Results of Aquifer Test Analysis

for the

Headwaters GCD

Monitoring Well No. 4

for

Headwaters Groundwater Conservation District

125 Lehmann Dr., Suite 100

Kerrville, TX 78028

WRGS Project No. 072-001-10

August 2, 2010

Wet Rock Groundwater Services, L.L.C.
Groundwater Specialists
TBPG Firm No: 50038
P.O. Box 163144
Austin, Texas 78716
Ph: 512-773-3226 Fax: 512-879-6809
www.wetrockgs.com

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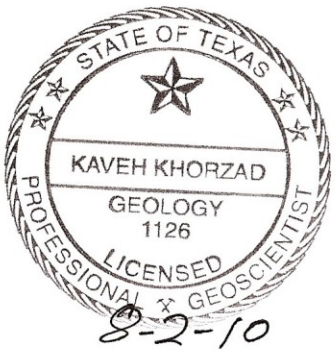

Kaveh Khorzad, P.G.
License No. 1126

Wet Rock Groundwater Services, LLC
TBPG Firm Registration No. 50038

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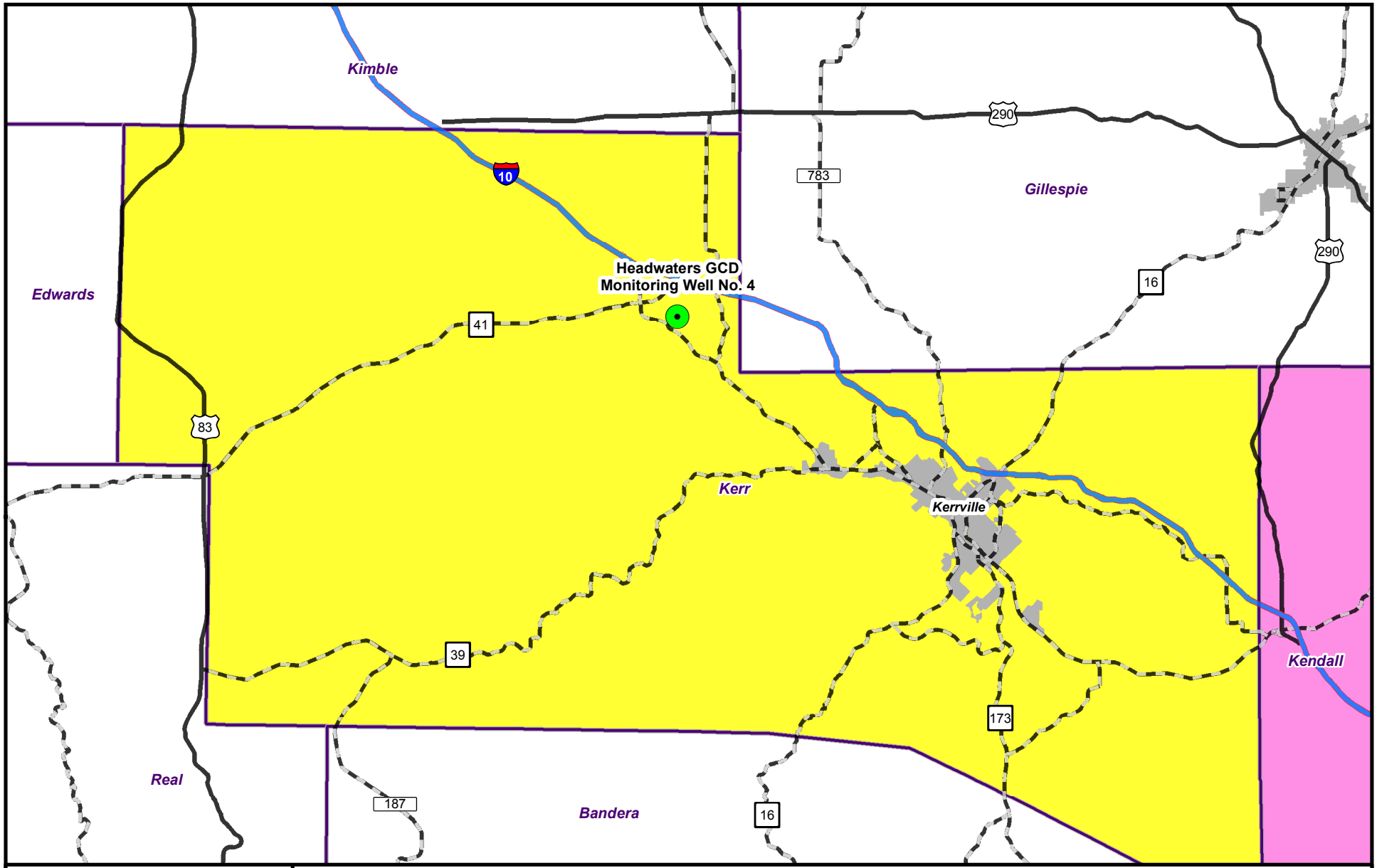
Headwaters Groundwater Conservation District
Monitoring Well No. 4
Middle Trinity Aquifer

Contents

Attachment 1

Well Location Map



Headwaters GCD Monitoring Well No. 4 Location Map

DRAWN BY: CAM DATE: 7/10

REVISED BY: DATE:

PROJECTION: UTM NAD 83 Zone 14

Headwaters GCD

Kerr County, Texas

Wet Rock Groundwater Services, L.L.C.
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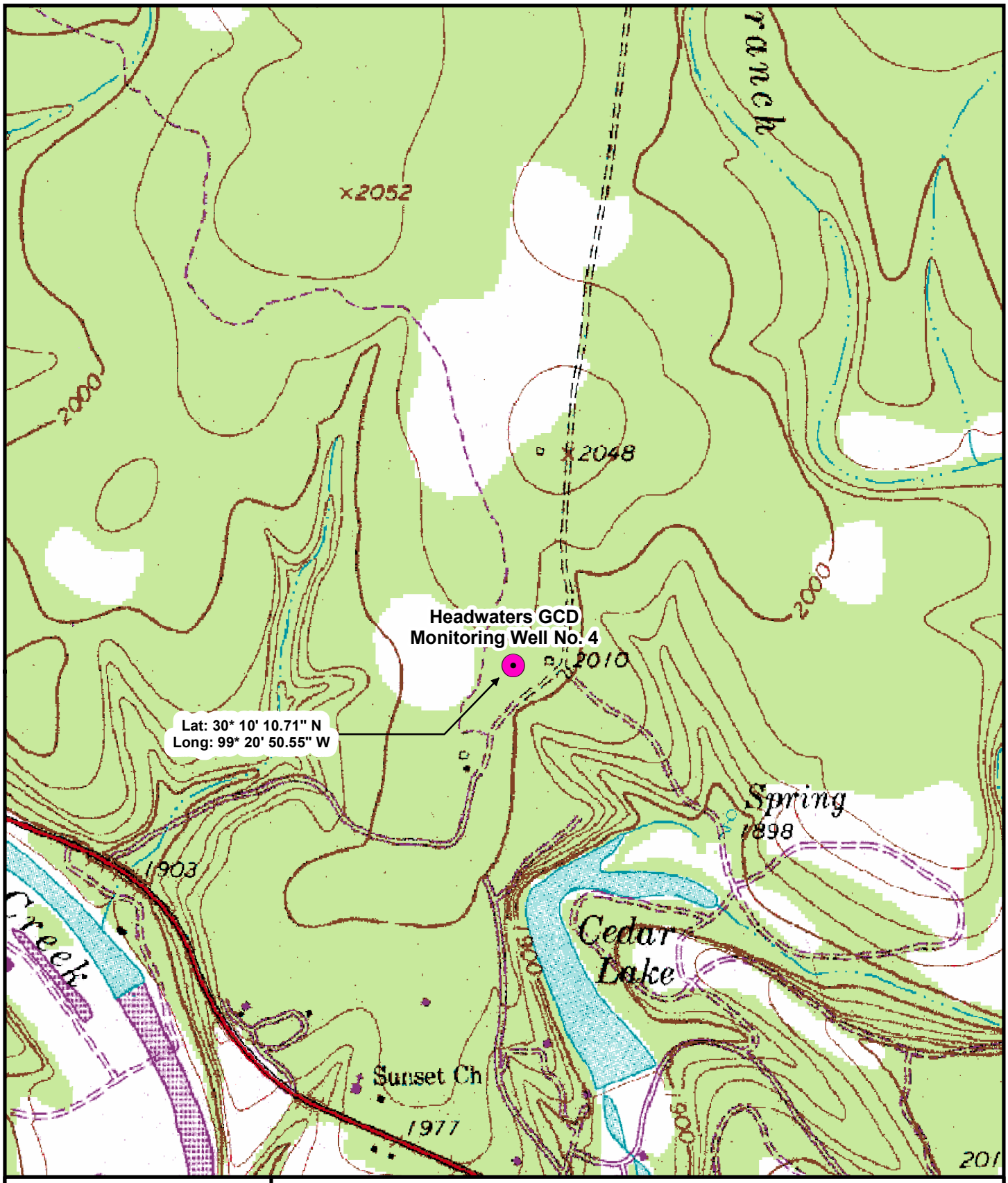
Attachment 2

U.S. Geological Survey Topographic Map



Headwaters GCD Monitoring Well No. 4 Topo Map

DRAWN BY: CAM DATE: 7/10

REVISED BY: DATE:

PROJECTION: UTM NAD 83 Zone 14

Headwaters GCD

Monitoring Well No. 4

Kerr County, Texas

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Attachment 3

Log Plot: Monitoring Well No. 4

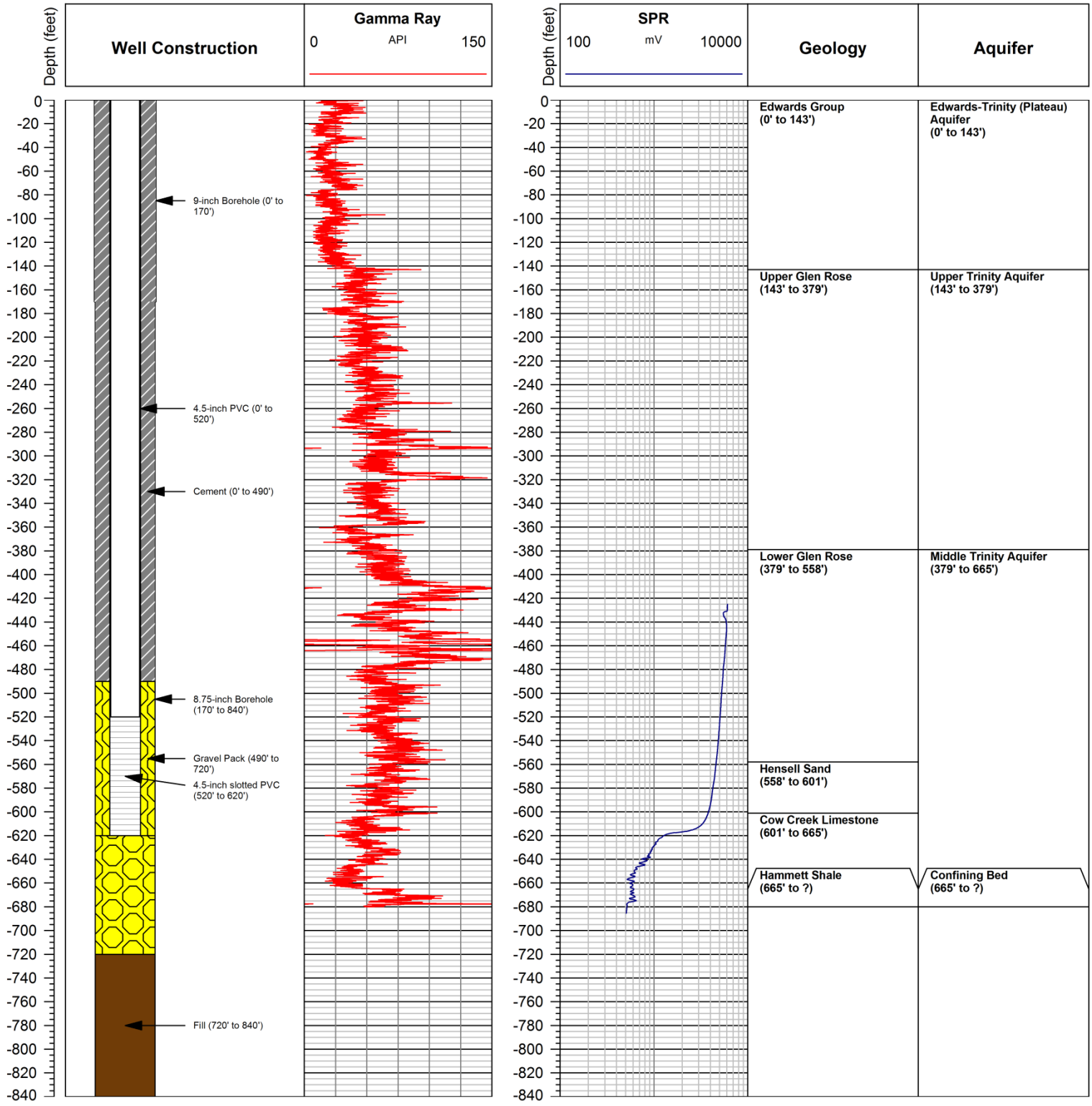
Wet Rock Groundwater Services, LLC

Groundwater Specialists

P.O. Box 163144 Austin, TX 78716
Ph: 512.799.5875 Fax: 512.879.6809
www.wetrockgs.com

Well Name: HGCD MW No. 4

Client:	**Headwaters GCD**	Elevation:	**2,020 ft msl**
Location:	**Kerr County, Texas**	Total Depth:	**840 ft bgs**
Drill Date:	**4/3/2004**	Latitude:	**30.169642**
Drilled By:	**Armadigger, Inc.**	Longitude:	**-99.347378**



Attachment 4

State of Texas Well Report

TRACKING# 41399 **STATE OF TEXAS WELL REPORT** **Date Entered:** 7/23/2004

OWNER: Headwaters Groundwater Cons. Dist.

OWNER ADDRESS: 1418 Sidney Baker Kerrville , TX 78028

ADDRESS OF WELL'S LOCATION:
15 miles NW Kerrville
Mountain Home , TX

COUNTY: Kerr **LATITUDE:** 301001 **LONGITUDE:** 992051 **Brand/Model of GPS:** Extrex

Owner's Well Number: Monitor #4 **ELEVATION:** 2020 **Grid Number:** 56 - 54 - 4

TYPE OF WORK:
☑ New Well ☐ Replacement Well
☐ Deepening ☐ Reconditioning

PROPOSED USE: ☑ Monitor Well ☐ Env. Soil Boring ☐ Domestic ☐ Test Well
☐ Industrial ☐ Irrigation ☐ Injection ☐ Geothermal Heat Loop
☐ Public Supply ☐ De-watering ☐ Rig Supply ☐ Stock or Livestock
If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

WELL LOG:
Date Drilling Started 4/3/2004
Completed 4/13/2004

DIAMETER OF HOLE

Dia. (in)	From (ft.)	To (ft.)
9	Surface	170
8.75	170	840

DRILLING METHOD:
☐ Driven ☐ Air Hammer ☐ Hollow Stem Auger ☐ Bored
☑ Air Rotary ☐ Cable Tool ☐ Reverse Circulation
☐ Mud Rotary ☐ Jetted ☐ Other

BOREHOLE COMPLETION:
☐ Open Hole ☐ Underreamed ☐ Other
☐ Straight Wall ☑ Gravel Packed
Gravel Packed Interval from 490 **ft. to** 720 **ft.**
Size 1/4"

ANNULAR SEAL DATA
From 0 **ft. to** 2 **ft. #Sacks + Material** 1 - cement
From 2 **ft. to** 490 **ft. #Sacks + Material** 37 - grout
From **ft. to** **ft. #Sacks + Material**
Method Used Pressure grout
Cemented By Armadigger, Inc.
Distance to Septic System
Distance to Property Line:
Method of Verification
Approved by Variance No.

