

HALLIBURTON

ARRAY COMPENSATED RESISTIVITY LOG

COMPANY		QUAIL OIL & GAS	
WELL		STOPPEL 1-8	
FIELD/BLOCK		WISBY	
COUNTY		RENO	
STATE		KANSAS	
Permanent Datum	GL	Sect. 8	Twp. 22S
Log measured from	KB		Rge. 9W
Drilling measured from	KB		Elev. 1725.0 ft
Date	02-Jun-16		5.0 ft above perm. Datum
Run No.	ONE		
Depth - Driller	3720.0 ft		
Depth - Logger	3718.0 ft		
Bottom - Logged Interval	3718.00 ft		
Top - Logged Interval	324.00 ft		
Casing - Driller	8.625 in		@
Casing - Logger	324.0 ft		@
Bit Size	7.875 in		@
Type Fluid in Hole	Water Based Mud		
Density	9.4 ppg	54.00	sl/qt
PH	11.00 pH	8.8	cp/m
Source of Sample	FLOWLINE		
Rm @ Meas. Temperature	0.51 ohmm	@	95.00 degF
Rmf @ Meas. Temperature	0.43 ohmm	@	70.00 degF
Rmc @ Meas. Temperature	0.63 ohmm	@	70.00 degF
Source Rmf	MEASURED		MEASURED
Rm @ BHT	0.48 ohmm	@	102.0 degF
Time Since Circulation	3.0 hrs hr		
Time on Bottom	02-Jun-16 20:42		
Max. Rec. Temperature	102.00 degF	@	3718.0 ft
Equipment	12156883	EL	RENO
Recorded By	COTHREN		
Witnessed By	WRAY VALENTINE		
Other Services:		SDLT DSNT MICROLOG ACRT	
Elev.: K.B.		1730.0 ft	
D.F.		1730.0 ft	
G.L.		1725.0 ft	

Fold here

Service Ticket No.: 903345423				API No.: 15-155-21736-00-00				PGM Version: WL INSITE R5.0.0 (Build 4)			
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 202	N/A	1.5" STANDOFF	N/A			
Rmc @ Meas. Temp.		@									
Source Rmf	Rmc										
Rm @ BHT		@									
Rmf @ BHT		@									
Rmc @ BHT		@									
EQUIPMENT DATA											
GAMMA			ACOUSTIC			DENSITY			NEUTRON		
Run No.	ONE		Run No.			Run No.			Run No.		
Serial No.	138		Serial No.			Serial No.			Serial No.		
Model No.	GTET		Model No.			Model No.			Model No.		
Diameter	3.625"		No. of Cent.			Diameter			Diameter		
Detector Model No.	A-102		Spacing			Log Type			Log Type		
Type	SCINT.					Source Type			Source Type		
Length	8"		LSA [Y/N]			Serial No.			Serial No.		
Distance to Source	10'		FWDA [Y/N]			Strength			Strength		

GENERAL			GAMMA		ACOUSTIC			DENSITY			NEUTRON			
Run No.	Depth		Speed	Scale		Scale		Matrix	Scale		Matrix	Scale		Matrix
	From	To	ft/min	L	R	L	R		L	R		L	R	
ONE	TD	CSG	REC	0	150									

DIRECTIONAL INFORMATION

Maximum Deviation @ KOP @

Remarks: THANKS FOR USING HALLIBURTON ENERGY SERVICES.

ANNULAR HOLE VOLUME CALCULATED FOR 5.5 INCH CASING.

CHLORIDES REPORTED AT 6500 mg/L

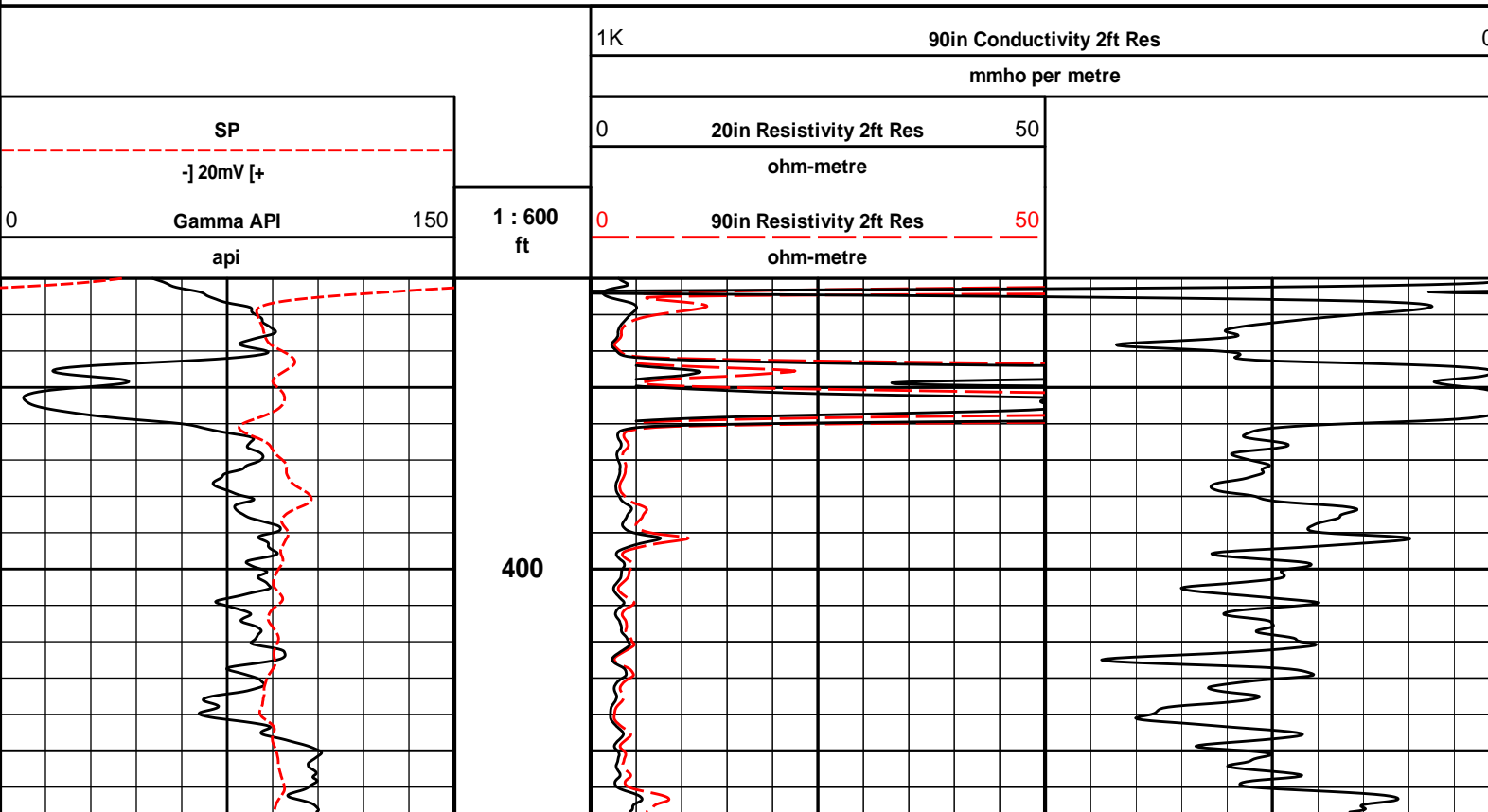
HALLIBURTON DOES NOT GUARANTEE THE ACCURACY OF ANY INTERPRETATION OF THE LOG DATA, CONVERSION OF LOG DATA TO PHYSICAL ROCK PARAMETERS OR RECOMMENDATIONS WHICH MAY BE GIVEN BY HALLIBURTON PERSONNEL OR WHICH APPEAR ON THE LOG OR IN ANY OTHER FORM. ANY USER OF SUCH DATA, INTERPRETATIONS, CONVERSIONS, OR 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.

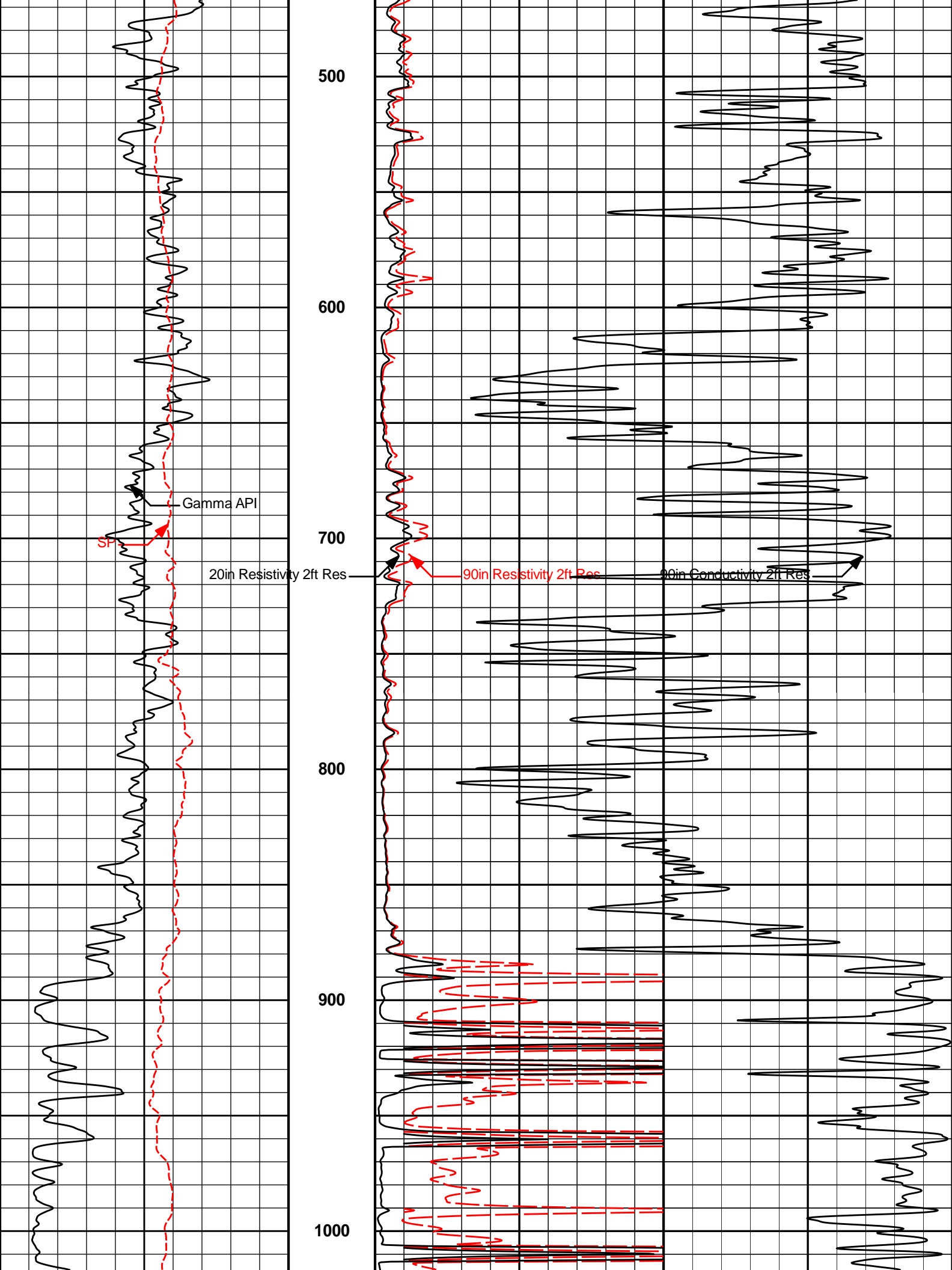
HALLIBURTON

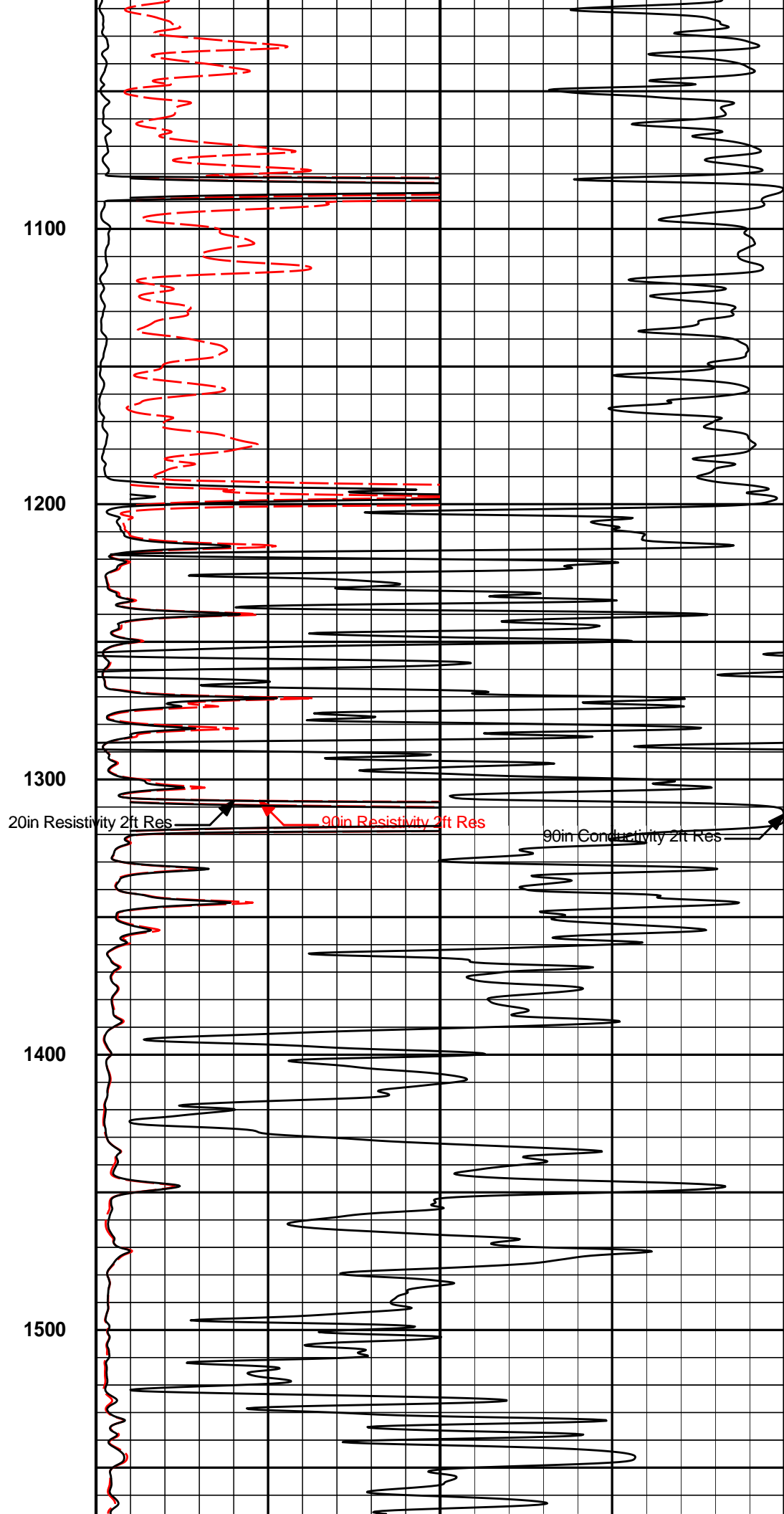
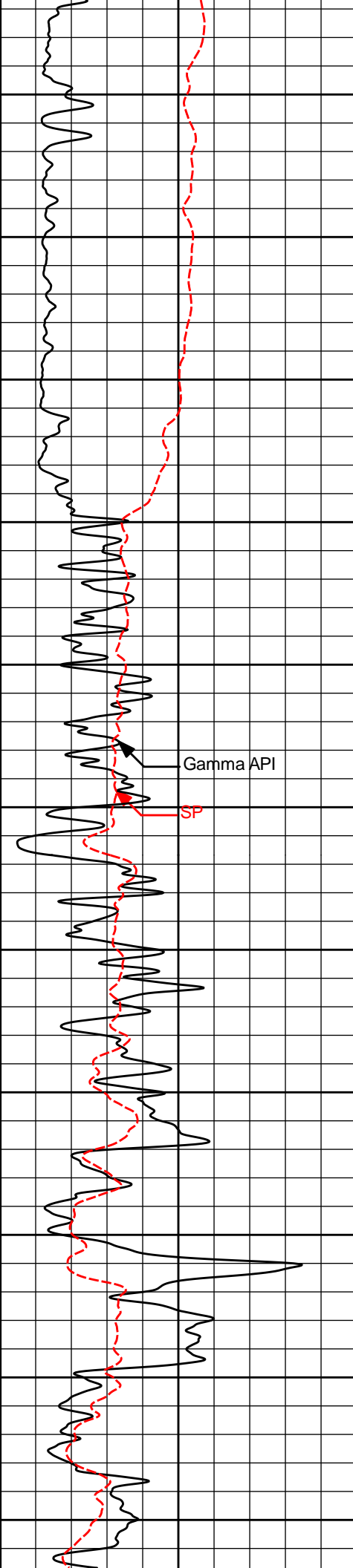


