
ARSENIC TRANSPORT CALIBRATION FOR WELL MW098B

| | |
|---|---|
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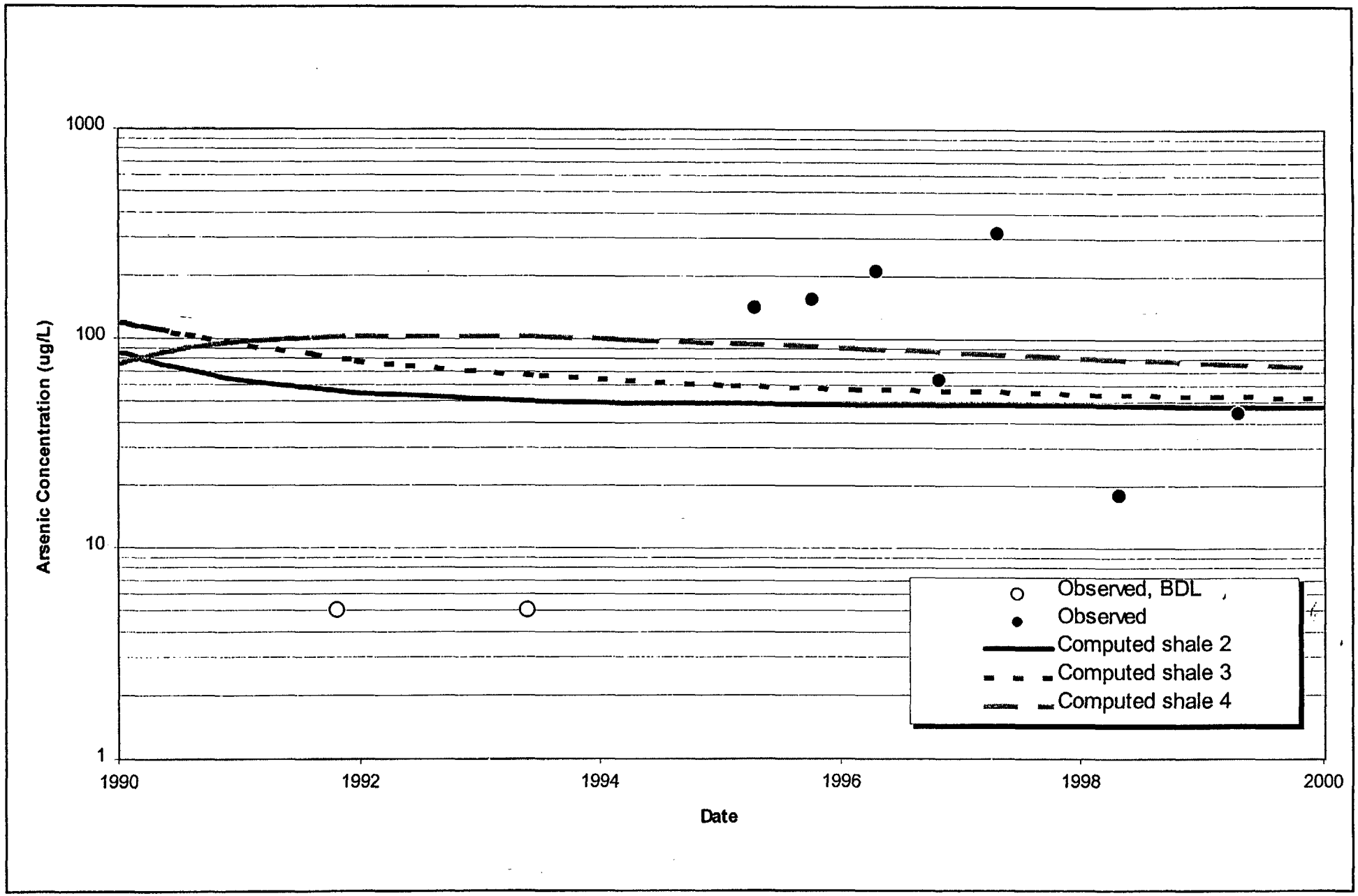


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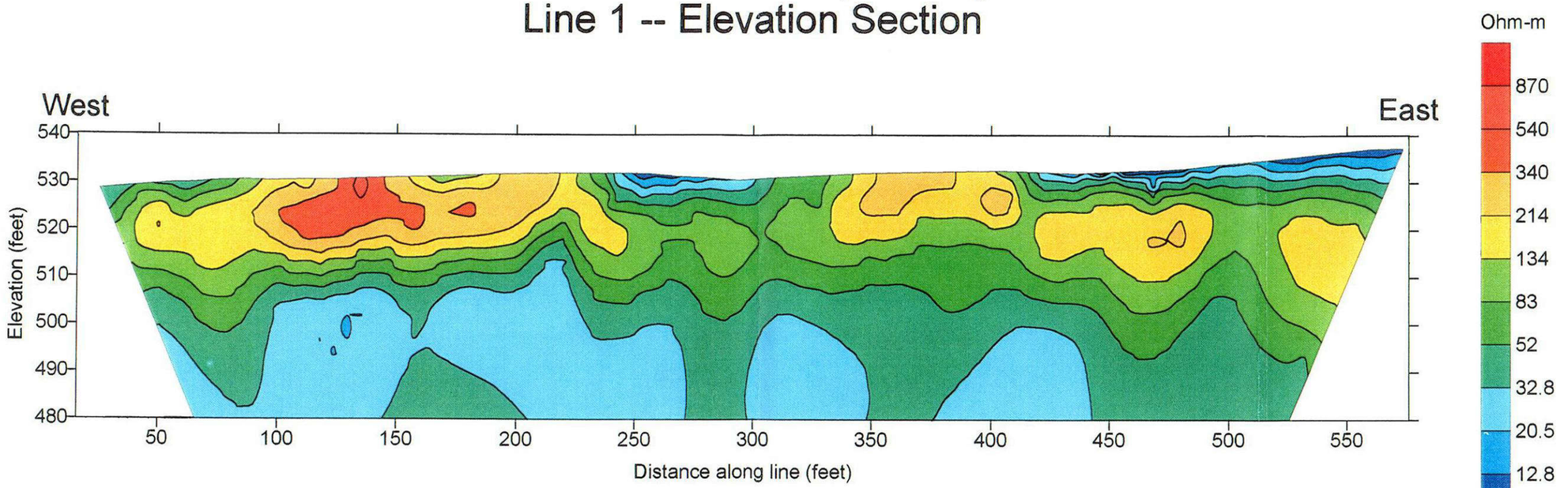
FIGURE
ARSENIC TRANSPORT CALIBRATION FOR WELL MW102A

