Region II Well Construction and Testing Report for Site A-3

Northwest Florida Water Management District

E213001410

Cardno
Shaping the Future

Document Information

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Cardno
Shaping the Future

Cardno
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Acronyms

bls	below land surface
gpd	gallons per day
gpm	gallons per minute
ITB	invitation to bid
mg/L	milligrams per liter
NTU	Nephelometric Turbidity Unit
PVC	polyvinylchloride
uS/cm	microsiemens per centimeter

1 Introduction

The Northwest Florida Water Management District (District) contracted Cardno to oversee exploratory drilling, construction, and testing activities at well site A-3 in support of development of minimum aquifer levels in the District's Planning Region II. The site is located adjacent to the Freeport Wastewater Treatment Plant in southern Walton County on Earl Godwin Road (Figure 1-1). Site A-3 is directly north of the treatment plant on the west side of an open field. The land surface elevation at the site ranges from 20 to 60 feet above sea level.

Two wells were drilled on site A-3 for long-term monitoring of water quality and water levels in the surficial and Floridan aquifers. All specifications and materials were to follow the Invitation to Bid (ITB) document (ITB No. 16B-007) and any deviations were noted and are described in this report.

Prior to construction, the quarter-acre area surrounding the wells was cleared of brush. Initial site conditions were documented during a pre-construction onsite meeting between District representatives, the manager of the wastewater plant, Cardno staff, and the project manager and lead driller from Applied Drilling and Engineering, Inc. (Driller). Appendix A provides the photo documentation of the initial site visit by Cardno staff.

Final site conditions were documented during the final inspection after completion of construction activities and all heavy machinery was demobilized from the site. Appendix B shows the photo documentation of the final site visit by Cardno staff. No unacceptable conditions were noted.

Figure 1-1. Location Map for Site A-3

2 Site Hydrogeology

Data obtained from District-owned monitor wells and Florida Geological Survey wells in the surrounding area and Pratt et al. (1996)[1] were used to anticipate hydrogeologic conditions. Formation descriptions were available for varying depths depending on well construction specifications of the surrounding monitor wells. The most complete well log extended to a depth of 720 feet below land surface (bls) and was located approximately three miles northwest in the city of Freeport in Walton County. Site A-3 formation samples were expected to be similar in appearance to the reference well's descriptions. A general description of the regional hydrogeology based on the reference well is provided below.

2.1 Surficial Aquifer

The surficial aquifer is made up of undifferentiated clastics, primarily sands and clays between land surface and 50 feet bls. Highly permeable sand dominates this unit with small amounts of silt, clay, and phosphate.

2.2 Intermediate Aquifer

The Intermediate aquifer is characterized by sediments that slow the movement of water from the surficial aquifer to the Floridan aquifer. Its lithology is generally fine-grained clastic sediments interbedded with carbonate beds, coarser-grained clastics, and shell. The Intermediate aquifer occurs between 50 and 190 feet bls.

2.3 Undifferentiated Floridan Aquifer

The Floridan aquifer consists of consolidated carbonate sequences that occur between 190 and 760 feet bls. These interbedded limestones and dolostones generally have high permeability and are well-indurated. Within the bottom 300 feet of the aquifer, the sand and glauconite content ranges from trace to five percent. The Sub-Floridan aquifer is located below 760 feet bls and is comprised of very fine to coarse sand with some shell.

[1] Pratt, T.R., C.J. Richards, K.A. Milla, J.R. Wagner, J.L. Johnson, and R.J. Curry, 1996. Hydrogeology of the Northwest Florida Water Management District: Northwest Florida Water Management District, Water Resources Special Report 96-4.

3 Well Drilling and Construction

3.1 Site Setup

The Driller mobilized the rig and heavy equipment and made preparations to begin drilling at site A-3 on November 15, 2016. The general construction sequence was as follows: surficial aquifer well (A-3b) was constructed first for the intent to be used as a water supply well for other well construction activities on site, followed by the long-term Floridan aquifer monitor well (A-3). A-3b did not produce enough water to provide water supply for drilling. The drillers were able to hook into the treatment plant's water supply line. The drilling rig was a Failing top-drive rig and heavy equipment included a Mud Puppy model MP-170-25C, a Versa-Matic air-operated double-diaphragm pump, a Doosan P185WDO-T4F portable air compressor, and a John Deere 310J standard backhoe. The air compressor and backhoe were rented from Sunbelt Rentals. As built drawings for each well are included as Appendix C.

3.2 Surficial Well (A-3b)

Drilling of A-3b by mud-rotary method commenced on November 17, 2016. A six-inch pilot hole was drilled to 230 feet bls, a temporary 6-inch polyvinylchloride (PVC) casing was set to 55 feet bls, and geophysical logs were run. Geophysical logs are discussed under Section 4.2. The temporary casing separated when the drillers attempted to pull it from the hole so the borehole was back-plugged with cement to the surface. The rig was then moved to the proposed location of well A-3 and well A-3b was drilled in its place.

A four-inch permanent PVC casing with ten feet of slotted screen and a five-foot blank was set to a depth of 45 feet bls. The annulus was filled with a 20-30 sand pack to 27 feet bls, topped with 30-65 fine sand, and capped off with Type I/II Portland cement. The fine sand was approved as a substitute for the bentonite seal (as outlined in ITB). The wellhead was completed on December 21, 2016. Well A-4b was completed approximately three feet above grade with an 8-inch, square aluminum surface protector and expandable well seal. The surface protector was filled with coarse sand, completed in a 4-ft x 4-ft x 4-in concrete pad and secured with a lock. Concrete-filled metal bollards were installed around the concrete pad for additional protection. The bollards were painted bright yellow (see Appendix B).

3.3 Long-Term Floridan Monitor (A-3)

The drilling rig was set up over the location of the abandoned A-3b hole on December 1, 2016 and the pilot hole was advanced to 63 feet bls. Progress was slow as Applied had to drill through the cemented temporary casing left in place when the intital pilot hole for A-3b was abandoned. An 18-inch steel pipe was set to 60 feet bls and cemented in place as a secondary surface casing to prevent destabilization of the sandy formation during drilling. This addition to the original specifications was proposed by the Driller and approved by the District. A 12-inch steel pipe was installed as a primary surface casing to 223 feet and cemented in place. Once the cement plug was drilled out, the Driller cleared the drilling mud from the hole and prepared the rig to begin drilling by reverse-air.

An eight-inch pilot hole was drilled by reverse-air to 700 feet bls. Exploratory drilling continued beyond the proposed depth of 650 feet based on in-field water quality analysis that indicated the aquifer to be much fresher at depth than originally thought. The Floridan aquifer was fully penetrated and the Sub-Floridan aquifer was encountered at approximately 695 feet bls. On December 20, 2016, additional geophysical logs were run from the base of the 12-inch casing to total depth (see Section 4.2).

On December 28, 2016, the well was back-plugged to 479 feet bls with medium sand and topped off with a cement plug to 475 feet bls. The following day, a Step Drawdown Test was conducted on A-3 with the 12-inch steel casing and 252-foot open hole well design. The results of the Step Drawdown Test are discussed in Section 4.3.

Final drilling and construction of A-3 was resumed on January 3, 2017 with the drilling-out of the cement plug/sand and reaming of the borehole to 561 feet bls. The well was cased to 560 feet bls with 6-inch PVC on January 5, 2017 and three grouting events followed. On January 12, 2017 the final reaming to a total depth of 670 feet bls and development were completed. On January 20, 2017, A-3 was completed approximately three feet above grade with a 12-inch steel surface protector and expandable well seal. The surface protector was filled with coarse sand, completed in a 4-ft x 4-ft x 4-in concrete pad and secured with a lock. Concrete filled metal bollards were installed around the concrete pad for additional protection. The surface protector and bollards were painted bright yellow (see Appendix B).

4 Geologic Sampling and Testing

4.1 Lithologic Sampling

Drill cuttings were collected at ten-foot intervals, bagged, and provided to Cardno by the Driller. Cardno staff were on site throughout the exploratory drilling process to observe and note variations in drill speed, rig reactions, and lithologic changes. A hand lens and Munsell Chart were used to determine accurate texture and color of the drill cuttings. Due to the close proximity of wells A-3 and A-3b their lithologic descriptions were combined into one log presented in Appendix E. The sample cuttings collected were submitted to the Florida Geological Survey for description and formation identification. The general lithology is described in Table 4-1 below.

Table 4-1. Generalized Lithology for Site A-3

Depth Range (feet bls)	Lithology
0-80	sand
80-130	clay
130-180	limestone
180-220	clay
220-280	limestone/clay
280-368	dolostone
368-695	limestone/dolostone
695-700 (TD)	sand

4.2 Geophysical Logging

Geophysical logging was performed on well A-3b during initial exploratory drilling. Advanced Borehole Services ran natural gamma ray, caliper, and dual induction logs on November 22, 2016. Cardno staff was on site during additional logging of well A-3 on December 20, 2016 which included logs for natural gamma ray, caliper, electrical resistivity, spontaneous potential, single-point resistance, dual induction, static and pumping water quality, static and dynamic flow, and borehole-compensated sonic/density. The geophysical logs were used in conjunction with lithologic and water quality sampling results to determine final well construction for long term monitoring. Copies of the geophysical logs are provided in Appendix D.

4.3 Step Drawdown Test

The Driller performed the step drawdown test on December 29, 2016. As indicated, A-3 was completed with 223 feet of 12-in steel casing and 252 feet of open hole. A 50-horsepower John Deere Quiet Flow centrifugal pump was connected to a 90-degree elbow joint affixed to the top of the well casing with 125 feet of eight-inch pipe in the casing. The discharge from the pump was monitored with a totalizing flow meter. A pretest was performed to determine the maximum sustainable pumping rate. The maximum sustainable pumping rate was determined to be 1,150 gallons per minute (gpm). The pump was shutoff and water levels were allowed to recovery prior to initiating the step drawdown test.

The step drawdown test consisted of four pumping rates (500 gpm, 700 gpm, 900 gpm, and 1,100 gpm) at one hour each. Water levels were recorded at an interval of one second on wells A-3 and A-3b using dataloggers with absolute pressure transducers. A barometric logger recorded atmospheric pressure to allow for the compensation of the absolute water level readings for barometric affects. The dataloggers

were preprogrammed to continuously record water levels before, during and after the step test. Manual water level measurements were made in each well just prior to the start of the test and at the end of each step.

The specific capacity of well A-3 was calculated for each step using the equation Q/s; where "Q" is the discharge rate in gallons per minute (gpm) and "s" is the measured drawdown in feet. Both the manual water level measurements and the maximum drawdown recorded by the datalogger at the end of each test step were used to calculate the specific capacity of well A-3. Table 4-2 and Table 4-3 summarize the drawdown at the end of each step and specific capacity calculated from the manual readings and transducer readings, respectively. Graphic results of the step drawdown test are provided as Appendix F.

Table 4-2. Summary of A-3 Step Drawdown Test Results Based on Manual Readings

Step Number	Drawdown (feet)	Pumping Rate (gpm)	Specific Capacity (gpm/foot)
1	7.28	500	68.7
2	11.06	700	63.3
3	15.50	900	58.1
4	19.66	1,100	56.0

Table 4-3. Summary of A-3 Step Drawdown Test Results Based on Transducer Readings

Step Number	Drawdown (feet)	Pumping Rate (gpm)	Specific Capacity (gpm/foot)
1	6.5	500	76.9
2	9.8	700	71.4
3	13.9	900	64.7
4	17.6	1,100	62.5

4.4 Water Quality Sampling

Samples of produced water from the borehole were collected through the drill stem by reverse-air circulation throughout exploratory drilling. Water samples were collected every 20 feet for testing of field parameters. Laboratory samples were collected to verify field parameters at some but not all of the same depths (refer to Table 4-4). Field chloride measurements showed that no changes in the chloride profile were found during drilling that would indicate contact with the saltwater-freshwater interface. Laboratory results, summarized in Table 4-3 and provided as Appendix G, confirm that the Upper Floridan aquifer is mostly fresh throughout.

Water quality samples were collected at the end of each step of the step drawdown test. Field parameters were run for these samples in addition to collecting laboratory samples to confirm field results (refer to Table 4-4). A total of ten samples were collected for laboratory analysis.

Table 4-3. Drill Stem Water Quality Screening during Exploratory Drilling

Sample ID	Depth (feet)	Field Results				Laboratory Results		
		Temperature (°C)	Turbidity (NTU)	Specific Conductance (uS/cm)	Chloride (mg/L)	Specific Conductance (uS/cm)	Total Dissolved Solids (mg/L)	Chloride (mg/L)
	260	22.8	62	200.0	85			
	280	23.6	128	214.9	90			
	300	23.1	360	216.8	90			
	320	23.0	305	215.2	85			
A-3-1	340	23.0	209	215.6	90	182	118	2.38

Sample ID	Depth (feet)	Field Results				Laboratory Results		
		Temperature (°C)	Turbidity (NTU)	Specific Conductance (uS/cm)	Chloride (mg/L)	Specific Conductance (uS/cm)	Total Dissolved Solids (mg/L)	Chloride (mg/L)
	360	21.3	231	217.0	85			
	380	22.9	416	210.8	90			
	400	23.0	288	211.7	95			
	420	23.4	137	212.7	110			
A-3-2	440	23.2	110	215.1	110	186	130	2.11
	460	23.1	55.9	212.9	135			
	480	23.2	206	214.5	140			
	500	23.0	103	213.2	145			
	520	22.9	105	208.9	150			
A-3-3	540	21.5	67.4	214.7	140	185	119	2.04
	560	21.7	93.7	216.8	140			
	580	21.6	291	217.7	125			
	600	22.3	582	211.4				
	620	22.6	241	216.0	150			
A-3-4	640	22.4	696	209.3	145	182	123	2.59
	660	22.2	326	194.7	160			
	680	21.4	815	199.8				
A-3-5	700	23.0	55.5	216.7	175	184	119	2.96

Table 4-4. Borehole Water Quality during Step-Drawdown Testing

Sample ID	Field Results			Laboratory Results	
	Temperature (°C)	pH	Specific Conductance (uS/cm)	Specific Conductance (uS/cm)	Total Dissolved Solids (mg/L)
Step 1	23.16	9.37	205	168	106
Step 2	23.16	9.08	202	179	116
Step 3	23.13	8.82	202	190	100
Step 4	23.13	8.86	201	185	310

Table 4-5. Borehole Water Quality at End of Final Well Development

Sample ID	Depth Interval (ft)	Field Results				Laboratory Results		
		Temperature (°C)	Turbidity (NTU)	Specific Conductance (uS/cm)	Chloride (mg/L)	Specific Conductance (uS/cm)	Total Dissolved Solids (mg/L)	Chloride (mg/L)
A-3-6	560-670	25.7	1.07	238.9		225	122	5.39

Region II Well Construction and Testing Report for Site A-3

APPENDIX A

PRE-CONSTRUCTION PHOTO DOCUMENTATION


Gate to entrance of Site A-3, facing east.


Existing shallow monitor well outside of gated area, facing north.


Right side of gate and WTP in background, facing south.


Left side of gate and view of Site A-3 in background, facing north.

Date Photos Taken: Oct 13, 2016 Photographer: M. Leonard Compiler: M. Leonard

View down fence line, facing north. Note powerlines at extreme north end of site.

Orange flags marking locations of wells, facing north.

Two-track roadway with WTP in background, facing south.

View of Site A-3 from access road, facing east.

Region II Well Construction and Testing Report for Site A-3

APPENDIX B

POST-CONSTRUCTION PHOTO DOCUMENTATION

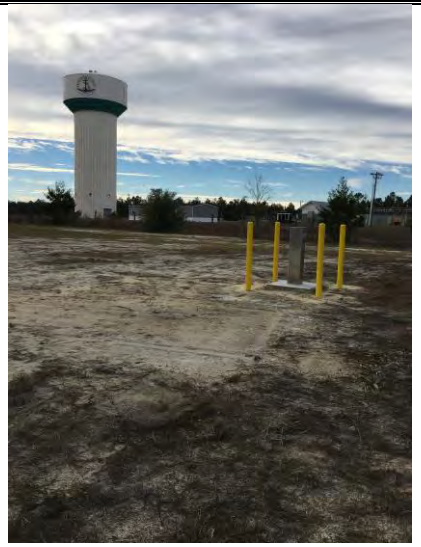
From entrance gate, facing north.

Finished A-3b shallow monitor well, facing west.

Finished A-3 deep monitor well, facing west.

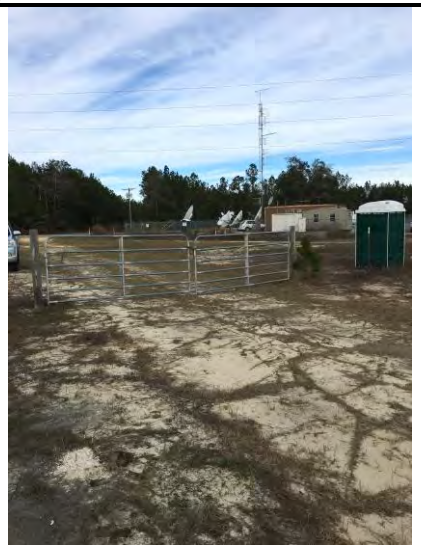
Cleared and graded site, facing east. This area will be further graded by the property owners at a later date, the manager commented that this was perfect for their needs.

Date Photos Taken: Jan 27, 2017 Photographer: M. Leonard Compiler: M. Leonard



View of site, facing south.

View down fenceline, facing north.



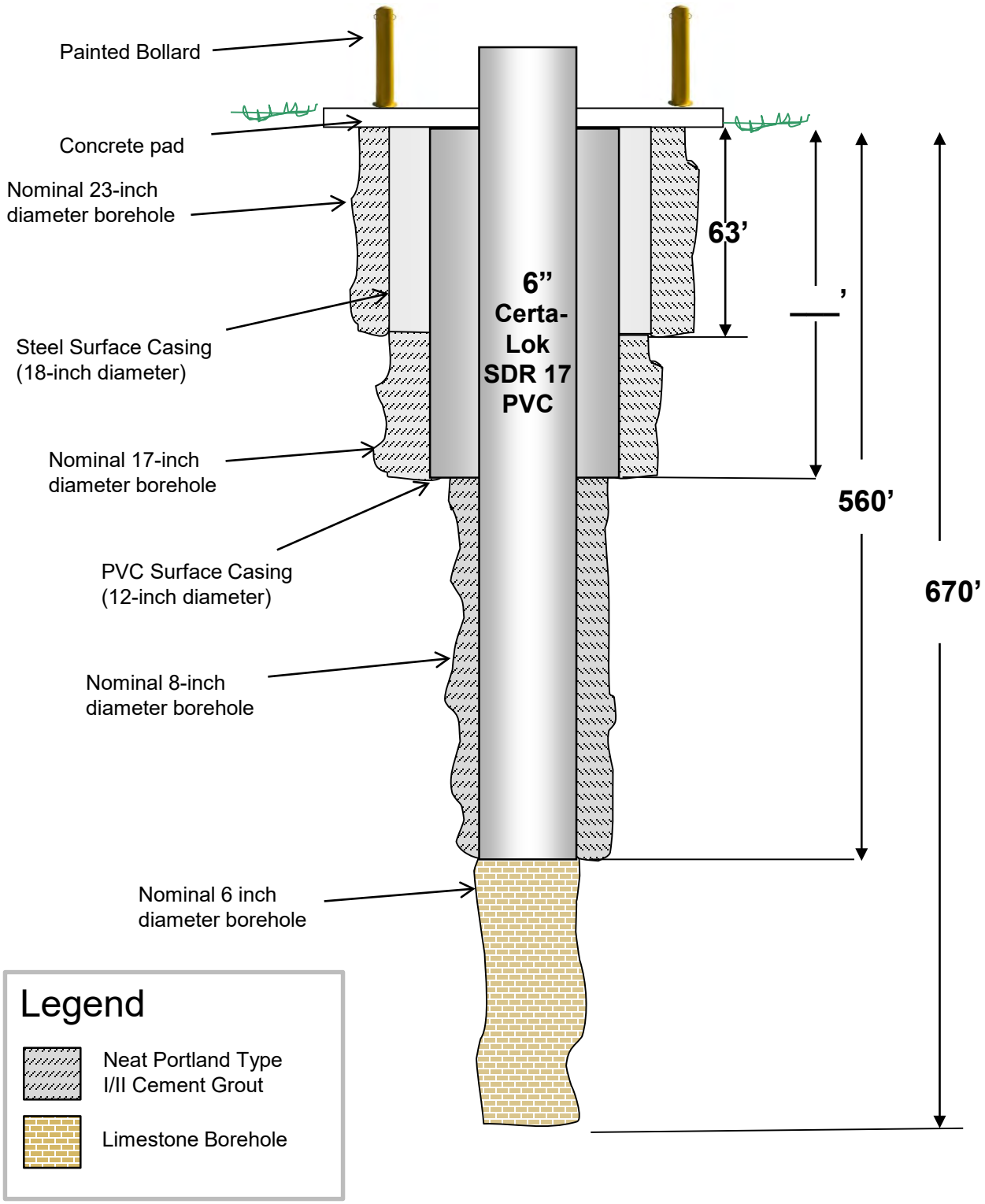
View of site access gate, facing west.

View of Site A-3 from access road, facing east. Note sanitary facilities have not yet been removed.