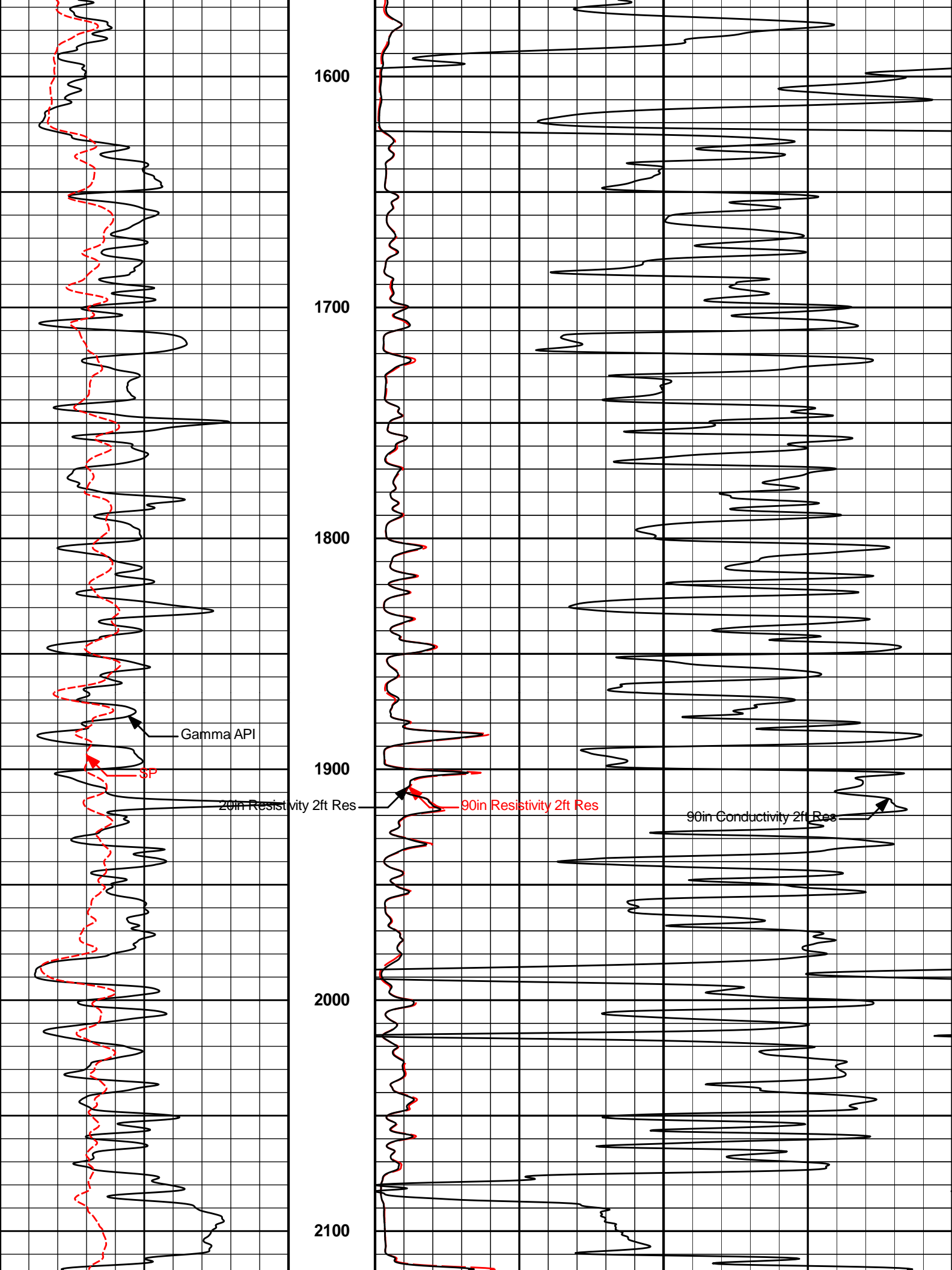
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 Plot File: \\-LOCAL-\SPOPPEL_1_8\0001 GTET-DSN-SDL-ACRT\ACRT1_ACRT_2inx

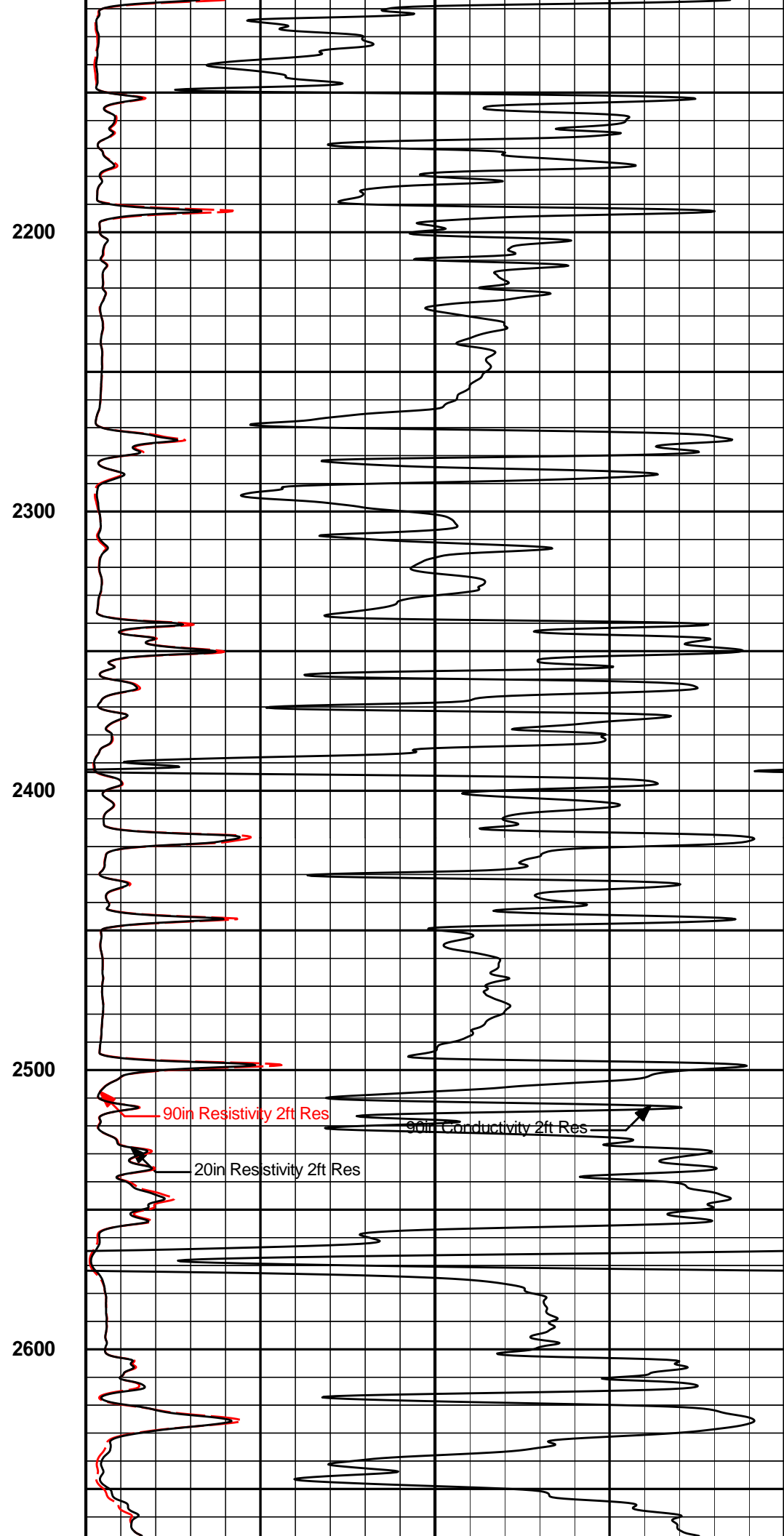
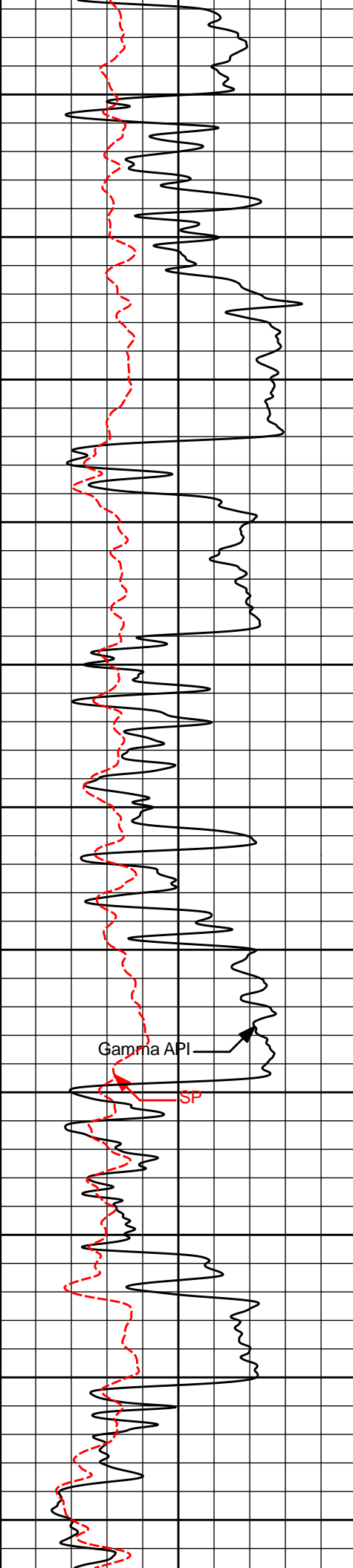
2 INCH MAIN LOG

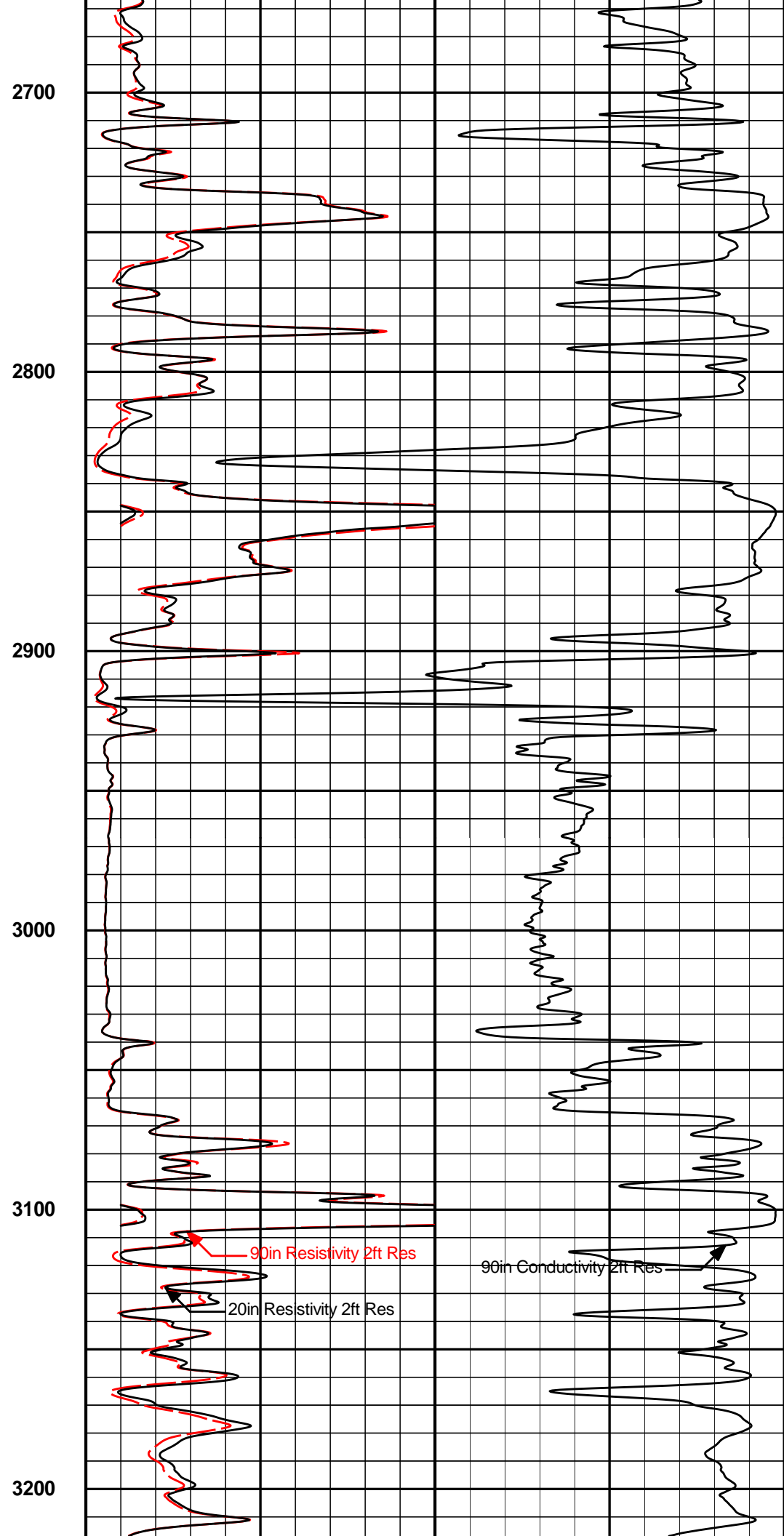
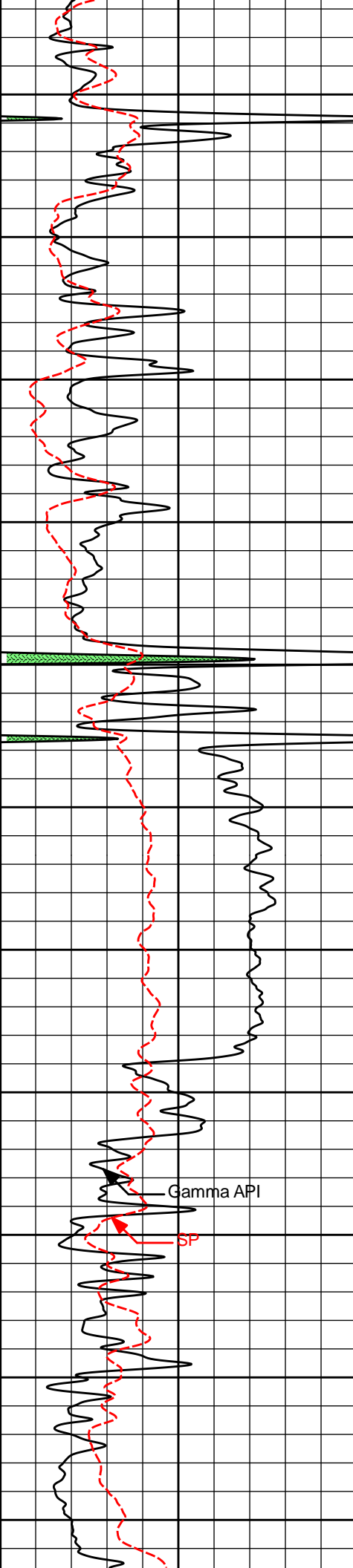












Gamma API

SP

90in Resistivity 2ft Res

20in Resistivity 2ft Res

90in Conductivity 2ft Res

2700

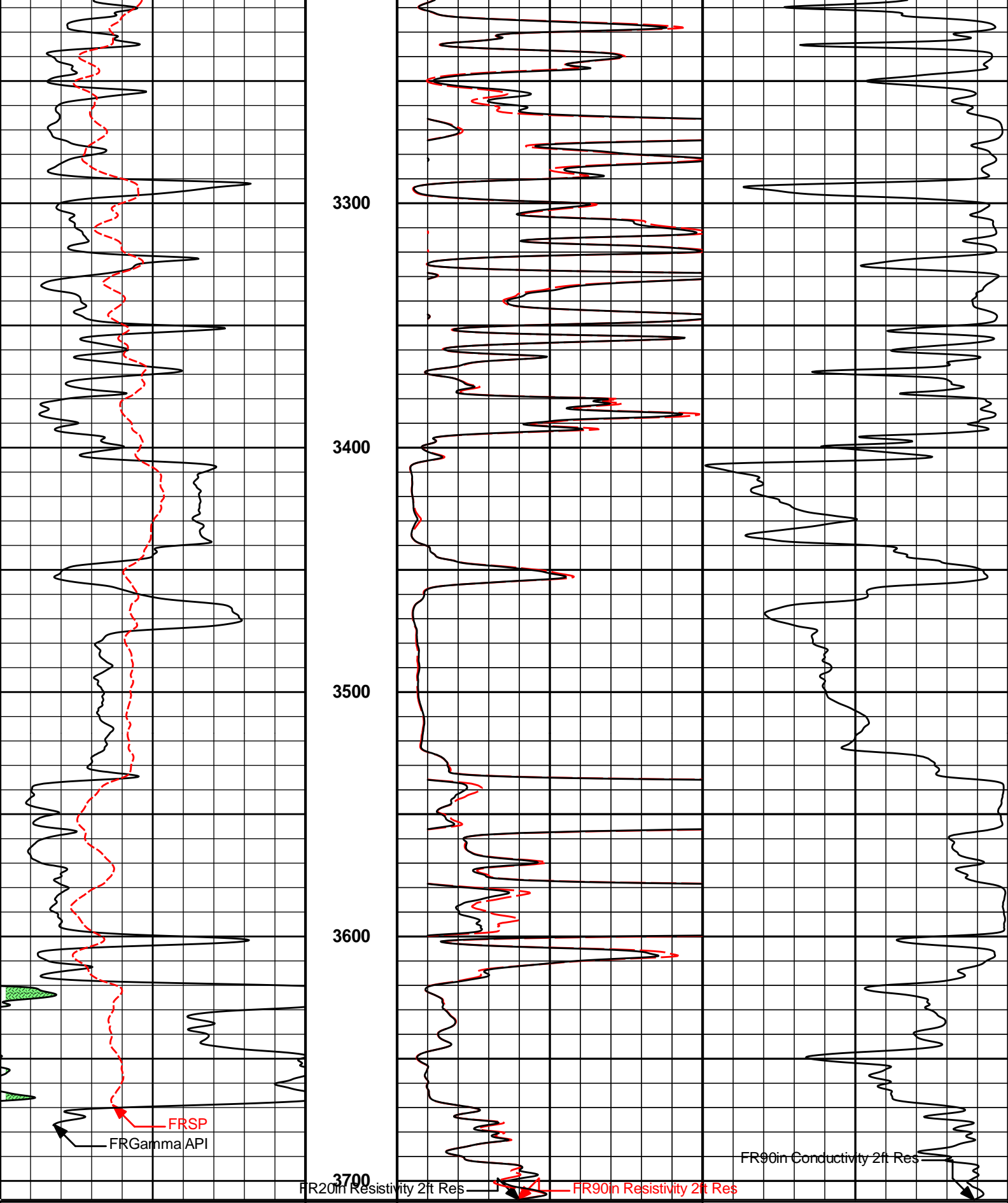
2800

2900

3000

3100

3200



0	Gamma API	150
	api	
	SP	
	-] 20mV [+]	

1 : 600
ft

0	90in Resistivity 2ft Res	50
	ohm-metre	
0	20in Resistivity 2ft Res	50
	ohm-metre	