| | |
|---|---|
| Date: | AUGUST 2002 |
| Project: | P:\100734-2\REV CHAR RPT |
| File: | AS FIGURES.ppt |

# Sequoyah Fuels
# Electrical Resistivity Survey
# Line 1 -- Elevation Section




Feet

0 50 100 150 200

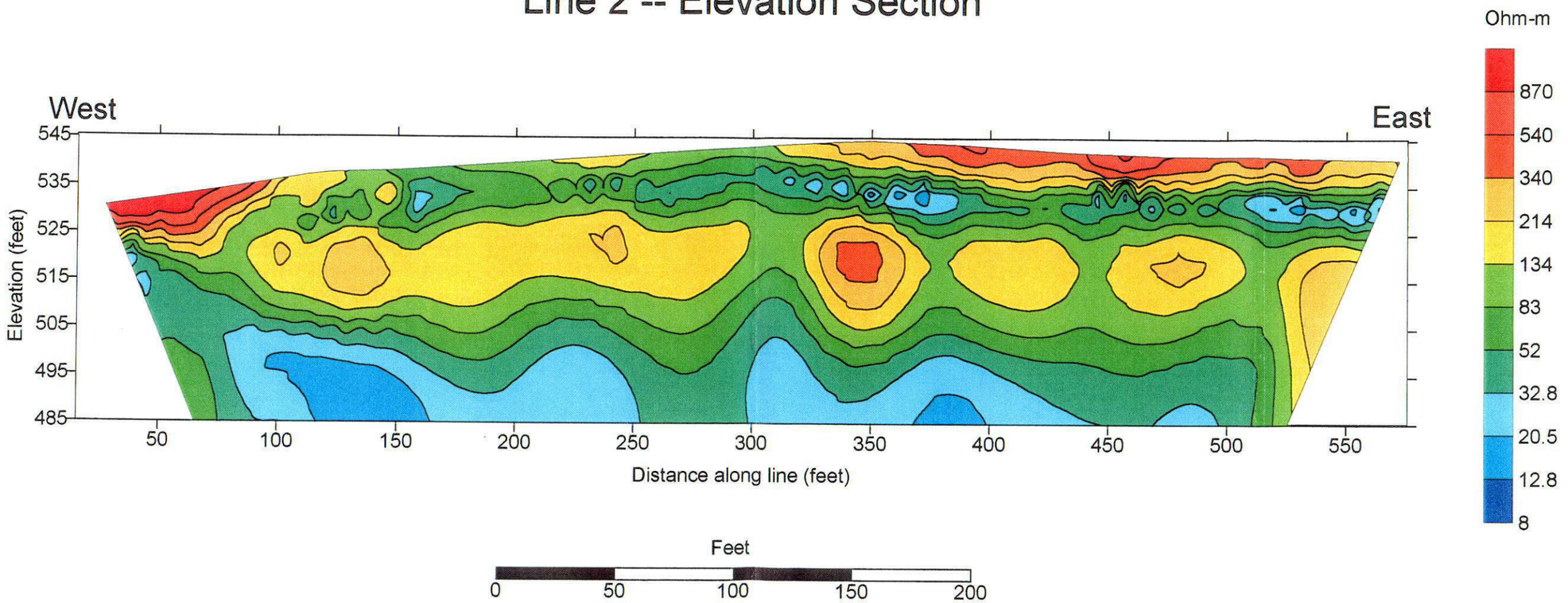
Vertical exaggeration = 2

Hasbrouck Geophysics, Inc.
Montrose, Colorado
May 2001

C02

Line1ElevShallow-2.srf