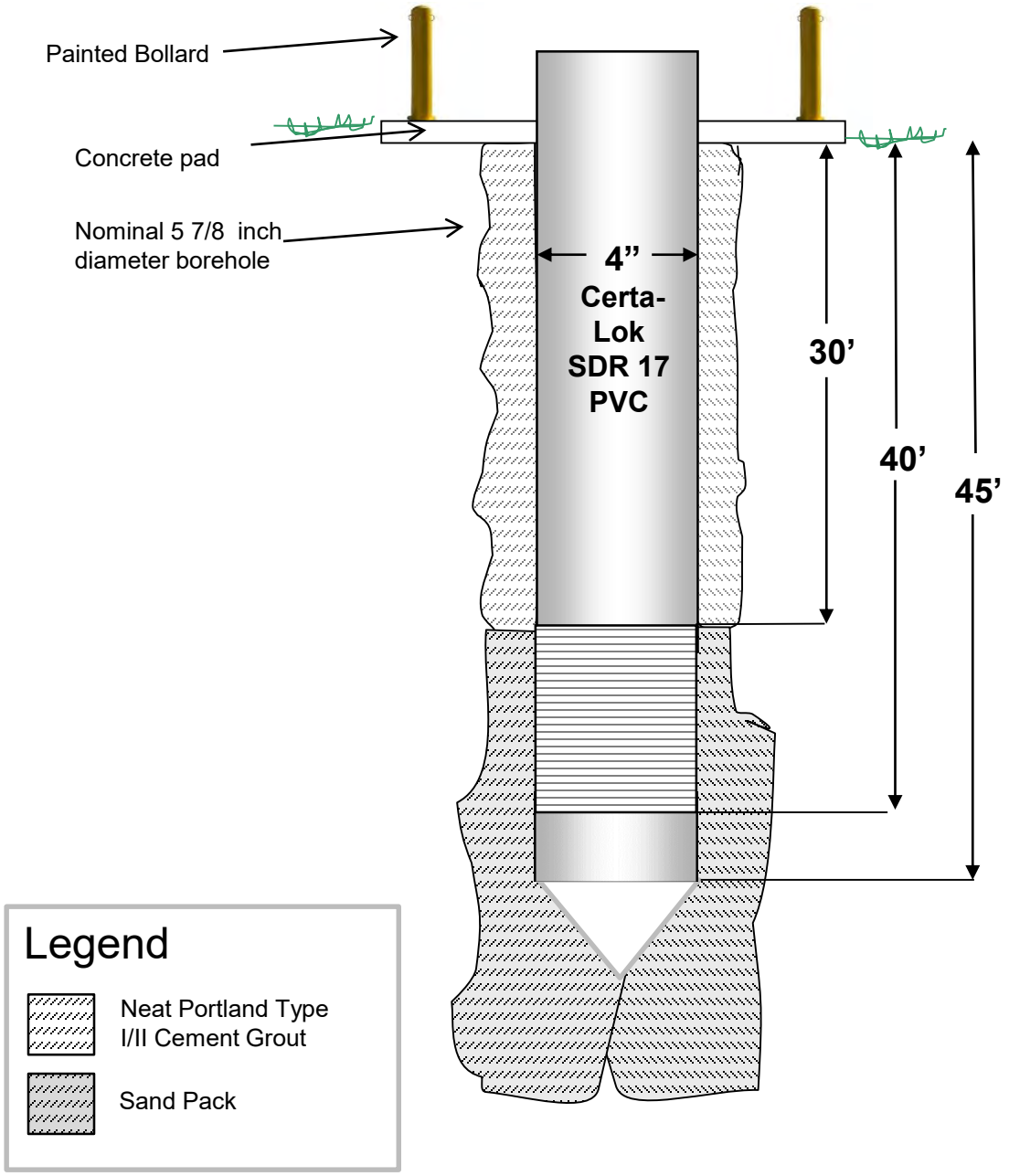
Region II Well Construction and Testing Report for Site A-3

APPENDIX C

AS-BUILT DRAWING OF WELLS



As-Built Well Schematic
A-3: Freeport WWTP
Walton County, Florida



As-Built Well Schematic
A-3b: Freeport WWTP

Walton County, Florida

Region II Well Construction and Testing Report for Site A-3

APPENDIX D

GEOPHYSICAL LOGS

ABS

Advanced Borehole Services

GAMMA RAY (API)-CALIPER
BH-VOLUME
A-3-PILOT

COMPANY	: APPLIED DRILLING ENG	OTHER SERVICES:
WELL	: A-3-PILOT	
FIELD	: FREEPORT	
COUNTY	: BAY	
STATE	: FLORIDA	

LOCATION	:		
SECTION	: None		
TOWNSHIP	: None		
RANGE	: None		
API NO.	:		
UNIQUE WELL ID.	:		
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DRL MEASURED FROM:	NA	ELEVATION GL:	NA
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LOG BOTTOM	: 228.75		
CASING OD	:		
CASING BOTTOM	: 55		
CASING TYPE	: pvc		
BOREHOLE FLUID	: mud		
RM TEMPERATURE	: 0		
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MUD WEIGHT	:		
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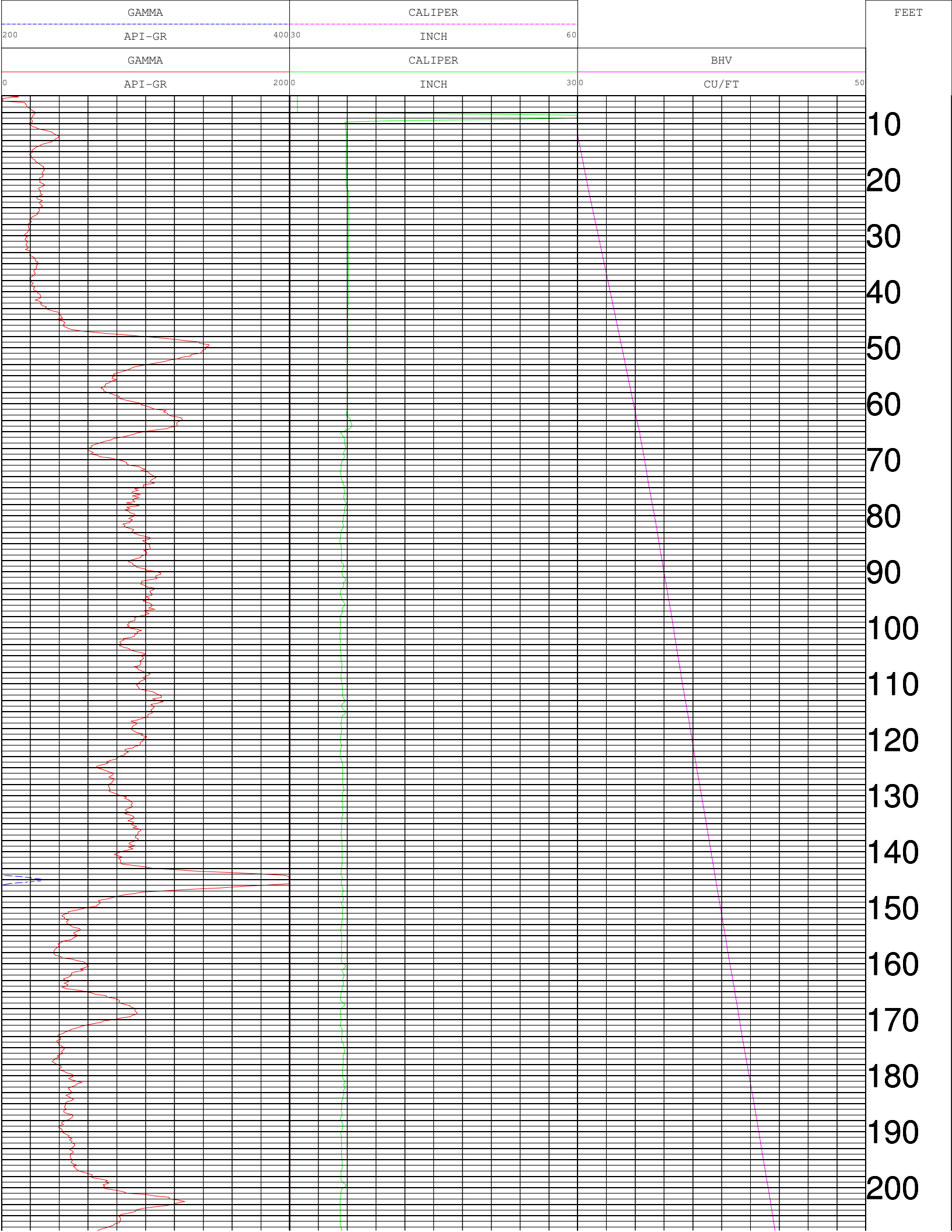
REMARKS 2	:		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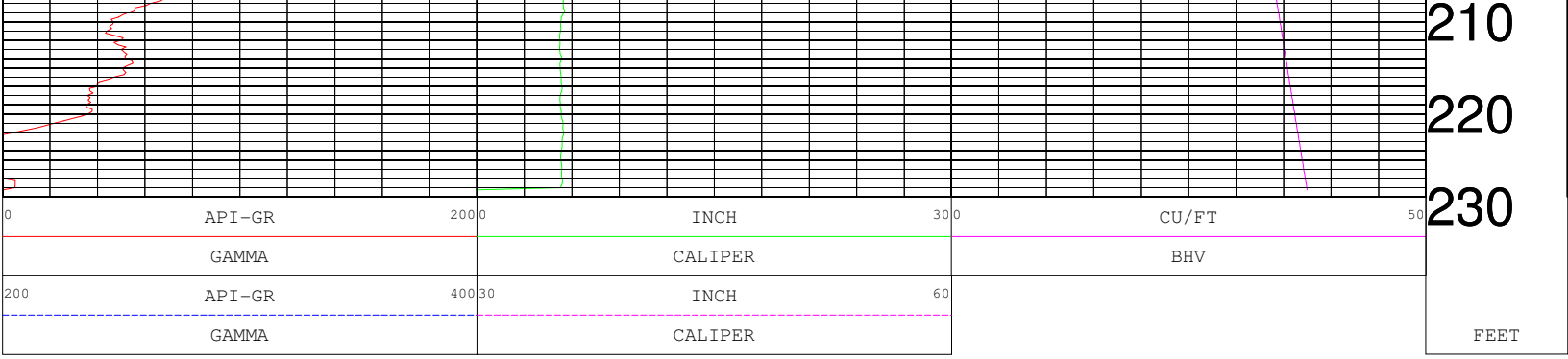
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CALIPER
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SERIAL NUMBER   857

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ABS

Advanced Borehole Services

DUAL INDUCTION-GAMMA RAY

A-3-PILOT

COMPANY	: APPLIED DRILLING ENG	OTHER SERVICES:
WELL	: A-3-PILOT	
FIELD	: FREEPORT	
COUNTY	: BAY	
STATE	: FLORIDA	

LOCATION	:		
SECTION	: None		
TOWNSHIP	: None		
RANGE	: None		
API NO.	:		
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DRL MEASURED FROM:	NA	ELEVATION GL:	NA
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LOG BOTTOM	: 228.75		
CASING OD	:		
CASING BOTTOM	: 55		
CASING TYPE	: pvc		
BOREHOLE FLUID	: mud		
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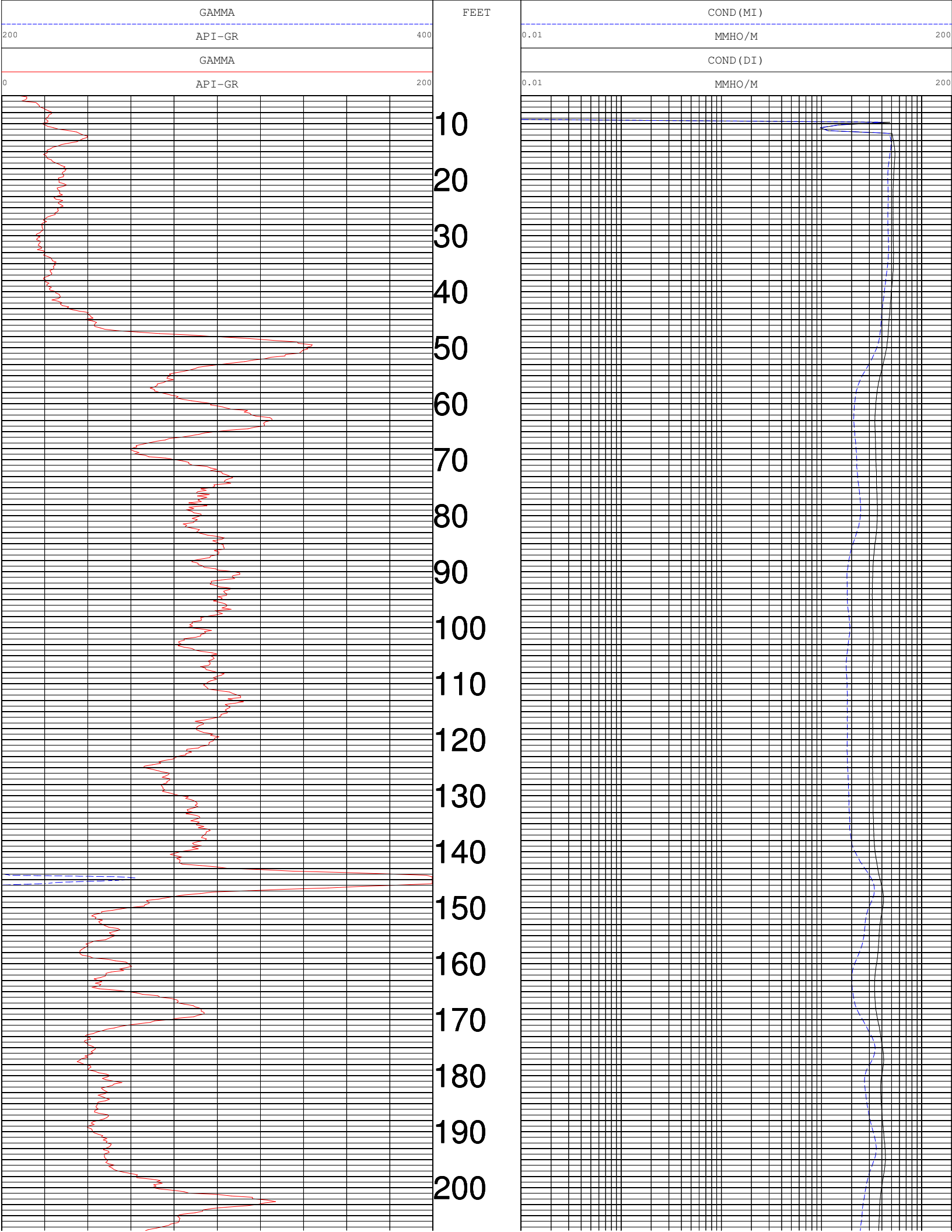
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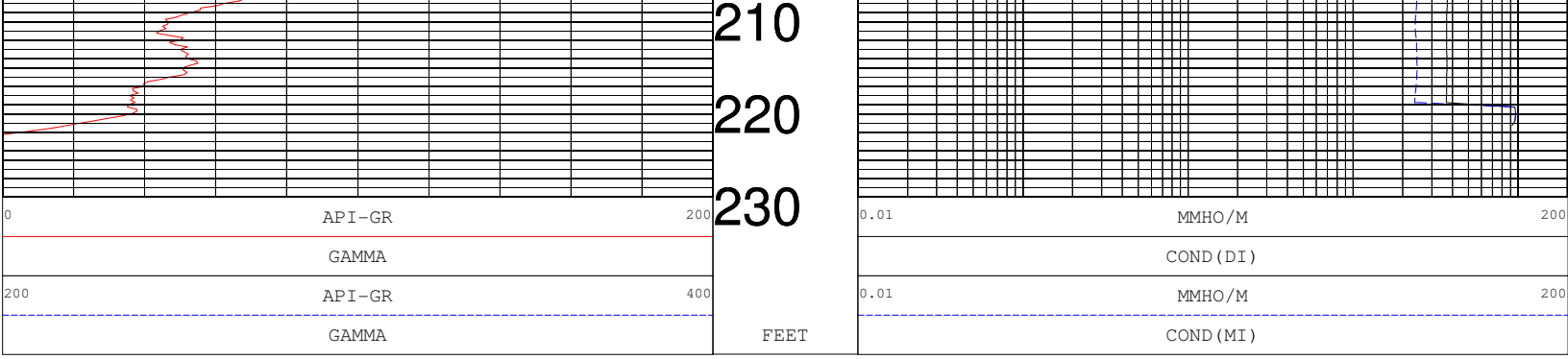

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200	API-GR	400	0.01 MMHO/M 200
	GAMMA	FEET	COND(MI)

ABS

Advanced Borehole Services

GAMMA RAY (API)-CALIPER

WELL A-3

COMPANY	:	APPLIED DRILLING ENGINEERING
WELL	:	WELL A-3
FIELD	:	FREEPORT WTP
COUNTY	:	WALTON
STATE	:	FLORIDA

OTHER SERVICES:
COMPL
DIL
AVL

LOCATION	:			
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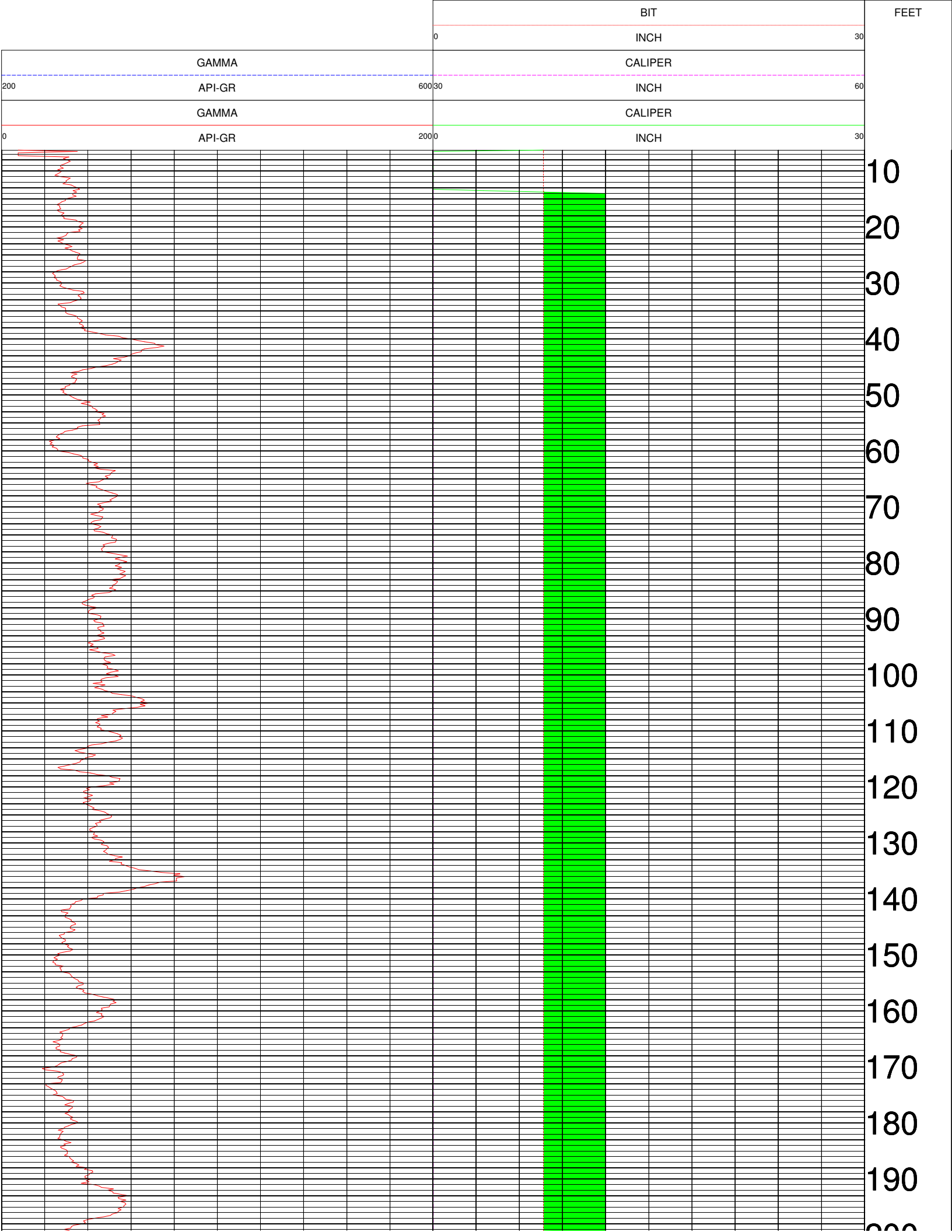
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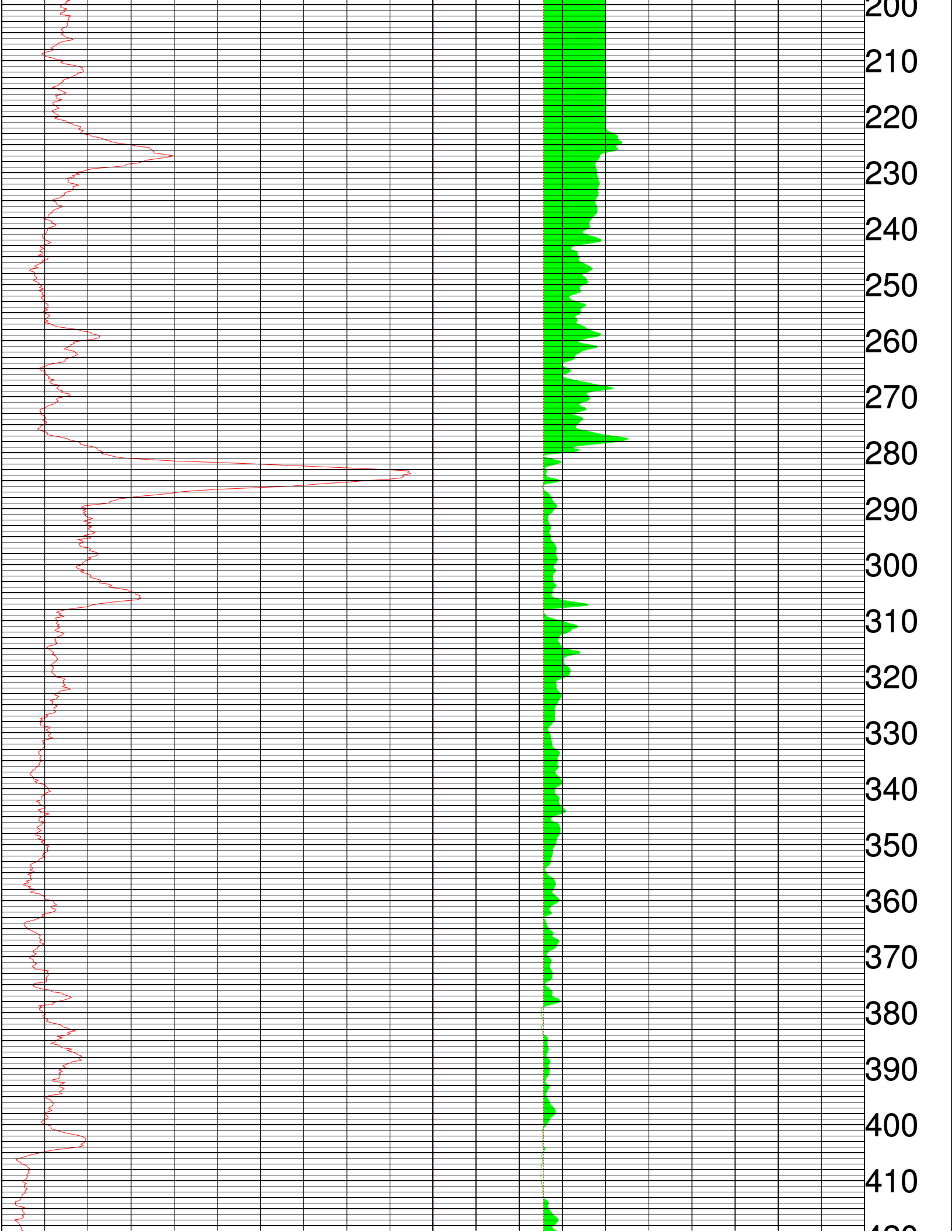
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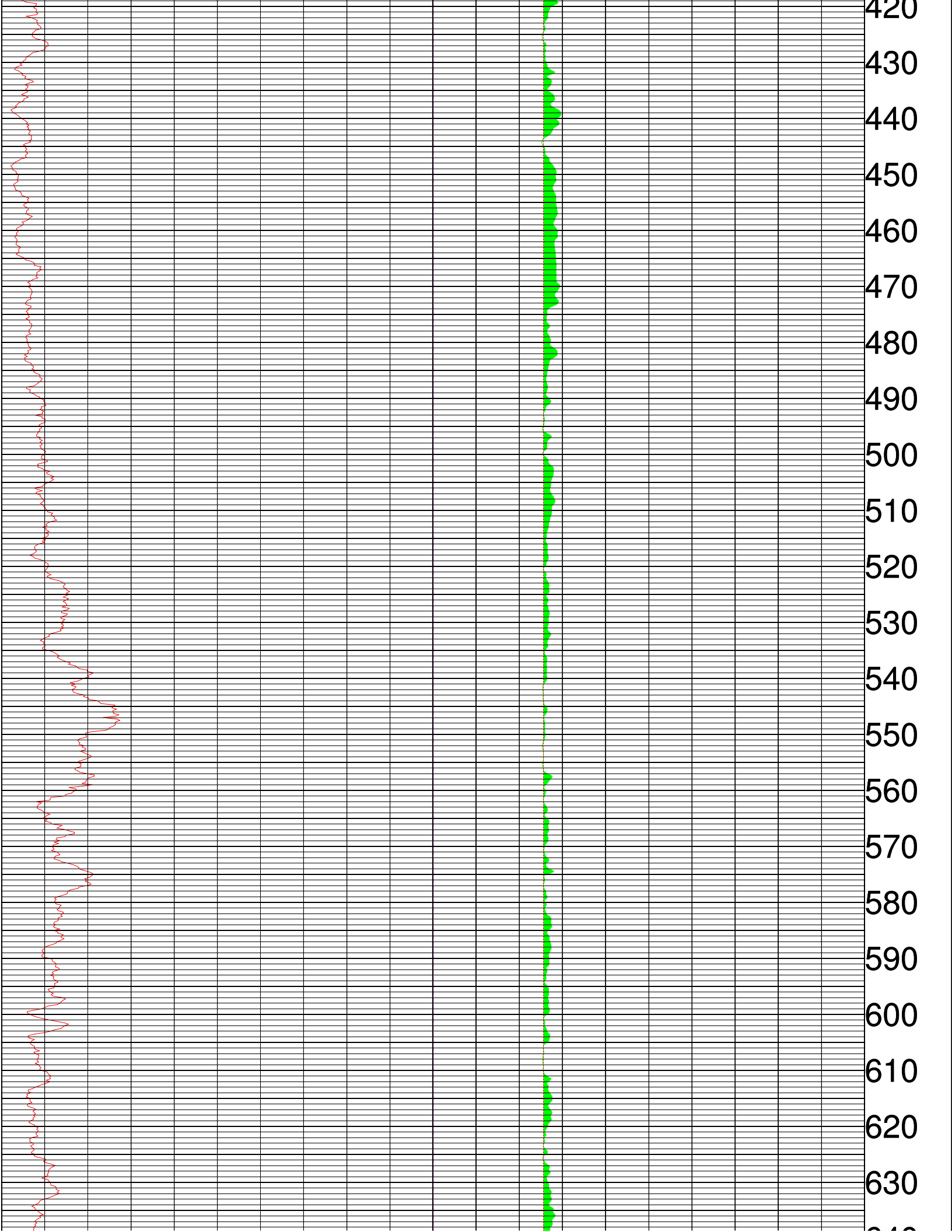
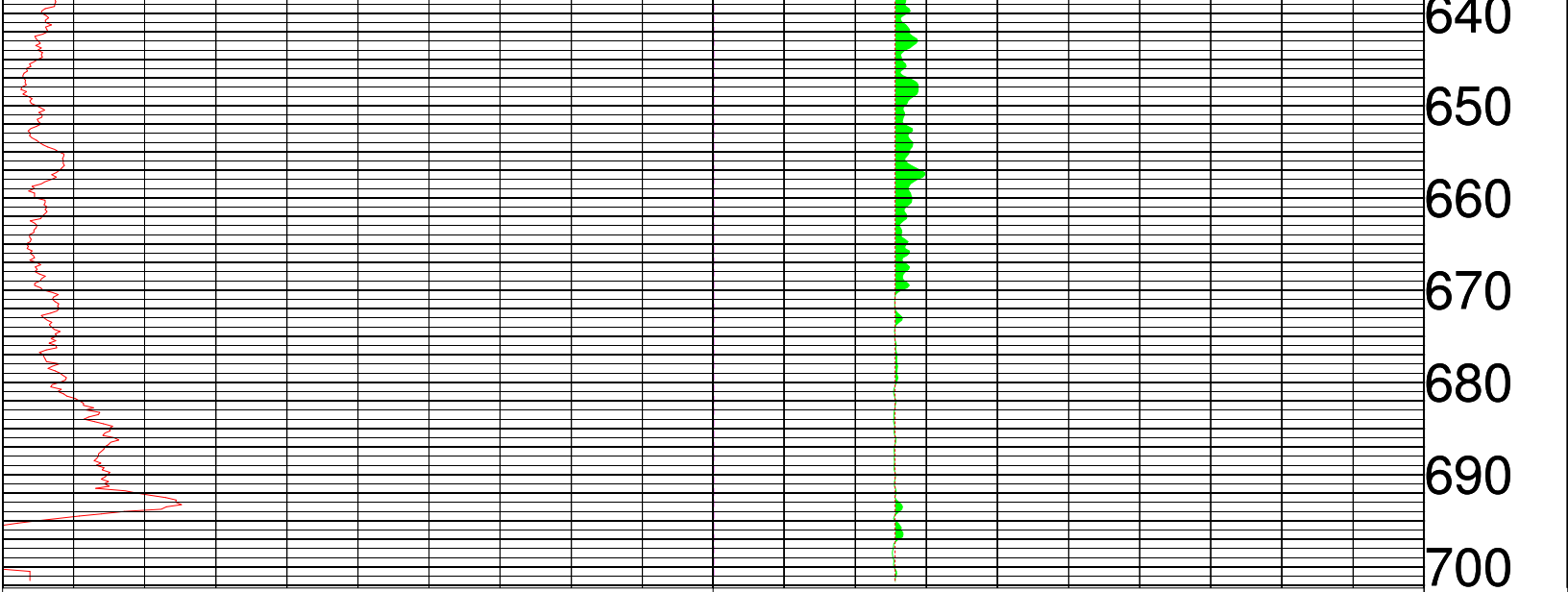
330
340
350
360
370
380
390
400
410