FR90in Conductivity 2ft Res

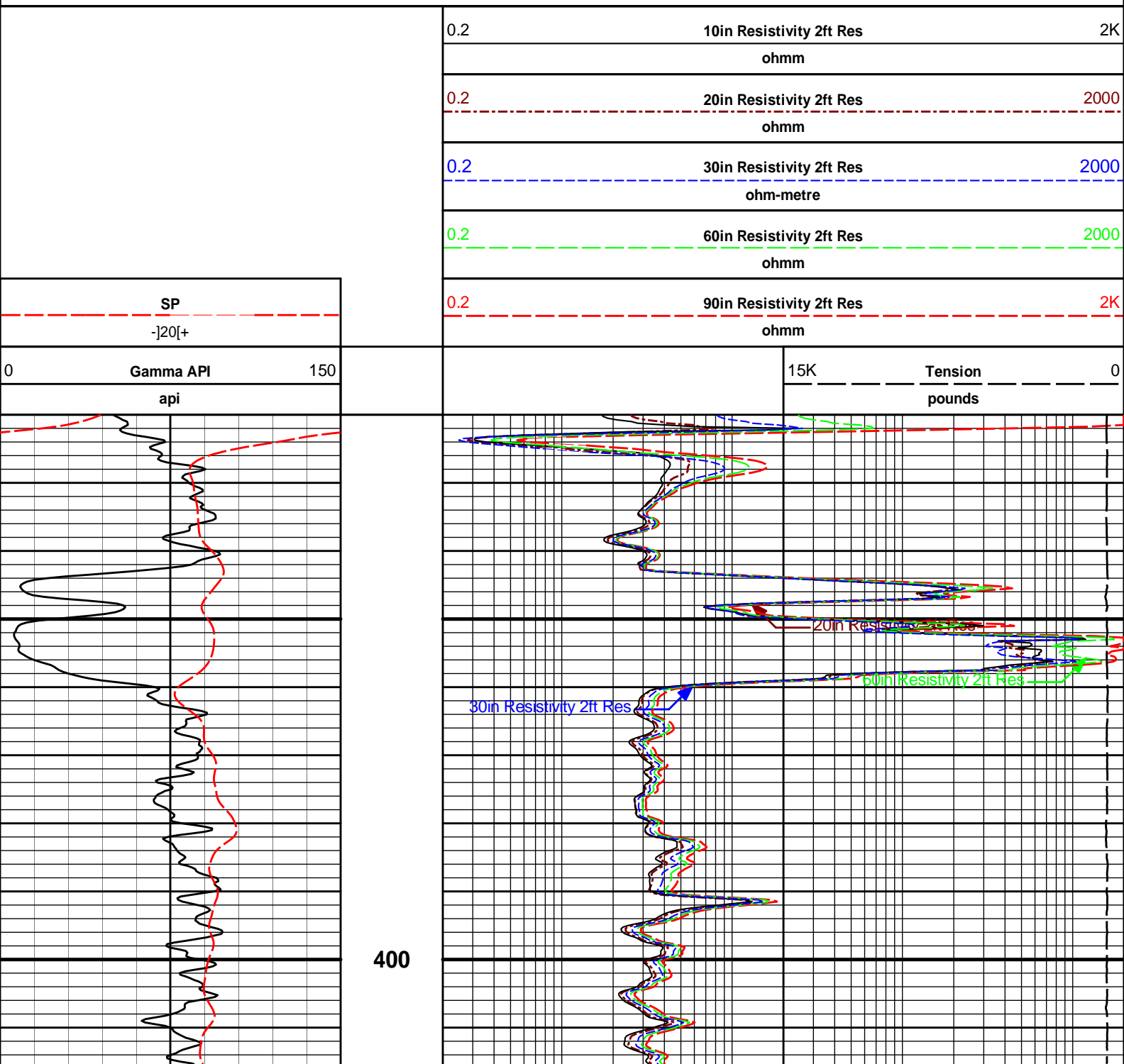
4K 20in Conductivity 2ft Res

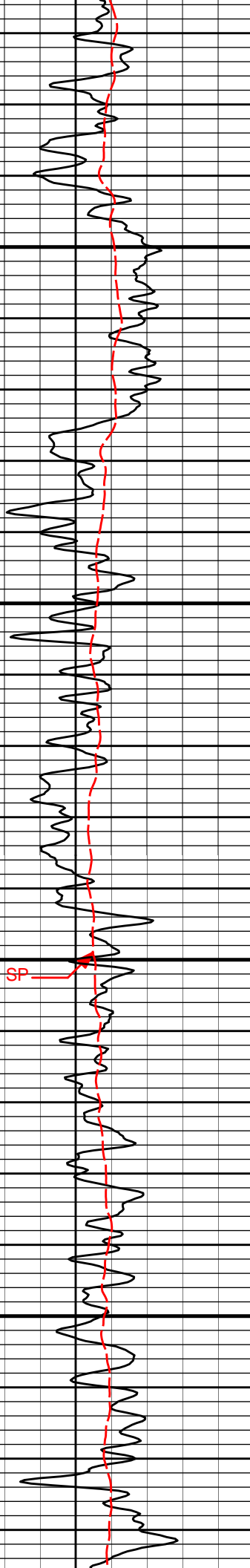
HALLIBURTON

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 Plot Range: 320 ft to 3707.75 ft
 Data: {ActiveWell}\Well Based\DAQ-0001-003\
 Plot File: \\-LOCAL-SPOPPEL_1_8\0001 GTET-DSN-SDL-ACRT\ACRT1_ACRT_2inx