SURFACE COMPLETION:
☑ Surface Slab Installed ☐ Pitless Adapter Used
☐ Surface Sleeve Installed ☐ Alternative Procedure Used

WATER LEVEL:
Static Level 420 **ft. below land surface**
Artesian Flow **gpm.** **Date** 4/12/2004

PLUGGING INFO:
☐ Well Plugged within 48 hours
Casing left in well: **From (ft.)** **To (ft.**
Cement/Bentonite left in well: **From (ft.)** **To (ft.)** **Cem/Bent** **Sacks Used:**

TYPE OF PUMP:
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other
Depth to pump bowls, cylinder, jet, etc.

PACKERS:
Type **Depth**

WELL TESTS:
Type of test: ☐ Pump ☐ Bailer ☑ Jetted ☐ Estimated
Yield: 200 **gpm with** **ft. drawdown after** **hrs.**

WATER QUALITY:
Did Driller knowingly penetrate any strata which contained undesirable constituents? ☐ Yes ☑ No
Type of water:
Depth of Strata:
Chemical Analysis made? ☐ Yes ☑ No

COMPANY NAME: Armadigger, Inc **WELL DRILLER'S LICENSE NO.** 4785
ADDRESS P. O. Box 1329 Bandera TX 78003
Name as Signature Michael Tumlinson **Registered Driller Apprentice**
Driller Comments

56-54-405

WELL REPORT CONFIDENTIALITY NOTICE

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner. Please include the report's Tracking number on your written request.

Texas Department of Licensing Regulation
Water Well Driller/Pump Installer Section
P.O. Box 12157 Austin, TX 78711
Toll free (800)803-9202 (512)463-7880 FAX (512)463-8616
Email address: water.well@license.state.tx.us Web address: www.license.state.tx.us

DESCRIPTION AND COLOR OF FORMATION MATERIAL

From (ft.)	To (ft.)	Description
0	143	Light gray & white limestone
143	180	Gray limestone & shale
180	405	Light gray limestone & shale
405	422	Green & gray shale
422	493	White limestone & lignite
493	840	White sandy limestone (Water 493 - 820)

CASING, BLANK PIPE, AND WELL SCREEN DATA

Dia.	New/Used	Type	Setting From/To	Gage
4 1/2	N	SDR-17 PVC (slotted 520 - 620)	0 - 620	

56.54.405

Attachment 5

Table 1 - Well Construction Summary
Table 2 - Aquifer Testing Summary
Table 3 - Summary of Aquifer Testing Analyses

Table 1 - Well Construction Summary

Well	Hole Diameter (inches)	From (ft)	To (ft)	Casing Type	Casing Diameter (inches)	From (ft)	To (ft)
Monitoring Well No. 4	9	0	170	PVC	4.5	0	520
	8.75	170	840	Slotted PVC	4.5	520	620
				Gravel Pack	n/a	490	720

Table 2 - Aquifer Testing Summary

Well	Static Water Level (ft MSL)	Q (gpm)	Drawdown (ft)	SC (gpm/ft)	Pumping Duration (minutes)	Δ t (°F)	T_{R90} (minutes)
Monitoring Well No. 4	1,581.5	39	10.3	3.77	2,885	-1.32	1,063

Notes: Q = discharge; SC = specific capacity; r = distance from pumping well; Δt = change in temperature; T_{R90} = Time pumping well Recovered 90%

Table 3 - Summary of Aquifer Testing Analyses

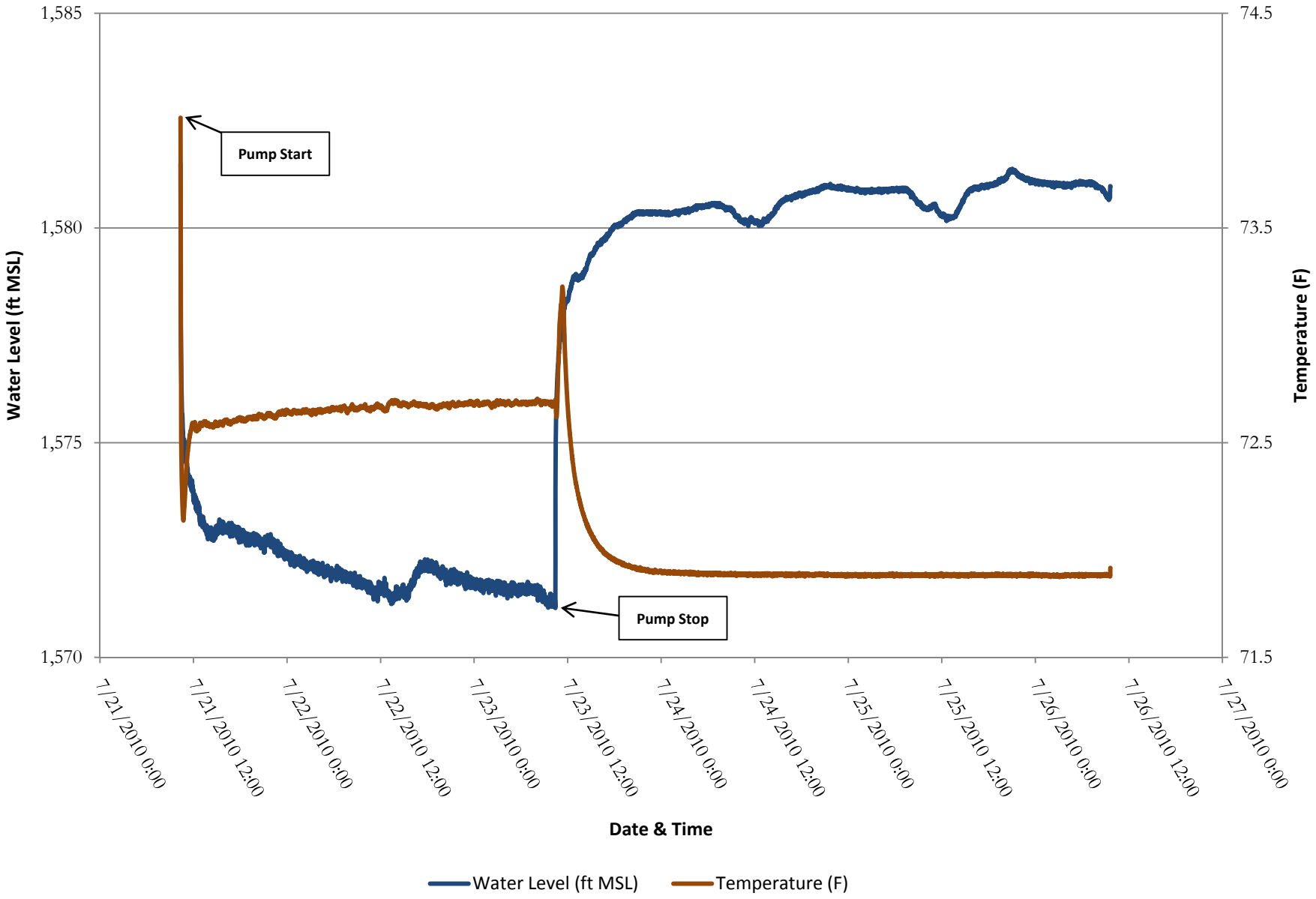
Well	Analysis	b (ft)	T (ft^2/day)	K
Monitoring Well No. 4	**Theis**	286	846	2.96
	Theis Recovery	286	648	2.27
	Average:	286	747	2.62

