Appendix F

Aquifer Pumping Test Calculation

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Technical Task Cover Sheet

Discipline: Hydrology **Number of Sheets** 12

Project:

UMTRA Ground Water

Site:

Durango

Subject:

Slug Tests

Sources of Data:

U.S. Department of Interior Bureau of Reclamation Durango Projects Office, 1990. *Durango Pumping Plant Animas La Plata Project Hydrogeochemical Site Characterization,* Volumes I and II, November.

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,* 12:423–428.

Bouwer, Herman, 1989. "The Bouwer and Rice Slug Test—An Update," *Ground Water Journal,* 27(3):304–309, May–June.

Environmental Simulations, Inc., 1997–2000. AquiferWin32 Version 2.31 software, Developed by Doug Rumbaugh and Jim Rumbaugh, Herndon, Virginia (703) 834-3054.

Kearl, Peter, John Ludlam, Verner Johnson, and Don Diego Gonzalez, 1983. *Preliminary Hydrogeochemical Characterization of the Durango, Colorado, Tailings and Raffinate Ponds Areas,* GJ-03(83), prepared for the U.S. Department of Energy, Uranium Mill Tailings Remedial Action Project Technology Development, contract DE-AC07-76GJO1664, U.S. Department of Energy Grand Junction Area Office, Grand Junction, Colorado, April.

Task Order No. MAC01-05 **File Index No.** GWDUR 1.1

Proj. No. UGW-511-0006-08-000 **Calc. No.** U0133300 **Supersedes Calc. No.** N/A

Calculated by	Date	Checked by	Date	Approved by	Date	DOE Concurrence (if required)	Date
Mark Kautsky	7-03-01	Craig Goodlight	7/5/01		05/16/01		

mactec-ers

U.S. Department of Energy Grand Junction Office

Problem Statement

Estimates of hydraulic conductivity are required for site characterization at UMTRA Ground Water Project sites. The estimates are used to make modeling predictions of the flushing rate of contamination in ground water from beneath former tailings sites.

Method of Solution

The Durango UMTRA Project site is composed of two sites: the former tailings area and the raffinate ponds. Hydrogeologic units in the tailings area consists of Animas River and Lightner Creek alluvial deposits resting on Mancos Shale bedrock. The saturated alluvium is up to 5 feet (ft) thick, and the maximum thickness of saturation occurs during spring-runoff in May and June. The depth to water ranges from less than 5 ft to more than 50 ft. Pumping tests were considered as a means to characterize the alluvium but were ruled out because of a thin saturated zone. In addition, where the depth to water exceeds 25 ft, centrifugal pumps cannot be used. Near well 631 the saturated alluvium is only about 2 ft thick; therefore, it is impractical to perform a multiple-well pumping test at that location. In other locations, the depth to water exceeds 25 ft. At these locations, a submersible pump is required but cannot be used effectively because the pump is too long to adequately stress a thin aquifer. Consequently, the technical team recommended using slug tests to characterize the alluvial aquifer at the mill tailings site. Slug tests were performed at wells 612, 622, 630, 631, 633, 634, and 863 (Figure 1).

Ground water at the raffinate ponds site occurs in bedrock units of the Menefee Formation and the Point Lookout Sandstone. Except where the Bodo Fault crosses the raffinate ponds area, the low hydraulic conductivity of the bedrock formations makes it difficult to measure drawdown in observation wells. Along the Bodo Fault, Kearl and others (1983) successfully performed a pumping test, and the findings from that test are included in Appendix A and in the statistical summary (Table 2) of this calculation. Because of the anticipated low hydraulic conductivity of the bedrock formations, slug tests were recommended for characterizing the hydraulic conductivity at the raffinate ponds area. Slug tests were performed at wells 602, 876, 878, 879, 881, 882, 883, 888, 889, 890, and 902 (Figure 1).

In November 1990, the U.S. Bureau of Reclamation also performed slug tests and packer tests at the former raffinate ponds site as part of the design of the pumping plant for the Animas La-Plata water project. Results of those tests are in the U.S. Department of Interior Bureau of Reclamation Durango Projects Office and are included in Appendix B and the statistical summary (Table 2) of this calculation.

Assumptions

As presented in Bouwer and Rice (1976), the analyses of slug test data are based on the assumptions that

(1) Drawdown of the water table around the well is negligible.
(2) Flow above the water table (in the capillary fringe) can be ignored.
(3) Head losses as water enters the well (well losses) are negligible.
(4) The aquifer is homogeneous and isotropic.

Sources of Formulas and References:

The two primary references on slug testing are Bouwer and Rice (1976) and Bouwer (1989).

In situ MiniTroll data loggers were used to collect the water level data during the slug tests. WinSitu 2000 software was used to program the data loggers, download the field data, and export the data files to Microsoft Excel Worksheet files. Excel software was used to format the data prior to analysis. AquiferWin32 software (ESI, Inc. 1997–2000) was used to analyze the field data, solve for the hydraulic conductivity, and create data reports in Windows Metafile format.

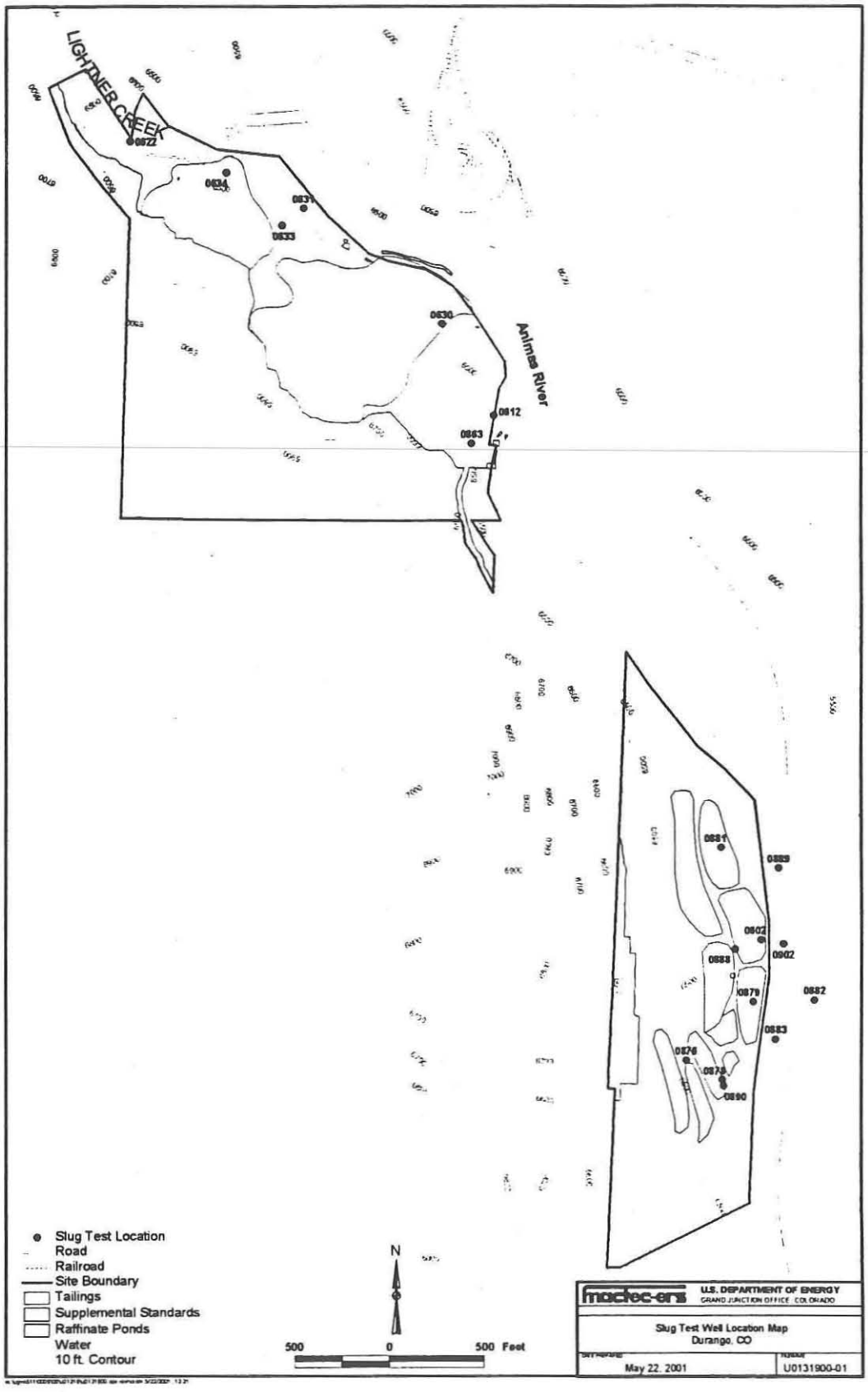


Figure 1. Slug Test Well Location Map

Calculation

Hydraulic conductivity (K) is calculated from the following equation:

$$K = \frac{r_c^{\,2} \ln(R_e / r_w)}{2L_e t} \ln(y_0 / y_t)$$

where

r_c is the radius of the casing or other section of the well where the rise of the water level is measured,
R_e is the effective radial distance over which the water level change is dissipated,
r_w is the radial distance from the centerline of the well to the undisturbed portion of the aquifer,
L_e is the screen length of the well,
y_0 is the water level decline in the well at time 0,
y_t is the water level decline in the well at any time t, and
t is the time elapsed since the beginning of the test.

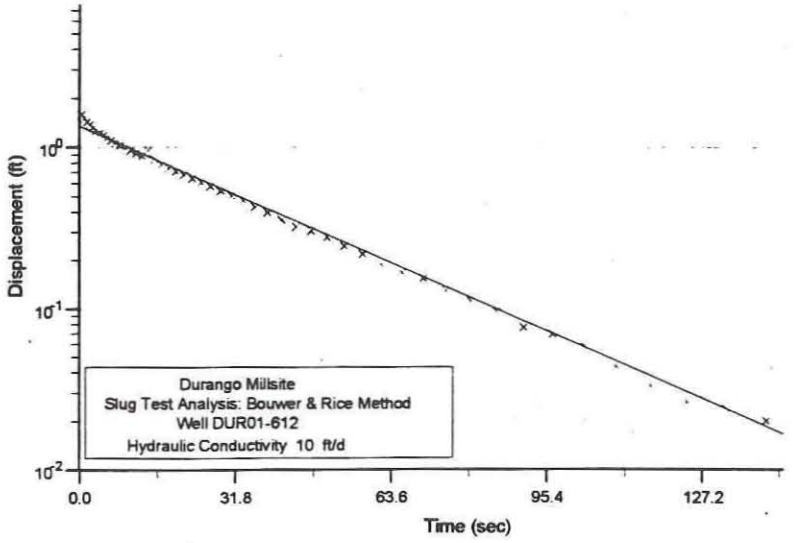
In some cases, the water level decline takes place inside the screened zone of the well. In these cases, r_w includes the open section of the well plus the radial thickness of the sand or gravel pack and the developed zone around the well. A porosity of 30 percent is assumed for the gravel and sand pack surrounding the well screen.

