Report of Findings: WRGS 20-007

Report of Findings
Aquifer Test Results of the Headwaters GCD Monitoring Well No. 19: Kerr County, Texas

For:
Headwaters Groundwater Conservation District
125 Lehmann Drive, Suite 202
Kerrville, TX 78028-6059

Wet Rock Groundwater Services, L.L.C.
Groundwater Specialists
TBPG Firm No: 50038
317 Ranch Road 620 South, Suite 203
Austin, TX 78734 Ph: 512.773.3226
www.wetrockgs.com

REPORT OF FINDINGS

WRGS 20-007

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125 Lehmann Drive, Suite 202

Kerrville, TX 78028-6059

Kerr County, Texas

September 2020

WRGS Project No. 072-001-20

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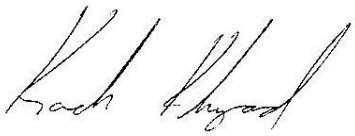
The seal appearing on this document was authorized by Kaveh Khorzad, P.G. 1126 on September 9, 2020.



Kaveh Khorzad, P.G.

License No. 1126

Wet Rock Groundwater Services, LLC

TBPG Firm Registration No. 50038

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Section I: Introduction

The Headwaters Groundwater Conservation District (HGCD) Monitoring Well No. 19 (Well No. 19) is located near the intersection of Loop 534 and Legion Drive in the southeastern portion of the City of Kerrville (Figure 1). The well was drilled to explore the groundwater resources of the geologic units beneath the Trinity Aquifer, specifically the units in the Llano Uplift Aquifer System, and ultimately to provide public supply to the City of Kerrville. This report provides a summary of the aquifer testing and analysis of Well No. 19 conducted by Wet Rock Groundwater Services (WRGS).

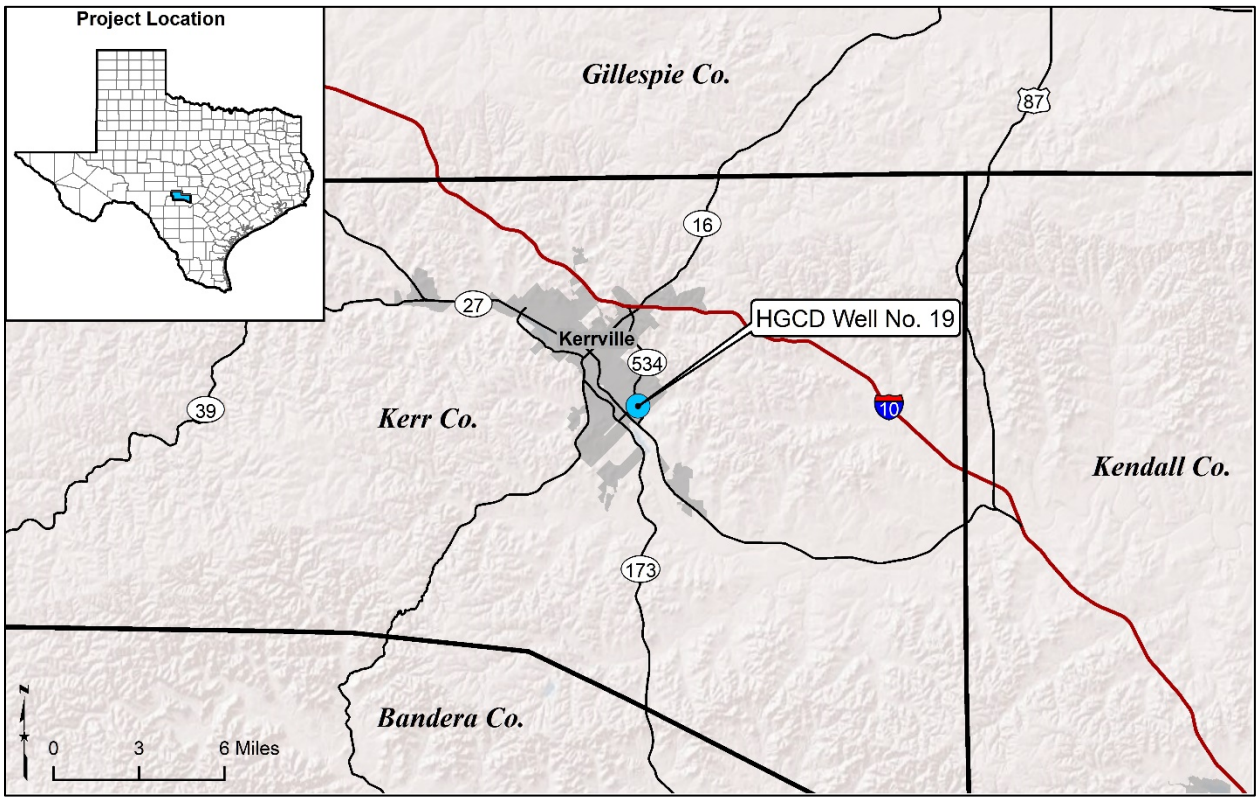


Figure 1: General location map

Section II: Well Details and Aquifer Testing

II.1. Introduction

McKinley Drilling completed Well No. 19 on July 13, 2020 to Texas Commission on Environmental Quality (TCEQ) public water supply well standards. Upon completion of the well, both McKinley Drilling and WRGS coordinated to perform a 36-hour aquifer test on Well No. 19 while utilizing the nearby City of Kerrville ASR Well No. 3 as an observation well. Figure 2 provides a site map showing the location of Well No. 19 and ASR Well No. 3; Appendix A provides the State Well Reports for both wells; and Appendix B provides the geophysical logs conducted on each well.

Figure 2: Well location map

II.2. Well Details

Table 1 provides a well construction summary and Figure 3 provides illustrations showing well construction with respective formation depths from Well No. 19 and ASR Well No. 3.

HGCD Well No. 19

During construction, a pilot hole was drilled to a depth of 1,520 feet below ground level (ft. bgl) in order to characterize the subsurface geology and to determine the feasibility of the groundwater resources beneath the Trinity Aquifer. Cuttings were analyzed by HGCD geologists, and a suite of geophysical logs was performed by GeoCam, Inc. on June 9, 2019 to determine formation depths, thicknesses, and geologic characteristics (Appendix B). According to geophysical and driller's logs, the following formations/units

were encountered:

- Upper Glen Rose Limestone from the surface to 50 ft. bgl;
- Lower Glen Rose Limestone from 50 ft. bgl to 142 ft. bgl;
- Hensell Sand from 143 ft. bgl to 340 ft. bgl;
- Bexar from 340 ft. bgl to 344 ft. bgl;
- Cow Creek from 344 ft. bgl to 360 ft. bgl;
- Hammett from 360 ft. bgl to 374 ft. bgl;
- Hosston from 374 ft. bgl to 604 ft. bgl;
- Ellenburger from 604 ft. bgl to 1,020 ft. bgl;
- San Saba from 1,020 ft. bgl to 1,146 ft. bgl;
- Point Peak from 1,146 ft. bgl to 1,264 ft. bgl;
- Morgan Creek from 1,264 ft. bgl to 1,364 ft. bgl;
- Welge from 1,364 ft. bgl to 1,402 ft. bgl;
- Lion Mountain from 1,402 ft. bgl to 1,420 ft. bgl; and,
- Cap Mountain from 1,420 to total depth.

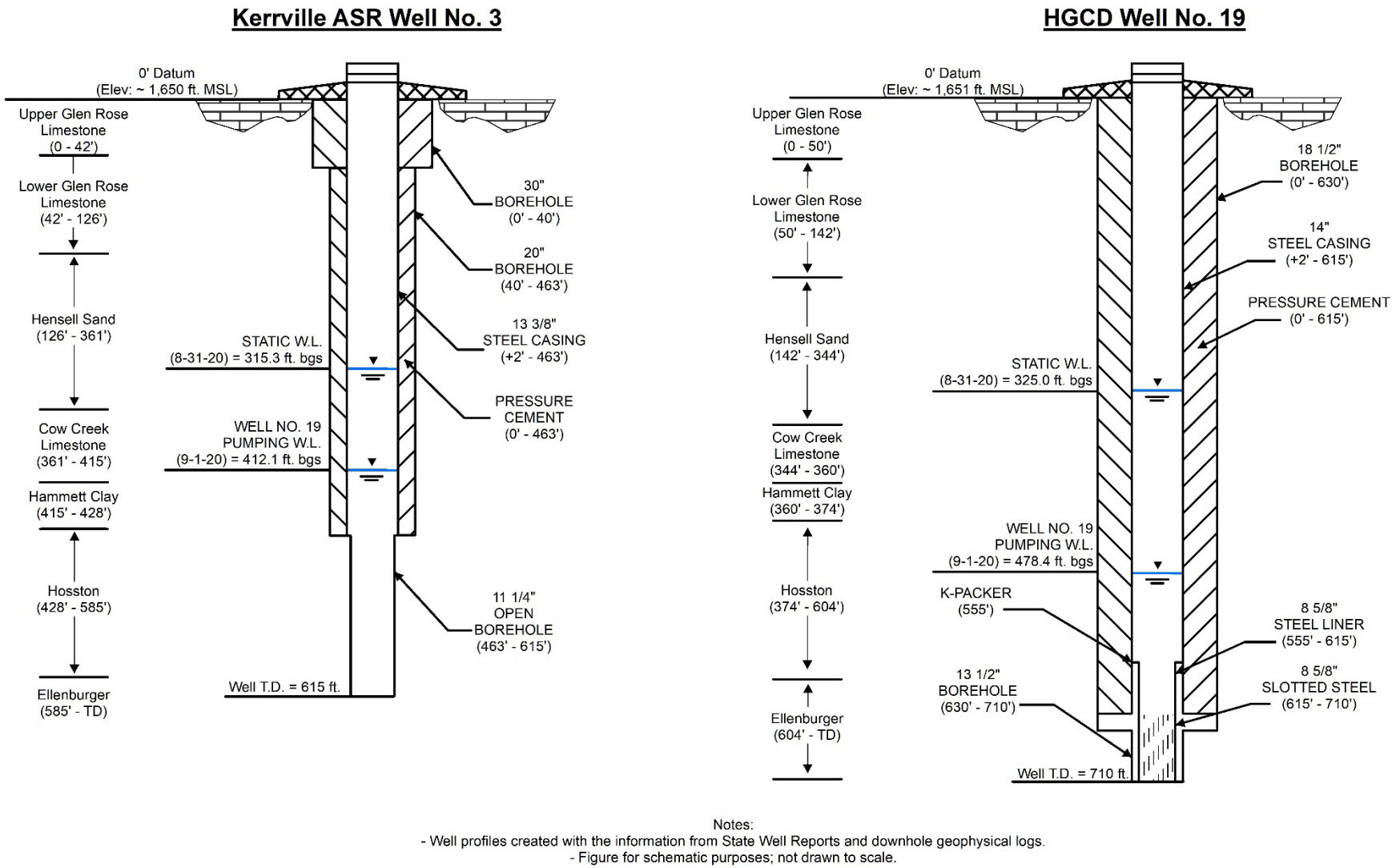
According to the State Well Report (Tracking No. 553033; Appendix A), the final well construction consists of 617 feet of 14-inch steel casing pressure cemented to 615 ft. bgl, 8 5/8-inch steel liner from 555 to 615 ft. bgl, and 8 5/8-inch slotted steel casing from 615 to 710 ft. bgl (Figure 3). The pilot hole was plugged with cement from 710 to 1,520 ft. bgl (Appendix A).

Kerrville ASR Well No. 3

According to the State Well Report (Tracking No. 311445; Appendix A), ASR Well No. 3 was completed by C&C Groundwater Services, LLC on April 20, 2010. The well was drilled to a total depth of 615 ft. bgl with a 30-inch borehole from 0 to 40 ft. bgl, a 20-inch borehole from 40 to 463 ft. bgl, and a 11 1/4-inch borehole from 463 to 615 ft. bgl. The well was constructed with 463 feet of 13 3/8-inch steel casing pressure cemented to 463 ft. bgl, and an open-hole completion from 463 to 615 ft. bgl. Cuttings were analyzed by HGCD geologists, and a suite of geophysical logs was performed GeoCam, Inc. on February 11, 2010 to determine formation depths, thicknesses, and geologic characteristics (Appendix B). According to the geophysical and driller's logs, the well is open to the Hosston and Ellenburger Formations (Figure 3; Appendix A; Appendix B). The well is currently being utilized as an observation well by the City of Kerrville.

Table 1: Well construction summary

Well	Tracking No.	Construction Date	Elevation (ft. MSL)	Production Zone	Well Depth (ft. bgl)	Static Water Level (date ft. bgl; ft. MSL)	Borehole (diameter; ft. bgl)	Casing (diameter; material; ft. bgl)	Screen (diameter; material; ft. bgl)
HGCD Well No. 19	553033	7/13/2020	1,651	Ellenburger Formation	710	8/31/2020 325.0 (1,326.0)	18 1/2" (0' - 630') 13 1/2" (630' - 710') 9 7/8" (710' - 1,520')	14" Steel (+2' - 615') 8 5/8" Steel (555' - 615')	8 5/8" Slotted Steel (615' - 710')
Kerrville ASR Well No. 3	311445	4/20/2010	1,650	Hosston Formation & Ellenburger Formation	615	8/31/2020 315.3 (1,334.7)	30" (0' - 40') 20" (40' - 463') 11 1/4" (463' - 615')	22" Steel (0' - 40') 13 3/8" Steel (0' - 463')	11 1/4" Open Hole (463' - 615')
Notes: ft. = feet; MSL = Mean Sea Level; bgl = below ground level									



Notes:
- Well profiles created with the information from State Well Reports and downhole geophysical logs.
- Figure for schematic purposes; not drawn to scale.

