

Results of Aquifer Test Analysis

for the

Horseshoe Oaks

Well No. 2 - Lower Trinity Aquifer

(HGCD Permit No. P0043; HGCD Well No. 917)

for

Aqua Texas, Inc.

512 Rodriguez Street

Kerrville, TX 78028

WRGS Project No. 006-008-09

March 17, 2010



Wet Rock Groundwater Services, L.L.C.

Groundwater Specialists

TBPG Firm No: 50038

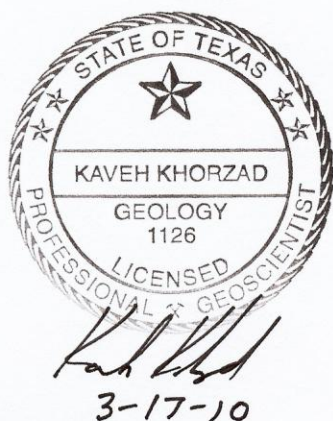
P.O. Box 163144

Austin, Texas 78716

Ph: 512-773-3226 Fax: 512-879-6809

www.wetrockgs.com

The seal appearing on this document was authorized on March 17, 2010 by:



Kaveh Khorzad, P.G.
License No. 1126

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



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Aqua Texas, Inc.

Horseshoe Oaks

Well No. 2 - Lower Trinity Aquifer

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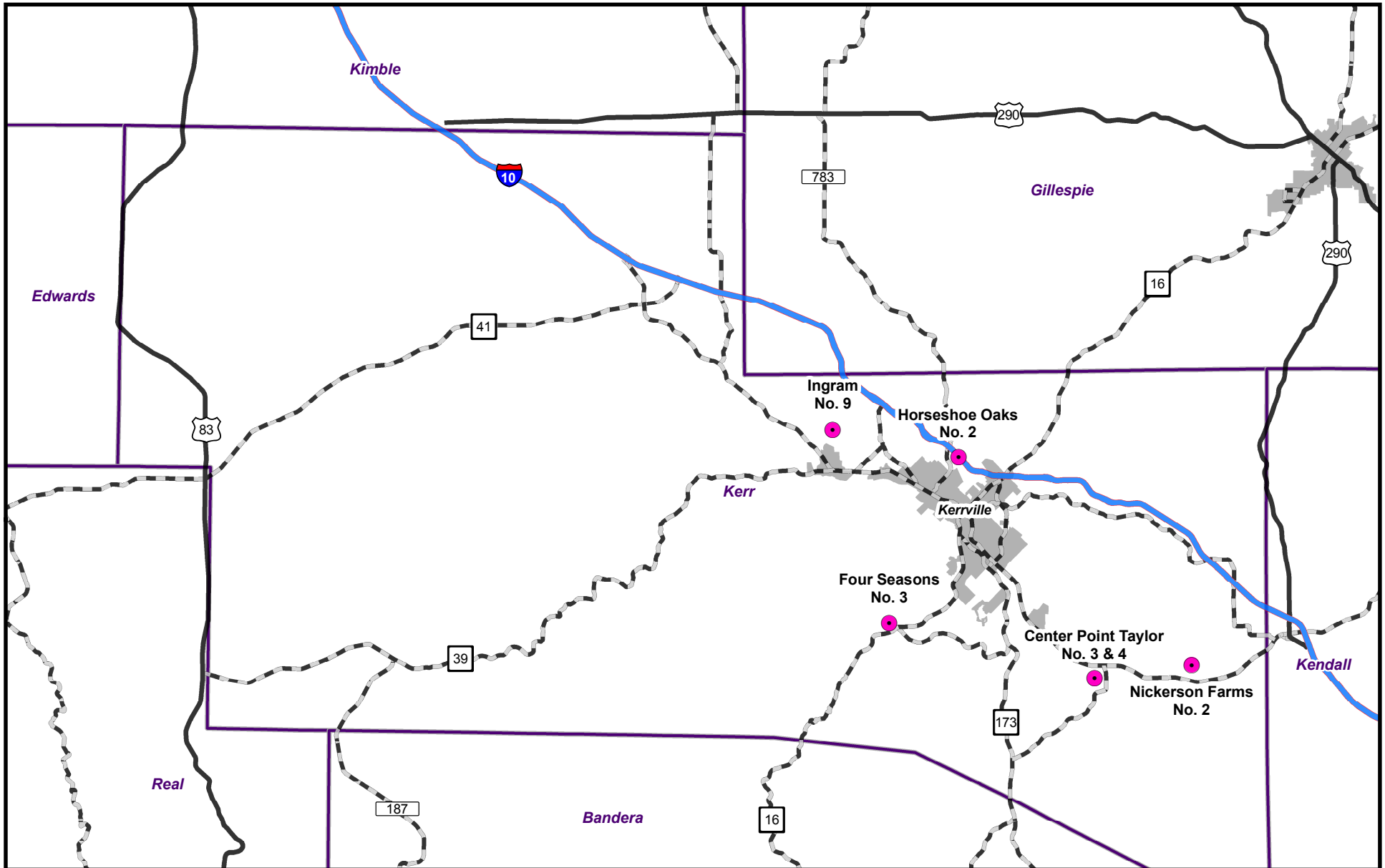
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Attachment 1

Well Location Map



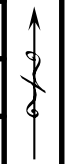


SCALE: 1 in = 6 miles

DRAWN BY: CAM DATE: 3/10

REVISED BY: DATE:

PROJECTION: UTM NAD 83 Zone 14



Aqua Texas, Inc.
Kerr County, Texas

Well Location Map



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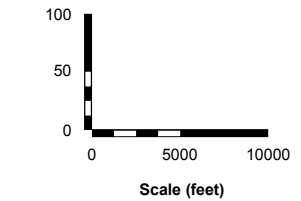
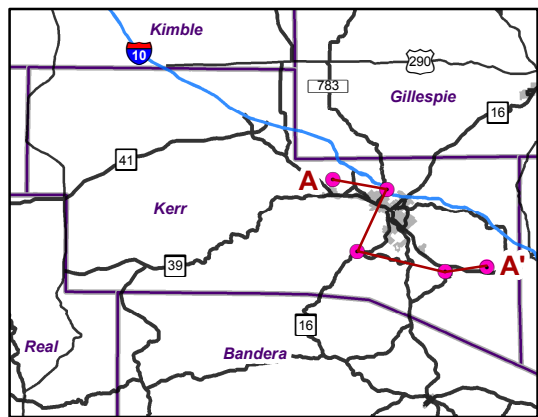
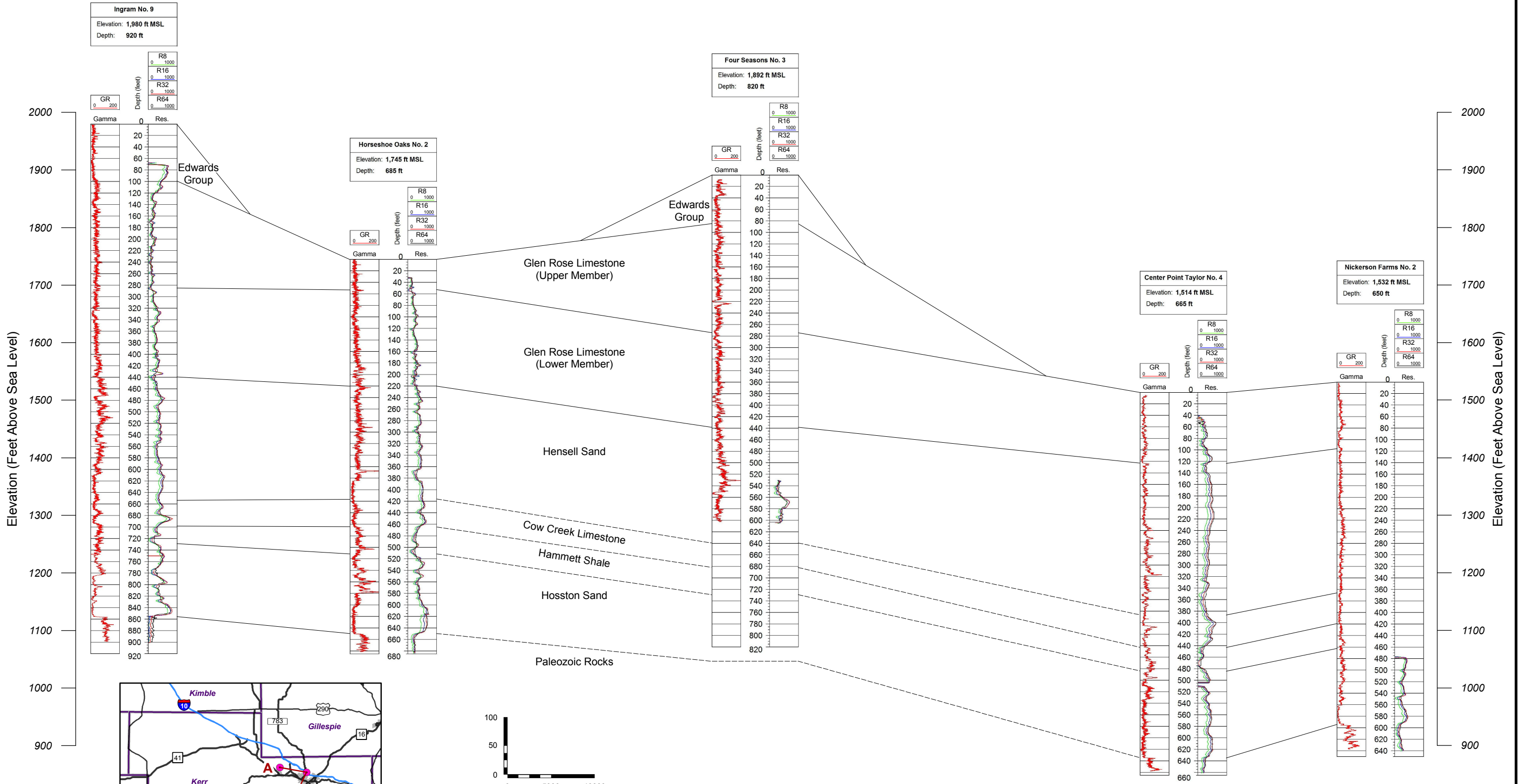
Attachment 2

Geological Cross Section



A

A'



VERTICAL EXAGGERATION = 66X

Geological Cross Section A-A'

