

**SPECTRAL DENSITY  
DUAL SPACED NEUTRON  
ARRAY COMPENSATED  
TRUE RESISTIVITY**

Fold here

Service Ticket No.: N/A						API Serial No.: 05123357670000						PGM Version: WL INSITE R3.6.0 (Build 3)					
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	1.25" S.O	N/A							
Rmc @ Meas. Temp.		@		@			E787-S797										
Source Rmf	Rmc																
Rm @ BHT		@		@													
Rmf @ BHT		@		@													
Rmc @ BHT		@		@													
EQUIPMENT DATA																	
GAMMA			ACOUSTIC			DENSITY			NEUTRON								
Run No.	ONE		Run No.			Run No.	ONE		Run No.	ONE							
Serial No.	11215095		Serial No.			Serial No.	10951319		Serial No.	11277440							
Model No.	GTET		Model No.			Model No.	SDLT		Model No.	DSNT							
Diameter	3.625"		No. of Cent.			Diameter	4.5"		Diameter	3.625"							
Detector Model No.	GTET		Spacing			Log Type	GAM.GAM		Log Type	NEU/NEU							
Type	SCINT					Source Type	Cs 137		Source Type	Am241Be							
Length	8"		LSA [Y/N]			Serial No.	5256 GW		Serial No.	DSN 430							
Distance to Source	10'		FWDA [Y/N ]			Strength	1.5 Ci		Strength	15 Ci							
LOGGING DATA																	
GENERAL			GAMMA		ACOUSTIC		DENSITY		NEUTRON								

GENERAL			GAMMA		ACOUSTIC		DENSITY		NEUTRON							
Run	Depth		Speed	Scale		Scale		Matrix	Scale		Matrix	Scale		Matrix		
No.	From	To	ft/min	L	R	L	R		L	R		L	R			
ONE	TD	7079	REC	0	250				20	0	2.68	20	0	SAND		
	7079	6769	REC	0	250				20	0	2.71	20	0	LIME		
	6769	CSG	REC	0	250				20	0	2.68	20	0	SAND		
DIRECTIONAL INFORMATION																
Maximum Deviation									@	KOP						@
Remarks: RWCH, GTET, CSNG, DSNT, SDLT, ACRt RAN IN COMBINATION																
TENSION PULLS, WASHOUTS, AND BOREHOLE RUGOSITY CAN AFFECT LOG RESPONSE																
ANNULAR HOLE VOLUME CALCULCATED FOR 4.5-INCH CASING																
YOUR CREW: S. KEENER, S. SPEAK																
RIG: ENSIGN #226																
THANK YOU FOR CHOOSING HALLIBURTON ENERGY SERVICES - BRIGHTON, CO - (303) - 825 - 4346																
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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PARAMETERS REPORT

Depth (ft)	Tool Name	Mnemonic	Description	Value	Units
TOP					
	DSNT	NLIT	Neutron Lithology	Sandstone	
	SDLT Pad	DMA	Formation Density Matrix	2.680	g/cc
6769.00					
	DSNT	NLIT	Neutron Lithology	Limestone	
	SDLT Pad	DMA	Formation Density Matrix	2.710	g/cc
7079.00					
	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	9.800	ppg
	SHARED	WAGT	Weighting Agent	Barite	
	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	0.870	ohmm
	SHARED	TRM	Temperature of Mud	122.3	degF
	SHARED	CSD	Logging Interval is Cased?	No	
	SHARED	ICOD	AHV Casing OD	4.500	in
	SHARED	ST	Surface Temperature	75.0	degF
	SHARED	TD	Total Well Depth	7261.00	ft
	SHARED	BHT	Bottom Hole Temperature	209.3	degF
	SHARED	SVTM	Navigation and Survey Master Tool	NONE	
	SHARED	AZTM	High Res Z Accelerometer Master Tool	GTET	

SHARED	TEMM	Temperature Master Tool	NONE	
SHARED	BHSM	Borehole Size Master Tool	NONE	
GTET	GROK	Process Gamma Ray?	Yes	
GTET	GRSO	Gamma Tool Standoff	0.000	in
GTET	GEOK	Process Gamma Ray EVR?	No	
GTET	TPOS	Tool Position for Gamma Ray Tools.	Eccentered	
CSNG	CGOK	Process CSNG Data?	Yes	
CSNG	CENT	Is Tool Centralized?	No	
CSNG	GBOK	Gamma Enviromental Corrections?	Yes	
CSNG	BARF	Barite Correction Factor	1.00	
CSNG	ORDG	Use Fixed Gain	No	
CSNG	ORDO	Use Fixed Offset	No	
CSNG	ORDR	Use Fixed Resolution Degradation Factor	No	
DSNT	DNOK	Process DSN?	Yes	
DSNT	DEOK	Process DSN EVR?	No	
DSNT	NLIT	Neutron Lithology	Sandstone	
DSNT	DNSO	DSN Standoff - 0.25 in (6.35 mm) Recommended	0.250	in
DSNT	DNTP	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	
SDLT	CLOK	Process Caliper 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	2.680	g/cc
SDLT Pad	DFL	Formation Density Fluid	1.000	g/cc
ACRt Sonde	RTOK	Process ACRt?	Yes	
ACRt Sonde	MNSO	Minimum Tool Standoff	1.25	in
ACRt Sonde	TCS1	Temperature Correction Source	FP Lwr & FP Up	
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	RMIN	Maximum Resistivity for MAP	200.00	ohmm
ACRt Sonde	THQY	Threshold Quality	0.50	
ACRt Sonde	MRFX	Fixed mud resistivity	2000	ohmm
BOTTOM				