# Sequoyah Fuels
# Electrical Resistivity Survey
# Line 2 -- Elevation Section



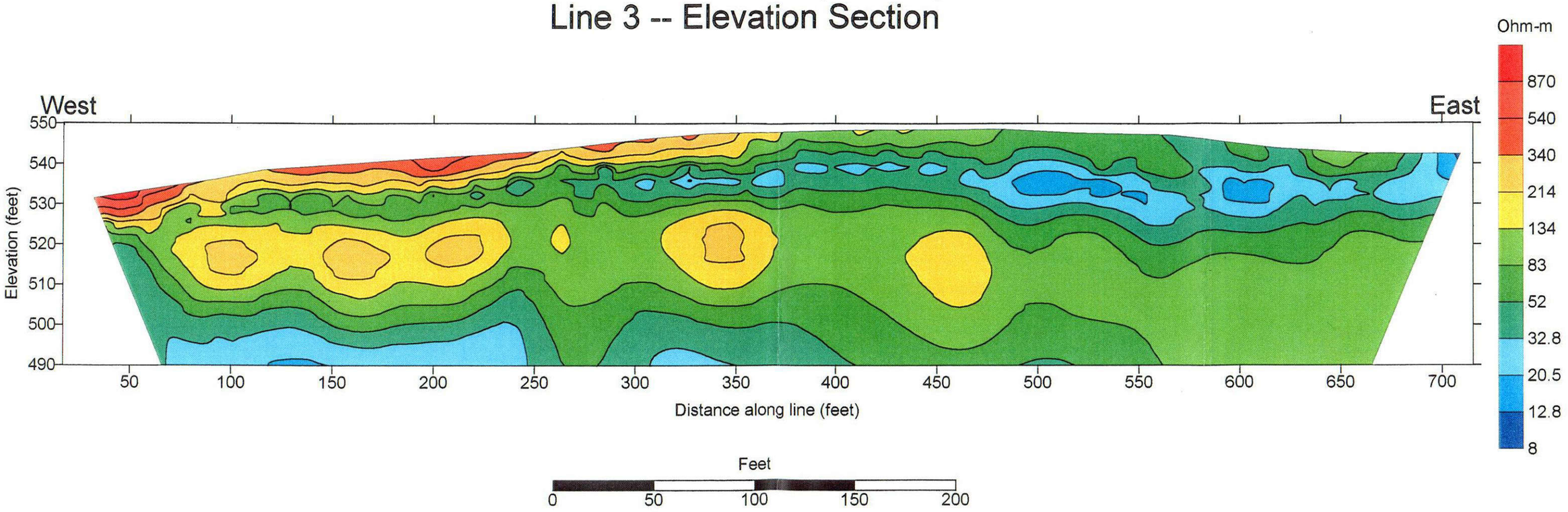

Vertical exaggeration = 2

Hasbrouck Geophysics, Inc.
Montrose, Colorado
May 2001

C03

Line2ElevShallow-2.srf

# Sequoyah Fuels
# Electrical Resistivity Survey
# Line 3 -- Elevation Section




Feet

0 50 100 150 200

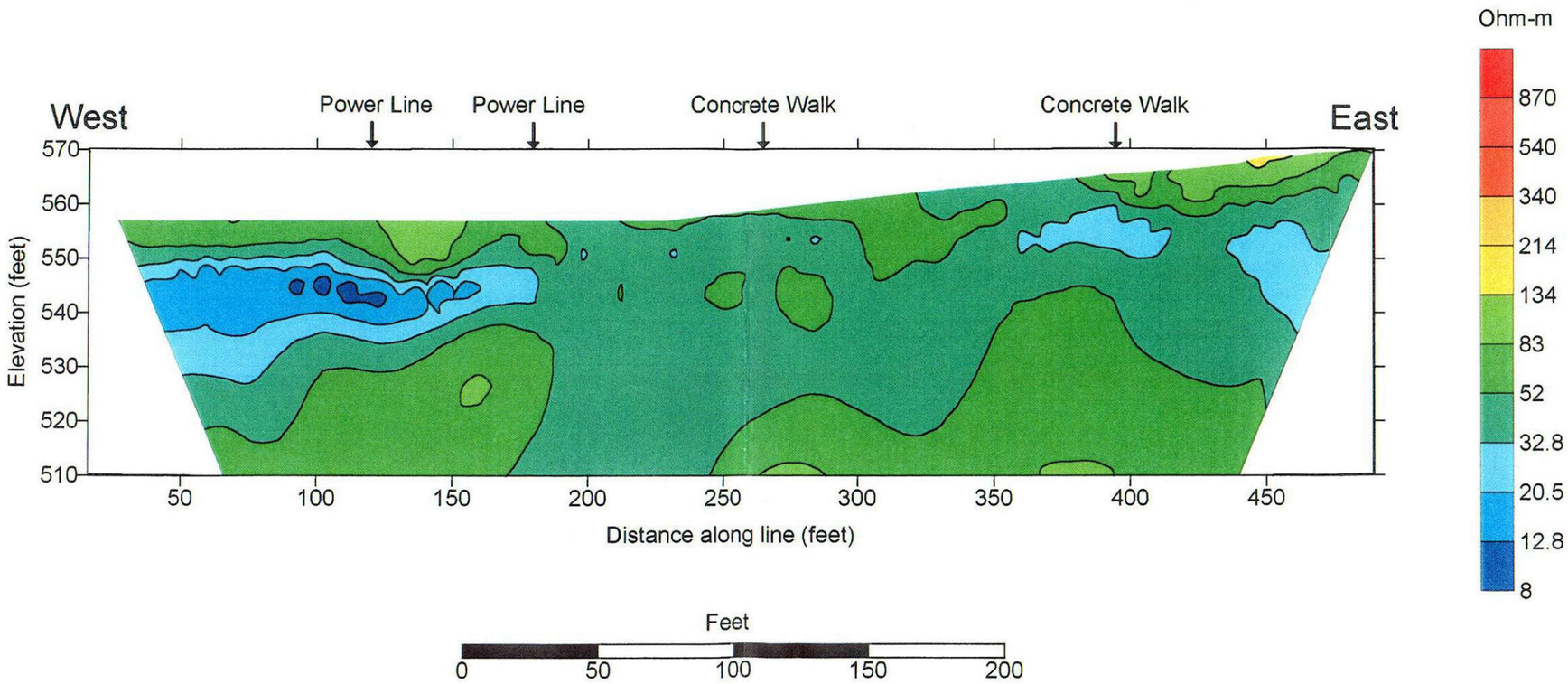
Vertical exaggeration = 2

Hasbrouck Geophysics, Inc.
Montrose, Colorado
May 2001

C04

Line3AllElevShallow-2.srf