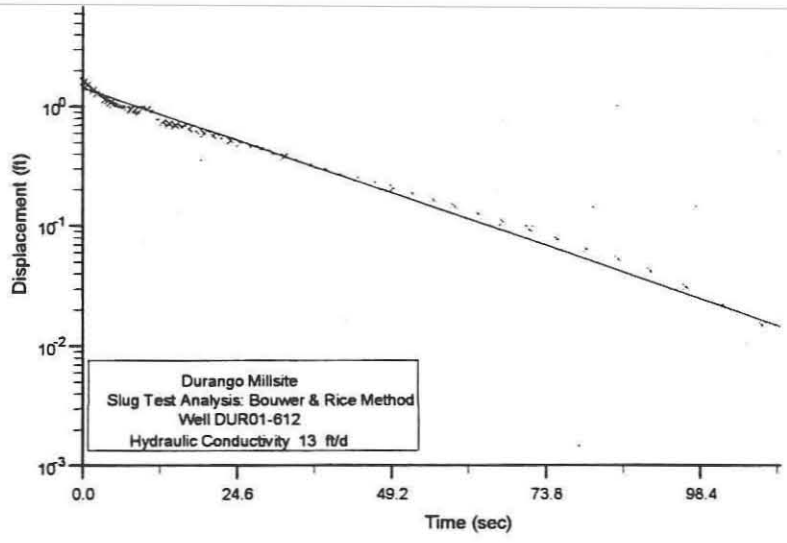
The field data are used to create an input file for the analysis software. The field data are formatted in two columns: the left column contains the elapsed time since the test began; the right column contains the values of the water level depression since the test began. Appendix C contains the time and water level data for each of the tests performed. Table 1 presents a summary of the slug tests.

Table 1. Summary of Slug Tests Performed at the Durango Site by MACTEC-ERS

	Well	Hydraulic Conductivity (ft/day)	Formation		Well	Hydraulic Conductivity (ft/day)	Formation
DUR-01 Tailings Area	612	10	Alluvium	DUR-02 Raffinate Ponds Area	602	0.26	Menefee
	612-dup	13	Alluvium		876	0.09	Menefee
	622	66	Lightner Cr. Alluvium		878	1	Menefee
	630	13	Alluvium		879	0.043	Menefee
	631	27	Alluvium		881	0.016	Point Lookout
	631-dup	26	Alluvium		882	4.7	Menefee (coal)
	633	1	Alluvium		882-dup	5.3	Menefee (coal)
	634	8	Alluvium		883	0.017	Menefee
	863	26	Alluvium		888	6.4	Menefee (Fault)
	863-dup	28	Alluvium		889	0.014	Point Lookout
					890	0.3	Menefee
					902	0.003	Menefee

Note: All alluvium is derived from the Animas River unless noted otherwise.





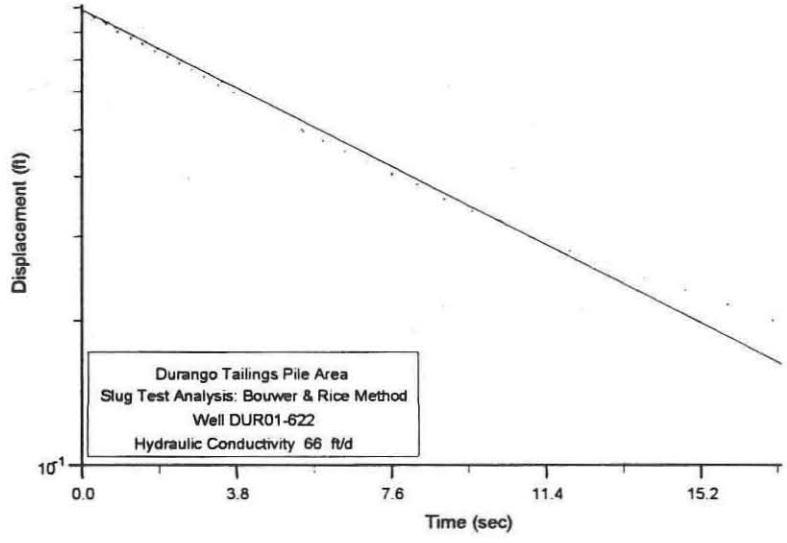
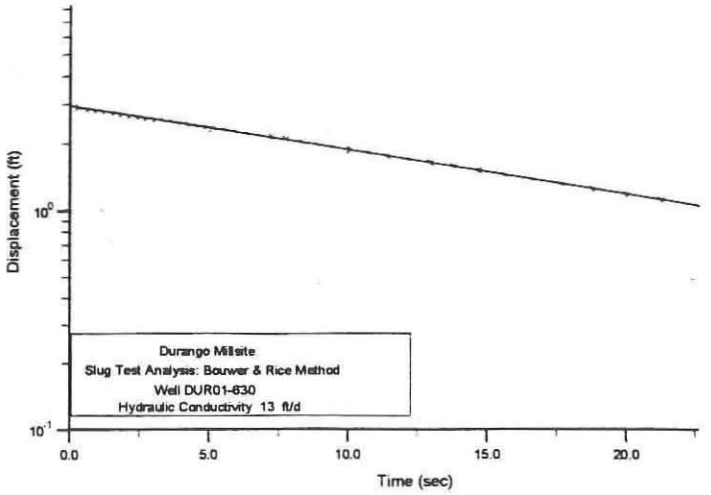
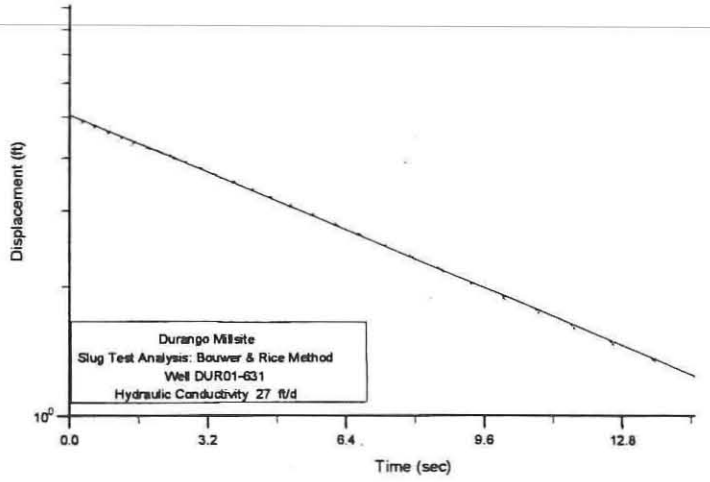


Figure 2. Plots of Displacement Versus Time for Durango Millsite Wells





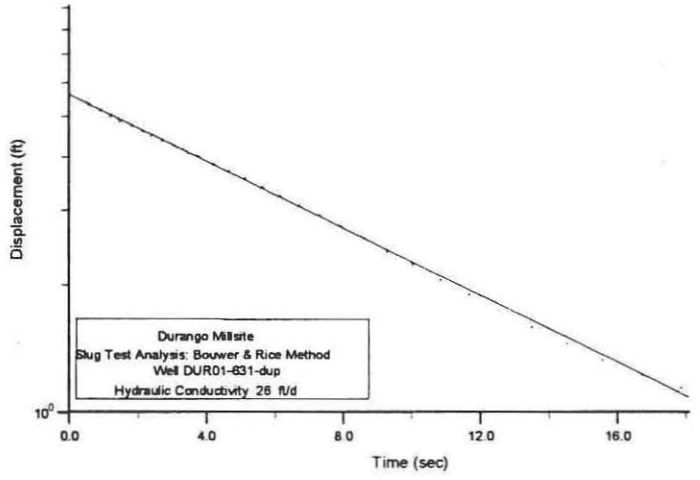


Figure 2 (continued). Plots of Displacement Versus Time for Durango Millsite Wells

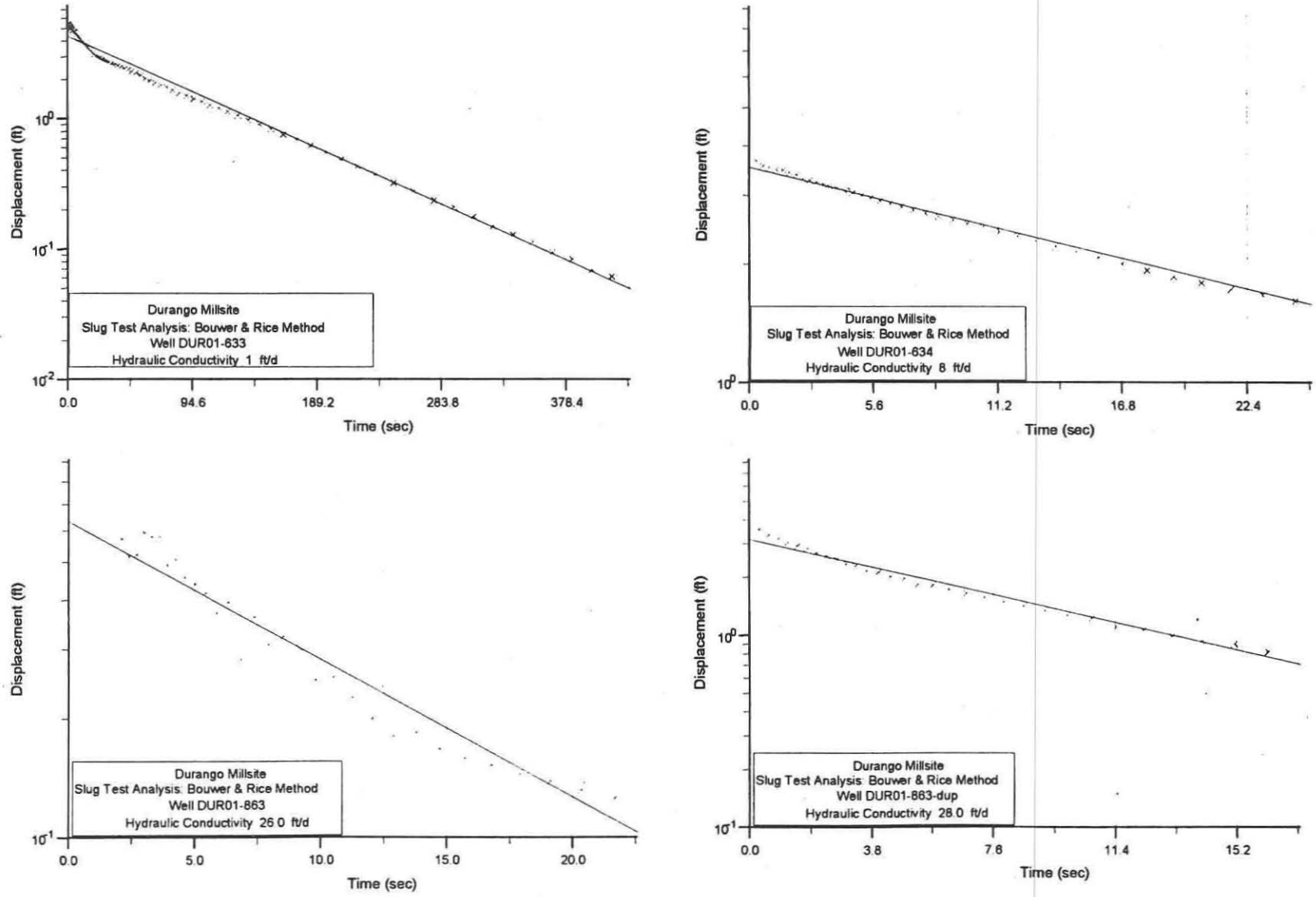


Figure 2 (continued). Plots of Displacement Versus Time for Durango Millsite Wells