Data: LORENZ\_F22\_\_17\0001 NOBLE\_TC-CSNG\002.01 04-Aug-12 17:04 Up

Date: 04-Aug-12 17:17:59



Plot Time: 04-Aug-12 18:07:21

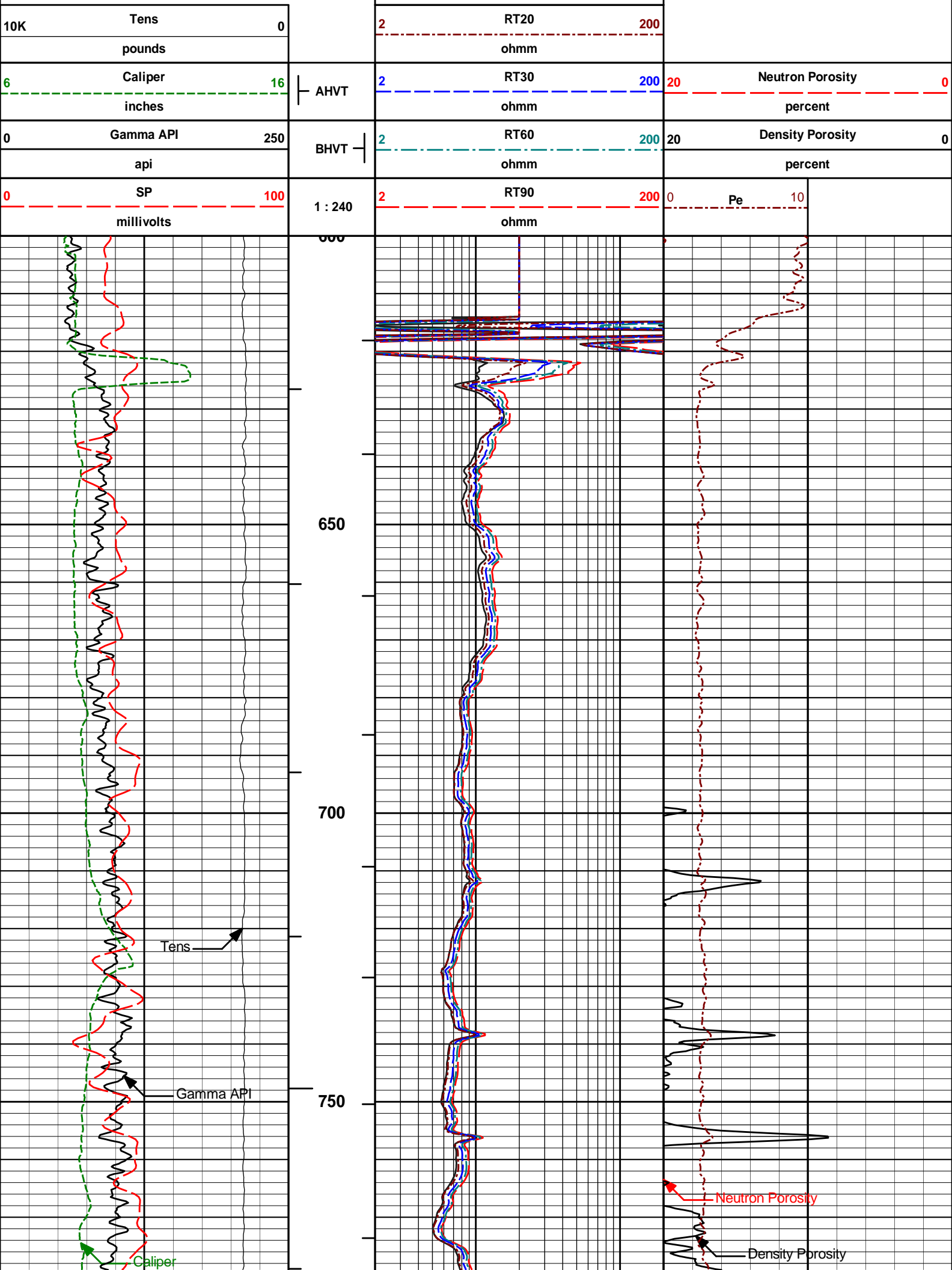
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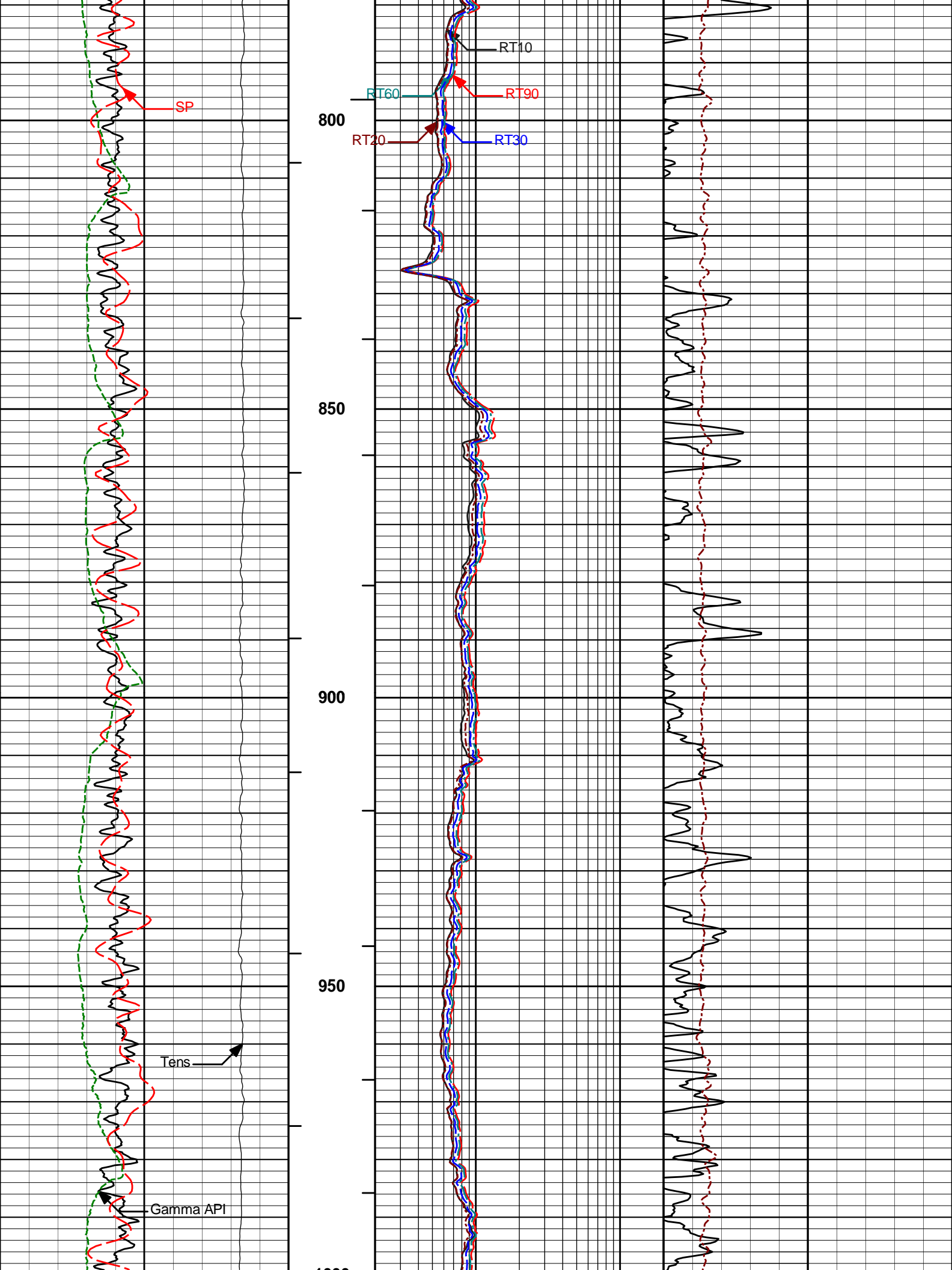
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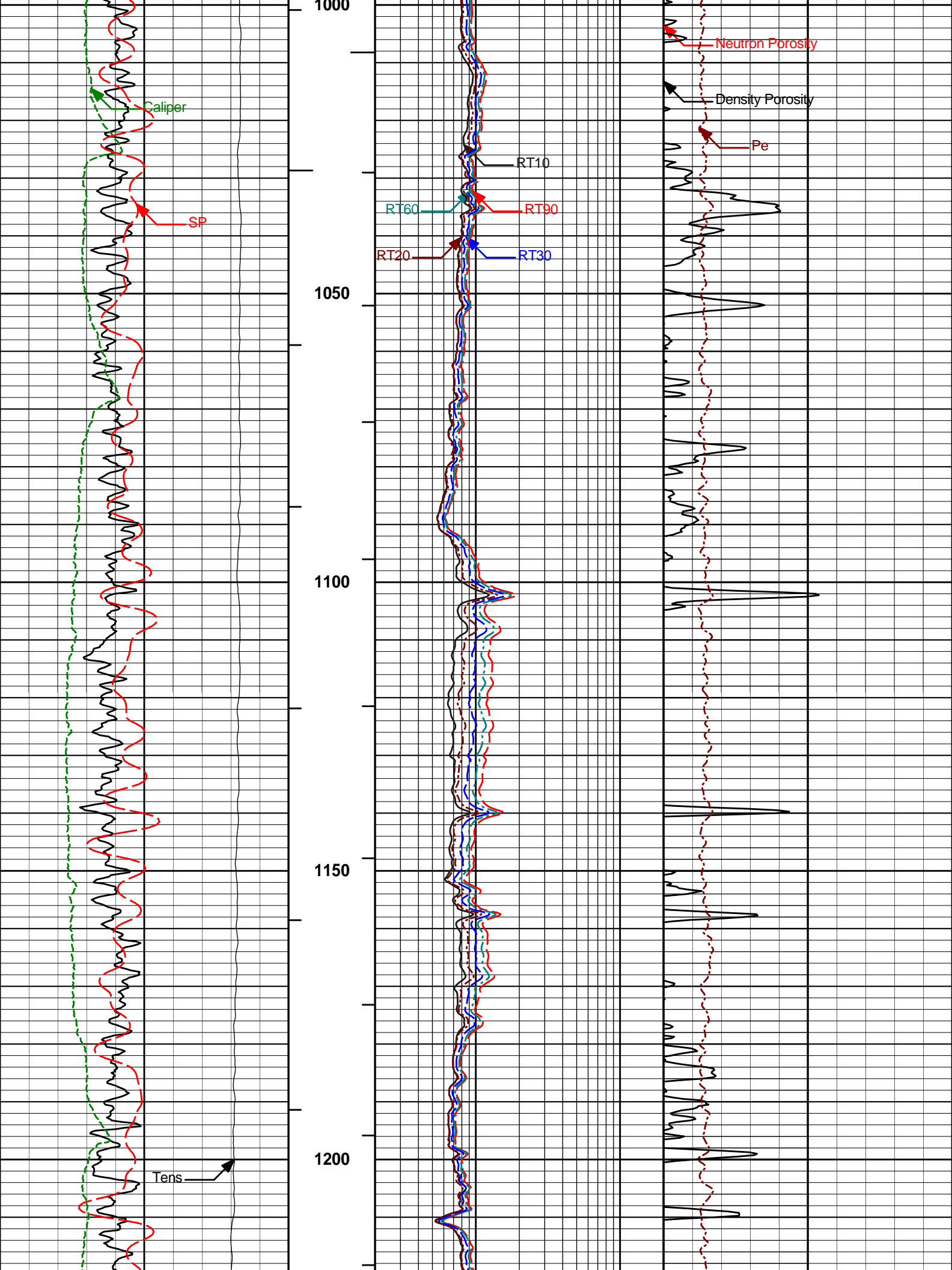
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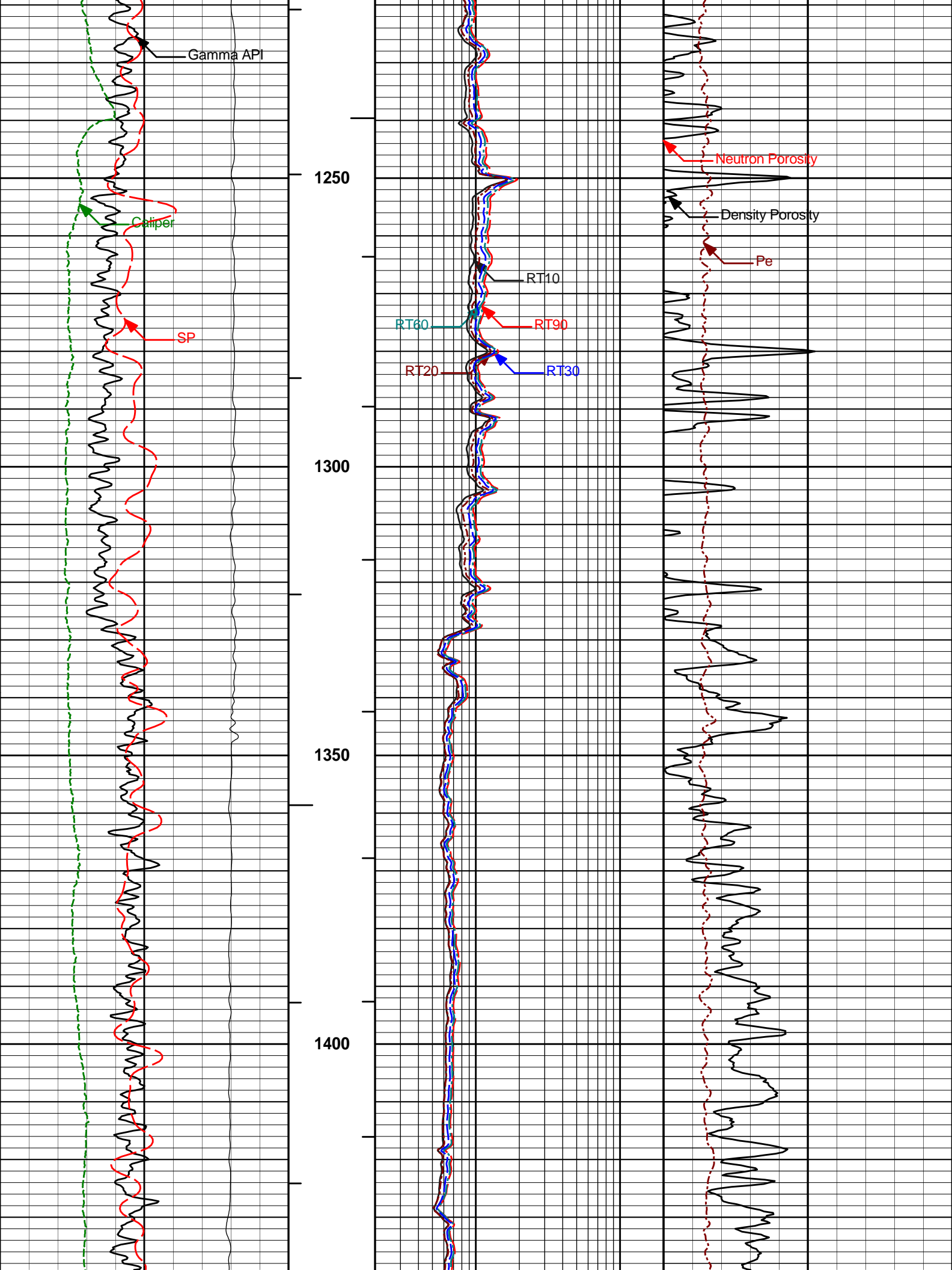
MAIN PASS 5" = 100'