# Sequoyah Fuels
# Electrical Resistivity Survey
# Line 4 -- Elevation Section



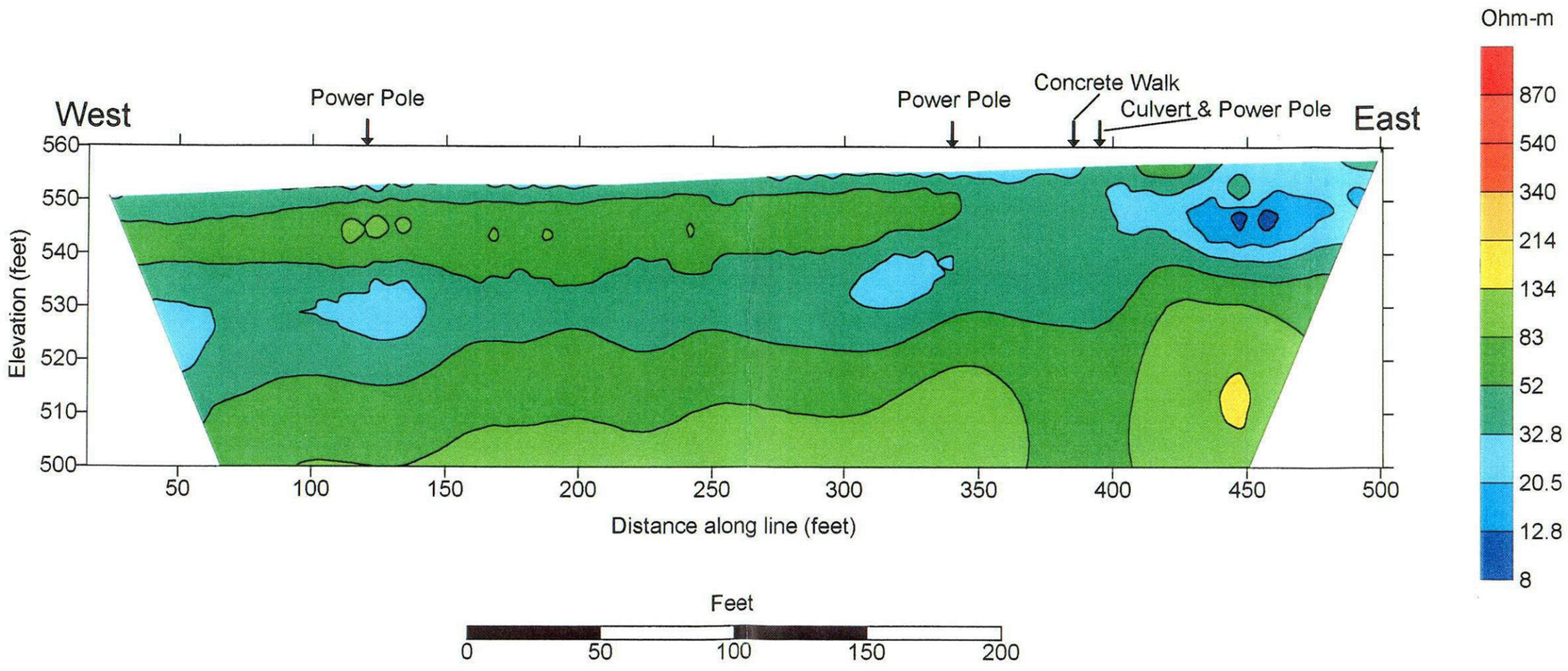

Vertical exaggeration = 2

Hasbrouck Geophysics, Inc.
Montrose, Colorado
May 2001

C05

Line4ElevShallow-2.srf

# Sequoyah Fuels
# Electrical Resistivity Survey
# Line 5 -- Elevation Section



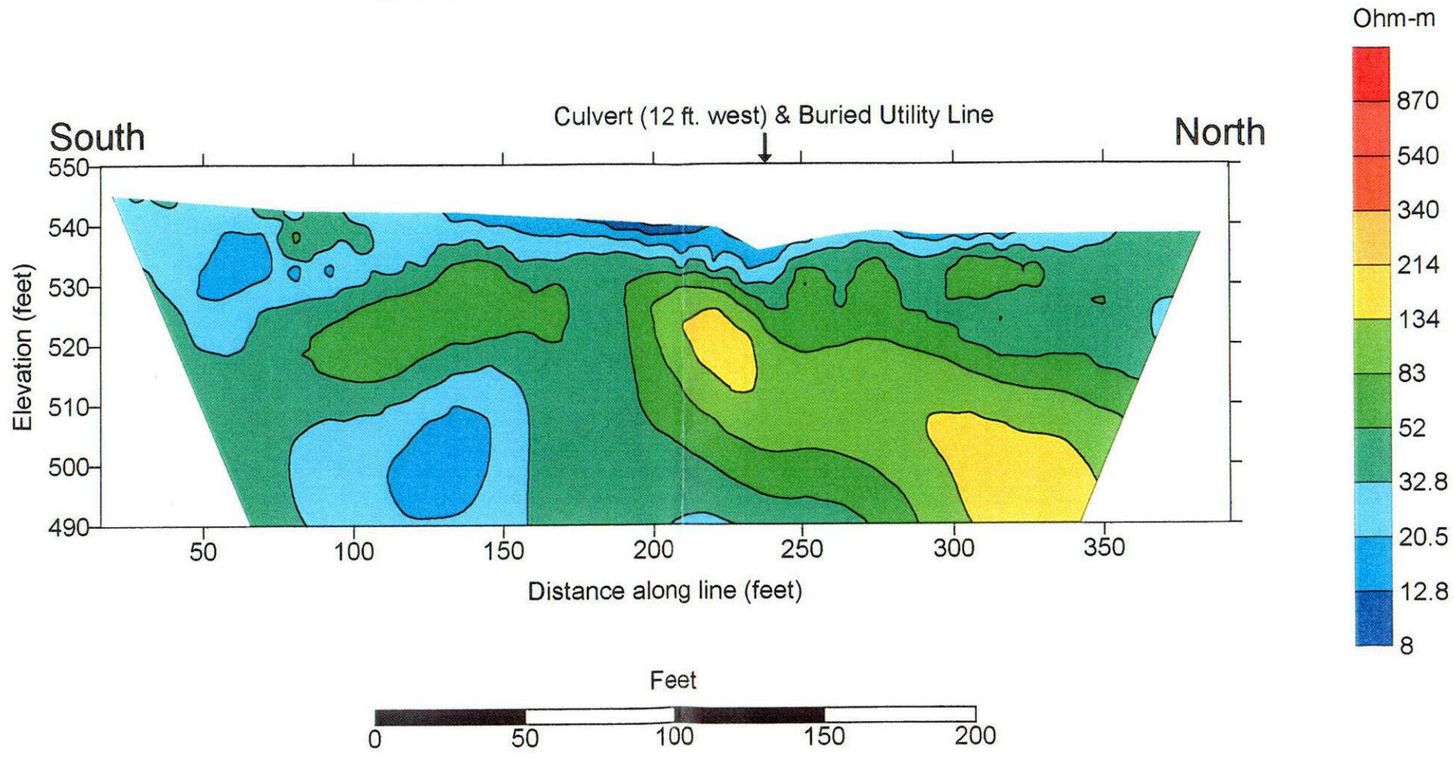

Vertical exaggeration = 2

Hasbrouck Geophysics, Inc.