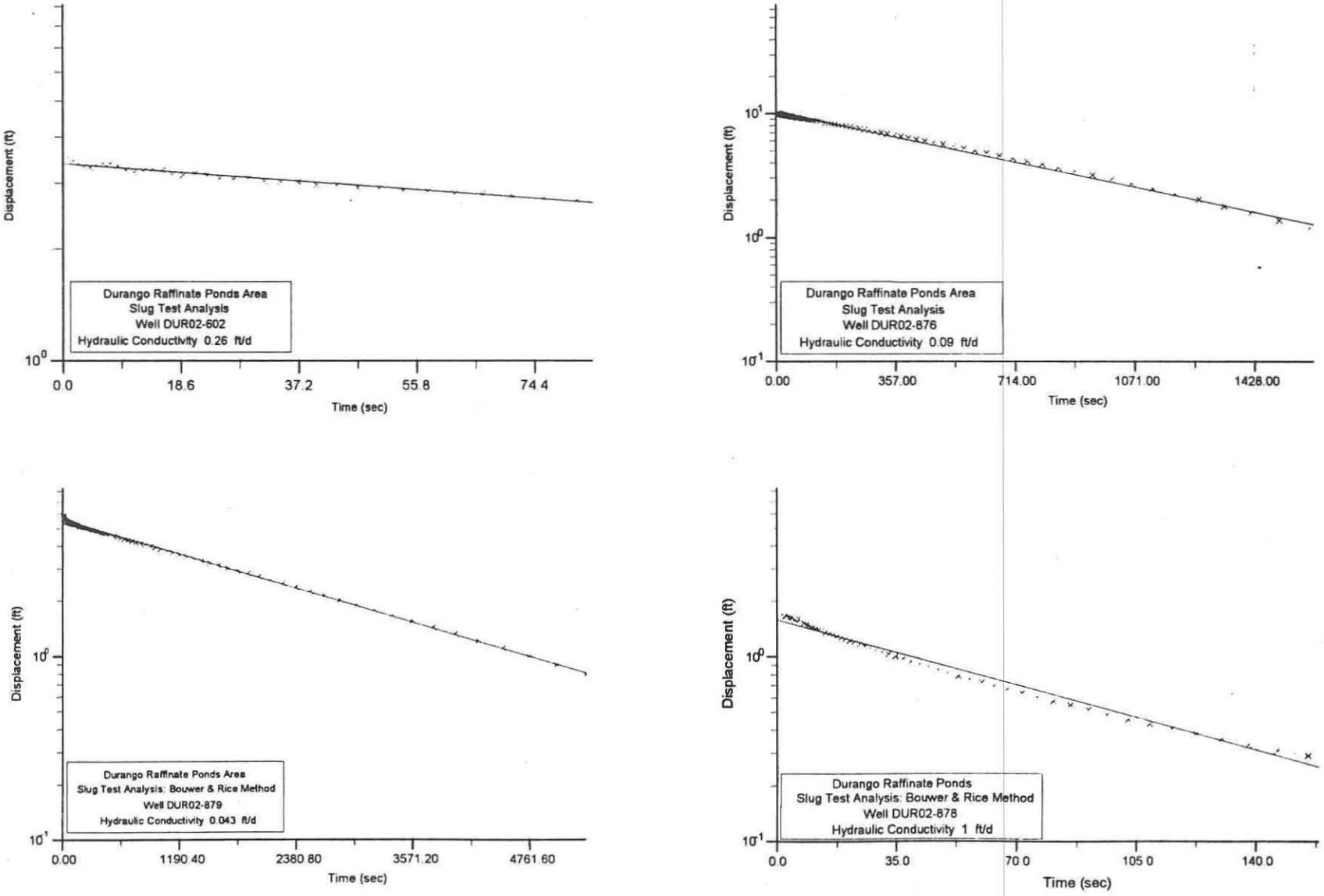


Figure 3. Plots of Displacement Versus Time for Durango Raffinate Ponds Wells

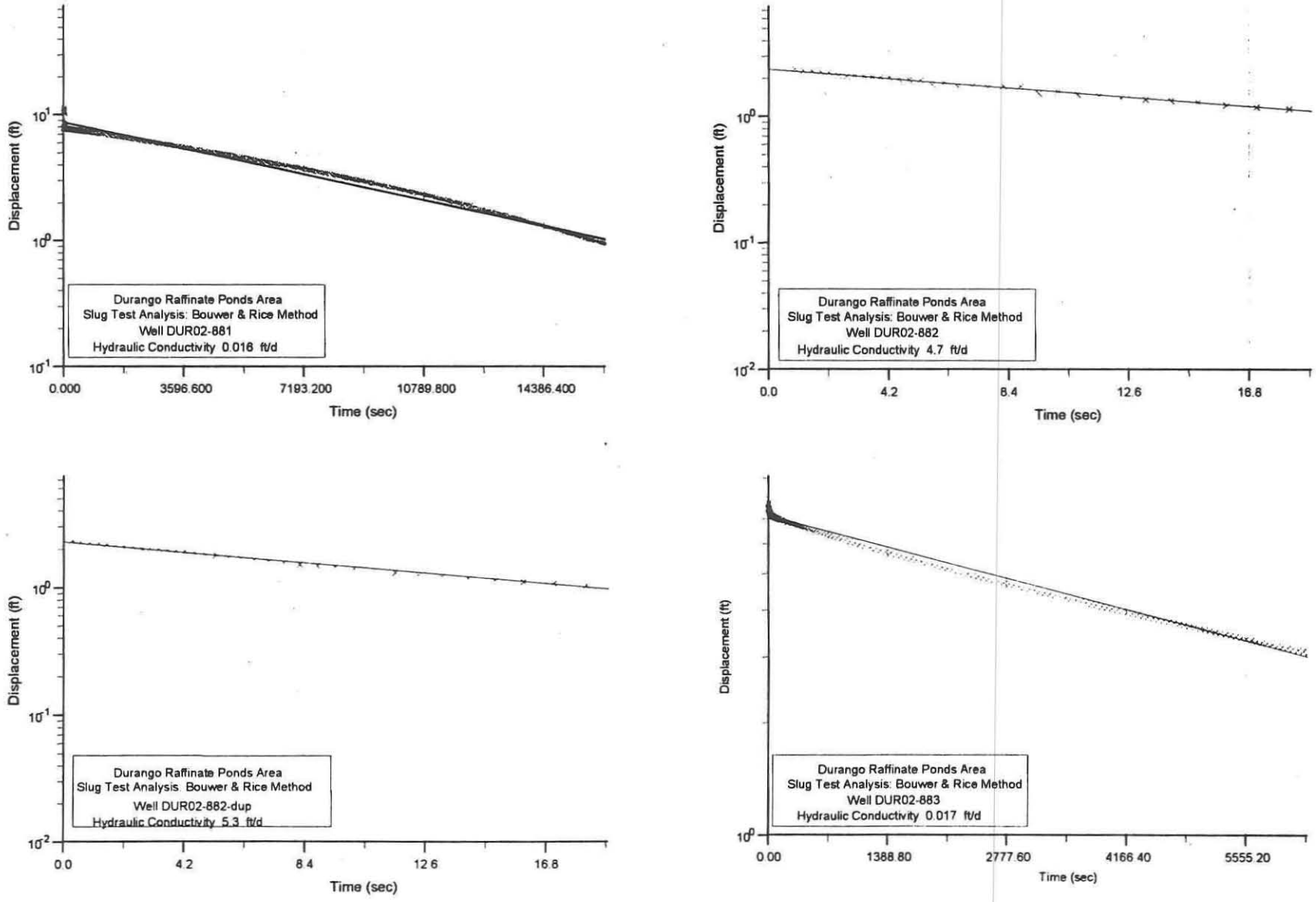


Figure 3 (continued). Plots of Displacement Versus Time for Durango Raffinate Ponds Wells

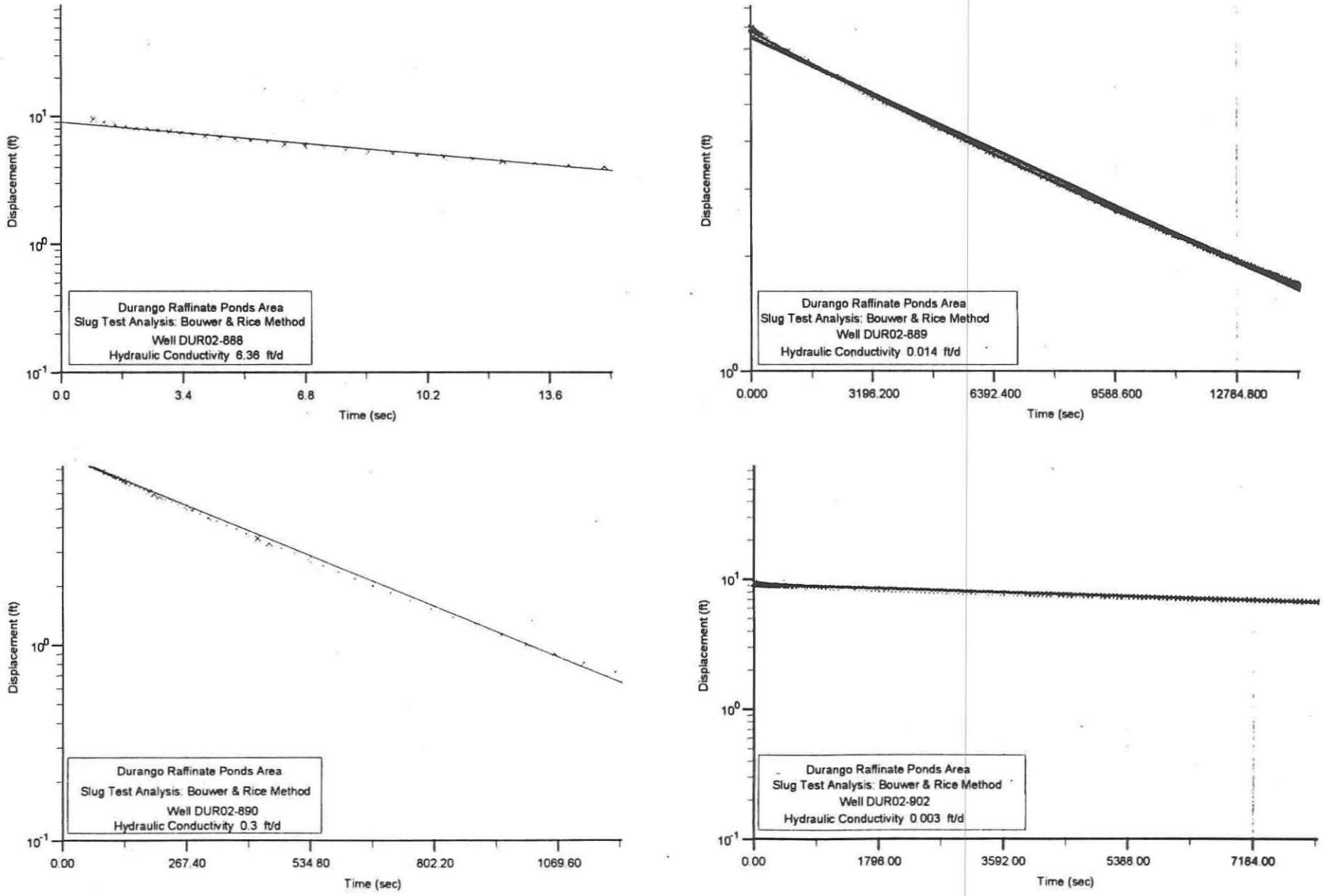


Figure 3 (continued). Plots of Displacement Versus Time for Durango Raffinate Ponds Wells

Discussion

Tailings Area

MACTEC–ERS performed slug tests at seven locations in the tailings area of the site. The hydraulic conductivity ranged from 1 to 28 ft/day for the Animas River alluvium and was 66 ft/day for the Lightner Creek alluvium (Table 1).

The investigation by Kearl and others (1983) reported results at four Animas River alluvium locations and one Lightner Creek alluvium location (Appendix A). The tests were conducted in triplicate, however, one of the results was reported in duplicate. The Lightner Creek alluvium test had the highest hydraulic conductivities and the highest variability. Results for the Animas River alluvium were comparable to the range of values determined by MACTEC–ERS. Results for the Lightner Creek alluvium, however, were much greater than the results obtained by MACTEC–ERS. Because the equipment used by MACTEC–ERS is more responsive to quickly recovering water levels than the equipment used by the Kearl investigation, it is our opinion that the MACTEC–ERS results have less bias, more precision, and are therefore more accurate.

