

HALLIBURTON				ARRAY COMPENSATED TRUE RESISTIVITY LOG			
COMPANY		CMX, INC.		COMPANY		CMX, INC.	
WELL		LEGHORN #1-22		WELL		LEGHORN #1-22	
FIELD/BLOCK		CHASE-SILICA		FIELD/BLOCK		CHASE-SILICA	
COUNTY		BARTON		COUNTY		BARTON	
STATE		KANSAS		STATE		KANSAS	
Permanent Datum		GL		API No. 15-009-26165-00-00		Other Services: ACRT BSAT MICRO DSNT/SDLT	
Log measured from		KB		Location 2310' FSL & 2610' FEL		Elev. 1759.0 ft	
Drilling measured from		KB		Sect. 22 Twp. 20S Rge. 11W		D.F. 1767.0 ft	
Date		08-Mar-17				G.L. 1759.0 ft	
Run No.		ONE					
Depth - Driller		3312.0 ft					
Depth - Logger		3310.0 ft					
Bottom - Logged Interval		3307.0 ft					
Top - Logged Interval		252.0 ft					
Casing - Driller		8.625 in		@ 256.0 ft		@	
Casing - Logger		252.0 ft					
Bit Size		7.875 in				@	
Type Fluid in Hole		Water Based Mud					
Density		9.1 ppg		57.00 sl/qt			
PH		9.20 pH		7.6 cpm			
Source of Sample		FLOWLINE					
Rm @ Meas. Temperature		0.54 ohmm		@ 75.00 degF		@	
Rmf @ Meas. Temperature		0.45 ohmm		@ 75.00 degF		@	
Rmc @ Meas. Temperature		0.63 ohmm		@ 75.00 degF		@	
Source Rmf		CALC		CALC			
Rm @ BHT		0.42 ohmm		@ 103.0 degF		@	
Time Since Circulation		15:52 hr					
Time on Bottom		08-Mar-17 11:52					
Max. Rec. Temperature		103.00 degF		@ 3310.0 ft		@	
Equipment		11072142		EL RENO, OK			
Recorded By		THOMAS HYDE					
Witnessed By		K. LEBLANC		JORGE ORLANDO PEREZ			

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Service Ticket No.: 903889174						API No.: 15-009-26165-00-00						PGM Version: WL INSITE R5.0.5 (Build 8)					
CHANGE IN MUD TYPE OR ADDITIONAL SAMPLE									RESISTIVITY SCALE CHANGES								
Date	Sample No.					Type Log	Depth	Scale Up Hole			Scale Down Hole						
Depth-Driller																	
Type Fluid in Hole																	
Density	Viscosity																
Ph	Fluid Loss																
Source of Sample						RESISTIVITY EQUIPMENT DATA											
Rm @ Meas. Temp		@				Run No.	Tool Type & No.	Pad Type		Tool Pos.		Other					
Rmf @ Meas. Temp.		@				ONE	ACRT	N/A		CENT.		N/A					
Rmc @ Meas. Temp.		@					I-11026094										
Source Rmf	Rmc						S-11024142										
Rm @ BHT		@															
Rmf @ BHT		@															
Rmc @ BHT		@															
EQUIPMENT DATA																	
GAMMA				ACOUSTIC				DENSITY				NEUTRON					
Run No.		ONE		Run No.		ONE		Run No.		ONE		Run No.		ONE			
Serial No.		11013114		Serial No.		10939050		Serial No.		10960494		Serial No.		10993115			
Model No.		GTET		Model No.		BSAT		Model No.		SDLT		Model No.		DSNT			
Diameter		3.625"		No. of Cent.		2		Diameter		5.5"		Diameter		3.625"			
Detector Model No.		T-102		Spacing		EVEN		Log Type		GAM-GAM		Log Type		NEU-NEU			
Type		SCINT						Source Type		Cs137		Source Type		Am241Be			
Length		8"		LSA [Y/N]				Serial No.		5168GW		Serial No.		DSD-424			
Distance to Source		N/A		FWDA [Y/N]				Strength		1.5 Ci		Strength		15 Ci			
LOGGING DATA																	
GENERAL				GAMMA		ACOUSTIC			DENSITY				NEUTRON				
Run		Depth		Speed		Scale		Scale		Matrix		Scale		Matrix			
No.		From To		ft/min		L R		L R		Matrix		L R		Matrix			
ONE		2210 252		REC		0 150		20 10		47.6		20 10		2.71			
														LIME			

ONE	3510	292	REC	0	150	30	-10	47.0	30	-10	2.71	30	510	TIME	
DIRECTIONAL INFORMATION															
Maximum Deviation							@	KOP				@			
Remarks: RUN 1: GTET															
RUN 2: GTET-DSNT-SDLT															
RUN 3: GTET-BSAT-ACRT															
TOOLS RUN PER CUSTOMER REQUEST															
ANNULAR HOLE VOLUME CALCULATED FOR 5.5 INCH CASING															
TODAY'S CREW K. KING T. SUMNER															
THANK YOU FOR CHOOSING HALLIBURTON ENERGY SERVICES EL RENO, OK 405-278-9685															
HALLIBURTON DOES NOT GUARANTEE THE ACCURACY OF ANY INTERPRETATION OF THE LOG DATA, CONVERSION OF LOG DATA TO PHYSICAL ROCK PARAMETERS OR RECOMMENDATIONS WHICH MAY BE GIVEN BY HALLIBURTON PERSONNEL OR WHICH APPEAR ON THE LOG OR IN ANY OTHER FORM. ANY USER OF SUCH DATA, INTERPRETATIONS, CONVERSIONS, OR RECOMMENDATIONS AGREES THAT HALLIBURTON IS NOT RESPONSIBLE EXCEPT WHERE DUE TO GROSS NEGLIGENCE OR WILLFUL MISCONDUCT, FOR ANY LOSS, DAMAGES, OR EXPENSES RESULTING FROM THE USE THEREOF.															
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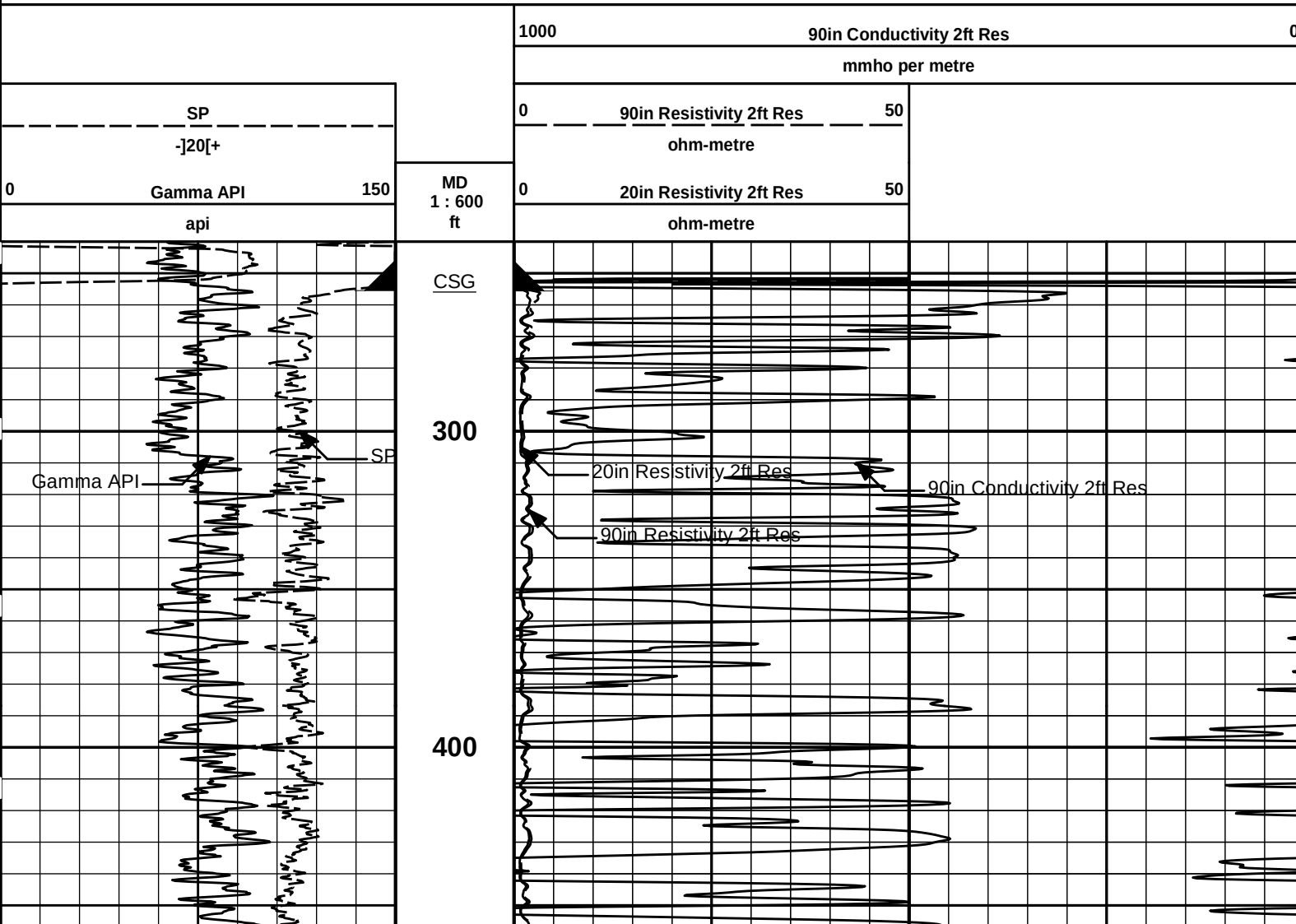
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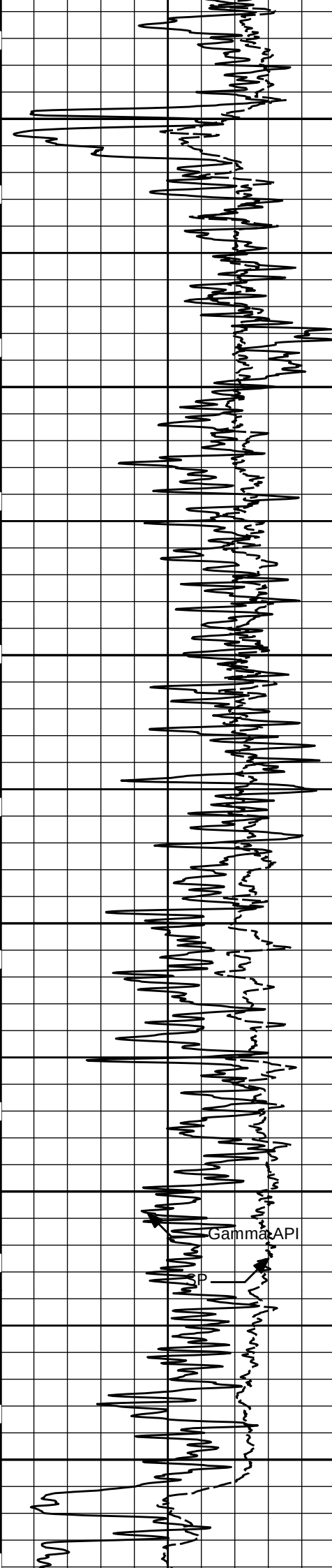
Plot Range: 240 ft to 3317.25 ft

Data: LEGHORN_1-22\Well Based*

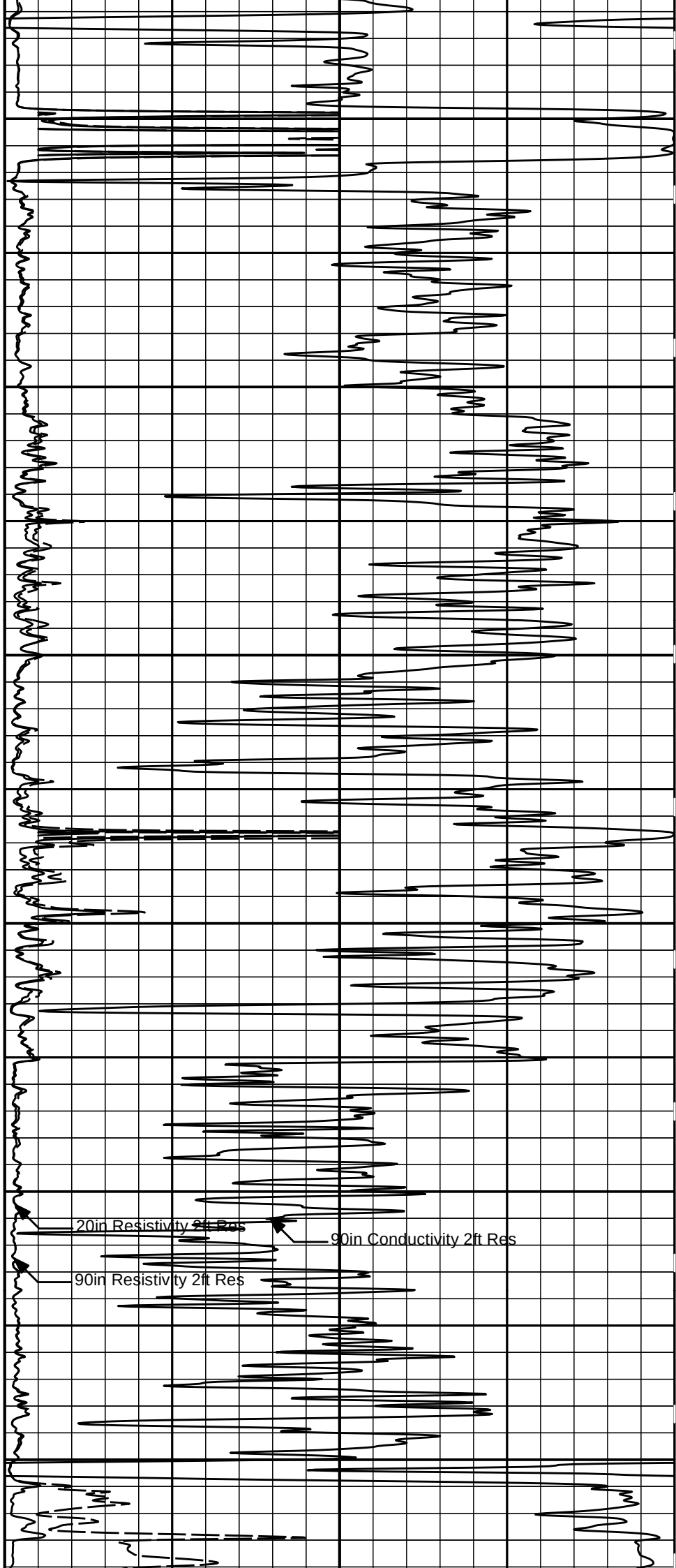
Plot File: \\LOCAL-LEGHORN_1-22\0003 GTET-BSAT-ACRT\ACRT\ACRT_2.lib