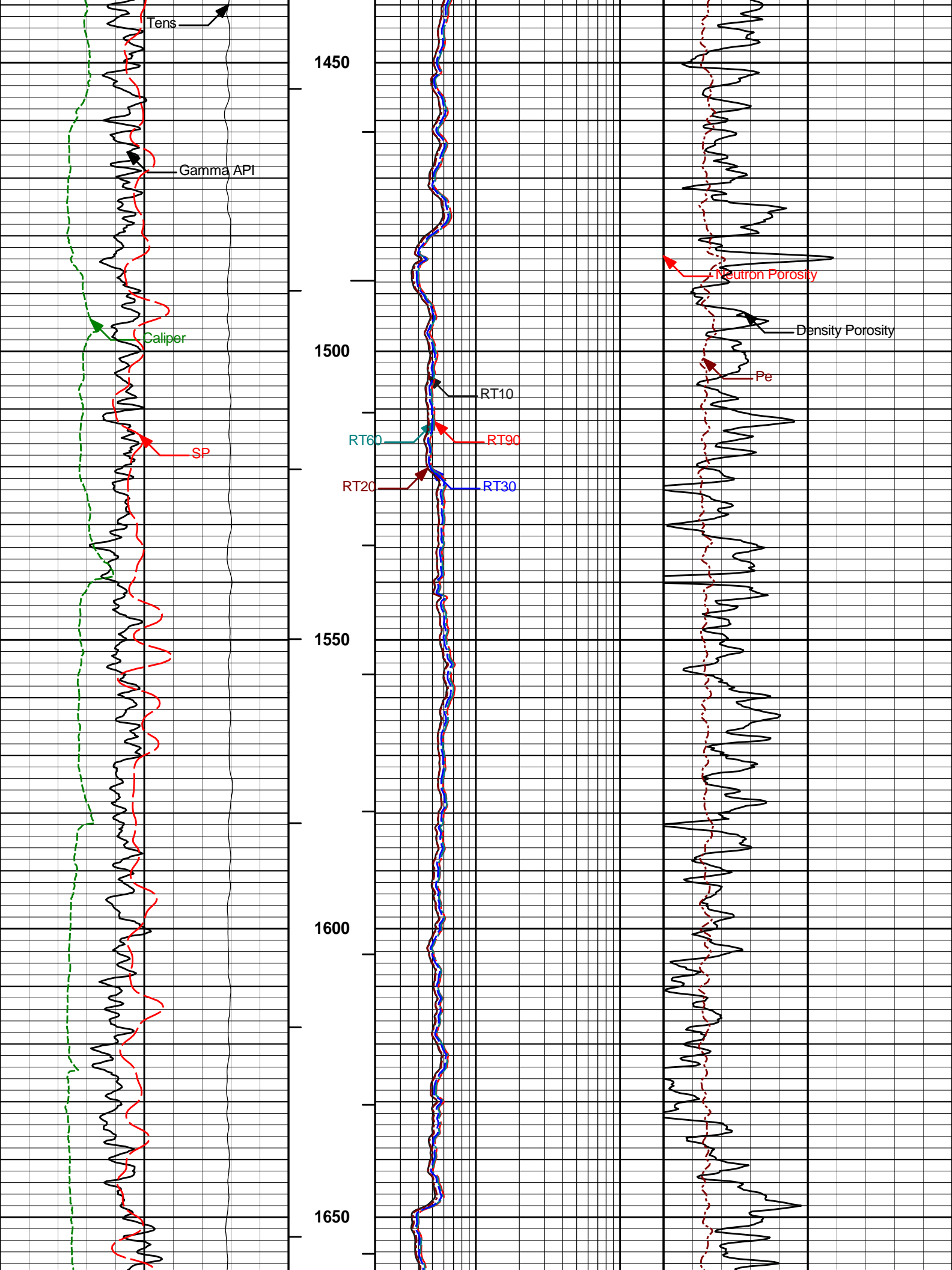
	2	RT10	200	
		ohmm		



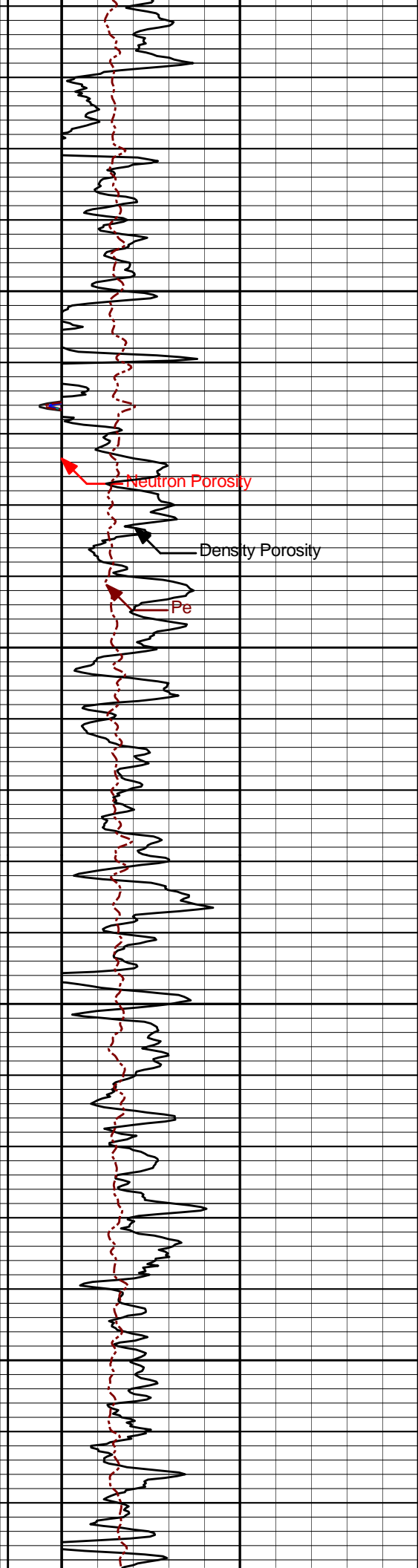
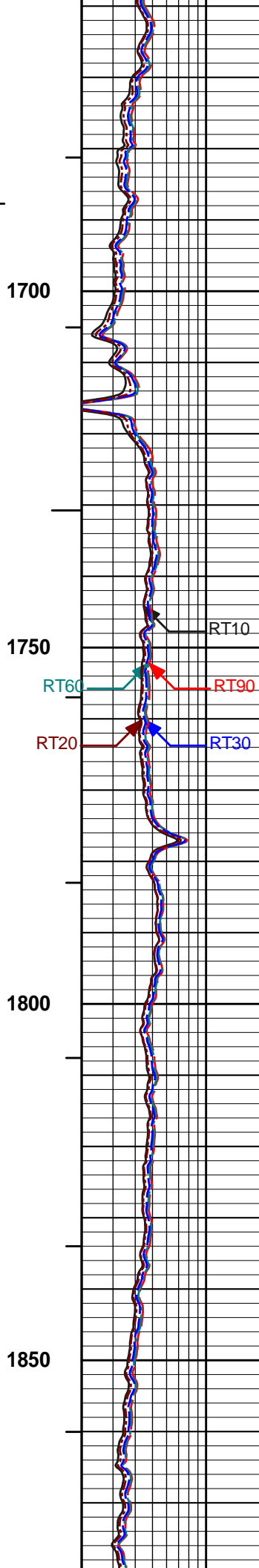
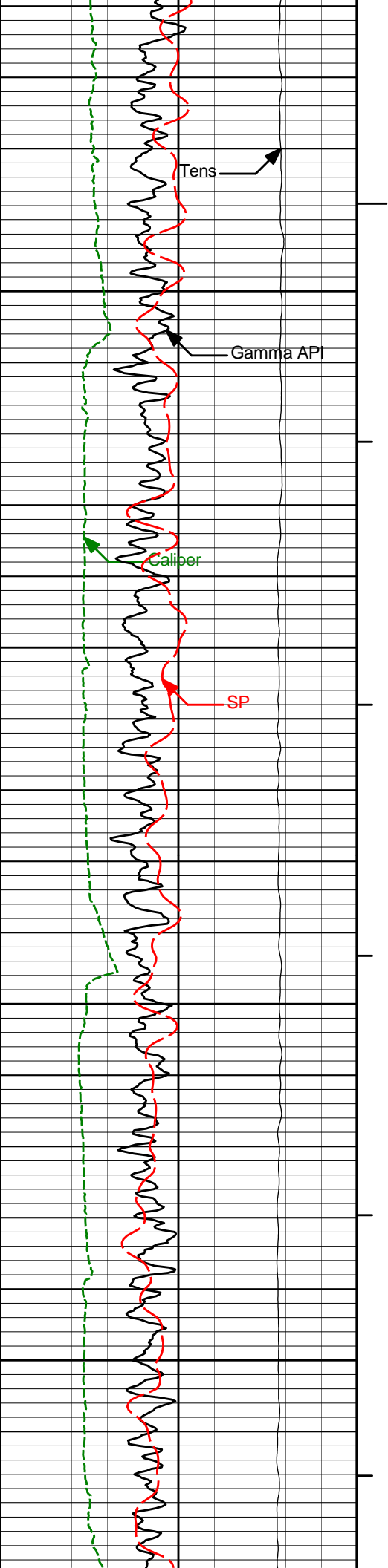