The "Trial 1" results of the duplicate and triplicate results of the Kearl investigation were selected and combined with MACTEC–ERS results to evaluate the basic statistics of the alluvial deposits. The results are presented in Table 2. Using one significant figure accuracy, the median hydraulic conductivity for the Animas Creek and Lightner Creek alluvium is 20 ft/d and 70 ft/d, respectively.

Raffinate Ponds Area

MACTEC–ERS performed slug tests at eleven locations at the Raffinate Ponds area. The slug tests indicate that the hydraulic conductivity of the Menefee Formation ranges from a minimum of 0.003 ft/day at well 902 to 5.3 ft/day for the duplicate test at well 882. Lithologic data obtained during drilling indicate that the relatively high hydraulic conductivity for the Menefee Formation at well 882 was apparently obtained from a coal bed at a depth of 27 to 34.5 ft. This result strengthens the belief that coal deposits within the Menefee Formation are important conduits for ground water flow.

The two slug tests performed by MACTEC–ERS on the Basal Member Point Lookout Sandstone indicate that the hydraulic conductivity is in the range of 0.014 to 0.016 ft/day. Low hydraulic conductivity values in the Basal Member Point Lookout Sandstone were also reported in earlier reports. [Kearl (1983) and U.S. Bureau of Reclamation (1990)].

Within the Bodo Fault, the slug test for well 888 indicates a hydraulic conductivity of 6.4 ft/day. The result for the Bodo Fault confirms earlier tests by Kearl and others (1983) when a value of 4.4 ft/day was determined. The slug test results support the belief that the Bodo Fault is an important conduit for ground water flow at the site.

Results of slug tests, packer tests, and pumping tests performed previously by others (Appendix A and Appendix B) were combined with the slug test results obtained during this investigation. The basic statistics for the combined results are presented by formation in Table 2. The combination of all these results reveals that the Basal Member Point Lookout Sandstone has a uniformly low hydraulic conductivity. Except in zones where coal seams are present, the Menefee Formation also has a relatively low hydraulic conductivity.

Table 2. Basic Statistics of Hydraulic Conductivity by Geologic Formation at the Durango site

Statistical Parameter	Basal Member Point Lookout Sandstone	Menefee Formation	Bodo Fault	Qal Animas River	Qal Lightner Creek
No. of cases	16	12	10	11	2
Minimum	0.006	0.003	0.120	1	66
Maximum	0.304	5.3	6.98	28.6	260
Range	0.298	5.297	6.86	27.6	194
Sum	1.089	12.73	23.394	190.5	326
Median	0.050	0.175	0.623	20.6	163
Mean	0.068	1.061	2.339	17.318	163
Std. Error	0.018	0.541	0.866	2.898	97.000
Standard Dev.	0.074	1.874	2.738	9.612	137.179
Variance	0.005	3.513	7.498	92.398	18,818.000
C.V.	1.083	1.767	1.170	0.555	0.842

Note: All hydraulic conductivity calculations are reported in feet per day.

Conclusion and Recommendations

In the tailings area, the alluvial deposits are thin but conductive. Alluvium along Lightner Creek is apparently more hydraulically conductive than that of the Animas River.

In the raffinate ponds area west and northwest of the Bodo Fault, the Point Lookout Sandstone has consistently low hydraulic conductivity. The Menefee Formation contains sandstone beds that are more conductive if fractured. Along the trace of the Bodo Fault, the hydraulic conductivity of the Menefee Formation is significantly higher than in other areas. The Menefee Formation also contains coal beds that function as zones of higher hydraulic conductivity.

Representative hydraulic conductivities for each hydrostratigraphic unit are presented in Table 3. The values are weighted toward the statistical median value in all cases except for the Lightner Creek alluvium, where the minimum value is more heavily weighted.

Table 3. Representative Hydraulic Conductivities of Hydrostratigraphic Units at the Durango UMTRA sites

Representative Hydraulic Conductivity (ft/d)				
Animas River Alluvium	Lightner Creek Alluvium	Menefee Formation	Bodo Canyon Fault Zone	Basal Member Point Lookout Sandstone
20	70	0.2	0.6	0.05

Computer Source:

Environmental Simulations, Inc., 1997–2000. AquiferWin32 Version 2.31 software, Developed by Doug Rumbaugh and Jim Rumbaugh, Herndon, Virginia (703) 834-3054.

Appendix A

Hydraulic Conductivity Results from Kearl and Others (1983)

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HYDRAULIC EVALUATION OF AQUIFERS

Bail tests were used primarily to determine hydraulic conductivity (K) values for the study area. A 24-hour pump test was attempted in the tailings pile area. However, a pumping rate of only 2 gpm (8 l/m) was available before drawdown levels reached the pump intake. Response in the observation wells was minimal. Storativity values for the unconfined aquifer were therefore assumed to be equal to the porosity.

Air lifting was the method used to remove water from the well bore for the bail tests. An air hose attached to a stainless steel nozzle was placed down the well. The air hose was attached to a nitrogen bottle. A small-diameter air line was attached to the air hose and the end placed near the nozzle. The other end was attached to another nitrogen bottle and a pressure gauge. The valve on the nitrogen bottle was opened, air lifting the water from the well bore. Recovery-versus-time was then recorded, using the air line and pressure gauge.

Using the Hvorslev method (1951) for bail tests in unconfined aquifers, values of hydraulic conductivity (K) were determined (Table 2). The highest K values (DR-82-21) are found in the Lightner Creek alluvium (383.2 ft/d or 0.13 cm/s). Animas River alluvium K values (DR-82-12, -15, -16, and -19) range between 6.1 ft/d (0.0022 cm/s) and 35.3 ft/d (0.012 cm/s). The Menefee Formation and Point Lookout Sandstone units (DR-82-02 and -03) show values of 0.89 ft/d (0.00031 cm/s) and 0.0062 ft/d (0.0000022 cm/s), respectively. Well DR-82-10, completed in the fault, has an average K value of 4.4 ft/d (0.0016 cm/s), four times greater than adjacent wells completed in the bedrock.

Table 2. Hydraulic Conductivity Values Determined from Bail-Test Data

Well	Hydraulic Conductivity					
	Trial 1		Trial 2		Trial 3	
Number	ft/d	cm/s	ft/d	cm/s	ft/d	cm/s
DR-82-02	0.89	0.00031	-	-	-	-
DR-82-03	0.0062	0.0000022	-	-	-	-
DR-82-06	22.9	0.0081	22.0	0.0077	22.9	0.0081
DR-82-10	4.5	0.0016	4.2	0.0015	4.4	0.0016
DR-82-12	7.8	0.0027	6.1	0.0022	6.1	0.0022
DR-82-15	20.6	0.0073	35.3	0.012	-	-
DR-82-16	25.8	0.0091	21.8	0.0077	26.3	0.0093
DR-82-19	28.6	0.010	27.9	0.0098	30.4	0.011
DR-82-21	260.6	0.092	369.9	0.130	383.2	0.135
DR-82-23	22.7	0.0080	19.9	0.0070	21.9	0.0077
DR-82-24	0.12	0.000041	-	-	-	-

Appendix B

Hydraulic Conductivity Results from U.S. Bureau of Reclamation (1990)

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Table 3
Durango Pumping Plant Site
Bailout/Slug Test Results

Well	Formation	Date	Type		Hydraulic Conductivity Values Based on 2-inch Casing (ft/day) Unconfined Conditions	Average
110	Fault	8/22	Bail		0.203	
					0.355	0.352
					0.459	
111	Pt Lookout	8/22	Bail		0.152	
		8/22	Bail		0.056	
		8/22	Bail		0.095	0.083
		8/22	Bail		0.076	
		8/22	Slug		0.036	
112	Pt Lookout	8/22	Bail		0.068	
		8/22	Bail		0.304	0.135
		8/22	Slug		0.034	
113	Pt Lookout	8/22	Bail		0.066	0.079
		8/24	Slug		0.089	
114	Pt Lookout	8/23	Bail/Board	0.042	0.020	
115	Pt Lookout	8/23	Slug/Board	0.011	0.014	0.029
		8/23	Bail/Board	0.033	0.043	
116	Menefee	8/23	Bail	0.053		0.059
117	Menefee	8/23	Bail	0.048		0.068
118	Fault	8/24	Bail/Board	0.690		0.787

Average Values

Pt. Lookout	0.081
Menefee	0.063
Fault	0.352

Values Corrected for sandpack and 4.9-inch hole.

Pt. Lookout	0.187
Menefee	0.147
Fault	0.813

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Appendix C

Time versus Water Level Data
Slug Tests Performed by MACTEC–ERS

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Well DUR01-612

Time (sec)	Displacement (ft)
0.498	1.596
1.038	1.517
1.59	1.442
2.19	1.38
2.82	1.327
3.48	1.28
4.17	1.229
4.92	1.189
5.718	1.15
6.558	1.11
7.452	1.072
8.388	1.035
9.39	0.995
10.44	0.962
11.568	0.924
12.762	0.889
14.01	0.968
15.348	0.849
16.758	0.787
18.24	0.749
19.74	0.714
21.348	0.681
23.052	0.643
24.852	0.61
26.742	0.577
28.848	0.539
31.05	0.502
33.348	0.473
35.85	0.431
38.448	0.398
41.238	0.356
44.142	0.323
47.238	0.305
50.55	0.278
54.048	0.245
57.75	0.219
61.638	0.188
65.85	0.168
70.248	0.155
74.94	0.13
79.938	0.112
85.248	0.097
90.852	0.077
96.75	0.07
103.05	0.059
109.638	0.044
116.64	0.033
124.152	0.026
132.042	0.024
140.442	0.02
149.352	0.015
158.748	0.017

Well DUR01-612dup

Time (sec)	Displacement (ft)
0.3	1.632
0.6	1.588
0.888	1.535
1.2	1.488
1.5	1.439
1.788	1.391
2.1	1.349
2.4	1.307
2.7	1.269
3	1.234
3.348	1.196
3.708	1.161
4.11	1.132
4.53	1.097
4.962	1.072
5.43	1.044
5.928	1.019
6.468	0.995
7.02	0.968
7.62	0.951
8.25	0.922
8.91	0.898
9.6	0.991
10.35	0.957
11.148	0.933
11.988	0.785
12.882	0.75
13.818	0.725
14.82	0.701
15.87	0.674
16.998	0.65
18.192	0.623
19.44	0.597
20.778	0.57
22.188	0.544
23.67	0.517
25.17	0.491
26.778	0.464
28.482	0.438
30.282	0.409
32.172	0.382
34.278	0.356
36.48	0.329
38.778	0.305
41.28	0.278
43.878	0.256
46.668	0.232
49.572	0.208
52.668	0.186
55.98	0.166
59.478	0.146
63.18	0.126
67.068	0.108
71.28	0.093
75.678	0.077
80.37	0.064
85.368	0.053
90.678	0.042
96.282	0.031
102.18	0.022
108.48	0.015
115.068	0.009
122.07	0.004

Well DUR01-622

Time (sec)	Displacement (ft)
0.3	0.858
0.6	0.832
0.888	0.803
1.2	0.776
1.5	0.754
1.788	0.732
2.1	0.712
2.4	0.69
2.7	0.668
3	0.646
3.348	0.621
3.708	0.599
4.11	0.575
4.53	0.548
4.962	0.524
5.43	0.498
5.928	0.475
6.468	0.451
7.02	0.429
7.62	0.405
8.25	0.385
8.91	0.36
9.6	0.34
10.35	0.321
11.148	0.303
11.988	0.281
12.882	0.265
13.818	0.245
14.82	0.232
15.87	0.217
16.998	0.201
18.192	0.19