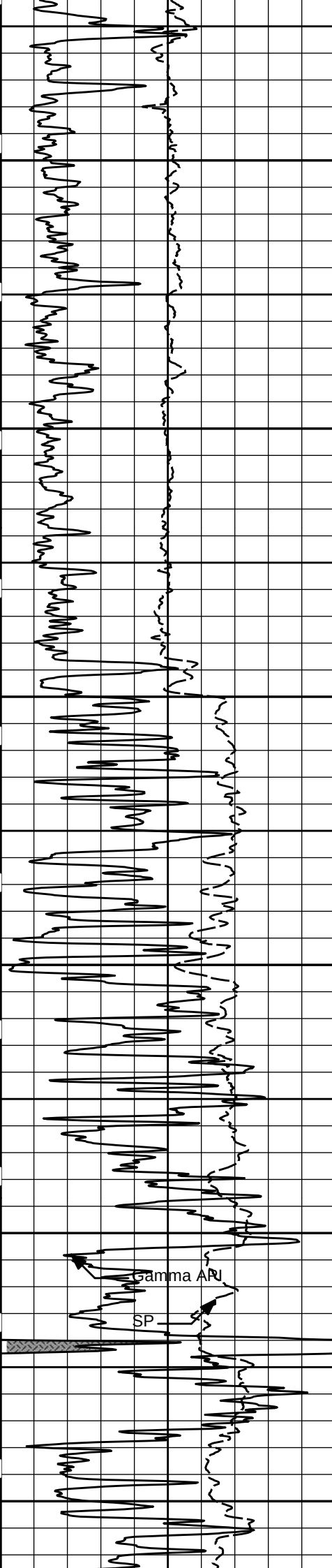
2 INCH MAIN LOG





500
600
700
800
900
1000





1100

1200

1300

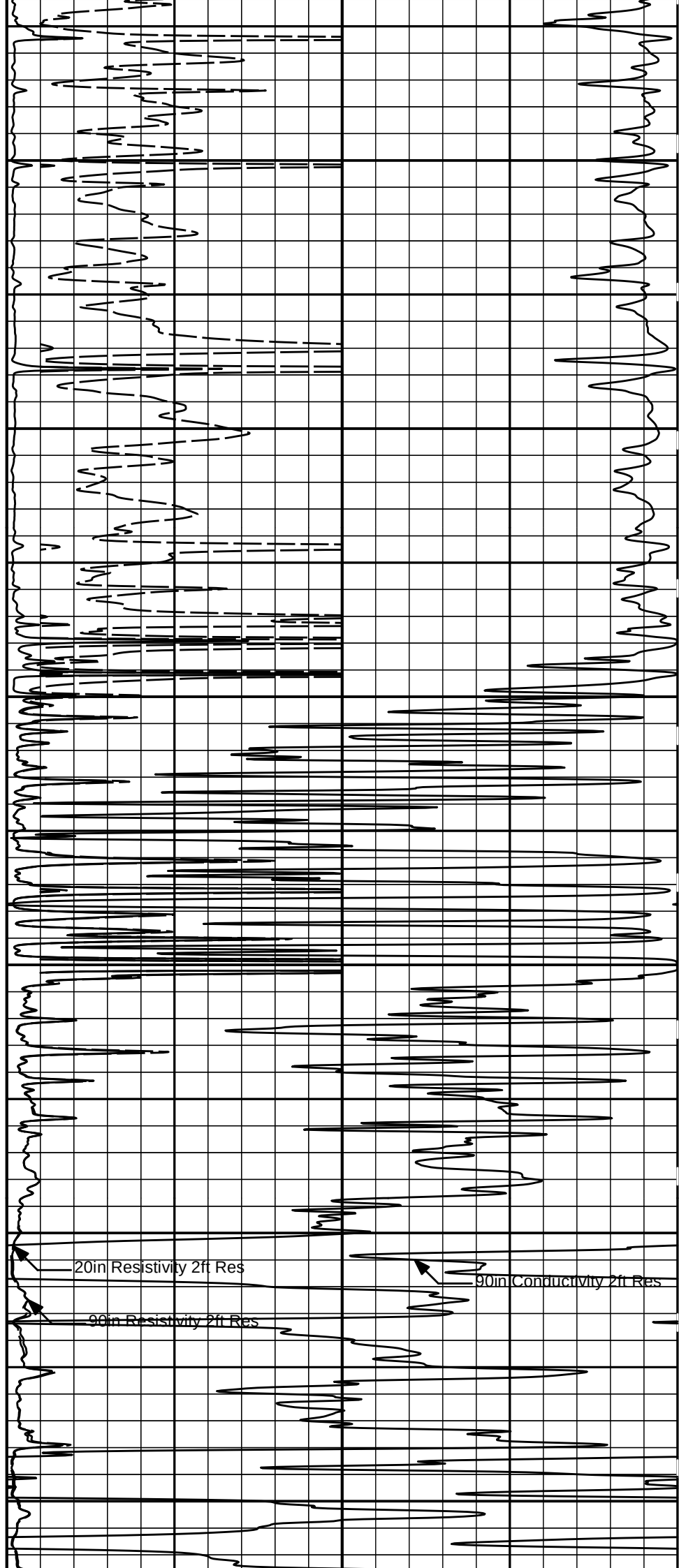
1400

1500

1600

Gamma Ray

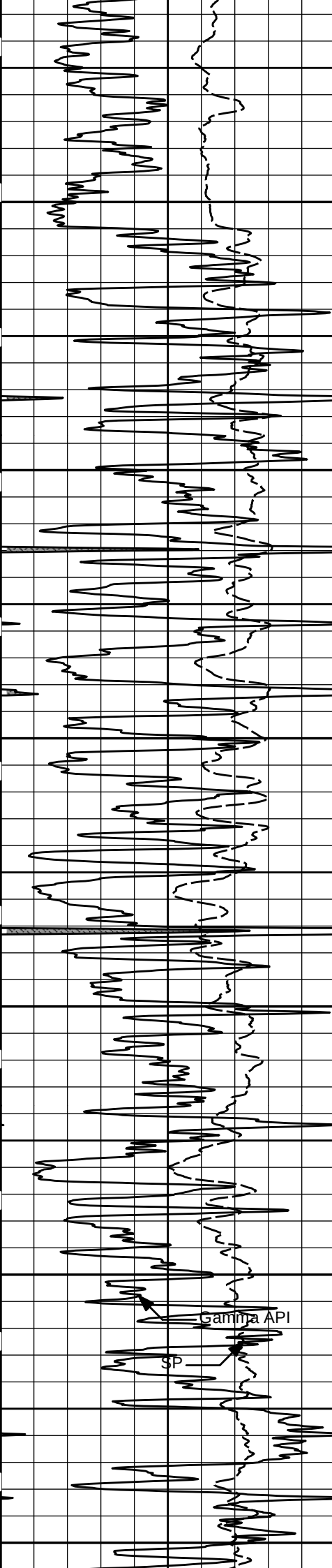
SP



20in Resistivity 2ft Res

90in Resistivity 2ft Res

90in Conductivity 2ft Res



1700

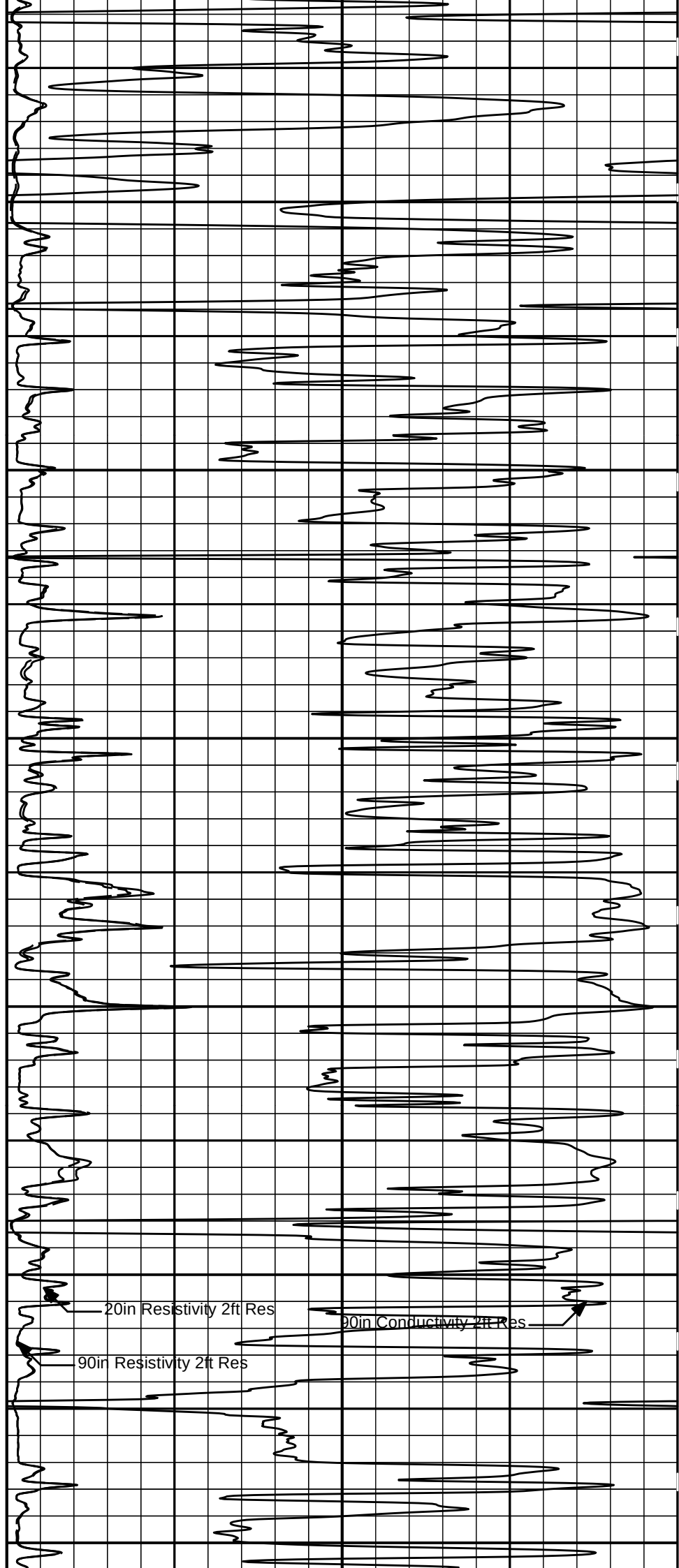
1800

1900