Montrose, Colorado
May 2001

C06

Line5ElevShallow-2.srf

# Sequoyah Fuels
# Electrical Resistivity Survey
# Line 6 -- Elevation Section



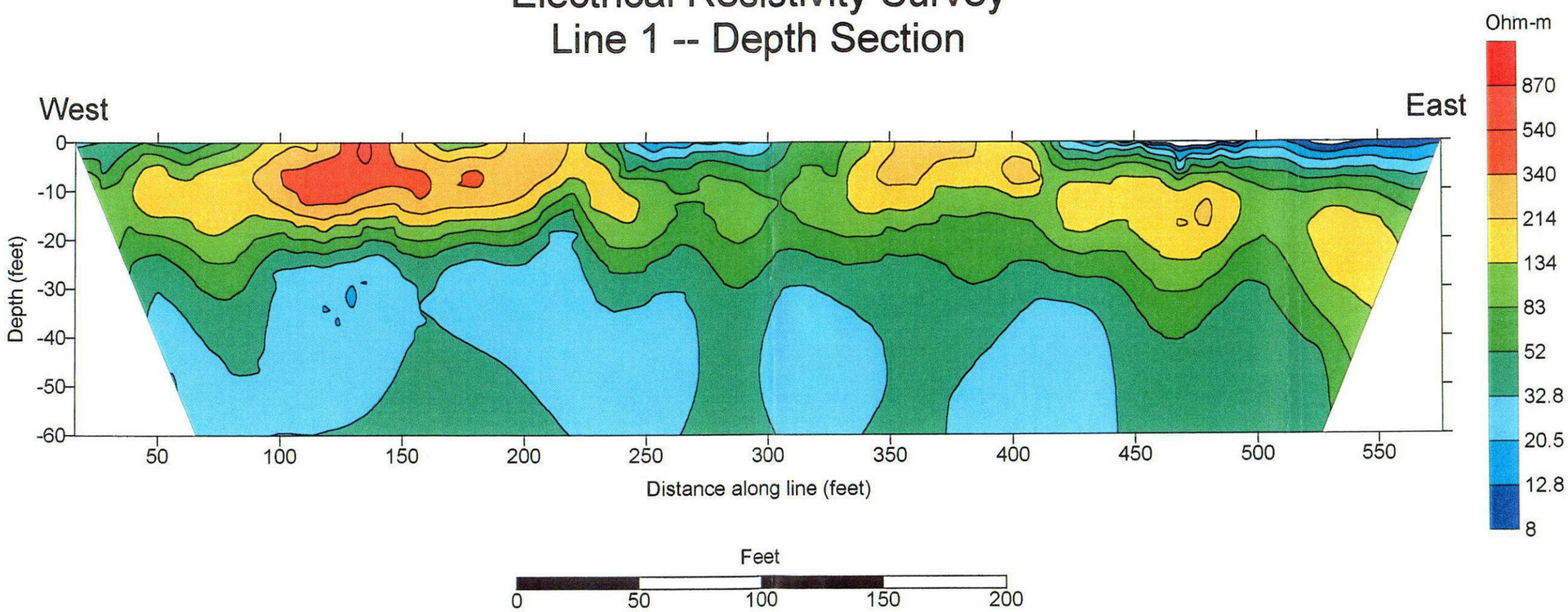

Vertical exaggeration = 2

Hasbrouck Geophysics, Inc.
Montrose, Colorado
May 2001

C07

Line6ElevShallow-2.srf

# Sequoyah Fuels
# Electrical Resistivity Survey
# Line 1 -- Depth Section




Feet

0 50 100 150 200

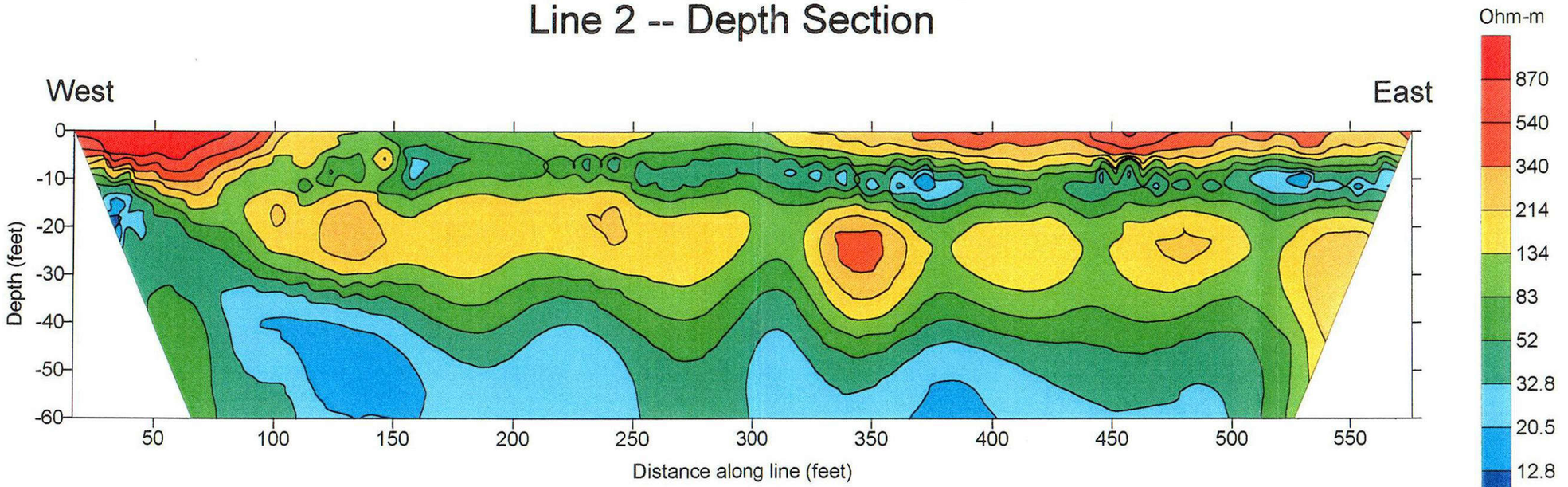