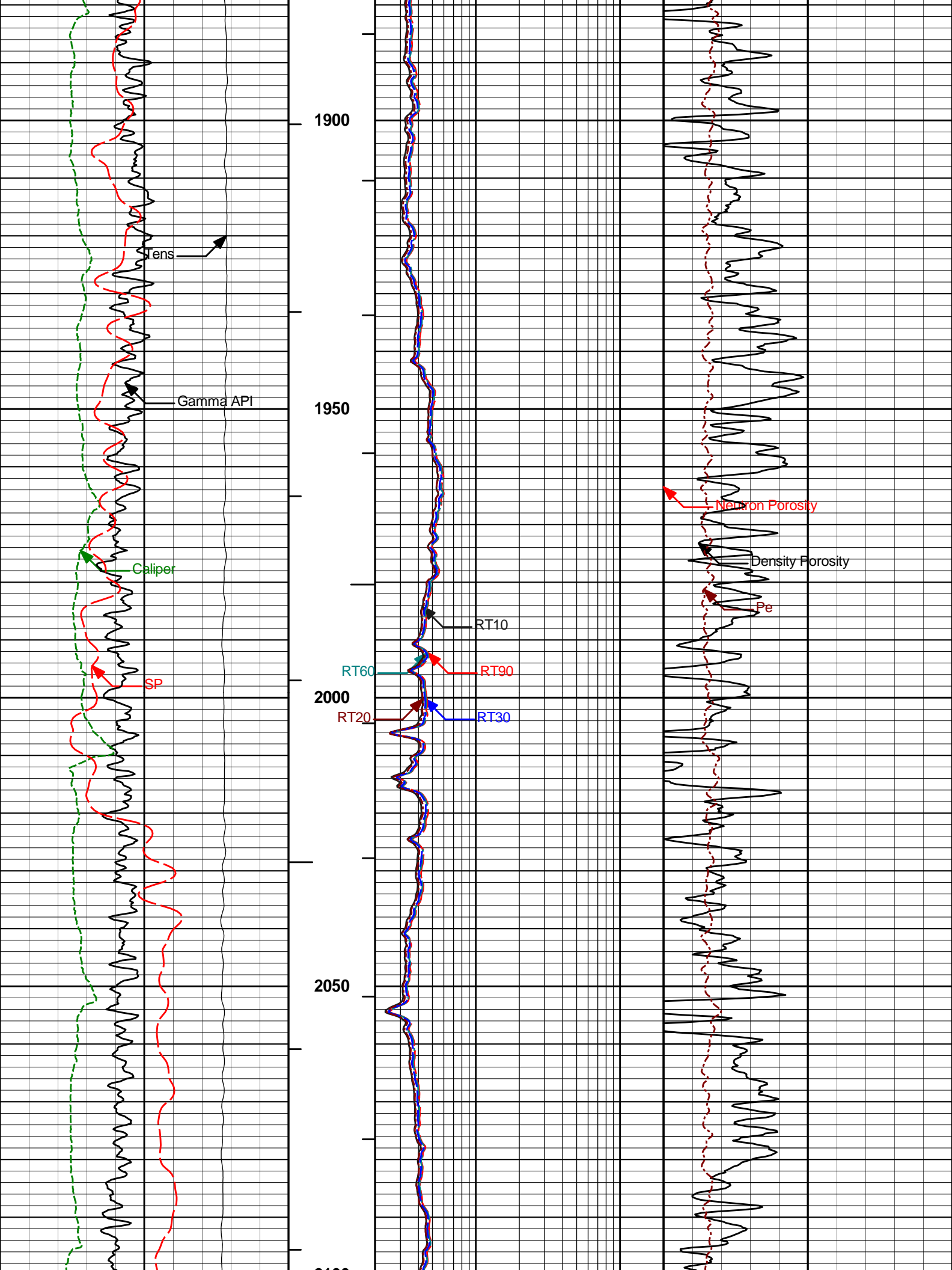


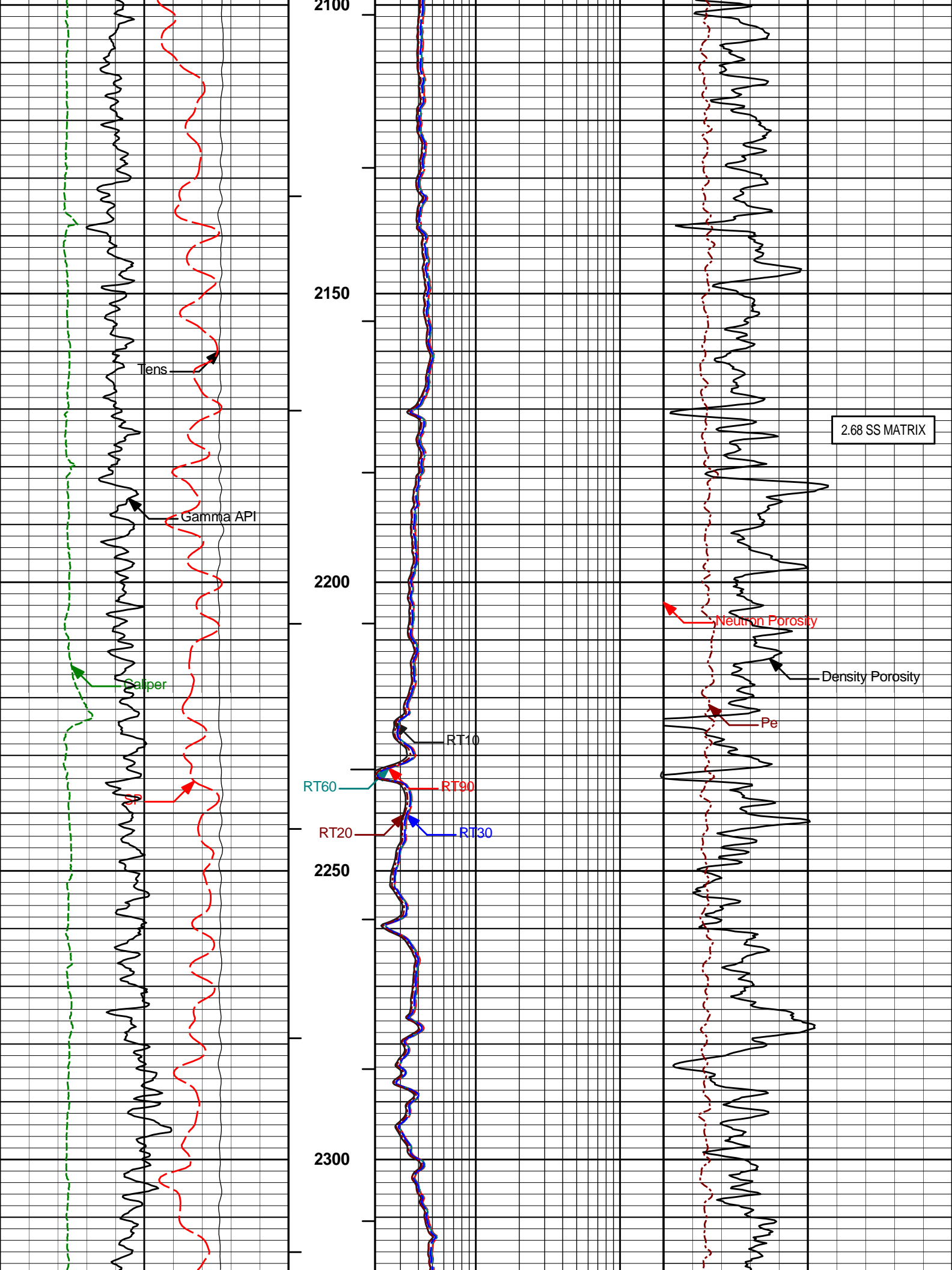


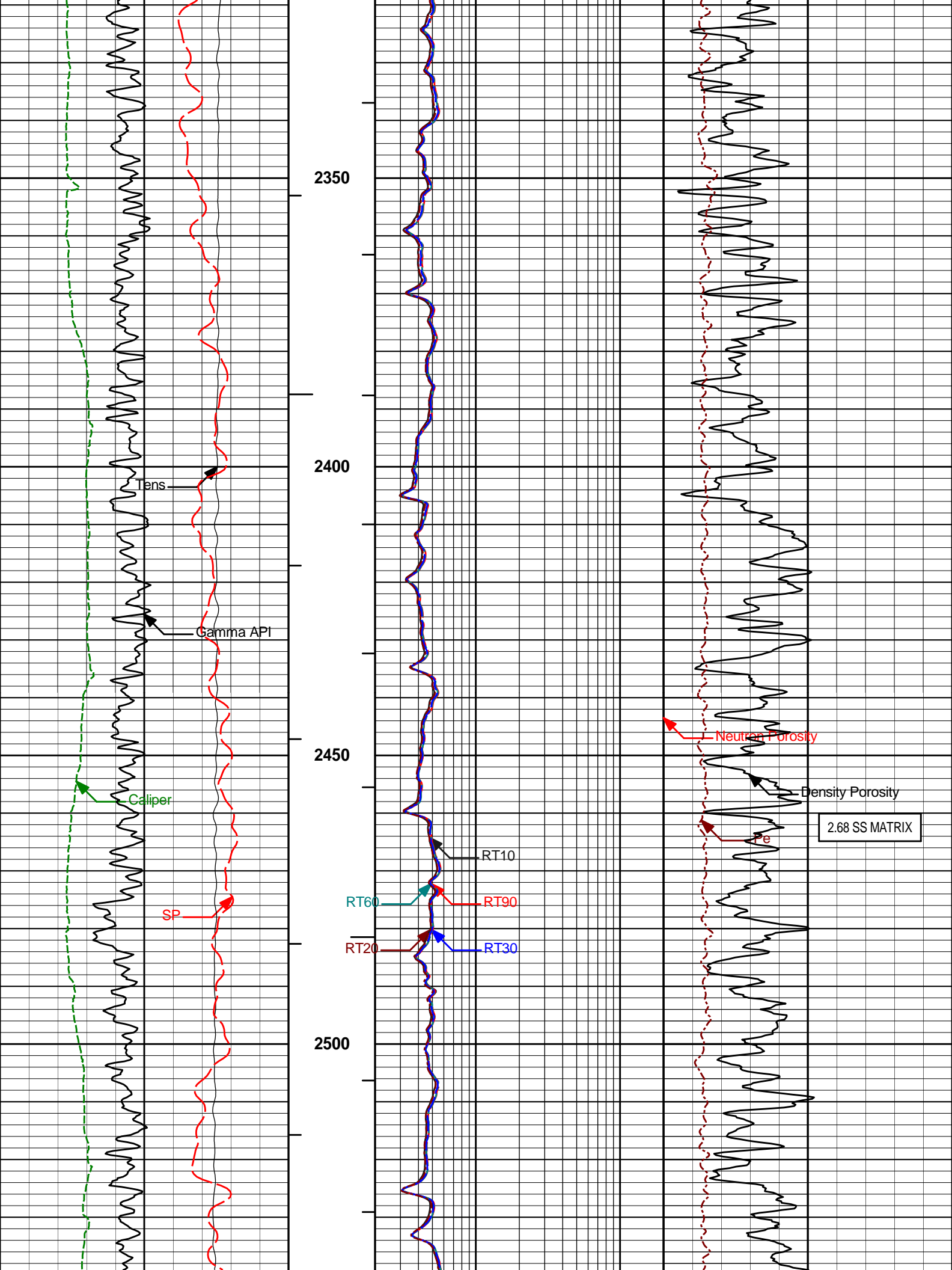


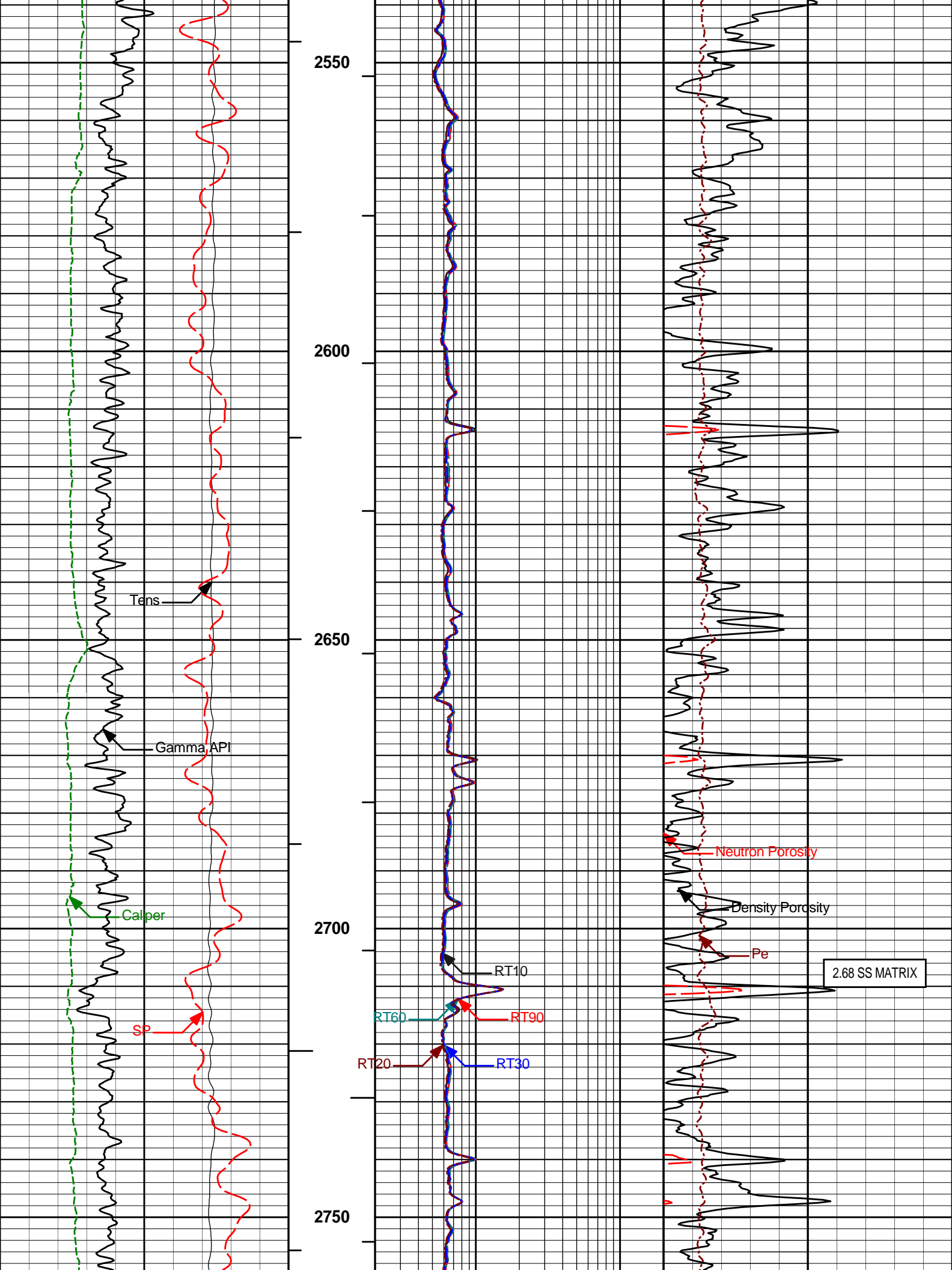