2000

2100

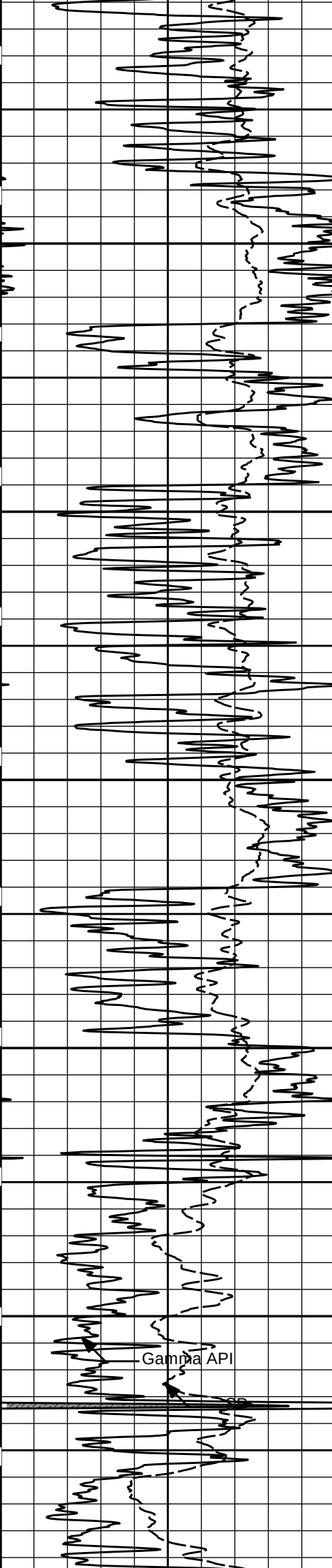
2200



20in Resistivity 2ft Res

90in Resistivity 2ft Res

90in Conductivity 2ft Res



2300

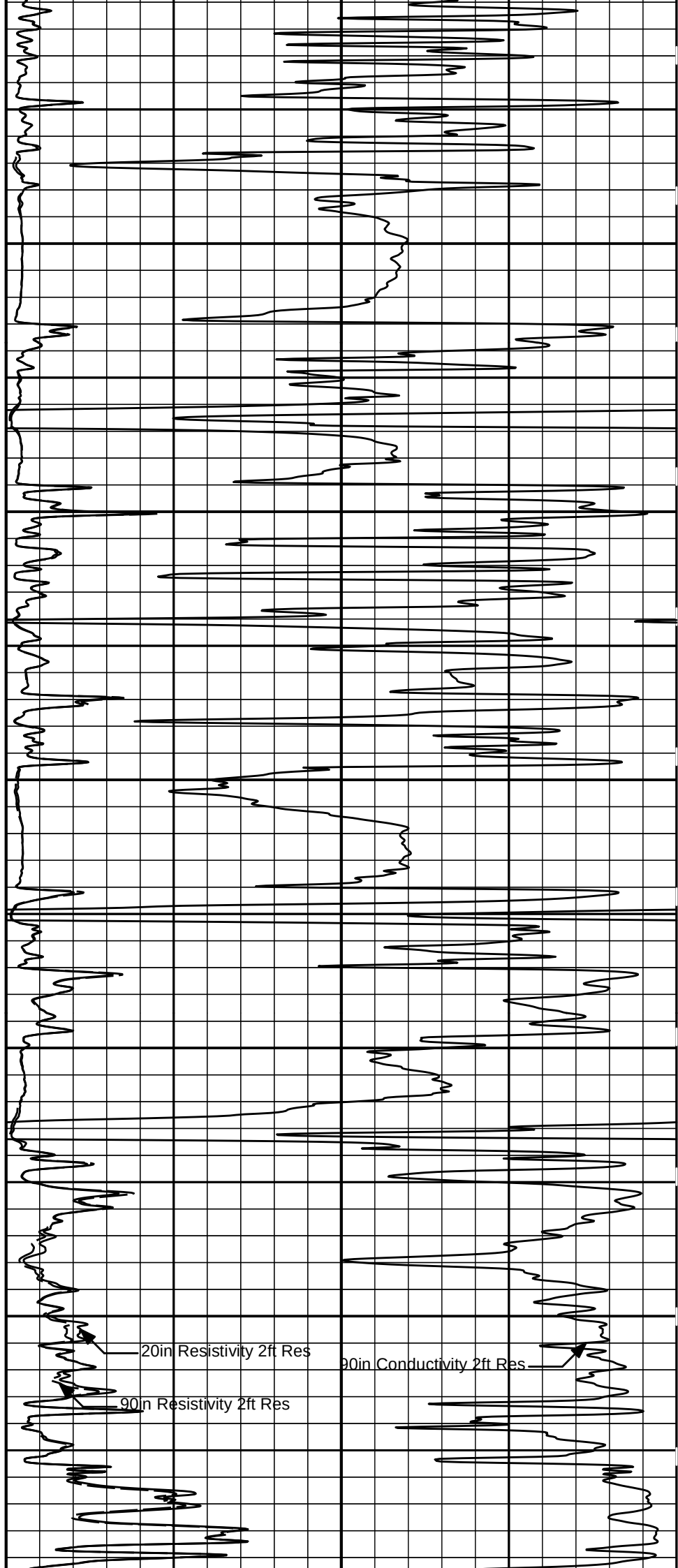
2400

2500

2600

2700

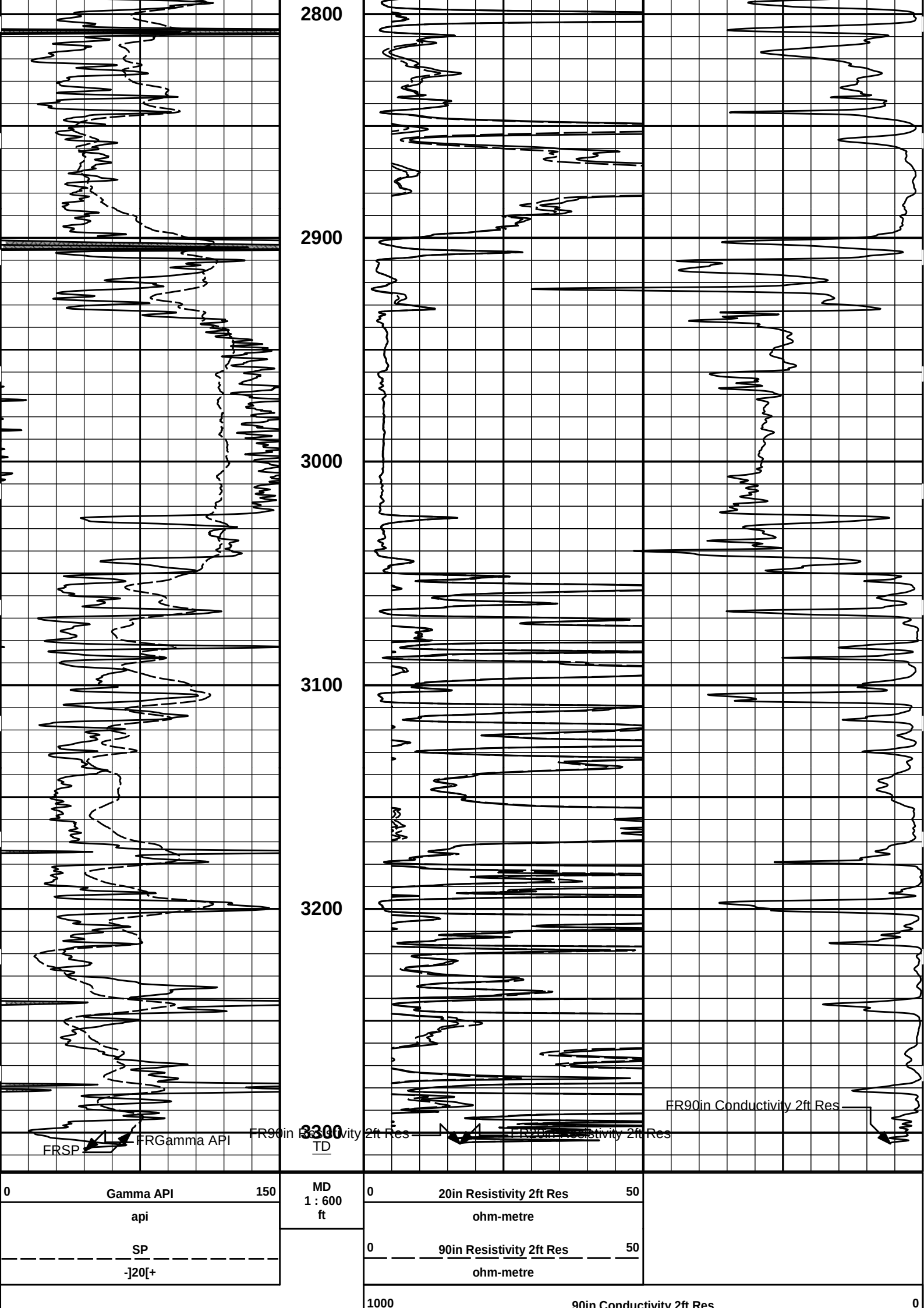
Gamma API

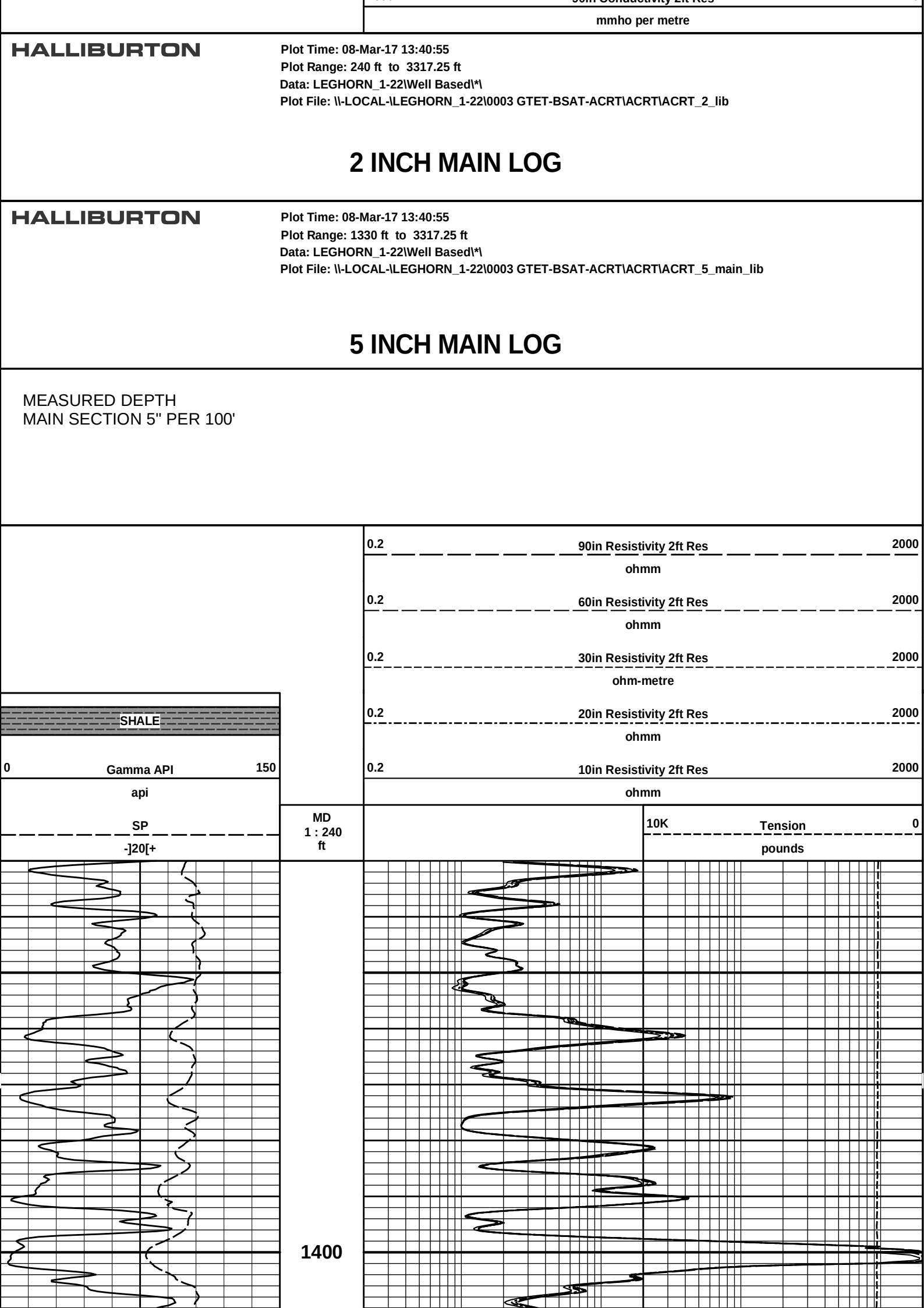


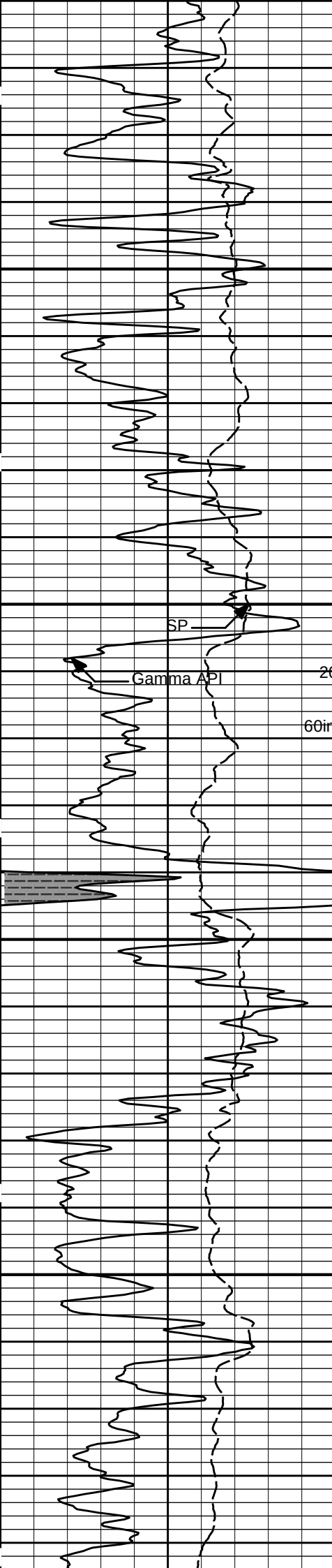
20in Resistivity 2ft Res