Vertical exaggeration = 2

Hasbrouck Geophysics, Inc.
Montrose, Colorado
May 2001

C08

Line1DepthShallow.srf

# Sequoyah Fuels
# Electrical Resistivity Survey
# Line 2 -- Depth Section




Feet

0 50 100 150 200

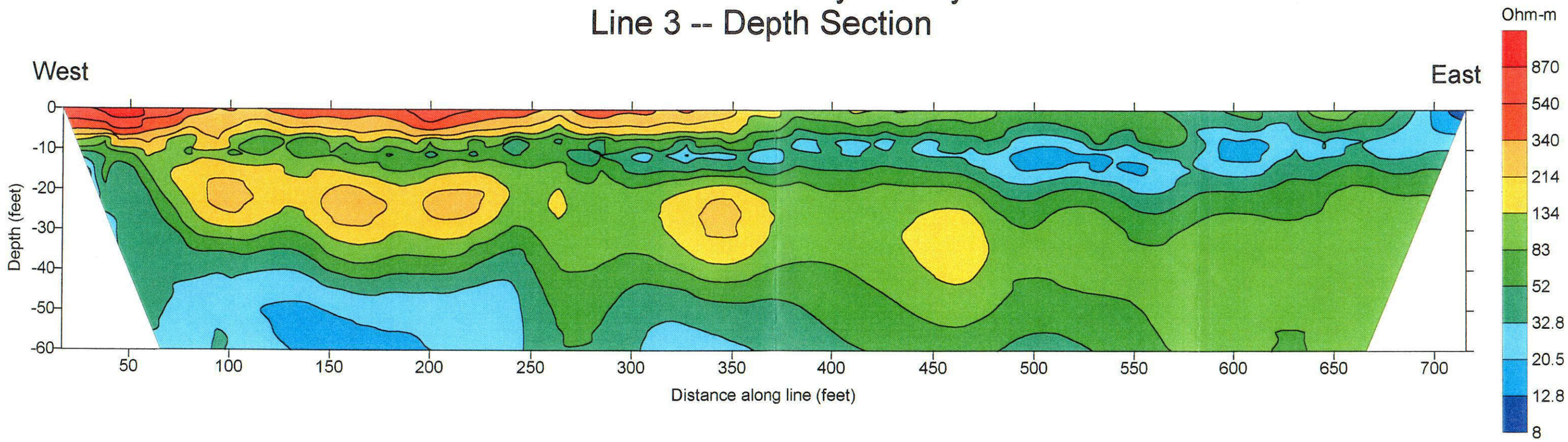
Vertical exaggeration = 2

Hasbrouck Geophysics, Inc.
Montrose, Colorado
May 2001

C09

Line2DepthShallow.srf

# Sequoyah Fuels
# Electrical Resistivity Survey
# Line 3 -- Depth Section




Feet