Figure 3: Well construction profiles of ASR Well No. 3 and HGCD Well No. 19

II.3. Aquifer Test

A 36-hour aquifer test was conducted to assess the site-specific hydrogeologic properties of the Ellenburger Formation and to satisfy TCEQ requirements for permitting a Public Water Supply well. Prior to the start of the aquifer test, a pressure transducer capable of measuring the water level and temperature at one-minute intervals was placed in ASR Well No. 3 (observation well) to gather data for the duration of the test. An airline was installed in Well No. 19 (pumping well), which allowed a crew from McKinley Drilling to measure the water level throughout the duration of the aquifer test. Figure 4 provides a graph of the water levels in the pumping and observation well during the aquifer test.

A vertical turbine lineshaft pump (SM13 10 Stage) powered by a 450 horsepower (HP) motor was set in Well No. 19 on 520 feet of 8-inch steel column pipe. The pump was started on August 31, 2020 at 10:28 AM and ran for 36 hours. Water levels in the pumping well and observation well were monitored for the duration of the 36-hour test. After the pump was stopped, the water level was measured in the pumping well for 3 hours; water levels in the observation well were measured for approximately 35 hours. The discharge rate was monitored using a 10-inch by 8-inch circular orifice weir. Prior to the pumping phase of the aquifer test, the static water levels were measured at 325.0 ft. bgl and 315.3 ft. bgl in Well No. 19 and ASR Well No. 3, respectively.

Well No. 19 was pumped at an average rate of 793 gallons per minute (gpm) for 36 hours with an initial pumping rate of 800 gpm and a final pumping rate of 772 gpm with 153.4 feet of drawdown, resulting in a specific capacity of 5.03 gpm/ft. Approximately 24 hours after the pump started, the pumping rate was reduced to 772 gpm to ensure the water level did not reach the pump. During the aquifer test, the water level dropped approximately 135 feet within the first 12 hours of pumping, then slowly declined and oscillated throughout the remainder of the pumping phase. ASR Well No. 3 experienced 84.1 feet of drawdown before the pump was shut off (Figure 4, Appendix B). After the pump was shut off, recovery was measured in the pumping well for approximately 3 hours; during that time, the water level recovered by approximately 86% (Appendix B).

From the hydrograph, it appears that other nearby pumping wells influenced the water levels in both Well No. 19 and ASR Well No. 3 (Figure 4). On September 1, 2020 at approximately 11:00 AM, the water levels in both the pumping and observation wells sharply declined by 12 feet and 17 feet, respectively. Due to the sudden decrease in water levels, the discharge rate was reduced at Well No. 19 to mitigate any risk associated with the pumping level reaching the pump. At approximately 12:18 PM, the water levels began to rise in both the pumping and observation wells, which could be due to a nearby well shutting off (Figure 4). The same scenario in which the water levels decreased in both wells happened again at approximately 7:30 PM that day prior to terminating the 36-hour aquifer test. HGCD staff confirmed that at least one nearby well (Kerrville VA Hospital public supply well) was pumping during the 36-hour aquifer test.

The aquifer test data were analyzed using the Cooper and Jacob (1946) solution to calculate transmissivity, hydraulic conductivity, and storativity for the pumping and observation wells (Appendix B). The analyses resulted in a transmissivity of 940.17 $ft.^2$/day and a hydraulic conductivity of 8.87 ft./day for Well No. 19. A maximum drawdown of 95.89 feet was measured in the observation well, indicating a strong hydraulic connection between the wells. The strong hydraulic connection between Well No. 19 and ASR Well No. 3 is likely due to the open-hole portion of ASR Well No. 3 being open to the top 30 feet of the Ellenburger Formation. Due to the observed hydraulic connection, we calculated a storativity value of

7.36 x 10^{-5} for ASR Well No. 3 (Appendix B). A summary of the aquifer test results is provided in Table 2. There were no discernable boundary conditions detected from the aquifer test data beyond the aforementioned well interference.

Table 2: Summary of aquifer test results

Date	Well	Final Pump Rate (gpm)	Drawdown (ft.)	Specific Capacity (gpm/ft.)	Transmissivity ($ft.^2/d$)	Hydraulic Conductivity (ft./d)	Storativity
8/31/2020	PW No. 19	772	153.42	5.03	907.26	8.87	-
	OW ASR No. 3	-	84.11	-	1,049.56	9.90	7.36 x 10^{-5}
Notes: PW = Pumping Well; OW = Observation Well; ft. = feet; gpm = gallons per minute; d = day.							

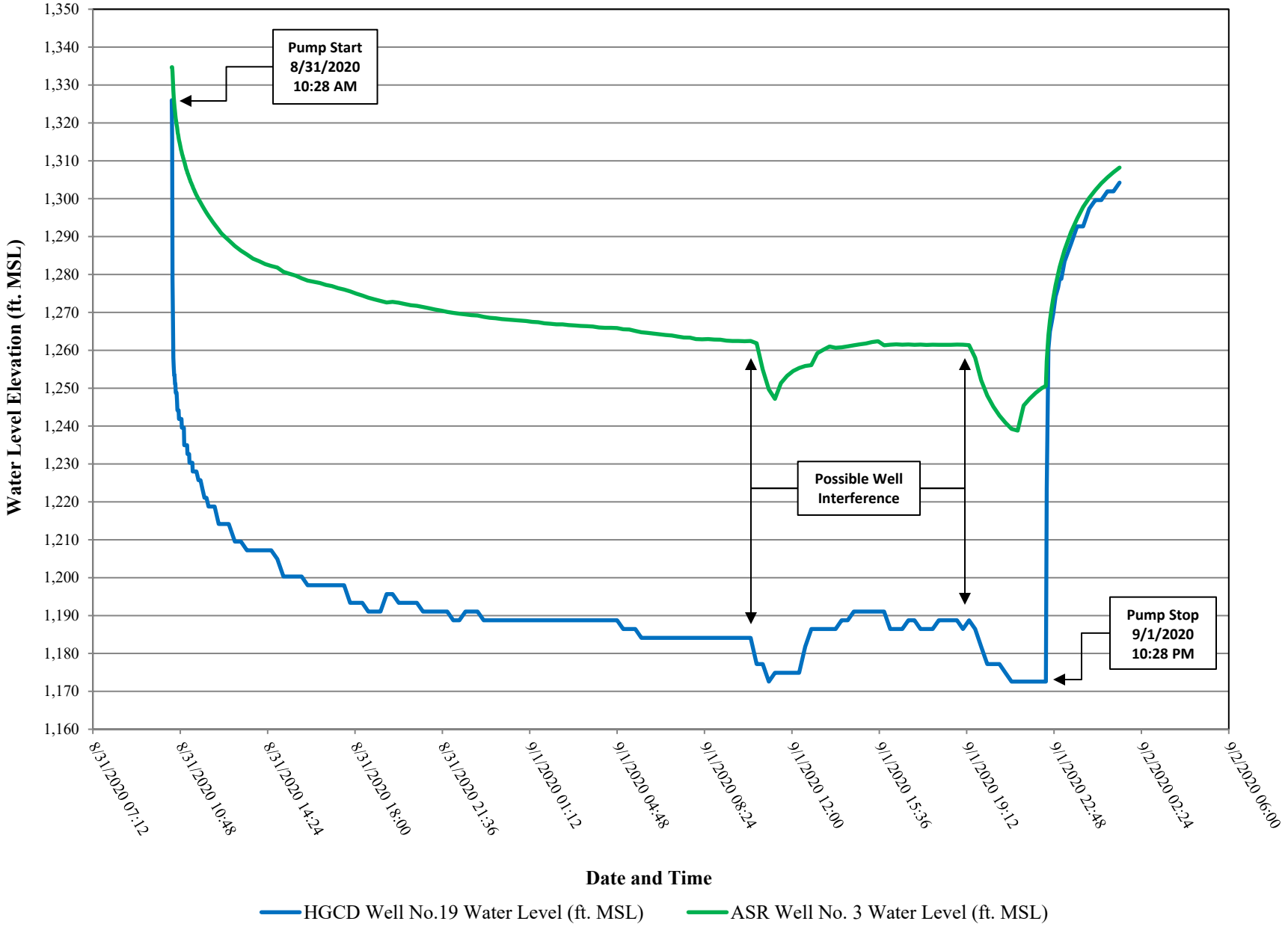


Figure 4: HGCD Well No. 19 aquifer test (August 31, 2020)

Section III: Conclusions

The Headwaters Groundwater Conservations District Monitoring Well No. 19 is located near the intersection of Loop 534 and Legion Drive in the southeastern portion of the City of Kerrville. The well was drilled to explore the groundwater resources of the geologic units beneath the Trinity Aquifer, specifically the units in the Llano Uplift Aquifer System, and ultimately to provide public supply to the City of Kerrville. This report provided a summary of the aquifer testing and analysis of Well No. 19 conducted by WRGS. Based upon the aquifer test, we can conclude the following:

- Well No. 19 is completed within the Ellenburger Formation of the Ellenburger-San Saba Aquifer. According to geophysical and driller's logs, the Ellenburger Formation is located at depths between 604 and 1,020 ft. bgl. Geologists from HGCD determined that the most productive zone within the Ellenburger Formation is between 615 and 710 ft. bgl, where the well is screened;

- The City of Kerrville ASR Well No. 3 is open to both the Hosston and Ellenburger Formations, and was utilized as an observation well during the aquifer test;

- Well No. 19 was pumped for 36 hours at an average rate of 793 gpm with an initial pumping rate of 800 gpm and a final pumping rate of 772 gpm with 153.4 feet of drawdown, resulting in a specific capacity of 5.03 gpm/ft. The observation well experienced 84.1 feet of drawdown before the pump was shut off, indicating a strong hydraulic connection between both wells. The strong hydraulic connection between Well No. 19 and ASR Well No. 3 is likely due to the open-hole portion of ASR Well No. 3 being open to the top 30 feet of the Ellenburger Formation; and,

- The aquifer test data were analyzed using the Cooper and Jacob (1946) solution to calculate transmissivity, hydraulic conductivity, and storativity for the pumping and observation wells. The analyses resulted in a transmissivity of 940.17 $ft.^2$/day and a hydraulic conductivity of 8.87 ft./day for Well No. 19. A storativity value of 7.36×10^{-5} was calculated for ASR Well No. 3.

Section IV: References

Cooper, H.H. and C.E. Jacob, 1946. A generalized graphical method for evaluating formation constants and summarizing well field history, Am. Geophys. Union Trans., vol. 27, pp. 526-534.

Appendix A

State of Texas Well Reports

HGCD Monitoring Well No. 19

STATE OF TEXAS WELL REPORT for Tracking #553033

Owner:	**Headwaters Groundwater Conservation**	Owner Well #:	**56-64-712**
Address:	**125 Lehmann Dr. #201 Kerrville, TX 78028**	Grid #:	**56-64-7**
Well Location:	**Legion Dr. Kerrville, TX 78028**	Latitude:	**30° 01' 11.95" N**
	from Hwy 173, head north on SH-534. take a right on Legion Dr. and proceed .2 miles and the well site will be on your left-hand side.	Longitude:	**099° 06' 44.06" W**
		Elevation:	**1651 ft. above sea level**
Well County:	**Kerr**		

Type of Work: **New Well** Proposed Use: **Monitor**

Drilling Start Date: **6/3/2020** Drilling End Date: **7/13/2020**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
18.5	**0**	**630**
13.5	**630**	**710**
9.875	**710**	**1520**

Drilling Method: **Air Rotary; Mud (Hydraulic) Rotary**

Borehole Completion: **Perforated or Slotted**

Annular Seal Data:

Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
0	**615**	**Cement 380 Bags/Sacks**

Seal Method: **Positive Displacement**

Sealed By: **CUDD Energy Services**

Distance to Property Line (ft.): **160**

Distance to Septic Field or other concentrated contamination (ft.): **150+**

Distance to Septic Tank (ft.): **150+**

Method of Verification: **Google Earth**

Surface Completion: **Surface Slab Installed** **Surface Completion by Driller**

Water Level: **335 ft.** below land surface on **2020-08-31** Measurement Method: **Electric Line**

Packers: **K-Packer at 555 ft.**

Type of Pump: **Turbine** Pump Depth (ft.): **520**

Well Tests: **Pump** **Yield: 800 GPM with 131 ft. drawdown after 36 hours**

Plug Information:

Description (number of sacks & material)	Top Depth (ft.)	Bottom Depth (ft.)
Cement	**615**	**1520**

Water Quality:

Strata Depth (ft.)	Water Type
615 - 710	**Ellenburger**

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

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 report(s) being returned for completion and resubmittal.

Company Information: **McKinley Drilling**

10315 Mill Path
San Antonio, TX 78254

Driller Name: **Andrew J Stevenson** License Number: **59646**

Comments: **Casing Centralizers placed every 42ft on 14in casing.**
Double K-packer set on 8 5/8 liner at 555ft.
Metal cap on bottom of 8 5/8 liner.
July 3, 2020 CUDD Energy plugged well from 1520ft up to 615ft.
Re-Entered well with 13.5' bit and drilled to 710ft to set 8 5/8 liner
July 14, 2020 CUDD Energy acidized production zone with 2500 gallons of 28% hydrochloric acid.