420
430
440
450
460
470
480
490
500
510
520
530
540
550
560
570
580
590
600
610
620
630



0	API-GR	200	0	INCH	30
	GAMMA			CALIPER	
200	API-GR	600	30	INCH	60
	GAMMA			CALIPER	
			0	INCH	30
				BIT	FEET

TOOL CALIBRATION WELL A-3 12/20/16 11:56
TOOL 9074A1 TM VERSION 0
SERIAL NUMBER 857

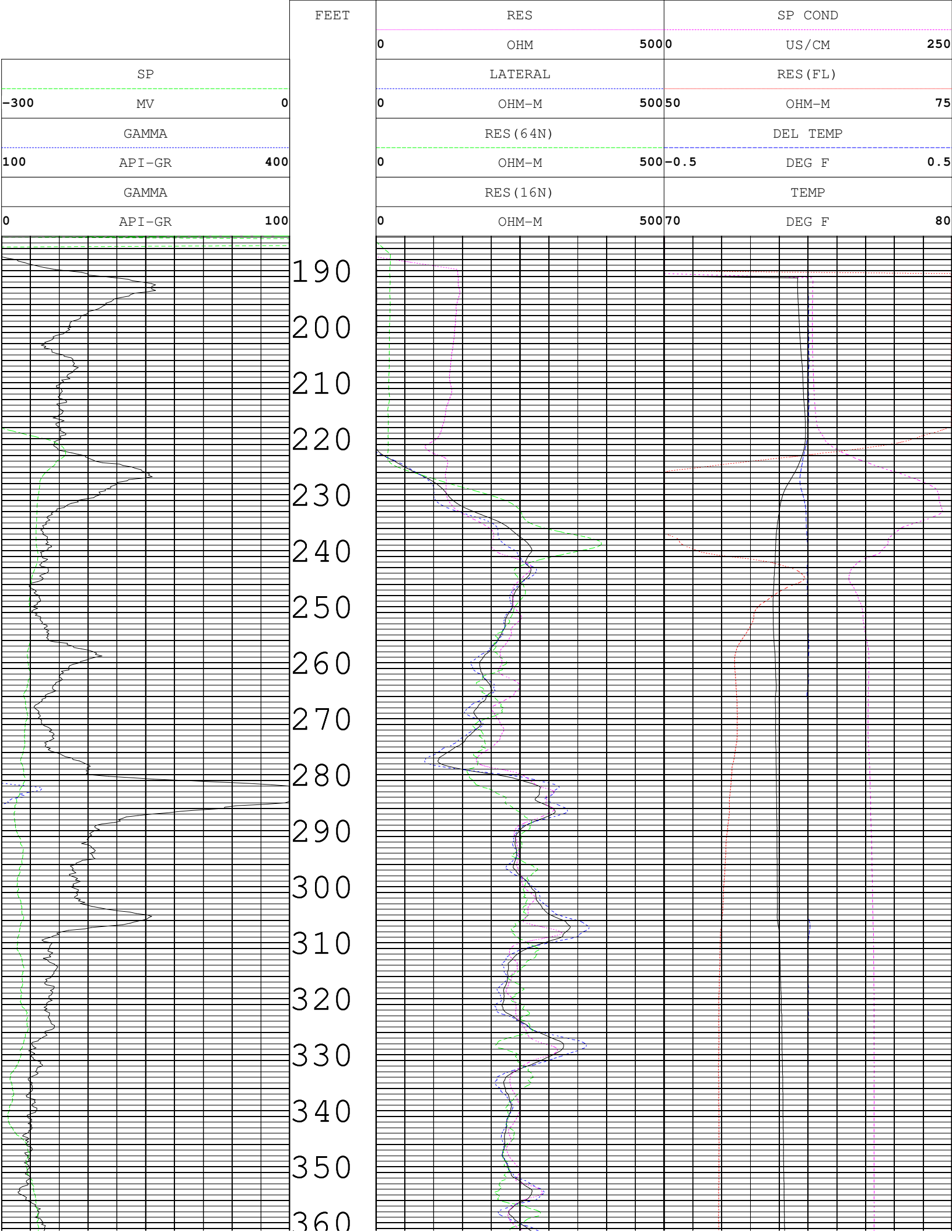
	DATE	TIME	SENSOR	STANDARD		RESPONSE	
1	Jan12,03	07:10:06	GAMMA	Default	[CPS]	Default	[CPS]
	Jan12,03	04:10:06	GAMMA	180.000	[API-GR]	205.00	[CPS]
2	Dec13,00	22:19:45	CALIPER	Default	[CPS]	Default	[CPS]
	Dec13,00	22:19:45	CALIPER	Default	[CPS]	Default	[CPS]
3	Dec14,16	14:45:26	CALIPERL	5.000	[INCH]	152745.00	[CPS]
	Dec14,16	14:45:26	CALIPERL	35.500	[INCH]	85352.00	[CPS]
4	Dec13,00	22:19:45	CALIPERX	Default	[CPS]	Default	[CPS]
	Dec13,00	22:19:45	CALIPERX	Default	[CPS]	Default	[CPS]

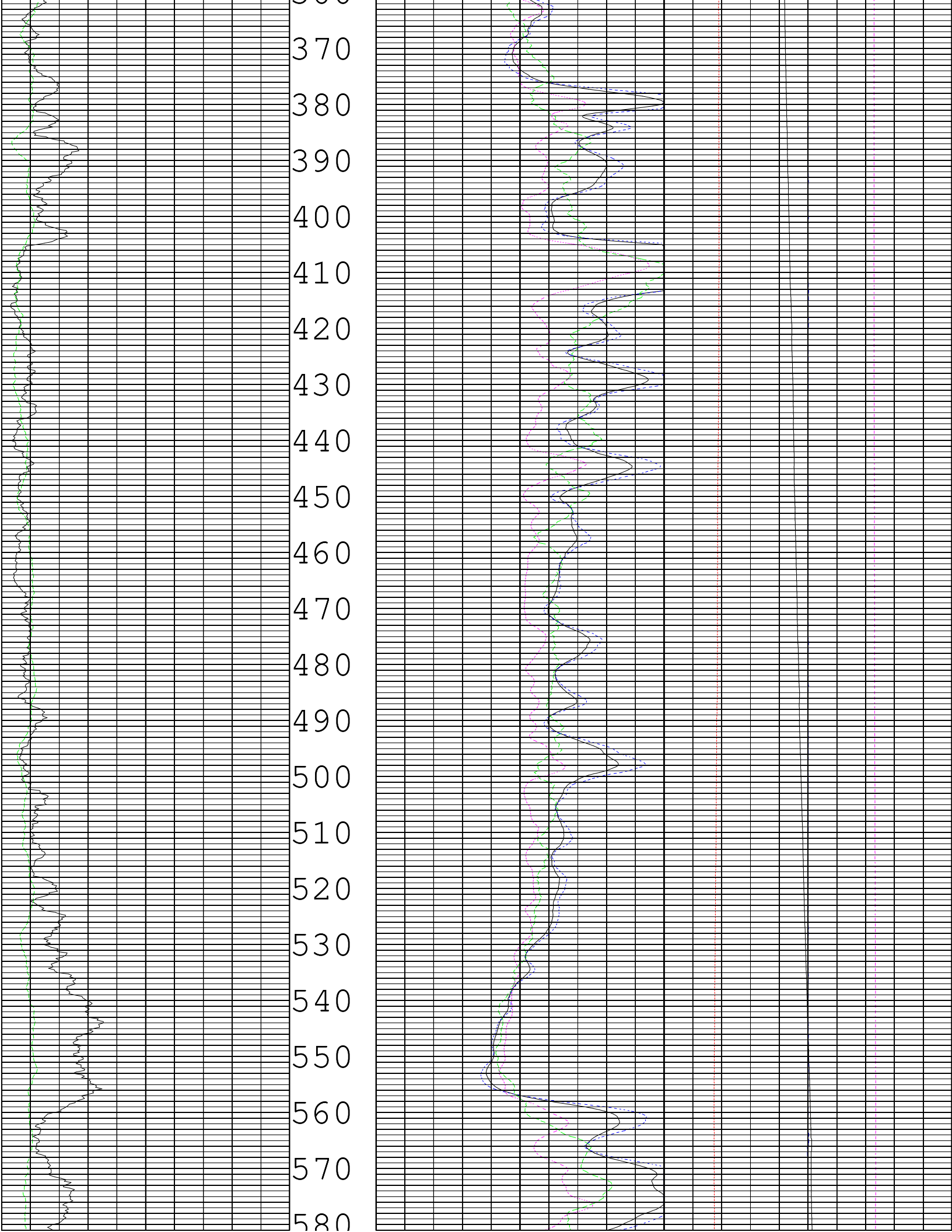
ABS
Advanced Borehole Services

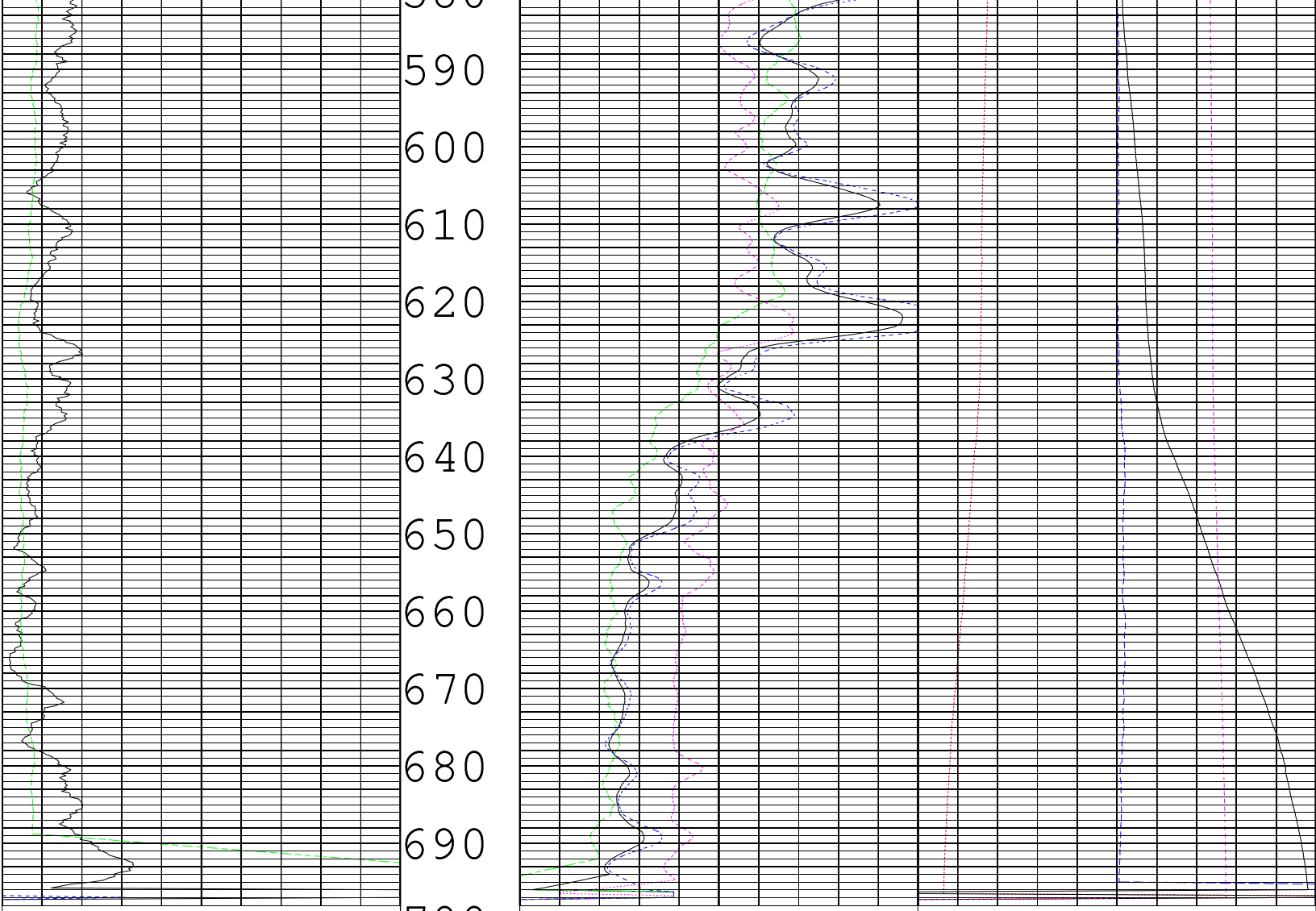
COMBINATION LOG
STATIC WATER QUALITY
WELL A-3

COMPANY	: APPLIED DRILLING ENGINEERING	OTHER SERVICES:
WELL	: WELL A-3	COMPL
FIELD	: FREEPORT WTP	DIL
COUNTY	: WALTON	AVL
STATE	: FLORIDA	

LOCATION	:		
SECTION	: None		
TOWNSHIP	: None		
RANGE	: None		
API NO.	:		
UNIQUE WELL ID.	:		
PERMANENT DATUM	: MSL	ELEVATION KB:	None
LOG MEASURED FROM:	CASE	ELEVATION DF:	NA
DRL MEASURED FROM:	NA	ELEVATION GL:	NA
DATE	: 12/20/16		
DEPTH DRILLER	: 700		
BIT SIZE	: 7.8		
LOG TOP	: 183.75		
LOG BOTTOM	: 697.75		
CASING OD	:		
CASING BOTTOM	: 240		
CASING TYPE	: STEEL		
BOREHOLE FLUID	: MUD		
RM TEMPERATURE	: 0		
MUD RES	: 0		
MUD WEIGHT	:		
WITNESSED BY	:		
RECORDED BY	: AFB		
REMARKS 1	:		
REMARKS 2	:		


FEET
SP
-300 MV 0
GAMMA
100 API-GR 400
GAMMA
0 API-GR 100
RES
0 OHM 500
LATERAL
0 OHM-M 500
RES(64N)
0 OHM-M 500
RES(16N)
0 OHM-M 500
SP COND
0 US/CM 250
RES(FL)
50 OHM-M 75
DEL TEMP
-0.5 DEG F 0.5
TEMP
70 DEG F 80
190
200
210
220
230
240
250
260
270
280
290
300
310
320
330
340
350
360


370
380
390
400
410
420
430
440
450
460
470
480
490
500
510
520
530
540
550
560
570
580



0	API-GR	100	0	OHM-M	500	70	DEG F	80
	GAMMA			RES(16N)			TEMP	
100	API-GR	400	0	OHM-M	500	-0.5	DEG F	0.5
	GAMMA			RES(64N)			DEL TEMP	
-300	MV	0	0	OHM-M	500	50	OHM-M	75
	SP			LATERAL			RES(FL)	
			0	OHM	500	0	US/CM	250
	FEET			RES			SP COND	

TOOL CALIBRATION WELL A-3 12/20/16 12:35
TOOL 8044A TM VERSION 0
SERIAL NUMBER 938

	DATE	TIME	SENSOR	STANDARD		RESPONSE	
1	Jan03,03	10:49:05	GAMMA	0.001	[API-GR]	0.00	[CPS]
	Jan03,03	07:49:05	GAMMA	180.000	[API-GR]	169.00	[CPS]
2	Nov03,16	17:41:12	RES(FL	41.600	[OHM-M]	54104.00	[CPS]
	Nov03,16	17:41:12	RES(FL	1.980	[OHM-M]	13283.00	[CPS]
3	Aug17,14	17:00:23	SP	0.000	[MV]	59670.00	[CPS]
	Aug17,14	17:00:23	SP	395.000	[MV]	23612.00	[CPS]
4	Aug17,14	15:38:06	RES(16	0.000	[OHM-M]	4284.00	[CPS]
	Aug17,14	15:38:06	RES(16	1996.000	[OHM-M]	103525.00	[CPS]
5	Aug17,14	15:38:38	RES(64	0.000	[OHM-M]	4160.00	[CPS]
	Aug17,14	15:38:38	RES(64	1990.000	[OHM-M]	102789.00	[CPS]
6	Aug17,14	17:19:05	TEMP	71.700	[DEG F]	63355.00	[CPS]
	Aug17,14	17:19:05	TEMP	81.500	[DEG F]	58740.00	[CPS]
7	Aug17,14	15:39:11	RES	0.000	[OHM]	9855.00	[CPS]
	Aug17,14	15:39:11	RES	988.000	[OHM]	58788.00	[CPS]