2 INCH MAIN LOG

5 INCH MAIN LOG





500

10in Resistivity 2ft Res

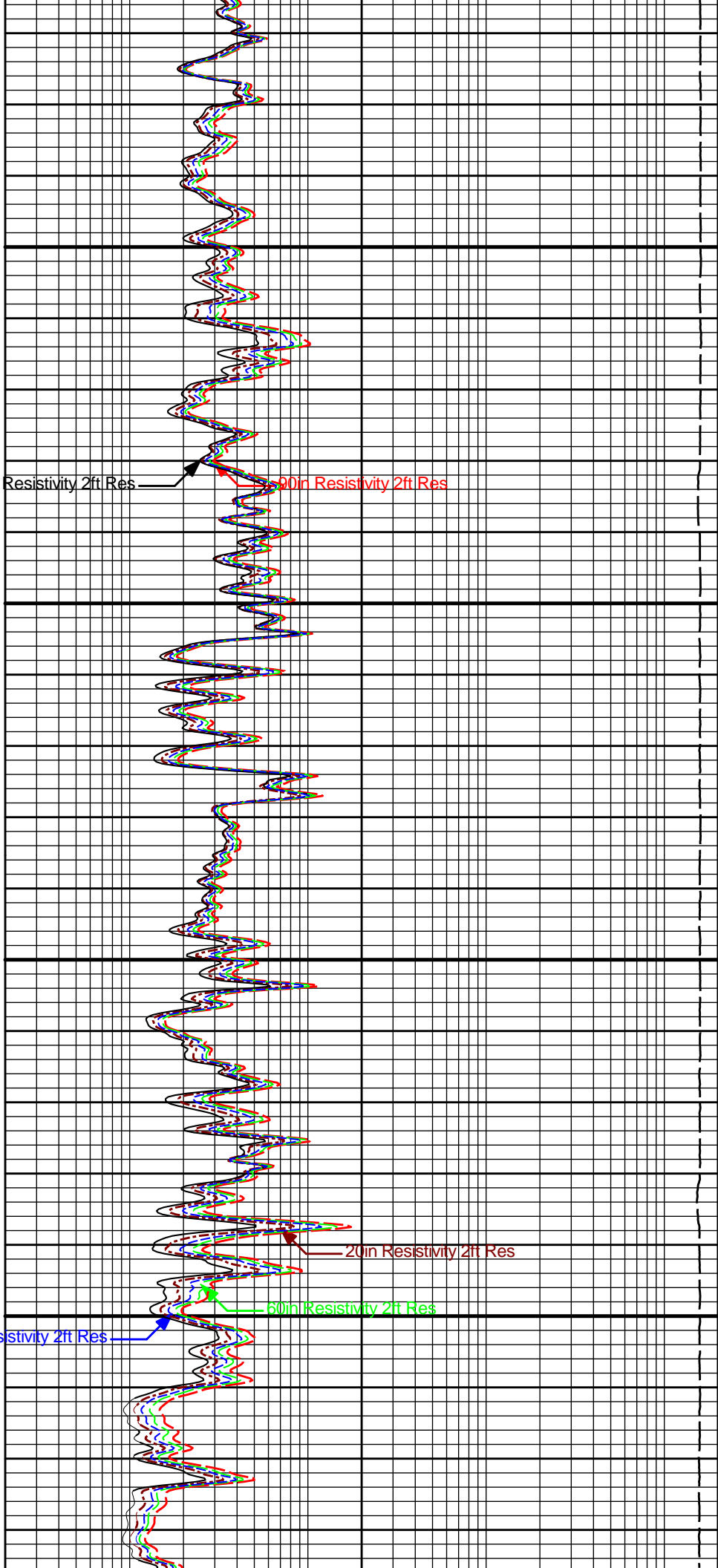
90in Resistivity 2ft Res

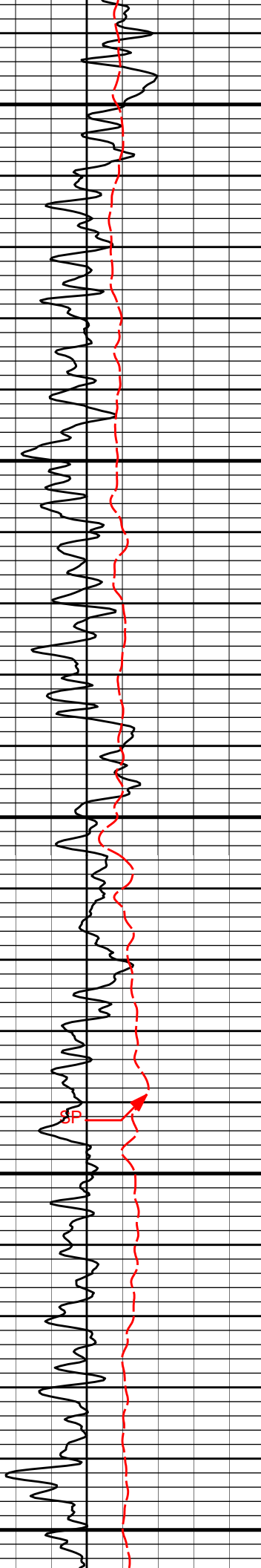
600

30in Resistivity 2ft Res

20in Resistivity 2ft Res

60in Resistivity 2ft Res





700

10in Resistivity 2ft Res

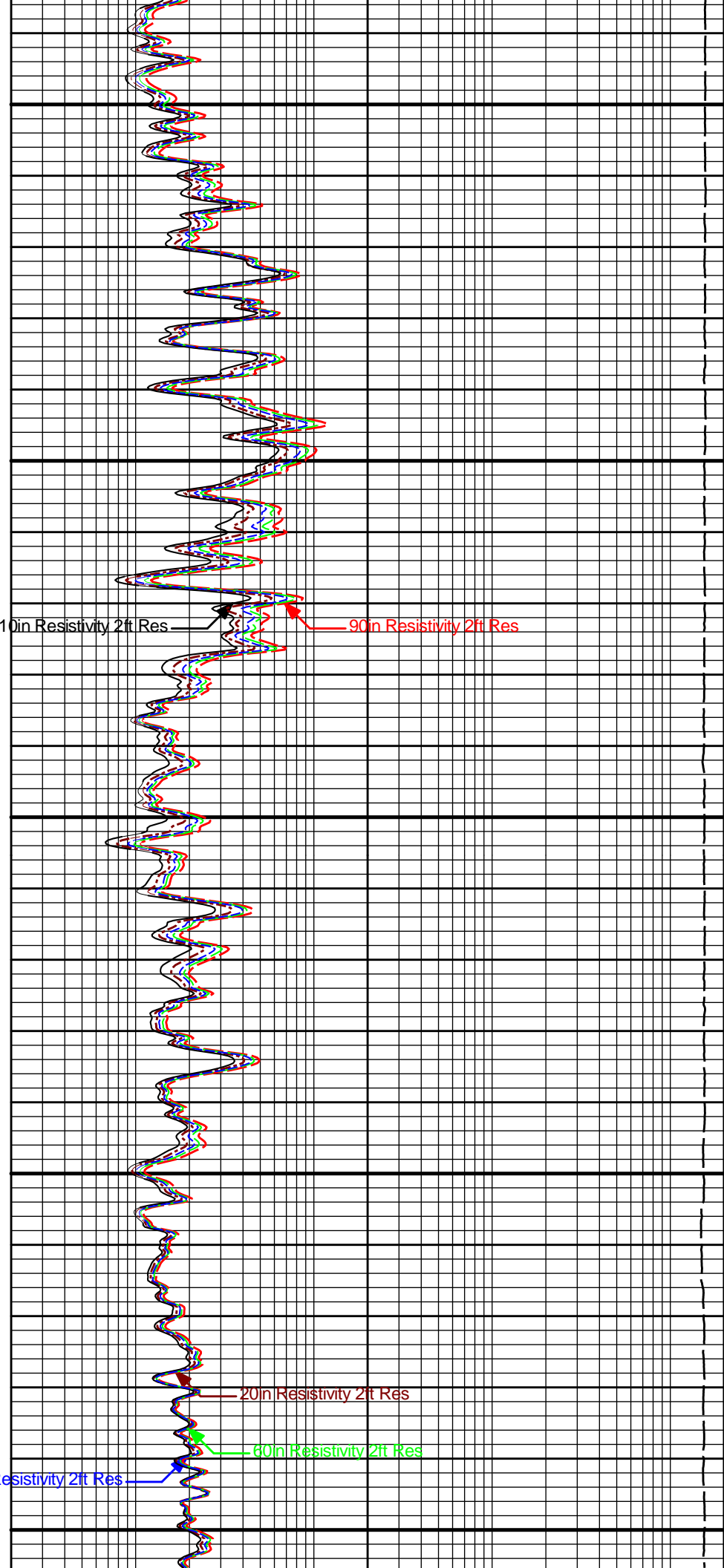
90in Resistivity 2ft Res

800

20in Resistivity 2ft Res

60in Resistivity 2ft Res

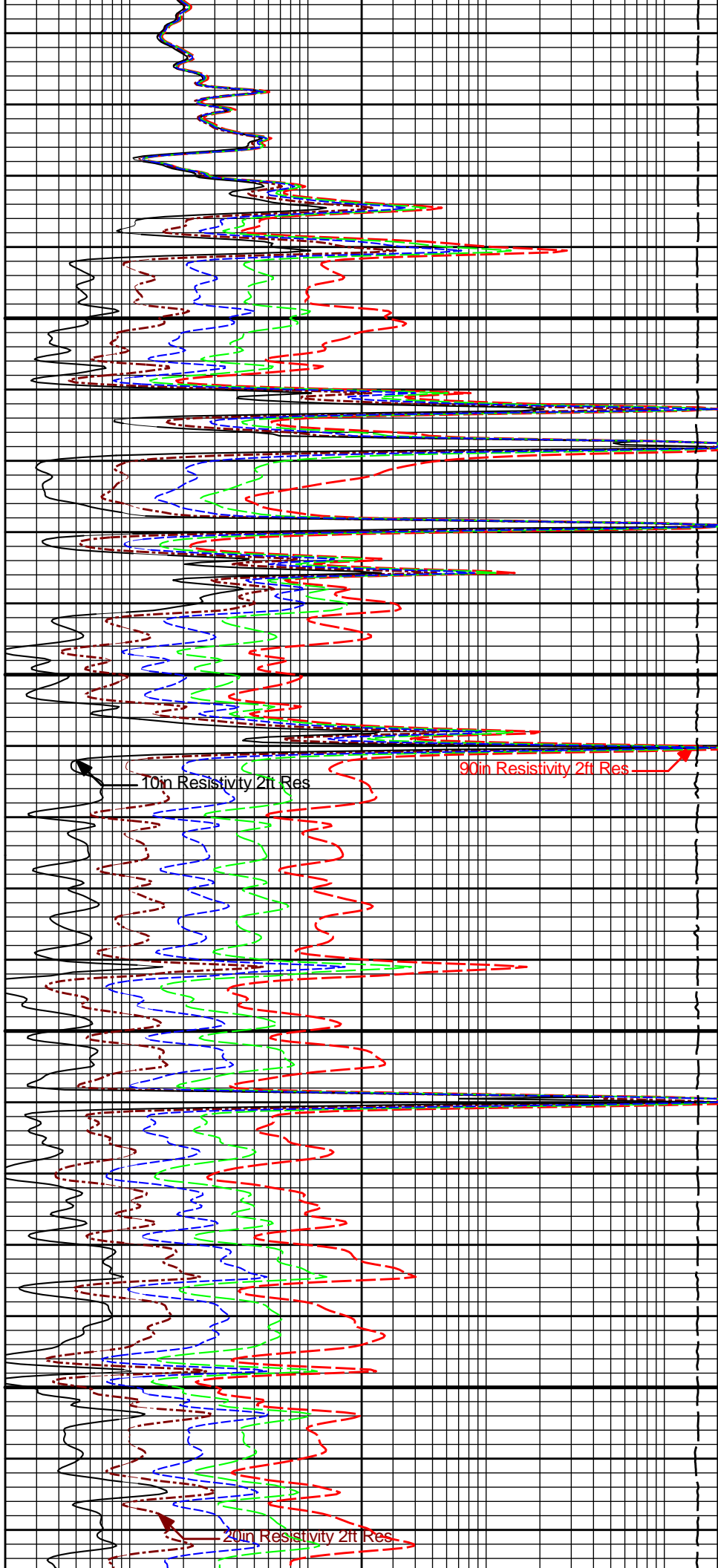
30in Resistivity 2ft Res





900

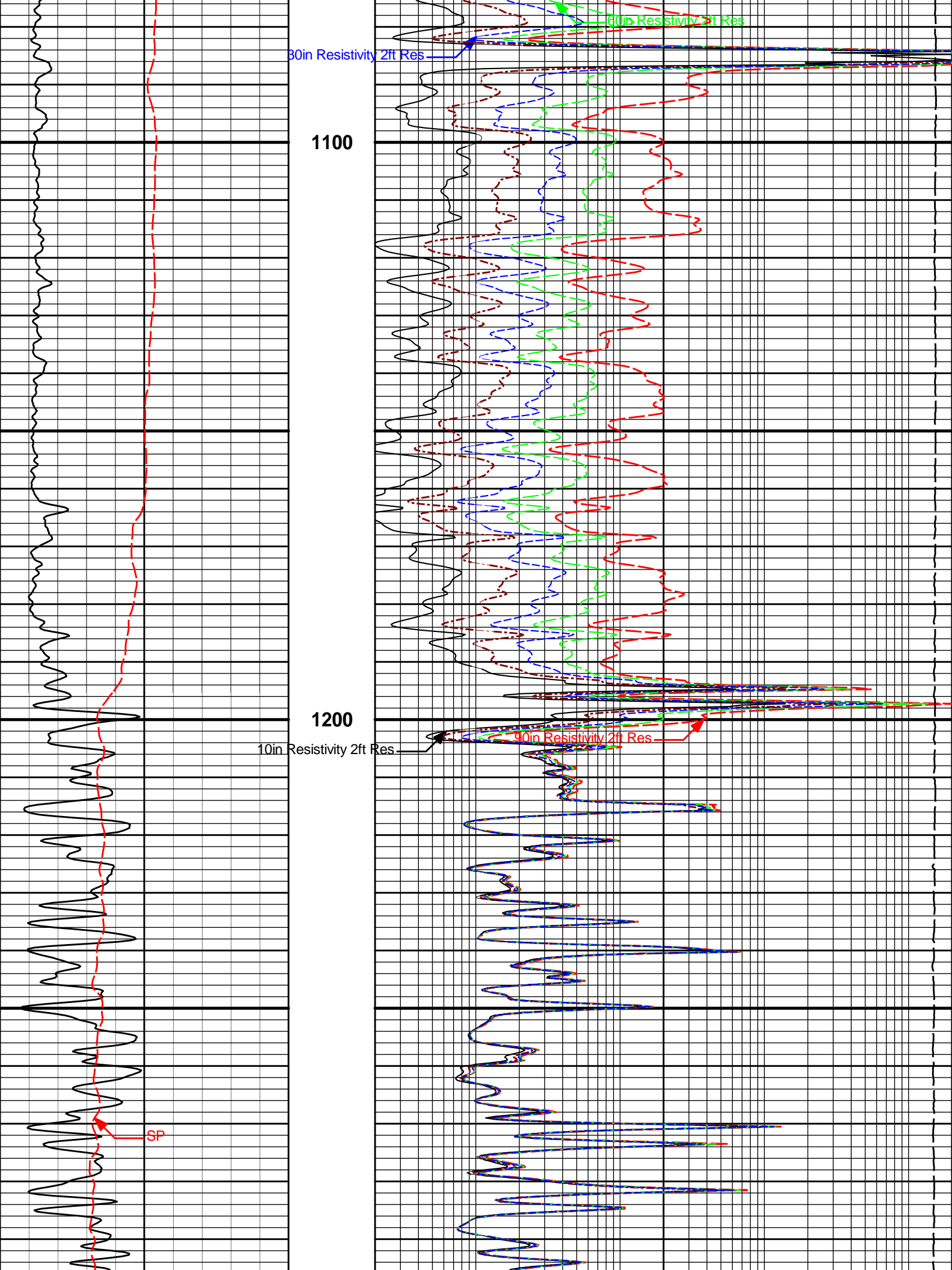
1000

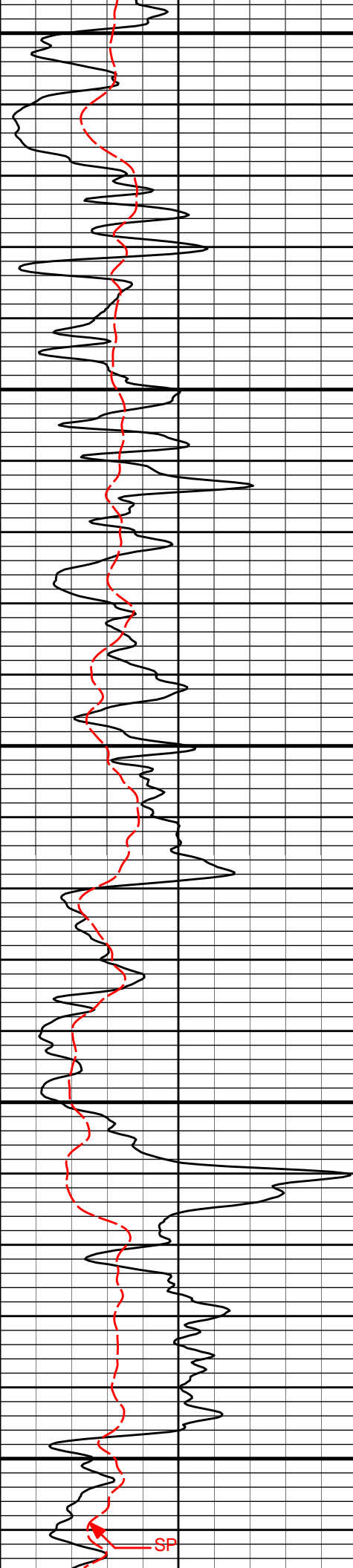


10in Resistivity 2ft Res