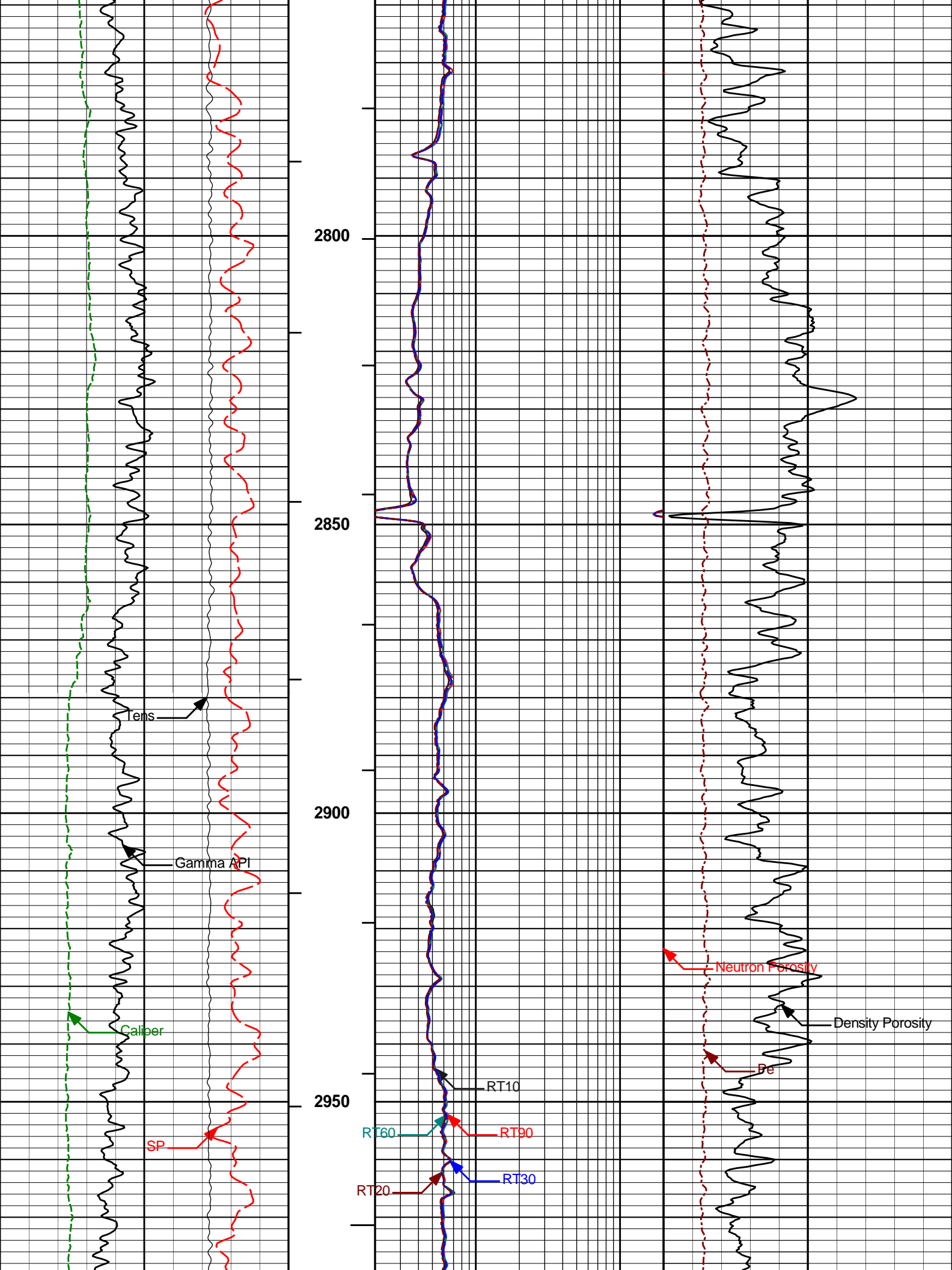


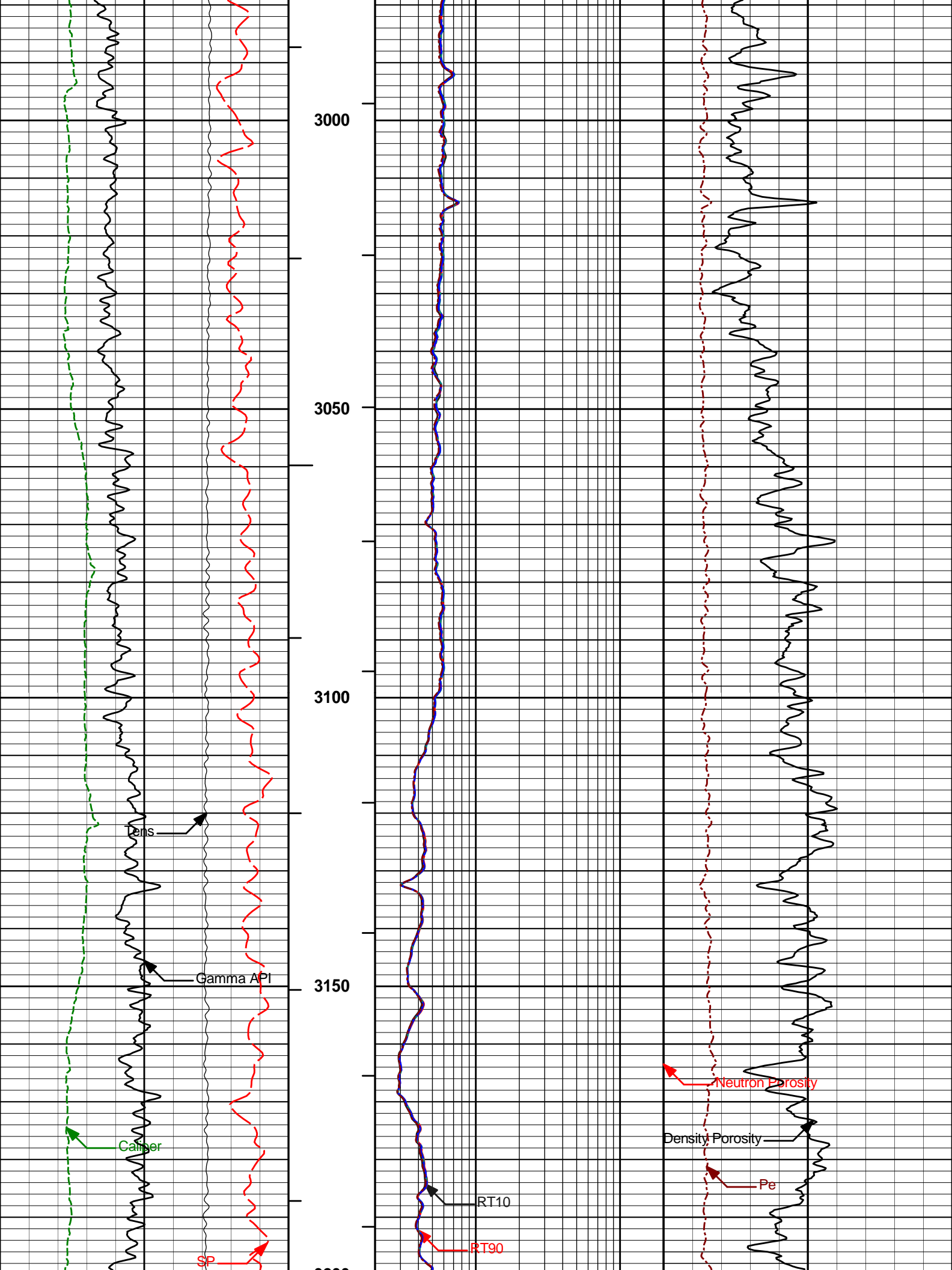


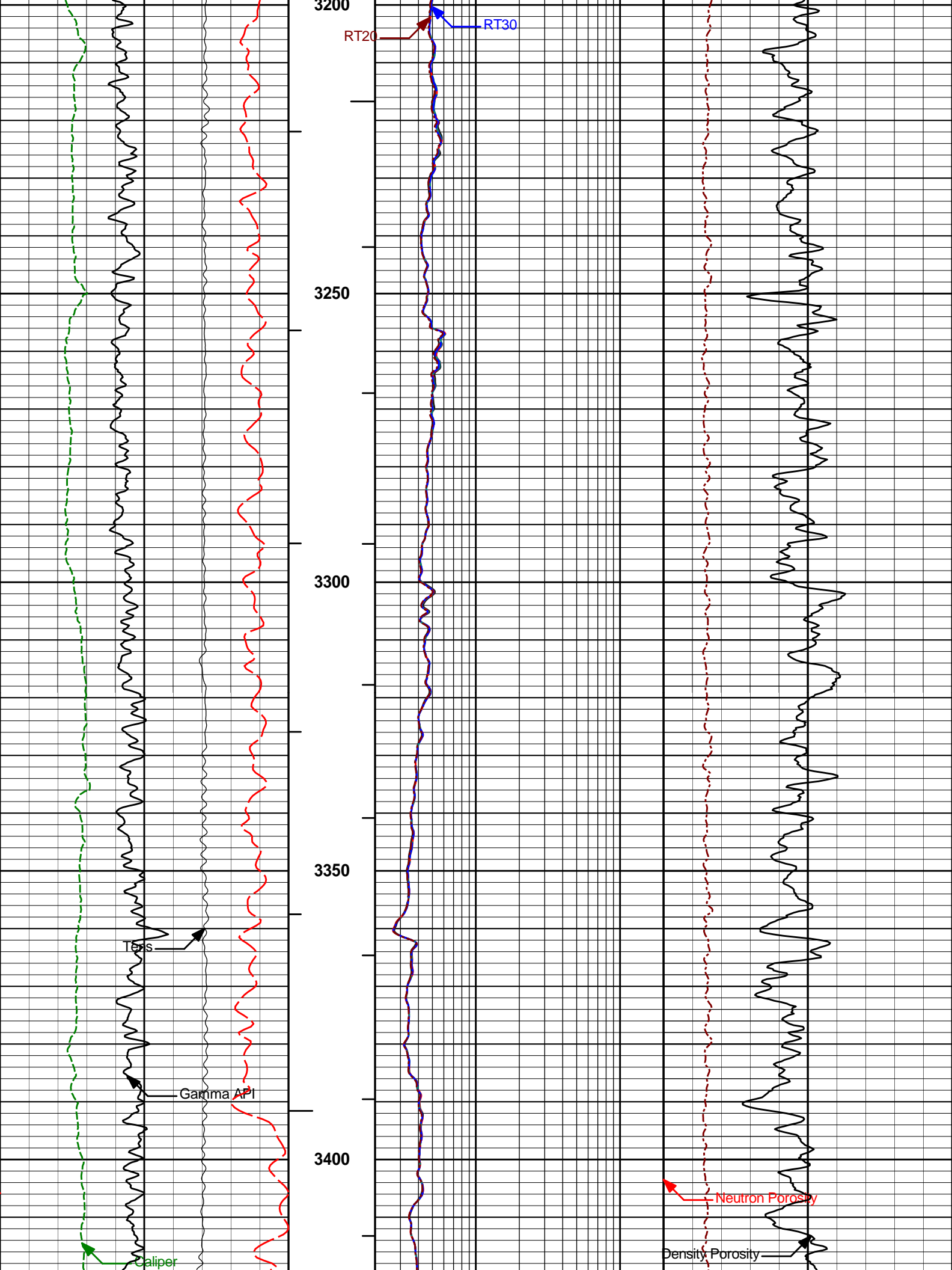




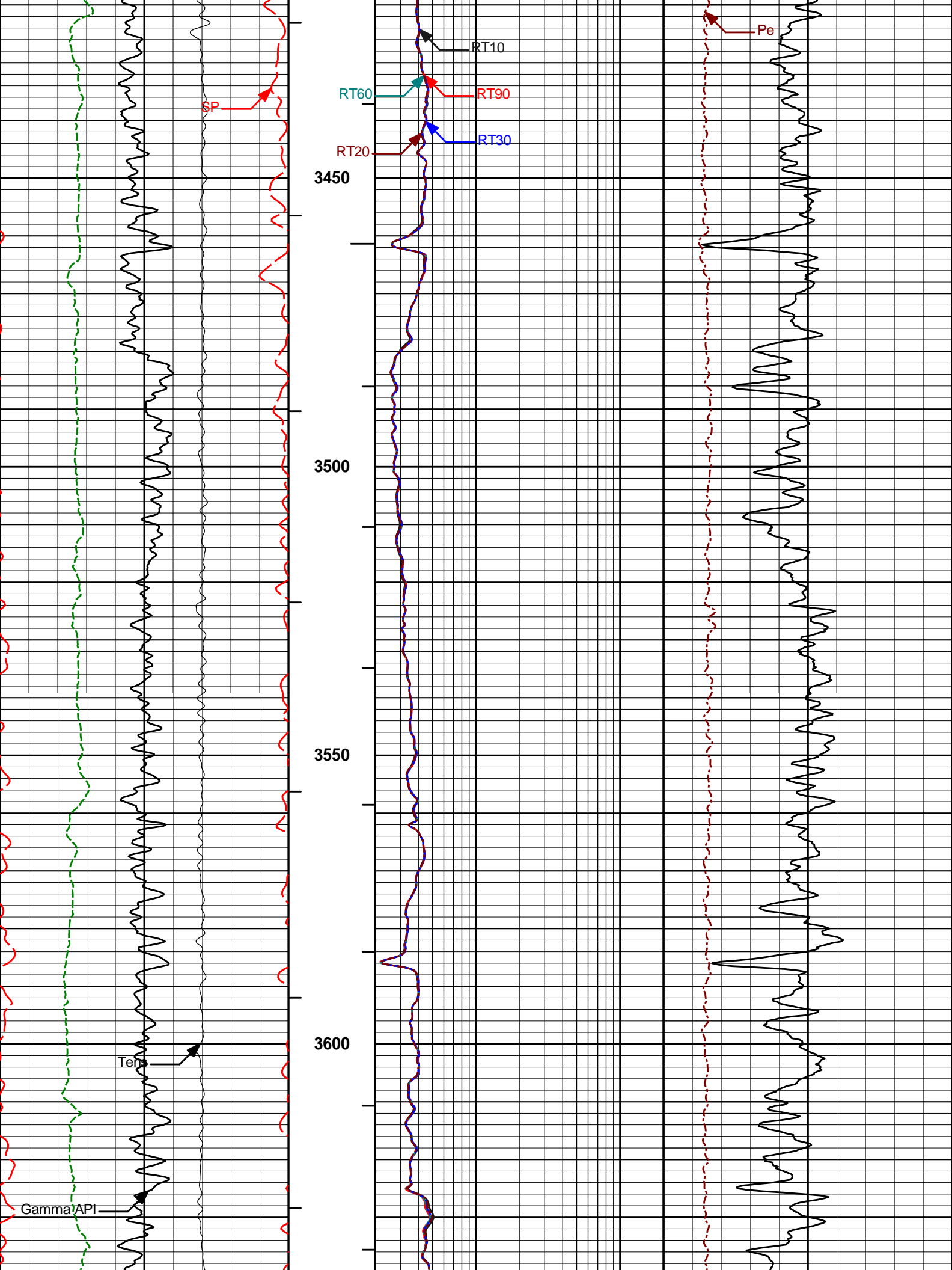