ABS

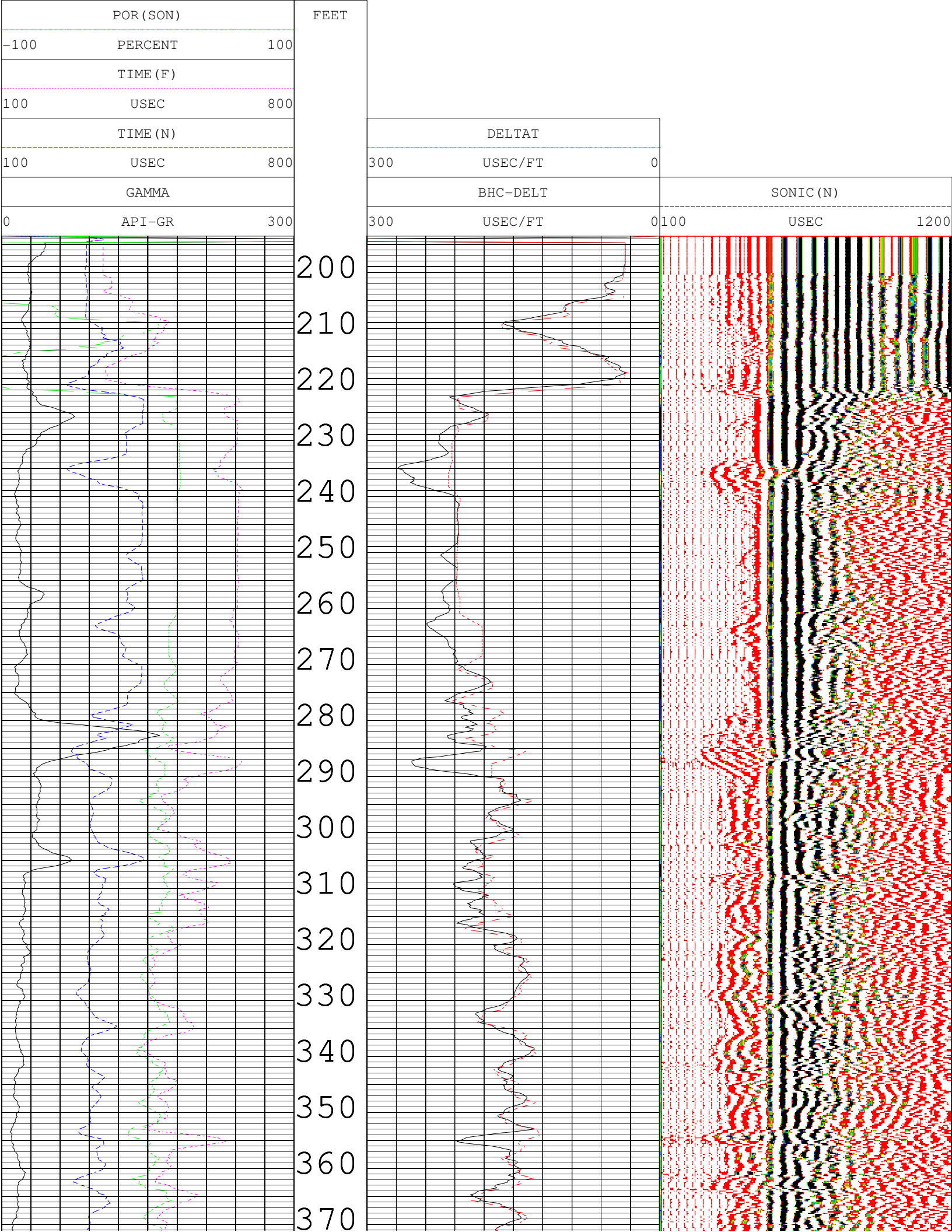
Advanced Borehole Services

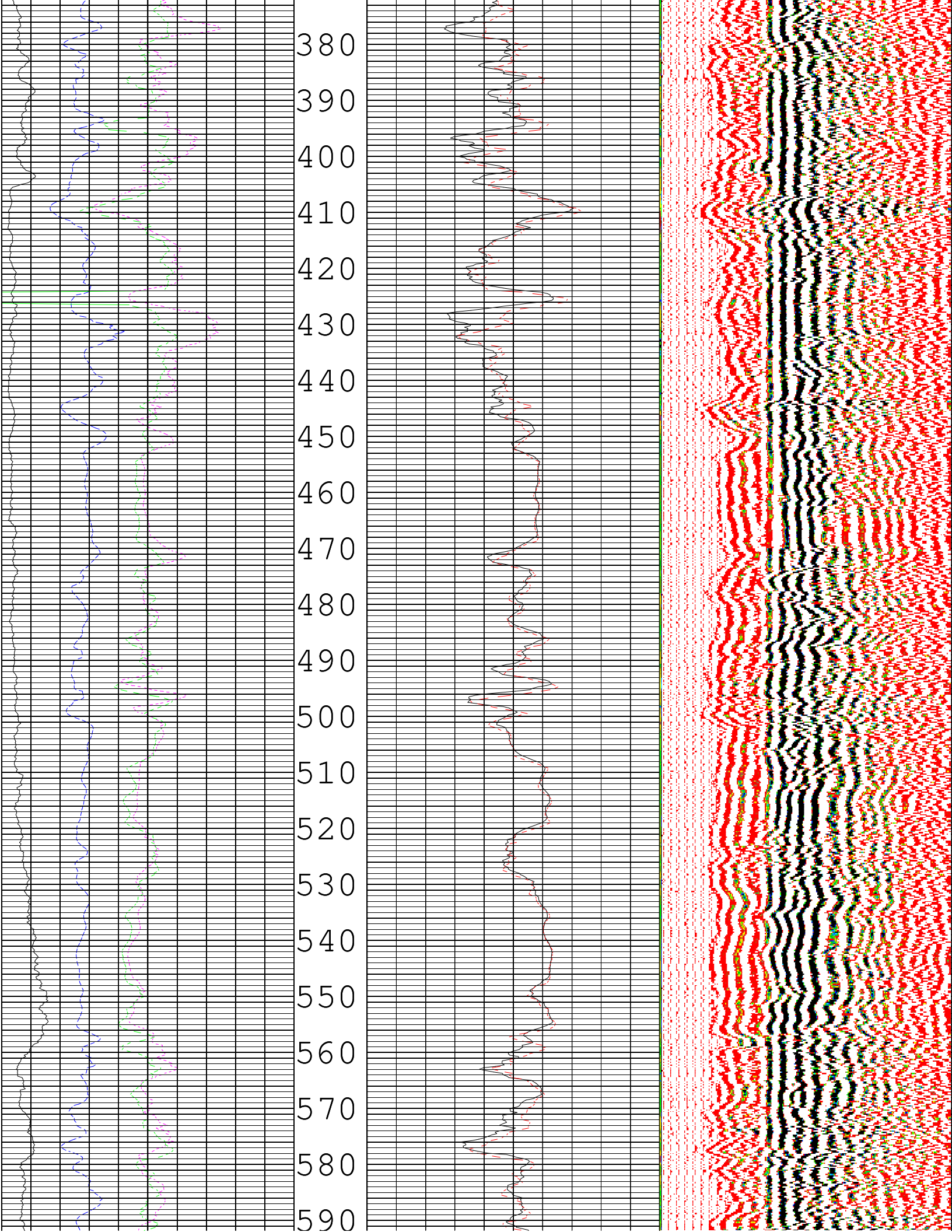
FULL WAVE BHC ACOUSTIC-VDL

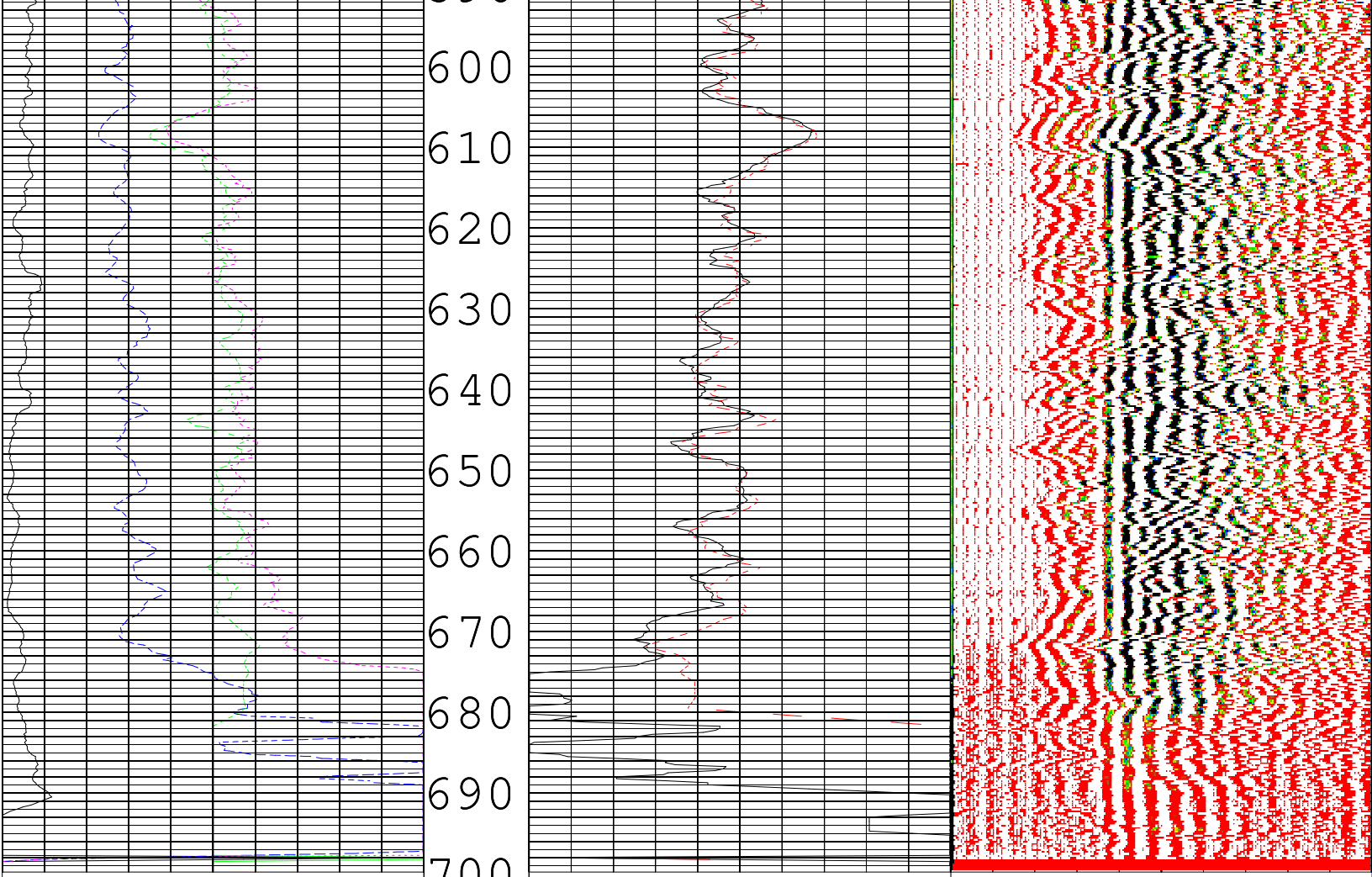
WELL A-3

COMPANY	: APPLIED DRILLING ENGINEERING	OTHER SERVICES:
WELL	: WELL A-3	COMPL
FIELD	: FREEPORT WTP	DIL
COUNTY	: WALTON	AVL
STATE	: FLORIDA	

LOCATION	:		
SECTION	: None		
TOWNSHIP	: None		
RANGE	: None		
API NO.	:		
UNIQUE WELL ID.	:		
PERMANENT DATUM	: MSL	ELEVATION KB:	None
LOG MEASURED FROM:	CASE	ELEVATION DF:	NA
DRL MEASURED FROM:	NA	ELEVATION GL:	NA
DATE	: 12/20/16		
DEPTH DRILLER	: 700		
BIT SIZE	: 7.8		
LOG TOP	: 194.50		
LOG BOTTOM	: 699.50		
CASING OD	:		
CASING BOTTOM	: 240		
CASING TYPE	: STEEL		
BOREHOLE FLUID	: MUD		
RM TEMPERATURE	: 0		
MUD RES	: 0		
MUD WEIGHT	:		
WITNESSED BY	:		
RECORDED BY	: AFB		
REMARKS 1	:		
REMARKS 2	:		


POR(SON)
FEET
-100
PERCENT
100
TIME(F)
100
USEC
800
TIME(N)
100
USEC
800
GAMMA
0
API-GR
300
DELTAT
300
USEC/FT
0
BHC-DELT
300
USEC/FT
0
SONIC(N)
100
USEC
1200
200
210
220
230
240
250
260
270
280
290
300
310
320
330
340
350
360
370


380
390
400
410
420
430
440
450
460
470
480
490
500
510
520
530
540
550
560
570
580
590



0	API-GR	300	300	USEC/FT	0	100	USEC	1200
GAMMA			BHC-DELT			SONIC(N)		
100	USEC	800	300	USEC/FT	0			
TIME(N)			DELTAT					
100	USEC	800						
TIME(F)								
-100	PERCENT	100						
POR(SON)								

FEET

TOOL CALIBRATION WELL A-3 12/20/16 15:31
TOOL 9320A2 TM VERSION 0
SERIAL NUMBER 667

	DATE	TIME	SENSOR	STANDARD		RESPONSE	
1	Apr12,99	23:12:30	GAMMA	Default	[CPS]	Default	[CPS]
	Apr12,99	20:12:30	GAMMA	Default	[CPS]	Default	[CPS]

ABS

Advanced Borehole Services

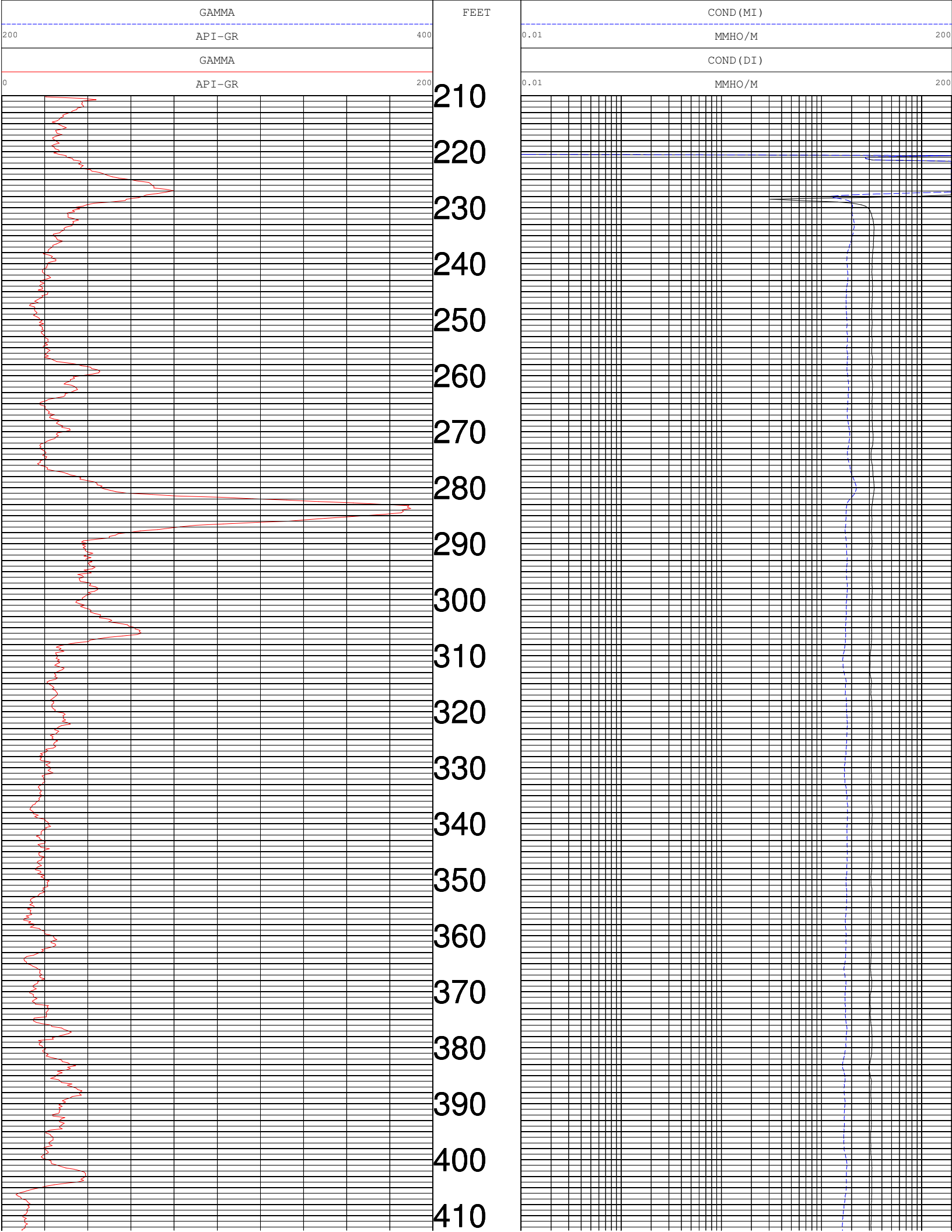
DUAL INDUCTION-GAMMA RAY

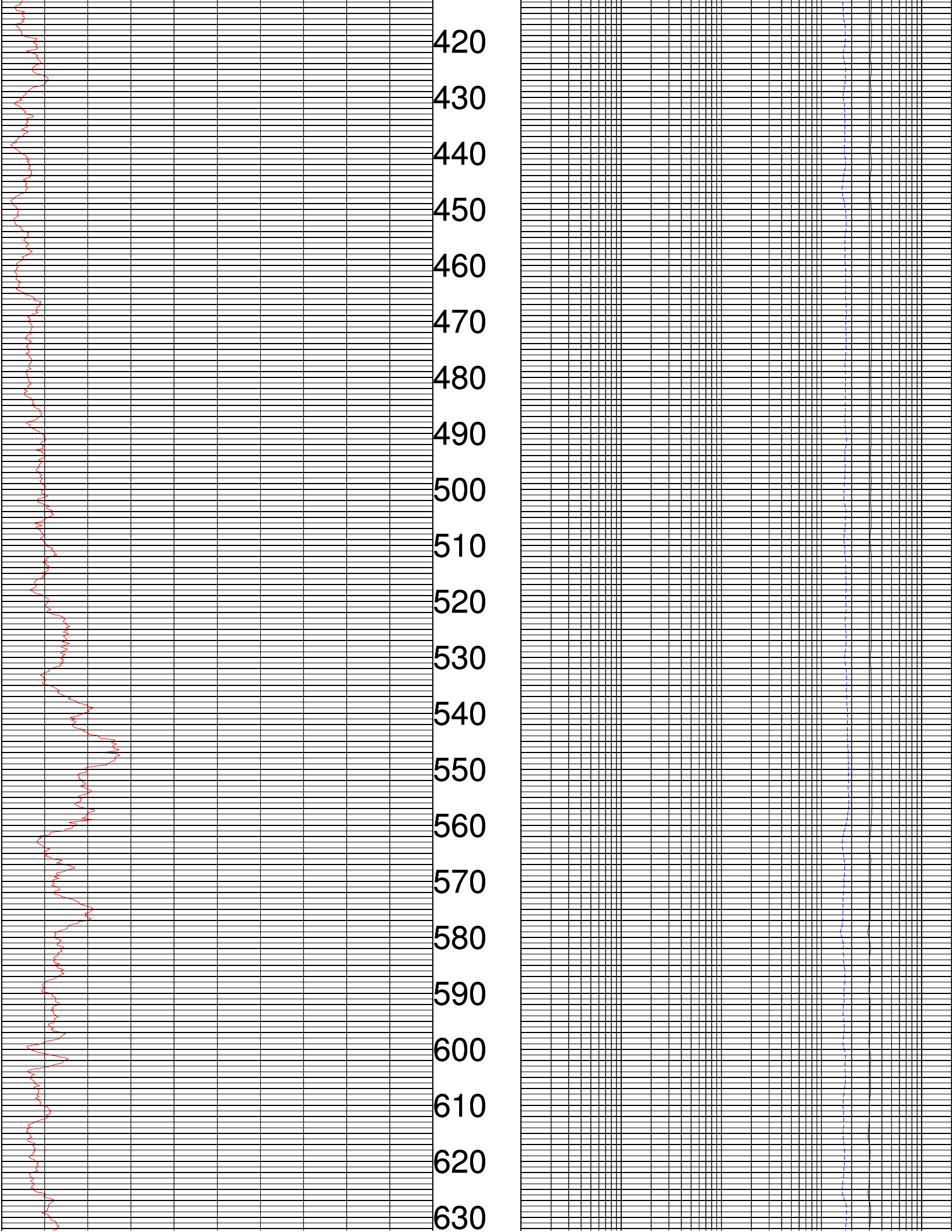
WELL A-3

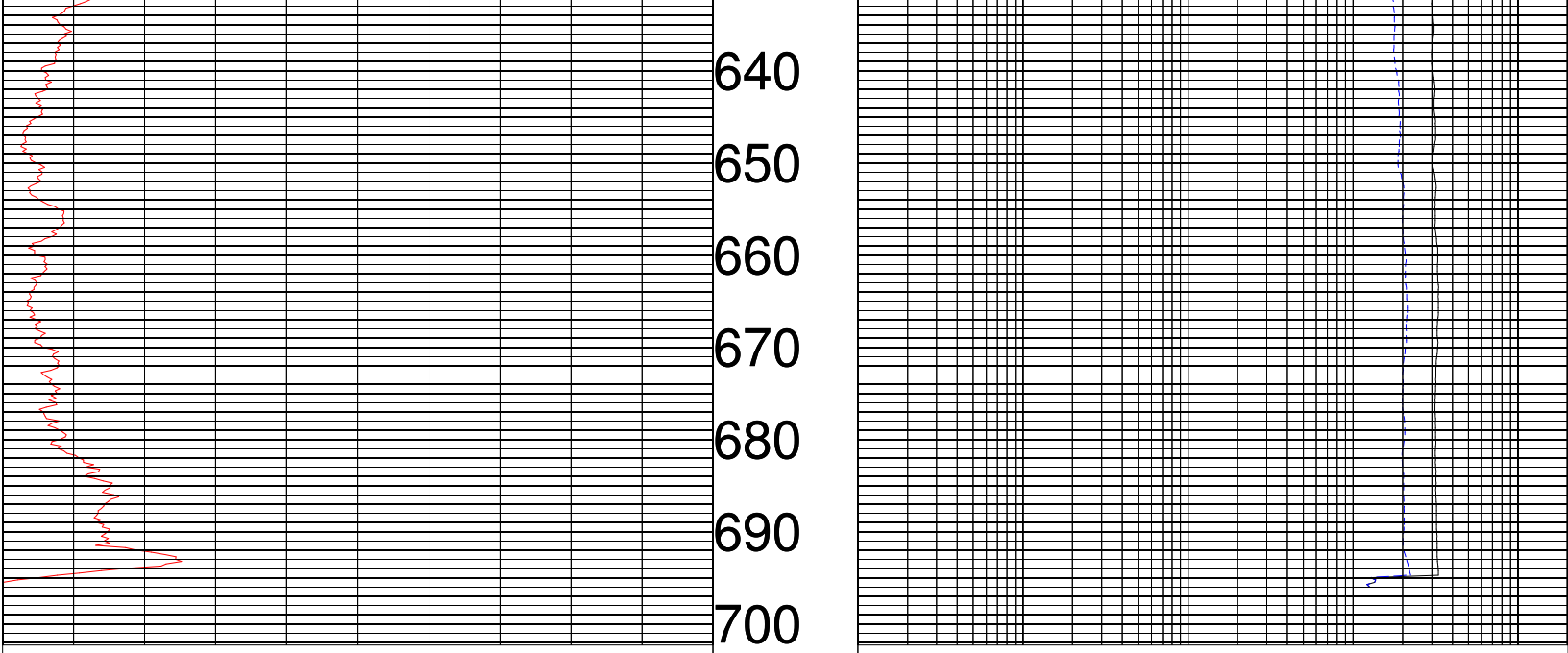
COMPANY	:	APPLIED DRILLING ENGINEERING
WELL	:	WELL A-3
FIELD	:	FREEPORT WTP
COUNTY	:	WALTON
STATE	:	FLORIDA

OTHER SERVICES:
COMPL
DIL
AVL

LOCATION	:			
SECTION	:	None		
TOWNSHIP	:	None		
RANGE	:	None		
API NO.	:			
UNIQUE WELL ID.	:			
PERMANENT DATUM	:	MSL	ELEVATION KB:	None
LOG MEASURED FROM:		CASE	ELEVATION DF:	NA
DRL MEASURED FROM:		NA	ELEVATION GL:	NA
DATE	:	12/20/16		
DEPTH DRILLER	:	700		
BIT SIZE	:	7.8		
LOG TOP	:	6.25		
LOG BOTTOM	:	702.00		
CASING OD	:			
CASING BOTTOM	:	240		
CASING TYPE	:	STEEL		
BOREHOLE FLUID	:	MUD		
RM TEMPERATURE	:	0		
MUD RES	:	0		
MUD WEIGHT	:			
WITNESSED BY	:			
RECORDED BY	:	AFB		
REMARKS 1	:			
REMARKS 2	:			


GAMMA
200
API-GR
400
GAMMA
0
API-GR
200
FEET
210
220
230
240
250
260
270
280
290
300
310
320
330
340
350
360
370
380
390
400
410
COND(MI)
0.01
MMHO/M
200
COND(DI)
0.01
MMHO/M
200