Well DUR01-630

Time (sec)	Displacement (ft)
0.312	2.922
0.612	2.849
0.912	2.803
1.2	2.779
1.512	2.743
1.812	2.706
2.112	2.657
2.412	2.621
2.7	2.584
3.012	2.562
3.312	2.575
3.6	2.537
3.912	2.482
4.212	2.46
4.512	2.422
4.812	2.38
5.16	2.358
5.52	2.325
5.922	2.281
6.342	2.239
6.774	2.201
7.242	2.152
7.74	2.099
8.28	2.06
8.832	1.995
9.432	1.94
10.062	1.889
10.722	1.841
11.412	1.765
12.162	1.706
12.96	1.644
13.8	1.579
14.694	1.52
15.63	1.453
16.632	1.385
17.682	1.318
18.81	1.25
20.004	1.181
21.252	1.117
22.59	1.053
24	0.998

Well DUR01-631

Time (sec)	Displacement (ft)
0.3	4.867
0.588	4.73
0.9	4.584
1.2	4.458
1.488	4.347
1.8	4.232
2.1	4.119
2.4	4.002
2.7	3.903
3.048	3.781
3.408	3.646
3.81	3.526
4.23	3.389
4.662	3.25
5.13	3.108
5.628	2.962
6.168	2.812
6.72	2.659
7.32	2.502
7.95	2.343
8.61	2.19
9.3	2.038
10.05	1.885
10.848	1.741
11.688	1.602
12.582	1.471
13.518	1.352
14.52	1.246
15.57	1.155

Well DUR01-631dup

Time (sec)	Displacement (ft)
0.588	5.35
0.9	5.17
1.2	5.02
1.488	4.874
1.8	4.77
2.1	4.633
2.4	4.511
2.7	4.396
3.048	4.27
3.408	4.135
3.81	4.002
4.23	3.863
4.662	3.719
5.13	3.571
5.628	3.416
6.168	3.257
6.72	3.093
7.32	2.925
7.95	2.752
8.61	2.58
9.3	2.403
10.05	2.23
10.848	2.062
11.688	1.9
12.582	1.741
13.518	1.593
14.52	1.456
15.57	1.334
16.698	1.23
17.892	1.144
19.14	1.073

Well DUR01-633

Time (sec)	Displacement (ft)
0.288	5.528
0.6	5.506
0.9	5.382
1.188	5.375
1.5	5.291
1.8	5.258
2.1	5.194
2.4	5.136
2.748	5.092
3.108	5.019
3.51	4.961
3.93	4.902
4.362	4.837
4.83	4.773
5.328	4.705
5.868	4.634
6.42	4.563
7.02	4.483
7.65	4.402
8.31	4.318
9	4.22
9.75	4.134
10.548	4.034
11.388	3.941
12.282	3.84
13.218	3.738
14.22	3.634
15.27	3.532
16.398	3.433
17.592	3.335
18.84	3.242
20.178	3.156
21.588	3.079
23.07	3.006
24.57	2.944
26.178	2.891
27.882	2.84
29.682	2.787
31.572	2.742
33.678	2.689
35.88	2.641
38.178	2.585
40.68	2.528
43.278	2.47
46.068	2.408
48.972	2.344
52.068	2.265
55.38	2.163
58.878	2.057
62.58	1.968
66.468	1.891
70.68	1.831
75.078	1.754
79.77	1.663
84.768	1.574
90.078	1.501
95.682	1.431
101.58	1.358
107.88	1.282
114.468	1.209
121.47	1.137
128.982	1.061
136.872	0.984
145.272	0.909
154.182	0.838
163.578	0.763
173.58	0.692
184.182	0.623
195.378	0.555
207.27	0.491
219.882	0.435
233.178	0.376
247.272	0.325
262.182	0.281
277.968	0.239
292.968	0.214
307.968	0.179
322.968	0.152
337.968	0.13
352.968	0.115
367.968	0.095
382.968	0.084
397.968	0.07
412.968	0.062
427.968	0.053
442.968	0.046
457.968	0.035
472.968	0.033

Well DUR01-634

Time (sec)	Displacement (ft)
0.288	5.528
0.6	5.506
0.9	5.382
1.188	5.375
1.5	5.291
1.8	5.258
2.1	5.194
2.4	5.136
2.748	5.092
3.108	5.019
3.51	4.961
3.93	4.902
4.362	4.837
4.83	4.773
5.328	4.705
5.868	4.634
6.42	4.563
7.02	4.483
7.65	4.402
8.31	4.318
9	4.22
9.75	4.134
10.548	4.034
11.388	3.941
12.282	3.84
13.218	3.738
14.22	3.634
15.27	3.532
16.398	3.433
17.592	3.335
18.84	3.242
20.178	3.156
21.588	3.079
23.07	3.006
24.57	2.944
26.178	2.891
27.882	2.84
29.682	2.787
31.572	2.742
33.678	2.689
35.88	2.641
38.178	2.585
40.68	2.528
43.278	2.47
46.068	2.408
48.972	2.344
52.068	2.265
55.38	2.163
58.878	2.057
62.58	1.968
66.468	1.891
70.68	1.831
75.078	1.754
79.77	1.663
84.768	1.574
90.078	1.501
95.682	1.431
101.58	1.358
107.88	1.282
114.468	1.209
121.47	1.137
128.982	1.061
136.872	0.984
145.272	0.909
154.182	0.838
163.578	0.763
173.58	0.692
184.182	0.623
195.378	0.555
207.27	0.491
219.882	0.435
233.178	0.376
247.272	0.325
262.182	0.281
277.968	0.239
292.968	0.214
307.968	0.179
322.968	0.152
337.968	0.13
352.968	0.115
367.968	0.095
382.968	0.084
397.968	0.07
412.968	0.062
427.968	0.053
442.968	0.046
457.968	0.035
472.968	0.033

Well DUR01-863

Time (sec)	Displacement (ft)
2.1	0.573
2.4	0.517
2.688	0.523
3	0.595
3.3	0.581
3.6	0.581
3.9	0.491
4.248	0.507
4.608	0.456
5.01	0.44
5.43	0.418
5.862	0.372
6.33	0.396
6.828	0.283
7.368	0.364
7.92	0.309
8.52	0.324
9.15	0.303
9.81	0.251
10.5	0.255
11.25	0.227
12.048	0.201
12.888	0.181
13.782	0.185
14.718	0.168
15.72	0.159
16.77	0.153
17.898	0.145
19.092	0.139
20.34	0.132
21.678	0.126
23.088	0.12
24.57	0.114

Well DUR01-863dup

Time (sec)	Displacement (ft)
0.3	3.569
0.6	3.334
0.9	3.189
1.188	3.064
1.5	2.937
1.8	2.847
2.088	2.692
2.4	2.591
2.7	2.494
3	2.355
3.3	2.299
3.648	2.16
4.008	2.126
4.41	2.025
4.83	1.971
5.262	1.844
5.73	1.832
6.228	1.725
6.768	1.654
7.32	1.576
7.92	1.499
8.55	1.427
9.21	1.348
9.9	1.278
10.65	1.228
11.448	1.111
12.288	1.067
13.182	0.99
14.118	0.93
15.12	0.902
16.17	0.821
17.298	0.771
18.492	0.718

Well DUR02-602

Time (sec)	Displacement (ft)
0.75	3.531
1.548	3.458
2.388	3.374
3.282	3.314
4.218	3.303
5.22	3.345
6.27	3.398
7.398	3.405
8.592	3.345
9.84	3.257
11.178	3.221
12.588	3.248
14.07	3.288
15.57	3.252
17.178	3.175
18.882	3.162
20.682	3.19
22.572	3.175
24.678	3.1
26.88	3.091
29.178	3.106
31.68	3.044
34.278	3.033
37.068	3.031
39.972	2.974
43.068	2.973
46.38	2.929
49.878	2.914
53.58	2.876
57.468	2.859
61.68	2.821
66.078	2.801
70.77	2.768
75.768	2.737
81.078	2.708
86.682	2.679
92.58	2.651

Well DUR02-876

Time (sec)	Displacement (ft)
5.928	10.194
6.468	10.123
7.02	10.194
7.62	10.091
8.25	10.076
8.91	10.076
9.6	10.056
10.35	9.999
11.148	9.962
11.988	9.945
12.882	9.94
13.818	9.915
14.82	9.893
15.87	9.864
16.998	9.854
18.192	9.817
19.44	9.802
20.778	9.777
22.188	9.757
23.67	9.753
25.17	9.725
26.778	9.688
28.482	9.661
30.282	9.639
32.172	9.614
34.278	9.587
36.48	9.56
38.778	9.533
41.28	9.503
43.878	9.471
46.668	9.439
49.572	9.407
52.668	9.373
55.98	9.336
59.478	9.296
63.18	9.257
67.068	9.217
71.28	9.173
75.678	9.126
80.37	9.079
85.368	9.03
90.678	8.975
96.282	8.919
102.18	8.862
108.48	8.8
115.068	8.736
122.07	8.667
129.582	8.598
137.472	8.524
145.872	8.445
154.782	8.363
164.178	8.277
174.18	8.186
184.782	8.092
195.978	7.991
207.87	7.887

220.482	7.778
233.778	7.665
247.872	7.544
262.782	7.421
278.568	7.29
295.368	7.154
313.182	7.014
331.98	6.863
351.87	6.71
372.978	6.55
395.37	6.382
419.07	6.209
444.18	6.032
470.778	5.844
498.978	5.652
528.87	5.452
560.478	5.247
593.982	5.037
629.478	4.823
667.08	4.601
706.872	4.374
749.082	4.142
793.77	3.905
841.182	3.663
891.372	3.426
944.478	3.187
1000.77	2.948
1060.38	2.708
1123.57	2.472
1190.48	2.242
1261.38	2.018
1336.48	1.798
1415.98	1.591
1500.27	1.389
1589.57	1.201
1684.07	1.028
1784.18	0.868

Well DUR01-879

Time (sec)	Displacement (ft)
6.186	5.964
7.026	5.932
7.92	5.855
8.856	5.781
9.858	5.759
10.908	5.714
12.036	5.69
13.23	5.663
14.478	5.638
15.816	5.621
17.226	5.603
18.708	5.589
20.208	5.576
21.816	5.566
23.52	5.554
25.32	5.544
27.21	5.534
29.316	5.522
31.518	5.512
33.816	5.502
36.318	5.492
38.916	5.482
41.706	5.473
44.61	5.465
47.706	5.458
51.018	5.448
54.516	5.438
58.218	5.425
62.106	5.416
66.318	5.403
70.716	5.413
75.408	5.376
80.406	5.364
85.716	5.349
91.32	5.334
97.218	5.319
103.518	5.305
110.106	5.29
117.108	5.272
124.62	5.258
132.51	5.238
140.91	5.22
149.82	5.201
159.216	5.169
169.218	5.149
179.82	5.127
191.016	5.104
202.908	5.082
215.52	5.057
228.816	5.033
242.91	5.006
257.82	4.978
273.606	4.949
290.406	4.919
308.22	4.887
327.018	4.855
346.908	4.82
368.016	4.783
390.408	4.744
414.108	4.704
439.218	4.665
465.816	4.62
494.016	4.573
523.908	4.529
555.516	4.48
589.02	4.428
624.516	4.376
662.118	4.319
701.91	4.262
744.12	4.201
788.808	4.139
836.22	4.072
886.41	4.003
939.516	3.932
995.808	3.855
1055.42	3.774
1118.61	3.692
1185.52	3.608
1256.42	3.52
1331.52	3.431
1411.02	3.337
1495.31	3.241
1584.61	3.142
1679.11	3.043
1779.22	2.937
1885.31	2.833
1997.72	2.725
2116.71	2.614
2242.82	2.5
2376.42	2.387
2517.92	2.268
2667.82	2.152
2826.61	2.034
2994.82	1.915
3172.92	1.794
3361.61	1.676
3561.52	1.56
3773.22	1.441
3997.52	1.333
4235.11	1.219
4486.72	1.111
4753.31	1.002
5035.72	0.898
5334.81	0.797
5651.61	0.706
5951.61	0.632