90in Resistivity 2ft Res

20in Resistivity 2ft Res

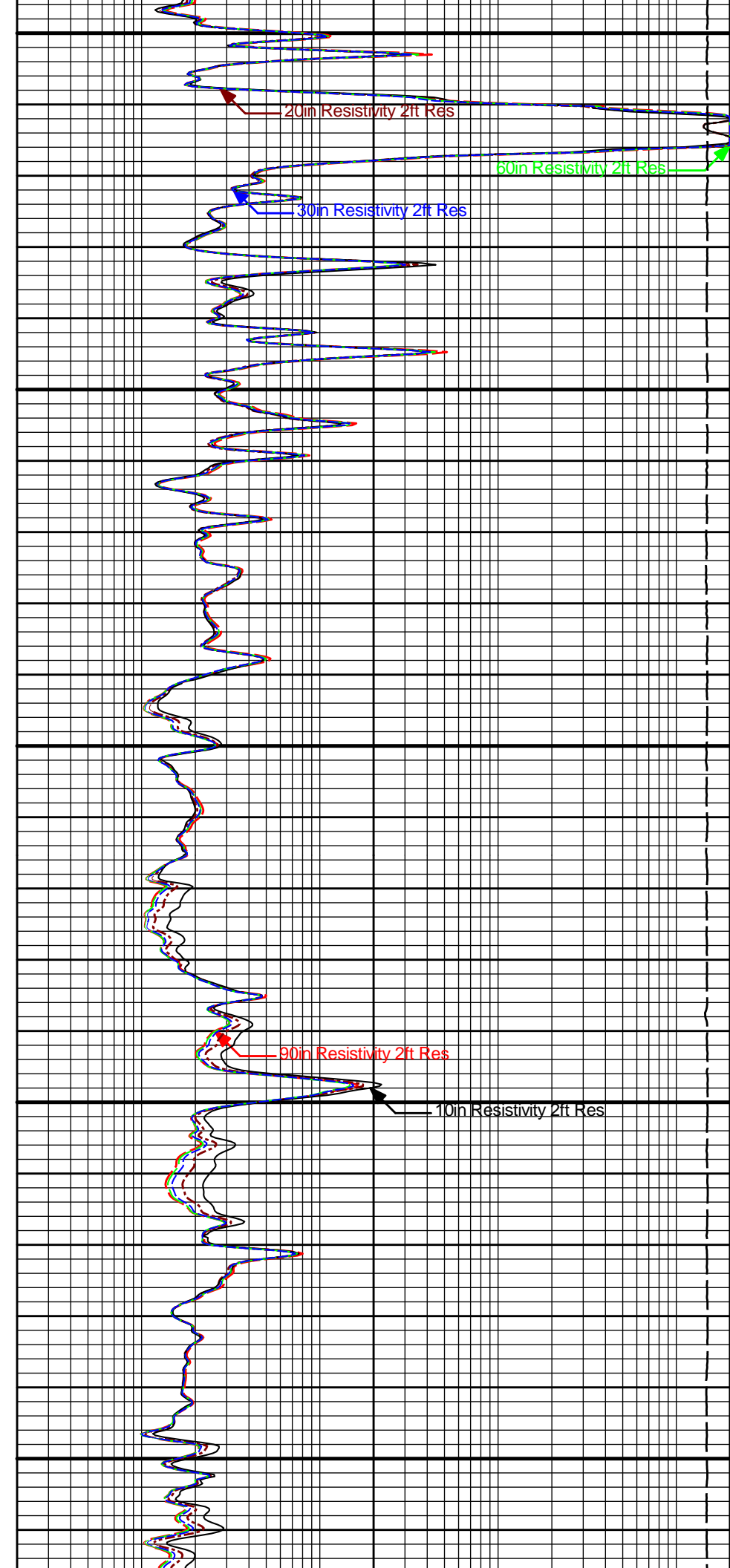




1300

1400

1500



20in Resistivity 2ft Res

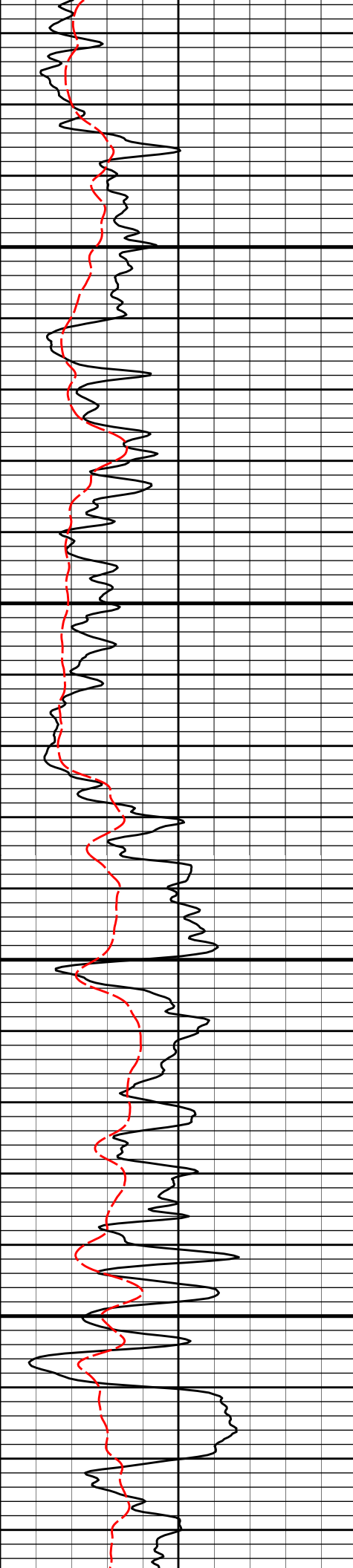
60in Resistivity 2ft Res

30in Resistivity 2ft Res

90in Resistivity 2ft Res

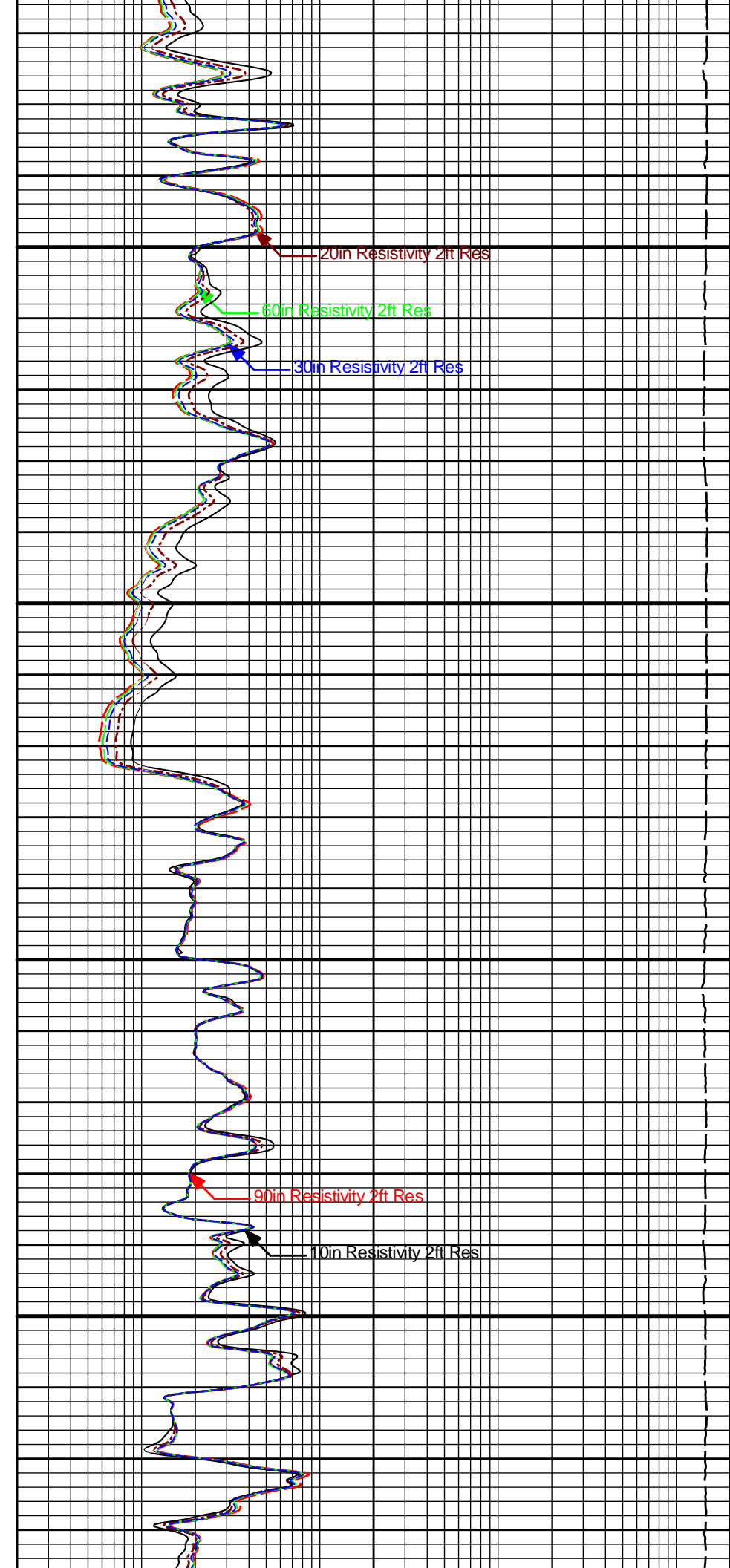
10in Resistivity 2ft Res

SP



1600

1700



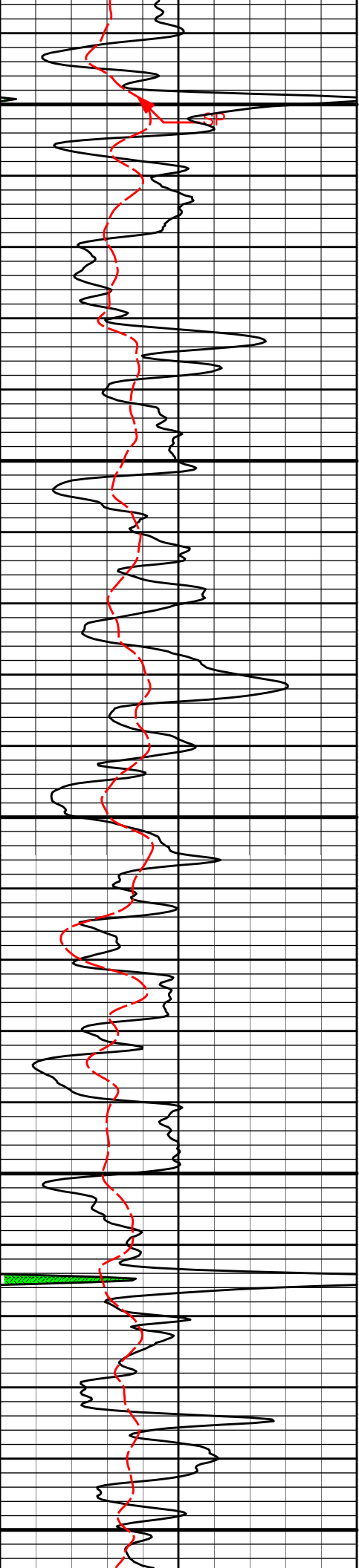
20in Resistivity 2ft Res

60in Resistivity 2ft Res

30in Resistivity 2ft Res

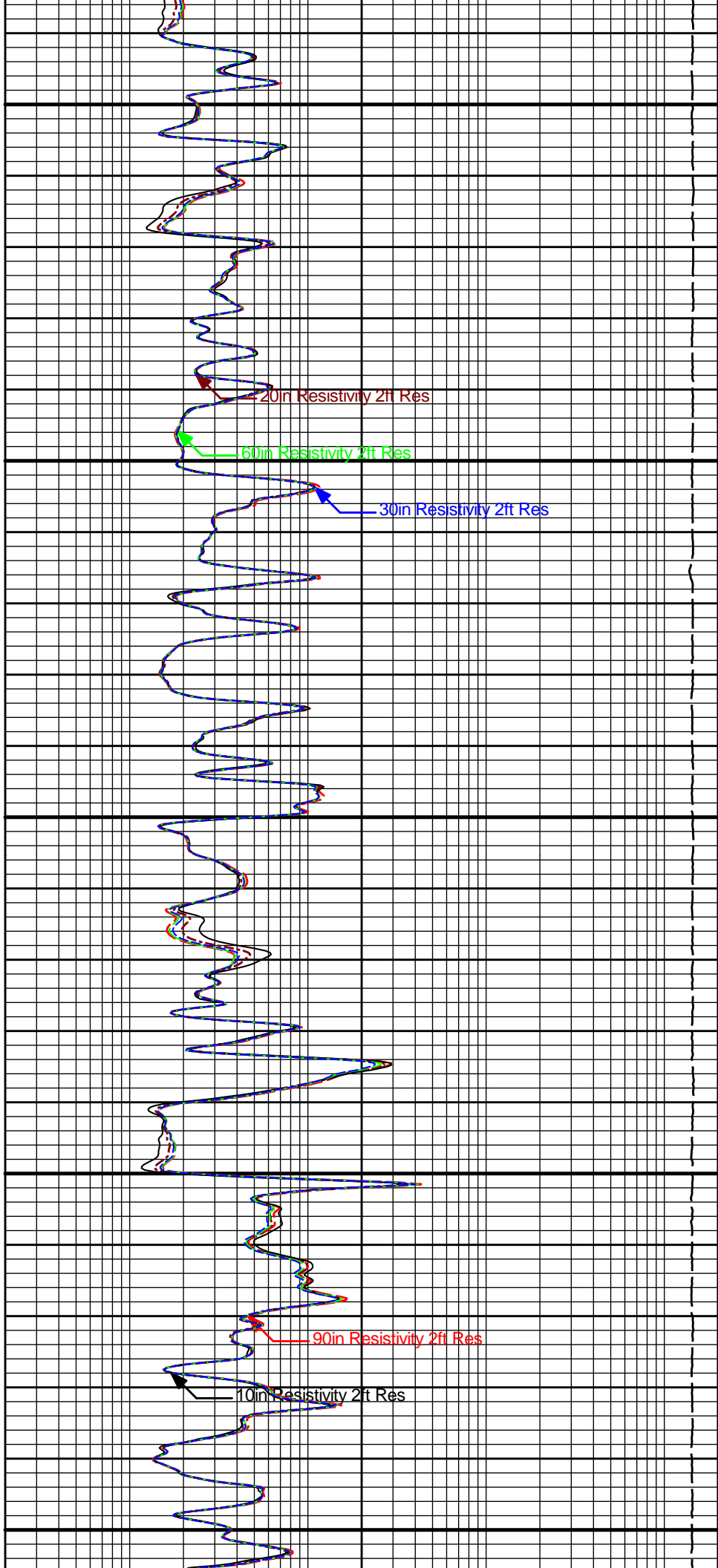
90in Resistivity 2ft Res

10in Resistivity 2ft Res



1800

1900