90in Resistivity 2ft Res

90in Conductivity 2ft Res





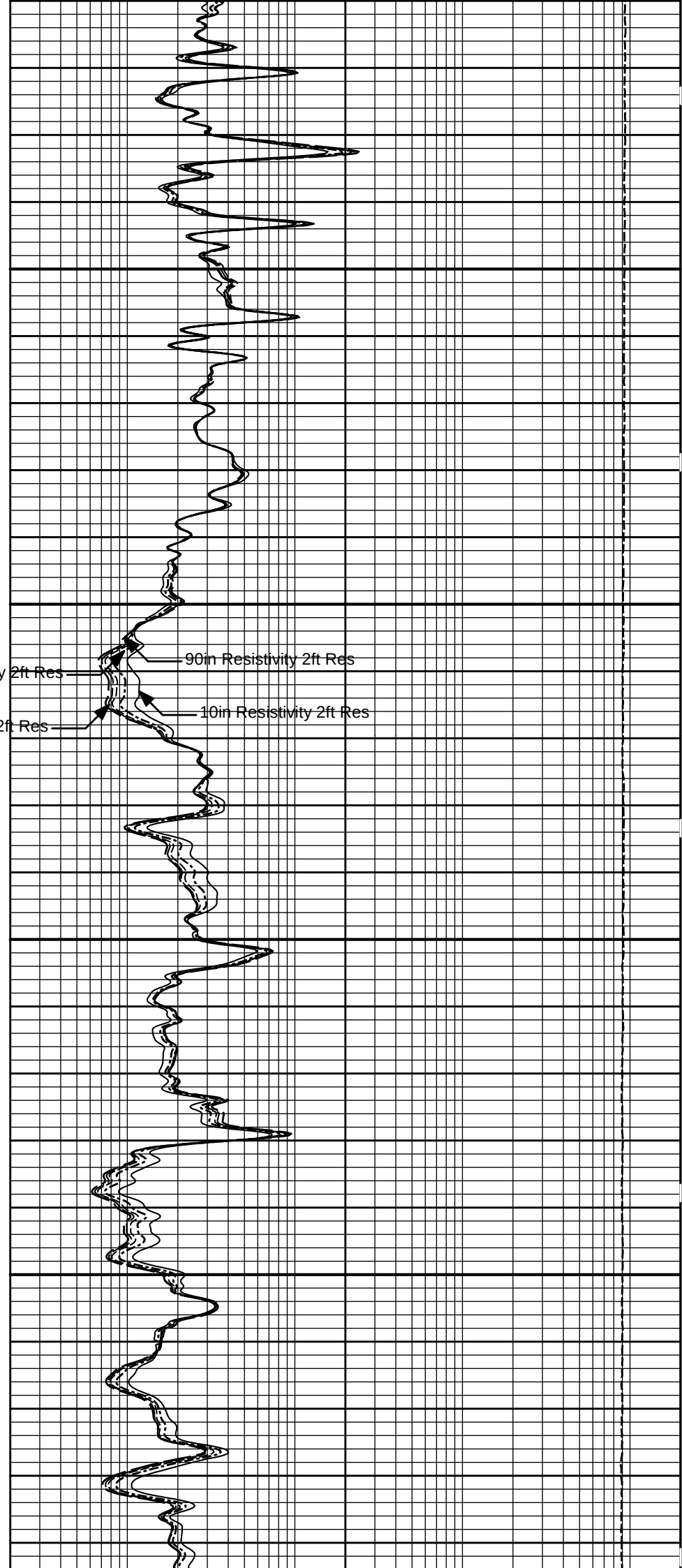


1500

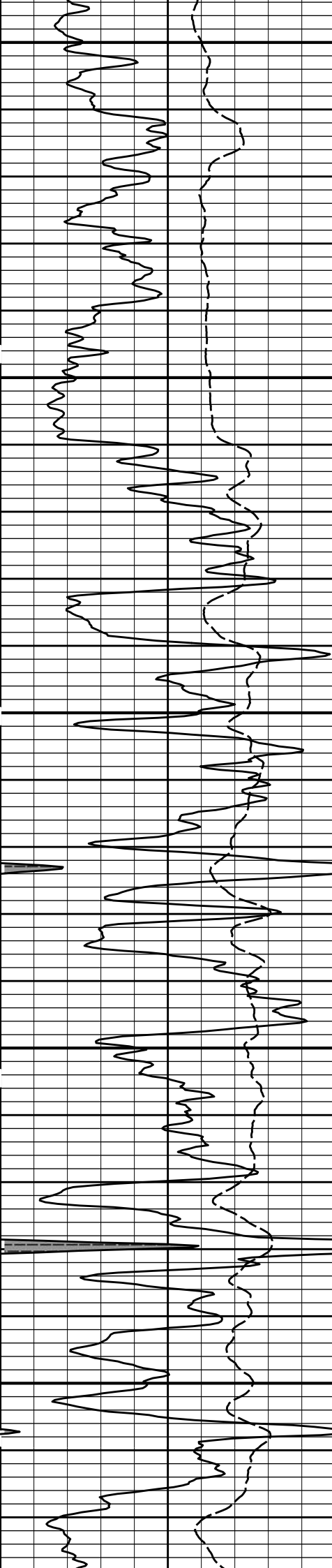
SP
Gamma API

26in Resistivity 2ft Res
60in Resistivity 2ft Res

1600

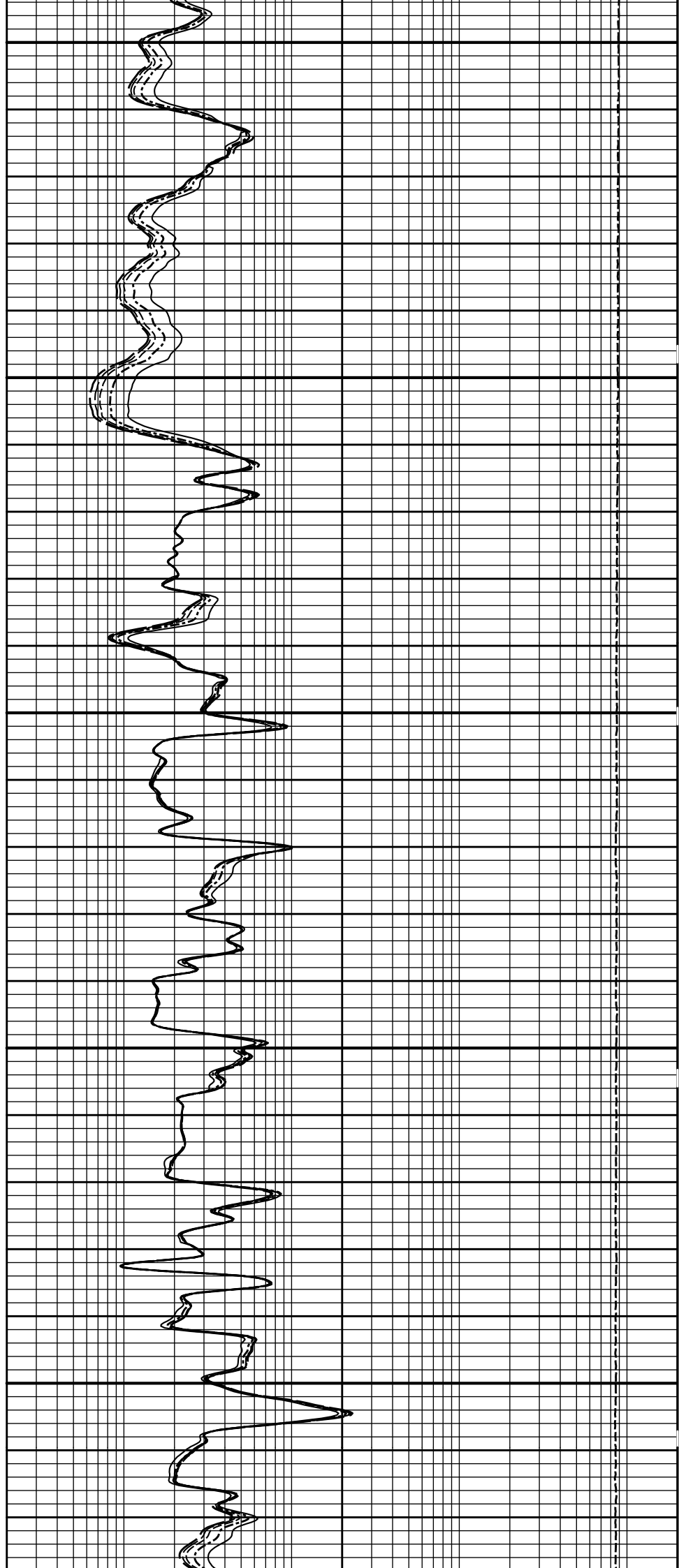


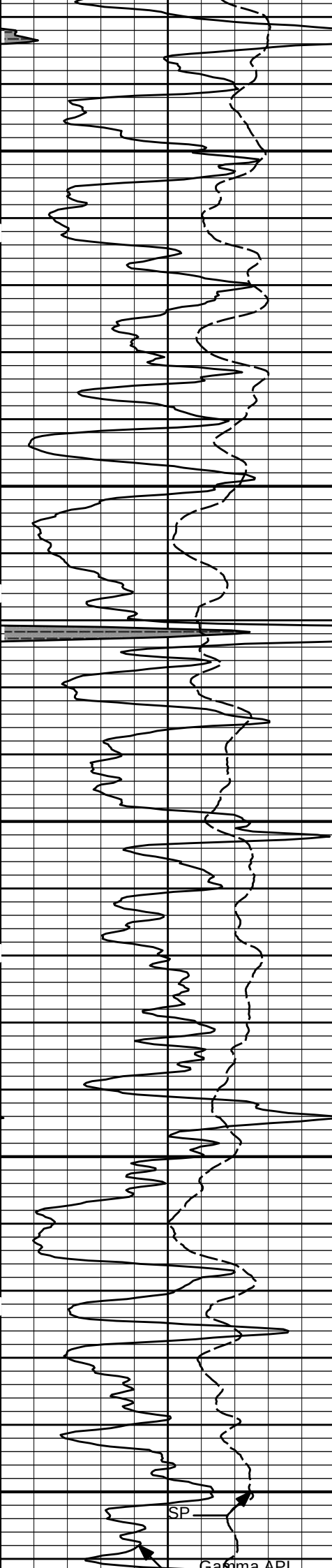
90in Resistivity 2ft Res
10in Resistivity 2ft Res