Notes: b = aquifer thickness; r = distance from pumping well; T = transmissivity; S = storativity; K = hydraulic conductivity

Attachment 6

Aquifer Test Drawdown and Temperature Curves

Headwaters GCD MW No. 4 - 7/21/2010



Attachment 7

Aquifer Test Analyses

Wet Rock Groundwater Services, LLC
Groundwater Specialists
P.O. Box 163144 Austin, Texas 78716
Ph: 512.773.3226 Fax: 512.879.6809
www.wetrockgs.com

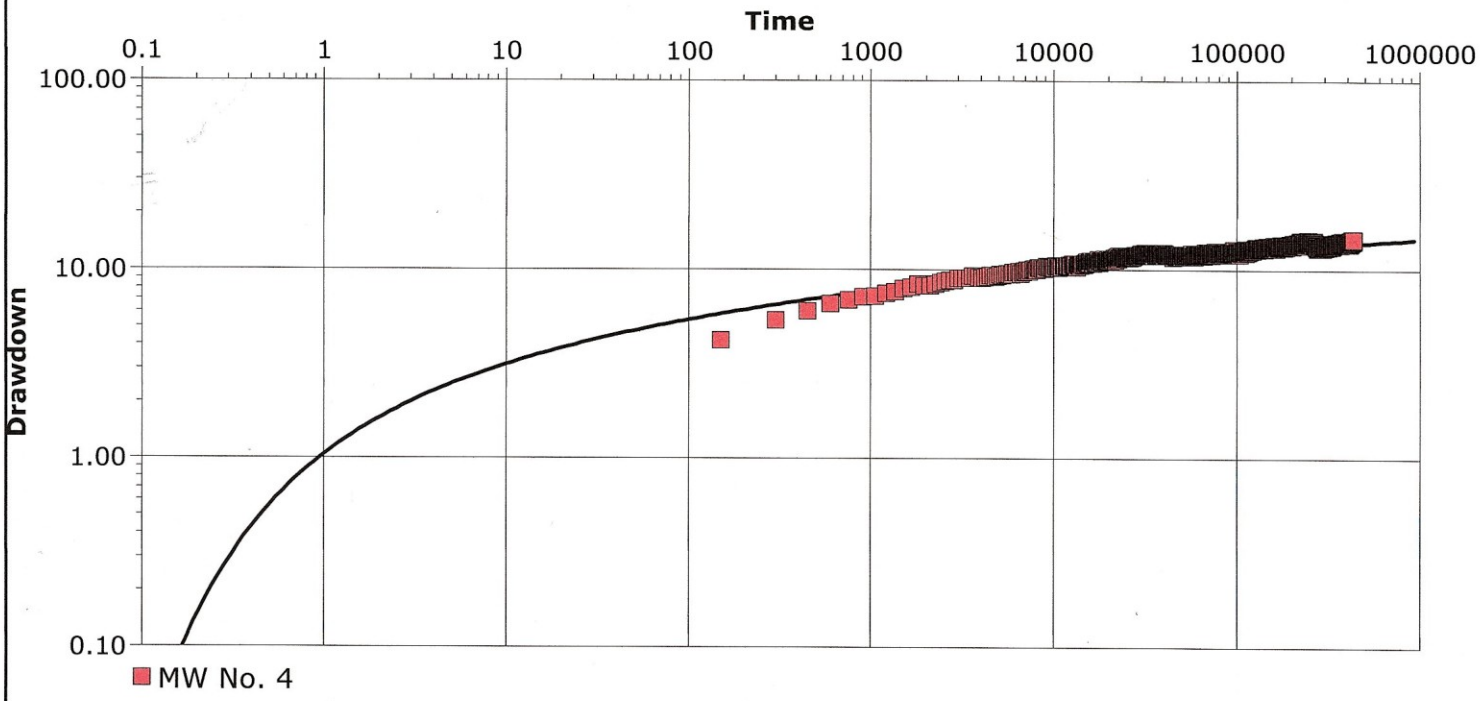
Pumping Test Analysis Report

Project: HGCD MW No. 4

Number: 072-001-10

Client: Headwaters GCD

Location: Kerr County, Texas	Pumping Test: HGCD MW No. 4	Pumping Well: MW No. 4
Test Conducted by: Cassidy Miller		Test Date: 7/21/2010
Analysis Performed by: Cassidy Miller	Theis	Analysis Date: 7/30/2010
Aquifer Thickness: 286.00 ft	Discharge: variable, average rate 39.14 [U.S. gal/min]	



Calculation after Theis