DRAWN BY: CAM	DATE: 3/10
REVISED BY:	DATE:
PROJECTION: UTM NAD 83 Zone 14	

Aqua Texas, Inc.
Kerr County, Texas

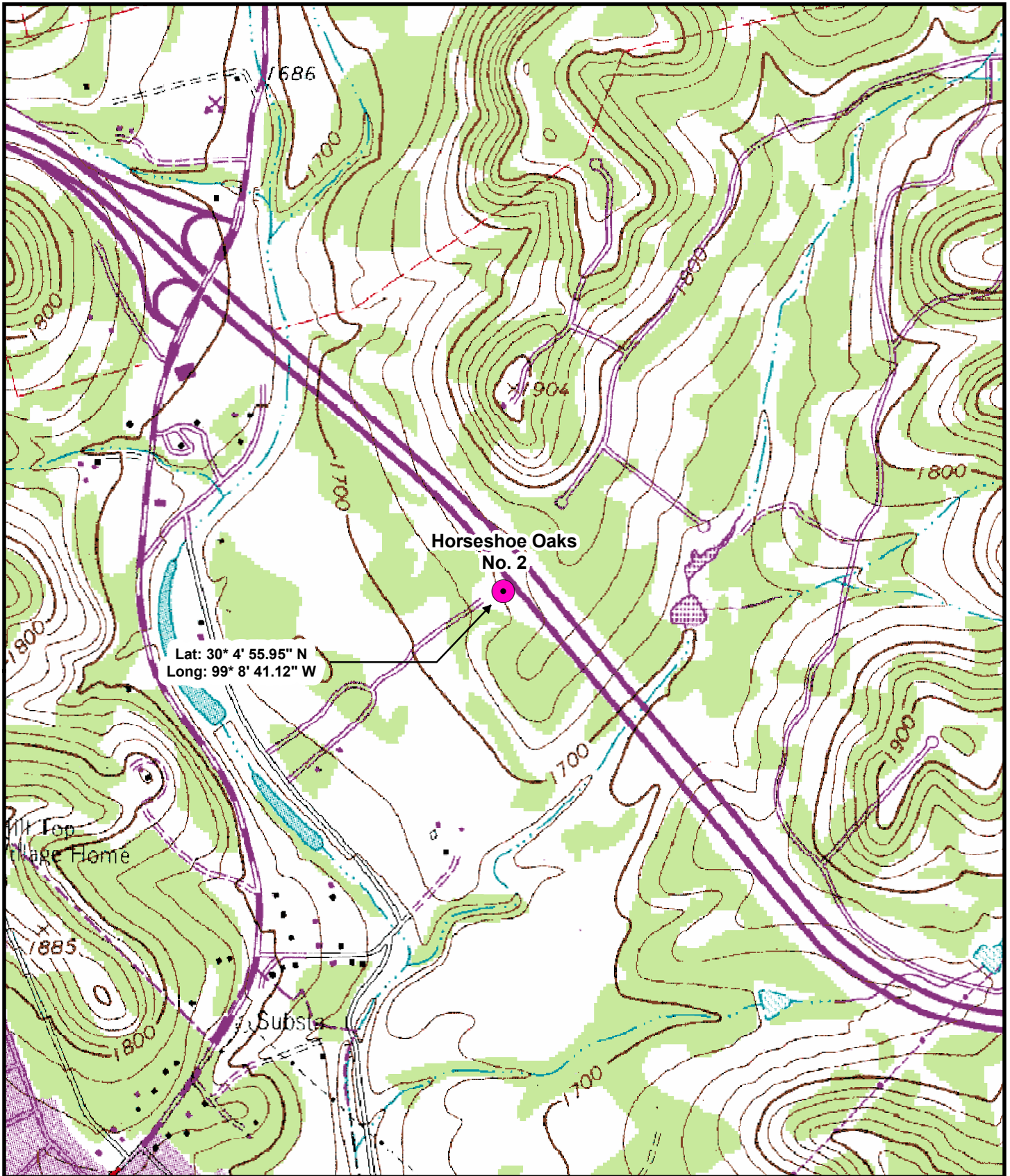


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Attachment 3

U.S. Geological Survey Topographic Map





SCALE: 1 in = 1,000 ft

Horseshoe Oaks No. 2 Topo Map

DRAWN BY: CAM DATE: 3/10

REVISED BY: DATE:

PROJECTION: UTM NAD 83 Zone 14

Aqua Texas, Inc.
 Horseshoe Oaks
 No. 2
 Kerr County, Texas



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Attachment 4

Log Plot: Horseshoe Oaks Well No. 2





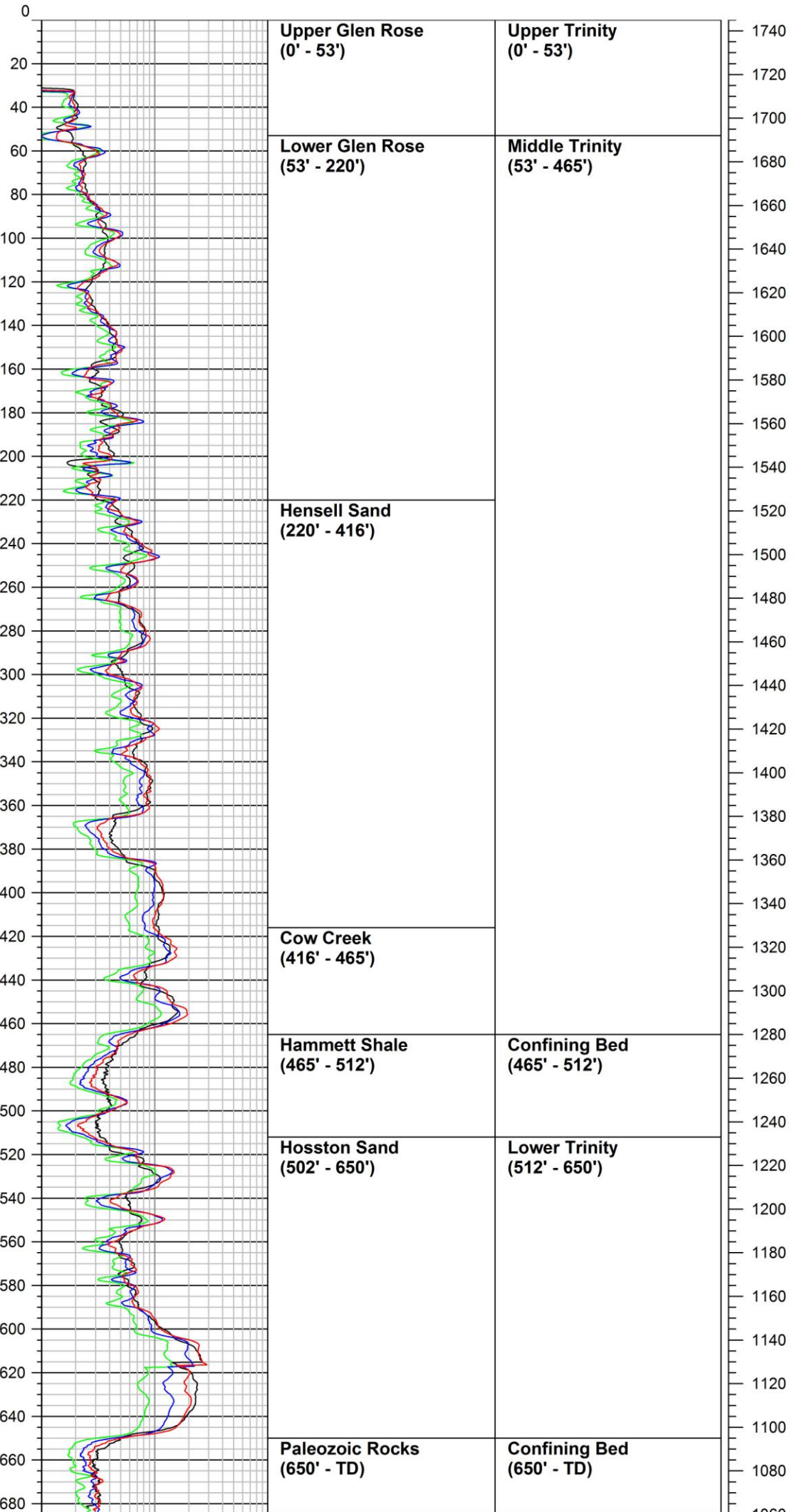
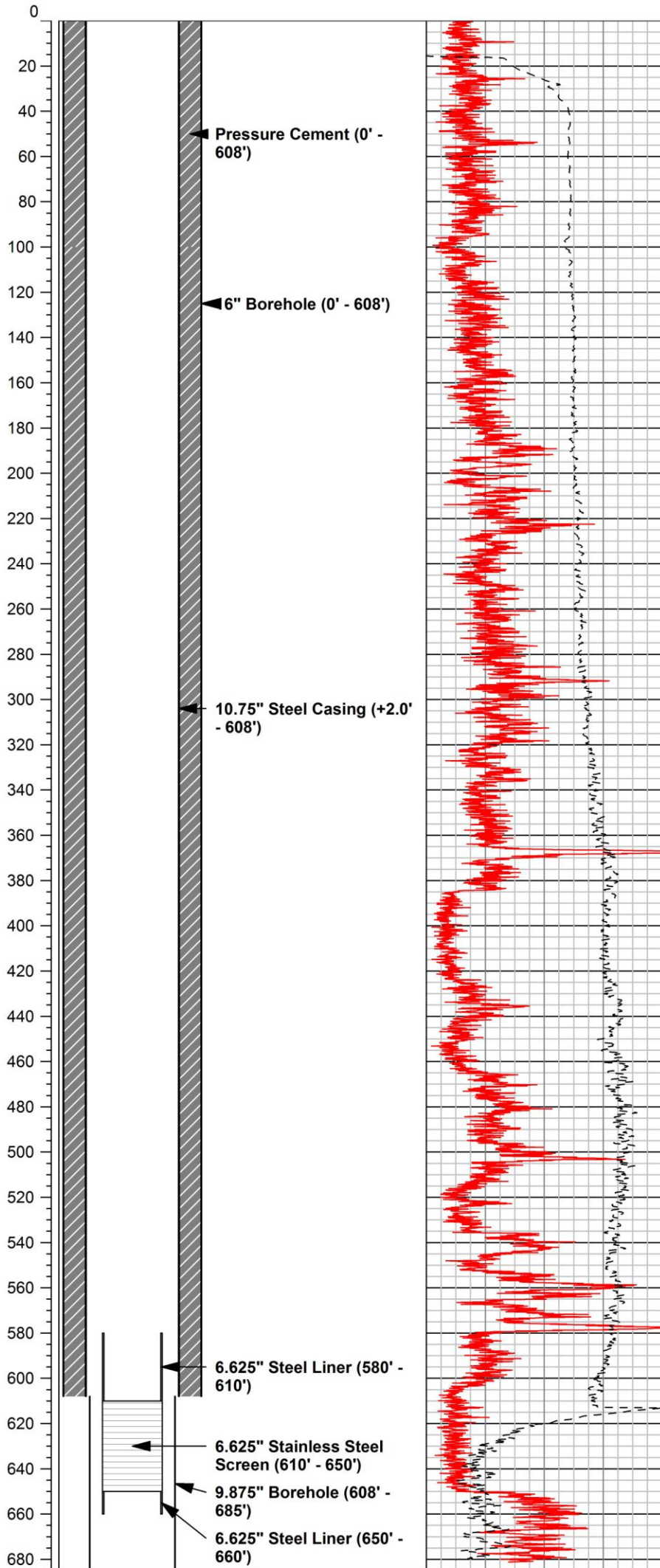
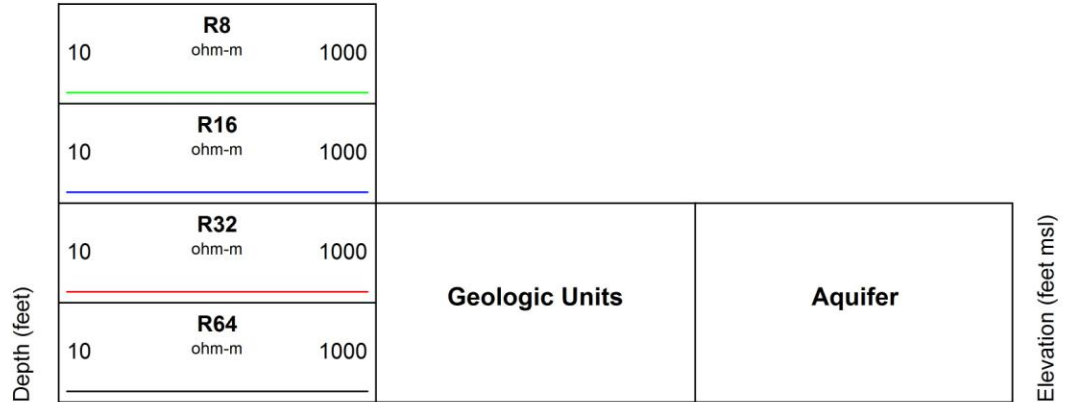
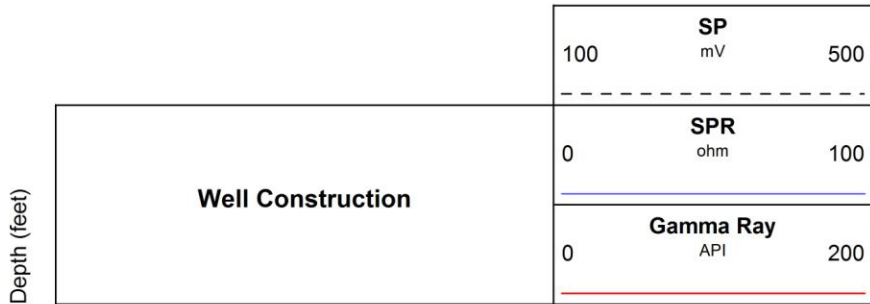
Wet Rock Groundwater Services, LLC
Groundwater Specialists