1700

1800





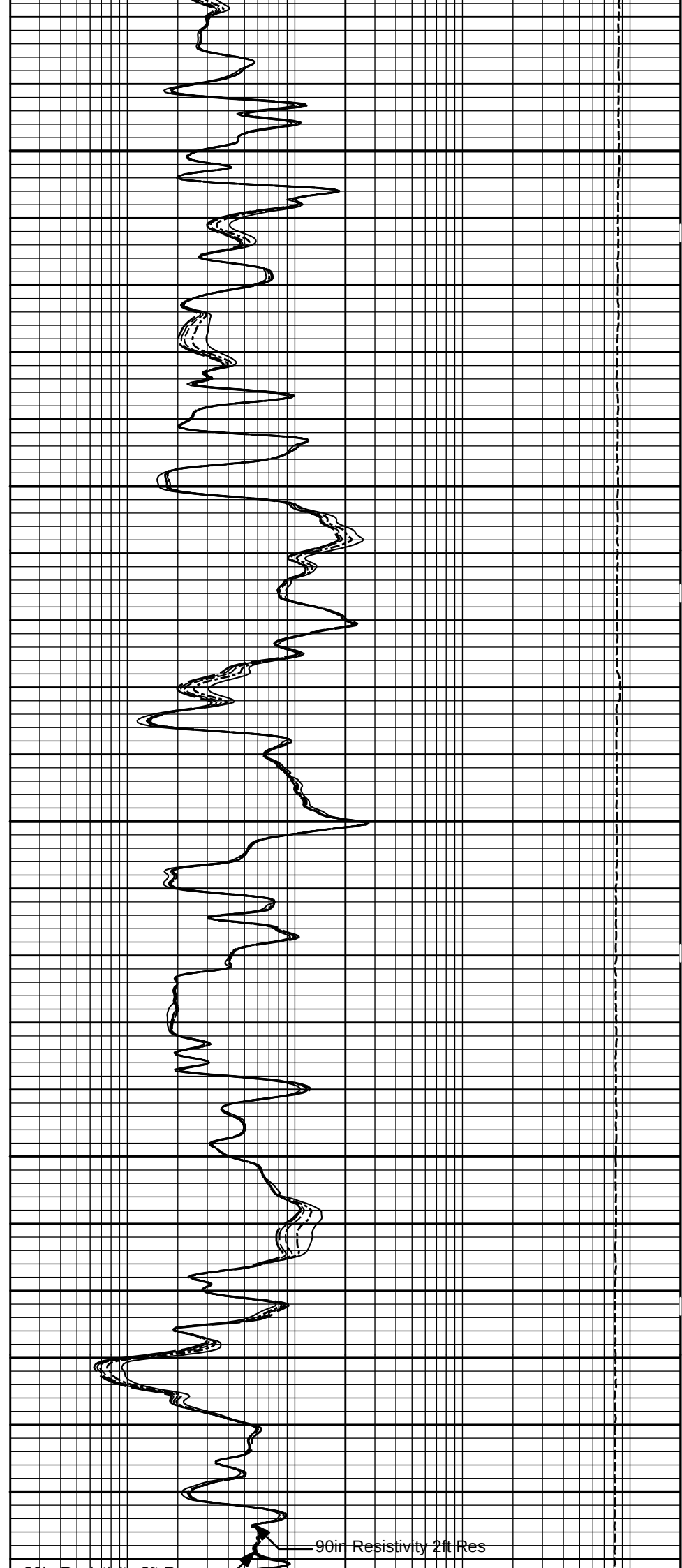
1900

2000

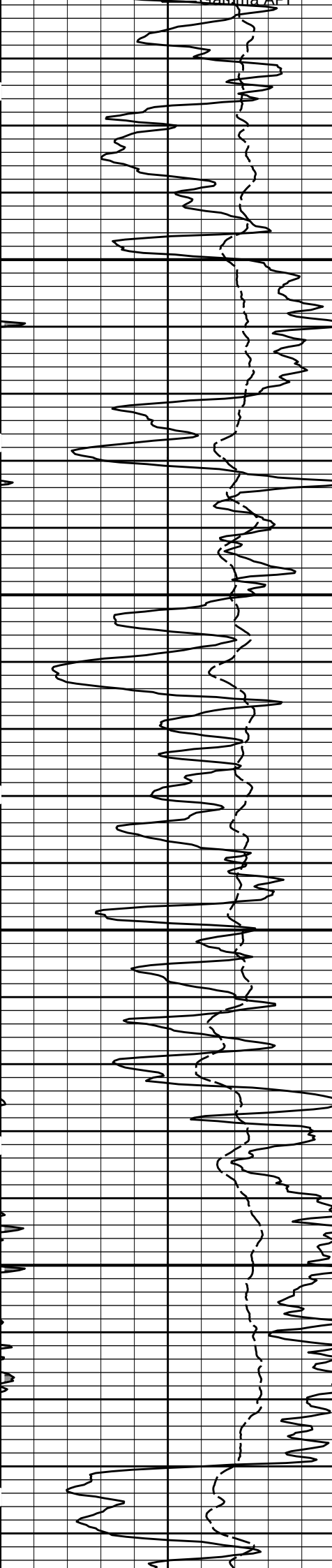
2100

SP

Gamma API

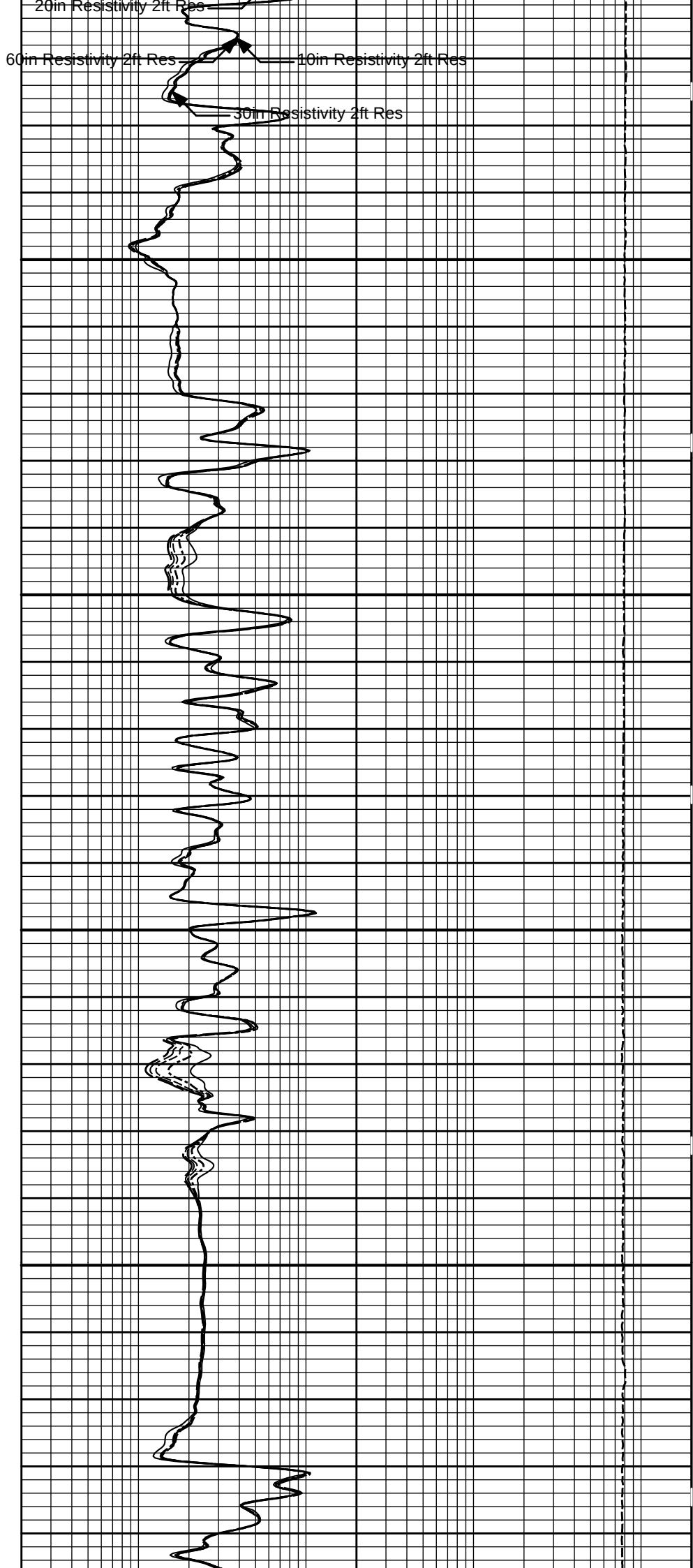


90in Resistivity 2ft Res



2200

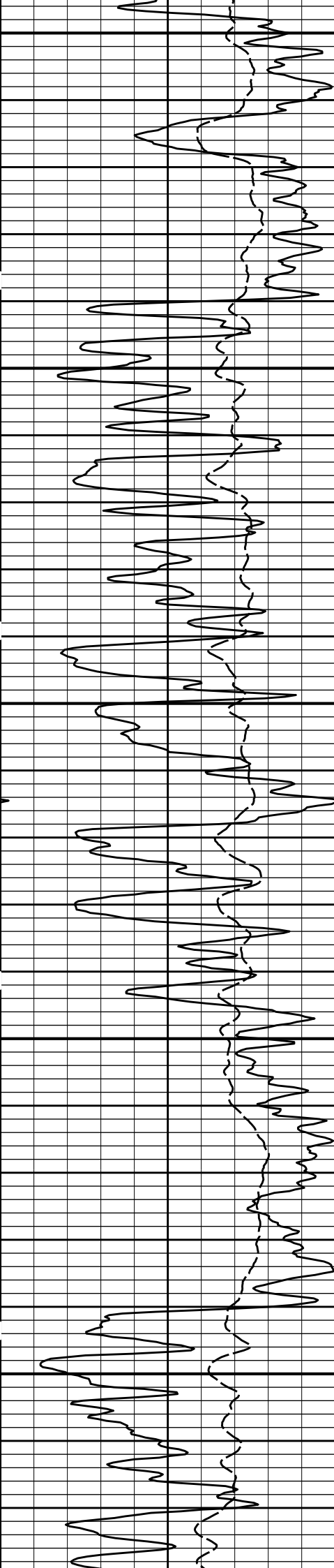
2300



20in Resistivity 2ft Res

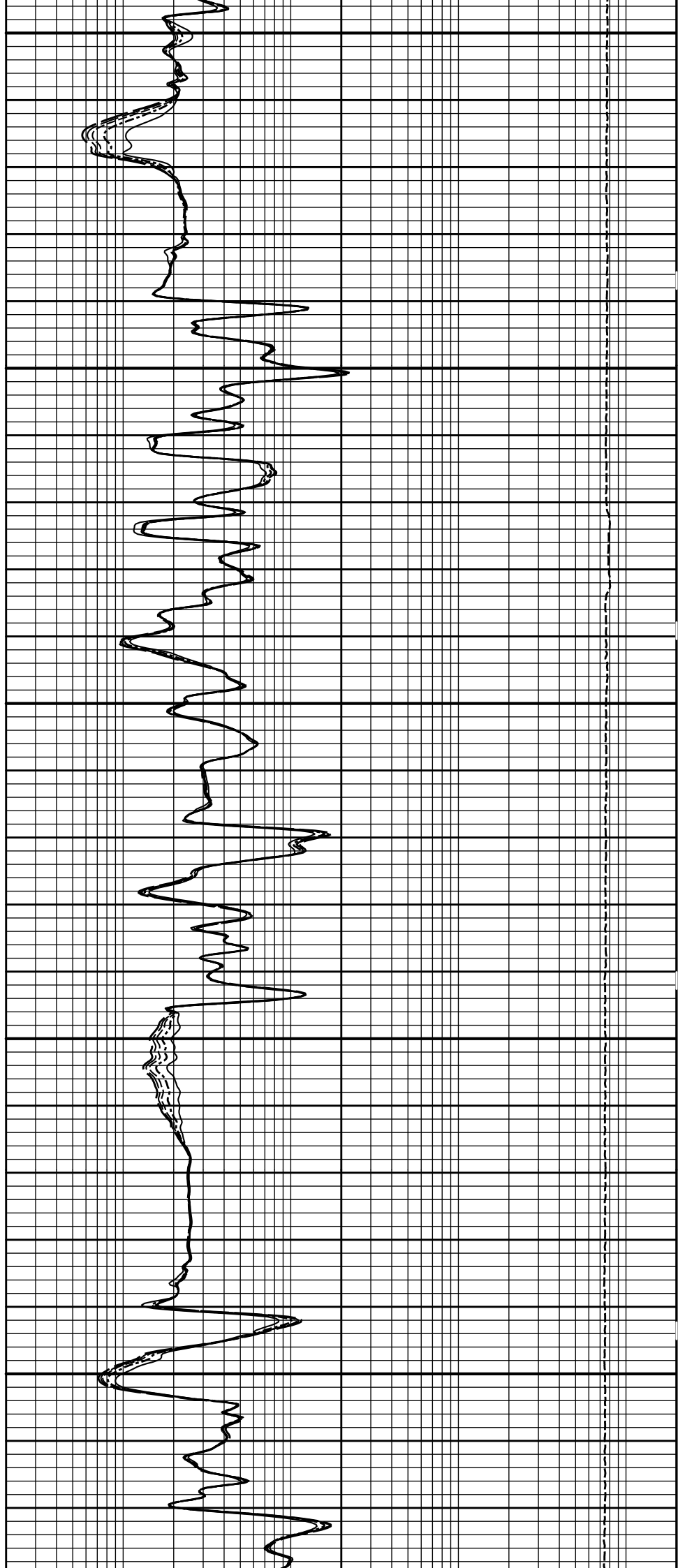
10in Resistivity 2ft Res

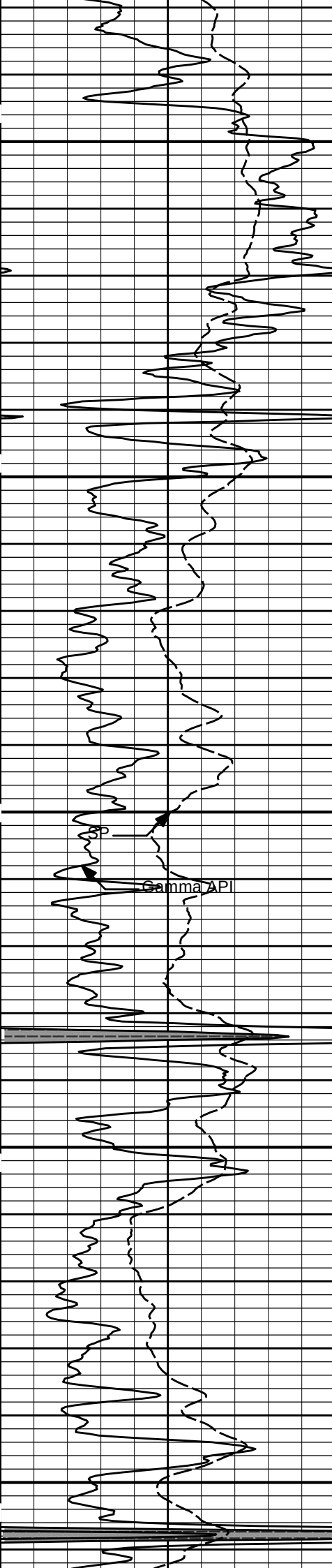