Observation Well	Transmissivity [ft²/d]	Hydraulic Conductivity [ft/d]	Storage coefficient	Radial Distance to PW [ft]	
MW No. 4	8.46×10^{2}	2.96×10^{0}			

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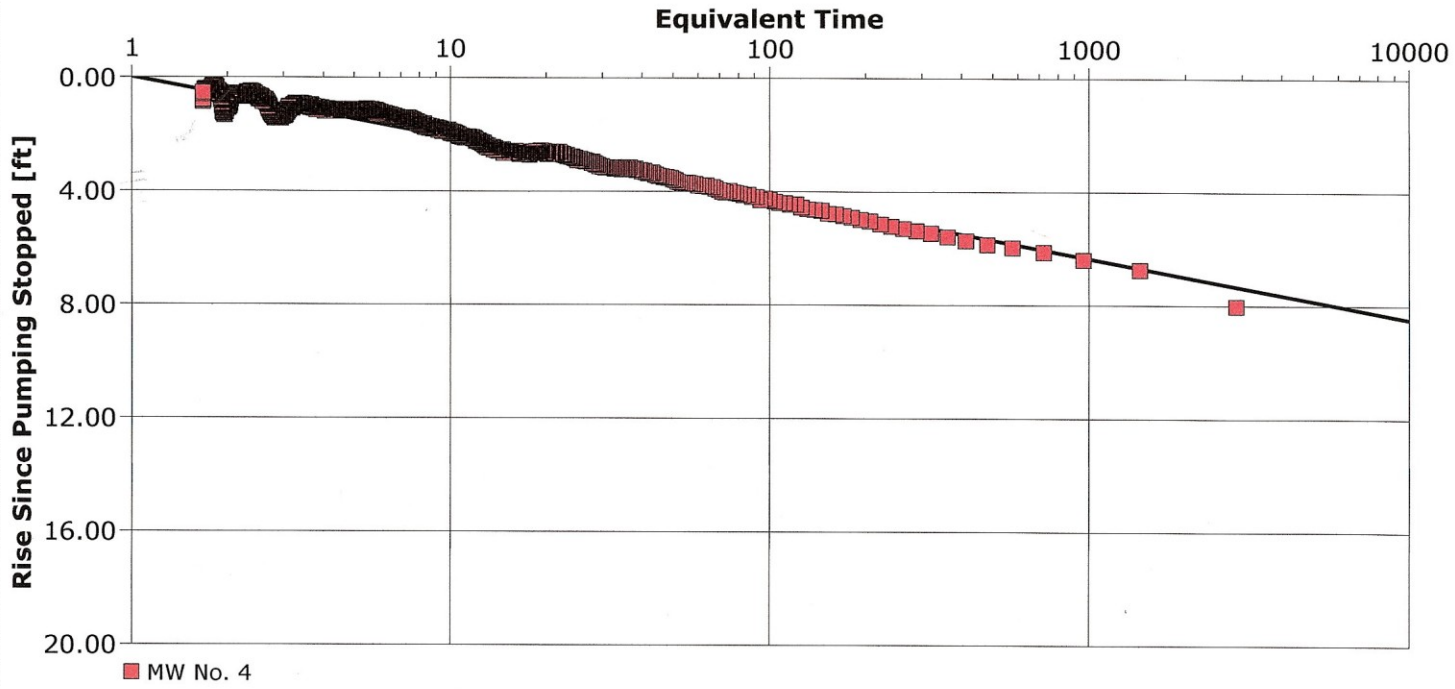
Pumping Test Analysis Report

Project: HGCD MW No. 4

Number: 072-001-10

Client: Headwaters GCD

Location: Kerr County, Texas	Pumping Test: HGCD MW No. 4	Pumping Well: MW No. 4
Test Conducted by: Cassidy Miller		Test Date: 7/21/2010
Analysis Performed by: Cassidy Miller	Theis Recovery	Analysis Date: 7/30/2010
Aquifer Thickness: 286.00 ft	Discharge: variable, average rate 39.14 [U.S. gal/min]	



Calculation after Theis & Jacob

Observation Well	Transmissivity [ft²/d]	Hydraulic Conductivity [ft/d]	Radial Distance to PW [ft]	
MW No. 4	6.48×10^{2}	2.27×10^{0}		

Attachment 8

Aquifer Test Data

HGCD MW No. 4 Pump Test Summary (7-21-2010)