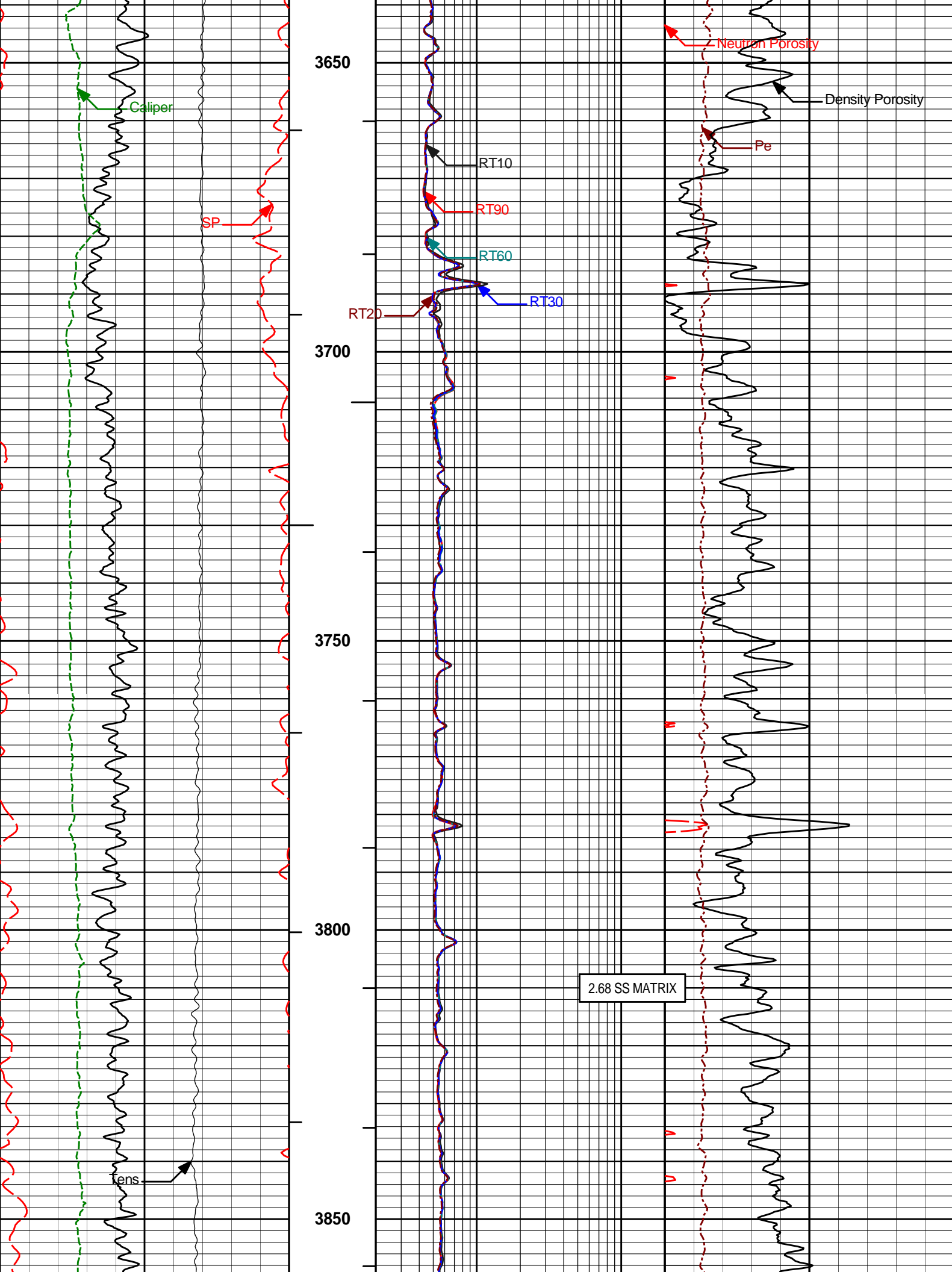


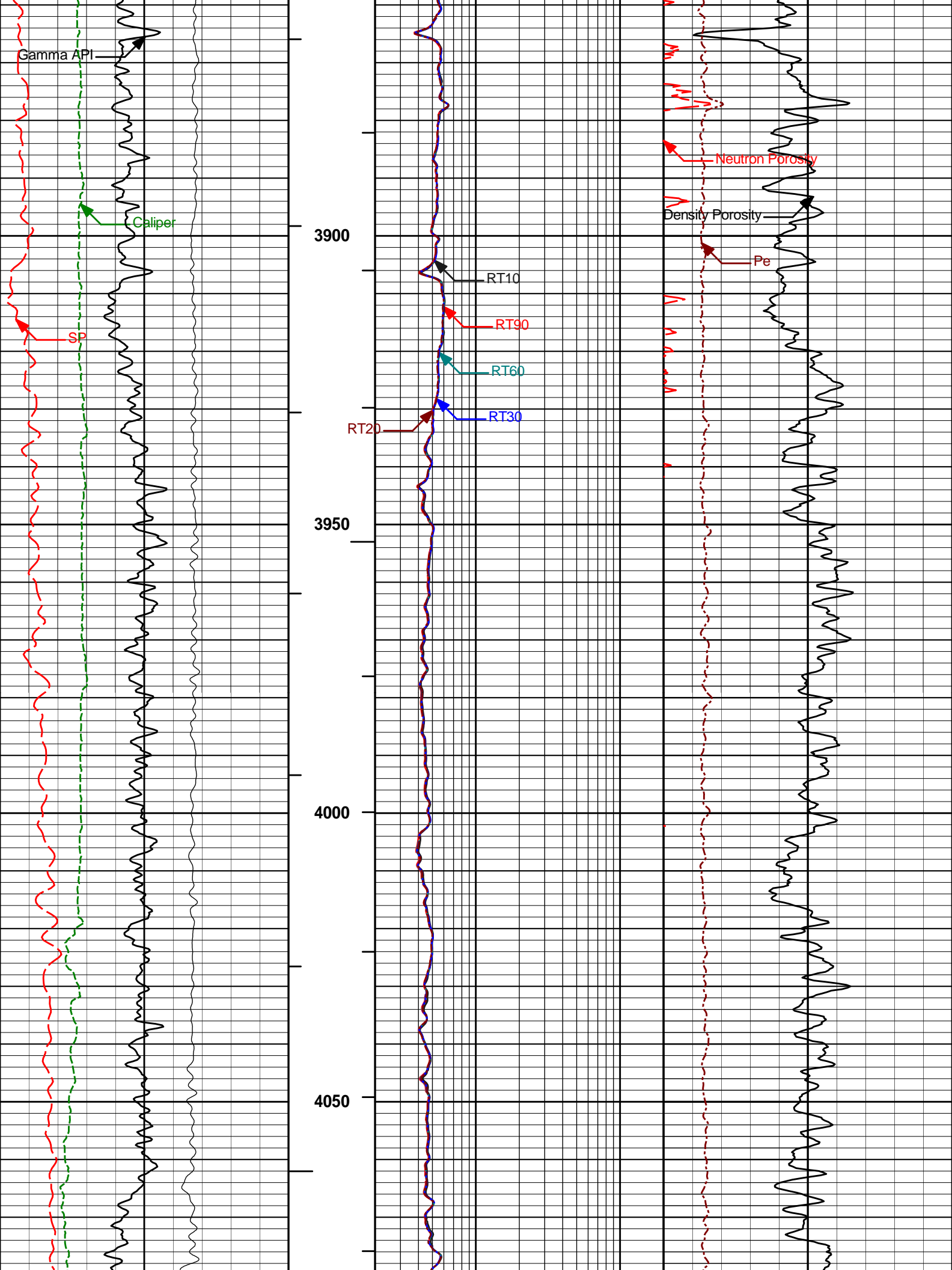


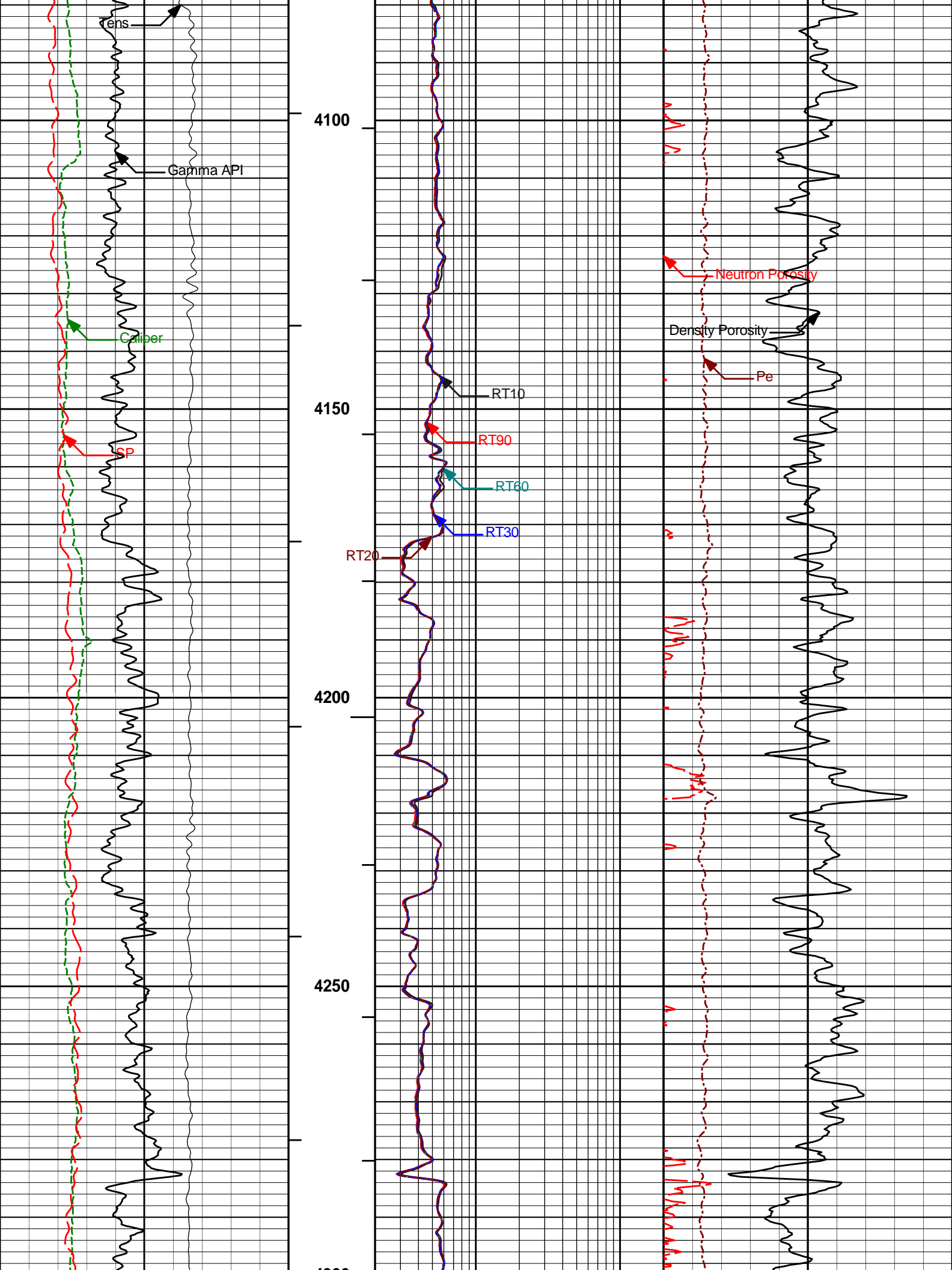