0 50 100 150 200

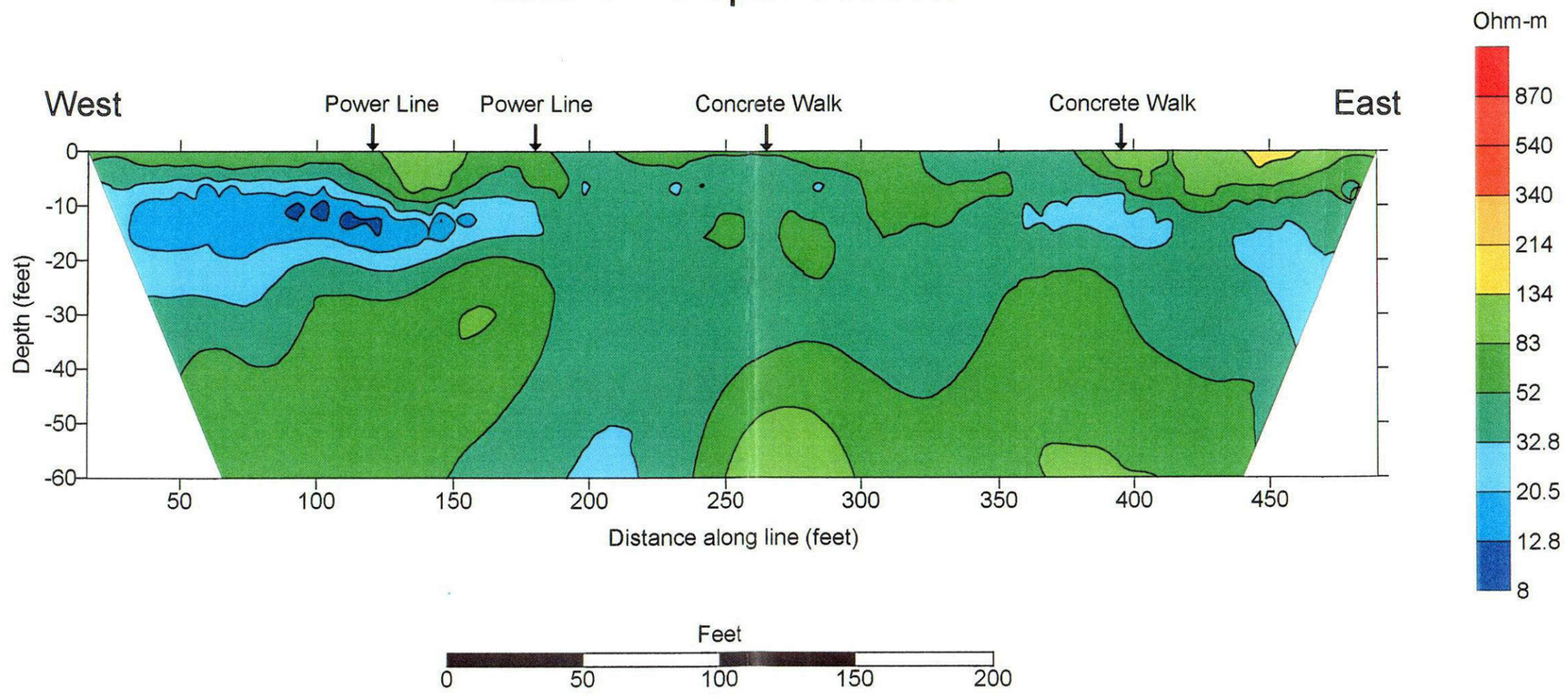
Vertical exaggeration = 2

Hasbrouck Geophysics, Inc.
Montrose, Colorado
May 2001

C10

Line3AllDepthShallow.srf

# Sequoyah Fuels
# Electrical Resistivity Survey
# Line 4 -- Depth Section



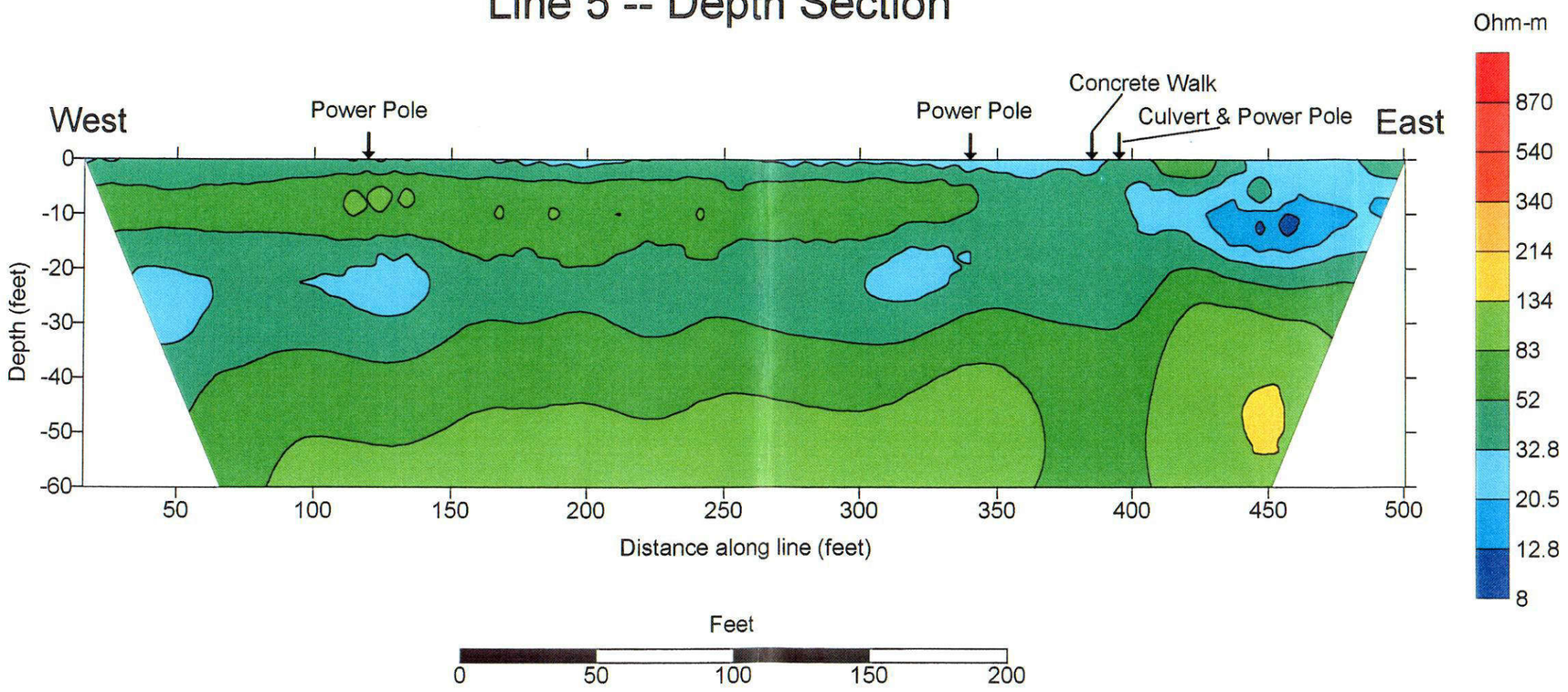

Vertical exaggeration = 2

Hasbrouck Geophysics, Inc.
Montrose, Colorado
May 2001

C11

Line4DepthShallow.srf