Well DUR02-878

Time (sec)	Displacement (ft)
1.5	1.691
2.088	1.654
2.7	1.667
3.3	1.652
4.008	1.647
4.41	1.627
5.262	1.593
5.73	1.558
6.228	1.622
6.768	1.59
7.32	1.558
7.92	1.528
8.55	1.501
9.21	1.481
9.9	1.462
10.65	1.447
11.448	1.43
12.288	1.407
13.182	1.388
14.118	1.365
15.12	1.343
16.17	1.321
17.298	1.296
18.492	1.272
19.74	1.247
21.078	1.225
22.488	1.198
23.97	1.17
25.47	1.146
27.078	1.121
28.782	1.094
30.582	1.064
32.472	1.037
34.578	1.008
36.78	0.978
39.078	0.946
41.58	0.916
44.178	0.887
46.968	0.854
49.872	0.822
52.968	0.79
56.28	0.761
59.778	0.729
63.48	0.696
67.368	0.667
71.58	0.635
75.978	0.605
80.67	0.573
85.668	0.546
90.978	0.516
96.582	0.486
102.48	0.457
108.78	0.432
115.368	0.407
122.37	0.383
129.882	0.358
137.772	0.333
146.172	0.311
155.082	0.291
164.478	0.272
174.48	0.254

Well DUR02-881

Time (sec)	Displacement (ft)
0.3	11.416
0.588	10.377
0.9	8.704
1.2	10.605
1.5	10.919
1.8	10.828
2.148	10.503
2.508	11.26
2.91	10.636
3.33	10.658
4.23	9.199
4.728	7.493
5.268	8.644
5.82	7.915
6.42	8.178
7.05	8.107
7.71	8.074
8.4	8.072
9.15	8.045
9.948	8.014
10.788	8.056
11.682	8.014
12.618	7.979
13.62	7.959
14.67	7.937
15.798	7.93
16.992	7.924
18.24	7.917
19.578	7.908
20.988	7.901
22.47	7.895
23.97	7.89
25.578	7.886
27.282	7.882
29.082	7.875
30.972	7.873
33.078	7.868
35.28	7.864
37.578	7.859
40.08	7.857
42.678	7.853
45.468	7.851
48.372	7.844
51.468	7.844
54.78	7.84
58.278	7.835
61.98	7.831
65.868	7.826
70.08	7.824
74.478	7.817
79.17	7.813
84.168	7.809
89.478	7.804
95.082	7.798
100.98	7.793
107.28	7.786

113.868	7.78
120.87	7.778
128.382	7.771
136.272	7.764
144.672	7.758
153.582	7.749
162.978	7.742
172.98	7.733
183.582	7.725
194.778	7.716
206.67	7.707
219.282	7.696
232.578	7.687
246.672	7.676
261.582	7.665
277.368	7.654
294.168	7.641
311.982	7.627
330.78	7.614
350.67	7.599
371.778	7.583
394.17	7.568
417.87	7.55
442.98	7.532
469.578	7.512
497.778	7.492
527.67	7.47
559.278	7.448
592.782	7.426
628.278	7.4
665.88	7.375
705.672	7.349
747.882	7.318
792.57	7.287
839.982	7.256
890.172	7.223
943.278	7.185
999.57	7.15
1059.18	7.11
1122.37	7.068
1182.37	7.026
1242.37	6.986
1302.37	6.949
1362.37	6.909
1422.37	6.871
1482.37	6.834
1542.37	6.794
1602.37	6.756
1662.37	6.717
1722.37	6.681
1782.37	6.641
1842.37	6.606
1902.37	6.566
1962.37	6.529
2022.38	6.493
2082.37	6.456
2142.37	6.42
2202.37	6.381
2262.37	6.345

2322.37	6.308
2382.37	6.272
2442.37	6.235
2502.37	6.199
2562.37	6.164
2622.37	6.129
2682.37	6.091
2742.37	6.056
2802.37	6.02
2862.37	5.985
2922.37	5.95
2982.37	5.914
3042.37	5.881
3102.37	5.846
3162.37	5.81
3222.37	5.777
3282.37	5.742
3342.37	5.706
3402.37	5.673
3462.37	5.638
3522.37	5.603
3582.37	5.569
3642.37	5.536
3702.37	5.501
3762.37	5.468
3822.37	5.435
3882.37	5.401
3942.37	5.368
4002.37	5.335
4062.37	5.302
4122.37	5.269
4182.37	5.236
4242.37	5.202
4302.37	5.171
4362.37	5.138
4422.37	5.105
4482.37	5.072
4542.37	5.043
4602.37	5.01
4662.37	4.979
4722.37	4.948
4782.37	4.917
4842.37	4.886
4902.37	4.855
4962.37	4.824
5022.37	4.794
5082.37	4.765
5142.37	4.732
5202.37	4.701
5262.37	4.672
5322.37	4.641
5382.37	4.612
5442.37	4.581
5502.37	4.55
5562.37	4.522
5622.37	4.491
5682.37	4.462
5742.37	4.431
5802.37	4.402

5862.37	4.374
5922.37	4.343
5982.37	4.314
6042.37	4.285
6102.37	4.259
6162.37	4.228
6222.37	4.199
6282.37	4.17
6342.37	4.142
6402.37	4.115
6462.37	4.084
6522.37	4.058
6582.37	4.029
6642.37	4.002
6702.37	3.974
6762.37	3.943
6822.37	3.918
6882.37	3.89
6942.37	3.861
7002.37	3.834
7062.37	3.806
7122.37	3.779
7182.37	3.753
7242.37	3.728
7302.37	3.7
7362.37	3.673
7422.37	3.646
7482.37	3.62
7542.37	3.596
7602.37	3.569
7662.37	3.543
7722.37	3.518
7782.37	3.492
7842.37	3.467
7902.37	3.441
7962.37	3.414
8022.37	3.392
8082.37	3.366
8142.37	3.341
8202.37	3.319
8262.37	3.293
8322.37	3.269
8382.37	3.244
8442.37	3.22
8502.37	3.196
8562.37	3.171
8622.37	3.147
8682.37	3.123
8742.37	3.098
8802.37	3.074
8862.37	3.05
8922.37	3.025
8982.37	3.001
9042.37	2.977
9102.37	2.955
9162.37	2.93
9222.37	2.908
9282.37	2.884
9342.37	2.862

9402.37	2.838
9462.37	2.815
9522.37	2.791
9582.37	2.771
9642.37	2.747
9702.37	2.725
9762.37	2.703
9822.37	2.681
9882.37	2.659
9942.37	2.636
10002.4	2.612
10062.4	2.592
10122.4	2.57
10182.4	2.548
10242.4	2.526
10302.4	2.506
10362.4	2.484
10422.4	2.464
10482.4	2.444
10542.4	2.422
10602.4	2.402
10662.4	2.382
10722.4	2.362
10782.4	2.343
10842.4	2.323
10902.4	2.303
10962.4	2.283
11022.4	2.263
11082.4	2.243
11142.4	2.225
11202.4	2.203
11262.4	2.188
11322.4	2.168
11382.4	2.148
11442.4	2.128
11502.4	2.11
11562.4	2.091
11622.4	2.073
11682.4	2.053
11742.4	2.035
11802.4	2.015
11862.4	1.998
11922.4	1.98
11982.4	1.962
12042.4	1.943
12102.4	1.925
12162.4	1.907
12222.4	1.889
12282.4	1.872
12342.4	1.854
12402.4	1.836
12462.4	1.819
12522.4	1.803
12582.4	1.786
12642.4	1.768
12702.4	1.75
12762.4	1.735
12822.4	1.717
12882.4	1.702

12942.4	1.686
13002.4	1.668
13062.4	1.651
13122.4	1.635
13182.4	1.62
13242.4	1.604
13302.4	1.589
13362.4	1.571
13422.4	1.556
13482.4	1.54
13542.4	1.525
13602.4	1.509
13662.4	1.494
13722.4	1.478
13782.4	1.463
13842.4	1.45
13902.4	1.434
13962.4	1.419
14022.4	1.405
14082.4	1.39
14142.4	1.375
14202.4	1.361
14262.4	1.348
14322.4	1.335
14382.4	1.319
14442.4	1.306
14502.4	1.293
14562.4	1.277
14622.4	1.266
14682.4	1.249
14742.4	1.238
14802.4	1.227
14862.4	1.211
14922.4	1.2
14982.4	1.184
15042.4	1.173
15102.4	1.162
15162.4	1.149
15222.4	1.138
15282.4	1.125
15342.4	1.112
15402.4	1.1
15462.4	1.089
15522.4	1.076
15582.4	1.065
15642.4	1.054
15702.4	1.043
15762.4	1.03
15822.4	1.019
15882.4	1.008
15942.4	0.997
16002.4	0.986
16062.4	0.975
16122.4	0.963
16182.4	0.955
16242.4	0.944
16302.4	0.933
16362.4	0.921
16422.4	0.913

16482.4	0.902
16542.4	0.893
16602.4	0.882
16662.4	0.873
16722.4	0.862
16782.4	0.853
16842.4	0.844
16902.4	0.833
16962.4	0.822
17022.4	0.815
17082.4	0.804
17142.4	0.796
17202.4	0.787
17262.4	0.778
17322.4	0.769
17382.4	0.76
17442.4	0.751
17502.4	0.743
17562.4	0.734
17622.4	0.725
17682.4	0.716
17742.4	0.707
17802.4	0.698
17862.4	0.689
17922.4	0.681
17982.4	0.674

Well DUR02-882

Time (sec)	Displacement (ft)
0.9	2.381
1.2	2.3
1.5	2.296
1.8	2.248
2.088	2.226
2.4	2.117
2.7	2.069
2.988	2.101
3.3	2.071
3.6	2.051
3.9	2.039
4.2	2.032
4.548	1.988
4.908	1.964
5.31	1.944
5.73	1.787
6.162	1.859
6.63	1.725
7.128	1.741
7.668	1.712
8.22	1.755
8.82	1.747
9.45	1.529
10.11	1.576
10.8	1.503
11.55	1.465
12.348	1.404
13.188	1.372
14.082	1.336
15.018	1.302
16.02	1.234
17.07	1.189
18.198	1.153
19.392	1.125
20.64	1.101

Well DUR02-882dup

Time (sec)	Displacement (ft)
0.3	2.351
0.588	2.274
0.9	2.27
1.2	2.25
1.5	2.206
1.8	2.153
2.088	2.099
2.4	2.093
2.7	2.026
2.988	2.038
3.3	2.017
3.6	1.984
3.9	1.954
4.2	1.938
4.548	1.886
4.908	1.845
5.31	1.815
5.73	1.743
6.162	1.708
6.63	1.664
7.128	1.62
7.668	1.574
8.22	1.533
8.82	1.491
9.45	1.449
10.11	1.406
10.8	1.36
11.55	1.314
12.348	1.266
13.188	1.225
14.082	1.181
15.018	1.143
16.02	1.109
17.07	1.081
18.198	1.058
19.392	1.036
20.64	1.02