30in Resistivity 2ft Res



2400

2500

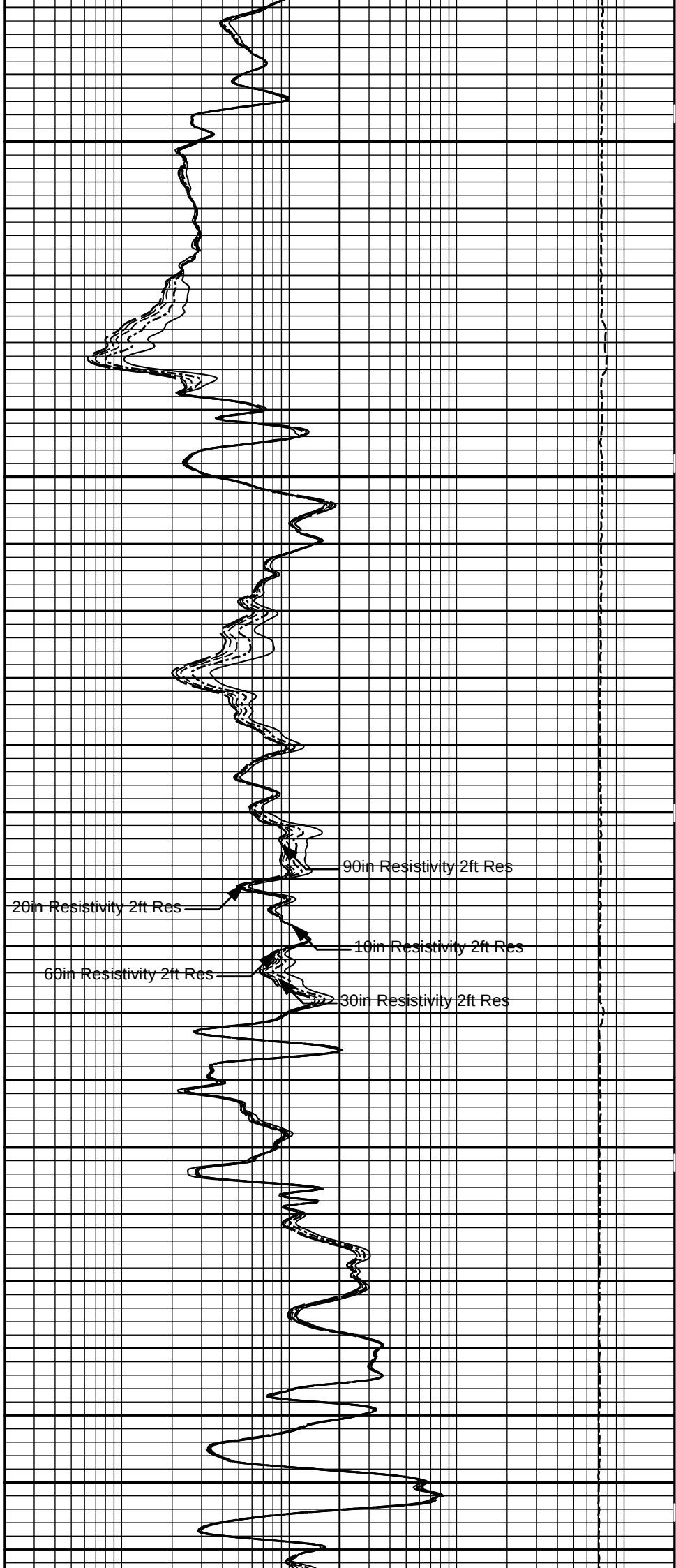


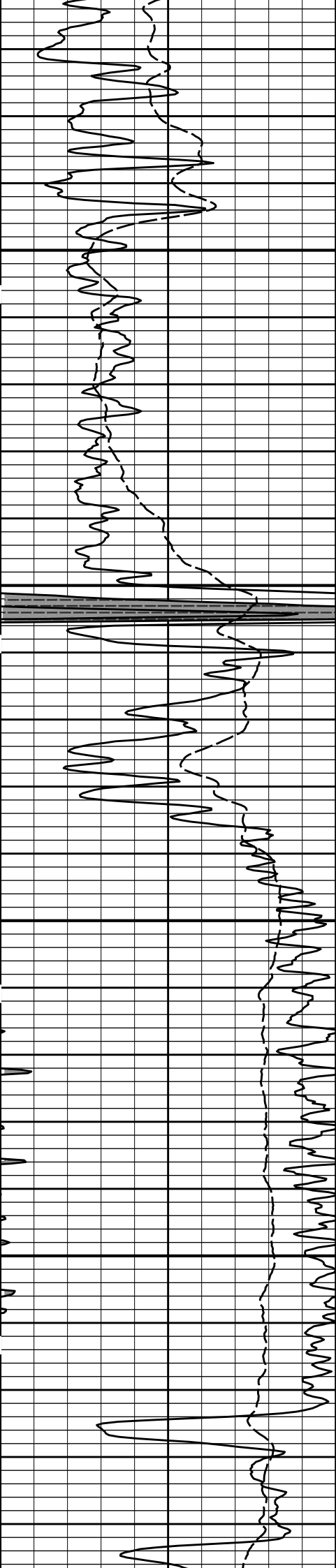


2600

2700

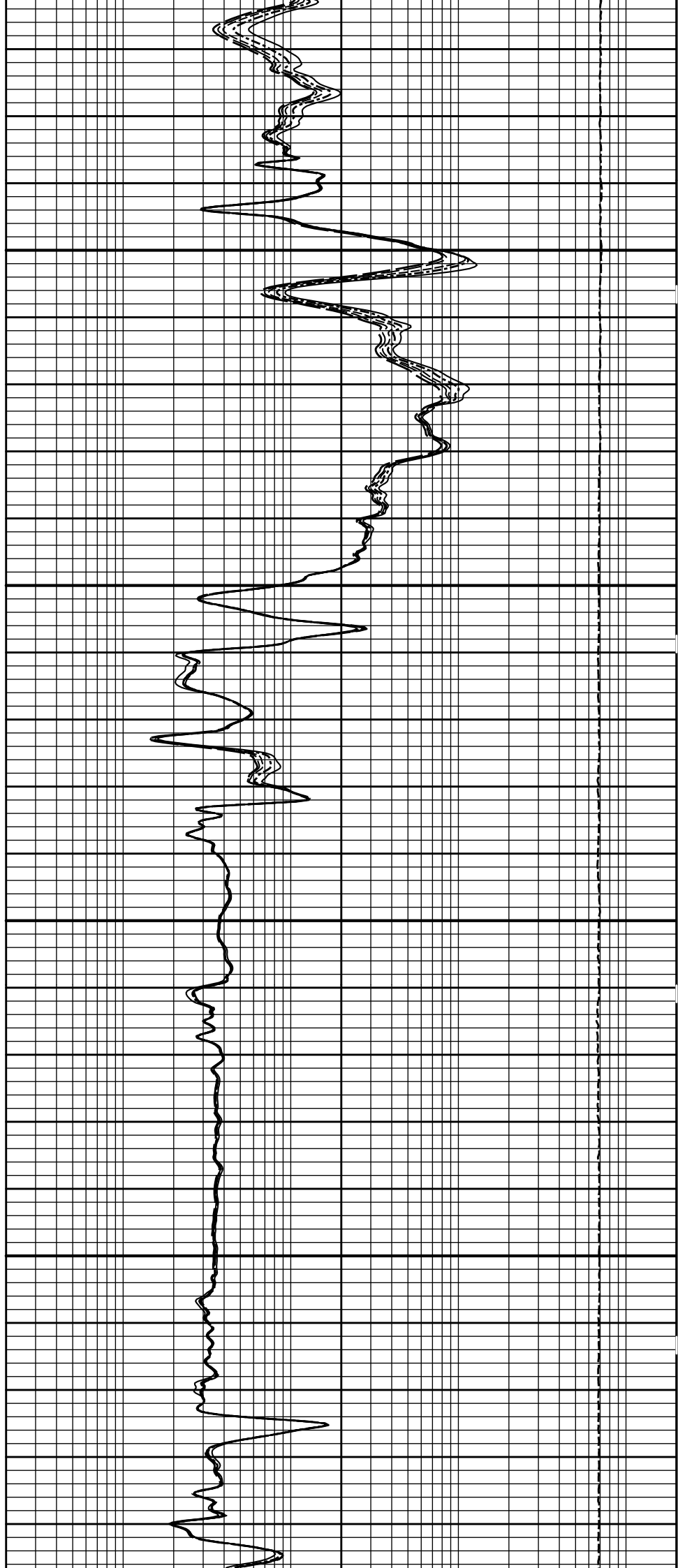
2800

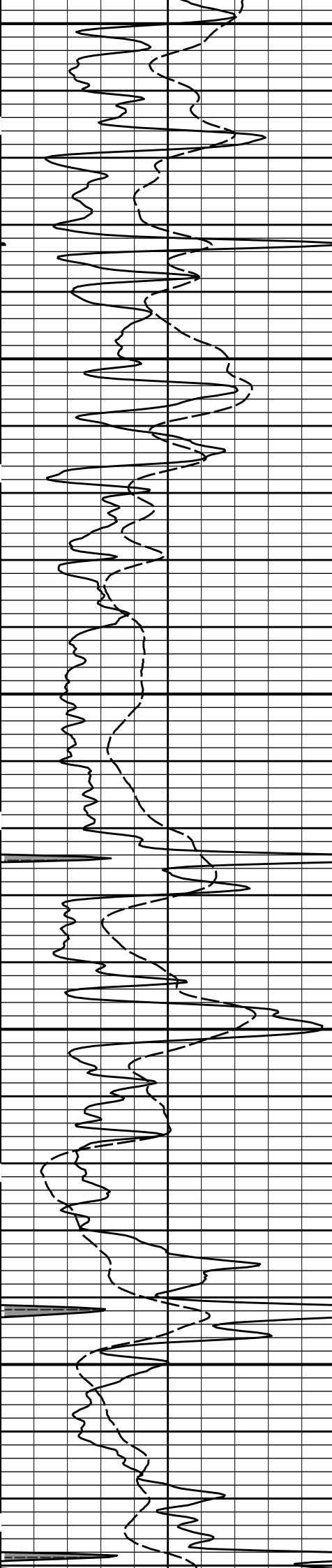




2900

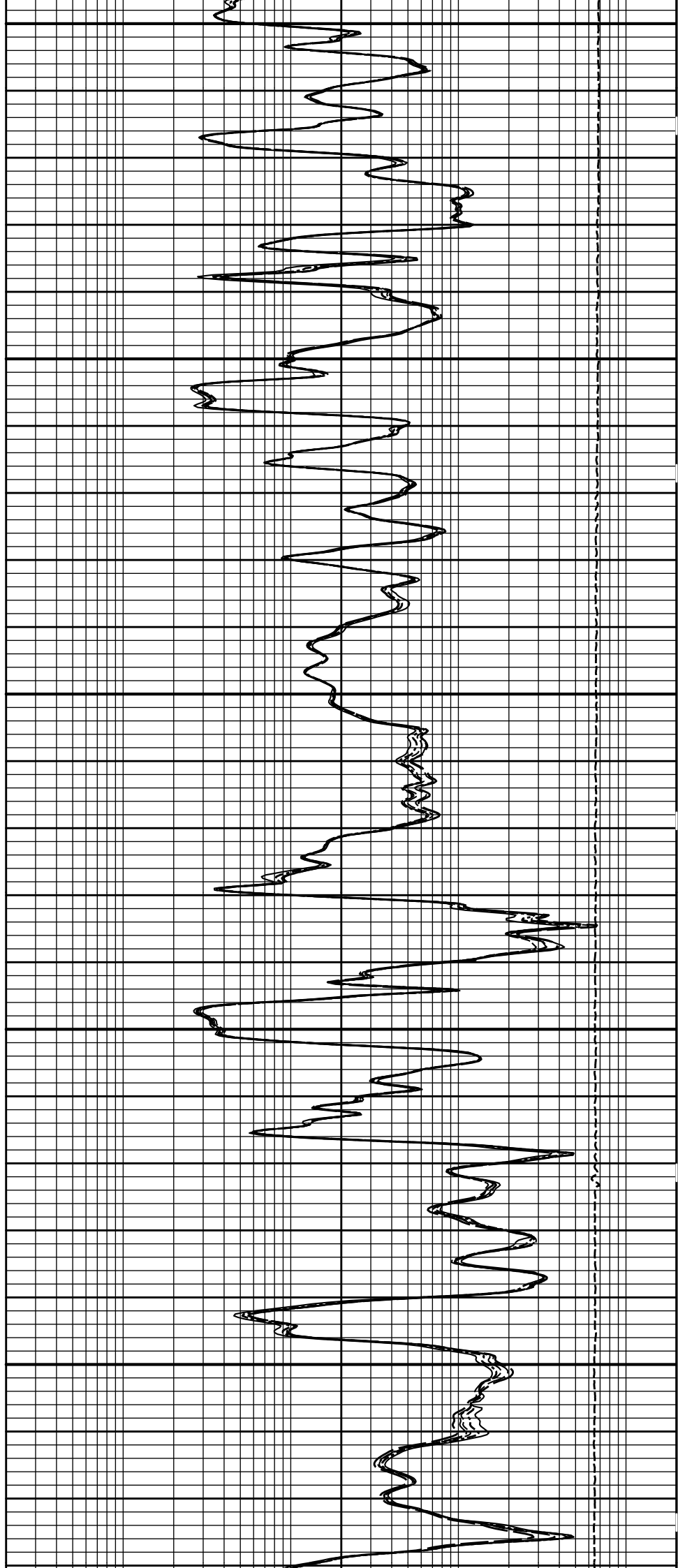
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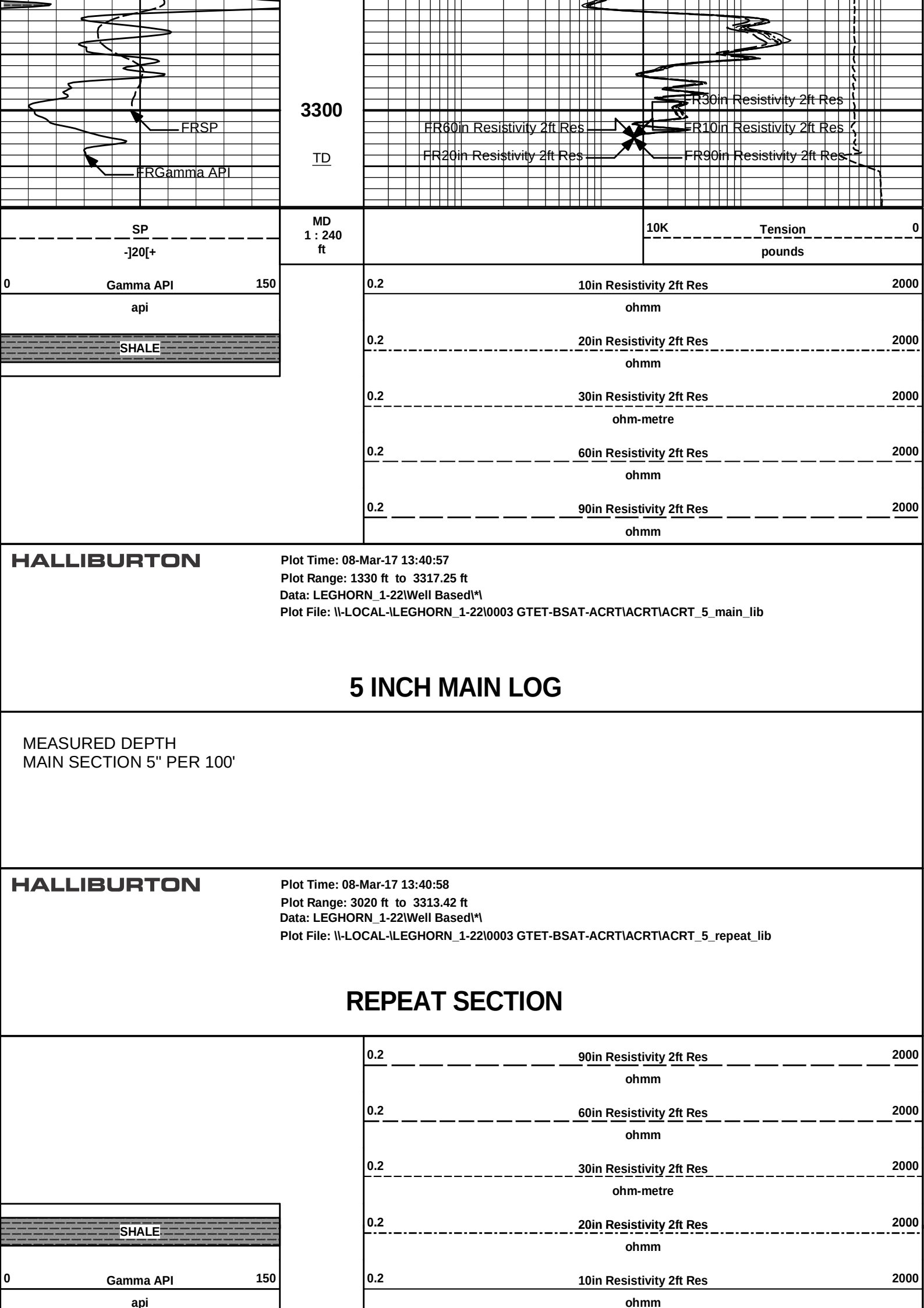