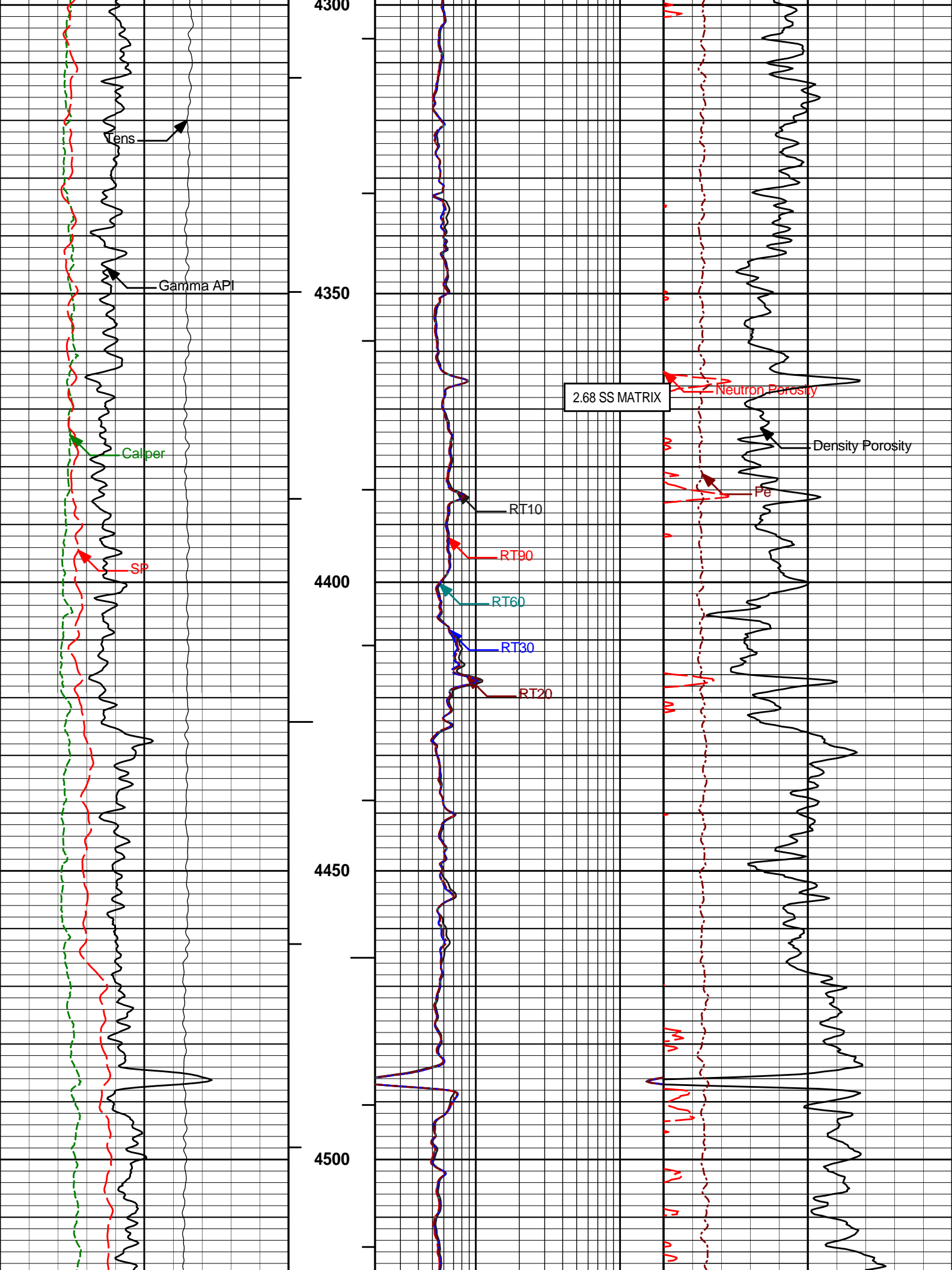


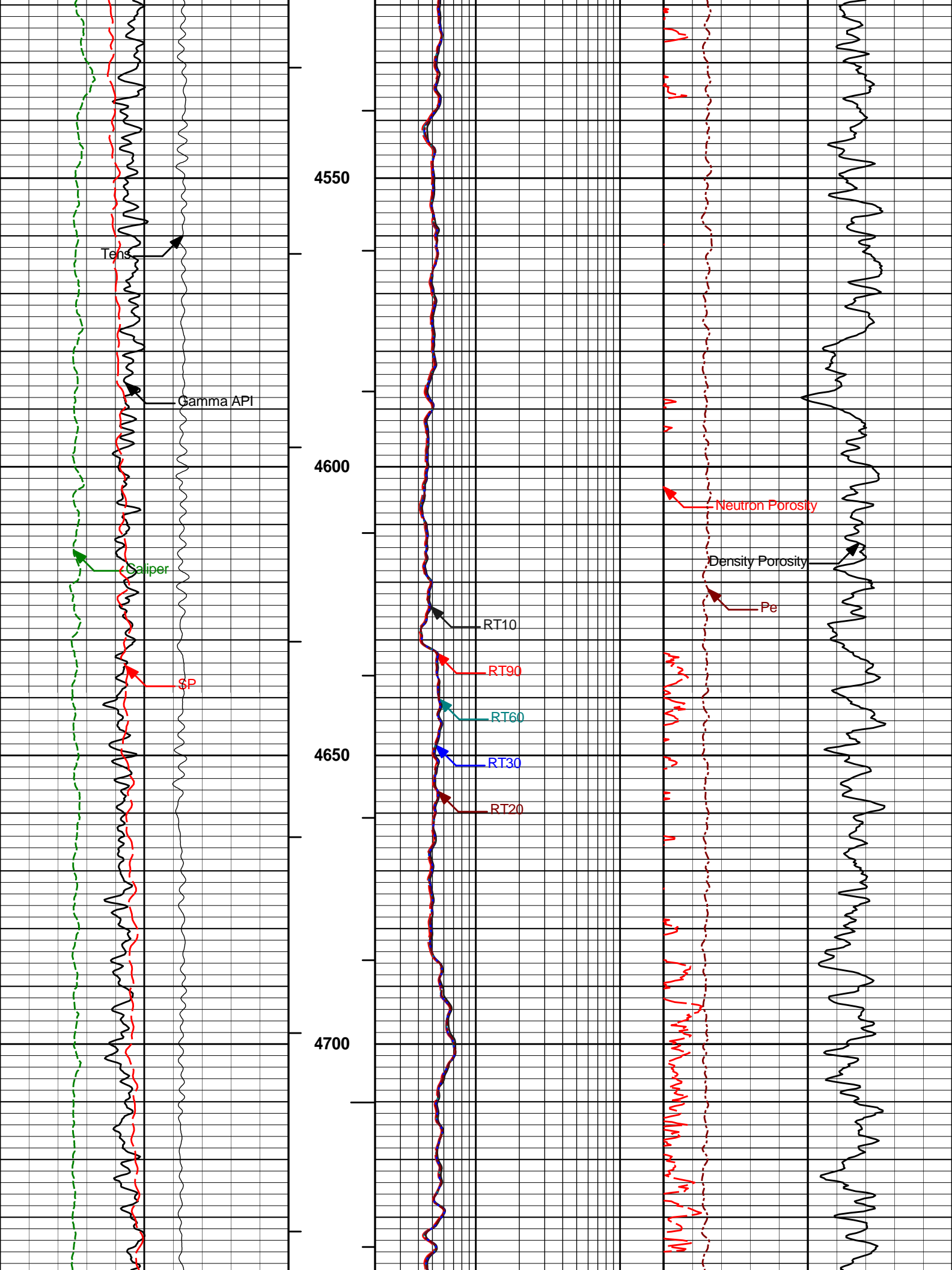


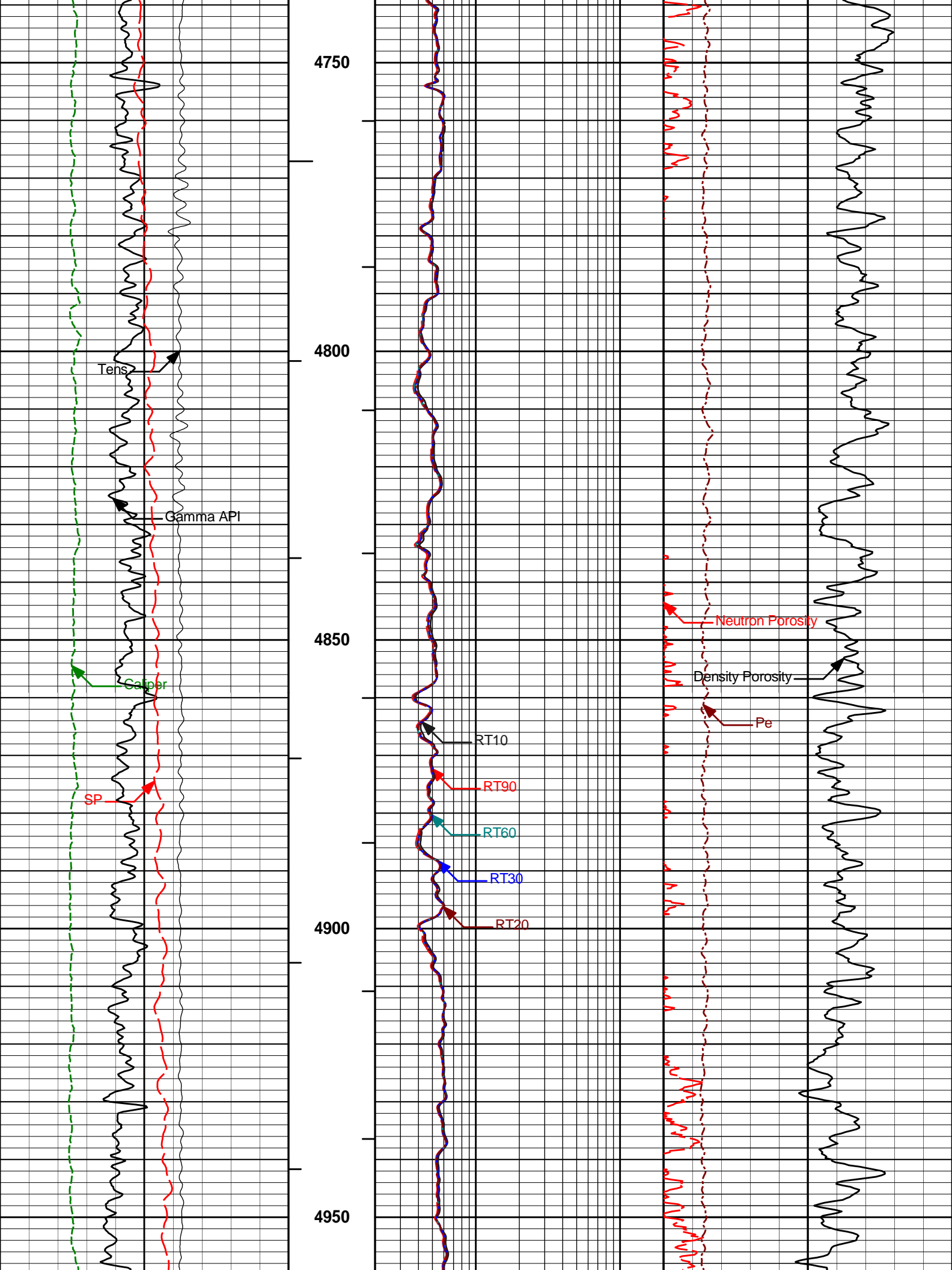


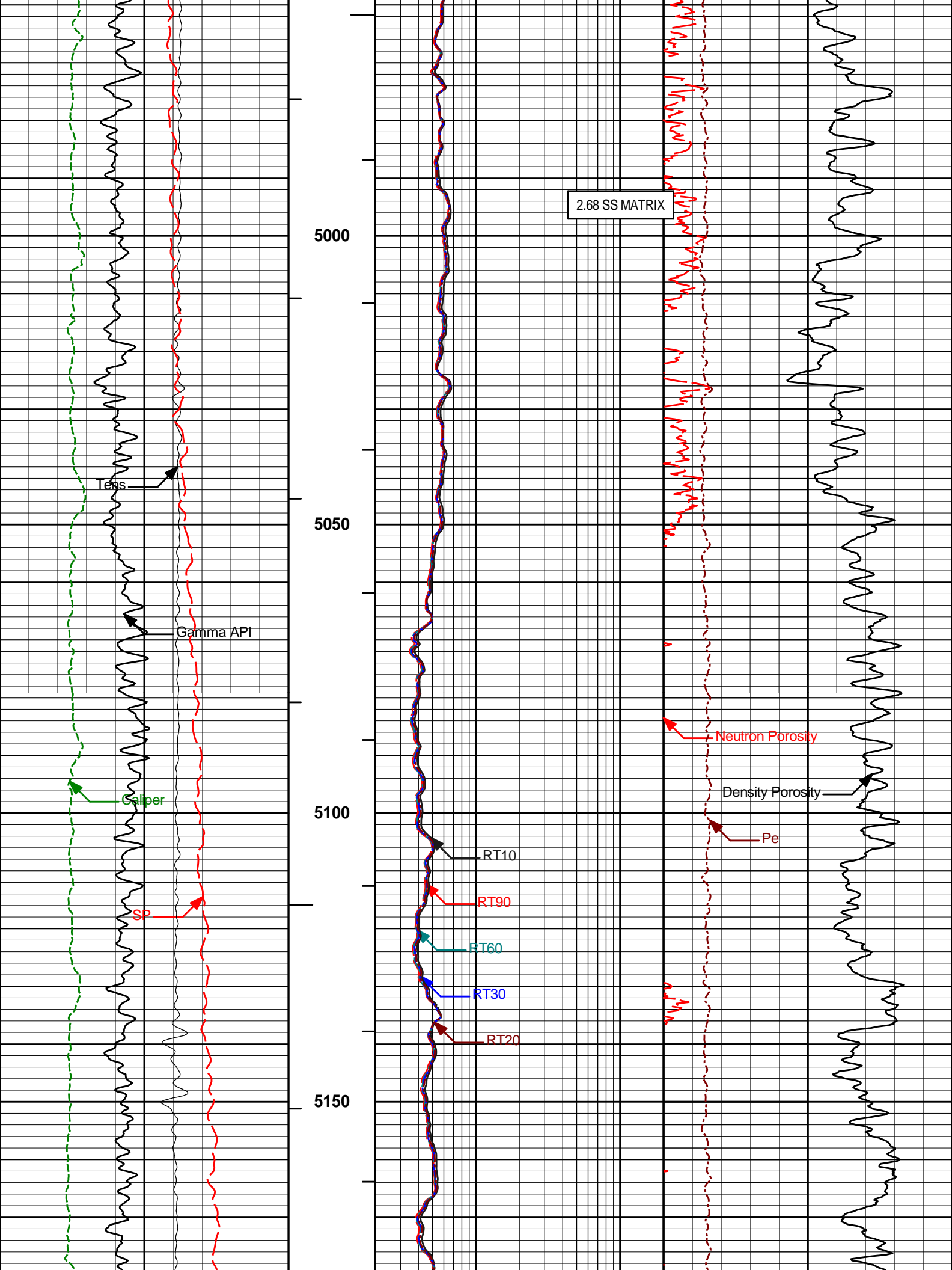