Well DUR02-883

Time (sec)	Displacement (ft)
0.3	7.758
0.588	7.705
0.9	7.667
1.2	7.611
1.488	7.516
1.8	7.453
2.1	7.439
2.4	7.469
2.7	7.496
3.048	7.443
3.408	7.423
3.81	7.421
4.23	7.421
4.662	7.397
5.13	7.385
5.628	7.401
6.168	7.367
6.72	7.365
7.32	7.463
7.95	7.397
8.61	7.385
9.3	7.381
10.05	7.351
10.848	7.31
11.688	7.298
12.582	7.284
13.518	7.278
14.52	7.268
15.57	7.26
16.698	7.254
17.892	7.244
19.14	7.236
20.478	7.228
21.888	7.212
23.37	7.194
24.87	7.186
26.478	7.178
28.182	7.174
29.982	7.169
31.872	7.163
33.978	7.157
36.18	7.151
38.478	7.145
40.98	7.139
43.578	7.133
46.368	7.125
49.272	7.121
52.368	7.113
55.68	7.105
59.178	7.097
62.88	7.091
66.768	7.083
70.98	7.075
75.378	7.067
80.07	7.059
85.068	7.049

90.378	7.041
95.982	7.033
101.88	7.023
108.18	7.011
114.768	7.001
121.77	6.992
129.282	6.982
137.172	6.968
145.572	6.958
154.482	6.944
163.878	6.93
173.88	6.916
184.482	6.9
195.678	6.886
207.57	6.87
220.182	6.852
233.478	6.837
247.572	6.819
262.482	6.801
278.268	6.781
295.068	6.757
312.882	6.735
331.68	6.711
351.57	6.684
372.678	6.66
395.07	6.633
418.77	6.607
443.88	6.579
470.478	6.549
498.678	6.517
528.57	6.483
560.178	6.451
593.682	6.415
629.178	6.382
666.78	6.342
706.572	6.304
748.782	6.26
793.47	6.221
840.882	6.175
891.072	6.129
944.178	6.082
1000.47	6.03
1060.08	5.978
1123.27	5.923
1183.27	5.871
1243.27	5.819
1303.27	5.768
1363.27	5.718
1423.27	5.67
1483.27	5.623
1543.27	5.575
1603.27	5.527
1663.27	5.48
1723.27	5.434
1783.27	5.388
1843.27	5.345
1903.27	5.299
1963.27	5.255
2023.28	5.211

2083.27	5.168
2143.27	5.126
2203.27	5.084
2263.27	5.043
2323.27	5.003
2383.27	4.961
2443.27	4.921
2503.27	4.884
2563.27	4.842
2623.27	4.804
2683.27	4.764
2743.27	4.727
2803.27	4.689
2863.27	4.653
2923.27	4.616
2983.27	4.58
3043.27	4.544
3103.27	4.508
3163.27	4.475
3223.27	4.439
3283.27	4.405
3343.27	4.371
3403.27	4.337
3463.27	4.306
3523.27	4.274
3583.27	4.24
3643.27	4.21
3703.27	4.178
3763.27	4.147
3823.27	4.115
3883.27	4.085
3943.27	4.055
4003.27	4.026
4063.27	3.996
4123.27	3.968
4183.27	3.938
4243.27	3.908
4303.27	3.881
4363.27	3.853
4423.27	3.827
4483.27	3.799
4543.27	3.771
4603.27	3.744
4663.27	3.718
4723.27	3.694
4783.27	3.668
4843.27	3.642
4903.27	3.616
4963.27	3.593
5023.27	3.567
5083.27	3.543
5143.27	3.517
5203.27	3.493
5263.27	3.469
5323.27	3.446
5383.27	3.422
5443.27	3.398
5503.27	3.374
5563.27	3.35

5623.27	3.328
5683.27	3.305
5743.27	3.283
5803.27	3.261
5863.27	3.239
5923.27	3.215
5983.27	3.193
6043.27	3.172
6103.27	3.152
6163.27	3.132
6223.27	3.11
6283.27	3.09
6343.27	3.068
6403.27	3.046
6463.27	3.027
6523.27	3.007
6583.27	2.987
6643.27	2.965
6703.27	2.949
6763.27	2.929
6823.27	2.909
6883.27	2.889
6943.27	2.872

Well DUR02-888

Time (sec)	Displacement (ft)
0.9	9.494
1.188	9.018
1.5	8.673
1.8	8.438
2.088	8.155
2.4	8.014
2.7	7.81
3	7.605
3.3	7.43
3.648	7.274
4.008	7.05
4.41	6.907
4.83	6.692
5.262	6.471
5.73	6.298
6.228	6.091
6.768	5.931
7.32	5.718
7.92	5.541
8.55	5.353
9.21	5.188
9.9	5.003
10.65	4.836
11.448	4.68
12.288	4.527
13.182	4.382
14.118	4.246
15.12	4.116
16.17	3.995

Well DUR02-889

Time (sec)	Displacement (ft)
12.288	8.02
13.182	8.006
14.118	7.986
15.12	7.956
16.17	7.951
17.298	7.942
18.492	7.925
19.74	7.92
21.078	7.914
22.488	7.907
23.97	7.9
25.47	7.896
27.078	7.889
28.782	7.885
30.582	7.878
32.472	7.874
34.578	7.867
36.78	7.863
39.078	7.856
41.58	7.852
44.178	7.845
46.968	7.841
49.872	7.834
52.968	7.829
56.28	7.823
59.778	7.816
63.48	7.81
67.368	7.803
71.58	7.796
75.978	7.792
80.67	7.785
85.668	7.776
90.978	7.77
96.582	7.763
102.48	7.754
108.78	7.745
115.368	7.737
122.37	7.728
129.882	7.717
137.772	7.708
146.172	7.697
155.082	7.688
164.478	7.675
174.48	7.664
185.082	7.65
196.278	7.637
208.17	7.624
220.782	7.613
234.078	7.597
248.172	7.582
263.082	7.564
278.868	7.549
295.668	7.529
313.482	7.511
332.28	7.489
352.17	7.469
373.278	7.442
395.67	7.422
419.37	7.396
444.48	7.374
471.078	7.354
499.278	7.327
529.17	7.299
560.778	7.268
590.778	7.241
620.778	7.212
650.778	7.186
680.778	7.157
710.778	7.131
740.778	7.104
770.778	7.077
800.778	7.049
830.778	7.024
860.778	6.998
890.778	6.971
920.778	6.945
950.778	6.92
980.778	6.894
1010.78	6.87
1040.78	6.843
1070.78	6.819
1100.78	6.792
1130.78	6.768
1160.78	6.744
1190.78	6.719
1220.78	6.695
1250.78	6.671
1280.78	6.644
1310.78	6.622
1340.78	6.598
1370.78	6.573
1400.78	6.551
1430.78	6.527
1460.78	6.505
1490.78	6.48
1520.78	6.456
1550.78	6.434
1580.78	6.41
1610.78	6.387
1640.78	6.365
1670.78	6.343
1700.78	6.319
1730.78	6.297
1760.78	6.275
1790.78	6.253
1820.78	6.228
1850.78	6.208
1880.78	6.184
1910.78	6.162
1940.78	6.14
1970.78	6.12
2000.78	6.098
2030.78	6.076
2060.78	6.056
2090.78	6.034

2120.78	6.012
2150.78	5.992
2180.78	5.97
2210.78	5.947
2240.78	5.928
2270.78	5.908
2300.78	5.886
2330.78	5.866
2360.78	5.846
2390.78	5.824
2420.78	5.804
2450.78	5.786
2480.78	5.764
2510.78	5.744
2540.78	5.722
2570.78	5.704
2600.78	5.684
2630.78	5.664
2660.78	5.645
2690.78	5.625
2720.78	5.605
2750.78	5.587
2780.78	5.567
2810.78	5.547
2840.78	5.53
2870.78	5.51
2900.78	5.49
2930.78	5.472
2960.78	5.452
2990.78	5.432
3020.78	5.415
3050.78	5.395
3080.78	5.377
3110.78	5.359
3140.78	5.339
3170.78	5.322
3200.78	5.304
3230.78	5.286
3260.78	5.266
3290.78	5.249
3320.78	5.231
3350.78	5.213
3380.78	5.196
3410.78	5.176
3440.78	5.16
3470.78	5.143
3500.78	5.123
3530.78	5.107
3560.78	5.09
3590.78	5.074
3620.78	5.054
3650.78	5.036
3680.78	5.019
3710.78	5.003
3740.78	4.986
3770.78	4.97
3800.78	4.952
3830.78	4.937
3860.78	4.919

3890.78	4.902
3920.78	4.886
3950.78	4.871
3980.78	4.853
4010.78	4.837
4040.78	4.822
4070.78	4.804
4100.78	4.789
4130.78	4.771
4160.78	4.756
4190.78	4.74
4220.78	4.722
4250.78	4.709
4280.78	4.691
4310.78	4.676
4340.78	4.661
4370.78	4.643
4400.78	4.63
4430.78	4.614
4460.78	4.599
4490.78	4.583
4520.78	4.568
4550.78	4.552
4580.78	4.537
4610.78	4.521
4640.78	4.506
4670.78	4.49
4700.78	4.477
4730.78	4.461
4760.78	4.446
4790.78	4.431
4820.78	4.417
4850.78	4.402
4880.78	4.389
4910.78	4.373
4940.78	4.358
4970.78	4.344
5000.78	4.331
5030.78	4.316
5060.78	4.302
5090.78	4.287
5120.78	4.274
5150.78	4.258
5180.78	4.245
5210.78	4.232
5240.78	4.216
5270.78	4.203
5300.78	4.19
5330.78	4.174
5360.78	4.161
5390.78	4.148
5420.78	4.134
5450.78	4.119
5480.78	4.106
5510.78	4.092
5540.78	4.079
5570.78	4.066
5600.78	4.052
5630.78	4.039

5660.78	4.026
5690.78	4.013
5720.78	3.999
5750.78	3.988
5780.78	3.975
5810.78	3.962
5840.78	3.946
5870.78	3.935
5900.78	3.922
5930.78	3.909
5960.78	3.895
5990.78	3.882
6020.78	3.871
6050.78	3.86
6080.78	3.847
6110.78	3.834
6140.78	3.82
6170.78	3.809
6200.78	3.798
6230.78	3.785
6260.78	3.772
6290.78	3.761
6320.78	3.747
6350.78	3.736
6380.78	3.723
6410.78	3.71
6440.78	3.699
6470.78	3.688
6500.78	3.674
6530.78	3.663
6560.78	3.652
6590.78	3.639
6620.78	3.63
6650.78	3.617
6680.78	3.606
6710.78	3.595
6740.78	3.582
6770.78	3.57
6800.78	3.559
6830.78	3.548
6860.78	3.537
6890.78	3.526
6920.78	3.513
6950.78	3.502
6980.78	3.493
7010.78	3.48
7040.78	3.469
7070.78	3.46
7100.78	3.447
7130.78	3.436
7160.78	3.425
7190.78	3.413
7220.78	3.405
7250.78	3.391
7280.78	3.383
7310.78	3.371
7340.78	3.36
7370.78	3.352
7400.78	3.338

7430.78	3.329
7460.78	3.318
7490.78	3.307
7520.78	3.296
7550.78	3.285
7580.78	3.274
7610.78	3.265
7640.78	3.254
7670.78	3.245
7700.78	3.237
7730.78	3.226
7760.78	3.214
7790.78	3.203
7820.78	3.195
7850.78	3.186
7880.78	3.175
7910.78	3.164
7940.78	3.155
7970.78	3.146
8000.78	3.135
8030.78	3.126
8060.78	3.115
8090.78	3.104
8120.78	3.095
8150.78	3.086
8180.78	3.077
8210.77	3.069
8240.77	3.057
8270.77	3.049
8300.77	3.04
8330.77	3.029
8360.77	3.022
8390.77	3.011
8420.77	3.002
8450.77	2.991
8480.77	2.982
8510.77	2.973
8540.77	2.965
8570.77	2.956
8600.77	2.945
8630.77	2.938
8660.77	2.929
8690.77	2.916
8720.77	2.909
8750.77	2.901
8780.77	2.889
8810.77	2.883
8840.77	2.876
8870.77	2.865
8900.77	2.856
8930.77	2.847
8960.77	2.836
8990.77	2.83
9020.77	2.819
9050.77	2.812
9080.77	2.803
9110.77	2.794
9140.77	2.786
9170.77	2.779