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 www.wetrockgs.com

Horseshoe Oaks No. 2

Client: **Aqua Texas, Inc.**
 Date Started: **2/4/2005**
 Date Completed: **3/12/2005**
 Drilled By: **Tim Hall Inc.**
 Drilling Type: **Mud Rotary**

Location: **Kerr County, TX**
 Elevation: **1,745 ft MSL**
 Total Depth: **685 ft**
 Latitude: **30.082214 (WGS84)**
 Longitude: **-99.144786 (WGS84)**



Attachment 5

State of Texas Well Report



STATE OF TEXAS WELL REPORT for Tracking #57245

Owner:	AQUA UTILITIES, INC	Owner Well #:	2
Address:	9450 SILVER CREEK ROAD FT WORTH , TX 76108	Grid #:	56-63-6
Well Location:	1721 SILVER SADDLE KERRVILLE , TX 78028	Latitude:	30° 04' 56" N
Well County:	Kerr	Longitude:	099° 08' 41" W
Elevation:	1736 ft.	GPS Brand Used:	No Data
Type of Work: New Well		Proposed Use:	Public Supply; Plans Approved by TCEQ

Drilling Date: Started: **2/4/2005**
 Completed: **3/12/2005**

Diameter of Hole: Diameter: **16 in From Surface To 608 ft**
 Diameter: **9 7/8 in From 608 ft To 685 ft**

Drilling Method: **Mud Rotary**

Borehole
Completion: **Open Hole**

Annular Seal Data: 1st Interval: **From 0 ft to 610 ft with 275 (#sacks and material)**
 2nd Interval: **From 660 ft to 685 ft with 25 (#sacks and material)**
 3rd Interval: **No Data**
 Method Used: **HALIBURTON**
 Cemented By: **JET STAR CO.**
 Distance to Septic Field or other Concentrated Contamination: **No Data**
 Distance to Property Line: **No Data**
 Method of Verification: **No Data**
 Approved by Variance: **No Data**

Surface
Completion: **Surface Slab Installed**

Water Level: Static level: **No Data**
 Artesian flow: **No Data**

Packers: **K-PACKER 580'**
 K-PACKER 590'

Plugging Info: Casing or Cement/Bentonite left in well: **No Data**

Type Of Pump: **Submersible**
 Depth to pump bowl: **(No Data) ft**

Well Tests: **Pump**
 Yield: **(No Data) GPM with (No Data) ft drawdown after (No Data) hours**

Water Quality: Type of Water: **No Data**
 Depth of Strata: **No Data**
 Chemical Analysis Made: **No Data**
 Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct

supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for completion and resubmittal.

Company Information: **TIM HALL INC.
PO BOX 1300
BOWIE , TX 76230**

Driller License Number: **1824**

Licensed Well Driller Signature: **EDWIN ANDERSON**

Registered Driller Apprentice Signature: **No Data**

Apprentice Registration Number: **No Data**

Comments: **No Data**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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 (Tracking #57245) on your written request.

**Texas Department of Licensing & Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880**

DESC. & COLOR OF FORMATION MATERIAL

CASING, BLANK PIPE & WELL SCREEN DATA

From (ft) To (ft) Description
1 - 150 SANDY SILTY
150 - 160 CLAYEY SAND
160 - 180 SANDY SILTY
180 - 185 COAL
185 - 190 CLAYEY SAND
190 - 200 SANDY
200 - 210 SANDY MICRODOLOMITE
210 - 240 SANDSTONE
240 - 260 CLAYEY SAND
260 - 280 SAND
280 - 290 SANDY MICRODOLOMITE
290 - 300 CLAY & SILT
300 - 310 MICRODOLOMITE
310 - 320 CLAYEY SAND
320 - 330 LIMESTONE
330 - 360 SAND
360 - 380 PALEOSOL
380 - 420 CONGLOMERATE
420 - 475 SAND
475 - 540 CLAYEY
540 - 570 SANDY

Dia. New/Used Type Setting From/To
10 3/4" NEW STEEL CASING +2 - 608
6 5/8" NEW STEEL LINER 580 - 610
6 5/8" NEW ALLOY S/S SCREEN 610 - 650 .025
6 5/8" NEW STEEL LINER 650 - 660

570 - 580 CLAY
580 - 650 SAND
650 - 685 SHALE & ROCK

Attachment 6

Table 1 - Well Construction Summary

Table 2 - Aquifer Testing Summary

Table 3 - Summary of Aquifer Testing Analyses



Table 1 - Well Construction Summary

<u>Well</u>	<u>Hole Diameter (inches)</u>	<u>From (ft)</u>	<u>To (ft)</u>	<u>Casing Type</u>	<u>Casing Diameter (inches)</u>	<u>From (ft)</u>	<u>To (ft)</u>
<u>Horseshoe Oaks No. 2</u>	16	0	608	Steel Casing	10.75	2	608
	9.875	608	685	Steel Liner	6.625	580	610
				SS Screen	6.625	610	650
					6.625	650	660

Table 2 - Aquifer Testing Summary

<u>Well</u>	<u>Static Water Level (ft MSL)</u>	<u>Q (gpm)</u>	<u>Drawdown (ft)</u>	<u>SC (gpm/ft)</u>	<u>Pumping Duration (minutes)</u>	<u>Δ t (°F)</u>	<u>T₉₀ (minutes)</u>
<u>Horseshoe Oaks No. 2</u>	1,541.7	230	223.7	1.03	2,160	n/a	n/a

Notes: Q = discharge; SC = specific capacity; r = distance from pumping well; Δt = change in temperature; T₉₀ = Time pumping well Recovered 90%

Table 3 - Summary of Aquifer Testing Analyses

<u>Analysis</u>	<u>b (ft)</u>	<u>T (ft²/day)</u>	<u>K</u>
<u>Theis</u>	138	365	2.65
<u>Theis Recovery</u>	138	2130	15.40
<u>Average:</u>	138	1248	9.03