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	Bottom (ft.)	Description
0	**50**	**Marl- Upper Glen Rose Mbr**
50	**142**	**Limestone and Marl Interbeds- Lower Glen Rose**
142	**340**	**Marly Silt and Sand- Hensell sand**
340	**345**	**coal**
345	**360**	**white-gray biosparite- Cow Creek**
360	**375**	**Clay - Hammett**
375	**512**	**Sand and Silt - Hosston**
512	**525**	**Silty Clay**
525	**605**	**sand and gravel**
605	**670**	**dolomite - Ellenburger**
670	**680**	**limestone**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
14	**Blank**	**New Steel**	**.375**	**0**	**615**
8.625	**Blank**	**New Steel**	**.375**	**555**	**615**
8.625	**Perforated or Slotted**	**New Steel**	**.375**	**615**	**710**

680	690	breccia
690	740	dolomite
740	750	black dolomite
750	790	dolomite
790	800	black dolomite
800	860	dolomite
860	880	black dolomite
880	930	dolomite
930	950	black dolomite
950	960	dolomite
960	1010	black dolomite
1010	1020	dolomite
1020	1100	Glauconitic Dolomite - San Saba
1100	1145	black dolomite
1145	1265	Argillaceous Sandstone - Point Peak
1265	1282	Limestone - Morgan Creek
1282	1295	Claystone
1295	1365	Limestone
1365	1402	sandstone - Welge
1402	1420	sand - Lion Mountain
1420	1520	Limestone - Cap Mountain

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 on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 334-5540

WQ FY 2020

TWDB Water Quality Field Data Sheet

SWN: 56-64-712
County: Kerr
County Code: 265
Aquifer Code:
Aquifer Id:

Name: Headwaters GCD MW # 19
Address: 125 Lehmann drive
Kerrville, TX 78028
Attention: Gene Williams
Well Name or #: Monitor well # 19

Newly Inventoried Well: Y
ID Number: 630
Date: 9/1/20
Sampler(s): P.Valladolid

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	10	11
250 ml filtered Cation RED HNO_3	500 ml filtered Anions/T. Alk. ICE	250 ml filtered Nitrate YELLOW ICE + H_2SO_4	1 Liter filtered Gross Alpha HNO_3 by lab	1 Liter filtered Radium 226/228 HNO_3 by lab	1 L unfiltered C14/C13 corr O18 Deuterium None	250 ml unfiltered Sr-87/Sr-86 None	1 L unfiltered Tritium None	40 ml unfiltered Atrazine ICE		

Calibration Verification Readings

pH Orion 230 A+	SLOPE =	95.7
	7 =	6.98
	4 or 10 =	4.02 / 10.09
Conductivity Orion 105 A+ (512, 1000, 1964)	500 =	512
	1000 =	1000
	2000 =	1964
	5000 =	-

Time In: 09:55
Time Out: 11:45
Water Level: /
M.P. =
W.L. remark: / no static WL measurement
Pumping time: Rig pumping since 1 day ago
Sampling Point:
Well Use: N/A at time
Lift: Rig/turbine
Power: Rig
Casing Type: Steel
Casing Size:
Sample Time: 10:40
Filter pressure: hand pump / line / spring sampler

FIELD G.P.S. readings
Latitude: 30.02003
Longitude: -99.11229

Field Alkalinity Titration

7.77 @ 11:05	Start pH
4.49	End pH
50	mL Sample Size
/	mL Acid Phenol (> 8.3)
15.1	mL Acid Total (to pH 4.5)

mL acid added x 20 = Alkalinity

Phenol Alkalinity (82244): X mg/L
Total Alkalinity (39086): 302 mg/L

Water Quality Stabilization Parameters Table (At least 3 readings @ 5 min. intervals)

Time	10:28	10:33	10:38						
pH (00400)	7.23	7.25	7.26						
Temp°C (00010)	23.6	23.4	23.5						
Conduct (00094)	491	491	490						

Notes: well was sampled day(s) after it was drilled. Rig was at well during sampling.

City of Kerrville ASR Well No. 3

STATE OF TEXAS WELL REPORT for Tracking #311445

Owner:	**City of Kerrville**	Owner Well #:	**ASR#3**
Address:	**800 Junction Hwy Kerrville, TX 78028**	Grid #:	**56-64-7**
Well Location:	**Legion Drive Kerrville, TX 78028**	Latitude:	**30° 01' 14" N**
		Longitude:	**099° 06' 46" W**
Well County:	**Kerr**	Elevation:	**1644 ft. above sea level**
Type of Work:	**New Well**	Proposed Use:	**Public Supply**

Drilling Start Date: **2/6/2010** Drilling End Date: **4/20/2010** **Plans Approved by TCEQ - YES**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
30	**0**	**40**
20	**40**	**463**
11.25	**463**	**615**

Drilling Method: **Air Rotary**

Borehole Completion: **Open Hole**

Annular Seal Data:

Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
0	**214**	**192**
214	**463**	**1086**

Seal Method: **Pressure Cement/Tremmie**

Sealed By: **Schlumberger/C&C Groundwater**

Distance to Property Line (ft.): **500+**

Distance to Septic Field or other concentrated contamination (ft.): **500+**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **Engineer**

Surface Completion: **Unknown**

Water Level: **232 ft.** below land surface on **2010-02-11** Measurement Method: **Unknown**

Packers: **Halliburton 460'**

Type of Pump: **No Data**

Well Tests: **Pump** **Yield: 500-700 GPM**

Water Quality:

Strata Depth (ft.)	Water Type
No Data	**Trinity**

Chemical Analysis Made: **Yes**

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

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 report(s) being returned for completion and resubmittal.

Company Information: **C&C Groundwater Services LLC**

29143 Old Fredericksburg Rd
Boerne, TX 78015

Driller Name: **Richard Kyle Courtney** License Number: **2546**

Apprentice Name: **Alejandro Aleman** Apprentice Number: **57787**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

From (ft)	To (ft)	Description
30-45 Cement		
45-60 Tan Grey Limestone		
60-85 Tan Grey Limestone (Upper Glen)		
85-130 Tan Grey Limestone (Lower Glen)		
130-140 Tan SandStone		
140-170 Tan Sandstone		
170-200 Tan Grey Shell/Rock		
200-320 Tan SandStone		
320-400 Tan Brown Limestone (Cow Creek)		
400-410 Tan Brown Limestone (Cow Creek)		
410-415- Grey Pine Island Hammet		
415-560 Tan Pink Trinity		
560-595 Tan Trinity		
595-615 Dark Brown Hallenburger Shell		

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia. (in.)	New/Used	Type	Setting From/To (ft.)
22" New Steel 0-40 ft			
13 3/8" New Steel 0-463 ft			

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Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 334-5540

Appendix B

Geophysical Logs

HGCD Monitoring Well No. 19

GEO CAM

Water Well Logging & Video Recording Services

Borehole: MW- 19

Logs: GAMMA, RESISTIVITY, SP

Geo Cam, Inc. 17118 Classen Rd. San Antonio, TX 78217 210-495-9121

Project: HEADWATERS GCD MONITOR WELL
Client: HEADWATERS GCD
Location: 30.019982 , -99.11221

Date: 06/09/2019
County: KERR
State: TX

BOREHOLE DATA

Drilling Contractor: MCKINLEY DRILLING
Elevation: 1651'
Depth Ref: KB

Driller T.D. (ft) : 670'
Logger T.D. (ft) : 655'
Date Drilled: 06/09/2020

BIT RECORD				CASING RECORD		
RUN	BIT SIZE (in)	FROM (ft)	TO (ft)	SIZE/WGT/THK	FROM (ft)	TO (ft)
1	12.25"	40'	TD	24" SURFACE	AGL	40'
2						
3						

Drill Method: MUD ROTARY
Hole Medium:
Viscosity:

Weight:
Mud Type: NATIVE
Rm: at: Deg C

Fluid Level (ft) : FULL
Time Since Circ: -1HR

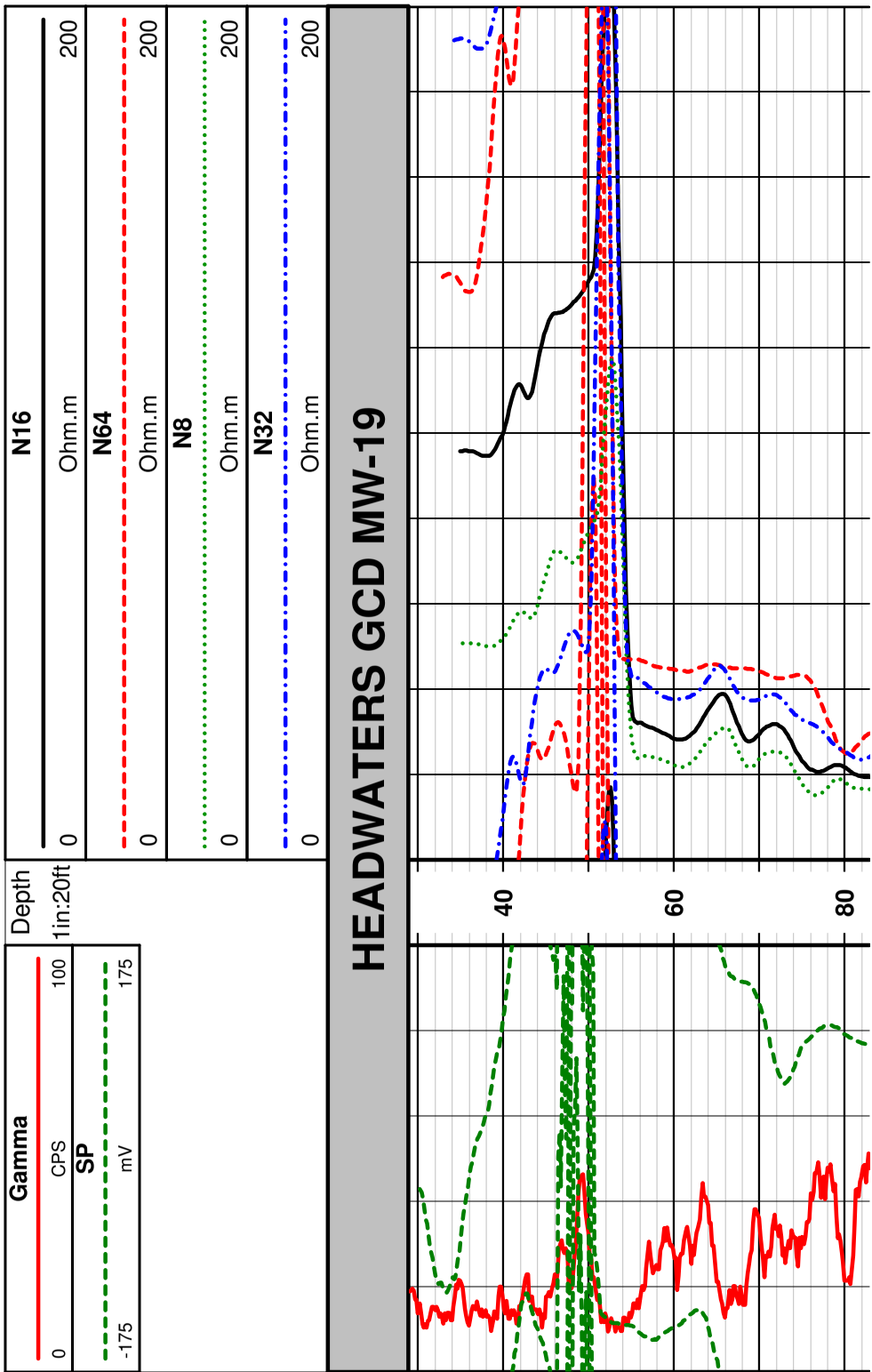
GENERAL DATA

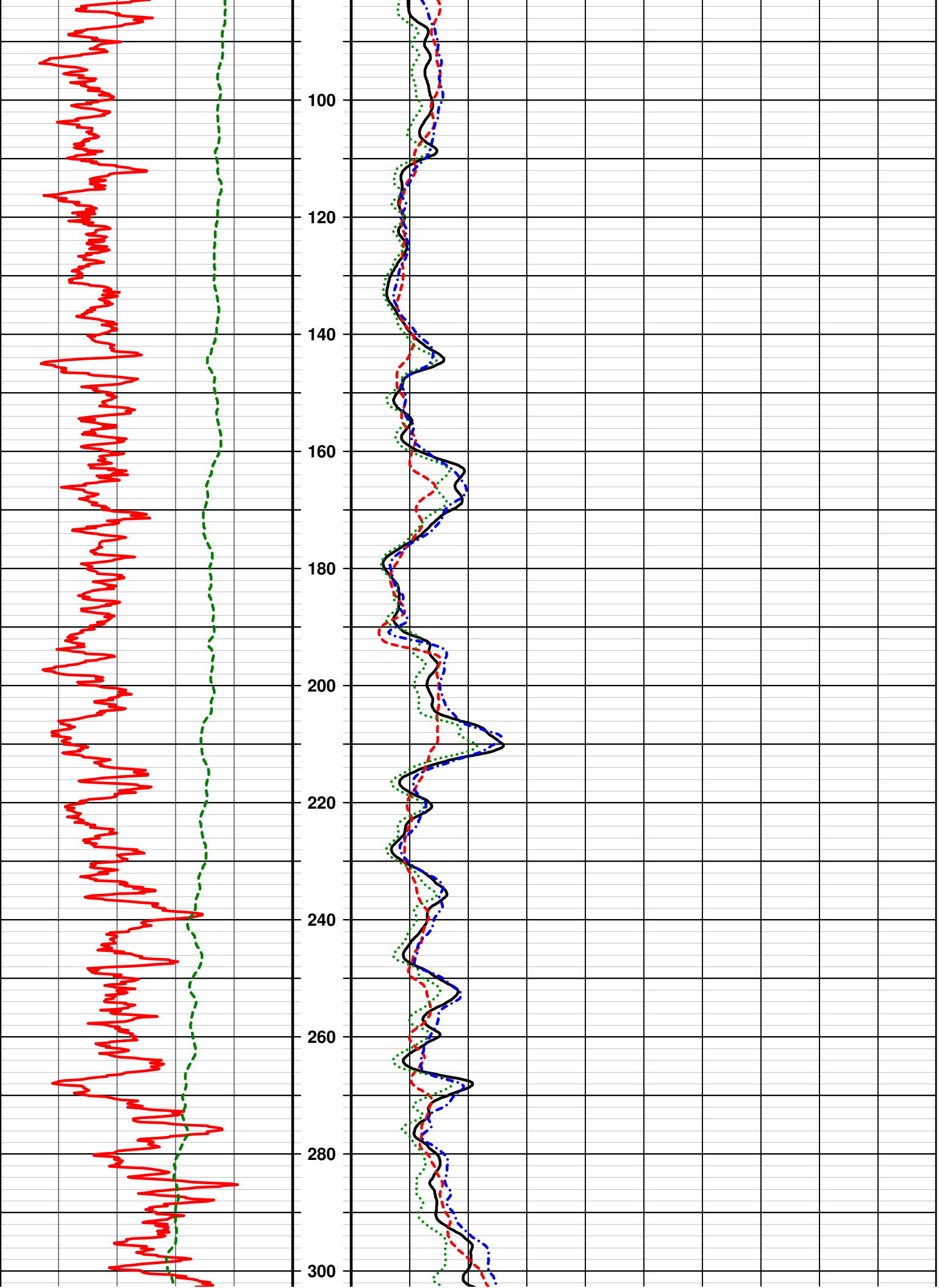
Logged by: ADAM ROBERTS
Witness: Andrew Stevenson , Feather Wilson, Gene Williams