9200.77	2.768
9230.77	2.761
9260.77	2.752
9290.77	2.744
9320.77	2.735
9350.77	2.726
9380.77	2.719
9410.77	2.71
9440.77	2.704
9470.77	2.695
9500.77	2.686
9530.77	2.677
9560.77	2.666
9590.77	2.662
9620.77	2.655
9650.77	2.646
9680.77	2.637
9710.77	2.629
9740.77	2.622
9770.77	2.615
9800.77	2.606
9830.77	2.6
9860.77	2.591
9890.77	2.584
9920.77	2.576
9950.77	2.569
9980.77	2.56
10010.8	2.551
10040.8	2.547
10070.8	2.538
10100.8	2.529
10130.8	2.522
10160.8	2.516
10190.8	2.507
10220.8	2.5
10250.8	2.494
10280.8	2.485
10310.8	2.476
10340.8	2.472
10370.8	2.465
10400.8	2.456
10430.8	2.449
10460.8	2.443
10490.8	2.434
10520.8	2.427
10550.8	2.419
10580.8	2.412
10610.8	2.405
10640.8	2.399
10670.8	2.392
10700.8	2.383
10730.8	2.377
10760.8	2.37
10790.8	2.363
10820.8	2.357
10850.8	2.35
10880.8	2.341
10910.8	2.337
10940.8	2.328

10970.8	2.321
11000.8	2.315
11030.8	2.308
11060.8	2.301
11090.8	2.293
11120.8	2.288
11150.8	2.281
11180.8	2.275
11210.8	2.27
11240.8	2.264
11270.8	2.255
11300.8	2.248
11330.8	2.242
11360.8	2.235
11390.8	2.228
11420.8	2.224
11450.8	2.217
11480.8	2.211
11510.8	2.204
11540.8	2.197
11570.8	2.191
11600.8	2.186
11630.8	2.18
11660.8	2.173
11690.8	2.167
11720.8	2.162
11750.8	2.155
11780.8	2.147
11810.8	2.142
11840.8	2.136
11870.8	2.131
11900.8	2.124
11930.8	2.118
11960.8	2.113
11990.8	2.105
12020.8	2.1
12050.8	2.094
12080.8	2.087
12110.8	2.083
12140.8	2.076
12170.8	2.071
12200.8	2.065
12230.8	2.06
12260.8	2.054
12290.8	2.047
12320.8	2.043
12350.8	2.036
12380.8	2.029
12410.8	2.025
12440.8	2.018
12470.8	2.014
12500.8	2.007
12530.8	2.003
12560.8	1.996
12590.8	1.99
12620.8	1.985
12650.8	1.981
12680.8	1.972
12710.8	1.968

12740.8	1.963
12770.8	1.959
12800.8	1.952
12830.8	1.945
12860.8	1.941
12890.8	1.937
12920.8	1.93
12950.8	1.926
12980.8	1.919
13010.8	1.914
13040.8	1.91
13070.8	1.903
13100.8	1.899
13130.8	1.895
13160.8	1.888
13190.8	1.884
13220.8	1.877
13250.8	1.872
13280.8	1.87
13310.8	1.861
13340.8	1.859
13370.8	1.853
13400.8	1.848
13430.8	1.844
13460.8	1.839
13490.8	1.833
13520.8	1.826
13550.8	1.822
13580.8	1.817
13610.8	1.813
13640.8	1.808
13670.8	1.804
13700.8	1.8
13730.8	1.795
13760.8	1.791
13790.8	1.784
13820.8	1.78
13850.8	1.775
13880.8	1.769
13910.8	1.764
13940.8	1.755
13970.8	1.755
14000.8	1.751
14030.8	1.749
14060.8	1.742
14090.8	1.738
14120.8	1.733
14150.8	1.729
14180.8	1.722
14210.8	1.718
14240.8	1.713
14270.8	1.709
14300.8	1.707
14330.8	1.702
14360.8	1.696
14390.8	1.691
14420.8	1.687
14450.8	1.685
14480.8	1.678
14510.8	1.676
14540.8	1.671
14570.8	1.665
14600.8	1.66
14630.8	1.658
14660.8	1.651
14690.8	1.647
14720.8	1.643
14750.8	1.638
14780.8	1.634
14810.8	1.631
14840.8	1.625
14870.8	1.623
14900.8	1.618
14930.8	1.614
14960.8	1.609
14990.8	1.607
15020.8	1.603
15050.8	1.598
15080.8	1.594
15110.8	1.589
15140.8	1.587
15170.8	1.583
15200.8	1.578
15230.8	1.574
15260.8	1.57
15290.8	1.567
15320.8	1.561
15350.8	1.552
15380.8	1.554
15410.8	1.55
15440.8	1.547
15470.8	1.543
15500.8	1.541
15530.8	1.534
15560.8	1.532
15590.8	1.525
15620.8	1.523
15650.8	1.519
15680.8	1.514
15710.8	1.51
15740.8	1.508
15770.8	1.503
15800.8	1.501
15830.8	1.497
15860.8	1.492
15890.8	1.49
15920.8	1.483
15950.8	1.483
15980.8	1.479

Well DUR02-890

Time (sec)	Displacement (ft)
12.288	9.982
13.182	9.933
14.118	9.849
15.12	9.775
16.17	9.713
17.298	9.642
18.492	9.555
19.74	9.486
21.078	9.412
22.488	9.358
23.97	9.294
25.47	9.232
27.078	9.178
28.782	9.121
30.582	9.064
32.472	9.007
34.578	8.946
36.78	8.887
39.078	8.827
41.58	8.761
44.178	8.694
46.968	8.625
49.872	8.556
52.968	8.484
56.28	8.408
59.778	8.334
63.48	8.253
67.368	8.169
71.58	8.08
75.978	7.981
80.67	7.885
85.668	7.786
90.978	7.682
96.582	7.574
102.48	7.463
108.78	7.347
115.368	7.228
122.37	7.108
129.882	6.979
137.772	6.848
146.172	6.71
155.082	6.569
164.478	6.424
174.48	6.273
185.082	6.118
196.278	5.958
208.17	5.792
220.782	5.622
234.078	5.449
248.172	5.274
263.082	5.092
278.868	4.907
295.668	4.717
313.482	4.524
332.28	4.332
352.17	4.134
373.278	3.935
395.67	3.735
419.37	3.537
444.48	3.338
471.078	3.14
499.278	2.95
529.17	2.755
560.778	2.565
594.282	2.378
629.778	2.198
667.38	2.02
707.172	1.852
749.382	1.692
794.07	1.539
841.482	1.394
891.672	1.26
944.778	1.134
1001.07	1.019
1060.68	0.912
1123.87	0.816
1190.78	0.73
1261.68	0.651
1336.78	0.579

Well DUR02-902

Time (sec)	Displacement (ft)
0.432	9.5
0.9	9.464
1.398	9.407
1.938	9.349
2.49	9.407
3.09	9.376
3.72	9.394
4.38	9.349
5.07	9.374
5.82	9.352
6.618	9.305
7.458	9.341
8.352	9.318
9.288	9.276
10.29	9.294
11.34	9.296
12.468	9.338
13.662	9.314
14.91	9.316
16.248	9.287
17.658	9.272
19.14	9.265
20.64	9.265
22.248	9.261
23.952	9.254
25.752	9.252
27.642	9.248
29.748	9.243
31.95	9.241
34.248	9.234
36.75	9.234
39.348	9.23
42.138	9.226
45.042	9.221
48.138	9.217
51.45	9.212
54.948	9.208
58.65	9.206
62.538	9.201
66.75	9.195
71.148	9.19
75.84	9.186
80.838	9.179
86.148	9.175
91.752	9.17
97.65	9.161
103.95	9.157
110.538	9.152
117.54	9.146
125.052	9.137
132.942	9.13
141.342	9.128
150.252	9.124
159.648	9.113
169.65	9.106
180.252	9.099

191.448	9.093
203.34	9.082
215.952	9.075
229.248	9.066
243.342	9.06
258.252	9.046
274.038	9.026
290.838	9.02
308.652	9.011
327.45	9
347.34	8.991
368.448	8.98
390.84	8.967
414.54	8.956
439.65	8.945
466.248	8.931
494.448	8.918
524.34	8.905
555.948	8.889
589.452	8.874
624.948	8.858
662.55	8.843
702.342	8.825
744.552	8.807
789.24	8.787
836.652	8.768
886.842	8.748
939.948	8.726
996.24	8.703
1055.85	8.679
1119.04	8.655
1179.04	8.63
1239.04	8.608
1299.04	8.586
1359.04	8.564
1419.04	8.542
1479.04	8.522
1539.04	8.498
1599.04	8.48
1659.04	8.456
1719.04	8.436
1779.04	8.414
1839.04	8.392
1899.04	8.374
1959.04	8.352
2019.05	8.332
2079.04	8.312
2139.04	8.292
2199.04	8.272
2259.04	8.254
2319.04	8.235
2379.04	8.215
2439.04	8.195
2499.04	8.177
2559.04	8.157
2619.04	8.139
2679.04	8.122
2739.04	8.102
2799.04	8.084

2859.04	8.066
2919.04	8.049
2979.04	8.029
3039.04	8.013
3099.04	7.996
3159.04	7.978
3219.04	7.963
3279.04	7.945
3339.04	7.927
3399.04	7.909
3459.04	7.892
3519.04	7.876
3579.04	7.856
3639.04	7.841
3699.04	7.823
3759.04	7.808
3819.04	7.792
3879.04	7.775
3939.04	7.757
3999.04	7.741
4059.04	7.726
4119.04	7.71
4179.04	7.693
4239.04	7.677
4299.04	7.662
4359.04	7.646
4419.04	7.631
4479.04	7.613
4539.04	7.598
4599.04	7.582
4659.04	7.567
4719.04	7.551
4779.04	7.536
4839.04	7.522
4899.04	7.507
4959.04	7.491
5019.04	7.478
5079.04	7.46
5139.04	7.447
5199.04	7.434
5259.04	7.418
5319.04	7.405
5379.04	7.39
5439.04	7.376
5499.04	7.363
5559.04	7.345
5619.04	7.332
5679.04	7.319
5739.04	7.303
5799.04	7.29
5859.04	7.277
5919.04	7.264
5979.04	7.25
6039.04	7.235
6099.04	7.222
6159.04	7.208
6219.04	7.195
6279.04	7.182
6339.04	7.166

6399.04	7.153
6459.04	7.142
6519.04	7.129
6579.04	7.115
6639.04	7.102
6699.04	7.089
6759.04	7.078
6819.04	7.065
6879.04	7.051
6939.04	7.038
6999.04	7.027
7059.04	7.016
7119.04	7.003
7179.04	6.989
7239.04	6.978
7299.04	6.967
7359.04	6.954
7419.04	6.943
7479.04	6.932
7539.04	6.921
7599.04	6.908
7659.04	6.897
7719.04	6.885
7779.04	6.874
7839.04	6.863
7899.04	6.852
7959.04	6.839
8019.04	6.828
8079.04	6.817
8139.04	6.806
8199.04	6.795
8259.04	6.782
8319.04	6.77
8379.04	6.762
8439.04	6.751
8499.04	6.74
8559.04	6.728
8619.04	6.717
8679.04	6.706
8739.04	6.693
8799.04	6.684
8859.04	6.673
8919.04	6.664
8979.04	6.651

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