Date and Time	Time Since Pump Start (min)	Time Since Pump Stop (min)	Temperature (F)	Water Level (ft bgs)	Water Level (ft MSL)	Drawdown (ft)	Pump Rate (gpm)	Specific Capacity (gpm/ft)	pH	Cond (µS*cm-1)	Comments
7/21/2010 10:20	0		74.01	438.51	1,581.49	0.00					Meter = 5,911,390
7/21/2010 10:21	1		73.64	441.49	1,578.51	2.99	41	13.73	7.3	840	
7/21/2010 10:22	2		73.22	442.34	1,577.66	3.83					
7/21/2010 10:23	3		72.93	442.78	1,577.22	4.28					
7/21/2010 10:24	4		72.75	443.17	1,576.83	4.66					
7/21/2010 10:25	5		72.62	443.39	1,576.61	4.89	43	8.80	7.22	760	
7/21/2010 10:26	6		72.51	443.57	1,576.43	5.06					
7/21/2010 10:27	7		72.43	443.66	1,576.34	5.15					
7/21/2010 10:28	8		72.37	443.85	1,576.15	5.34					
7/21/2010 10:29	9		72.32	443.91	1,576.09	5.40					
7/21/2010 10:30	10		72.29	444.14	1,575.86	5.63	43	7.64	7.19	710	
7/21/2010 10:31	11		72.26	444.22	1,575.78	5.71					
7/21/2010 10:32	12		72.24	444.44	1,575.56	5.93					
7/21/2010 10:33	13		72.22	444.37	1,575.63	5.86					
7/21/2010 10:34	14		72.21	444.35	1,575.65	5.84					
7/21/2010 10:35	15		72.20	444.44	1,575.56	5.94	43	7.24	7.19	720	
7/21/2010 10:50	30		72.20	445.17	1,574.83	6.67	42	6.30	7.21	720	
7/21/2010 11:05	45		72.38	445.42	1,574.58	6.91	42	6.07	7.22	720	
7/21/2010 11:20	60		72.48	445.75	1,574.25	7.25	43	5.93	7.21	720	
7/21/2010 11:35	75		72.55	445.99	1,574.01	7.48	43	5.75	7.24	720	
7/21/2010 11:50	90		72.59	446.13	1,573.87	7.62	42	5.51	7.23	720	
7/21/2010 12:05	105		72.58	446.41	1,573.59	7.90	42	5.32	7.22	710	
7/21/2010 12:20	120		72.56	446.52	1,573.48	8.01	42	5.24	7.24	710	
7/21/2010 13:20	180		72.59	446.84	1,573.16	8.33					
7/21/2010 14:20	240		72.58	447.04	1,572.96	8.53					
7/21/2010 15:20	300		72.59	446.97	1,573.03	8.46					
7/21/2010 16:20	360		72.60	446.95	1,573.05	8.45					
7/21/2010 17:20	420		72.61	447.07	1,572.93	8.57					
7/21/2010 18:20	480		72.61	447.11	1,572.89	8.61					
7/21/2010 19:20	540		72.61	447.31	1,572.69	8.80					
7/21/2010 20:20	600		72.63	447.35	1,572.65	8.84					
7/21/2010 21:20	660		72.62	447.29	1,572.71	8.78					
7/21/2010 22:20	720		72.62	447.51	1,572.49	9.00					
7/21/2010 23:20	780		72.64	447.55	1,572.45	9.05					
7/22/2010 0:20	840		72.64	447.71	1,572.29	9.21					
7/22/2010 1:20	900		72.64	447.77	1,572.23	9.26					
7/22/2010 2:20	960		72.65	447.83	1,572.17	9.32					

Note: bgs = below ground surface Column Pipe Diameter = 1.5-inch steel Horsepower = 10 HP
MSL = Mean Sea Level Pump Setting = 546 feet bgs

HGCD MW No. 4 Pump Test Summary (7-21-2010)

Date and Time	Time Since Pump Start (min)	Time Since Pump Stop (min)	Temperature (F)	Water Level (ft bgs)	Water Level (ft MSL)	Drawdown (ft)	Pump Rate (gpm)	Specific Capacity (gpm/ft)	pH	Cond (µS*cm-1)	Comments
7/22/2010 3:20	1,020		72.65	447.86	1,572.14	9.35					
7/22/2010 4:20	1,080		72.65	447.97	1,572.03	9.46					
7/22/2010 5:20	1,140		72.65	447.96	1,572.04	9.46					
7/22/2010 6:20	1,200		72.66	448.20	1,571.80	9.69					
7/22/2010 7:20	1,260		72.67	448.17	1,571.83	9.66					
7/22/2010 8:20	1,320		72.68	448.22	1,571.78	9.71					
7/22/2010 9:20	1,380		72.66	448.21	1,571.79	9.70					
7/22/2010 10:20	1,440		72.66	448.36	1,571.64	9.86					
7/22/2010 11:20	1,500		72.67	448.41	1,571.59	9.91					
7/22/2010 12:20	1,560		72.66	448.40	1,571.60	9.90					
7/22/2010 13:20	1,620		72.69	448.59	1,571.41	10.08					
7/22/2010 14:20	1,680		72.68	448.62	1,571.38	10.11					
7/22/2010 15:20	1,740		72.68	448.47	1,571.53	9.96					
7/22/2010 16:20	1,800		72.68	448.28	1,571.72	9.77					
7/22/2010 17:20	1,860		72.67	447.99	1,572.01	9.48					
7/22/2010 18:20	1,920		72.67	447.80	1,572.20	9.30					
7/22/2010 19:20	1,980		72.66	448.02	1,571.98	9.52					
7/22/2010 20:20	2,040		72.67	448.21	1,571.79	9.70					
7/22/2010 21:20	2,100		72.69	448.11	1,571.89	9.60					
7/22/2010 22:20	2,160		72.68	448.22	1,571.78	9.71					
7/22/2010 23:20	2,220		72.69	448.33	1,571.67	9.83					
7/23/2010 0:20	2,280		72.69	448.22	1,571.78	9.71					
7/23/2010 1:20	2,340		72.69	448.36	1,571.64	9.86					
7/23/2010 2:20	2,400		72.67	448.34	1,571.66	9.83					
7/23/2010 3:20	2,460		72.68	448.33	1,571.67	9.83					
7/23/2010 4:20	2,520		72.69	448.43	1,571.57	9.93					
7/23/2010 5:20	2,580		72.70	448.44	1,571.56	9.94					
7/23/2010 6:20	2,640		72.69	448.38	1,571.62	9.87					
7/23/2010 7:20	2,700		72.68	448.37	1,571.63	9.87					
7/23/2010 8:20	2,760		72.70	448.51	1,571.49	10.00					
7/23/2010 9:20	2,820		72.68	448.66	1,571.34	10.15					
7/23/2010 10:20	2,880		72.69	448.62	1,571.38	10.12					
7/23/2010 10:25	2,885	0	72.69	448.85	1,571.15	10.34	39	3.77			Meter = 6,024,110
7/23/2010 10:26	2,886	1	72.70	446.54	1,573.46	8.03					
7/23/2010 10:27	2,887	2	72.69	445.25	1,574.75	6.74					
7/23/2010 10:28	2,888	3	72.68	444.90	1,575.10	6.39					
7/23/2010 10:29	2,889	4	72.67	444.64	1,575.36	6.13					