420
430
440
450
460
470
480
490
500
510
520
530
540
550
560
570
580
590
600
610
620
630



0	API-GR	200		0.01	MMHO/M	200
	GAMMA				COND(DI)	
200	API-GR	400		0.01	MMHO/M	200
	GAMMA		FEET		COND(MI)	

ABS
Advanced Borehole Services

PUMPING WATER QUALITY

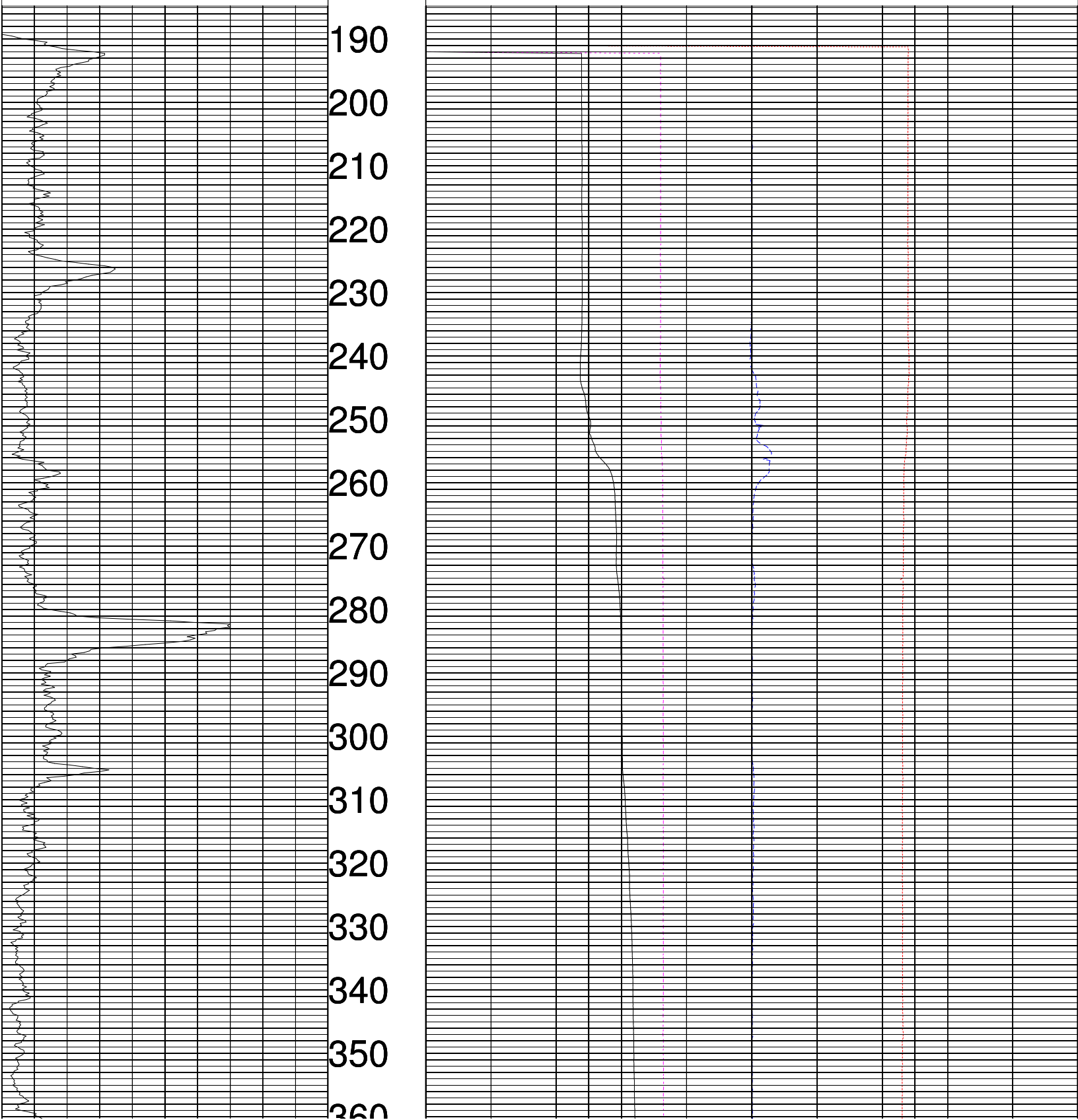
WELL A-3

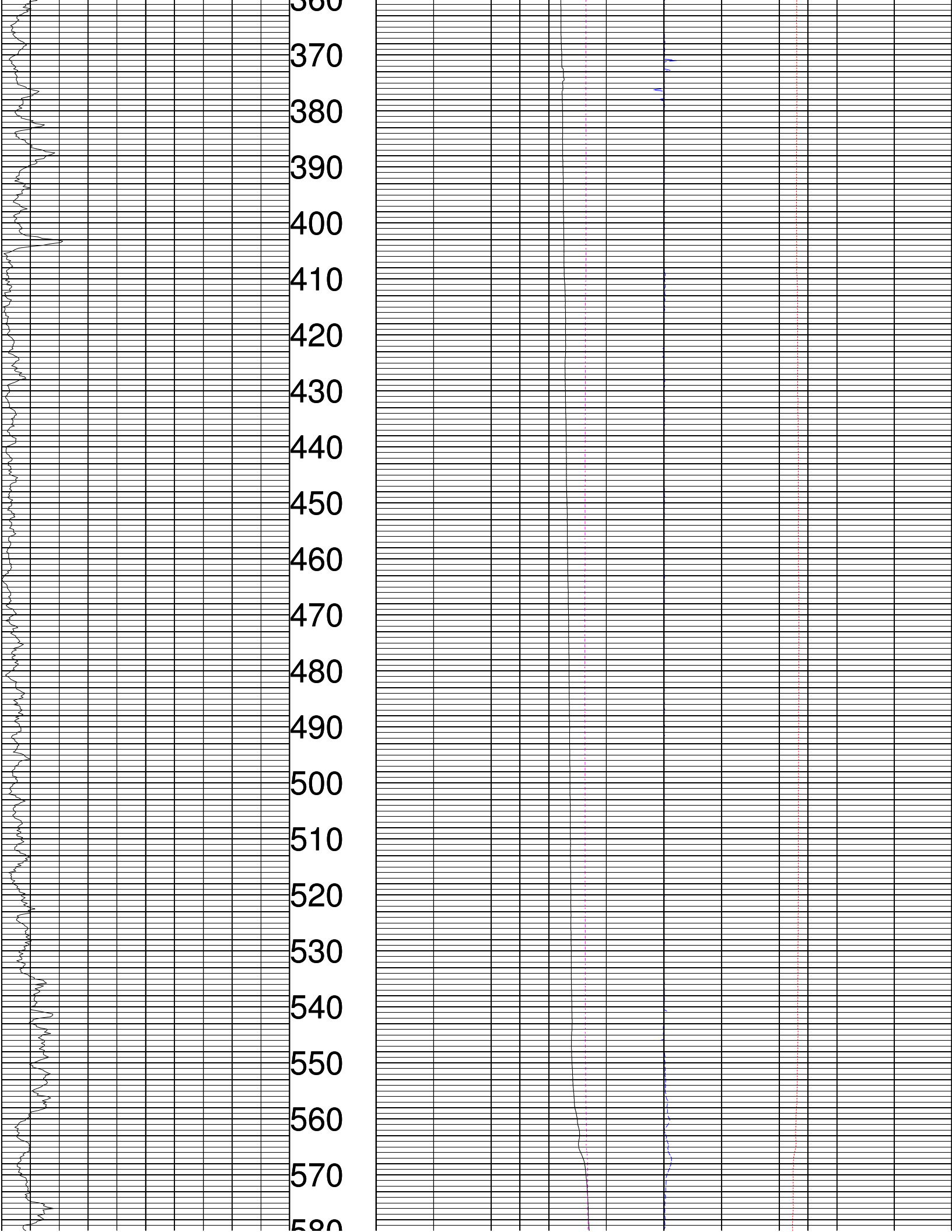
COMPANY	:	APPLIED DRILLING ENGINEERING
WELL	:	WELL A-3
FIELD	:	FREEPORT WTP
COUNTY	:	WALTON
STATE	:	FLORIDA

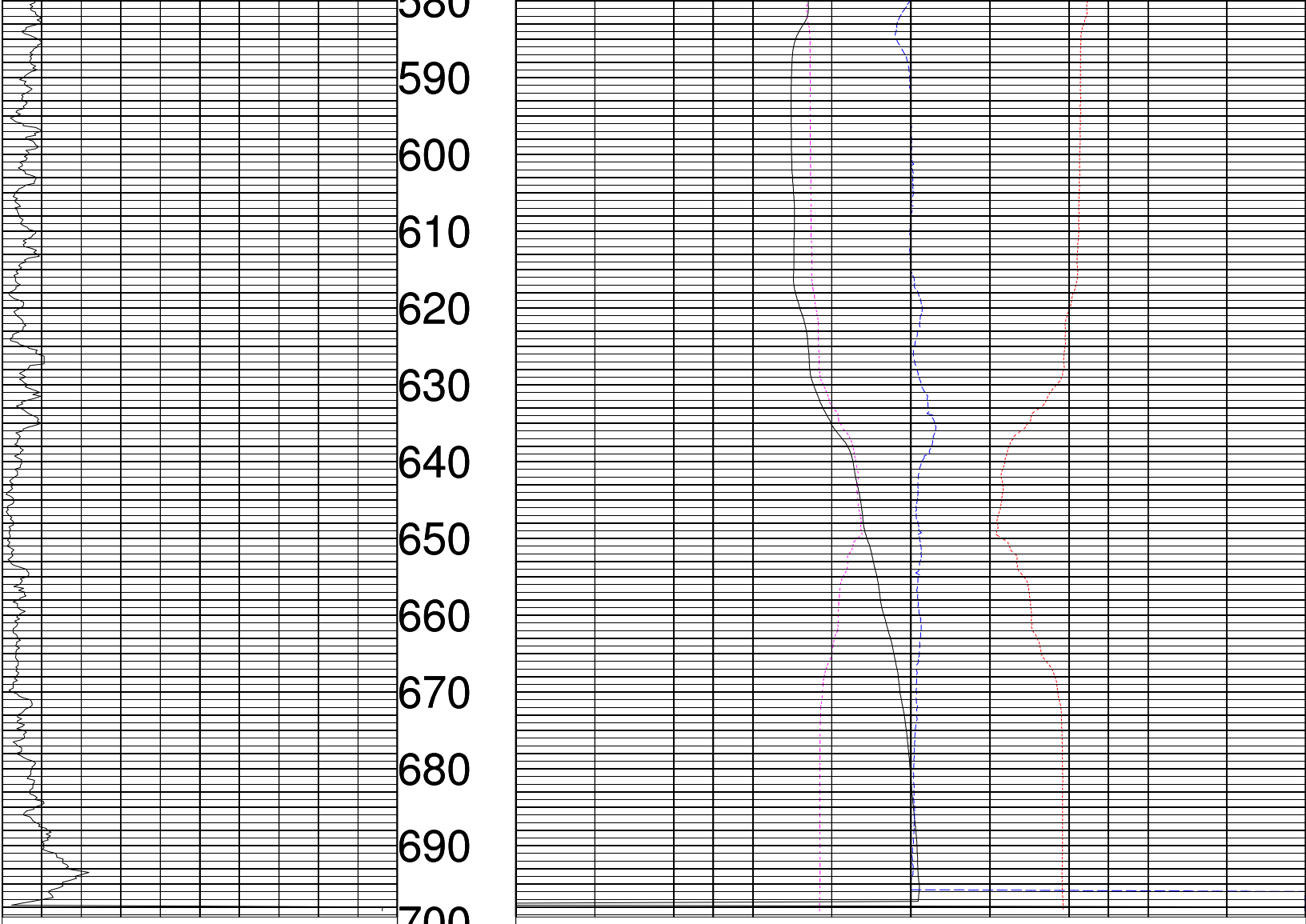
OTHER SERVICES:
COMPL
DIL
AVL

LOCATION	:			
SECTION	:	None		
TOWNSHIP	:	None		
RANGE	:	None		
API NO.	:			
UNIQUE WELL ID.	:			
PERMANENT DATUM	:	MSL	ELEVATION KB:	None
LOG MEASURED FROM:		CASE	ELEVATION DF:	NA
DRL MEASURED FROM:		NA	ELEVATION GL:	NA
DATE	:	12/20/16		
DEPTH DRILLER	:	700		
BIT SIZE	:	7.8		
LOG TOP	:	184.75		
LOG BOTTOM	:	699.00		
CASING OD	:			
CASING BOTTOM	:	240		
CASING TYPE	:	STEEL		
BOREHOLE FLUID	:	MUD		
RM TEMPERATURE	:	0		
MUD RES	:	0		
MUD WEIGHT	:			
WITNESSED BY	:			
RECORDED BY	:	AFB		
REMARKS 1	:			
REMARKS 2	:			

	FEET	
		SP COND
		0 US/CM 500
COMMENTS1		RES(FL)
		0 OHM-M 75
GAMMA		DEL TEMP
200 API-GR 400		-0.5 DEG F 0.5
GAMMA		TEMP
0 API-GR 200		70 DEG F 90




360
370
380
390
400
410
420
430
440
450
460
470
480
490
500
510
520
530
540
550
560
570
580



0	API-GR	200
	GAMMA	
200	API-GR	400
	GAMMA	
	COMMENTS1	

70	DEG F	90
	TEMP	
-0.5	DEG F	0.5
	DEL TEMP	
0	OHM-M	75
	RES(FL)	
0	US/CM	500
	SP COND	

FEET

TOOL CALIBRATION WELL A-3 12/20/16 14:57
TOOL 8044A TM VERSION 0
SERIAL NUMBER 938

	DATE	TIME	SENSOR	STANDARD		RESPONSE	
1	Jan03,03	10:49:05	GAMMA	0.001	[API-GR]	0.00	[CPS]
	Jan03,03	07:49:05	GAMMA	180.000	[API-GR]	169.00	[CPS]
2	Nov03,16	17:41:12	RES(FL)	41.600	[OHM-M]	54104.00	[CPS]
	Nov03,16	17:41:12	RES(FL)	1.980	[OHM-M]	13283.00	[CPS]
3	Aug17,14	17:00:23	SP	0.000	[MV]	59670.00	[CPS]
	Aug17,14	17:00:23	SP	395.000	[MV]	23612.00	[CPS]
4	Aug17,14	15:38:06	RES(16N)	0.000	[OHM-M]	4284.00	[CPS]
	Aug17,14	15:38:06	RES(16N)	1996.000	[OHM-M]	103525.00	[CPS]
5	Aug17,14	15:38:38	RES(64N)	0.000	[OHM-M]	4160.00	[CPS]
	Aug17,14	15:38:38	RES(64N)	1990.000	[OHM-M]	102789.00	[CPS]
6	Aug17,14	17:19:05	TEMP	71.700	[DEG F]	63355.00	[CPS]
	Aug17,14	17:19:05	TEMP	81.500	[DEG F]	58740.00	[CPS]
7	Aug17,14	15:39:11	RES	0.000	[OHM]	9855.00	[CPS]
	Aug17,14	15:39:11	RES	988.000	[OHM]	58788.00	[CPS]

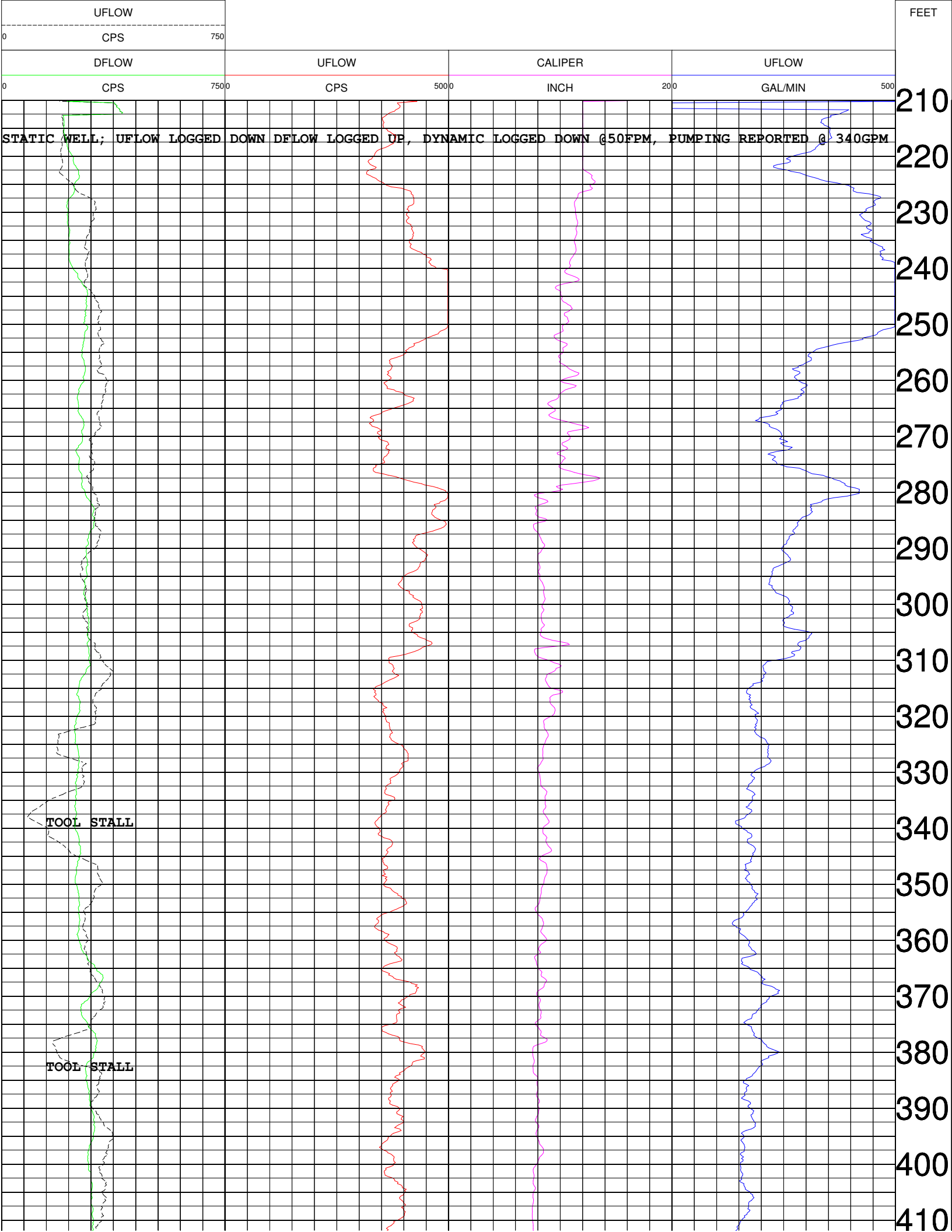
ABS
Advanced Borehole Services

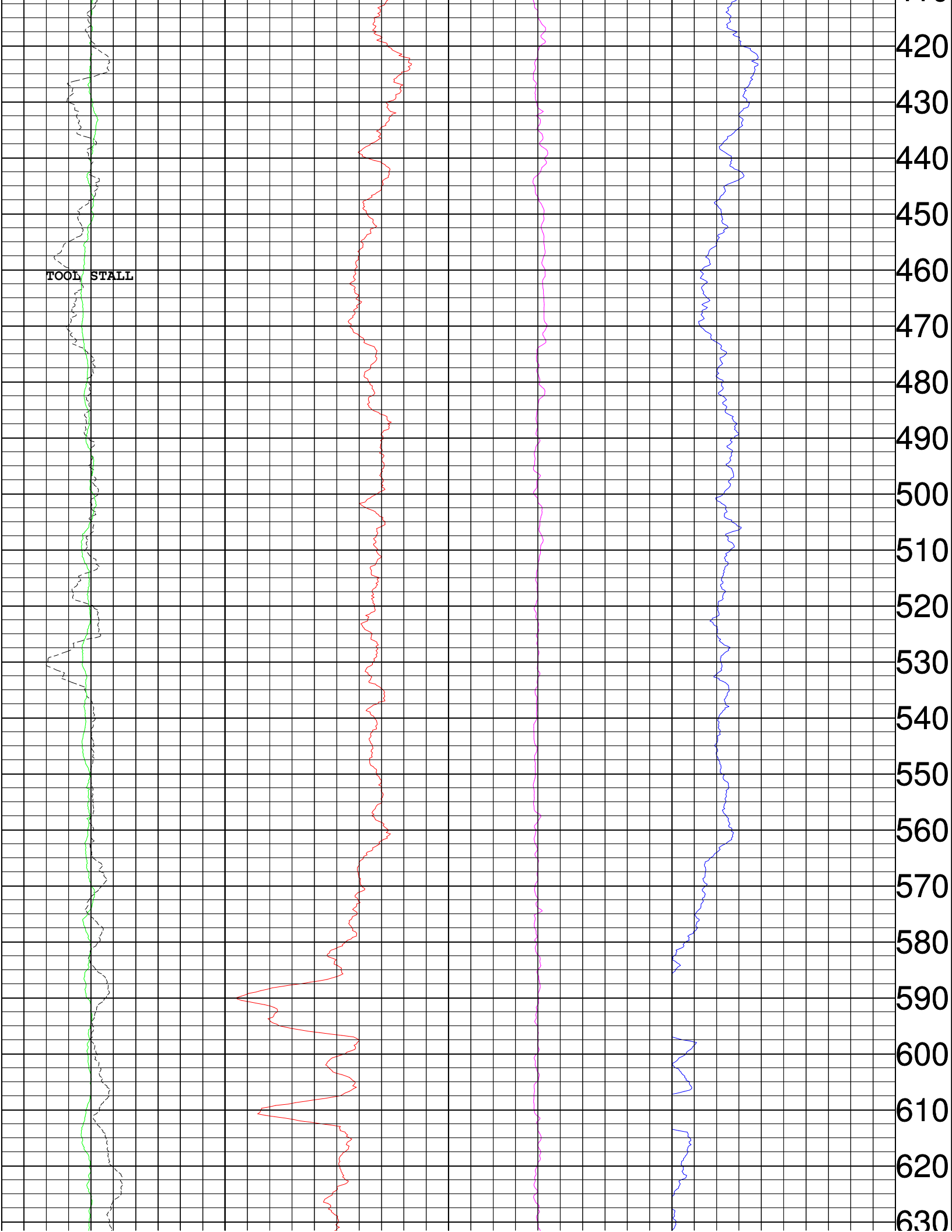
PRODUCTION-STATIC-PUMPING

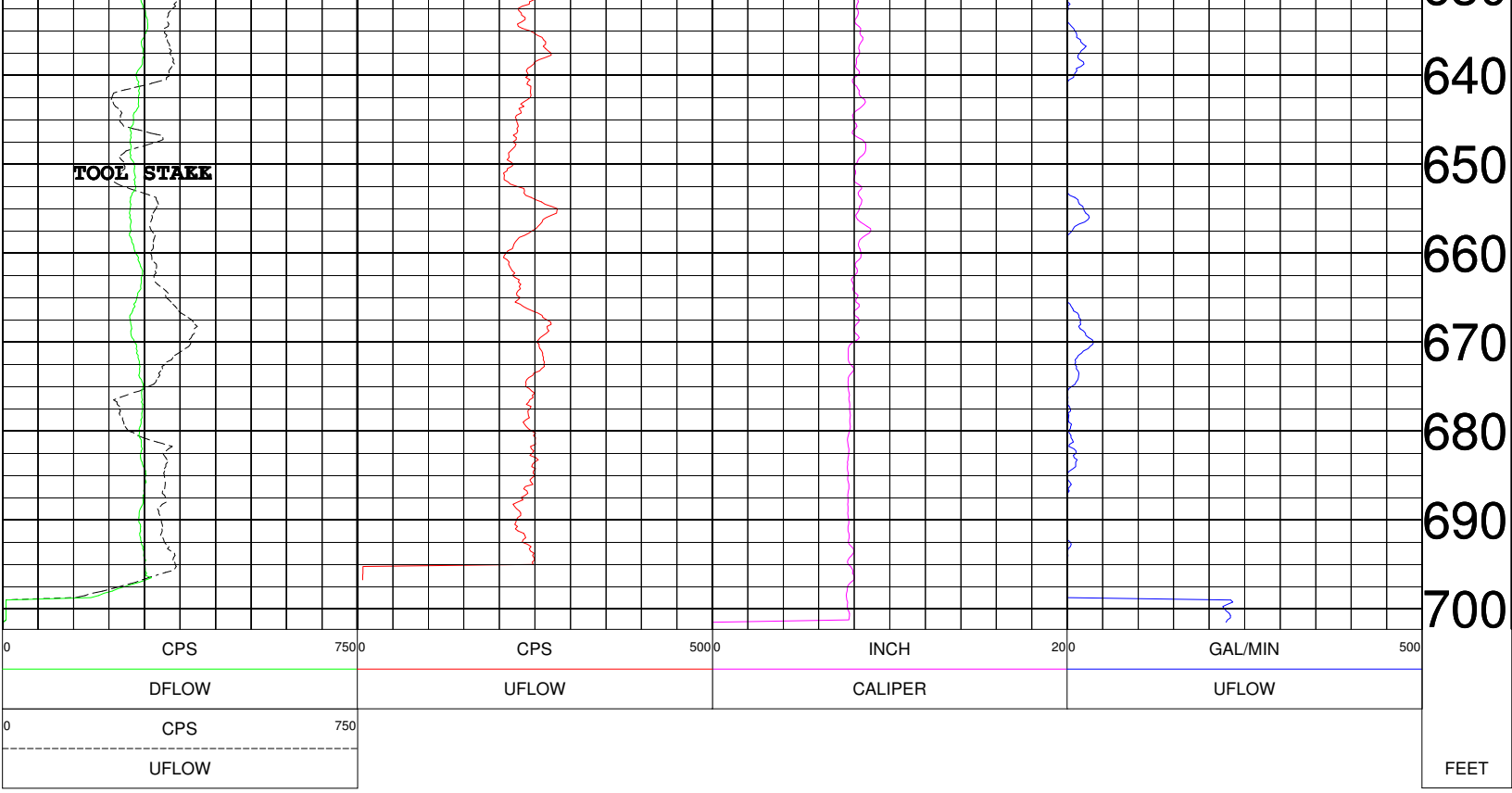
WELL A-3

COMPANY	: APPLIED DRILLING ENGINEERING	OTHER SERVICES:
WELL	: WELL A-3	COMPL
FIELD	: FREEPORT WTP	DIL
COUNTY	: WALTON	AVL
STATE	: FLORIDA	