# Sequoyah Fuels
# Electrical Resistivity Survey
# Line 5 -- Depth Section



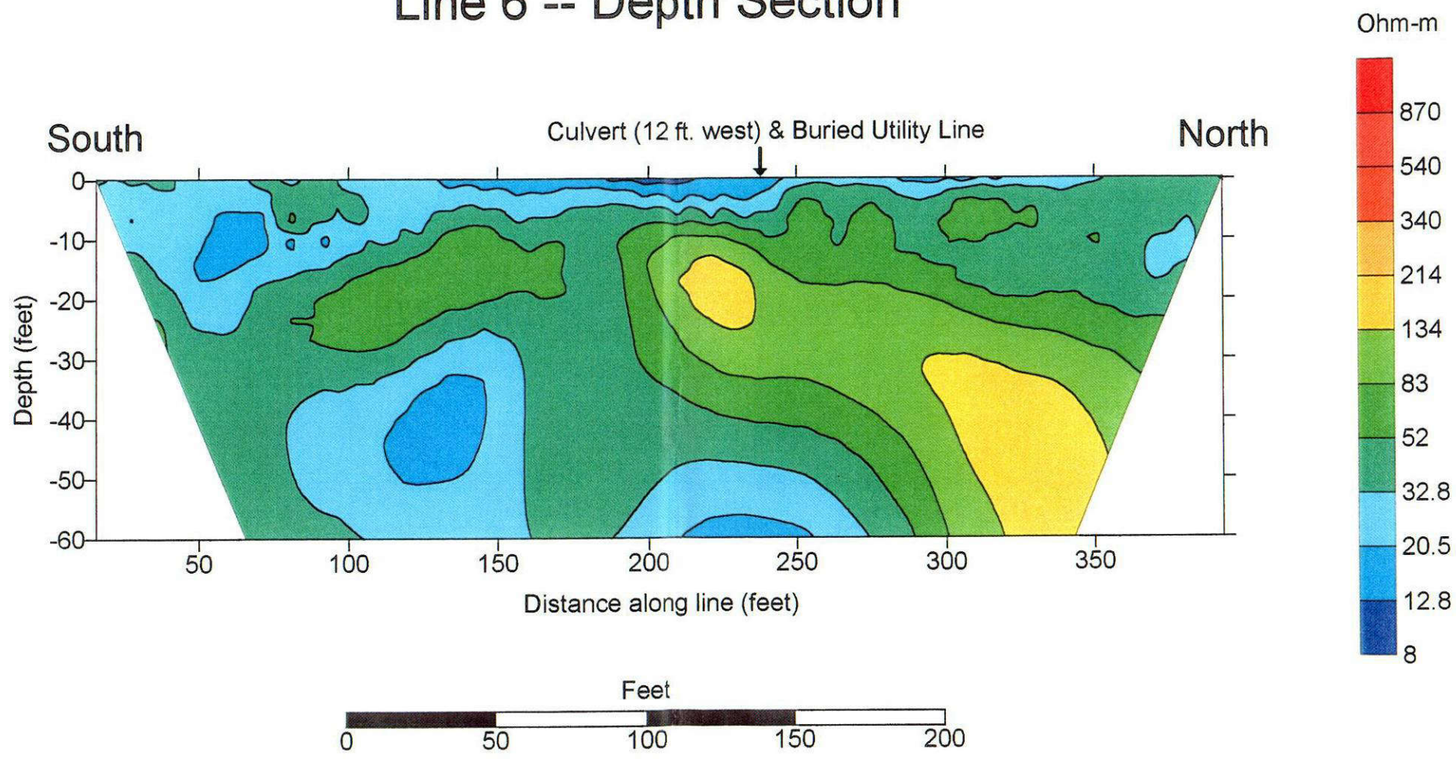

Vertical exaggeration = 2

Hasbrouck Geophysics, Inc.
Montrose, Colorado
May 2001

C12

Line5DepthShallow.srf

# Sequoyah Fuels
# Electrical Resistivity Survey
# Line 6 -- Depth Section




Vertical exaggeration = 2

Hasbrouck Geophysics, Inc.
Montrose, Colorado
May 2001

C13

Line6DepthSahllow.srf