Note: bgs = below ground surface Column Pipe Diameter = 1.5-inch steel Horsepower = 10 HP
MSL = Mean Sea Level Pump Setting = 546 feet bgs

HGCD MW No. 4 Pump Test Summary (7-21-2010)

Date and Time	Time Since Pump Start (min)	Time Since Pump Stop (min)	Temperature (F)	Water Level (ft bgs)	Water Level (ft MSL)	Drawdown (ft)	Pump Rate (gpm)	Specific Capacity (gpm/ft)	pH	Cond (µS*cm-1)	Comments
7/23/2010 10:30	2,890	5	72.66	444.48	1,575.52	5.98					
7/23/2010 10:31	2,891	6	72.64	444.37	1,575.63	5.86					
7/23/2010 10:32	2,892	7	72.64	444.24	1,575.76	5.73					
7/23/2010 10:33	2,893	8	72.62	444.10	1,575.90	5.59					
7/23/2010 10:34	2,894	9	72.62	443.96	1,576.04	5.46					
7/23/2010 10:35	2,895	10	72.62	443.89	1,576.11	5.38					
7/23/2010 10:36	2,896	11	72.63	443.81	1,576.19	5.31					
7/23/2010 10:37	2,897	12	72.64	443.74	1,576.26	5.24					
7/23/2010 10:38	2,898	13	72.65	443.65	1,576.35	5.14					
7/23/2010 10:39	2,899	14	72.68	443.55	1,576.45	5.04					
7/23/2010 10:40	2,900	15	72.68	443.50	1,576.50	4.99					
7/23/2010 10:55	2,915	30	73.01	442.76	1,577.24	4.25					
7/23/2010 11:10	2,930	45	73.14	442.35	1,577.65	3.84					
7/23/2010 11:25	2,945	60	73.20	442.03	1,577.97	3.52					
7/23/2010 11:40	2,960	75	72.90	441.77	1,578.23	3.26					
7/23/2010 11:55	2,975	90	72.72	441.72	1,578.28	3.21					
7/23/2010 12:10	2,990	105	72.59	441.55	1,578.45	3.04					
7/23/2010 12:25	3,005	120	72.49	441.41	1,578.59	2.91					
7/23/2010 13:25	3,065	180	72.25	441.20	1,578.80	2.69					
7/23/2010 14:25	3,125	240	72.12	440.95	1,579.05	2.44					
7/23/2010 15:25	3,185	300	72.05	440.52	1,579.48	2.01					
7/23/2010 16:25	3,245	360	72.00	440.27	1,579.73	1.76					
7/23/2010 17:25	3,305	420	71.97	440.12	1,579.88	1.62					
7/23/2010 18:25	3,365	480	71.95	439.93	1,580.07	1.43					
7/23/2010 19:25	3,425	540	71.93	439.80	1,580.20	1.29					
7/23/2010 20:25	3,485	600	71.92	439.67	1,580.33	1.16					
7/23/2010 21:25	3,545	660	71.91	439.66	1,580.34	1.15					
7/23/2010 22:25	3,605	720	71.90	439.66	1,580.34	1.15					
7/23/2010 23:25	3,665	780	71.90	439.64	1,580.36	1.13					
7/24/2010 0:25	3,725	840	71.89	439.69	1,580.31	1.18					
7/24/2010 1:25	3,785	900	71.90	439.64	1,580.36	1.13					
7/24/2010 2:25	3,845	960	71.89	439.61	1,580.39	1.10					
7/24/2010 3:25	3,905	1,020	71.89	439.59	1,580.41	1.09					
7/24/2010 4:25	3,965	1,080	71.89	439.49	1,580.51	0.98					

Note: bgs = below ground surface Column Pipe Diameter = 1.5-inch steel Horsepower = 10 HP
MSL = Mean Sea Level Pump Setting = 546 feet bgs