LOCATION	:		
SECTION	: None		
TOWNSHIP	: None		
RANGE	: None		
API NO.	:		
UNIQUE WELL ID.	:		
PERMANENT DATUM	: MSL	ELEVATION KB:	None
LOG MEASURED FROM:	CASE	ELEVATION DF:	NA
DRL MEASURED FROM:	NA	ELEVATION GL:	NA
DATE	: 12/20/16		
DEPTH DRILLER	: 700		
BIT SIZE	: 7.8		
LOG TOP	: 6.25		
LOG BOTTOM	: 702.00		
CASING OD	:		
CASING BOTTOM	: 240		
CASING TYPE	: STEEL		
BOREHOLE FLUID	: MUD		
RM TEMPERATURE	: 0		
MUD RES	: 0		
MUD WEIGHT	:		
WITNESSED BY	:		
RECORDED BY	: AFB		
REMARKS 1	:		
REMARKS 2	:		


UFLOW
0
CPS
750
DFLOW
0
CPS
750
UFLOW
0
CPS
500
CALIPER
0
INCH
20
UFLOW
0
GAL/MIN
500
FEET
STATIC WELL; UFLOW LOGGED DOWN DFLOW LOGGED UP, DYNAMIC LOGGED DOWN @50FPM, PUMPING REPORTED @ 340GPM
TOOL STALL
TOOL STALL
210
220
230
240
250
260
270
280
290
300
310
320
330
340
350
360
370
380
390
400
410


TOOL STALL
420
430
440
450
460
470
480
490
500
510
520
530
540
550
560
570
580
590
600
610
620
630


TOOL STAKE
640
650
660
670
680
690
700
0
CPS
750
DFLOW
0
CPS
500
UFLOW
0
INCH
20
CALIPER
0
GAL/MIN
500
UFLOW
0
CPS
750
UFLOW
FEET

Region II Well Construction and
Testing Report for Site A-3

APPENDIX E

LITHOLOGIC LOG

Project Name: A-3 Oversight

Project No.: E213001410

Well No.: A-3

Sampling Method: Strainer Collection

Described By: Michelle Leonard
Tony Countryman
David Hire

Lithology Log
(Drill Cuttings)

Depth Interval (feet bpl)	Thickness (feet)	Sample Description
0-8	8	Tan sand, fine to medium grained, unconsolidated, sub-angular to sub-rounded, moderately sorted Accessory: orange clay (trace), shell (trace), calc. rock fragments (trace)
8-19	11	White sand, fine grained, sub-angular to sub-rounded, well sorted
19-21	2	Gray-brown sand, fine to medium grained, sub-angular to sub-rounded, slightly silty, moderately sorted Accessory: heavy minerals (trace)
21-26	5	Gray-brown sand, fine to medium grained, sub-angular to sub-rounded, some dark brown silt, moderately sorted Accessory: heavy minerals (trace)
26-38	12	Dark brown sand, fine grained, sub-angular to sub-rounded, silty, moderately sorted Accessory: white calcareous rock fragments (trace)
38-50	12	Olive gray sand, fine grained, sub-angular to sub-rounded, slightly clayey, moderately sorted Accessory: heavy minerals (trace)
50-60	10	Olive gray sand, fine to medium grained, sub-angular to sub-rounded, clayey, poorly sorted Accesory: heavy minerals (trace)
60-70	10	Olive gray sand, fine grained, sub-angular to sub-rounded, clayey, poorly sorted Accessory: white calcareous clay and rock fragments (trace)
70-80	10	Gray sand, fine to medium grained, sub-angular to sub-rounded, clayey, moderately sorted Accessory: heavy minerals (trace)
80-90	10	Olive gray clay, soft Accessory: fine sand (45%), white calcareous clay and rock fragments (3%)
90-100	10	Olive gray clay, soft Accessory: fine sand (35%), mica (trace)
100-110	10	Grayish olive (10Y 4/2) sandy clay, soft, angular to sub-angular (20% sand), heavy minerals (5%)
110-130	20	Grayish olive (10Y 4/2) sandy clay, soft, angular to sub-angular (10% sand), heavy minerals (5%)

Project Name: A-3 Oversight

Project No.: E213001410

Well No.: A-3

Sampling Method: Strainer Collection

Described By: Michelle Leonard
Tony Countryman
David Hire

Lithology Log
(Drill Cuttings)

Depth Interval (feet bpl)	Thickness (feet)	Sample Description
130-140	10	Light olive gray (5Y 7/2) limestone, soft, friable, minor clayey sand and some shell fragments
140-150	10	Light olive gray (5Y 7/2) limestone, soft, friable, minor clayey sand
150-160	10	Yellowish gray (5Y 7/2) limestone, soft, friable, muddy/mushy Driller reported hard between 157' and 158', almost no clay
160-180	20	Yellowish gray (5Y 7/2) limestone, soft, friable, shell molds, no clay
180-190	10	Pale olive (10Y 6/2) sandy clay, limestone fragments (15%), much more clay than above
190-200	10	Olive gray (5 GY 4/1) sandy clay, limestone fragments (10%), more clayey with depth
200-210	10	Dark greenish gray (5GY 4/1) clay, limestone fragments, sandy
210-220	10	Dark greenish gray (5GY 4/1) clay, sandy, limestone fragments, sandy
220-230	10	Cement and yellowish gray (5Y 8/1) packestone, calcareous cement, moderate porosity, coral and gastropod fossils, well indurated
230-240	10	same as above, moderately to well indurated, less fossils
240-260	20	same as above, very good porosity, coral and gastropod fossils
260-270	10	same as above with lenses of dark greenish gray (5G 4/1) sticky clay
270-280	10	same as above (240-260) interbedded with light olive gray (5Y 5/2) grainstone, moderate porosity, well indurated, calcareous cement, bivalve fossils (45%), accessory glauconite (10%)
280-300	20	dusky yellow (5Y 6/4) dolostone, low to moderate porosity, accessory dark heavy minerals (5-10%), with very fine to medium sand, friable
300-310	10	same as above, moderately indurated
310-320	10	same as above without heavy minerals, very well indurated
320-340	20	same as above, sandy
340-368	28	same as above, less sand
368-370	2	yellowish gray (5Y 8/1) grainstone, bivalve and gastropod fossils, moderately indurated, no sand, high porosity
370-380	10	light bluish gray (5B 7/1) to light gray (N7) grainstone, galucontie (10%), very well indurated, low porosity

Project Name: A-3 Oversight

Project No.: E213001410

Well No.: A-3

Sampling Method: Strainer Collection

Described By: Michelle Leonard
Tony Countryman
David Hire

Lithology Log
(Drill Cuttings)

Depth Interval (feet bpl)	Thickness (feet)	Sample Description
380-390	10	light olive gray (5Y 5/2) dolostone, trace galuconite, bivalves, moderately indurated, low permeability, small vugs
390-400	10	yellowish gray (5Y 8/1) grainstone, bivalve and gastropod fossils, moderately indurated, no sand, high porosity
400-410	10	yellowish gray (5Y 8/1) grainstone, bivalve fossils, good porosity, very well indurated, limey
410-420	10	dusky yellow (5Y 6/4) dolostone, bivalves, good porosity, very well indurated
420-440	20	yellowish gray (5Y 8/1) abundant coral fossils, very good porosity, friable
440-460	20	yellowish gray (5Y 8/1) grainstone, abundant shell and coral, moderate porosity, very well indurated
460-470	10	very light gray (N8) grainstone, bivalve and coral, moderate porosity, very well indurated, accessory shell
470-480	10	yellowish gray (5Y 8/1) wackestone, bivalve and coral, moderate porosity, very well indurated, calcareous cement
480-490	10	dusky yellow (5Y 6/4) dolostone, low porosity, very few fossils
490-530	10	yellowish gray (5Y 8/1) grainstone, coral and abundant shell, ground up shell pieces
530-550	20	same as above, more shell
550-560	10	yellowish gray (5Y 8/1) to medium dark gray (N4) grainstone, sandy medium to fine, accessory shell, very poorly indurated, low porosity

Project Name: A-3 Oversight

Project No.: E213001410

Well No.: A-3

Sampling Method: Strainer Collection

Described By: Michelle Leonard
Tony Countryman
David Hire

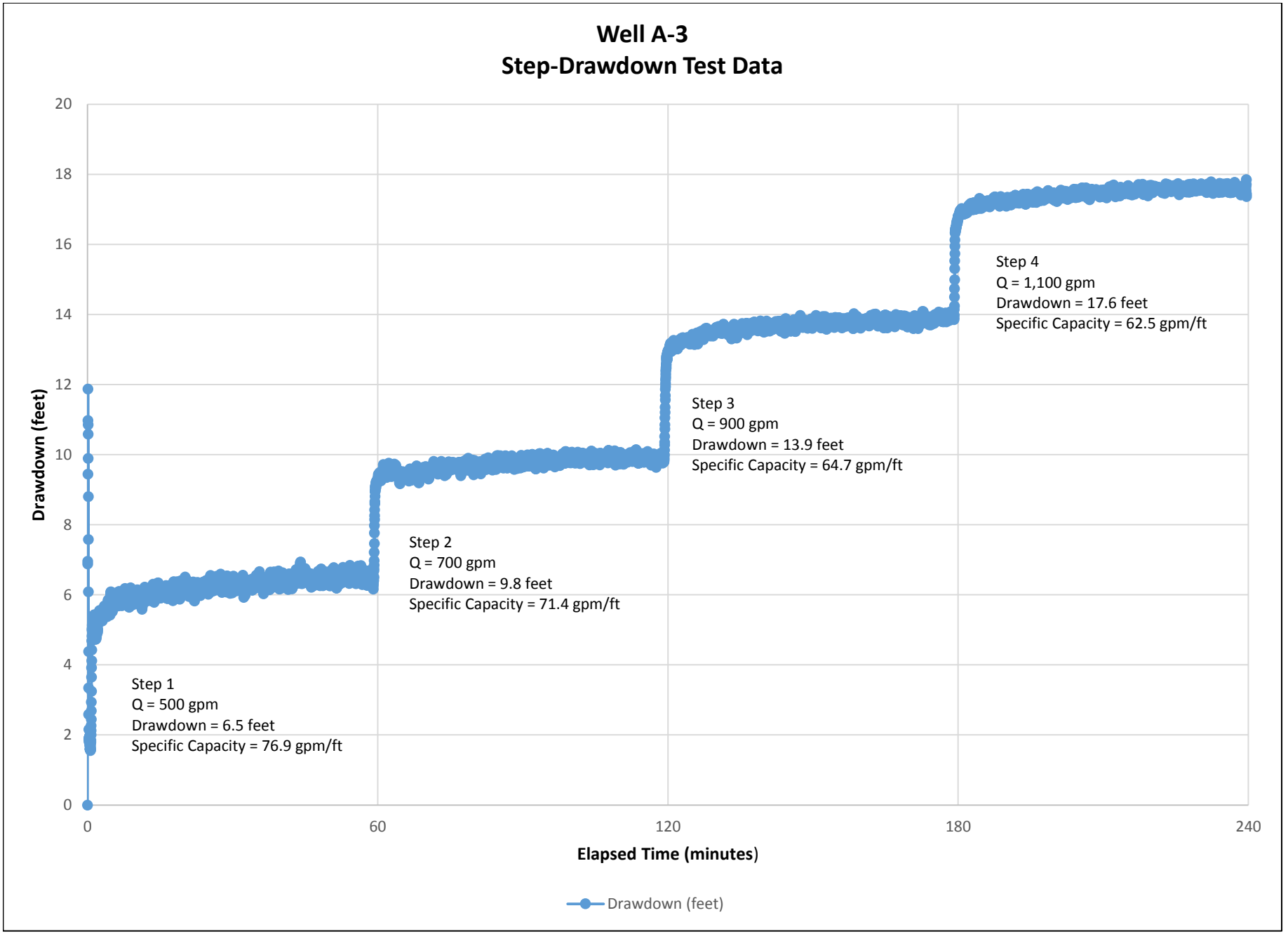
Lithology Log
(Drill Cuttings)

Depth Interval (feet bpl)	Thickness (feet)	Sample Description
560-580	20	yellowish gray (5Y 8/1) grainstone, coral and abundant shell, ground up shell pieces
580-590	10	yellowish gray (5Y 8/1) grainstone, moderate porosity, friable, few shell fragments
590-600	10	same as above, more shell (5%), accessory sand (1%), fine to medium, angular to sub-rounded
600-620	20	same as above
620-640	20	same as above, more shell
640-650	10	same as above, less shell
650-660	10	yellowish gray (5Y 8/1) grainstone, gastropod and bivalve fossils, coral, good porosity, very well indurated interbedded with dusky yellow (5Y 6/4) dolostone, crystalline, heavy minerals (1%), very well indurated, low porosity
660-695	35	limestone as above
695-700	5	fine sand

Region II Well Construction and Testing Report for Site A-3

APPENDIX F

STEP-TEST GRAPHICS


Well A-3
Step-Drawdown Test Data
Drawdown (feet)
20
18
16
14
12
10
8
6
4
2
0
0
60
120
180
240
Elapsed Time (minutes)
Step 1
Q = 500 gpm
Drawdown = 6.5 feet
Specific Capacity = 76.9 gpm/ft
Step 2
Q = 700 gpm
Drawdown = 9.8 feet
Specific Capacity = 71.4 gpm/ft
Step 3
Q = 900 gpm
Drawdown = 13.9 feet
Specific Capacity = 64.7 gpm/ft
Step 4
Q = 1,100 gpm
Drawdown = 17.6 feet
Specific Capacity = 62.5 gpm/ft
Drawdown (feet)

Region II Well Construction and Testing Report for Site A-3

APPENDIX G

LABORATORY REPORTS

Analytical Report

L6L0280

Project

A-3

Project Number

E213001410

January 09, 2017
Cardno - Riverview
3905 Crescent Park Drive
Riverview, FL 33578

Minority Women Business Enterprise
Small Disadvantaged Business Enterprise

Minority Women Business Enterprise
Small Disadvantaged Business Enterprise

1412 Tech Blvd
Tampa, FL 33619

Phone #: 813-620-2000
Website: www.ftsanalytical.com

January 09, 2017

Michelle Leonard
Cardno - Riverview
3905 Crescent Park Drive
Riverview, FL 33578

RE: A-3

We are reporting the results of the analyses performed on the samples recieved on 12/16/2016 under the project name referenced above and identified as the lab Work Order L6L0280. All results being reported under this Report apply to the samples analyzed and properly identified with a Laboratory ID number. Subcontracted analyses are identified in this report with either the NELAC certification number of the subcontracted lab, or the complete subcontracted report attached to this report.

Unless otherwise noted in a Case Narrative, all data reported in this Analytical Report are in compliance with NELAC standards. The uncertainty of measurement associated with the results of analysis reported is available upon request. Should insufficient sample be provided to the laboratory to meet the method and NELAC Matrix Duplicate and Matrix Spike requirements, then the data will be analyzed, evaluated and reporting using all other available quality control methods.

The validity and integrity of this report will remain intact as long as it is accompanied by this letter and reproduced in full, unless written approval is granted by FTS Analytical Laboratories. This report will be filed for at least 5 years in our archives after which time it will be destroyed without further notice, unless otherwise agreed upon. The samples received, and described as recorded in Work Order L6L0280 will be filed for 60 days, and after that time they will be properly disposed without further notice, unless otherwise agreed upon. We reserve the right to return to you any unused samples, extracts, or solutions if we consider so necessary (e.g., samples identified as hazardous waste, sample sizes exceeding standard practices, controlled/regulated substances, etc.)

We thank you for selecting FTS Analytical to serve your analytical needs. If you have any questions concerning this report, please do not hesitate to contact us at any time. We will be happy to help.

Sincerely,

Amy Atkins
Senior Project Manager

MWBE SDBE
NELAC DoD Accredited

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	1/9/17 13:40

Samples in this Report

Lab ID	Sample	Matrix	Date Sampled	Date Received
L6L0280-01	A-3-1	Water	13-Dec-2016 16:02	16-Dec-2016 14:35
L6L0280-02	A-3-2	Water	14-Dec-2016 13:39	16-Dec-2016 14:35
L6L0280-03	A-3-3	Water	15-Dec-2016 08:28	16-Dec-2016 14:35
L6L0280-04	A-3-4	Water	15-Dec-2016 12:04	16-Dec-2016 14:35
L6L0280-05	A-3-5	Water	15-Dec-2016 15:30	16-Dec-2016 14:35

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	1/9/17 13:40

Hits Summary

(Not Including Subcontracted Analysis)

Sample: A-3-1

Lab ID: L6L0280-01

Analyte	Result	Qual	PQL	MDL	Units	Dil	Date Analyzed	CAS #	Method
Specific conductance	**182**		1.00	0.00	mg/L	1	12/27/16 16:00		SM 2510B
TDS, Total Dissolved Solids	**118**		5.00	1.78	mg/L	1	12/20/16 19:00		SM 2540C
Chloride	**2.38**		2.00	0.104	mg/L	1	12/22/16 11:40	16887-00-6	EPA 300.0

Sample: A-3-2

Lab ID: L6L0280-02

Analyte	Result	Qual	PQL	MDL	Units	Dil	Date Analyzed	CAS #	Method
Specific conductance	**186**		1.00	0.00	mg/L	1	12/27/16 16:00		SM 2510B
TDS, Total Dissolved Solids	**130**		5.00	1.78	mg/L	1	12/21/16 15:45		SM 2540C
Chloride	**2.11**		2.00	0.104	mg/L	1	12/22/16 11:40	16887-00-6	EPA 300.0

Sample: A-3-3

Lab ID: L6L0280-03

Analyte	Result	Qual	PQL	MDL	Units	Dil	Date Analyzed	CAS #	Method
Specific conductance	**185**		1.00	0.00	mg/L	1	12/27/16 16:00		SM 2510B
TDS, Total Dissolved Solids	**119**		5.00	1.78	mg/L	1	12/21/16 15:45		SM 2540C
Chloride	**2.04**		2.00	0.104	mg/L	1	12/22/16 11:40	16887-00-6	EPA 300.0

Sample: A-3-4

Lab ID: L6L0280-04

Analyte	Result	Qual	PQL	MDL	Units	Dil	Date Analyzed	CAS #	Method
Specific conductance	**182**		1.00	0.00	mg/L	1	12/27/16 16:00		SM 2510B
TDS, Total Dissolved Solids	**123**		5.00	1.78	mg/L	1	12/21/16 15:45		SM 2540C
Chloride	**2.59**		2.00	0.104	mg/L	1	12/22/16 11:40	16887-00-6	EPA 300.0

Sample: A-3-5

Lab ID: L6L0280-05

Analyte	Result	Qual	PQL	MDL	Units	Dil	Date Analyzed	CAS #	Method
Specific conductance	**184**		1.00	0.00	mg/L	1	12/27/16 16:00		SM 2510B
TDS, Total Dissolved Solids	**119**		5.00	1.78	mg/L	1	12/21/16 15:45		SM 2540C
Chloride	**2.96**		2.00	0.104	mg/L	1	12/22/16 11:40	16887-00-6	EPA 300.0

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	1/9/17 13:40

Sample Results

Client Sample ID: A-3-1
Lab Sample ID: L6L0280-01 (Water) **Sampled:12/13/16 16:02**

Analyte	Result	Qual	PQL	MDL	Units	Dil	Date Prepared	Date Analyzed	CAS #
Anions by Method 300.0									
Chloride	**2.38**		2.00	0.104	mg/L	1	12/22/16 11:40	12/22/16 11:40	16887-00-6
Conductance by Method 2510B									
Specific conductance	**182**		1.00	0.00	mg/L	1	12/27/16 16:00	12/27/16 16:00	
TDS by Method 2540C									
TDS, Total Dissolved Solids	**118**		5.00	1.78	mg/L	1	12/20/16 19:00	12/20/16 19:00	

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	1/9/17 13:40

Sample Results
(Continued)

Client Sample ID: A-3-2
Lab Sample ID: L6L0280-02 (Water) **Sampled:12/14/16 13:39**

Analyte	Result	Qual	PQL	MDL	Units	Dil	Date Prepared	Date Analyzed	CAS #
Anions by Method 300.0									
Chloride	**2.11**		2.00	0.104	mg/L	1	12/22/16 11:40	12/22/16 11:40	16887-00-6
Conductance by Method 2510B									
Specific conductance	**186**		1.00	0.00	mg/L	1	12/27/16 16:00	12/27/16 16:00	
TDS by Method 2540C									
TDS, Total Dissolved Solids	**130**		5.00	1.78	mg/L	1	12/21/16 15:45	12/21/16 15:45	