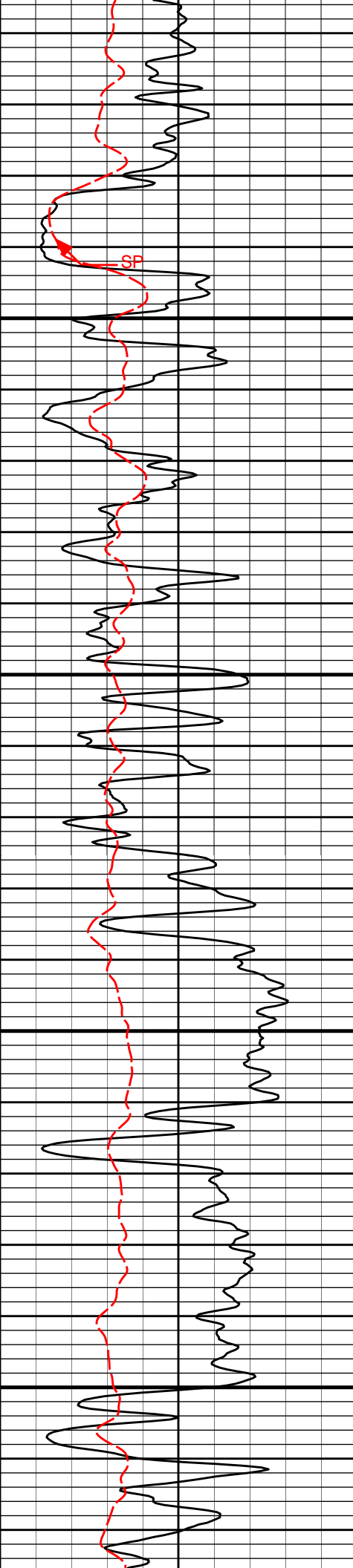
20in Resistivity 2ft Res

60in Resistivity 2ft Res

30in Resistivity 2ft Res

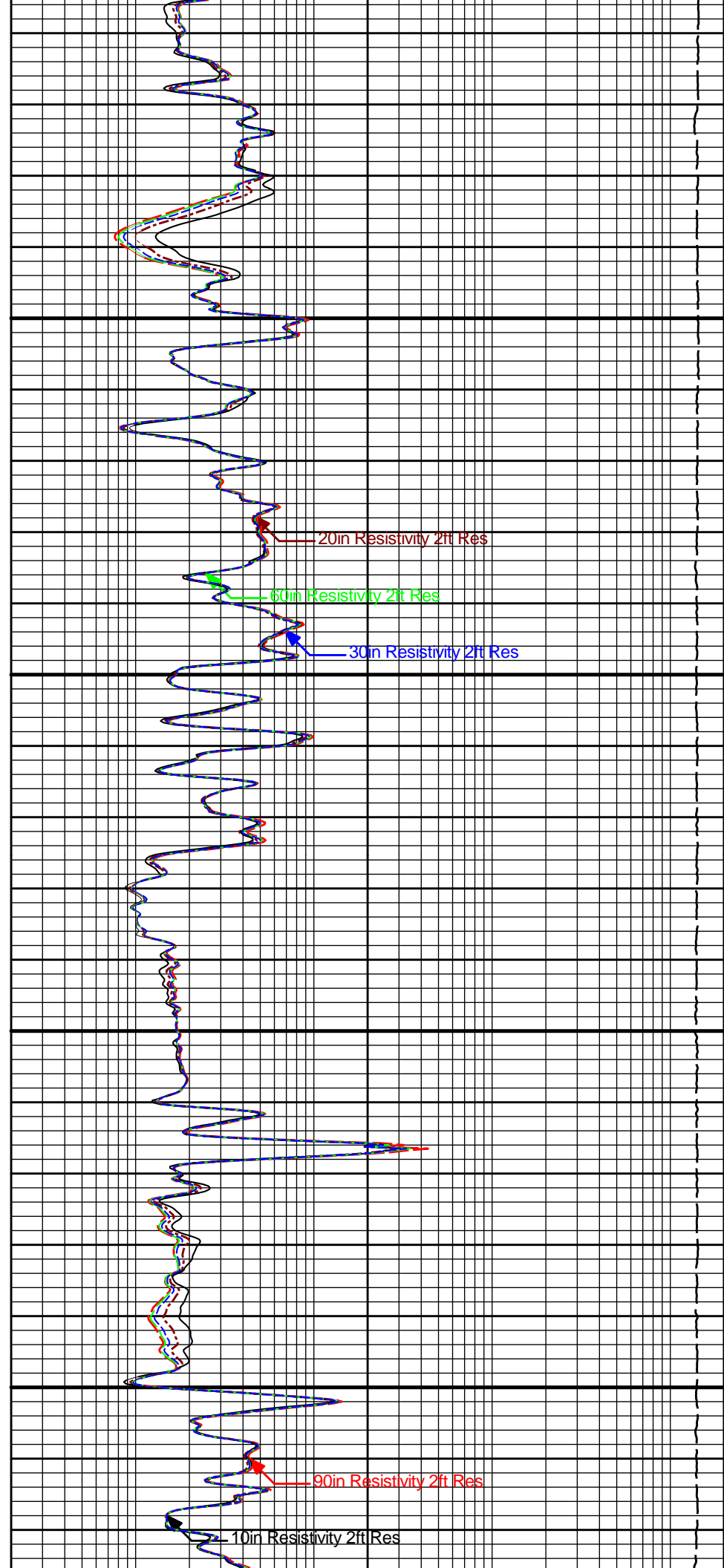
90in Resistivity 2ft Res

10in Resistivity 2ft Res



2000

2100



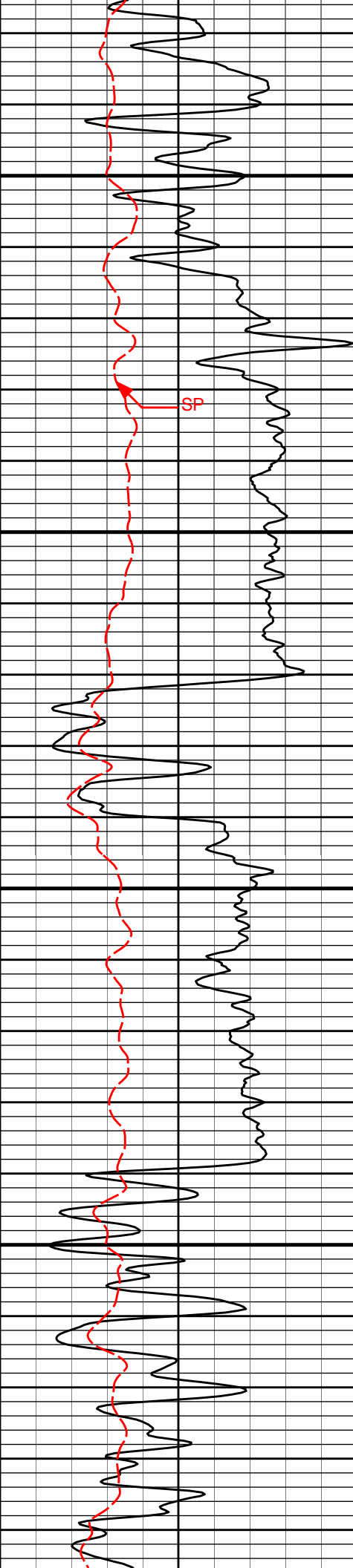
20in Resistivity 2ft Res

60in Resistivity 2ft Res

30in Resistivity 2ft Res

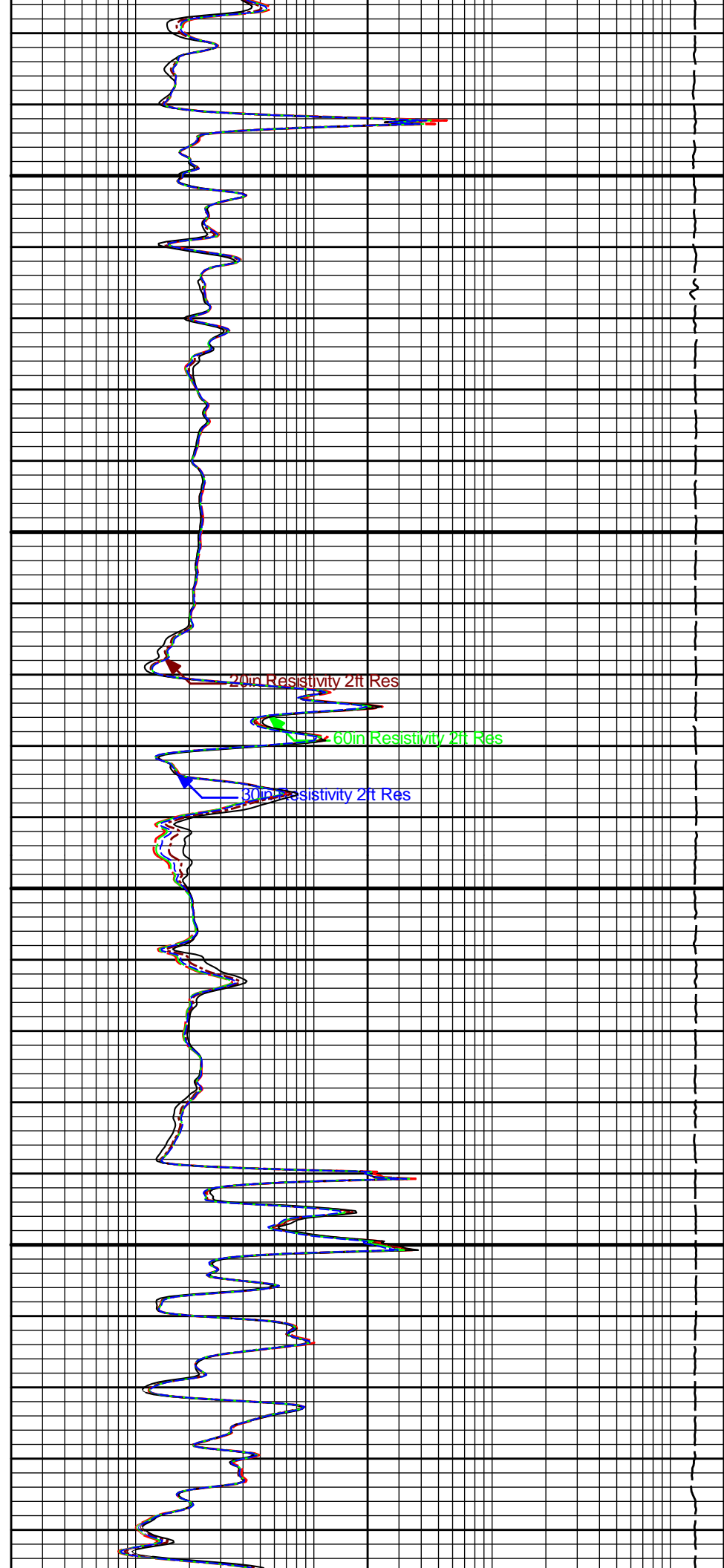
90in Resistivity 2ft Res

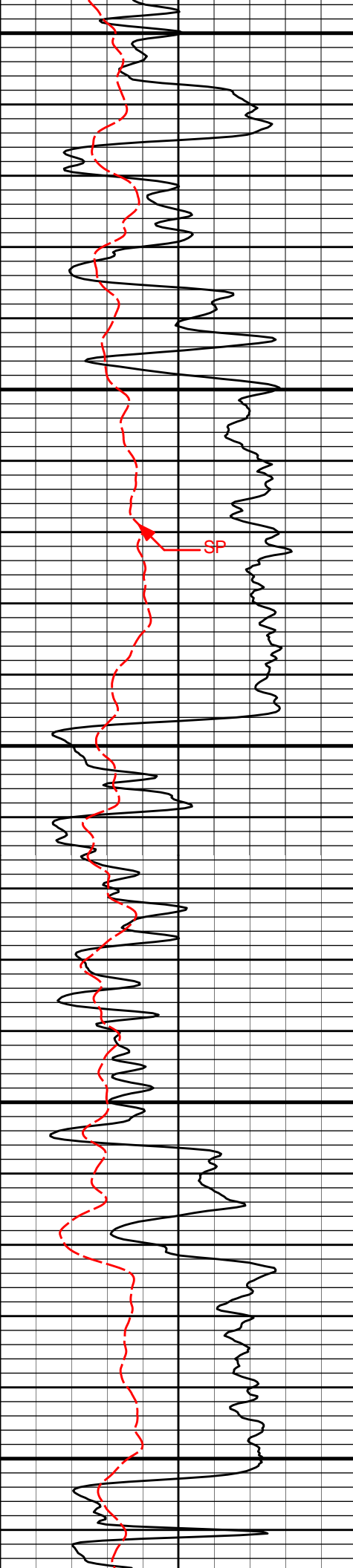
10in Resistivity 2ft Res



2200

2300

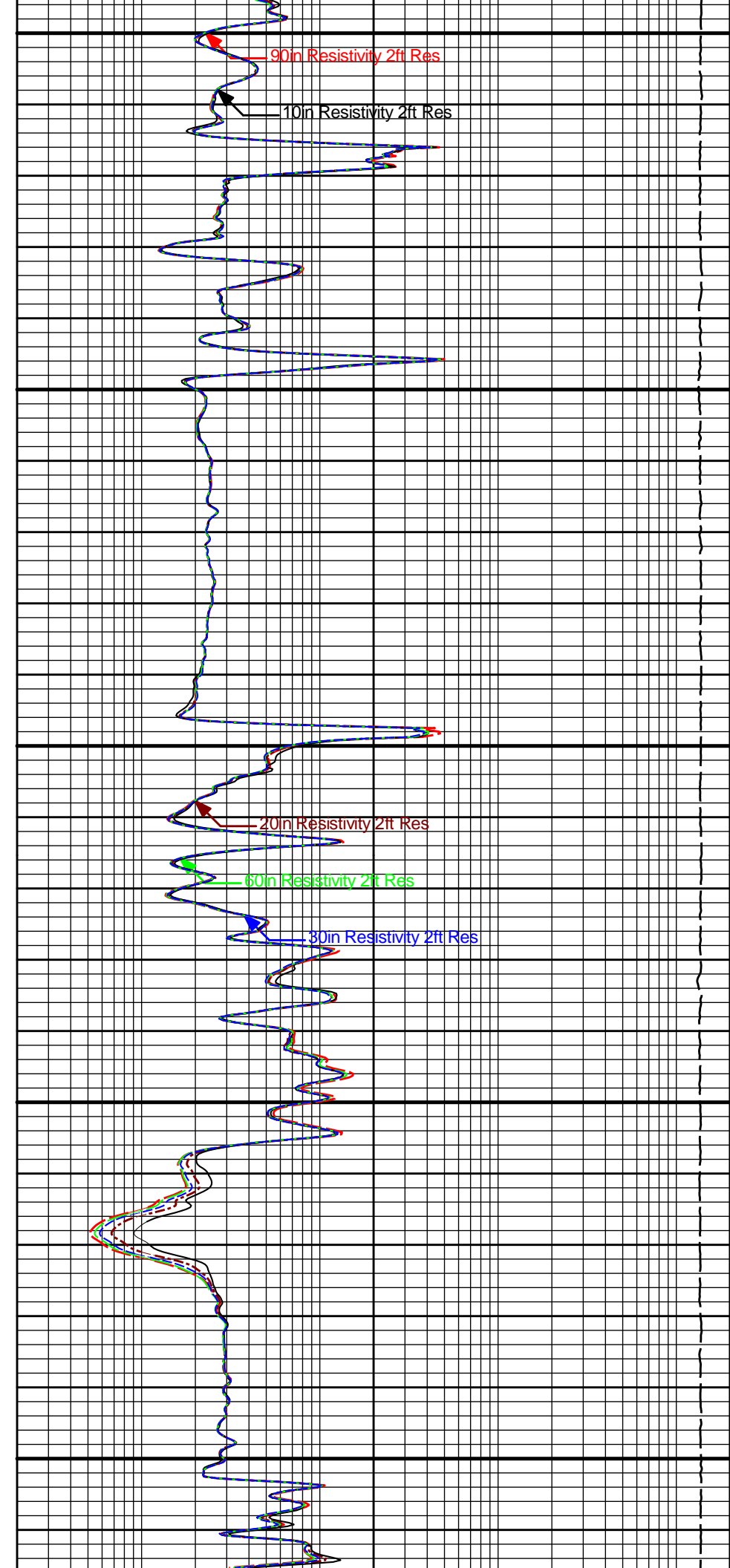


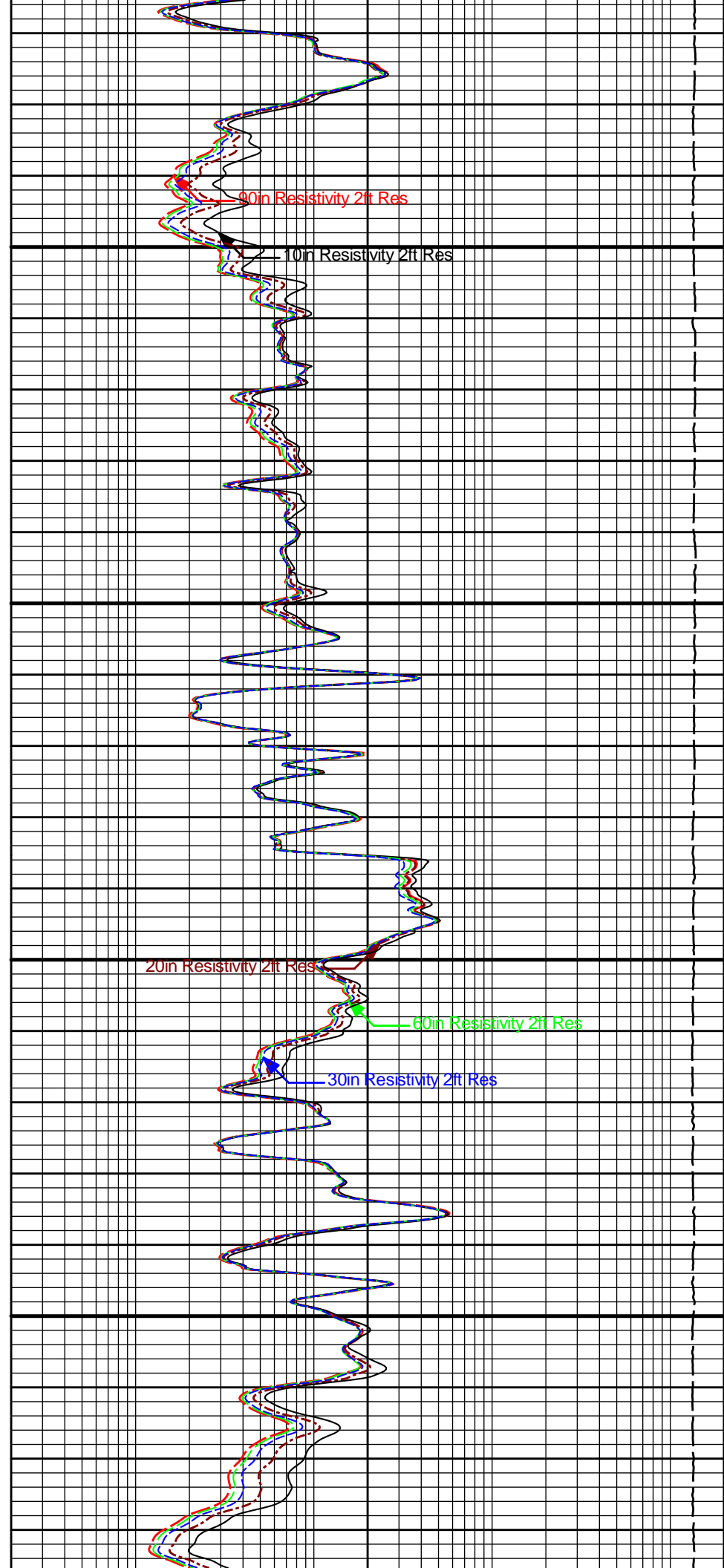
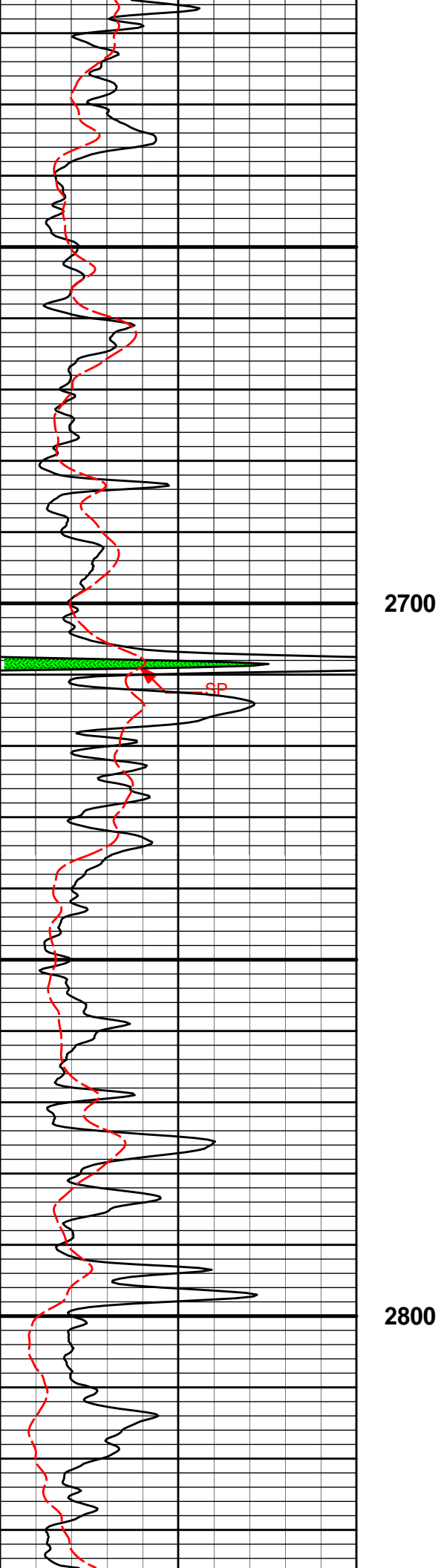