Unit/Truck: 09

LOG TYPE	RUN NO	SPEED (ft/min)	FROM (ft)	TO (ft)	FT./ IN.
GAMMA	2	35	644.9'	29'	20
RESISTIVITY	2	35	651.1'	35.2'	20
SP	2	35	646.1'	30.2'	20

Comments: ALL MEASUREMENTS TAKEN FROM KELLY BUSHING
K.B.= +4ft AGL

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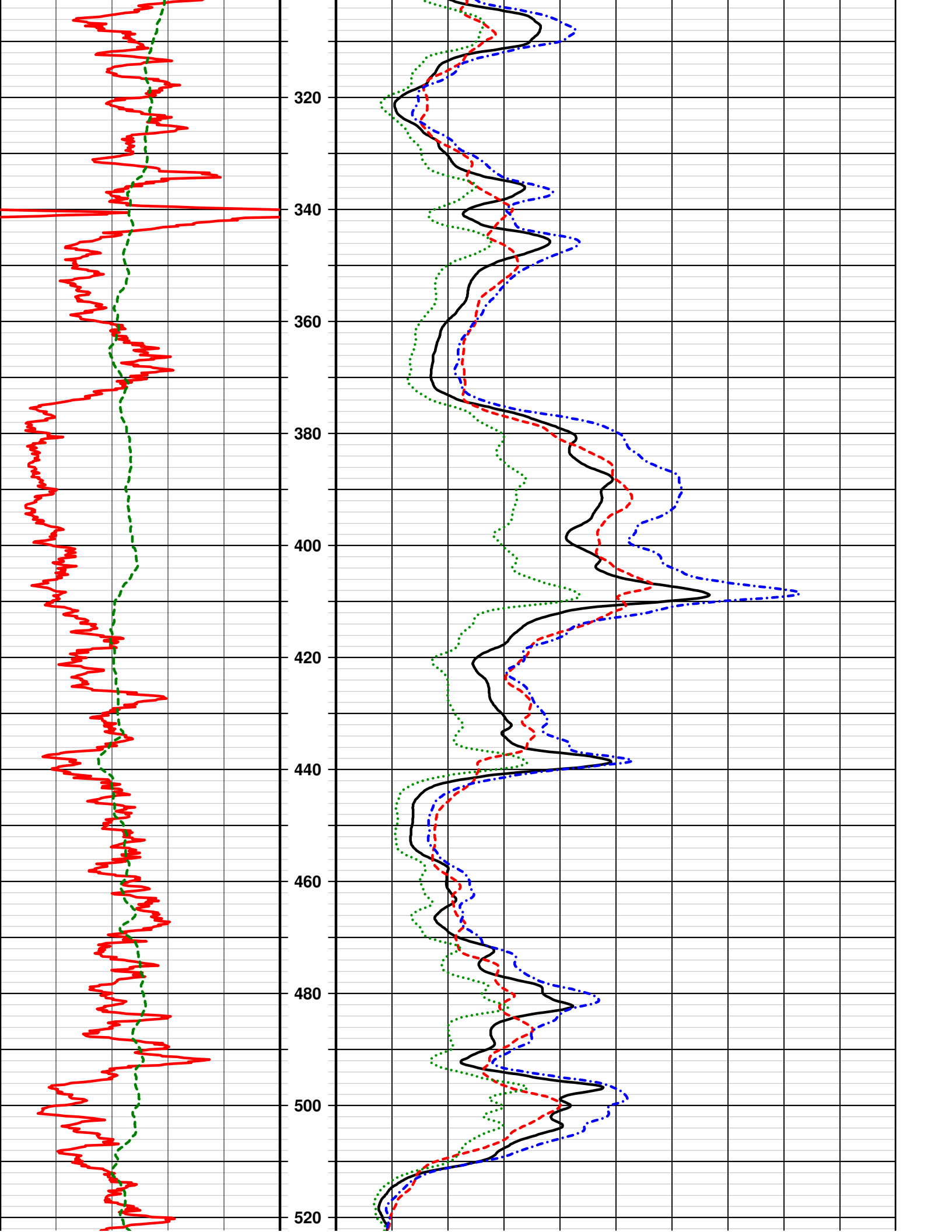
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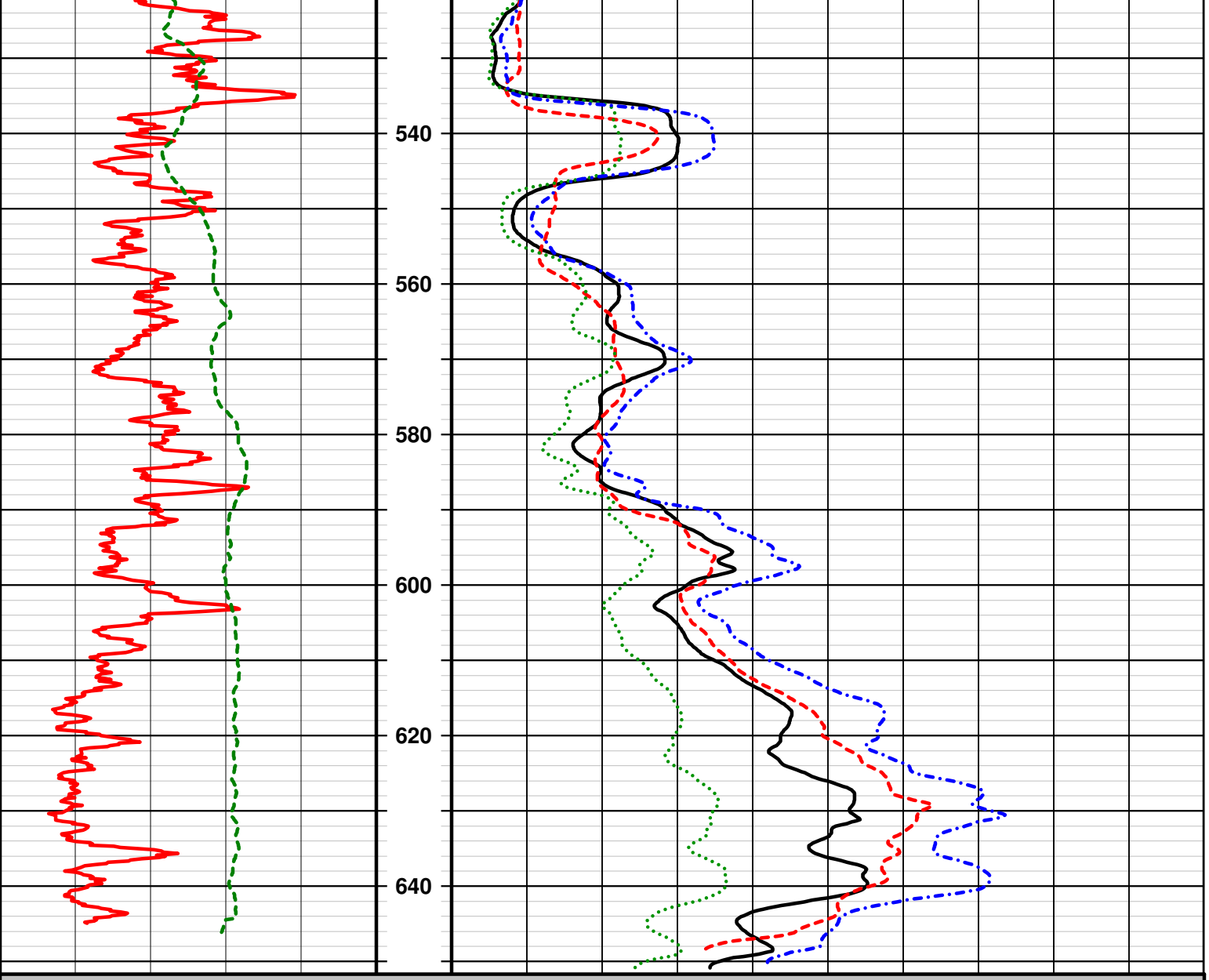
520



HEADWATERS GCD MW-19

SP		
-175	mV	175
Gamma		
0	CPS	100
Depth		
1in:20ft		
N32		
0	Ohm.m	200
N8		
0	Ohm.m	200
N64		
0	Ohm.m	200
N16		
0	Ohm.m	200

City of Kerrville ASR Well No. 3

GEO CAM

Water Well Logging & Video Recording Services

Geo Cam, Inc. 126 Palo Duro, San Antonio, TX 210-495-9121

Borehole: A.S.R. WELL 3

Logs: GAMMA, SP, RESISTIVITY, CALIPER

Project: CITY OF KERRVILLE-A.S.R.

Client: C & C GROUNDWATER

Location: N 30* 01' 13.8", W 99* 06' 45.9"

Date: 02-11-10

County: KERR

State: TX

BOREHOLE DATA

Drilling Contractor: C&C

Elevation: 1,644'

Depth Ref: G.L.

Driller T.D. (ft) : 615'

Logger T.D. (ft) : 602.5'

Date Drilled: 02-11-09

BIT RECORD				CASING RECORD		
RUN	BIT SIZE (in)	FROM (ft)	TO (ft)	SIZE/WGT/THK	FROM (ft)	TO (ft)
1	30"	0'	43.5'	22"	+3.6'	43.5'
2				10"	4.6'	30'
3	8 3/4"	43.5'	615'	OPEN		

Drill Method: AIR ROTARY

Weight:

Fluid Level (ft) : EST. 232'

Hole Medium:

Mud Type:

Time Since Circ: 3 HRS.

Viscosity:

Rm: at: Deg C

GENERAL DATA

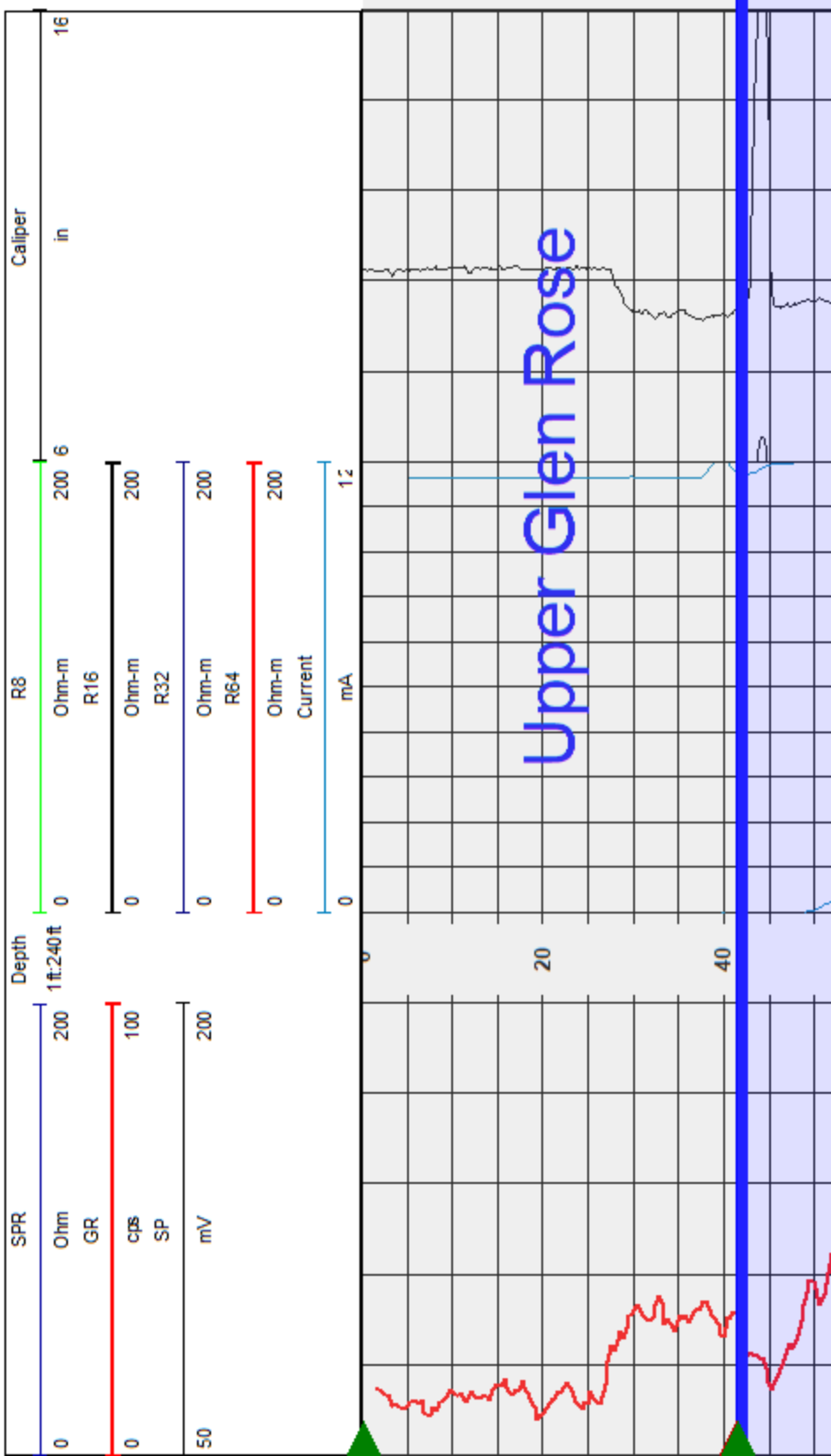
Logged by: Michael G. Miller

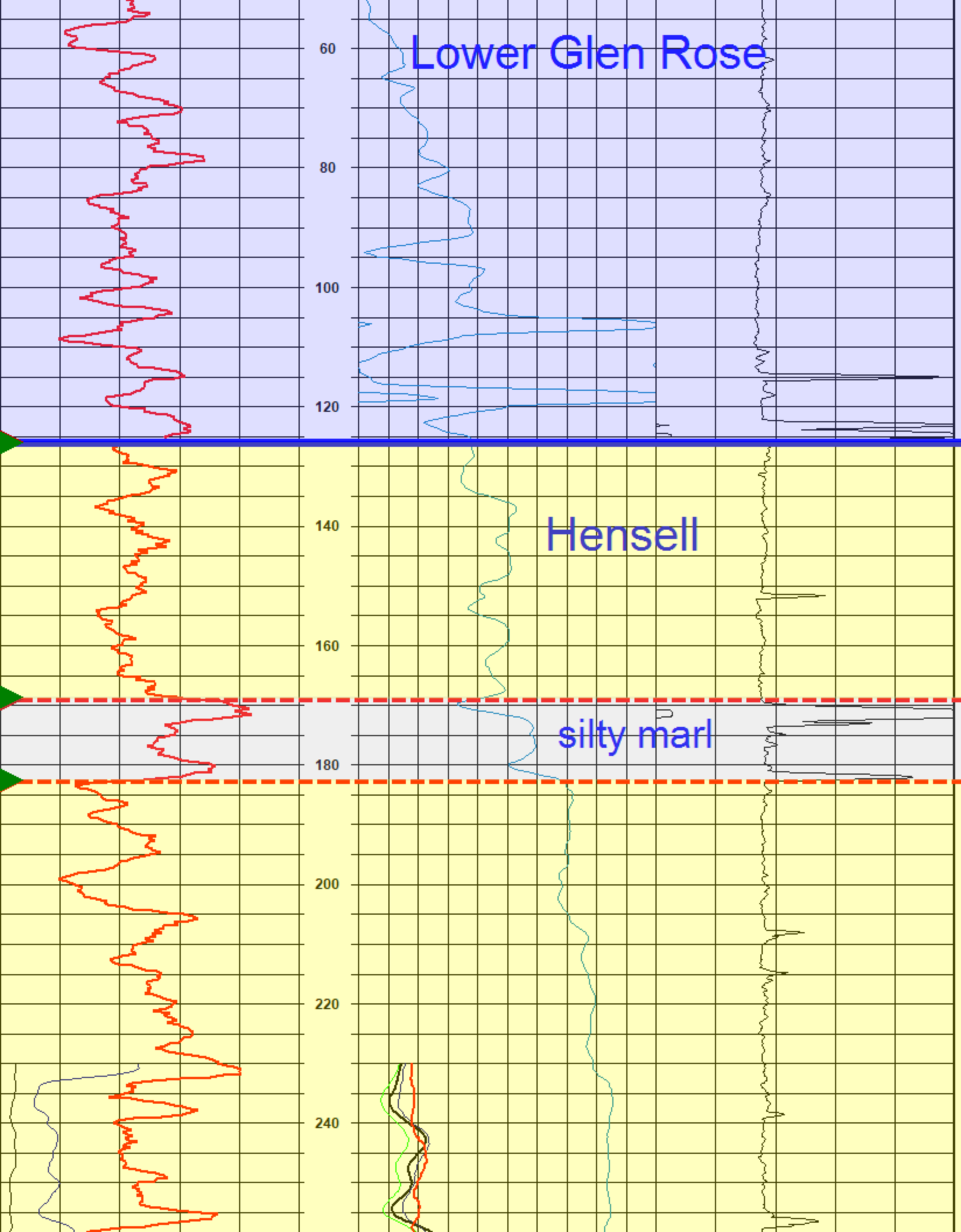
Unit/Truck: 05

Witness: COURTNEY,HEFLEY, F. WILSON

LOG TYPE	RUN NO	SPEED (ft/min)	FROM (ft)	TO (ft)	FT./ IN.
GAMMA	2	20'	598'	1'	20
SP, RESISTIVITY	2	20'	602'	230'	20
CALIPER	1	25'	590'	2'	20

Comments:

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Hensell
silty marl
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80
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120
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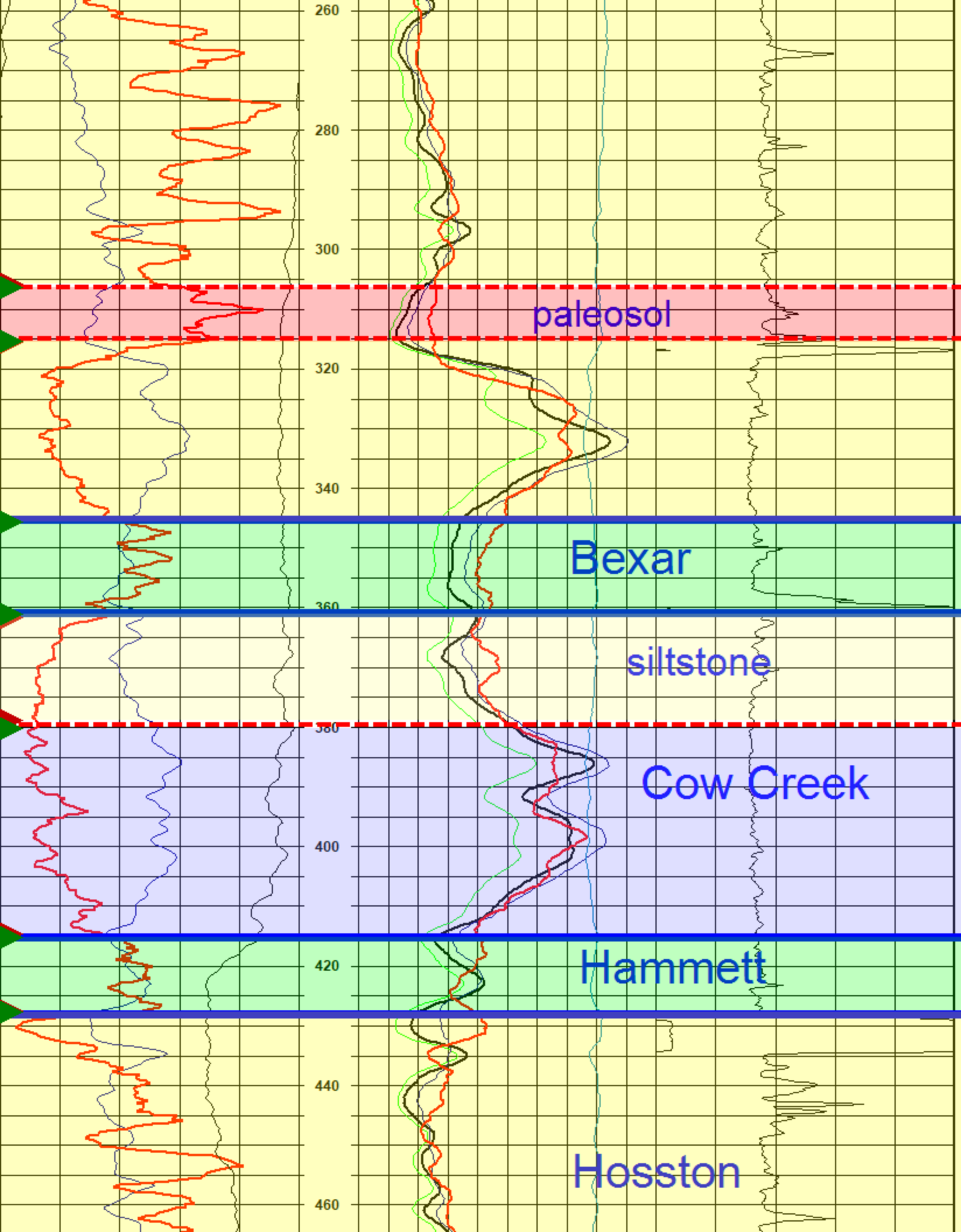
240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Bexar
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Cow Creek
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Hammett
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Hosston
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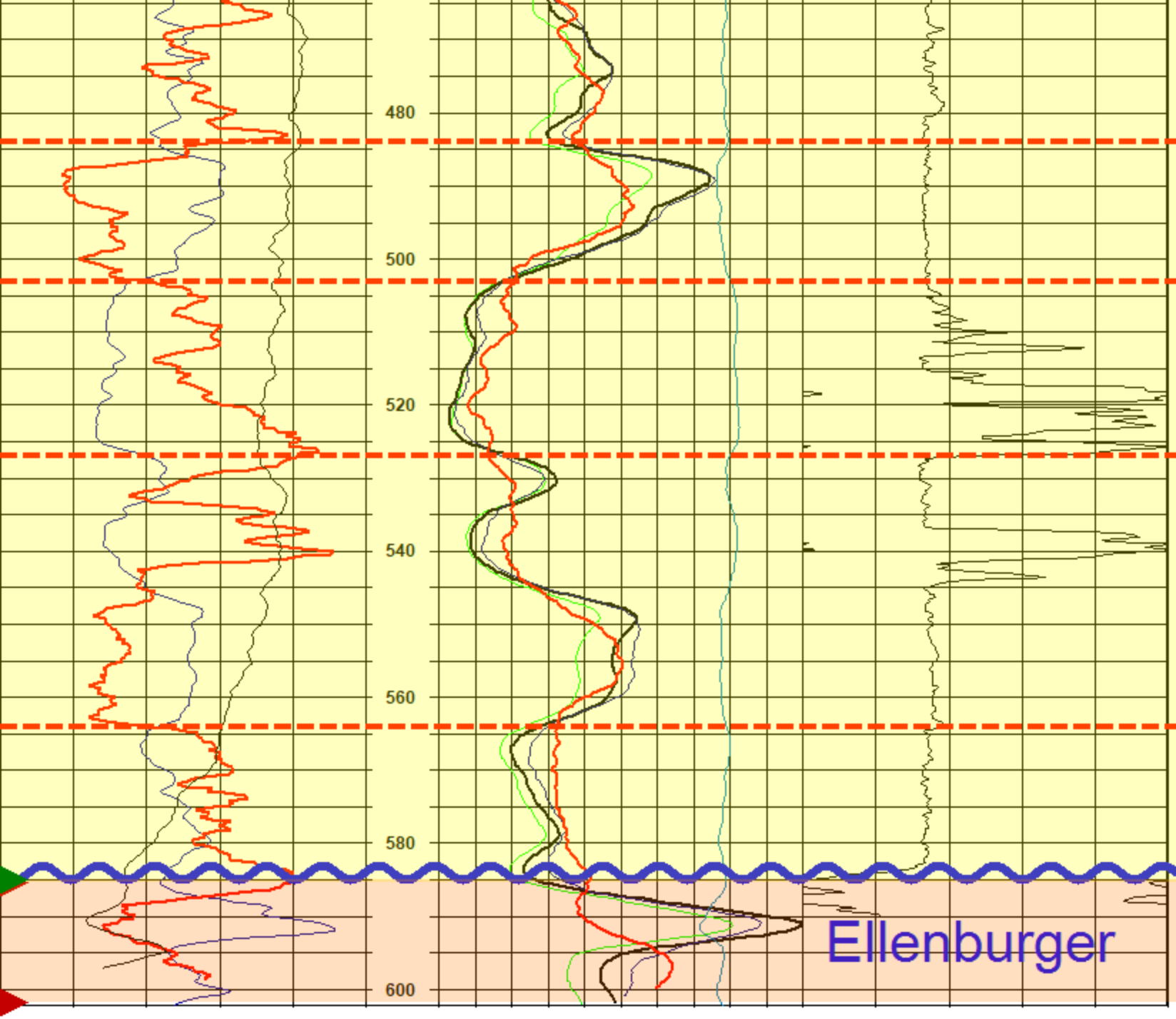