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

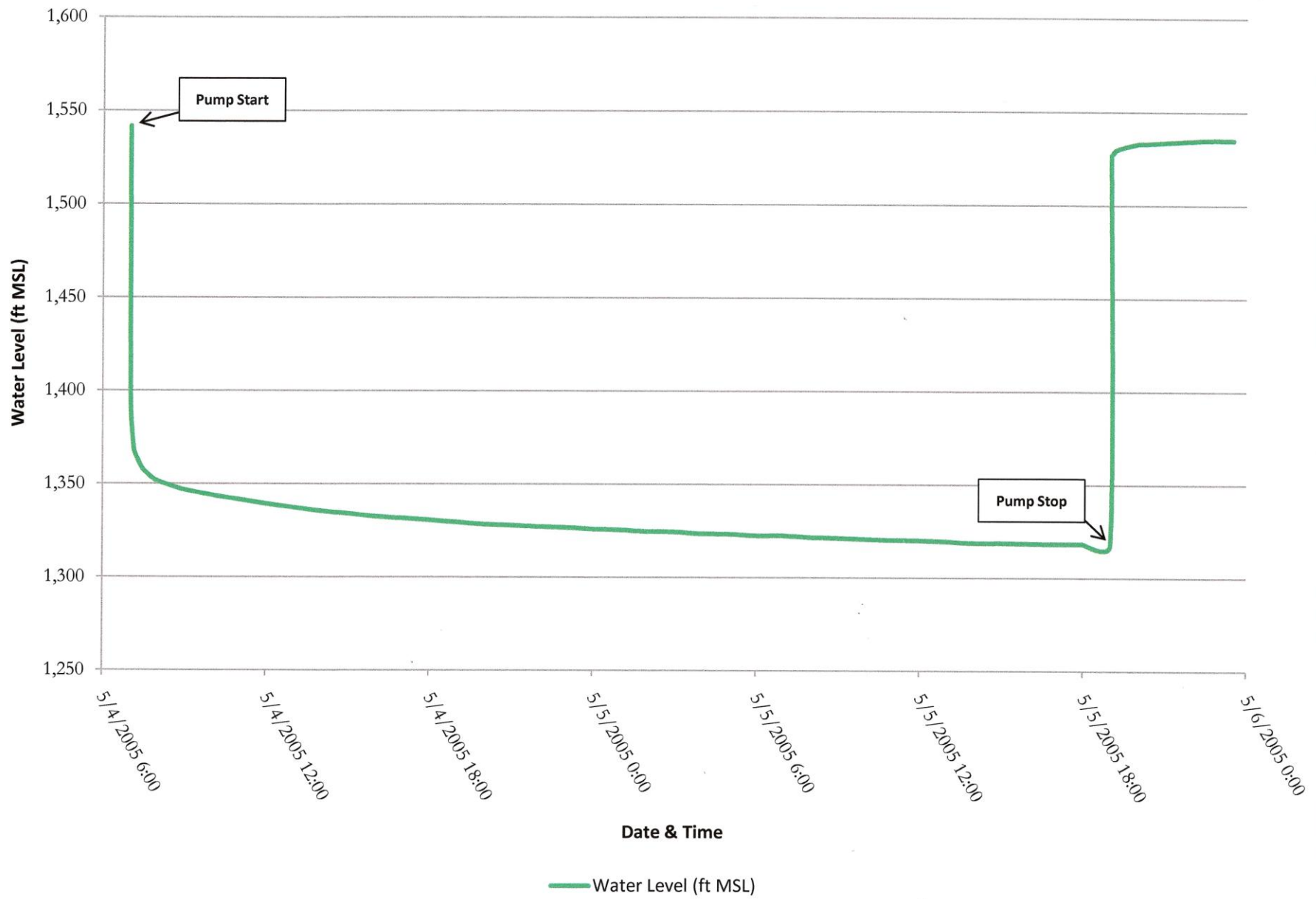


Attachment 7

Aquifer Test Drawdown and Temperature Curves



Horseshoe Oaks No. 2 Aquifer Test - 5/4/2005



Attachment 8

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: Headwaters Aquifer Properties

Number: 006-008-09

Client: Headwaters GCD

Location: Kerr County, TX

Pumping Test: Horseshoe Oaks No. 2

Pumping Well: Horseshoe Oaks No. 2

Test Conducted by:

Test Date: 5/4/2005

Analysis Performed by: Cassidy Miller

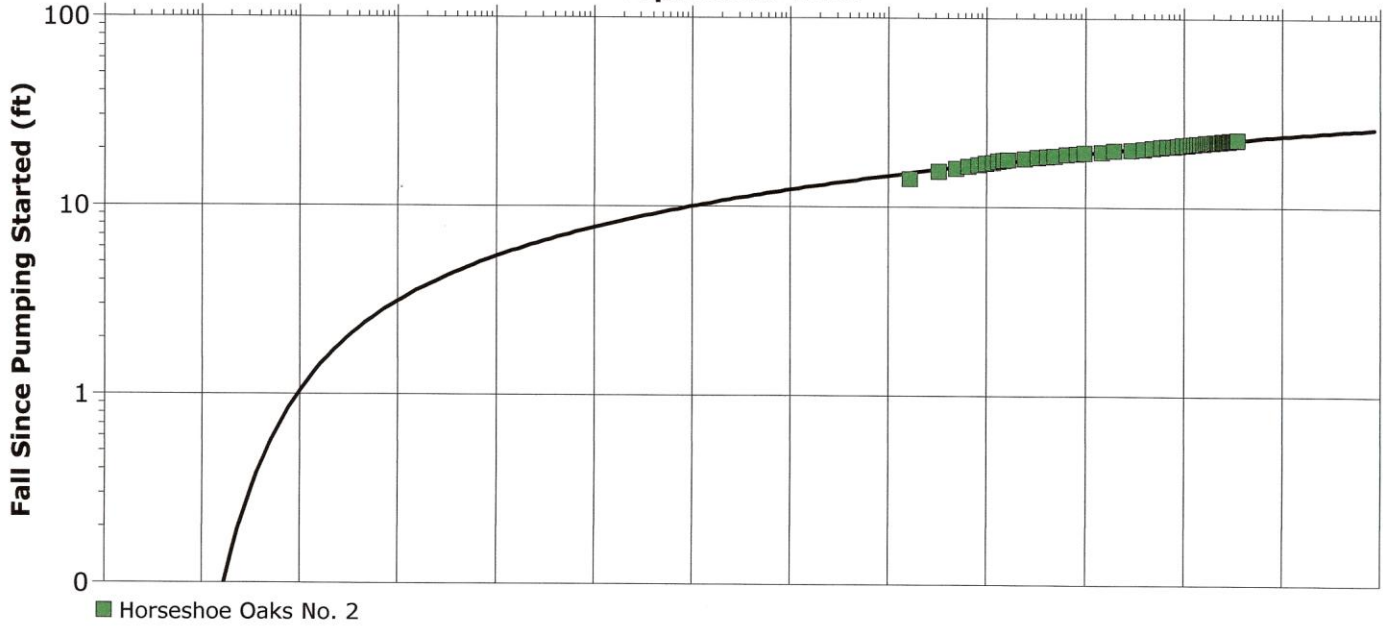
Theis

Analysis Date: 3/5/2010

Aquifer Thickness: 138.00 ft

Discharge: variable, average rate 233.91 [U.S. gal/min]

Equivalent Time



Calculation after Theis

Observation Well	Transmissivity [ft ² /d]	Hydraulic Conductivity [ft/d]	Storage coefficient	Radial Distance to PW [ft]
Horseshoe Oaks No. 2	3.65×10^2	2.65×10^0		



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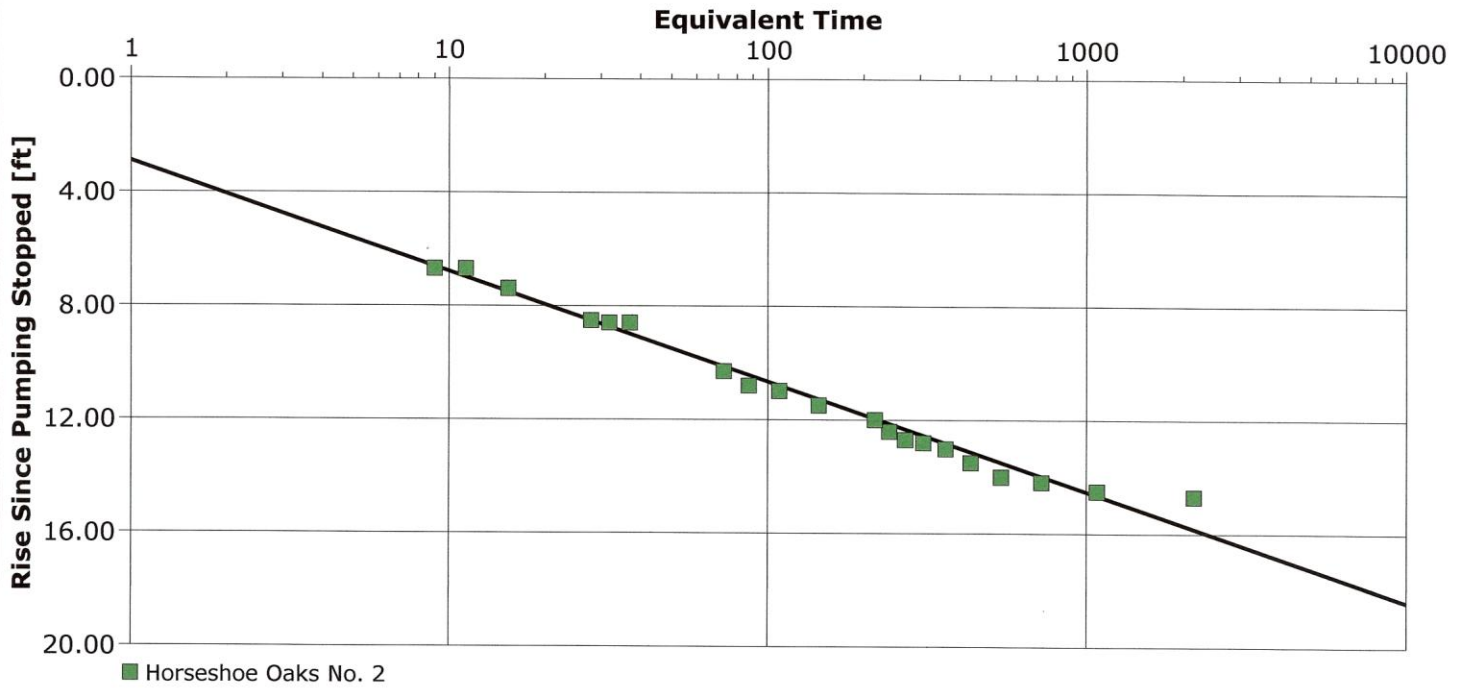
Pumping Test Analysis Report

Project: Headwaters Aquifer Properties

Number: 006-008-09

Client: Headwaters GCD

Location: Kerr County, TX	Pumping Test: Horseshoe Oaks No. 2	Pumping Well: Horseshoe Oaks No. 2
Test Conducted by:		Test Date: 5/4/2005
Analysis Performed by: Cassidy Miller	Theis Recovery	Analysis Date: 3/5/2010
Aquifer Thickness: 138.00 ft	Discharge: variable, average rate 233.91 [U.S. gal/min]	



Calculation after Theis & Jacob

Observation Well	Transmissivity [ft ² /d]	Hydraulic Conductivity [ft/d]	Radial Distance to PW [ft]
Horseshoe Oaks No. 2	2.13×10^3	1.54×10^1	

Attachment 9

Aquifer Test Data



Horseshoe Oaks No. 2 Pump Test Summary (5-4-2005)