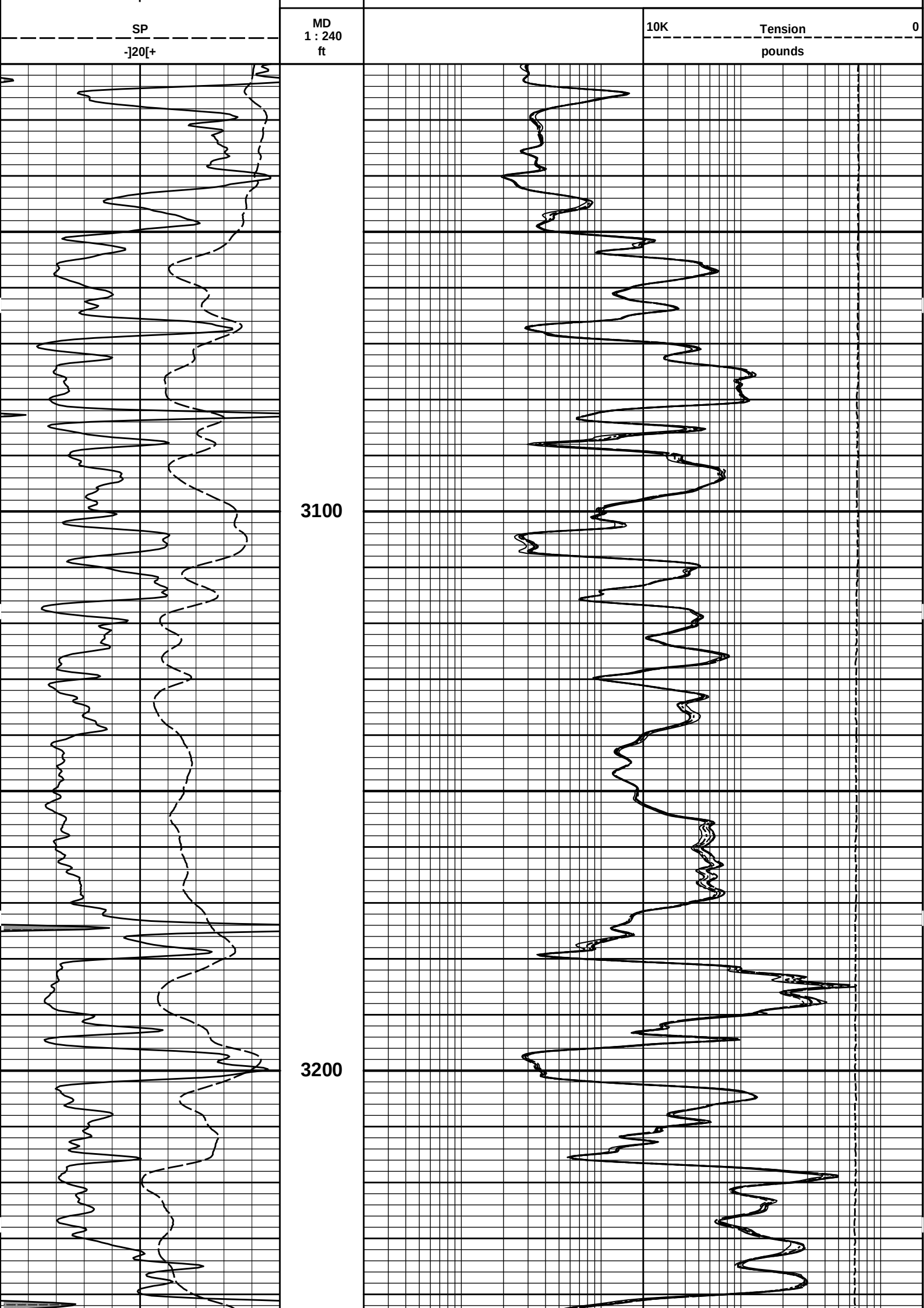


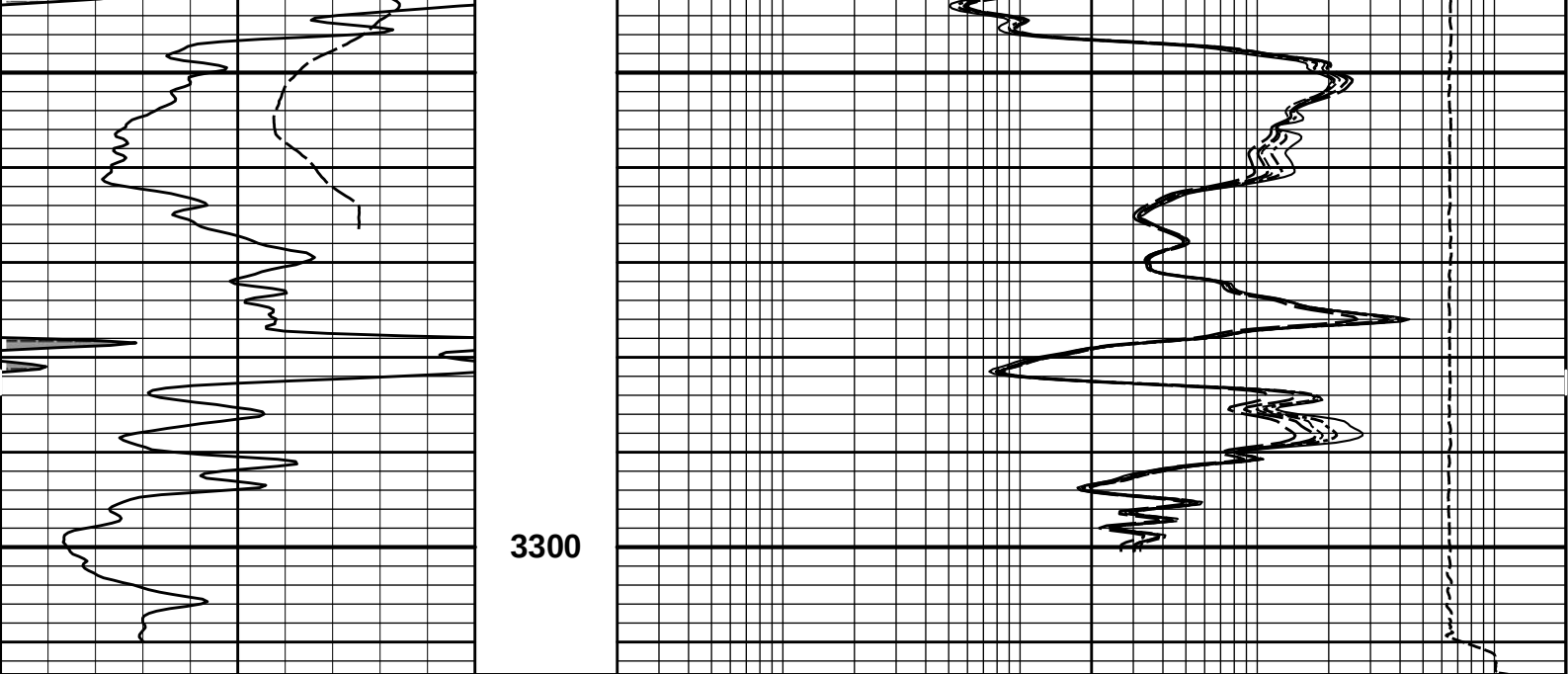
3100

3200









SP		MD 1 : 240 ft		10K	Tension	0	
-]20[+				pounds			
0	Gamma API	150		0.2	10in Resistivity 2ft Res		2000
api				ohmm			
SHALE				0.2	20in Resistivity 2ft Res		2000
				ohmm			
				0.2	30in Resistivity 2ft Res		2000
				ohm-metre			
				0.2	60in Resistivity 2ft Res		2000
				ohmm			
				0.2	90in Resistivity 2ft Res		2000
				ohmm			

HALLIBURTON

Plot Time: 08-Mar-17 13:40:59
Plot Range: 3020 ft to 3313.42 ft
Data: LEGHORN_1-22\Well Based*\
Plot File: \\-LOCAL-\\LEGHORN_1-22\0003 GTET-BSAT-ACRT\ACRT\ACRT_5_repeat_lib

REPEAT SECTION

HALLIBURTON

CALIBRATION REPORT

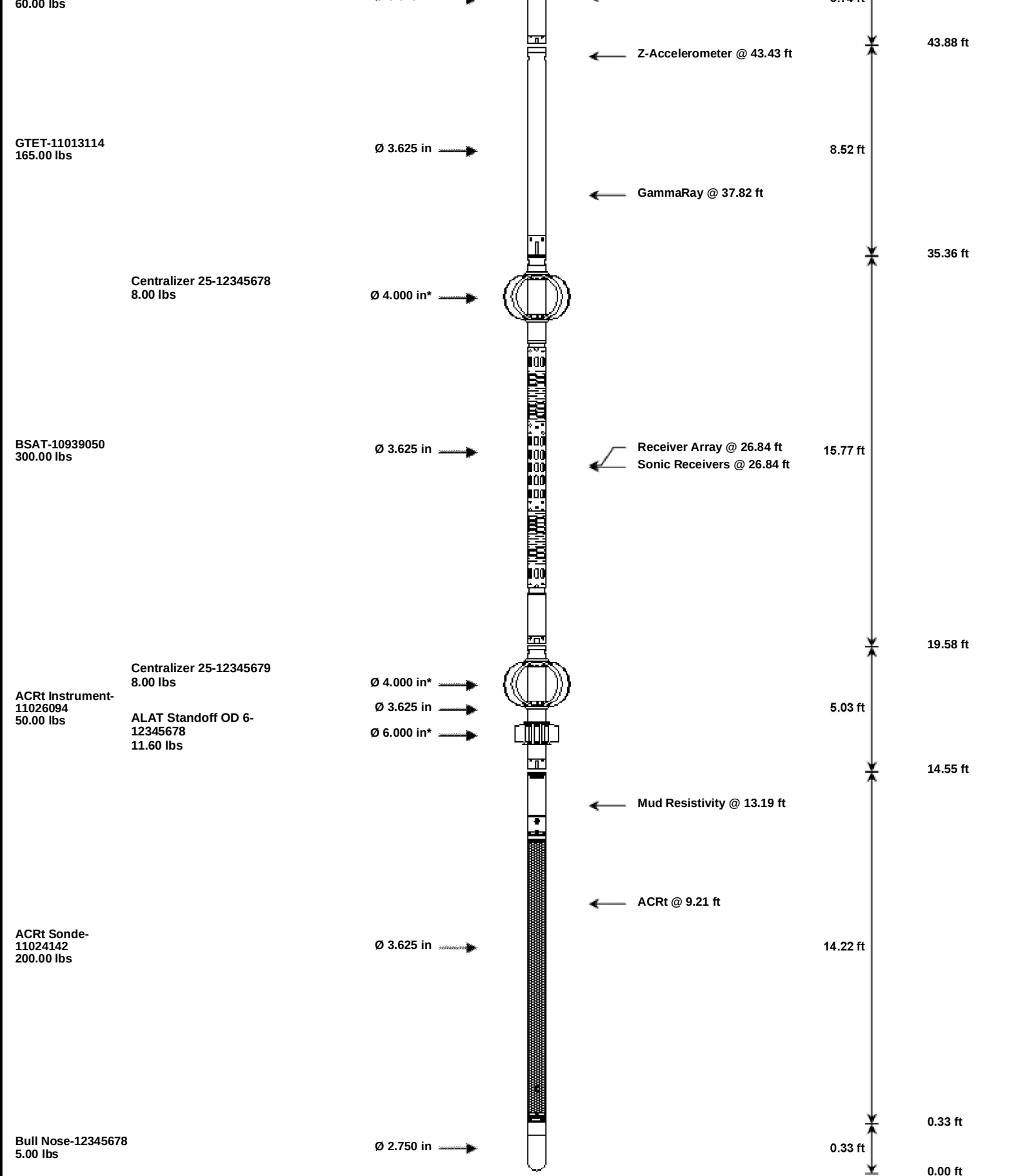
ARRAY COMPENSATED TRUE RESISTIVITY SHOP CALIBRATION			
Tool Name:	ACRt Sonde - 11024142	Reference Calibration Date:	11-Feb-16 15:39:53
Engineer:	JORGE ORLANDO PEREZ	Calibration Date:	05-May-16 12:01:02
Software Version:	WL INSITE R5.0.0 (Build 4)	Calibration Version:	1
Host Tool Name:	ACRt Instrument - 11026094		

TYPICAL GAIN RANGE									
Subarray	R12KHz			R36KHz			R72KHz		
	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper
A1 (80")	0.95	1.0183	1.05	0.95	1.0186	1.05	0.95	1.0186	1.05
A2 (50")	0.95	1.0137	1.05	0.95	1.0157	1.05	0.95	1.0182	1.05
A3 (29")	0.95	1.0028	1.05	0.95	1.0033	1.05	0.95	1.0025	1.05
A4 (17")	0.95	1.0154	1.05	0.95	1.0137	1.05	0.95	1.0160	1.05

A5 (10")	N/A	N/A	N/A	0.95	1.0013	1.05	0.95	1.0026	1.05
A6 (6")	N/A	N/A	N/A	0.95	0.9867	1.05	0.95	0.9858	1.05
SONDE OFFSET									
Subarray	R12KHz			R36KHz			R72KHz		
	(mmho/m)			(mmho/m)			(mmho/m)		
A1 (80")	-1.231			-4.217			-5.335		
A2 (50")	-2.612			-4.150			-4.627		
A3 (29")	-13.868			-4.114			-3.465		
A4 (17")	-107.166			-34.497			-26.679		
A5 (10")	N/A			-100.523			-48.886		
A6 (6")	N/A			234.776			124.027		
TRANSMITTER CURRENT GAIN									
Signal	Lower	R	Upper	Signal	Lower (ohm-m)	Measured (ohm-m)	Upper (ohm-m)		
12K	0.6	0.87	1.3	Mud Cell	0.95	1.00	1.05		
36K	1.0	1.84	2.0						
72K	1.0	1.13	2.0						
PASS/FAIL SUMMARY									
GAIN RANGE CHK				PASS					
SONDE OFFSET CHK				PASS					
TOOL OK TO LOG									
CALIBRATION SUMMARY									
Sensor		Shop	Field	Post	Difference	Tolerance	Units		
ACRt Sonde-11024142									
Mud Cell	1.00	-----	-----	0	-----	ohm-m			
Data: LEGHORN_1-2210003 GTET-BSAT-ACRTIDLE							Date: 08-Mar-17 12:12:07		
HALLIBURTON									
PARAMETERS REPORT									
Depth (ft)	Tool Name	Mnemonic	Description	Value	Units				
TOP									
	SHARED	BS	Bit Size	7.875	in				
	SHARED	UBS	Use Bit Size instead of Caliper for all applications.	No					
	SHARED	MDBS	Mud Base	Water					
	SHARED	MDWT	Borehole Fluid Weight	9.100	ppg				
	SHARED	WAGT	Weighting Agent	Natural					
	SHARED	BSAL	Borehole salinity	0.00	ppm				
	SHARED	FSAL	Formation Salinity NaCl	0.00	ppm				
	SHARED	KPCT	Percent K in Mud by Weight?	0.00	%				
	SHARED	RMUD	Mud Resistivity	0.540	ohmm				
	SHARED	TRM	Temperature of Mud	75.0	degF				
	SHARED	CSD	Logging Interval is Cased?	No					
	SHARED	ICOD	AHV Casing OD	5.500	in				
	SHARED	CSTR	Compressive Strength	1000.00	psia				
	SHARED	ST	Surface Temperature	75.0	degF				
	SHARED	TD	Total Well Depth	3310.00	ft				
	SHARED	BHT	Bottom Hole Temperature	103.0	degF				
	SHARED	SVTM	Navigation and Survey Master Tool	NONE					