480
500
520
540
560
580
600
Ellenburger

Appendix C

Aquifer Test Data

Headwaters GCD Monitor Well No. 19 - Aquifer Test (August 31, 2020)

Date and Time	Time Since Pump Start (min)	Time Since Pump Stop (min)	PW Well No. 19 Airline Reading (PSI)	PW Well No. 19 Water Level (ft. bgl)	PW Well No. 19 Water Level (ft. MSL)	PW Well No. 19 Drawdown (ft.)	PW Well No. 19 Pump Rate (gpm)	PW Well No. 19 Specific Capacity (gpm/ft.)	Comments	OW Well No. 3 Water Level (ft. MSL)	OW Well No. 3 Drawdown (ft.)
8/31/20 10:27	0			325.00	1,326.00	0.00			Pump Start	1,334.70	0.00
8/31/20 10:28	1		80	335.20	1,315.80	10.20	800	78.43		1,334.69	0.01
8/31/20 10:29	2		64	372.16	1,278.84	47.16	800	16.96		1,333.41	1.30
8/31/20 10:30	3		59	383.71	1,267.29	58.71	800	13.63		1,330.59	4.11
8/31/20 10:31	4		55	392.95	1,258.05	67.95	800	11.77		1,328.53	6.17
8/31/20 10:32	5		54	395.26	1,255.74	70.26	800	11.39		1,326.88	7.82
8/31/20 10:33	6		53	397.57	1,253.43	72.57	800	11.02		1,325.26	9.44
8/31/20 10:34	7		53	397.57	1,253.43	72.57	800	11.02		1,324.16	10.54
8/31/20 10:35	8		52	399.88	1,251.12	74.88	800	10.68		1,322.94	11.76
8/31/20 10:36	9		52	399.88	1,251.12	74.88	787	10.51	Pumping Rate Adjusted	1,321.92	12.78
8/31/20 10:37	10		51	402.19	1,248.81	77.19	800	10.36		1,321.10	13.60
8/31/20 10:38	11		51	402.19	1,248.81	77.19	800	10.36		1,320.32	14.38
8/31/20 10:39	12		51	402.19	1,248.81	77.19	800	10.36		1,319.58	15.12
8/31/20 10:40	13		50	404.50	1,246.50	79.50	800	10.06		1,318.88	15.82
8/31/20 10:41	14		49	406.81	1,244.19	81.81	800	9.78		1,318.11	16.59
8/31/20 10:42	15		49	406.81	1,244.19	81.81	800	9.78		1,317.31	17.39
8/31/20 10:43	16		49	406.81	1,244.19	81.81	800	9.78		1,316.74	17.96
8/31/20 10:44	17		49	406.81	1,244.19	81.81	800	9.78		1,316.07	18.63
8/31/20 10:45	18		48	409.12	1,241.88	84.12	800	9.51	pH: 6.7; EC: 1.7	1,315.51	19.19
8/31/20 10:46	19		48	409.12	1,241.88	84.12	800	9.51		1,314.96	19.74
8/31/20 10:47	20		48	409.12	1,241.88	84.12	800	9.51		1,314.55	20.15
8/31/20 10:48	21		48	409.12	1,241.88	84.12	800	9.51		1,313.91	20.79
8/31/20 10:49	22		48	409.12	1,241.88	84.12	800	9.51		1,313.45	21.25
8/31/20 10:50	23		48	409.12	1,241.88	84.12	800	9.51		1,312.91	21.79
8/31/20 10:51	24		48	409.12	1,241.88	84.12	800	9.51		1,312.53	22.17
8/31/20 10:52	25		47	411.43	1,239.57	86.43	800	9.26		1,312.07	22.63
8/31/20 10:53	26		47	411.43	1,239.57	86.43	800	9.26		1,311.66	23.04
8/31/20 10:54	27		47	411.43	1,239.57	86.43	800	9.26		1,311.30	23.40
8/31/20 10:55	28		47	411.43	1,239.57	86.43	800	9.26	pH: 6.63; EC: 1.33	1,310.87	23.84
8/31/20 10:56	29		47	411.43	1,239.57	86.43	800	9.26		1,310.49	24.21
8/31/20 10:57	30		47	411.43	1,239.57	86.43	800	9.26		1,310.11	24.59
8/31/20 10:58	31		45	416.05	1,234.95	91.05	800	8.79		1,309.81	24.89
8/31/20 10:59	32		45	416.05	1,234.95	91.05	800	8.79		1,309.40	25.30
8/31/20 11:00	33		45	416.05	1,234.95	91.05	800	8.79		1,308.96	25.74
8/31/20 11:01	34		45	416.05	1,234.95	91.05	800	8.79		1,308.49	26.21

Notes: bgs = below ground level; column pipe diameter = 8 inches; pump setting = 520 ft.; motor: 450 HP; MSL = Mean Sea Level; EC = electrical conductivity (mS/cm)

Headwaters GCD Monitor Well No. 19 - Aquifer Test (August 31, 2020)

Date and Time	Time Since Pump Start (min)	Time Since Pump Stop (min)	PW Well No. 19 Airline Reading (PSI)	PW Well No. 19 Water Level (ft. bgl)	PW Well No. 19 Water Level (ft. MSL)	PW Well No. 19 Drawdown (ft.)	PW Well No. 19 Pump Rate (gpm)	PW Well No. 19 Specific Capacity (gpm/ft.)	Comments	OW Well No. 3 Water Level (ft. MSL)	OW Well No. 3 Drawdown (ft.)
8/31/20 11:02	35		45	416.05	1,234.95	91.05	800	8.79		1,308.16	26.54
8/31/20 11:03	36		45	416.05	1,234.95	91.05	800	8.79		1,307.75	26.95
8/31/20 11:04	37		45	416.05	1,234.95	91.05	800	8.79		1,307.50	27.20
8/31/20 11:05	38		45	416.05	1,234.95	91.05	800	8.79		1,307.17	27.53
8/31/20 11:06	39		44	418.36	1,232.64	93.36	800	8.57		1,306.78	27.92
8/31/20 11:07	40		44	418.36	1,232.64	93.36	800	8.57		1,306.56	28.14
8/31/20 11:08	41		44	418.36	1,232.64	93.36	800	8.57		1,306.20	28.50
8/31/20 11:09	42		44	418.36	1,232.64	93.36	800	8.57		1,305.91	28.79
8/31/20 11:10	43		44	418.36	1,232.64	93.36	800	8.57	pH: 6.76; EC: 1.26	1,305.60	29.10
8/31/20 11:11	44		43	420.67	1,230.33	95.67	800	8.36		1,305.30	29.40
8/31/20 11:12	45		43	420.67	1,230.33	95.67	800	8.36		1,305.05	29.65
8/31/20 11:13	46		43	420.67	1,230.33	95.67	800	8.36		1,304.69	30.01
8/31/20 11:14	47		43	420.67	1,230.33	95.67	800	8.36		1,304.44	30.26
8/31/20 11:15	48		43	420.67	1,230.33	95.67	800	8.36	pH: 6.71; EC: 1.23	1,304.20	30.50
8/31/20 11:16	49		43	420.67	1,230.33	95.67	800	8.36		1,303.97	30.74
8/31/20 11:17	50		43	420.67	1,230.33	95.67	800	8.36		1,303.62	31.08
8/31/20 11:18	51		43	420.67	1,230.33	95.67	800	8.36		1,303.42	31.28
8/31/20 11:19	52		42	422.98	1,228.02	97.98	800	8.16		1,303.19	31.51
8/31/20 11:20	53		42	422.98	1,228.02	97.98	800	8.16		1,302.80	31.90
8/31/20 11:21	54		42	422.98	1,228.02	97.98	800	8.16		1,302.62	32.08
8/31/20 11:22	55		42	422.98	1,228.02	97.98	800	8.16		1,302.36	32.34
8/31/20 11:23	56		42	422.98	1,228.02	97.98	800	8.16		1,302.15	32.55
8/31/20 11:24	57		42	422.98	1,228.02	97.98	800	8.16		1,301.88	32.82
8/31/20 11:25	58		42	422.98	1,228.02	97.98	800	8.16		1,301.67	33.03
8/31/20 11:26	59		42	422.98	1,228.02	97.98	800	8.16		1,301.43	33.27
8/31/20 11:27	60		42	422.98	1,228.02	97.98	800	8.16		1,301.20	33.50
8/31/20 11:28	61		42	422.98	1,228.02	97.98	800	8.16	pH: 6.72; EC: 1.16	1,300.98	33.73
8/31/20 11:33	66		41	425.29	1,225.71	100.29	800	7.98		1,299.92	34.78
8/31/20 11:38	71		41	425.29	1,225.71	100.29	800	7.98		1,298.99	35.71
8/31/20 11:43	76		40	427.60	1,223.40	102.60	800	7.80		1,298.07	36.63
8/31/20 11:48	81		39	429.91	1,221.09	104.91	800	7.63	pH: 6.83; EC: 1.09	1,297.17	37.53
8/31/20 11:53	86		39	429.91	1,221.09	104.91	800	7.63		1,296.29	38.41
8/31/20 11:58	91		38	432.22	1,218.78	107.22	800	7.46		1,295.47	39.23
8/31/20 12:03	96		38	432.22	1,218.78	107.22	800	7.46	pH: 6.91; EC: 1.07	1,294.71	39.99
8/31/20 12:08	102		38	432.22	1,218.78	107.22	800	7.46		1,293.93	40.77

Notes: bgs = below ground level; column pipe diameter = 8 inches; pump setting = 520 ft.; motor: 450 HP; MSL = Mean Sea Level; EC = electrical conductivity (mS/cm)

Headwaters GCD Monitor Well No. 19 - Aquifer Test (August 31, 2020)

Date and Time	Time Since Pump Start (min)	Time Since Pump Stop (min)	PW Well No. 19 Airline Reading (PSI)	PW Well No. 19 Water Level (ft. bgl)	PW Well No. 19 Water Level (ft. MSL)	PW Well No. 19 Drawdown (ft.)	PW Well No. 19 Pump Rate (gpm)	PW Well No. 19 Specific Capacity (gpm/ft.)	Comments	OW Well No. 3 Water Level (ft. MSL)	OW Well No. 3 Drawdown (ft.)
8/31/20 12:13	107		38	432.22	1,218.78	107.22	800	7.46		1,293.20	41.50
8/31/20 12:18	112		37	434.53	1,216.47	109.53	800	7.30	pH: 6.92; EC: 1.02	1,292.49	42.21
8/31/20 12:23	117		36	436.84	1,214.16	111.84	800	7.15		1,291.81	42.89
8/31/20 12:28	122		36	436.84	1,214.16	111.84	800	7.15		1,291.05	43.65
8/31/20 12:33	127		36	436.84	1,214.16	111.84	800	7.15		1,290.49	44.21
8/31/20 12:38	132		36	436.84	1,214.16	111.84	800	7.15	pH: 6.97; EC: 0.97	1,290.02	44.68
8/31/20 12:48	142		36	436.84	1,214.16	111.84	800	7.15		1,289.03	45.67
8/31/20 13:03	157		34	441.46	1,209.54	116.46	800	6.87	pH: 6.99; EC: 0.94	1,287.51	47.19
8/31/20 13:18	172		34	441.46	1,209.54	116.46	800	6.87	pH: 6.99; EC: 0.93	1,286.30	48.40
8/31/20 13:33	187		33	443.77	1,207.23	118.77	800	6.74	pH: 6.97; EC: 0.89	1,285.27	49.43
8/31/20 13:48	202		33	443.77	1,207.23	118.77	800	6.74		1,284.17	50.53
8/31/20 14:03	217		33	443.77	1,207.23	118.77	800	6.74		1,283.52	51.18
8/31/20 14:18	232		33	443.77	1,207.23	118.77	800	6.74		1,282.75	51.95
8/31/20 14:33	247		33	443.77	1,207.23	118.77	800	6.74		1,282.26	52.44
8/31/20 14:48	262		32	446.08	1,204.92	121.08	800	6.61		1,281.84	52.86
8/31/20 15:03	277		30	450.70	1,200.30	125.70	800	6.36		1,280.69	54.01
8/31/20 15:18	292		30	450.70	1,200.30	125.70	800	6.36		1,280.19	54.51
8/31/20 15:33	307		30	450.70	1,200.30	125.70	800	6.36		1,279.71	54.99
8/31/20 15:48	322		30	450.70	1,200.30	125.70	800	6.36		1,279.00	55.70
8/31/20 16:03	337		29	453.01	1,197.99	128.01	800	6.25		1,278.41	56.30
8/31/20 16:18	352		29	453.01	1,197.99	128.01	800	6.25		1,278.08	56.62
8/31/20 16:33	367		29	453.01	1,197.99	128.01	800	6.25		1,277.77	56.93
8/31/20 16:48	382		29	453.01	1,197.99	128.01	800	6.25		1,277.27	57.44
8/31/20 17:03	397		29	453.01	1,197.99	128.01	800	6.25		1,276.93	57.77
8/31/20 17:18	412		29	453.01	1,197.99	128.01	800	6.25		1,276.41	58.29
8/31/20 17:33	427		29	453.01	1,197.99	128.01	800	6.25		1,276.02	58.68
8/31/20 17:48	442		27	457.63	1,193.37	132.63	800	6.03		1,275.57	59.13
8/31/20 18:03	457		27	457.63	1,193.37	132.63	800	6.03		1,274.97	59.73
8/31/20 18:18	472		27	457.63	1,193.37	132.63	800	6.03		1,274.44	60.26
8/31/20 18:33	487		26	459.94	1,191.06	134.94	800	5.93		1,273.89	60.81
8/31/20 18:48	502		26	459.94	1,191.06	134.94	800	5.93		1,273.45	61.25
8/31/20 19:03	517		26	459.94	1,191.06	134.94	800	5.93		1,273.03	61.67
8/31/20 19:18	532		28	455.32	1,195.68	130.32	800	6.14		1,272.62	62.08
8/31/20 19:33	547		28	455.32	1,195.68	130.32	800	6.14		1,272.79	61.91