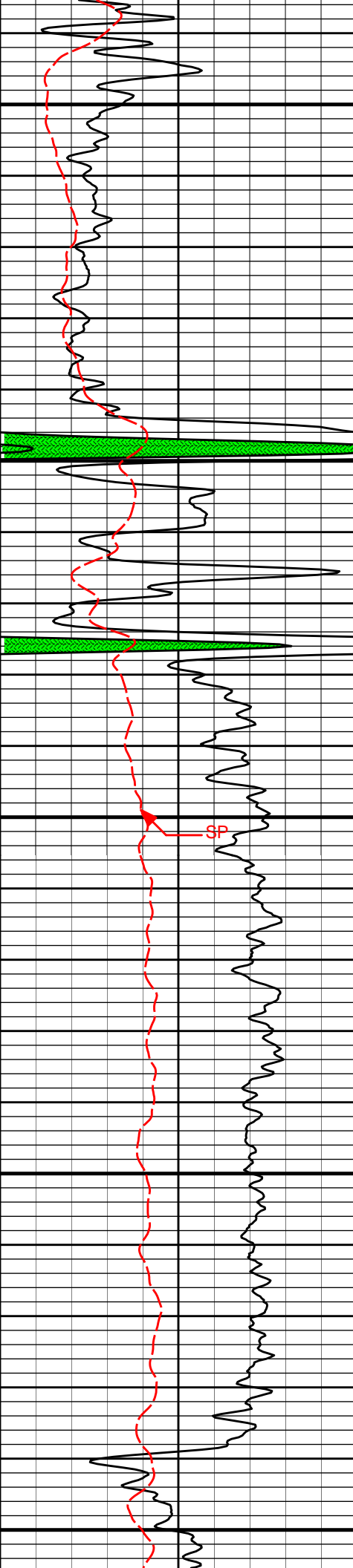
2400

2500

2600

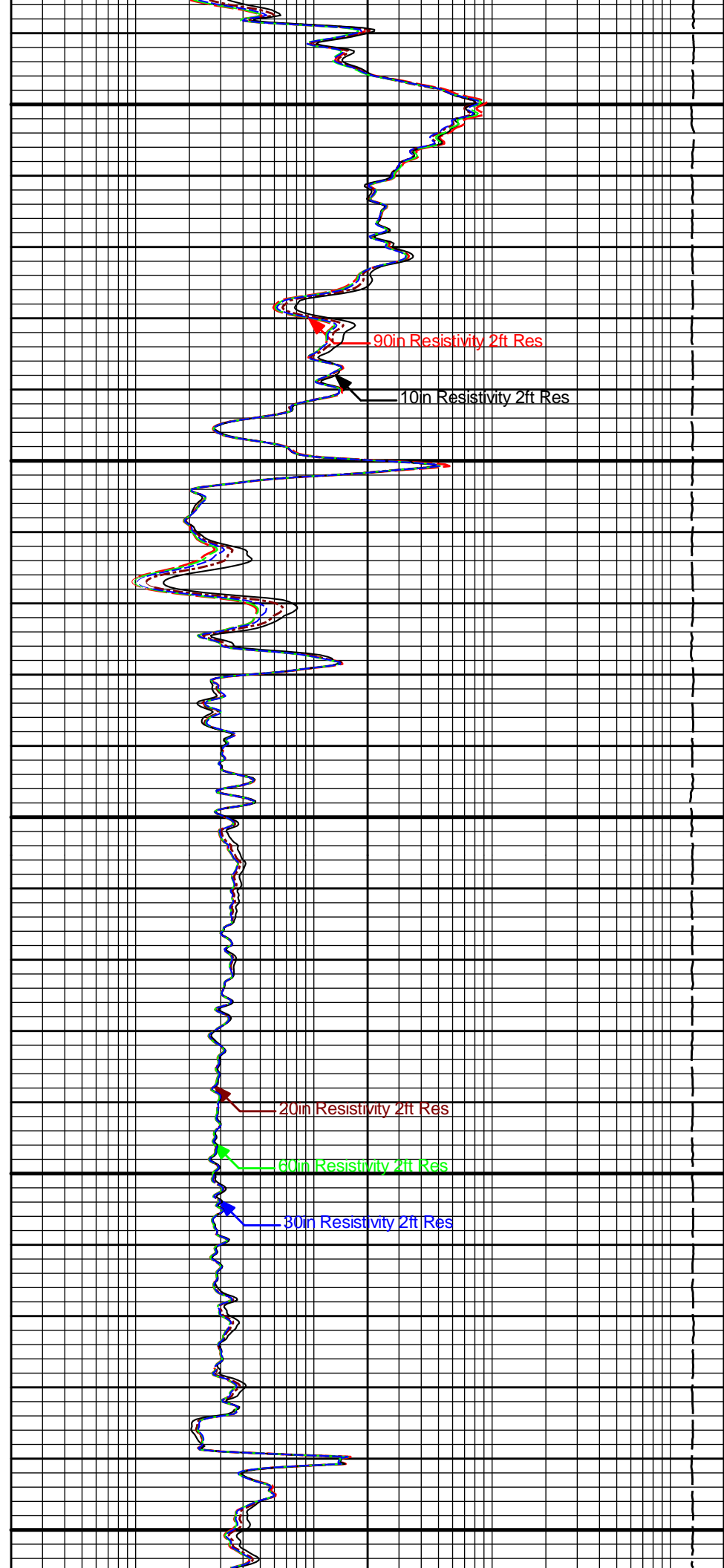






2900

3000



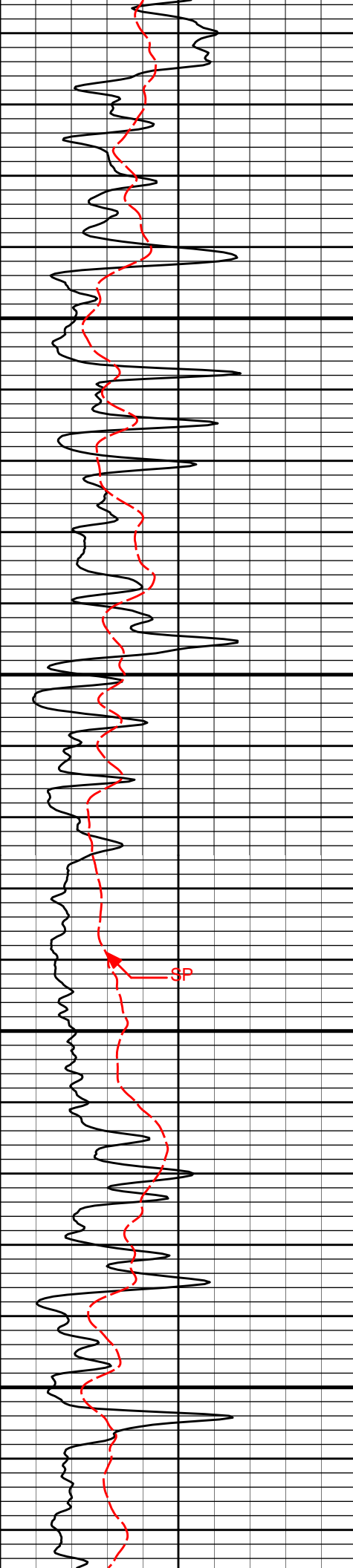
90in Resistivity 2ft Res

10in Resistivity 2ft Res

20in Resistivity 2ft Res

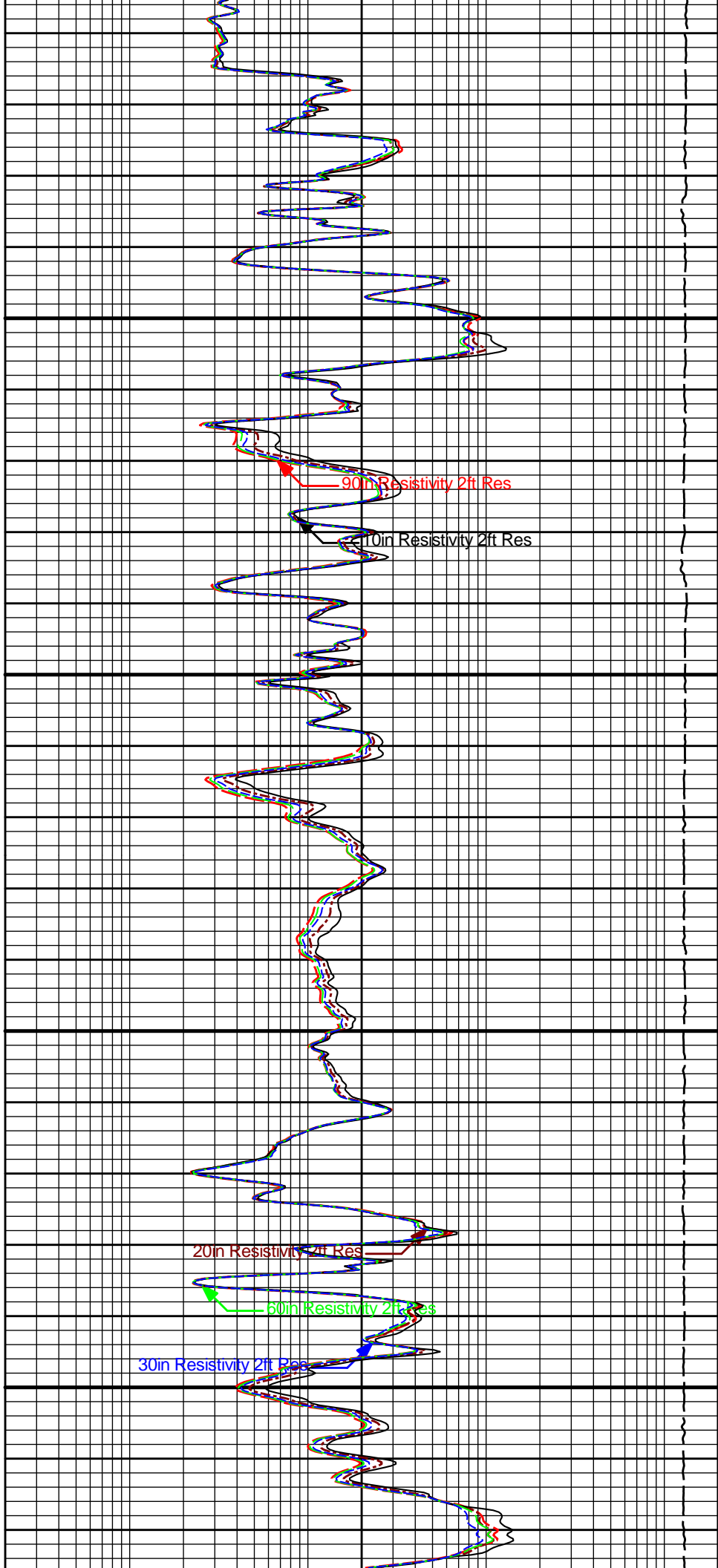
60in Resistivity 2ft Res

30in Resistivity 2ft Res



3100

3200



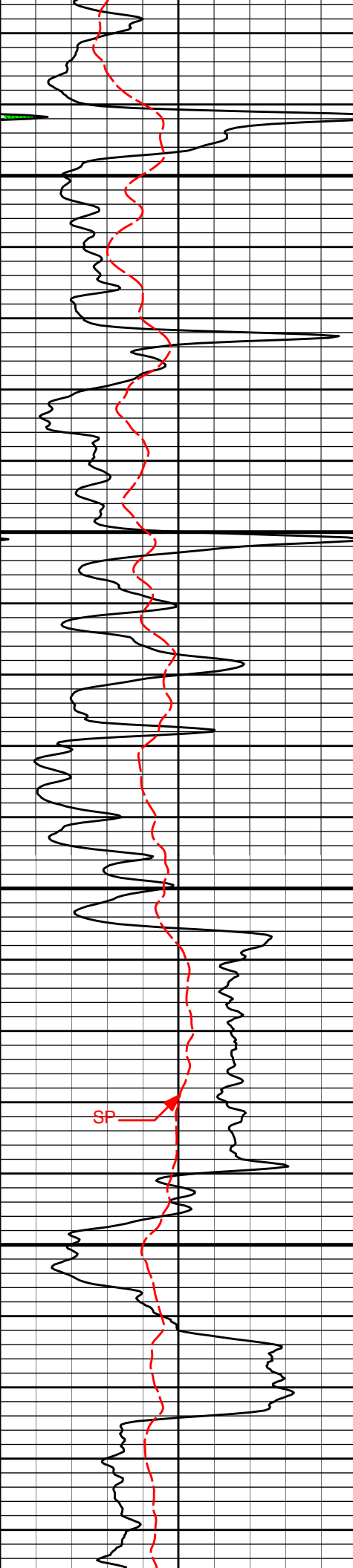
90in Resistivity 2ft Res

10in Resistivity 2ft Res

20in Resistivity 2ft Res

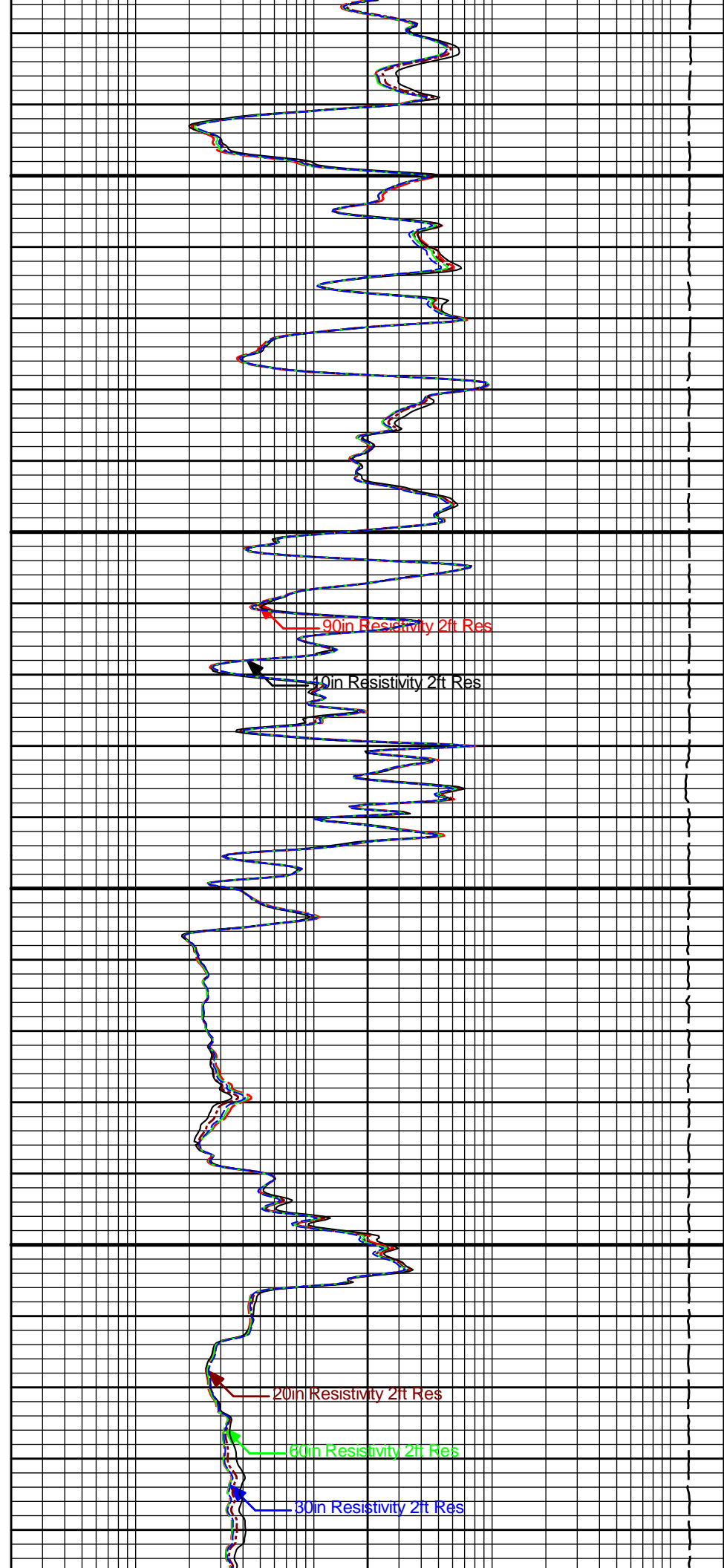
60in Resistivity 2ft Res

30in Resistivity 2ft Res



3300

3400



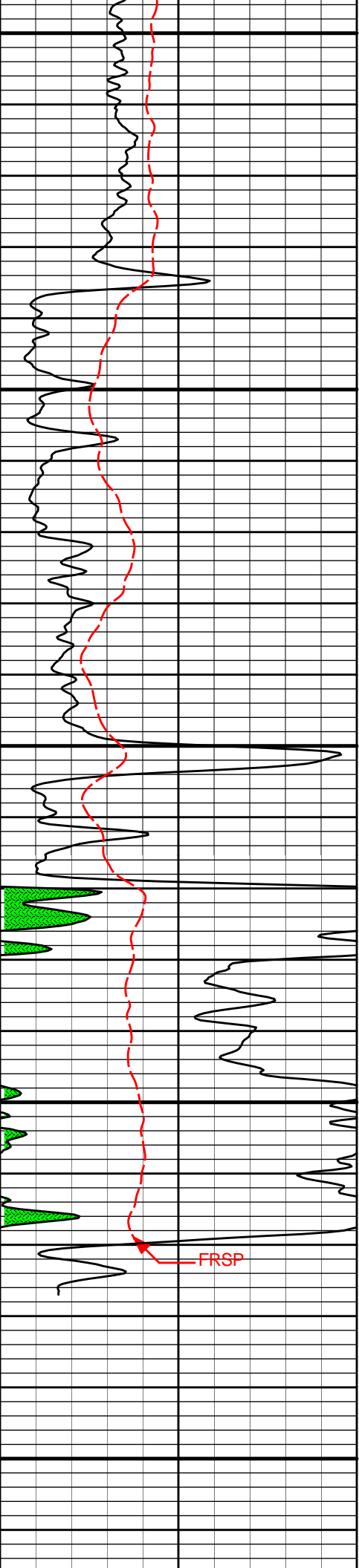
90in Resistivity 2ft Res

40in Resistivity 2ft Res

20in Resistivity 2ft Res

60in Resistivity 2ft Res

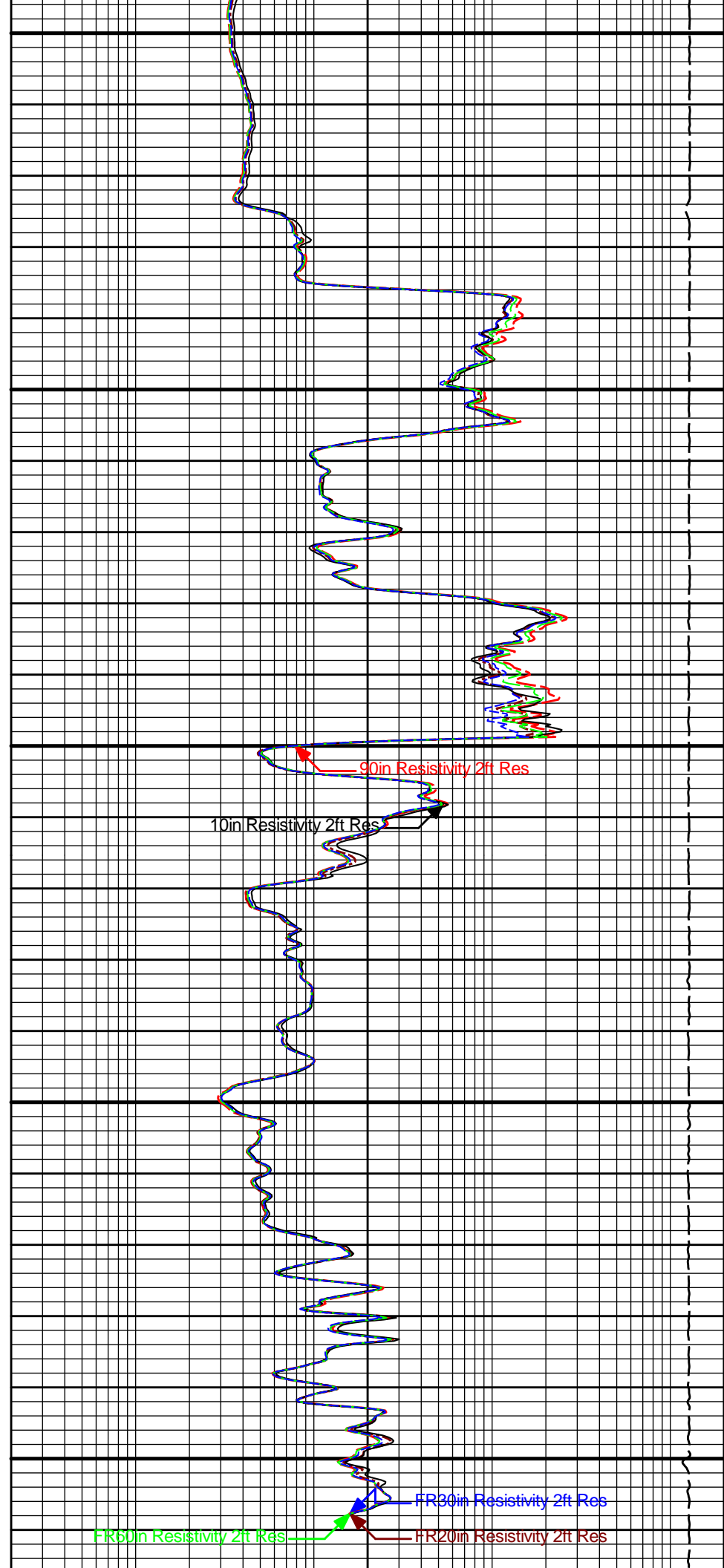
30in Resistivity 2ft Res



3500

3600

3700



90in Resistivity 2ft Res

10in Resistivity 2ft Res

FR30in Resistivity 2ft Res

FR60in Resistivity 2ft Res

FR20in Resistivity 2ft Res

0	Gamma API	150
	api	
	SP	
	-]20[+	

		15K	Tension	0
			pounds	
0.2	90in Resistivity 2ft Res			2K
	ohmm			
0.2	60in Resistivity 2ft Res			2000
	ohmm			
0.2	30in Resistivity 2ft Res			2000
	ohm-metre			
0.2	20in Resistivity 2ft Res			2000
	ohmm			
0.2	10in Resistivity 2ft Res			2K
	ohmm			

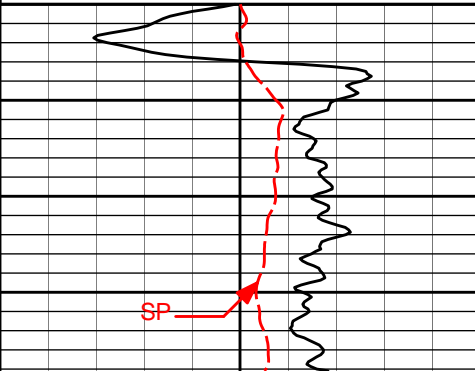
5 INCH MAIN LOG

REPEAT SECTION

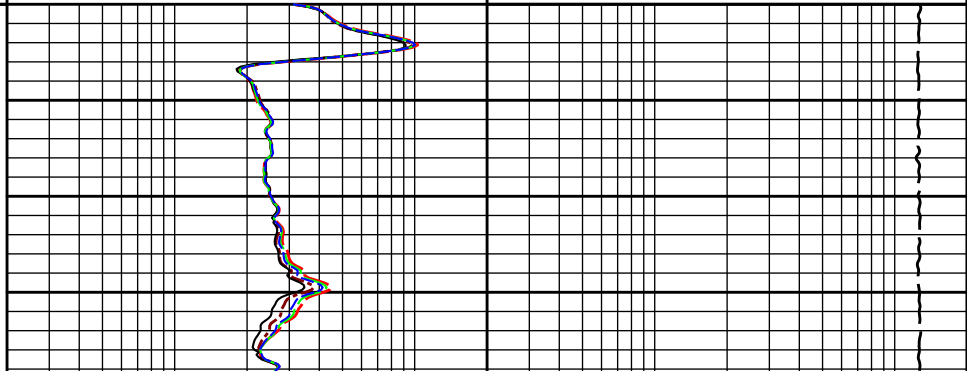
0.2	10in Resistivity 2ft Res			2K
	ohmm			
0.2	20in Resistivity 2ft Res			2000
	ohmm			
0.2	30in Resistivity 2ft Res			2000
	ohm-metre			
0.2	60in Resistivity 2ft Res			2000
	ohmm			
0.2	90in Resistivity 2ft Res			2K
	ohmm			

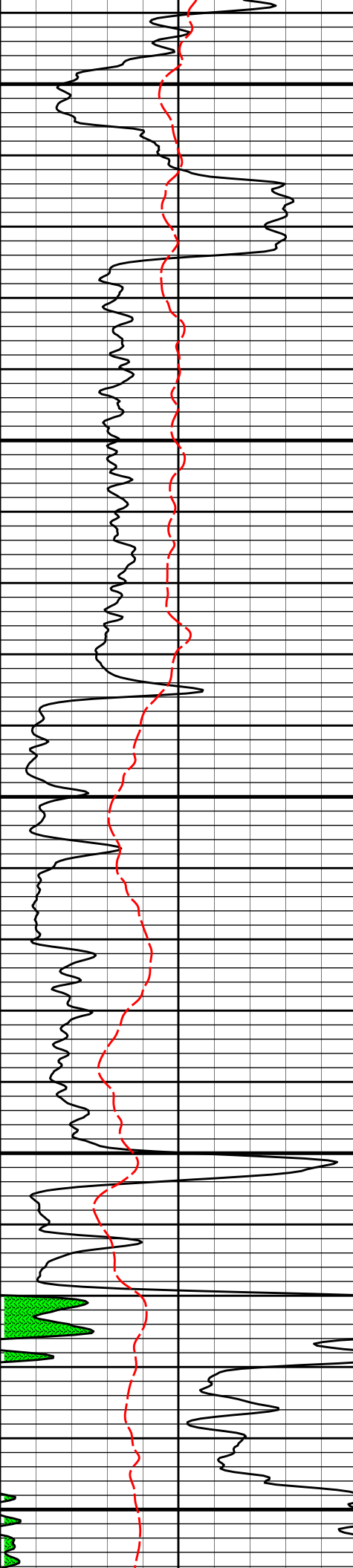
	SP	
	-]20[+	
0	Gamma API	150
	api	

		15K	Tension	0
			pounds	



3400





3500

3600

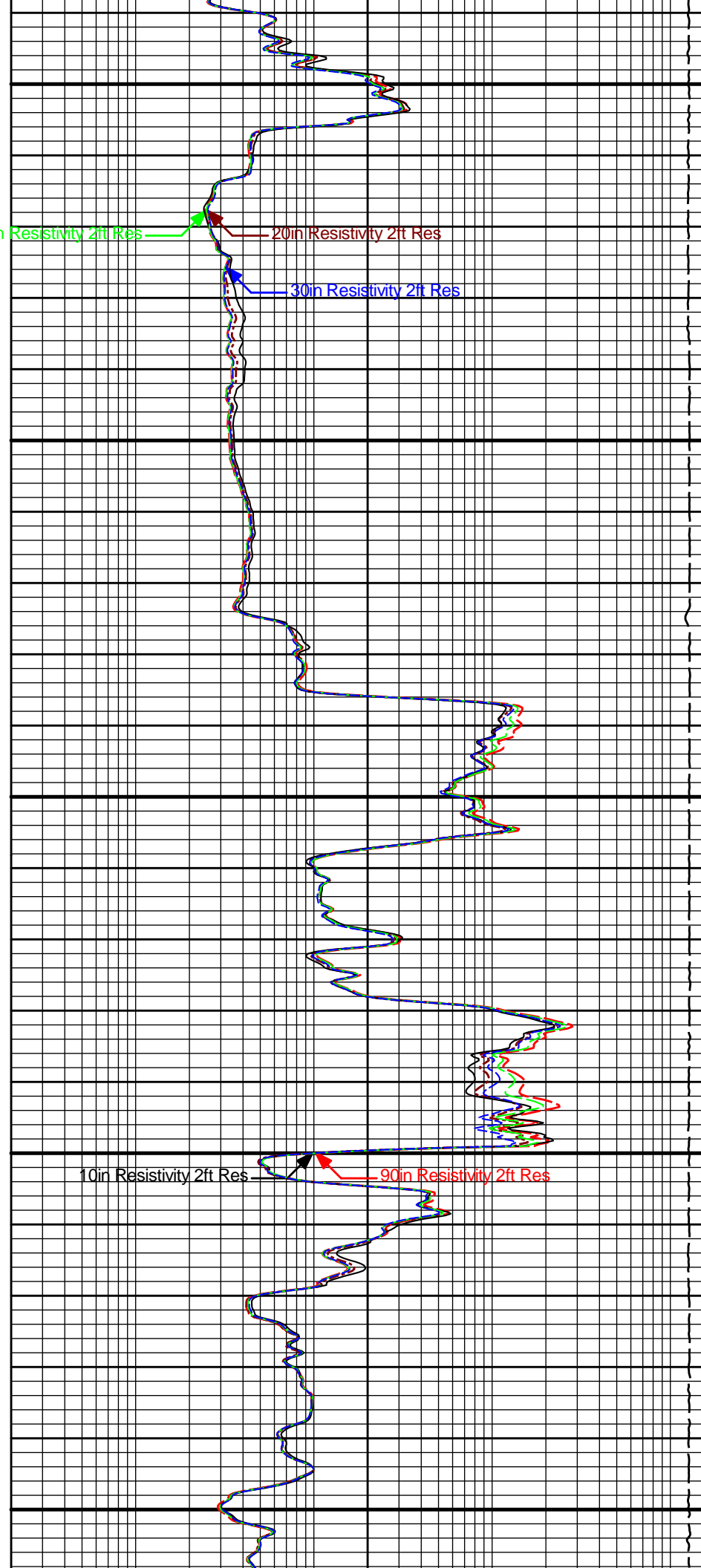
60in Resistivity 2ft Res

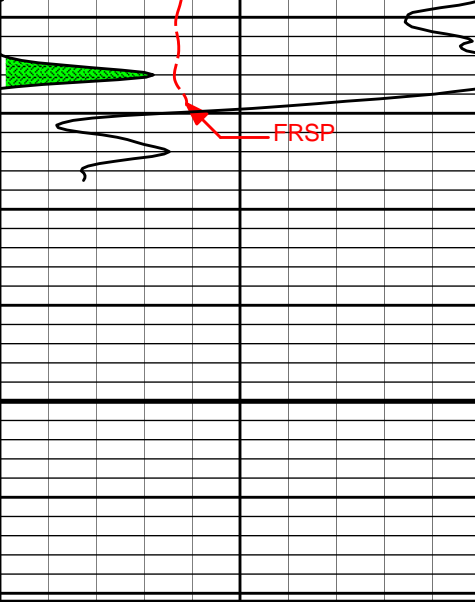
20in Resistivity 2ft Res

30in Resistivity 2ft Res

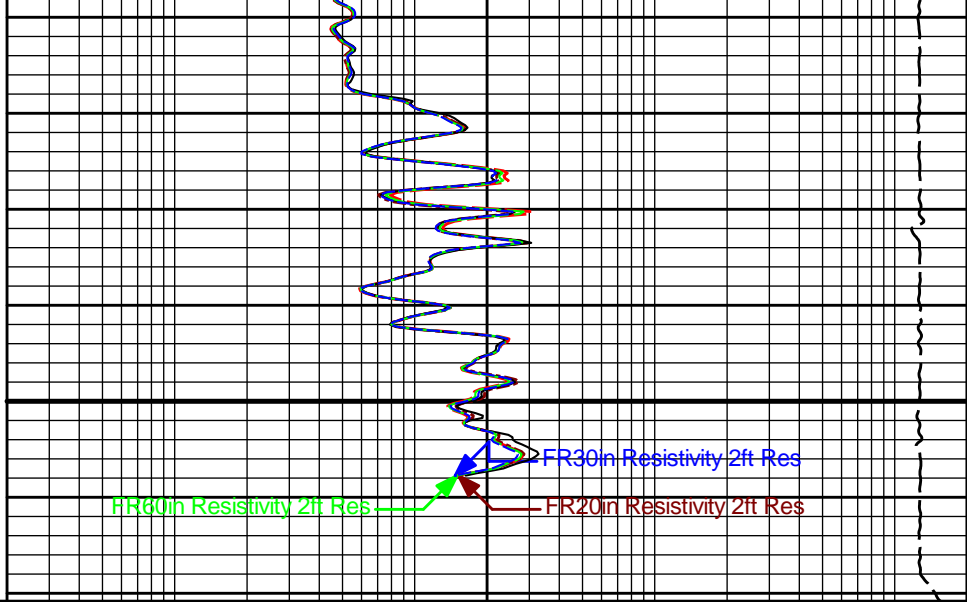
10in Resistivity 2ft Res

90in Resistivity 2ft Res





3700



0	Gamma API	150
	api	
	SP	
	-]20[+	

	15K	Tension	0
		pounds	
0.2	90in Resistivity 2ft Res		2K
	ohmm		
0.2	60in Resistivity 2ft Res		2000
	ohmm		
0.2	30in Resistivity 2ft Res		2000
	ohm-metre		
0.2	20in Resistivity 2ft Res		2000
	ohmm		
0.2	10in Resistivity 2ft Res		2K
	ohmm		

REPEAT SECTION

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	9.400	ppg
	SHARED	WAGT	Weighting Agent	Barite	
	SHARED	BSAL	Borehole salinity	6500.00	ppm
	SHARED	FSAL	Formation Salinity NaCl	0.00	ppm
	SHARED	KPCT	Percent K in Mud by Weight?	0.00	%
	SHARED	RMUD	Mud Resistivity	2.000	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	3750.00	ft
SHARED	BHT	Bottom Hole Temperature	120.0	degF
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	SDLT	
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	SDLT	
DSNT	DNOK	Process DSN?	Yes	
DSNT	DEOK	Process DSN EVR?	No	
DSNT	NLIT	Neutron Lithology	Limestone	
DSNT	DNSO	DSN Standoff - 0.25 in (6.35 mm) Recommended	0.250	in
DSNT	DNTT	Temperature Correction Type	None	
DSNT	DPRS	DSN Pressure Correction Type	None	
DSNT	SHCO	View More Correction Options	No	
DSNT	UTVD	Use TVD for Gradient Corrections?	No	
DSNT	LHWT	Logging Horizontal Water Tank?	No	
DSNT	BHSM	Borehole Size Source Tool	SDLT	
SDLT	CLOK	Process Caliper Outputs?	Yes	
Microlog Pad	MLOK	Process MicroLog Outputs?	Yes	
SDLT Pad	DNOK	Process Density?	Yes	
SDLT Pad	DNOK	Process Density EVR?	No	
SDLT Pad	CB	Logging Calibration Blocks?	No	
SDLT Pad	SPVT	SDLT Pad Temperature Valid?	Yes	
SDLT Pad	DTWN	Disable temperature warning	No	
SDLT Pad	DMA	Formation Density Matrix	2.710	g/cc
SDLT Pad	DFL	Formation Density Fluid	1.000	g/cc
SDLT Pad	BHSM	Borehole Size Source Tool	SDLT	
ACRt Sonde	RTOK	Process ACRt?	Yes	
ACRt Sonde	MNSO	Minimum Tool Standoff	1.50	in
ACRt Sonde	TCS1	Temperature Correction Source	FP Lwr & FP Upr	
ACRt Sonde	TPOS	Tool Position	Free Hanging	
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	SDLT	
ACRt Sonde	MBFL	Apply Corkscrew Effect?	No	