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	1/9/17 13:40

Sample Results
(Continued)

Client Sample ID: A-3-3
Lab Sample ID: L6L0280-03 (Water) **Sampled:12/15/16 8:28**

Analyte	Result	Qual	PQL	MDL	Units	Dil	Date Prepared	Date Analyzed	CAS #
Anions by Method 300.0									
Chloride	**2.04**		2.00	0.104	mg/L	1	12/22/16 11:40	12/22/16 11:40	16887-00-6
Conductance by Method 2510B									
Specific conductance	**185**		1.00	0.00	mg/L	1	12/27/16 16:00	12/27/16 16:00	
TDS by Method 2540C									
TDS, Total Dissolved Solids	**119**		5.00	1.78	mg/L	1	12/21/16 15:45	12/21/16 15:45	

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	1/9/17 13:40

Sample Results
(Continued)

Client Sample ID: A-3-4
Lab Sample ID: L6L0280-04 (Water) **Sampled:12/15/16 12:04**

Analyte	Result	Qual	PQL	MDL	Units	Dil	Date Prepared	Date Analyzed	CAS #
Anions by Method 300.0									
Chloride	**2.59**		2.00	0.104	mg/L	1	12/22/16 11:40	12/22/16 11:40	16887-00-6
Conductance by Method 2510B									
Specific conductance	**182**		1.00	0.00	mg/L	1	12/27/16 16:00	12/27/16 16:00	
TDS by Method 2540C									
TDS, Total Dissolved Solids	**123**		5.00	1.78	mg/L	1	12/21/16 15:45	12/21/16 15:45	

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	1/9/17 13:40

Sample Results
(Continued)

Client Sample ID: A-3-5
Lab Sample ID: L6L0280-05 (Water) **Sampled:12/15/16 15:30**

Analyte	Result	Qual	PQL	MDL	Units	Dil	Date Prepared	Date Analyzed	CAS #
Anions by Method 300.0									
Chloride	**2.96**		2.00	0.104	mg/L	1	12/22/16 11:40	12/22/16 11:40	16887-00-6
Conductance by Method 2510B									
Specific conductance	**184**		1.00	0.00	mg/L	1	12/27/16 16:00	12/27/16 16:00	
TDS by Method 2540C									
TDS, Total Dissolved Solids	**119**		5.00	1.78	mg/L	1	12/21/16 15:45	12/21/16 15:45	

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	1/9/17 13:40

Quality Control

Anions by Method 300.0

Analyte	Result	Qual	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B7A0045											
Blank (B7A0045-BLK1)						Prepared & Analyzed: 12/22/2016					
Chloride	0.104	U,	2.00	0.104	mg/L						
Blank (B7A0045-BLK2)						Prepared & Analyzed: 12/22/2016					
Chloride	0.104	U,	2.00	0.104	mg/L						
LCS (B7A0045-BS1)						Prepared & Analyzed: 12/22/2016					
Chloride	19.6		2.00	0.104	mg/L	20.0		98	90-110		
LCS (B7A0045-BS2)						Prepared & Analyzed: 12/22/2016					
Chloride	19.6		2.00	0.104	mg/L	20.0		98	90-110		
LCS Dup (B7A0045-BSD1)						Prepared & Analyzed: 12/22/2016					
Chloride	19.6		2.00	0.104	mg/L	20.0		98	90-110	0	20
LCS Dup (B7A0045-BSD2)						Prepared & Analyzed: 12/22/2016					
Chloride	19.6		2.00	0.104	mg/L	20.0		98	90-110	0.05	20
Matrix Spike (B7A0045-MS1)		**Source: L6L0319-01**				Prepared & Analyzed: 12/22/2016					
Chloride	69.2		2.00	0.104	mg/L	20.0	50.6	93	80-120		
Matrix Spike (B7A0045-MS2)		**Source: L6L0319-01**				Prepared & Analyzed: 12/22/2016					
Chloride	69.3		2.00	0.104	mg/L	20.0	50.6	94	80-120		
Matrix Spike Dup (B7A0045-MSD1)		**Source: L6L0319-01**				Prepared & Analyzed: 12/22/2016					
Chloride	66.6		2.00	0.104	mg/L	20.0	50.6	80	80-120	4	20
Matrix Spike Dup (B7A0045-MSD2)		**Source: L6L0319-01**				Prepared & Analyzed: 12/22/2016					
Chloride	67.3		2.00	0.104	mg/L	20.0	50.6	84	80-120	3	20

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	1/9/17 13:40

Quality Control
(Continued)

TDS by Method 2540C

Analyte	Result	Qual	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B6L0512											
Blank (B6L0512-BLK1)						Prepared & Analyzed: 12/20/2016					
TDS, Total Dissolved Solids	1.78	U,	5.00	1.78	mg/L						
LCS (B6L0512-BS1)						Prepared & Analyzed: 12/20/2016					
TDS, Total Dissolved Solids	107		5.00	1.78	mg/L	100		107	80-120		
LCS Dup (B6L0512-BSD1)						Prepared & Analyzed: 12/20/2016					
TDS, Total Dissolved Solids	118		5.00	1.78	mg/L	100		118	80-120	10	20
Duplicate (B6L0512-DUP1)		**Source: L6L0223-01**				Prepared & Analyzed: 12/20/2016					
TDS, Total Dissolved Solids	1110		5.00	1.78	mg/L		1070			4	20
Batch: B7A0017											
Blank (B7A0017-BLK1)						Prepared & Analyzed: 12/21/2016					
TDS, Total Dissolved Solids	1.78	U,	5.00	1.78	mg/L						
LCS (B7A0017-BS1)						Prepared & Analyzed: 12/21/2016					
TDS, Total Dissolved Solids	109		5.00	1.78	mg/L	100		109	80-120		
LCS Dup (B7A0017-BSD1)						Prepared & Analyzed: 12/21/2016					
TDS, Total Dissolved Solids	97.0		5.00	1.78	mg/L	100		97	80-120	12	20
Duplicate (B7A0017-DUP1)		**Source: L6L0273-01**				Prepared & Analyzed: 12/21/2016					
TDS, Total Dissolved Solids	125		5.00	1.78	mg/L		117			7	20

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	1/9/17 13:40

Quality Control
(Continued)

Conductance by Method 2510B

Analyte	Result	Qual	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B7A0117											
Duplicate (B7A0117-DUP1)		**Source: L6L0280-02**			Prepared & Analyzed: 12/27/2016						
Specific conductance	186		1.00	0.00	mg/L		186			0.1	20

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	1/9/17 13:40

List of Certifications for FTS - Florida

Number	Description	Code	Facility	Expires
04176	LA CERTIFICATE	LANELAC	FTSA	06/30/2016
483	NC CERTIFICATE	ANC	FTSA	12/31/2016
85	KENTUKY CERTIFICATE	KENTUKY	FTSA	
98015	SC CERTIFICATE	ASC	FTSA	06/30/2017
E84098	FL NELAC CERTIFICATE	LFLNELAC	FTSL	06/30/2017
E87429	FL NELAC CERTIFICATE	AFLNELAC	FTSA	06/30/2017
LI0-135	DoD CERTIFICATE	DOD	FTSA	06/30/2016
P330-07-00105	USDA CERTIFICATE	USDA	FTSA	

Notes and Definitions

Item	Definition
U	Compound was not detected.
Dry	Sample results reported on a dry weight basis.
I	Value estimated to be between the Laboratory Detection and Reporting Limit
J	QC Failure see Case Narrative
L	Concentration exceeds calibration range
N	Tentatively Identified Compound
Q	Hold time exceeded
V	Analyte equal to or above detection limit in the method blank
TNTC	Bacteria is present but Too Numerous To Count

RPD	Relative Percent Difference
%REC	Percent Recovery
Source	Sample that was matrix spiked or duplicated.

FTS ANALYTICAL SERVICES
CHAIN OF CUSTODY

2505 N. Falkenburg Rd., Tampa, FL 33619 (813-620-2000) / 5675 New Tampa Hwy, Lakeland, FL 33815 (863-646-8526)
6017 Financial Drive, Norcross, GA 30071 (770-449-8800)

Company Name: Cardno
Address: 3905 Crescent Park Drive Riverview
Results Sent to: Michelle Leonard
Email address: Michelle.leonard@cardno.com
Contact Phone #: 813-352-1626 Cell#: same
Project Name (Site): A-3
Project Number (ID): E21300141O
Regulatory Program: n/a

Receiver's Initials/Temp: 3.7 / [illegible]
Custody Seal(s): ___ Y N Lab Work Order # 1660280
P.O.# (if required):
Field Comments / Lab Precautions:

Sampler(s): (signature) [signature]
Sampler(s): (printed) Michelle Leonard

Line No.	Sample ID #	Sample Depth (Ft)	Collection Date / Time	Matrix (See below)	Composite	Grab	No. of Containers	Analysis Requested: SC	Chlorides	TDS
	Container Type:							P	P	P
	Preservation Code:							9	9	9
1	A-3-1	340	12/13/16 16:02	GW		✓	3	1	1	1
2	A-3-2	440	12/14/16 13:39	GW		✓	3	1	1	1
3	A-3-3	540	12/15/16 8:28	GW		✓	3	1	1	1
4	A-3-4	640	12/15/16 12:04	GW		✓	3	1	1	1
5	A-3-5	700	12/15/16 15:30	GW		✓	3	1	1	1
6										
7										
8										
9										
10										

1) Relinquished By: [signature] Date / Time 12/16/16 14:35
2) Received By: [signature] Date / Time 12/16/16 14:35
Delivered by: (Circle One) Fed Ex / UPS / Courier / Lab Pickup / Hand / Other

3) Relinquished By: Date / Time
4) Received By: Date / Time
5) Relinquished By: Date / Time
6) Received By: Date / Time

Turnaround Time (business days)
___10 Days ; ___5-7 Days; ✓ 3 Days
___2 Days ; ___1 Day; ___Same Day

Matrix Guide: (W=Water) (DW = Drinking Water) (GW = Groundwater) (SW = Surface Water) (L = Liquid) (O = Oil) (S = Soil) (SD = Solid) (SL = Sludge) (A = Air) (C = Air Cartridge)
Preservation: 1 = HCL 2 = HNO_3 3 = H_2SO_4 4 = NaOH + $NaAsO_2$ 5 = NaOH + ZnAc 6 = $Na_2S_2O_3$ 7 = DI Water & MeOH 8 = NaHSO4 & MeOH 9 = None 10 = NaHS04
Container Type: VC=Vial (Clear); VA =Vial (Amber); GC=Glass (Clear); GA=Glass (Amber); P=Plastic (HDPE); TB=Tedlar Bag; ES=EnCore Sampler; ZB=Ziploc Bag; O=Other

Analytical Report

L7A0101

Project

A-3

Project Number

E213001410

January 12, 2017
Cardno - Riverview
3905 Crescent Park Drive
Riverview, FL 33578

Minority Women Business Enterprise
Small Disadvantaged Business Enterprise

Minority Women Business Enterprise
Small Disadvantaged Business Enterprise

1412 Tech Blvd
Tampa, FL 33619

Phone #: 813-620-2000
Website: www.ftsanalytical.com

January 12, 2017

Michelle Leonard
Cardno - Riverview
3905 Crescent Park Drive
Riverview, FL 33578

RE: A-3

We are reporting the results of the analyses performed on the samples recieved on 1/5/2017 under the project name referenced above and identified as the lab Work Order L7A0101. All results being reported under this Report apply to the samples analyzed and properly identified with a Laboratory ID number. Subcontracted analyses are identified in this report with either the NELAC certification number of the subcontracted lab, or the complete subcontracted report attached to this report.

Unless otherwise noted in a Case Narrative, all data reported in this Analytical Report are in compliance with NELAC standards. The uncertainty of measurement associated with the results of analysis reported is available upon request. Should insufficient sample be provided to the laboratory to meet the method and NELAC Matrix Duplicate and Matrix Spike requirements, then the data will be analyzed, evaluated and reporting using all other available quality control methods.

The validity and integrity of this report will remain intact as long as it is accompanied by this letter and reproduced in full, unless written approval is granted by FTS Analytical Laboratories. This report will be filed for at least 5 years in our archives after which time it will be destroyed without further notice, unless otherwise agreed upon. The samples received, and described as recorded in Work Order L7A0101 will be filed for 60 days, and after that time they will be properly disposed without further notice, unless otherwise agreed upon. We reserve the right to return to you any unused samples, extracts, or solutions if we consider so necessary (e.g., samples identified as hazardous waste, sample sizes exceeding standard practices, controlled/regulated substances, etc.)

We thank you for selecting FTS Analytical to serve your analytical needs. If you have any questions concerning this report, please do not hesitate to contact us at any time. We will be happy to help.

Sincerely,

Amy Atkins
Senior Project Manager

MWBE SDBE
NELAC DoD Accredited

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	1/12/17 12:42

Samples in this Report

Lab ID	Sample	Matrix	Date Sampled	Date Received
L7A0101-01	Step 1	Water	29-Dec-2016 10:57	05-Jan-2017 17:00
L7A0101-02	Step 2	Water	29-Dec-2016 11:57	05-Jan-2017 17:00
L7A0101-03	Step 3	Water	29-Dec-2016 12:57	05-Jan-2017 17:00
L7A0101-04	Step 4	Water	29-Dec-2016 13:57	05-Jan-2017 17:00

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	1/12/17 12:42

Hits Summary

(Not Including Subcontracted Analysis)

Sample: Step 1

Lab ID: L7A0101-01

Analyte	Result	Qual	PQL	MDL	Units	Dil	Date Analyzed	CAS #	Method
Specific conductance	**168**		1.00	0.00	mg/L	1	1/6/17 16:50		SM 2510B
TDS, Total Dissolved Solids	**106**		5.00	1.78	mg/L	1	1/6/17 11:30		SM 2540C

Sample: Step 2

Lab ID: L7A0101-02

Analyte	Result	Qual	PQL	MDL	Units	Dil	Date Analyzed	CAS #	Method
Specific conductance	**179**		1.00	0.00	mg/L	1	1/6/17 16:50		SM 2510B
TDS, Total Dissolved Solids	**116**		5.00	1.78	mg/L	1	1/6/17 11:30		SM 2540C

Sample: Step 3

Lab ID: L7A0101-03

Analyte	Result	Qual	PQL	MDL	Units	Dil	Date Analyzed	CAS #	Method
Specific conductance	**190**		1.00	0.00	mg/L	1	1/6/17 16:50		SM 2510B
TDS, Total Dissolved Solids	**100**		5.00	1.78	mg/L	1	1/6/17 11:30		SM 2540C

Sample: Step 4

Lab ID: L7A0101-04

Analyte	Result	Qual	PQL	MDL	Units	Dil	Date Analyzed	CAS #	Method
Specific conductance	**185**		1.00	0.00	mg/L	1	1/6/17 16:50		SM 2510B
TDS, Total Dissolved Solids	**310**		5.00	1.78	mg/L	1	1/6/17 11:30		SM 2540C

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	1/12/17 12:42

Sample Results

Client Sample ID: Step 1
Lab Sample ID: L7A0101-01 (Water) **Sampled:12/29/16 10:57**

Analyte	Result	Qual	PQL	MDL	Units	Dil	Date Prepared	Date Analyzed	CAS #
Anions by Method 300.0									
Chloride	0.104	U	2.00	0.104	mg/L	1	1/11/17 8:50	1/11/17 13:24	16887-00-6
Conductance by Method 2510B									
Specific conductance	**168**		1.00	0.00	mg/L	1	1/6/17 16:50	1/6/17 16:50	
TDS by Method 2540C									
TDS, Total Dissolved Solids	**106**		5.00	1.78	mg/L	1	1/6/17 11:30	1/6/17 11:30	

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	1/12/17 12:42

Sample Results
(Continued)

Client Sample ID: Step 2
Lab Sample ID: L7A0101-02 (Water) **Sampled:12/29/16 11:57**

Analyte	Result	Qual	PQL	MDL	Units	Dil	Date Prepared	Date Analyzed	CAS #
Anions by Method 300.0									
Chloride	0.104	U	2.00	0.104	mg/L	1	1/11/17 8:50	1/11/17 14:14	16887-00-6
Conductance by Method 2510B									
Specific conductance	**179**		1.00	0.00	mg/L	1	1/6/17 16:50	1/6/17 16:50	
TDS by Method 2540C									
TDS, Total Dissolved Solids	**116**		5.00	1.78	mg/L	1	1/6/17 11:30	1/6/17 11:30	

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	1/12/17 12:42

Sample Results
(Continued)

Client Sample ID: Step 3
Lab Sample ID: L7A0101-03 (Water) **Sampled:12/29/16 12:57**

Analyte	Result	Qual	PQL	MDL	Units	Dil	Date Prepared	Date Analyzed	CAS #
Anions by Method 300.0									
Chloride	0.104	U	2.00	0.104	mg/L	1	1/11/17 8:50	1/11/17 14:27	16887-00-6
Conductance by Method 2510B									
Specific conductance	**190**		1.00	0.00	mg/L	1	1/6/17 16:50	1/6/17 16:50	
TDS by Method 2540C									
TDS, Total Dissolved Solids	**100**		5.00	1.78	mg/L	1	1/6/17 11:30	1/6/17 11:30	

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	1/12/17 12:42

Sample Results
(Continued)

Client Sample ID: Step 4
Lab Sample ID: L7A0101-04 (Water) **Sampled:12/29/16 13:57**

Analyte	Result	Qual	PQL	MDL	Units	Dil	Date Prepared	Date Analyzed	CAS #
Anions by Method 300.0									
Chloride	0.104	U	2.00	0.104	mg/L	1	1/11/17 8:50	1/11/17 14:39	16887-00-6
Conductance by Method 2510B									
Specific conductance	**185**		1.00	0.00	mg/L	1	1/6/17 16:50	1/6/17 16:50	
TDS by Method 2540C									
TDS, Total Dissolved Solids	**310**		5.00	1.78	mg/L	1	1/6/17 11:30	1/6/17 11:30	

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	1/12/17 12:42

Quality Control

Anions by Method 300.0

Analyte	Result	Qual	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B7A0196											
Blank (B7A0196-BLK1)						Prepared & Analyzed: 1/11/2017					
Chloride	0.104	U,	2.00	0.104	mg/L						
LCS (B7A0196-BS1)						Prepared & Analyzed: 1/11/2017					
Chloride	19.6		2.00	0.104	mg/L	20.0		98	90-110		
LCS Dup (B7A0196-BSD1)						Prepared & Analyzed: 1/11/2017					
Chloride	18.9		2.00	0.104	mg/L	20.0		94	90-110	4	20
Duplicate (B7A0196-DUP1)		**Source: L7A0101-01**				Prepared & Analyzed: 1/11/2017					
Chloride	1.44		2.00	0.104	mg/L		1.43			0.3	20
Matrix Spike (B7A0196-MS1)		**Source: L7A0101-01**				Prepared & Analyzed: 1/11/2017					
Chloride	21.6		2.00	0.104	mg/L	20.0	1.43	101	80-120		
Matrix Spike Dup (B7A0196-MSD1)		**Source: L7A0101-01**				Prepared & Analyzed: 1/11/2017					
Chloride	21.9		2.00	0.104	mg/L	20.0	1.43	102	80-120	1	20

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	1/12/17 12:42

Quality Control
(Continued)

TDS by Method 2540C

Analyte	Result	Qual	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B7A0193											
Blank (B7A0193-BLK1)						Prepared & Analyzed: 1/6/2017					
TDS, Total Dissolved Solids	1.78	U,	5.00	1.78	mg/L						
LCS (B7A0193-BS1)						Prepared & Analyzed: 1/6/2017					
TDS, Total Dissolved Solids	112		5.00	1.78	mg/L	100		112	80-120		
LCS Dup (B7A0193-BSD1)						Prepared & Analyzed: 1/6/2017					
TDS, Total Dissolved Solids	102		5.00	1.78	mg/L	100		102	80-120	9	20
Duplicate (B7A0193-DUP1)		**Source: L7A0101-04**				Prepared & Analyzed: 1/6/2017					
TDS, Total Dissolved Solids	120		5.00	1.78	mg/L		310			88	20

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	1/12/17 12:42

Quality Control
(Continued)

Conductance by Method 2510B

Analyte	Result	Qual	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B7A0116											
Duplicate (B7A0116-DUP1)		**Source: L7A0101-01**			Prepared & Analyzed: 1/6/2017						
Specific conductance	169		1.00	0.00	mg/L		168			0.06	20

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	1/12/17 12:42

List of Certifications for FTS - Florida

Number	Description	Code	Facility	Expires
04176	LA CERTIFICATE	LANELAC	FTSA	06/30/2016
483	NC CERTIFICATE	ANC	FTSA	12/31/2016
85	KENTUKY CERTIFICATE	KENTUKY	FTSA	
98015	SC CERTIFICATE	ASC	FTSA	06/30/2017
E84098	FL NELAC CERTIFICATE	LFLNELAC	FTSL	06/30/2017
E87429	FL NELAC CERTIFICATE	AFLNELAC	FTSA	06/30/2017
LI0-135	DoD CERTIFICATE	DOD	FTSA	06/30/2016
P330-07-00105	USDA CERTIFICATE	USDA	FTSA	

Notes and Definitions

Item	Definition
U	Compound was not detected.
Dry	Sample results reported on a dry weight basis.
I	Value estimated to be between the Laboratory Detection and Reporting Limit
J	QC Failure see Case Narrative
L	Concentration exceeds calibration range
N	Tentatively Identified Compound
Q	Hold time exceeded
V	Analyte equal to or above detection limit in the method blank
TNTC	Bacteria is present but Too Numerous To Count

RPD	Relative Percent Difference
%REC	Percent Recovery
Source	Sample that was matrix spiked or duplicated.