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)	Comments
5/4/2005 7:00	0			203.30	1,541.70	0.00	250		Pumping Start
5/4/2005 7:01	1			341.00	1,404.00	137.70	250	1.82	
5/4/2005 7:02	2			354.40	1,390.60	151.10	250	1.65	
5/4/2005 7:03	3			360.60	1,384.40	157.30	250	1.59	
5/4/2005 7:04	4			364.30	1,380.70	161.00	245	1.52	
5/4/2005 7:05	5			367.50	1,377.50	164.20	245	1.49	
5/4/2005 7:06	6			370.10	1,374.90	166.80	245	1.47	
5/4/2005 7:07	7			372.40	1,372.60	169.10	245	1.45	
5/4/2005 7:08	8			375.00	1,370.00	171.70	240	1.40	
5/4/2005 7:09	9			376.60	1,368.40	173.30	240	1.38	
5/4/2005 7:10	10			377.80	1,367.20	174.50	240	1.38	
5/4/2005 7:15	15			380.70	1,364.30	177.40	240	1.35	
5/4/2005 7:20	20			383.40	1,361.60	180.10	240	1.33	
5/4/2005 7:25	25			385.80	1,359.20	182.50	240	1.32	
5/4/2005 7:30	30			387.50	1,357.50	184.20	240	1.30	
5/4/2005 7:40	40			389.90	1,355.10	186.60	240	1.29	
5/4/2005 7:50	50			392.00	1,353.00	188.70	240	1.27	
5/4/2005 8:00	60			393.40	1,351.60	190.10	240	1.26	
5/4/2005 8:30	90			396.00	1,349.00	192.70	240	1.25	
5/4/2005 9:00	120			398.20	1,346.80	194.90	240	1.23	
5/4/2005 10:00	180			401.00	1,344.00	197.70	240	1.21	
5/4/2005 11:00	240			403.20	1,341.80	199.90	240	1.20	
5/4/2005 12:00	300			405.50	1,339.50	202.20	240	1.19	
5/4/2005 13:00	360			407.50	1,337.50	204.20	240	1.18	
5/4/2005 14:00	420			409.40	1,335.60	206.10	240	1.16	
5/4/2005 15:00	480			410.80	1,334.20	207.50	240	1.16	
5/4/2005 16:00	540			412.30	1,332.70	209.00	240	1.15	
5/4/2005 17:00	600			413.20	1,331.80	209.90	240	1.14	
5/4/2005 18:00	660			414.20	1,330.80	210.90	240	1.14	
5/4/2005 19:00	720			415.40	1,329.60	212.10	240	1.13	
5/4/2005 20:00	780			416.50	1,328.50	213.20	235	1.10	

Note: bgs = below ground surface

MSL = Mean Sea Level

Horseshoe Oaks No. 2 Pump Test Summary (5-4-2005)

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)	Comments
5/4/2005 21:00	840			417.00	1,328.00	213.70	235	1.10	
5/4/2005 22:00	900			417.70	1,327.30	214.40	235	1.10	
5/4/2005 23:00	960			418.10	1,326.90	214.80	235	1.09	
5/5/2005 0:00	1,020			419.00	1,326.00	215.70	230	1.07	
5/5/2005 1:00	1,080			419.40	1,325.60	216.10	230	1.06	
5/5/2005 2:00	1,140			420.30	1,324.70	217.00	230	1.06	
5/5/2005 3:00	1,200			420.40	1,324.60	217.10	230	1.06	
5/5/2005 4:00	1,260			421.40	1,323.60	218.10	230	1.05	
5/5/2005 5:00	1,320			421.60	1,323.40	218.30	230	1.05	
5/5/2005 6:00	1,380			422.40	1,322.60	219.10	230	1.05	
5/5/2005 7:00	1,440			422.40	1,322.60	219.10	230	1.05	
5/5/2005 8:00	1,500			423.20	1,321.80	219.90	230	1.05	
5/5/2005 9:00	1,560			423.60	1,321.40	220.30	230	1.04	
5/5/2005 10:00	1,620			424.10	1,320.90	220.80	230	1.04	
5/5/2005 11:00	1,680			424.60	1,320.40	221.30	230	1.04	
5/5/2005 12:00	1,740			424.80	1,320.20	221.50	230	1.04	
5/5/2005 13:00	1,800			425.30	1,319.70	222.00	230	1.04	
5/5/2005 14:00	1,860			426.10	1,318.90	222.80	230	1.03	
5/5/2005 15:00	1,920			426.10	1,318.90	222.80	230	1.03	
5/5/2005 16:00	1,980			426.30	1,318.70	223.00	230	1.03	
5/5/2005 17:00	2,040			426.60	1,318.40	223.30	230	1.03	
5/5/2005 18:00	2,100			426.60	1,318.40	223.30	230	1.03	
5/5/2005 19:00	2,160	0		427.00	1,318.00	223.70	230	1.03	Start Recovery
5/5/2005 19:01	2,161	1		218.00	1,527.00	14.70			
5/5/2005 19:02	2,162	2		217.80	1,527.20	14.50			
5/5/2005 19:03	2,163	3		217.50	1,527.50	14.20			
5/5/2005 19:04	2,164	4		217.30	1,527.70	14.00			
5/5/2005 19:05	2,165	5		216.80	1,528.20	13.50			
5/5/2005 19:06	2,166	6		216.30	1,528.70	13.00			
5/5/2005 19:07	2,167	7		216.10	1,528.90	12.80			
5/5/2005 19:08	2,168	8		216.00	1,529.00	12.70			

Note: bgs = below ground surface

MSL = Mean Sea Level

Horseshoe Oaks No. 2 Pump Test Summary (5-4-2005)

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)	Comments
5/5/2005 19:09	2,169	9		215.70	1,529.30	12.40			
5/5/2005 19:10	2,170	10		215.30	1,529.70	12.00			
5/5/2005 19:15	2,175	15		214.80	1,530.20	11.50			
5/5/2005 19:20	2,180	20		214.30	1,530.70	11.00			
5/5/2005 19:25	2,185	25		214.10	1,530.90	10.80			
5/5/2005 19:30	2,190	30		213.60	1,531.40	10.30			
5/5/2005 20:00	2,220	60		211.90	1,533.10	8.60			
5/5/2005 20:10	2,230	70		211.90	1,533.10	8.60			
5/5/2005 20:20	2,240	80		211.80	1,533.20	8.50			
5/5/2005 21:30	2,310	150		210.70	1,534.30	7.40			
5/5/2005 22:30	2,370	210		210.00	1,535.00	6.70			
5/5/2005 23:30	2,430	270		210.00	1,535.00	6.70			

Note: bgs = below ground surface

MSL = Mean Sea Level