Notes: bgs = below ground level; column pipe diameter = 8 inches; pump setting = 520 ft.; motor: 450 HP; MSL = Mean Sea Level; EC = electrical conductivity (mS/cm)

Headwaters GCD Monitor Well No. 19 - Aquifer Test (August 31, 2020)

Date and Time	Time Since Pump Start (min)	Time Since Pump Stop (min)	PW Well No. 19 Airline Reading (PSI)	PW Well No. 19 Water Level (ft. bgl)	PW Well No. 19 Water Level (ft. MSL)	PW Well No. 19 Drawdown (ft.)	PW Well No. 19 Pump Rate (gpm)	PW Well No. 19 Specific Capacity (gpm/ft.)	Comments	OW Well No. 3 Water Level (ft. MSL)	OW Well No. 3 Drawdown (ft.)
8/31/20 19:48	562		27	457.63	1,193.37	132.63	800	6.03		1,272.56	62.14
8/31/20 20:03	577		27	457.63	1,193.37	132.63	800	6.03		1,272.22	62.48
8/31/20 20:18	592		27	457.63	1,193.37	132.63	800	6.03		1,271.90	62.80
8/31/20 20:33	607		27	457.63	1,193.37	132.63	800	6.03		1,271.75	62.95
8/31/20 20:48	622		26	459.94	1,191.06	134.94	800	5.93		1,271.43	63.27
8/31/20 21:03	637		26	459.94	1,191.06	134.94	800	5.93		1,271.11	63.59
8/31/20 21:18	652		26	459.94	1,191.06	134.94	800	5.93		1,270.76	63.94
8/31/20 21:33	667		26	459.94	1,191.06	134.94	800	5.93		1,270.46	64.24
8/31/20 21:48	682		26	459.94	1,191.06	134.94	800	5.93		1,270.14	64.56
8/31/20 22:03	697		25	462.25	1,188.75	137.25	800	5.83		1,269.87	64.83
8/31/20 22:18	712		25	462.25	1,188.75	137.25	800	5.83		1,269.66	65.04
8/31/20 22:33	727		26	459.94	1,191.06	134.94	800	5.93		1,269.46	65.24
8/31/20 22:48	742		26	459.94	1,191.06	134.94	800	5.93		1,269.28	65.42
8/31/20 23:03	757		26	459.94	1,191.06	134.94	800	5.93		1,269.19	65.51
8/31/20 23:18	772		25	462.25	1,188.75	137.25	800	5.83		1,268.84	65.86
8/31/20 23:33	787		25	462.25	1,188.75	137.25	800	5.83		1,268.57	66.14
8/31/20 23:48	802		25	462.25	1,188.75	137.25	800	5.83		1,268.45	66.25
9/1/20 0:03	817		25	462.25	1,188.75	137.25	800	5.83		1,268.23	66.47
9/1/20 0:18	832		25	462.25	1,188.75	137.25	800	5.83		1,268.10	66.60
9/1/20 0:33	847		25	462.25	1,188.75	137.25	800	5.83		1,267.98	66.72
9/1/20 0:48	862		25	462.25	1,188.75	137.25	800	5.83		1,267.85	66.85
9/1/20 1:03	877		25	462.25	1,188.75	137.25	800	5.83		1,267.73	66.97
9/1/20 1:18	892		25	462.25	1,188.75	137.25	800	5.83		1,267.52	67.18
9/1/20 1:33	907		25	462.25	1,188.75	137.25	800	5.83		1,267.41	67.29
9/1/20 1:48	922		25	462.25	1,188.75	137.25	800	5.83		1,267.14	67.56
9/1/20 2:03	937		25	462.25	1,188.75	137.25	800	5.83		1,267.01	67.69
9/1/20 2:18	952		25	462.25	1,188.75	137.25	800	5.83		1,266.85	67.85
9/1/20 2:33	967		25	462.25	1,188.75	137.25	800	5.83		1,266.85	67.86
9/1/20 2:48	982		25	462.25	1,188.75	137.25	800	5.83		1,266.64	68.06
9/1/20 3:03	997		25	462.25	1,188.75	137.25	800	5.83		1,266.56	68.14

Notes: bgs = below ground level; column pipe diameter = 8 inches; pump setting = 520 ft.; motor: 450 HP; MSL = Mean Sea Level; EC = electrical conductivity (mS/cm)

Headwaters GCD Monitor Well No. 19 - Aquifer Test (August 31, 2020)

Date and Time	Time Since Pump Start (min)	Time Since Pump Stop (min)	PW Well No. 19 Airline Reading (PSI)	PW Well No. 19 Water Level (ft. bgl)	PW Well No. 19 Water Level (ft. MSL)	PW Well No. 19 Drawdown (ft.)	PW Well No. 19 Pump Rate (gpm)	PW Well No. 19 Specific Capacity (gpm/ft.)	Comments	OW Well No. 3 Water Level (ft. MSL)	OW Well No. 3 Drawdown (ft.)
9/1/20 3:18	1,012		25	462.25	1,188.75	137.25	800	5.83		1,266.44	68.26
9/1/20 3:33	1,027		25	462.25	1,188.75	137.25	800	5.83		1,266.37	68.33
9/1/20 3:48	1,042		25	462.25	1,188.75	137.25	800	5.83		1,266.29	68.41
9/1/20 4:03	1,057		25	462.25	1,188.75	137.25	800	5.83		1,266.04	68.66
9/1/20 4:18	1,072		25	462.25	1,188.75	137.25	800	5.83		1,265.92	68.78
9/1/20 4:33	1,087		25	462.25	1,188.75	137.25	800	5.83		1,265.93	68.77
9/1/20 4:48	1,102		25	462.25	1,188.75	137.25	800	5.83		1,265.85	68.85
9/1/20 5:03	1,117		24	464.56	1,186.44	139.56	800	5.73		1,265.56	69.15
9/1/20 5:18	1,132		24	464.56	1,186.44	139.56	800	5.73		1,265.50	69.20
9/1/20 5:33	1,147		24	464.56	1,186.44	139.56	800	5.73		1,265.11	69.59
9/1/20 5:48	1,162		23	466.87	1,184.13	141.87	800	5.64		1,264.75	69.95
9/1/20 6:03	1,177		23	466.87	1,184.13	141.87	800	5.64		1,264.59	70.11
9/1/20 6:18	1,192		23	466.87	1,184.13	141.87	800	5.64		1,264.42	70.28
9/1/20 6:33	1,207		23	466.87	1,184.13	141.87	800	5.64		1,264.23	70.47
9/1/20 6:48	1,222		23	466.87	1,184.13	141.87	800	5.64		1,264.05	70.66
9/1/20 7:03	1,237		23	466.87	1,184.13	141.87	800	5.64		1,263.89	70.81
9/1/20 7:18	1,252		23	466.87	1,184.13	141.87	800	5.64		1,263.63	71.07
9/1/20 7:33	1,267		23	466.87	1,184.13	141.87	800	5.64		1,263.38	71.32
9/1/20 7:48	1,282		23	466.87	1,184.13	141.87	800	5.64		1,263.32	71.38
9/1/20 8:03	1,297		23	466.87	1,184.13	141.87	800	5.64		1,262.96	71.74
9/1/20 8:18	1,312		23	466.87	1,184.13	141.87	800	5.64		1,262.89	71.81
9/1/20 8:33	1,327		23	466.87	1,184.13	141.87	800	5.64		1,262.95	71.75
9/1/20 8:48	1,342		23	466.87	1,184.13	141.87	800	5.64		1,262.82	71.88
9/1/20 9:03	1,357		23	466.87	1,184.13	141.87	800	5.64		1,262.82	71.88
9/1/20 9:18	1,372		23	466.87	1,184.13	141.87	800	5.64		1,262.54	72.16
9/1/20 9:33	1,387		23	466.87	1,184.13	141.87	800	5.64		1,262.45	72.25
9/1/20 9:48	1,402		23	466.87	1,184.13	141.87	800	5.64		1,262.46	72.24
9/1/20 10:03	1,417		23	466.87	1,184.13	141.87	800	5.64		1,262.39	72.31
9/1/20 10:18	1,432		23	466.87	1,184.13	141.87	800	5.64		1,262.45	72.25
9/1/20 10:33	1,447		20	473.80	1,177.20	148.80	800	5.38	pH: 7.25; EC: 0.491	1,261.85	72.85

Notes: bgs = below ground level; column pipe diameter = 8 inches; pump setting = 520 ft.; motor: 450 HP; MSL = Mean Sea Level; EC = electrical conductivity (mS/cm)

Headwaters GCD Monitor Well No. 19 - Aquifer Test (August 31, 2020)

Date and Time	Time Since Pump Start (min)	Time Since Pump Stop (min)	PW Well No. 19 Airline Reading (PSI)	PW Well No. 19 Water Level (ft. bgl)	PW Well No. 19 Water Level (ft. MSL)	PW Well No. 19 Drawdown (ft.)	PW Well No. 19 Pump Rate (gpm)	PW Well No. 19 Specific Capacity (gpm/ft.)	Comments	OW Well No. 3 Water Level (ft. MSL)	OW Well No. 3 Drawdown (ft.)
9/1/20 10:48	1,462		20	473.80	1,177.20	148.80	800	5.38		1,254.90	79.80
9/1/20 11:03	1,477		18	478.42	1,172.58	153.42	800	5.21		1,249.69	85.01
9/1/20 11:18	1,492		19	476.11	1,174.89	151.11	756	5.00		1,247.17	87.54
9/1/20 11:33	1,507		19	476.11	1,174.89	151.11	772	5.11		1,251.34	83.37
9/1/20 11:48	1,522		19	476.11	1,174.89	151.11	772	5.11		1,253.24	81.46
9/1/20 12:03	1,537		19	476.11	1,174.89	151.11	772	5.11		1,254.53	80.17
9/1/20 12:18	1,552		19	476.11	1,174.89	151.11	772	5.11		1,255.31	79.39
9/1/20 12:33	1,567		22	469.18	1,181.82	144.18	772	5.35		1,255.86	78.85
9/1/20 12:48	1,582		24	464.56	1,186.44	139.56	772	5.53		1,256.06	78.64
9/1/20 13:03	1,597		24	464.56	1,186.44	139.56	772	5.53		1,259.25	75.45
9/1/20 13:18	1,612		24	464.56	1,186.44	139.56	772	5.53		1,260.14	74.56
9/1/20 13:33	1,627		24	464.56	1,186.44	139.56	772	5.53		1,261.02	73.69
9/1/20 13:48	1,642		24	464.56	1,186.44	139.56	772	5.53		1,260.67	74.04
9/1/20 14:03	1,657		25	462.25	1,188.75	137.25	772	5.62		1,260.79	73.92
9/1/20 14:18	1,672		25	462.25	1,188.75	137.25	772	5.62		1,261.03	73.67
9/1/20 14:33	1,687		26	459.94	1,191.06	134.94	772	5.72		1,261.32	73.38
9/1/20 14:48	1,702		26	459.94	1,191.06	134.94	772	5.72		1,261.56	73.14
9/1/20 15:03	1,717		26	459.94	1,191.06	134.94	772	5.72		1,261.80	72.90
9/1/20 15:18	1,732		26	459.94	1,191.06	134.94	772	5.72		1,262.16	72.54
9/1/20 15:33	1,747		26	459.94	1,191.06	134.94	772	5.72		1,262.39	72.31
9/1/20 15:48	1,762		26	459.94	1,191.06	134.94	772	5.72		1,261.33	73.38
9/1/20 16:03	1,777		24	464.56	1,186.44	139.56	772	5.53		1,261.47	73.23
9/1/20 16:18	1,792		24	464.56	1,186.44	139.56	772	5.53		1,261.59	73.11
9/1/20 16:33	1,807		24	464.56	1,186.44	139.56	772	5.53		1,261.47	73.23
9/1/20 16:48	1,822		25	462.25	1,188.75	137.25	772	5.62		1,261.54	73.16
9/1/20 17:03	1,837		25	462.25	1,188.75	137.25	772	5.62		1,261.45	73.25
9/1/20 17:18	1,852		24	464.56	1,186.44	139.56	772	5.53		1,261.51	73.19
9/1/20 17:33	1,867		24	464.56	1,186.44	139.56	772	5.53		1,261.42	73.28
9/1/20 17:48	1,882		24	464.56	1,186.44	139.56	772	5.53		1,261.49	73.21
9/1/20 18:03	1,897		25	462.25	1,188.75	137.25	772	5.62		1,261.45	73.25

Notes: bgs = below ground level; column pipe diameter = 8 inches; pump setting = 520 ft.; motor: 450 HP; MSL = Mean Sea Level; EC = electrical conductivity (mS/cm)

Headwaters GCD Monitor Well No. 19 - Aquifer Test (August 31, 2020)