FTS ANALYTICAL SERVICES
CHAIN OF CUSTODY

2505 N. Falkenburg Rd., Tampa, FL 33619 (813-620-2000) / 5675 New Tampa Hwy, Lakeland, FL 33815 (863-646-8526)
6017 Financial Drive, Norcross, GA 30071 (770-449-8800)

Company Name: Cardno
Address: 3905 Crescent Park Drive, Riverview, FL 33578
Results Sent to: Michelle Leonard
Email address:
Contact Phone #: (813) 257-0075 Cell#: (813) 352-1626
Project Name (Site): NWFWM Site A-3
Project Number (ID): NWFWMD A-3
Regulatory Program:

Receiver's Initials/Temp: @ / 4.8
Custody Seal(s): ___ Y N Lab Work Order # L7A0101
P.O.# (if required):
Field Comments / Lab Precautions:

Sampler(s): (signature) David B. Hire
Sampler(s): (printed) David B. Hire

Line No.	Sample ID #	Sample Depth (Ft)	Collection Date / Time	Matrix (See below)	Composite	Grab	No. of Containers	Container Type: Chloride	TDS	Specific Conductance	Preservation Code: Chloride	TDS	Specific Conductance
								P	P	P	9	9	9
1	Step 1		12/29/16 @1057	GW		✓	3	1	1	1			
2	Step 2		12/29/16 @1157	GW		✓	3	1	1	1			
3	Step 3		12/29/16 @1257	GW		✓	3	1	1	1			
4	Step 4		12/29/16 @1357	GW		✓	3	1	1	1			
5													
6													
7													
8													
9													
10													

Analysis Requested

1) Relinquished By: David B. Hire	Date / Time 1/4/2017 @ 1520hrs	2) Received By:	Date / Time 1/5/17 1500
3) Relinquished By:	Date / Time	4) Received By:	Date / Time
5) Relinquished By:	Date / Time	6) Received By:	Date / Time

Delivered by: (Circle One)
Fed Ex / UPS / Courier / Lab Pickup / Hand / Other

Turnaround Time (business days)
___10 Days ; ___5-7 Days; ✓ 3 Days
___2 Days ; ___1 Day; ___Same Day

Matrix Guide: (W=Water) (DW = Drinking Water) (GW = Groundwater) (SW = Surface Water) (L = Liquid) (O = Oil) (S = Soil) (SD = Solid) (SL = Sludge) (A = Air) (C = Air Cartridge)
Preservation: 1 = HCL 2 = HNO_3 3 = H_2SO_4 4 = NaOH + $NaAsO_2$ 5 = NaOH + ZnAc 6 = $Na_2S_2O_3$ 7 = DI Water & MeOH 8 = NaHSO4 & MeOH 9 = None 10 = NaHS04
Container Type: VC=Vial (Clear); VA =Vial (Amber); GC=Glass (Clear); GA=Glass (Amber); P=Plastic (HDPE); TB=Tedlar Bag; ES=EnCore Sampler; ZB=Ziploc Bag; O=Other

Analytical Report

L7A0228

Project

A-3

Project Number

E213001410

February 07, 2017
Cardno - Riverview
3905 Crescent Park Drive
Riverview, FL 33578

Minority Women Business Enterprise
Small Disadvantaged Business Enterprise

Minority Women Business Enterprise
Small Disadvantaged Business Enterprise

1412 Tech Blvd
Tampa, FL 33619

Phone #: 813-620-2000
Website: www.ftsanalytical.com

February 07, 2017

Michelle Leonard
Cardno - Riverview
3905 Crescent Park Drive
Riverview, FL 33578

RE: A-3

We are reporting the results of the analyses performed on the samples recieved on 1/13/2017 under the project name referenced above and identified as the lab Work Order L7A0228. All results being reported under this Report apply to the samples analyzed and properly identified with a Laboratory ID number. Subcontracted analyses are identified in this report with either the NELAC certification number of the subcontracted lab, or the complete subcontracted report attached to this report.

Unless otherwise noted in a Case Narrative, all data reported in this Analytical Report are in compliance with NELAC standards. The uncertainty of measurement associated with the results of analysis reported is available upon request. Should insufficient sample be provided to the laboratory to meet the method and NELAC Matrix Duplicate and Matrix Spike requirements, then the data will be analyzed, evaluated and reporting using all other available quality control methods.

The validity and integrity of this report will remain intact as long as it is accompanied by this letter and reproduced in full, unless written approval is granted by FTS Analytical Laboratories. This report will be filed for at least 5 years in our archives after which time it will be destroyed without further notice, unless otherwise agreed upon. The samples received, and described as recorded in Work Order L7A0228 will be filed for 60 days, and after that time they will be properly disposed without further notice, unless otherwise agreed upon. We reserve the right to return to you any unused samples, extracts, or solutions if we consider so necessary (e.g., samples identified as hazardous waste, sample sizes exceeding standard practices, controlled/regulated substances, etc.)

We thank you for selecting FTS Analytical to serve your analytical needs. If you have any questions concerning this report, please do not hesitate to contact us at any time. We will be happy to help.

Sincerely,

Amy Atkins
Senior Project Manager

MWBE SDBE
NELAC DoD Accredited

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	2/7/17 11:53

Samples in this Report

Lab ID	Sample	Matrix	Date Sampled	Date Received
L7A0228-01	A-3-6	Water	12-Jan-2017 09:55	13-Jan-2017 11:24

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	2/7/17 11:53

Hits Summary

(Not Including Subcontracted Analysis)

Sample: A-3-6

Lab ID: L7A0228-01

Analyte	Result	Qual	PQL	MDL	Units	Dil	Date Analyzed	CAS #	Method
Specific conductance	**225**		1.00	0.00	mg/L	1	1/16/17 11:40		SM 2510B
TDS, Total Dissolved Solids	**122**		5.00	1.78	mg/L	1	1/17/17 11:40		SM 2540C
Turbidity	**0.665**		1.00	0.507	NTU	1	1/13/17 14:55		EPA 180.1
Chloride	**5.39**		2.00	0.104	mg/L	1	1/13/17 16:46	16887-00-6	EPA 300.0
Sulfate	**5.07**		2.00	0.168	mg/L	1	1/13/17 16:46	14808-79-8	EPA 300.0
Alkalinity, Total (as CaCO3)	**92.0**		2.00	0.500	mg/L	1	1/12/17 14:00		SM 2320B
pH	**8.17**		1.00	1.00	SU	1	1/16/17 9:00		SM 4500-H
Iron	**41.2**		10.0	0.306	ug/L	1	1/19/17 19:37	7439-89-6	EPA 6020A
Magnesium	**8960**		10.0	1.59	ug/L	1	1/19/17 19:37	7439-95-4	EPA 6020A
Hardness, Total as (Ca + Mg)	**87500**		50.0	3.80	ug/L	1	1/19/17 19:37		EPA 6020A
Potassium	**2400**		10.0	3.79	ug/L	1	1/19/17 19:37	9/7/7440	EPA 6020A
Sodium	**9250**		10.0	3.59	ug/L	1	1/19/17 19:37	7440-23-5	EPA 6020A

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	2/7/17 11:53

Sample Results

Client Sample ID: A-3-6
Lab Sample ID: L7A0228-01 (Water) **Sampled:1/12/17 9:55**

Analyte	Result	Qual	PQL	MDL	Units	Dil	Date Prepared	Date Analyzed	CAS #
Alkalinity, Total by Method 2320B									
Alkalinity, Total (as CaCO3)	**92.0**		2.00	0.500	mg/L	1	1/12/17 12:00	1/12/17 14:00	
Alkalinity, Bicarbonate (as CaCO3)	0.500	U	2.00	0.500	mg/L	1	1/12/17 12:00	1/12/17 14:00	
Alkalinity, Carbonate (as CaCO3)	0.500	U	2.00	0.500	mg/L	1	1/12/17 12:00	1/12/17 14:00	
Anions by Method 300.0									
Chloride	**5.39**		2.00	0.104	mg/L	1	1/13/17 10:35	1/13/17 16:46	16887-00-6
Sulfate	**5.07**		2.00	0.168	mg/L	1	1/13/17 10:35	1/13/17 16:46	14808-79-8
Conductance by Method 2510B									
Specific conductance	**225**		1.00	0.00	mg/L	1	1/16/17 11:40	1/16/17 11:40	
pH by Method 4500-H+-B									
pH	**8.17**		1.00	1.00	SU	1	1/16/17 9:00	1/16/17 9:00	
TDS by Method 2540C									
TDS, Total Dissolved Solids	**122**		5.00	1.78	mg/L	1	1/17/17 11:40	1/17/17 11:40	
Total Metal Analysis by Method 6020A									
Iron	**41.2**		10.0	0.306	ug/L	1	1/17/17 7:00	1/19/17 19:37	7439-89-6
Magnesium	**8960**		10.0	1.59	ug/L	1	1/17/17 7:00	1/19/17 19:37	7439-95-4
Hardness, Total as (Ca + Mg)	**87500**		50.0	3.80	ug/L	1	1/17/17 7:00	1/19/17 19:37	
Potassium	**2400**		10.0	3.79	ug/L	1	1/17/17 7:00	1/19/17 19:37	9/7/7440
Sodium	**9250**		10.0	3.59	ug/L	1	1/17/17 7:00	1/19/17 19:37	7440-23-5
Turbidity by Method 180.1									
Turbidity	**0.665**		1.00	0.507	NTU	1	1/13/17 14:55	1/13/17 14:55	

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	2/7/17 11:53

Quality Control

Total Metal Analysis by Method 6020A

Analyte	Result	Qual	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B7A0287											
Blank (B7A0287-BLK1)					Prepared: 1/17/2017 Analyzed: 1/19/2017						
Calcium	52.8		50.0	3.79	ug/L						
LCS (B7A0287-BS1)					Prepared: 1/17/2017 Analyzed: 1/19/2017						
Calcium	7630		50.0	3.79	ug/L	5000		153	80-120		
LCS Dup (B7A0287-BSD1)					Prepared: 1/17/2017 Analyzed: 1/19/2017						
Calcium	6650		50.0	3.79	ug/L	5000		133	80-120	14	20
Matrix Spike (B7A0287-MS1)		**Source: L7A0228-01**			Prepared: 1/17/2017 Analyzed: 1/19/2017						
Calcium	23400		50.0	3.79	ug/L	5000	20300	61	80-120		
Matrix Spike Dup (B7A0287-MSD1)		**Source: L7A0228-01**			Prepared: 1/17/2017 Analyzed: 1/19/2017						
Calcium	24700		50.0	3.79	ug/L	5000	20300	89	80-120	6	20

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	2/7/17 11:53

Quality Control
(Continued)

Total Metal Analysis by Method 6020A

Analyte	Result	Qual	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B7A0287											
Blank (B7A0287-BLK1)					Prepared: 1/17/2017 Analyzed: 1/19/2017						
Iron	16.7		10.0	0.306	ug/L						
LCS (B7A0287-BS1)					Prepared: 1/17/2017 Analyzed: 1/19/2017						
Iron	584		10.0	0.306	ug/L	500		117	80-120		
LCS Dup (B7A0287-BSD1)					Prepared: 1/17/2017 Analyzed: 1/19/2017						
Iron	551		10.0	0.306	ug/L	500		110	80-120	6	20
Matrix Spike (B7A0287-MS1)		**Source: L7A0228-01**			Prepared: 1/17/2017 Analyzed: 1/19/2017						
Iron	559		10.0	0.306	ug/L	500	41.2	104	80-120		
Matrix Spike Dup (B7A0287-MSD1)		**Source: L7A0228-01**			Prepared: 1/17/2017 Analyzed: 1/19/2017						
Iron	558		10.0	0.306	ug/L	500	41.2	103	80-120	0.2	20

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	2/7/17 11:53

Quality Control
(Continued)

Total Metal Analysis by Method 6020A

Analyte	Result	Qual	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B7A0287											
Blank (B7A0287-BLK1)					Prepared: 1/17/2017 Analyzed: 1/19/2017						
Magnesium	1.59	U,	10.0	1.59	ug/L						
LCS (B7A0287-BS1)					Prepared: 1/17/2017 Analyzed: 1/19/2017						
Magnesium	585		10.0	1.59	ug/L	500		117	80-120		
LCS Dup (B7A0287-BSD1)					Prepared: 1/17/2017 Analyzed: 1/19/2017						
Magnesium	559		10.0	1.59	ug/L	500		112	80-120	5	20
Matrix Spike (B7A0287-MS1)		**Source: L7A0228-01**			Prepared: 1/17/2017 Analyzed: 1/19/2017						
Magnesium	9130		10.0	1.59	ug/L	500	8960	33	80-120		
Matrix Spike Dup (B7A0287-MSD1)		**Source: L7A0228-01**			Prepared: 1/17/2017 Analyzed: 1/19/2017						
Magnesium	9410		10.0	1.59	ug/L	500	8960	90	80-120	3	20

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	2/7/17 11:53

Quality Control
(Continued)

Total Metal Analysis by Method 6020A

Analyte	Result	Qual	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B7A0287											
Blank (B7A0287-BLK1)					Prepared: 1/17/2017 Analyzed: 1/19/2017						
Potassium	322		10.0	3.79	ug/L						
LCS (B7A0287-BS1)					Prepared: 1/17/2017 Analyzed: 1/19/2017						
Potassium	595		10.0	3.79	ug/L	500		119	80-120		
LCS Dup (B7A0287-BSD1)					Prepared: 1/17/2017 Analyzed: 1/19/2017						
Potassium	565		10.0	3.79	ug/L	500		113	80-120	5	20
Matrix Spike (B7A0287-MS1)		**Source: L7A0228-01**			Prepared: 1/17/2017 Analyzed: 1/19/2017						
Potassium	3020		10.0	3.79	ug/L	500	2400	123	80-120		
Matrix Spike Dup (B7A0287-MSD1)		**Source: L7A0228-01**			Prepared: 1/17/2017 Analyzed: 1/19/2017						
Potassium	2900		10.0	3.79	ug/L	500	2400	100	80-120	4	20

Cardno - Riverview	Project: A-3	
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Riverview, FL 33578	Project Manager: Michelle Leonard	2/7/17 11:53

Quality Control
(Continued)

Total Metal Analysis by Method 6020A

Analyte	Result	Qual	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B7A0287											
Blank (B7A0287-BLK1)					Prepared: 1/17/2017 Analyzed: 1/19/2017						
Sodium	278		10.0	3.59	ug/L						
LCS (B7A0287-BS1)					Prepared: 1/17/2017 Analyzed: 1/19/2017						
Sodium	764		10.0	3.59	ug/L	500		153	80-120		
LCS Dup (B7A0287-BSD1)					Prepared: 1/17/2017 Analyzed: 1/19/2017						
Sodium	695		10.0	3.59	ug/L	500		139	80-120	9	20
Matrix Spike (B7A0287-MS1)		**Source: L7A0228-01**			Prepared: 1/17/2017 Analyzed: 1/19/2017						
Sodium	9540		10.0	3.59	ug/L	500	9250	57	80-120		
Matrix Spike Dup (B7A0287-MSD1)		**Source: L7A0228-01**			Prepared: 1/17/2017 Analyzed: 1/19/2017						
Sodium	9750		10.0	3.59	ug/L	500	9250	100	80-120	2	20

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
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Quality Control
(Continued)

Alkalinity, Total by Method 2320B

Analyte	Result	Qual	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B7A0431											
Blank (B7A0431-BLK1)						Prepared & Analyzed: 1/12/2017					
Alkalinity, Total (as CaCO3)	0.500	U,	2.00	0.500	mg/L						
LCS (B7A0431-BS1)						Prepared & Analyzed: 1/12/2017					
Alkalinity, Total (as CaCO3)	65.0		2.00	0.500	mg/L	69.0		94	90-110		
LCS Dup (B7A0431-BSD1)						Prepared & Analyzed: 1/12/2017					
Alkalinity, Total (as CaCO3)	66.0		2.00	0.500	mg/L	69.0		96	90-110	2	20
Duplicate (B7A0431-DUP1)		**Source: L7A0190-01**				Prepared & Analyzed: 1/12/2017					
Alkalinity, Total (as CaCO3)	95.0		2.00	0.500	mg/L		95.0			0	20

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	2/7/17 11:53

Quality Control
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Anions by Method 300.0

Analyte	Result	Qual	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B7A0260											
Blank (B7A0260-BLK1)					Prepared & Analyzed: 1/13/2017						
Chloride	0.104	U,	2.00	0.104	mg/L						
LCS (B7A0260-BS1)					Prepared & Analyzed: 1/13/2017						
Chloride	20.0		2.00	0.104	mg/L	20.0		100	90-110		
LCS Dup (B7A0260-BSD1)					Prepared & Analyzed: 1/13/2017						
Chloride	20.8		2.00	0.104	mg/L	20.0		104	90-110	4	20
Duplicate (B7A0260-DUP1)		**Source: L7A0217-01**			Prepared & Analyzed: 1/13/2017						
Chloride	13.4		2.00	0.104	mg/L		13.2			1	20
Matrix Spike (B7A0260-MS1)		**Source: L7A0217-01**			Prepared & Analyzed: 1/13/2017						
Chloride	36.2		2.00	0.104	mg/L	20.0	13.2	115	80-120		
Matrix Spike Dup (B7A0260-MSD1)		**Source: L7A0217-01**			Prepared & Analyzed: 1/13/2017						
Chloride	36.8		2.00	0.104	mg/L	20.0	13.2	118	80-120	2	20

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	2/7/17 11:53

Quality Control
(Continued)

Anions by Method 300.0

Analyte	Result	Qual	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B7A0260											
Blank (B7A0260-BLK1)					Prepared & Analyzed: 1/13/2017						
Sulfate	0.168	U,	2.00	0.168	mg/L						
LCS (B7A0260-BS1)					Prepared & Analyzed: 1/13/2017						
Sulfate	19.4		2.00	0.168	mg/L	20.0		97	90-110		
LCS Dup (B7A0260-BSD1)					Prepared & Analyzed: 1/13/2017						
Sulfate	20.9		2.00	0.168	mg/L	20.0		105	90-110	7	20
Duplicate (B7A0260-DUP1)		**Source: L7A0217-01**			Prepared & Analyzed: 1/13/2017						
Sulfate	7.52		2.00	0.168	mg/L		7.53			0.1	20
Matrix Spike (B7A0260-MS1)		**Source: L7A0217-01**			Prepared & Analyzed: 1/13/2017						
Sulfate	28.3		2.00	0.168	mg/L	20.0	7.53	104	80-120		
Matrix Spike Dup (B7A0260-MSD1)		**Source: L7A0217-01**			Prepared & Analyzed: 1/13/2017						
Sulfate	29.7		2.00	0.168	mg/L	20.0	7.53	111	80-120	5	20

Cardno - Riverview	Project: A-3	
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Riverview, FL 33578	Project Manager: Michelle Leonard	2/7/17 11:53

Quality Control
(Continued)

Turbidity by Method 180.1

Analyte	Result	Qual	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B7A0241											
Blank (B7A0241-BLK1)					Prepared & Analyzed: 1/13/2017						
Turbidity	0.507	U,	1.00	0.507	NTU						
LCS (B7A0241-BS1)					Prepared & Analyzed: 1/13/2017						
Turbidity	196		1.00	0.507	NTU	200		98	80-120		
LCS Dup (B7A0241-BSD1)					Prepared & Analyzed: 1/13/2017						
Turbidity	195		1.00	0.507	NTU	200		98	80-120	0.5	20
Duplicate (B7A0241-DUP1)		**Source: L7A0228-01**			Prepared & Analyzed: 1/13/2017						
Turbidity	0.649		1.00	0.507	NTU		0.665			2	20

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	2/7/17 11:53

Quality Control
(Continued)

TDS by Method 2540C

Analyte	Result	Qual	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B7A0421											
Blank (B7A0421-BLK1)						Prepared & Analyzed: 1/17/2017					
TDS, Total Dissolved Solids	1.78	U,	5.00	1.78	mg/L						
LCS (B7A0421-BS1)						Prepared & Analyzed: 1/17/2017					
TDS, Total Dissolved Solids	111		5.00	1.78	mg/L	100		111	80-120		
LCS Dup (B7A0421-BSD1)						Prepared & Analyzed: 1/17/2017					
TDS, Total Dissolved Solids	104		5.00	1.78	mg/L	100		104	80-120	7	20
Duplicate (B7A0421-DUP1)		**Source: L7A0228-01**				Prepared & Analyzed: 1/17/2017					
TDS, Total Dissolved Solids	122		5.00	1.78	mg/L		122			0	20

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	2/7/17 11:53

Quality Control
(Continued)

pH by Method 4500-H+-B

Analyte	Result	Qual	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B7A0270											
Duplicate (B7A0270-DUP1)		**Source: L7A0228-01**			Prepared & Analyzed: 1/16/2017						
pH	8.21		1.00	1.00	SU		8.17			0.5	20

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	2/7/17 11:53

Quality Control
(Continued)

Conductance by Method 2510B

Analyte	Result	Qual	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B7A0271											
Duplicate (B7A0271-DUP1)		**Source: L7A0228-01**			Prepared & Analyzed: 1/16/2017						
Specific conductance	226		1.00	0.00	mg/L		225			0.4	20

Cardno - Riverview	Project: A-3	
3905 Crescent Park Drive	Project Number: E213001410	**Reported:**
Riverview, FL 33578	Project Manager: Michelle Leonard	2/7/17 11:53

List of Certifications for FTS - Florida

Number	Description	Code	Facility	Expires
04176	LA CERTIFICATE	LANELAC	FTSA	06/30/2016
483	NC CERTIFICATE	ANC	FTSA	12/31/2017
85	KENTUKY CERTIFICATE	KENTUKY	FTSA	
98015	SC CERTIFICATE	ASC	FTSA	06/30/2017
E84098	FL NELAC CERTIFICATE	LFLNELAC	FTSL	06/30/2017
E87429	FL NELAC CERTIFICATE	AFLNELAC	FTSA	06/30/2017
LI0-135	DoD CERTIFICATE	DOD	FTSA	06/30/2016
P330-07-00105	USDA CERTIFICATE	USDA	FTSA	

Notes and Definitions

Item	Definition
U	Compound was not detected.
Dry	Sample results reported on a dry weight basis.
I	Value estimated to be between the Laboratory Detection and Reporting Limit
J	QC Failure see Case Narrative
L	Concentration exceeds calibration range
N	Tentatively Identified Compound
Q	Hold time exceeded
V	Analyte equal to or above detection limit in the method blank
TNTC	Bacteria is present but Too Numerous To Count

RPD	Relative Percent Difference
%REC	Percent Recovery
Source	Sample that was matrix spiked or duplicated.

FTS ANALYTICAL SERVICES
CHAIN OF CUSTODY

2505 N. Falkenburg Rd., Tampa, FL 33619 (813-620-2000) / 5675 New Tampa Hwy, Lakeland, FL 33815 (863-646-8526)
6017 Financial Drive, Norcross, GA 30071 (770-449-8800)

Company Name: Cardno
Address: 3905 Crescent Park Dr. Riverview, FL
Results Sent to: Michelle Leonard
Email address: Michelle.leonard@cardno.com
Contact Phone #: 813-352-1626 Cell#: same
Project Name (Site): A-3 oversight
Project Number (ID): E21300141B
Regulatory Program: n/a

Receiver's Initials/Temp: ____ / 4.1°
Custody Seal(s): ___ Y N Lab Work Order # L7A0228
P.O.# (if required):
Field Comments / Lab Precautions:

Sampler(s): (signature)
Sampler(s): (printed) Michelle Leonard

Line No.	Sample ID #	Sample Depth (Ft)	Collection Date / Time	Matrix (See below)	Composite	Grab	No. of Containers	Analysis Requested: Turbidity	Cl, SO4, HCO3	pH, TDS, SC	Ca, Mg, Na, K Fe + Hardness										
	Container Type:							P	P	P	P										
	Preservation Code:							9	9	9	2										
1	A-3-6	n/a	1/12/17 9:55	GW		✓	4	1	1	1	1										
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					

1) Relinquished By:	Date / Time 11/13/17 11:24	2) Received By:	Date / Time 1/13/17 1124
3) Relinquished By:	Date / Time	4) Received By:	Date / Time
5) Relinquished By:	Date / Time	6) Received By:	Date / Time

Delivered by: (Circle One)
Fed Ex / UPS / Courier / Lab Pickup / Hand / Other

Turnaround Time (business days)

___10 Days ; ✓5-7 Days; ___3 Days
___2 Days ; ___1 Day; ___Same Day

Matrix Guide: (W=Water) (DW = Drinking Water) (GW = Groundwater) (SW = Surface Water) (L = Liquid) (O = Oil) (S = Soil) (SD = Solid) (SL = Sludge) (A = Air) (C = Air Cartridge)
Preservation: 1 = HCL 2 = HNO_3 3 = H_2SO_4 4 = NaOH + $NaAsO_2$ 5 = NaOH + ZnAc 6 = $Na_2S_2O_3$ 7 = DI Water & MeOH 8 = NaHSO4 & MeOH 9 = None 10 = NaHS04
Container Type: VC=Vial (Clear); VA =Vial (Amber); GC=Glass (Clear); GA=Glass (Amber); P=Plastic (HDPE); TB=Tedlar Bag; ES=EnCore Sampler; ZB=Ziploc Bag; O=Other