BOTTOM_____

Data: SPOPPEL_1_8\0001 GTET-DSN-SDL-ACRTIDLE

Date: 02-Jun-16 19:16:39

HALLIBURTON

CALIBRATION REPORT

ARRAY COMPENSATED TRUE RESISTIVITY SHOP CALIBRATION

Tool Name: ACRt Sonde - 11038385	Reference Calibration Date: 26-Feb-16 10:05:33
Engineer: JORGE ORLANDO PEREZ	Calibration Date: 05-May-16 10:57:48
Software Version: WL INSITE R5.0.0 (Build 4)	Calibration Version: 1
Host Tool Name: ACRt Instrument - 11055059	

TYPICAL GAIN RANGE									
Subarray	R12KHz			R36KHz			R72KHz		
	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper
A1 (80")	0.95	1.0078	1.05	0.95	1.0117	1.05	0.95	1.0113	1.05
A2 (50")	0.95	1.0302	1.05	0.95	1.0333	1.05	0.95	1.0364	1.05
A3 (29")	0.95	1.0120	1.05	0.95	1.0141	1.05	0.95	1.0137	1.05
A4 (17")	0.95	1.0113	1.05	0.95	1.0115	1.05	0.95	1.0125	1.05
A5 (10")	N/A	N/A	N/A	0.95	1.0008	1.05	0.95	1.0014	1.05
A6 (6")	N/A	N/A	N/A	0.95	1.0019	1.05	0.95	1.0018	1.05

SONDE OFFSET						
Subarray	R12KHz		R36KHz		R72KHz	
	(mmho/m)		(mmho/m)		(mmho/m)	
A1 (80")	-2.040		-5.323		-4.924	
A2 (50")	-2.284		-3.995		-4.873	
A3 (29")	-13.753		-3.942		-3.021	
A4 (17")	-105.619		-33.161		-25.844	
A5 (10")	N/A		-81.771		-40.886	
A6 (6")	N/A		342.060		171.104	

TRANSMITTER CURRENT GAIN				R-MUD VERIFICATION			
Signal	Lower	R	Upper	Signal	Lower (ohm-m)	Measured (ohm-m)	Upper (ohm-m)
12K	0.6	0.90	1.3	Mud Cell	0.95	1.00	1.05
36K	1.0	1.36	2.0				
72K	1.0	1.62	2.0				

PASS/FAIL SUMMARY

GAIN RANGE CHK	PASS
SONDE OFFSET CHK	PASS

TOOL OK TO LOG

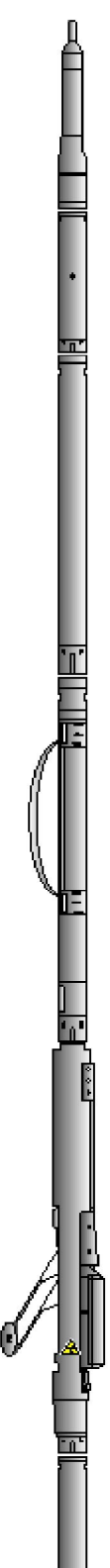
CALIBRATION SUMMARY

Sensor	Shop	Field	Post	Difference	Tolerance	Units
ACRt Sonde-11038385						
Mud Cell	1.00	-----	-----	0	-----	ohm-m

Data: SPOPPEL_1_8\0001 GTET-DSN-SDL-ACRTIDLE Date: 02-Jun-16 19:16:56

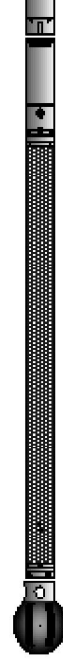
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TOOL STRING DIAGRAM REPORT

Description	Overbody Description	O.D.	Diagram	Sensors @ Delays	Length	Accumulated Length
CH_HOS_I 37.50 lbs		Ø 2.750 in		← Temperature @ 55.54 ft	3.03 ft	56.57 ft
XOHD-12345678 20.00 lbs		Ø 2.750 in Ø 3.625 in			0.95 ft	53.54 ft
SP Sub-12345678 60.00 lbs		Ø 3.625 in		← SP @ 50.81 ft	3.74 ft	52.59 ft
				← Z-Accelerometer @ 48.40 ft		48.85 ft
GTET-11021138 165.00 lbs		Ø 3.625 in		← GammaRay @ 42.79 ft	8.52 ft	40.33 ft
DSNT-11019641 174.00 lbs	DSN Decentralizer- 11019641 6.60 lbs	Ø 5.000 in* Ø 3.625 in		← DSN Far @ 33.39 ft ← DSN Near @ 32.64 ft	9.69 ft	30.64 ft
SDLT-10951315 360.00 lbs	SDLT Pad-10865873 65.00 lbs Microlog Pad-10951315 8.00 lbs RAM-Cs137-10948154 1.00 lbs	Ø 4.500 in Ø 4.500 in* Ø 4.750 in* Ø 0.800 in*		Microlog @ 22.83 ft SDL Caliper @ 22.65 ft SDL @ 22.64 ft	10.81 ft	19.83 ft
ACRt Instrument- 11055059 50.00 lbs		Ø 3.625 in			5.03 ft	

ACRt Sonde-
11038385
200.00 lbs

Ø 3.625 in →



← Mud Resistivity @ 13.44 ft

← ACRt @ 9.46 ft

14.22 ft

14.80 ft

Cabbage Head-
00000001
10.00 lbs

Ø 3.625 in →
Ø 6.000 in →

0.58 ft

0.58 ft

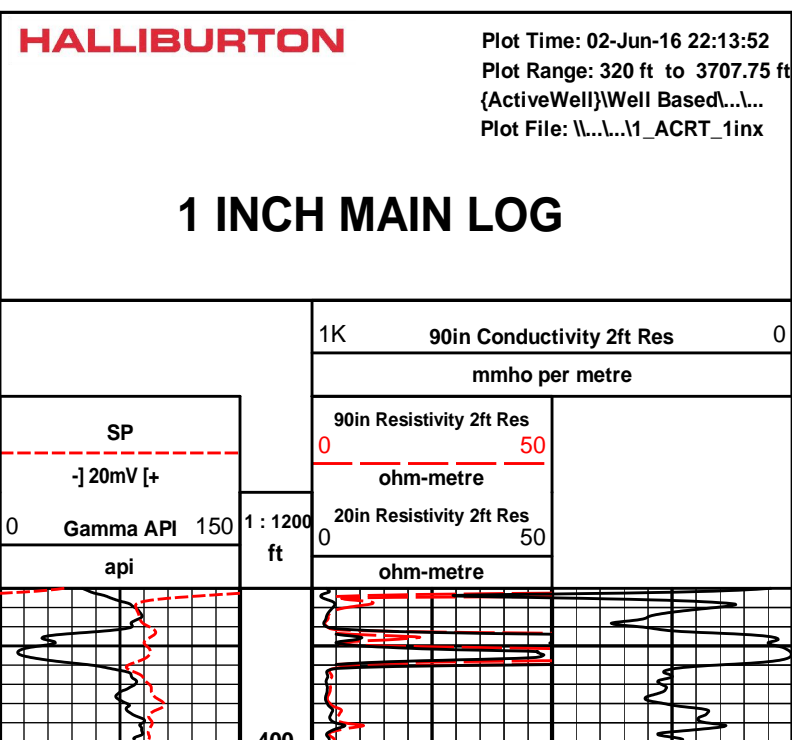
0.00 ft

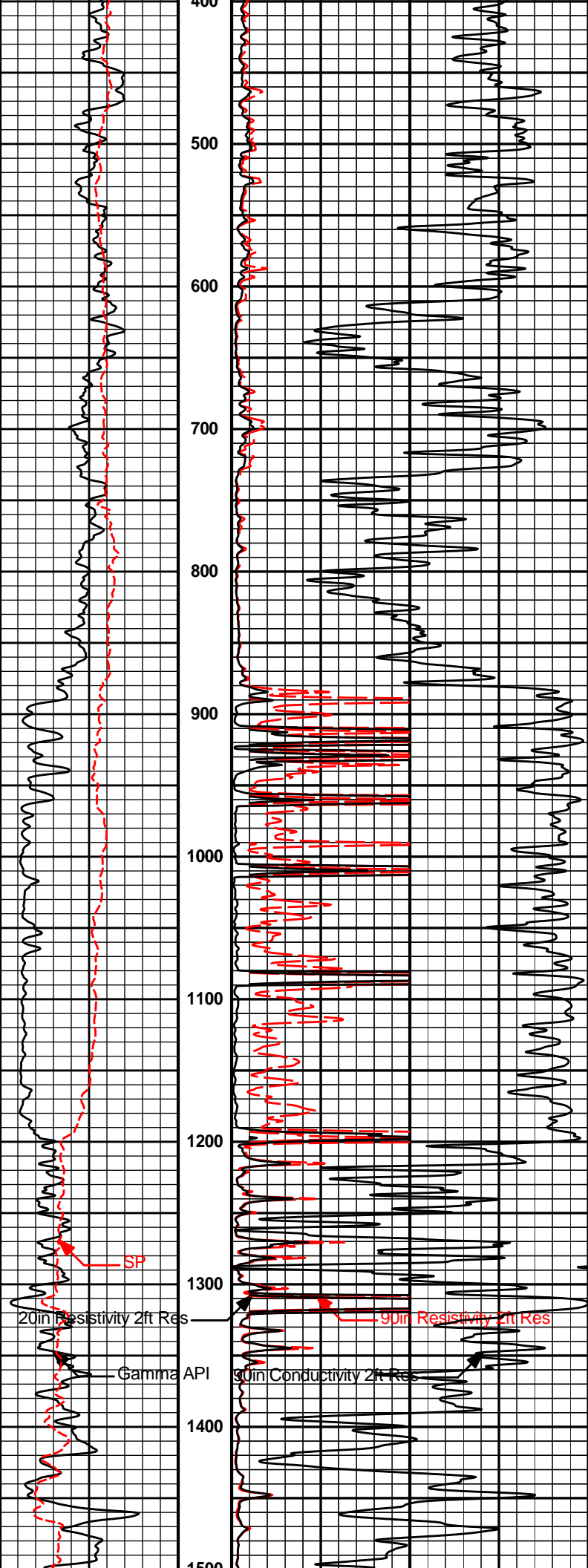
Mnemonic	Tool Name	Serial Number	Weight (lbs)	Length (ft)	Accumulated Length (ft)	Max.Log. Speed (fpm)
CH_HOS	Hostile Cable Head with Load Cell	CH_HOS_I	37.50	3.03	53.54	300.00
XOHD	Hostile to Dits Cross Over	12345678	20.00	0.95	52.59	300.00
SP	SP Sub	12345678	60.00	3.74	48.85	300.00
GTET	Gamma Telemetry Tool	11021138	165.00	8.52	40.33	60.00
DSNT	Dual Spaced Neutron	11019641	174.00	9.69	30.64	60.00
DCNT	DSN Decentralizer	11019641	6.60	5.13	*	33.97
SDLT	Spectral Density Tool	10951315	360.00	10.81	19.83	60.00
SDLP	Density Insite Pad	10865873	65.00	2.55	*	22.04
Cs137	Logging Source, SDLT-I, 1.78 Ci - Cs137	10948154	1.00	0.80	*	22.27
MICP	Microlog Pad	10951315	8.00	1.00	*	22.33
ACRt	Array Compensated True Resistivity Instrument Section	11055059	50.00	5.03	14.80	120.00
ACRt	Array Compensated True Resistivity Sonde Section	11038385	200.00	14.22	0.58	120.00
CBHD	Cabbage Head	00000001	10.00	0.58	0.00	300.00
Total			1,157.10	56.57		

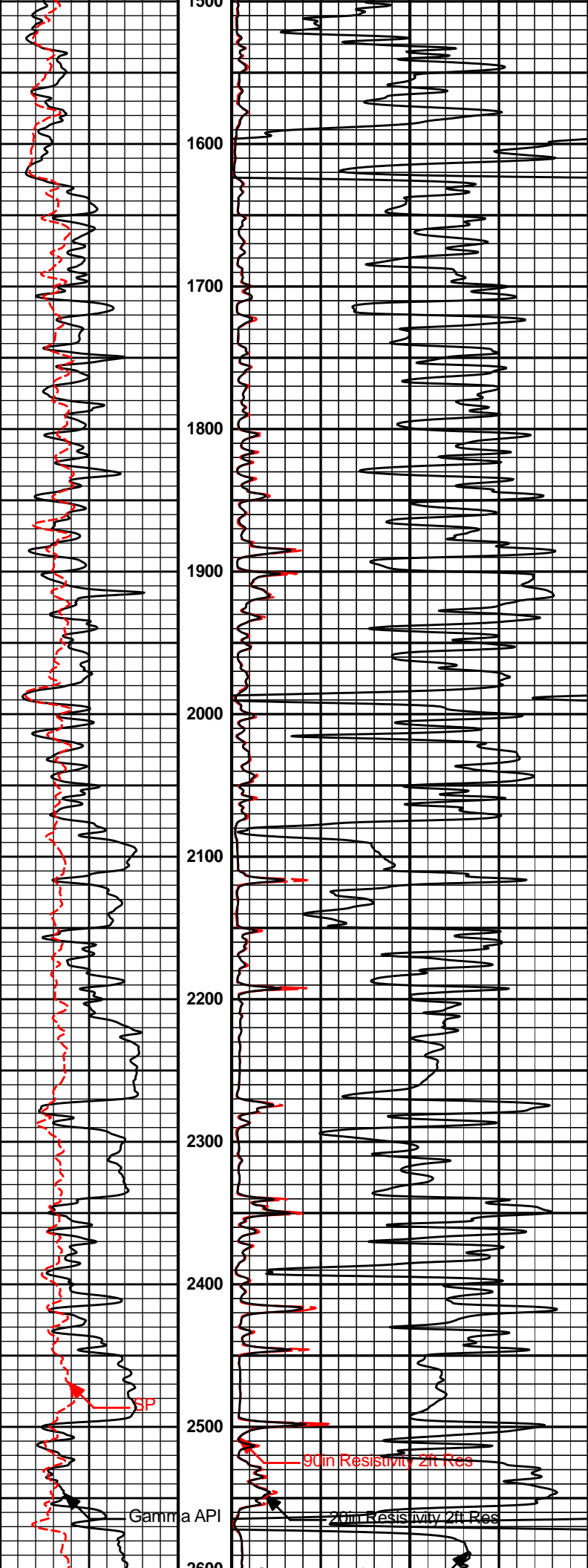
* Not included in Total Length and Length Accumulation.

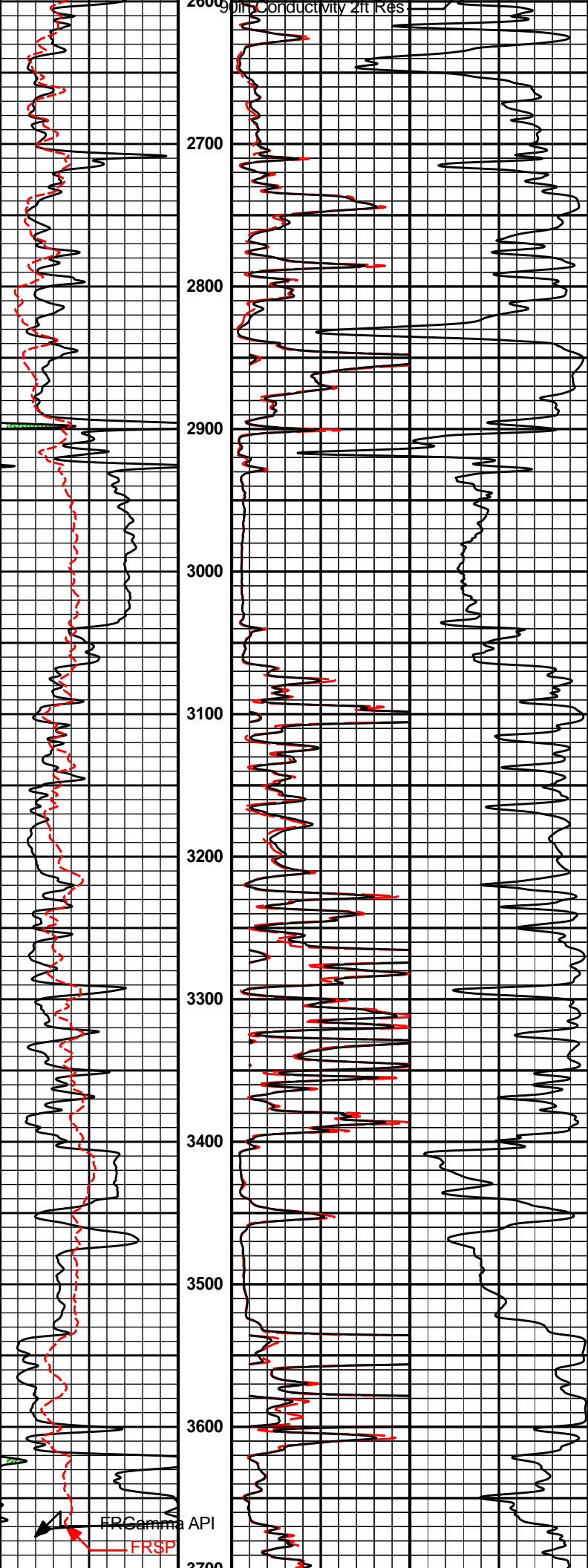
Data: SPOPPEL_1_8\0001 GTET-DSN-SDL-ACRT\IDLE

Date: 02-Jun-16 19:16:04









0	Gamma API	150	1 : 1200	20in Resistivity 2ft Res	0	50
	api		ft	ohm-metre		
	SP			90in Resistivity 2ft Res	0	50
	-] 20mV [+]			ohm-metre		
				1K	90in Conductivity 2ft Res	0
					mmho per metre	

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Plot Time: 02-Jun-16 22:13:54
Plot Range: 320 ft to 3707.75 ft
{ActiveWell}\Well Based\...\...
Plot File: \...\1_ACRT_1inx

1 INCH MAIN LOG

COMPANY	QUAIL OIL & GAS		
WELL	STOPPEL 1-8		
FIELD	WISBY		
COUNTY	RENO	STATE	KANSAS

HALLIBURTON	ARRAY COMPENSATED RESISTIVITY LOG
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