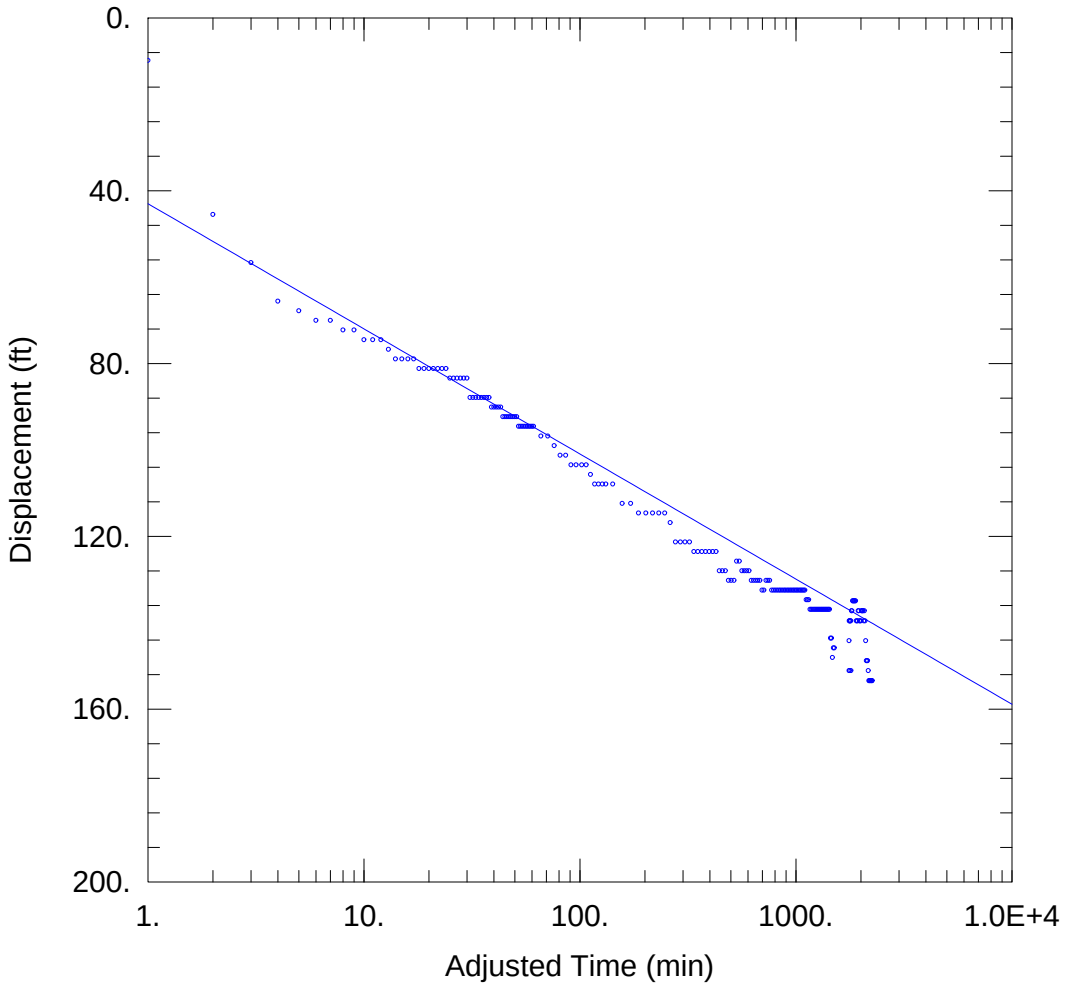
Date and Time	Time Since Pump Start (min)	Time Since Pump Stop (min)	PW Well No. 19 Airline Reading (PSI)	PW Well No. 19 Water Level (ft. bgl)	PW Well No. 19 Water Level (ft. MSL)	PW Well No. 19 Drawdown (ft.)	PW Well No. 19 Pump Rate (gpm)	PW Well No. 19 Specific Capacity (gpm/ft.)	Comments	OW Well No. 3 Water Level (ft. MSL)	OW Well No. 3 Drawdown (ft.)
9/1/20 18:18	1,912		25	462.25	1,188.75	137.25	772	5.62		1,261.45	73.25
9/1/20 18:33	1,927		25	462.25	1,188.75	137.25	772	5.62		1,261.45	73.25
9/1/20 18:48	1,942		25	462.25	1,188.75	137.25	772	5.62		1,261.50	73.21
9/1/20 19:03	1,957		24	464.56	1,186.44	139.56	772	5.53		1,261.47	73.23
9/1/20 19:18	1,972		25	462.25	1,188.75	137.25	772	5.62		1,261.36	73.34
9/1/20 19:33	1,987		24	464.56	1,186.44	139.56	772	5.53		1,258.04	76.66
9/1/20 19:48	2,002		22	469.18	1,181.82	144.18	772	5.35		1,252.11	82.60
9/1/20 20:03	2,017		20	473.80	1,177.20	148.80	772	5.19		1,248.08	86.62
9/1/20 20:18	2,032		20	473.80	1,177.20	148.80	772	5.19		1,245.14	89.56
9/1/20 20:33	2,047		20	473.80	1,177.20	148.80	772	5.19		1,242.75	91.95
9/1/20 20:48	2,062		19	476.11	1,174.89	151.11	772	5.11		1,240.89	93.81
9/1/20 21:03	2,077		18	478.42	1,172.58	153.42	724	4.72	Kink noted in orifice tube affecting production rate reading - No adjustment in actual pumping rate	1,239.26	95.44
9/1/20 21:18	2,092		18	478.42	1,172.58	153.42	708	4.61		1,238.81	95.89
9/1/20 21:33	2,107		18	478.42	1,172.58	153.42	772	5.03		1,245.40	89.30
9/1/20 21:48	2,122		18	478.42	1,172.58	153.42	772	5.03		1,247.23	87.47
9/1/20 22:03	2,137		18	478.42	1,172.58	153.42	772	5.03		1,248.79	85.91
9/1/20 22:18	2,152		18	478.42	1,172.58	153.42	772	5.03		1,250.05	84.65
9/1/20 22:28	2,162	0	18	478.42	1,172.58	153.42	772	5.03	Pump Stop	1,250.59	84.11
9/1/20 22:30	2,164	2	40	427.60	1,223.40	102.60				1,257.13	77.57
9/1/20 22:34	2,168	6	56	390.64	1,260.36	65.64				1,263.93	70.77
9/1/20 22:38	2,172	10	58	386.02	1,264.98	61.02				1,267.89	66.81
9/1/20 22:42	2,176	14	59	383.71	1,267.29	58.71				1,271.09	63.61
9/1/20 22:46	2,180	18	60	381.40	1,269.60	56.40				1,273.66	61.04
9/1/20 22:52	2,186	24	62	376.78	1,274.22	51.78				1,277.17	57.53
9/1/20 22:58	2,192	30	63	374.47	1,276.53	49.47				1,280.12	54.58
9/1/20 23:02	2,196	34	64	372.16	1,278.84	47.16				1,281.95	52.75
9/1/20 23:06	2,200	38	64	372.16	1,278.84	47.16				1,283.53	51.18
9/1/20 23:14	2,208	46	66	367.54	1,283.46	42.54				1,286.47	48.23

Notes: bgs = below ground level; column pipe diameter = 8 inches; pump setting = 520 ft.; motor: 450 HP; MSL = Mean Sea Level; EC = electrical conductivity (mS/cm)

Headwaters GCD Monitor Well No. 19 - Aquifer Test (August 31, 2020)

Date and Time	Time Since Pump Start (min)	Time Since Pump Stop (min)	PW Well No. 19 Airline Reading (PSI)	PW Well No. 19 Water Level (ft. bgl)	PW Well No. 19 Water Level (ft. MSL)	PW Well No. 19 Drawdown (ft.)	PW Well No. 19 Pump Rate (gpm)	PW Well No. 19 Specific Capacity (gpm/ft.)	Comments	OW Well No. 3 Water Level (ft. MSL)	OW Well No. 3 Drawdown (ft.)
9/1/20 23:30	2,224	62	68	362.92	1,288.08	37.92				1,291.22	43.48
9/1/20 23:45	2,239	77	70	358.30	1,292.70	33.30				1,294.76	39.94
9/2/20 0:00	2,254	92	70	358.30	1,292.70	33.30				1,297.81	36.89
9/2/20 0:15	2,269	107	72	353.68	1,297.32	28.68				1,300.21	34.49
9/2/20 0:30	2,284	122	73	351.37	1,299.63	26.37				1,302.25	32.45
9/2/20 0:45	2,299	137	73	351.37	1,299.63	26.37				1,304.04	30.66
9/2/20 1:00	2,314	152	74	349.06	1,301.94	24.06				1,305.60	29.10
9/2/20 1:15	2,329	167	74	349.06	1,301.94	24.06				1,306.99	27.71
9/2/20 1:30	2,344	182	75	346.75	1,304.25	21.75			Airline Readings Stop	1,308.23	26.47

Notes: bgs = below ground level; column pipe diameter = 8 inches; pump setting = 520 ft.; motor: 450 HP; MSL = Mean Sea Level; EC = electrical conductivity (mS/cm)



WELL TEST ANALYSIS

Data Set: \...\Well No. 19 CJ.aqt
Date: 09/09/20 Time: 13:46:03

PROJECT INFORMATION

Company: WRGS
Client: Headwaters GCD
Project: 072-001-20
Location: Kerr County
Test Well: HGCD Well No. 19
Test Date: 8-31-20

AQUIFER DATA

Saturated Thickness: 106. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
HGCD Well No. 19	0	0

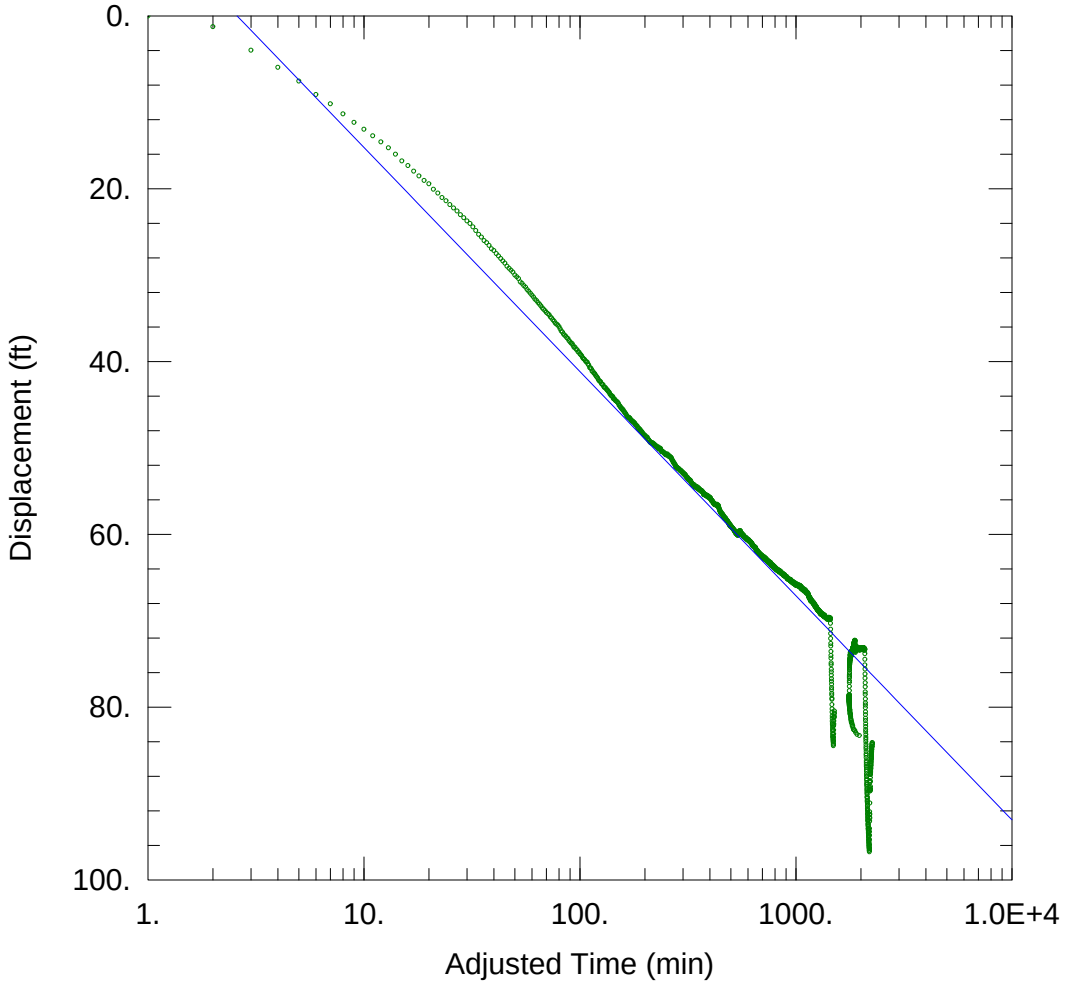
Observation Wells

Well Name	X (ft)	Y (ft)
◦ HGCD Well No. 19	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 940.2 ft^2/day S = 0.192



WELL TEST ANALYSIS

Data Set: \...\Well No. 3 CJ.aqt
Date: 09/09/20 Time: 13:44:37

PROJECT INFORMATION

Company: WRGS
Client: Headwaters GCD
Project: 072-001-20
Location: Kerr County
Test Well: HGCD Well No. 19
Test Date: 8-31-20

AQUIFER DATA

Saturated Thickness: 106. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
HGCD Well No. 19	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
◦ Kerrville ASR Well No. 3	240	0

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 1049.6 ft^2/day S = 7.361E-5