SHARED	SVTM	Navigation and Survey Master Tool	NONE	
SHARED	AZTM	High Res Z Accelerometer Master Tool	GTET	
SHARED	TEMM	CBM Temperature Master Tool	GTET	
Rwa / CrossPlot	XPOK	Process Crossplot?	Yes	
Rwa / CrossPlot	FCHO	Select Source of F	Automatic	
Rwa / CrossPlot	AFAC	Archie A factor	0.6200	
Rwa / CrossPlot	MFAC	Archie M factor	2.1500	
Rwa / CrossPlot	RMFR	Rmf Reference	0.10	ohmm
Rwa / CrossPlot	TMFR	Rmf Ref Temp	75.00	degF
Rwa / CrossPlot	RWA	Resistivity of Formation Water	0.05	ohmm
Rwa / CrossPlot	ADP	Use Air Porosity to calculate CrossplotPhi	No	
Rwa / CrossPlot	BHSM	Borehole Size Source Tool	Bit Size	
Rwa / CrossPlot	ROIN	Input for RO Calculation	Rwa	
GTET	GROK	Process Gamma Ray?	Yes	
GTET	GEOK	Process Gamma Ray EVR?	No	
GTET	TPOS	Tool Position for Gamma Ray Tools.	Eccentered	
GTET	BHSM	Borehole Size Source Tool	Bit Size	
BSAT	MBOK	Compute BCAS Results?	Yes	
BSAT	FLLO	Frequency Filter Low Pass Value?	5000	Hz
BSAT	FLHI	Frequency Filter High Pass Value?	27000	Hz
BSAT	DTFL	Delta -T Pore Fluid	189.00	uspf
BSAT	DTMT	Delta -T Matrix Type	User define	
BSAT	DTMA	Delta -T Matrix	47.60	uspf
BSAT	DTSH	Delta -T Shale	100.00	uspf
BSAT	SPEQ	Acoustic Porosity Equation	Wylie	
ACRt Sonde	RTOK	Process ACRT?	Yes	
ACRt Sonde	MNSO	Minimum Tool Standoff	1.50	in
ACRt Sonde	TCS1	Temperature Correction Source	FP Lwr & FP Up	
ACRt Sonde	TPOS	Tool Position	Centered	
ACRt Sonde	RMOP	Rmud Source	Mud Cell	
ACRt Sonde	RMIN	Minimum Resistivity for MAP	0.20	ohmm
ACRt Sonde	RMAX	Maximum Resistivity for MAP	200.00	ohmm
ACRt Sonde	THQY	Threshold Quality	0.50	
ACRt Sonde	MRFX	Fixed mud resistivity	2000	ohmm
ACRt Sonde	BHSM	Borehole Size Source Tool	Bit Size	
ACRt Sonde	MBFL	Apply Corkscrew Effect?	No	
BOTTOM				
Data: LEGHORN_1-22\0003 GTET-BSAT-ACRT\MIDDLE			Date: 08-Mar-17 12:34:40	

HALLIBURTON						
TOOL STRING DIAGRAM REPORT						
Description	Overbody Description	O.D.	Diagram	Sensors @ Delays	Length	Accumulated Length
CH_HOS-11459024 37.50 lbs		Ø 2.750 in		← Temperature @ 50.57 ft	2.50 ft	51.07 ft
XOHD-11569312 20.00 lbs		Ø 2.750 in Ø 3.625 in			0.95 ft	48.57 ft
						47.62 ft
SP Sub-11441455		Ø 3.625 in		← SP @ 45.84 ft	3.74 ft	

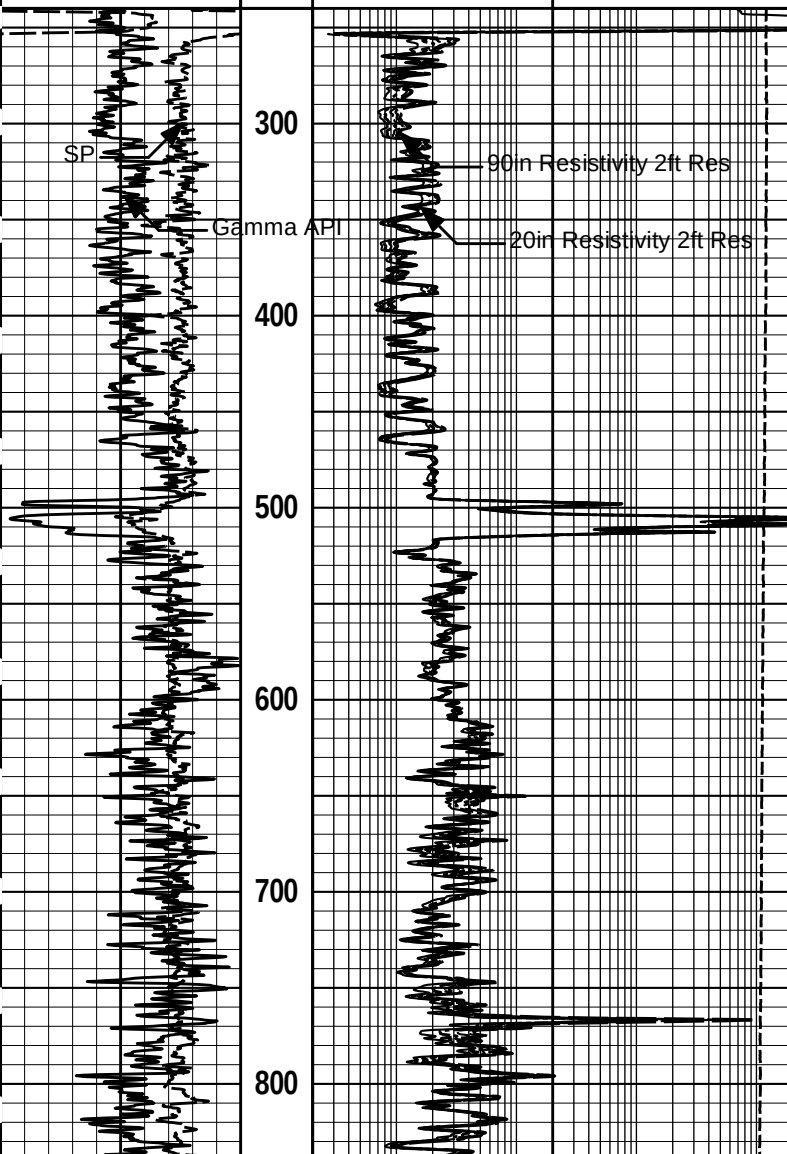


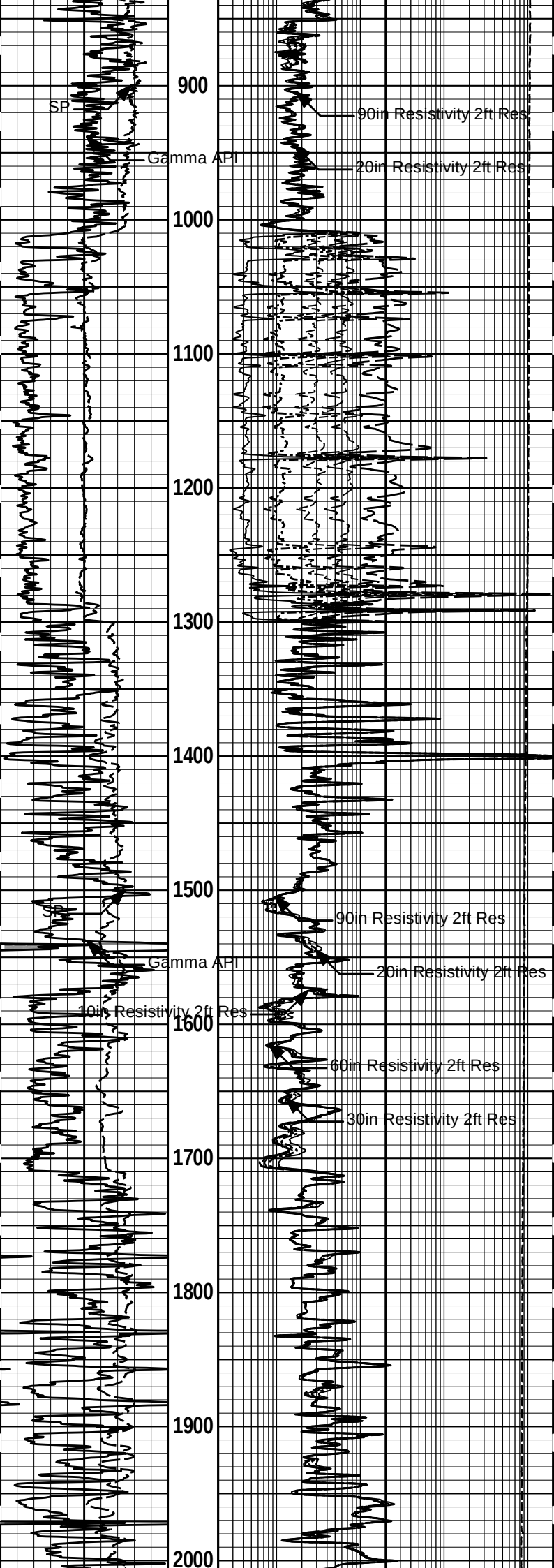
Mnemonic	Tool Name	Serial Number	Weight (lbs)	Length (ft)	Accumulated Length (ft)	Max.Log. Speed (fpm)
CH_HOS	Hostile Cable Head with Load Cell	11459024	37.50	2.50	48.57	300.00
XOHD	Hostile to Dits Cross Over	11569312	20.00	0.95	47.62	300.00
SP	SP Sub	11441455	60.00	3.74	43.88	300.00
GTET	Gamma Telemetry Tool	11013114	165.00	8.52	35.36	60.00
BSAT	Borehole Sonic Array Tool	10939050	300.00	15.77	19.58	60.00
OBCEN	Centralizer - 25 in. Overbody	12345678	8.00	2.08	32.63	300.00
ACRt	Array Compensated True Resistivity Instrument Section	11026094	50.00	5.03	14.55	120.00
ALATS	Array Laterolog Tool OD 6 Standoff	12345678	11.60	1.00	15.53	60.00
OBCEN	Centralizer - 25 in. Overbody	12345679	8.00	2.08	17.01	300.00
ACRt	Array Compensated True Resistivity Sonde Section	11024142	200.00	14.22	0.33	120.00

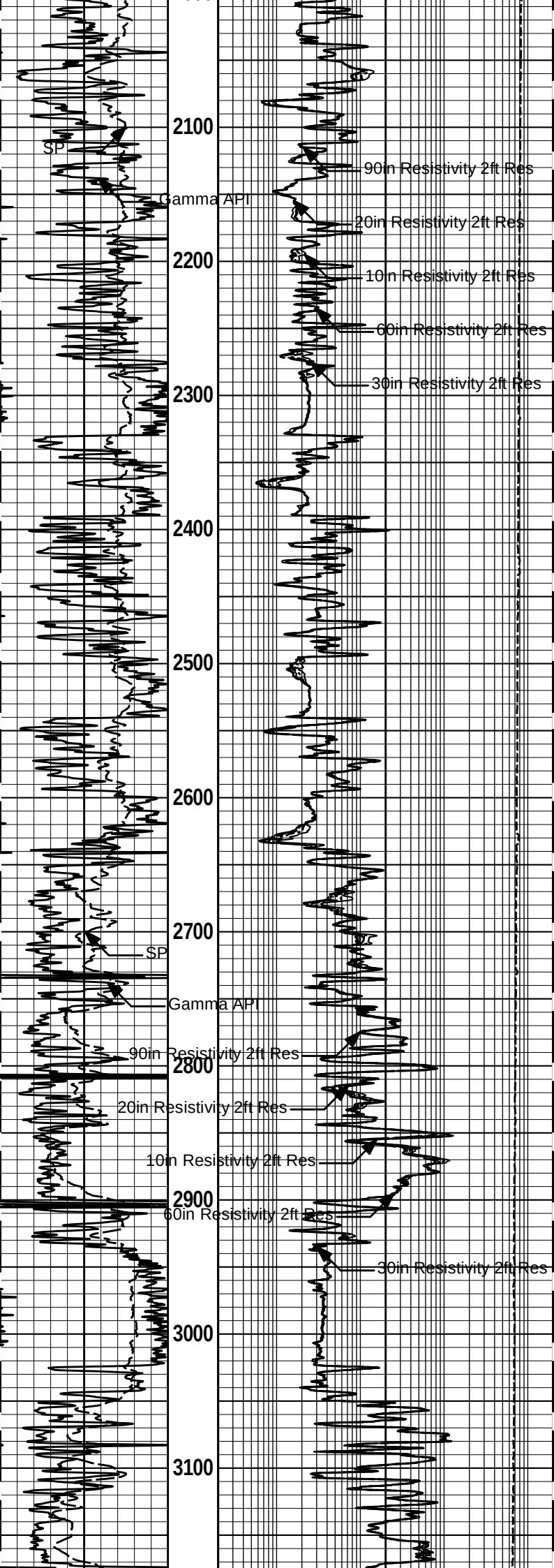
51.07

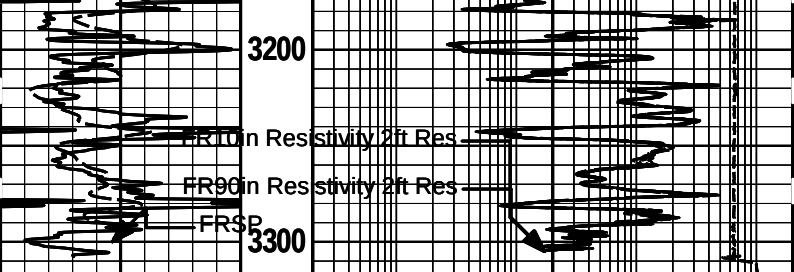
Date: 08-Mar-17 11:46:40

Plot File: \\-LOCAL-\\LEGHORN 1-22\\0003 GTET-BSAT-ACRT\\ACRT\\ACRT 1 main lib









SP		10K	Tension	0
-20[+	Tension Pull		pounds	
0	Gamma API	150	0.2	10in Resistivity 2ft Res
api	MD	1: 1200	0.2	20in Resistivity 2ft Res
SHALE	ft		0.2	30in Resistivity 2ft Res
			0.2	60in Resistivity 2ft Res
			0.2	90in Resistivity 2ft Res
				ohmm

HALLIBURTON

Plot Time: 08-Mar-17 13:41:02
Plot Range: 240 ft to 3317.25 ft
Data: LEGHORN_1-22\Well Based*
Plot File: \\LOCAL-LEGHORN_1-22\0003 GTET-BSAT-ACRT\ACRT\ACRT_1_main.lib

5 INCH MAIN LOG

COMPANY	CMX, INC.		
WELL	LEGHORN #1-22		
FIELD	CHASE-SILICA		
COUNTY	BARTON	STATE	KANSAS
HALLIBURTON		ARRAY COMPENSATED TRUE RESISTIVITY LOG	