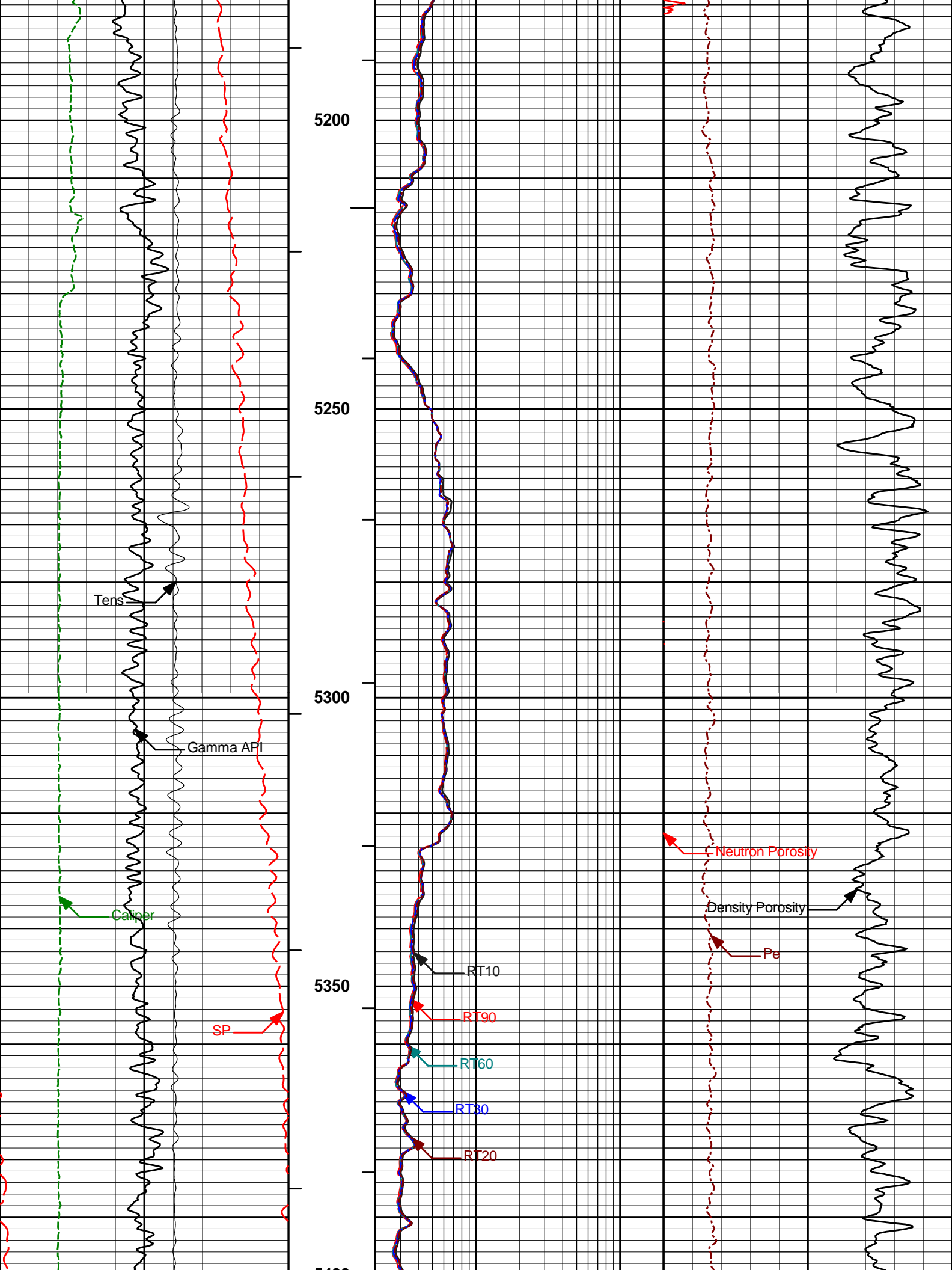


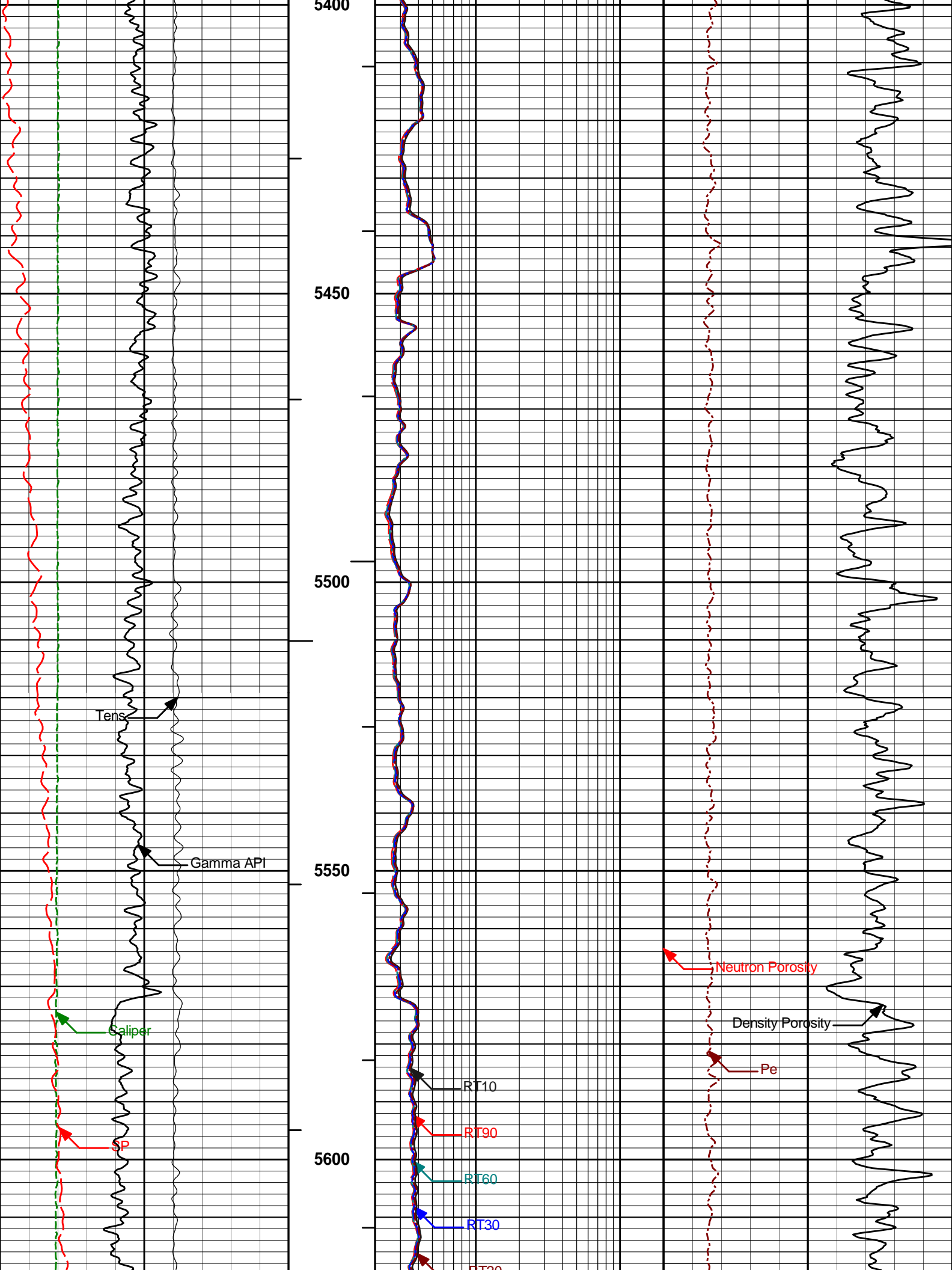


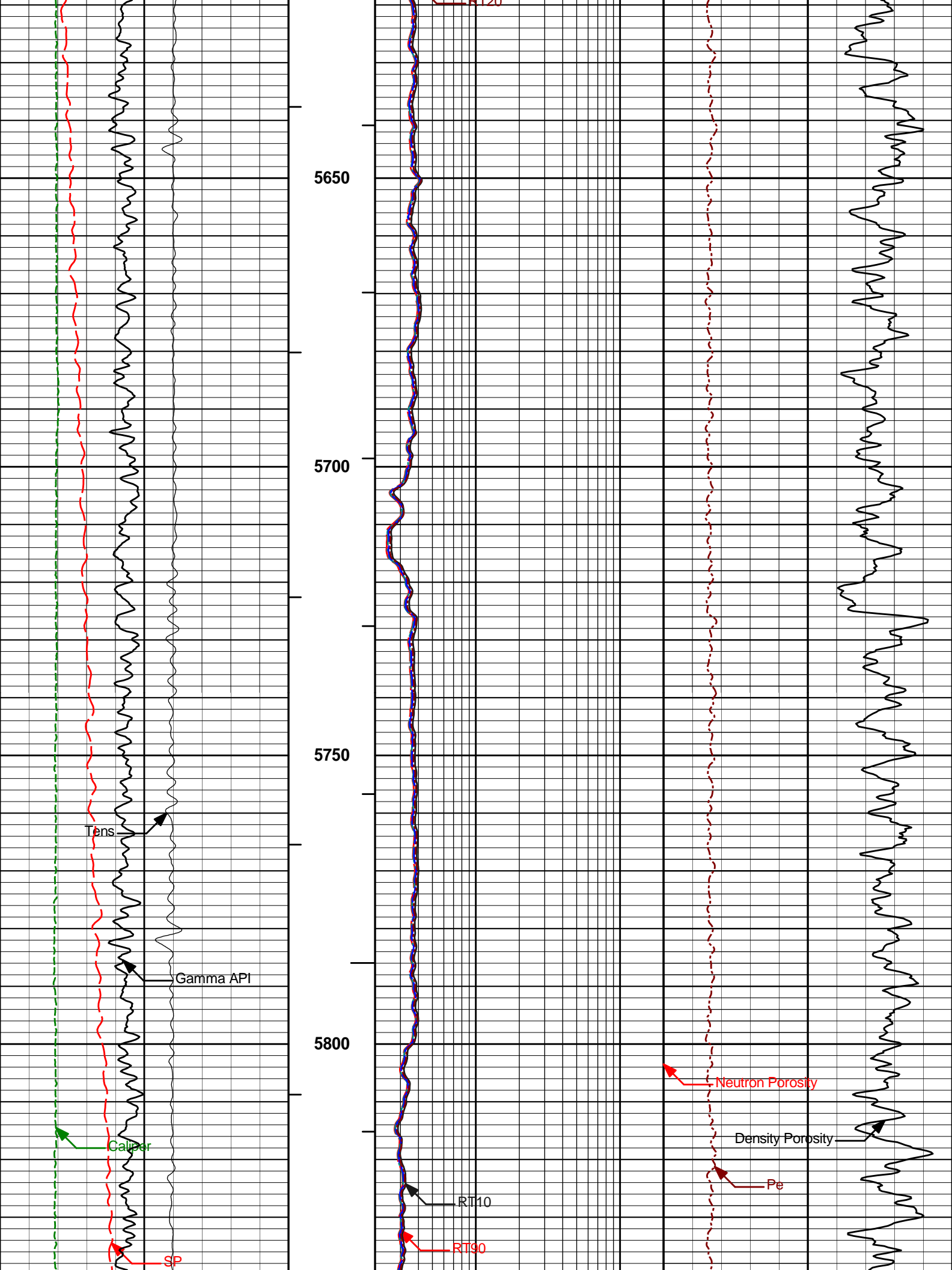


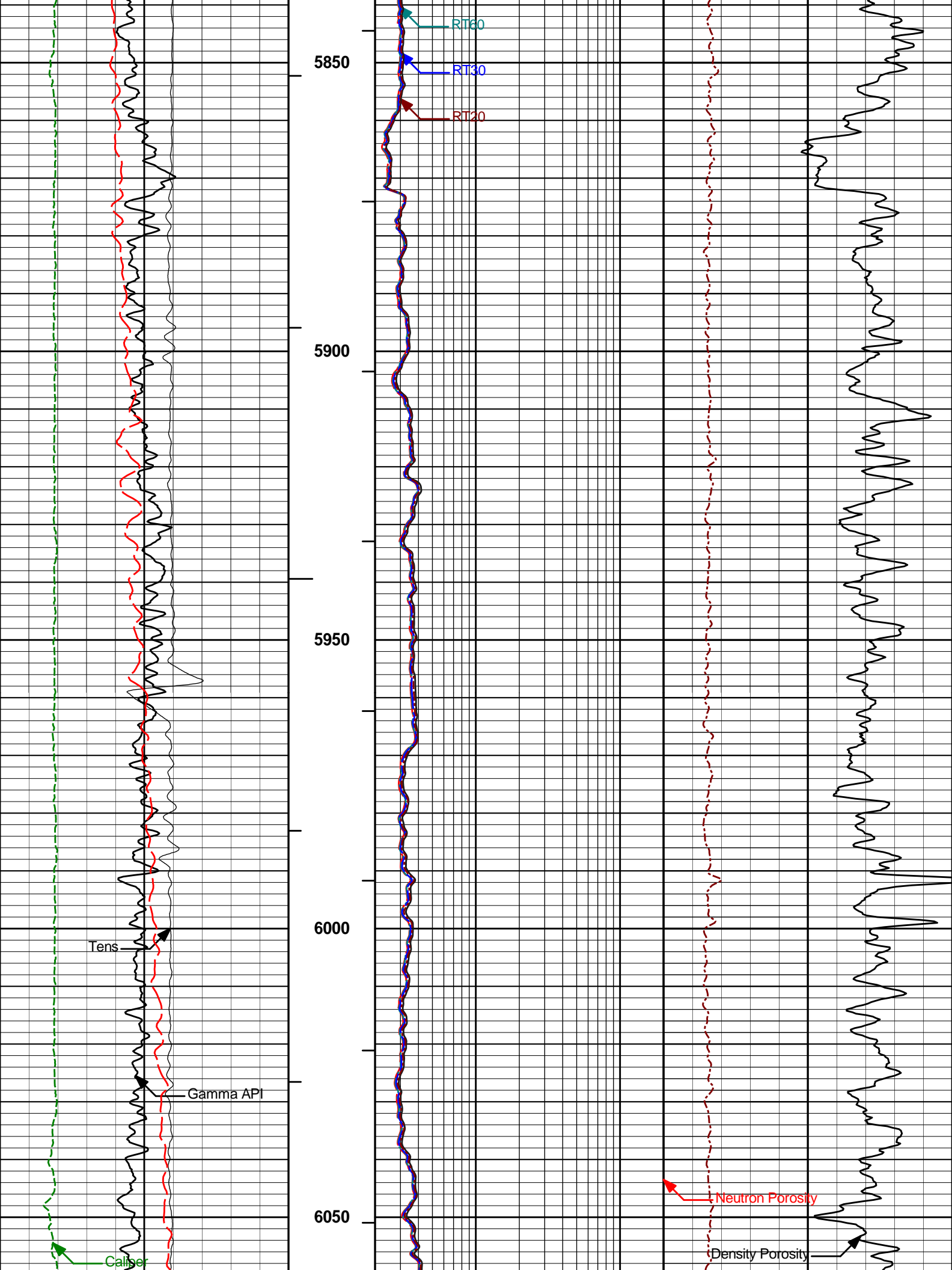


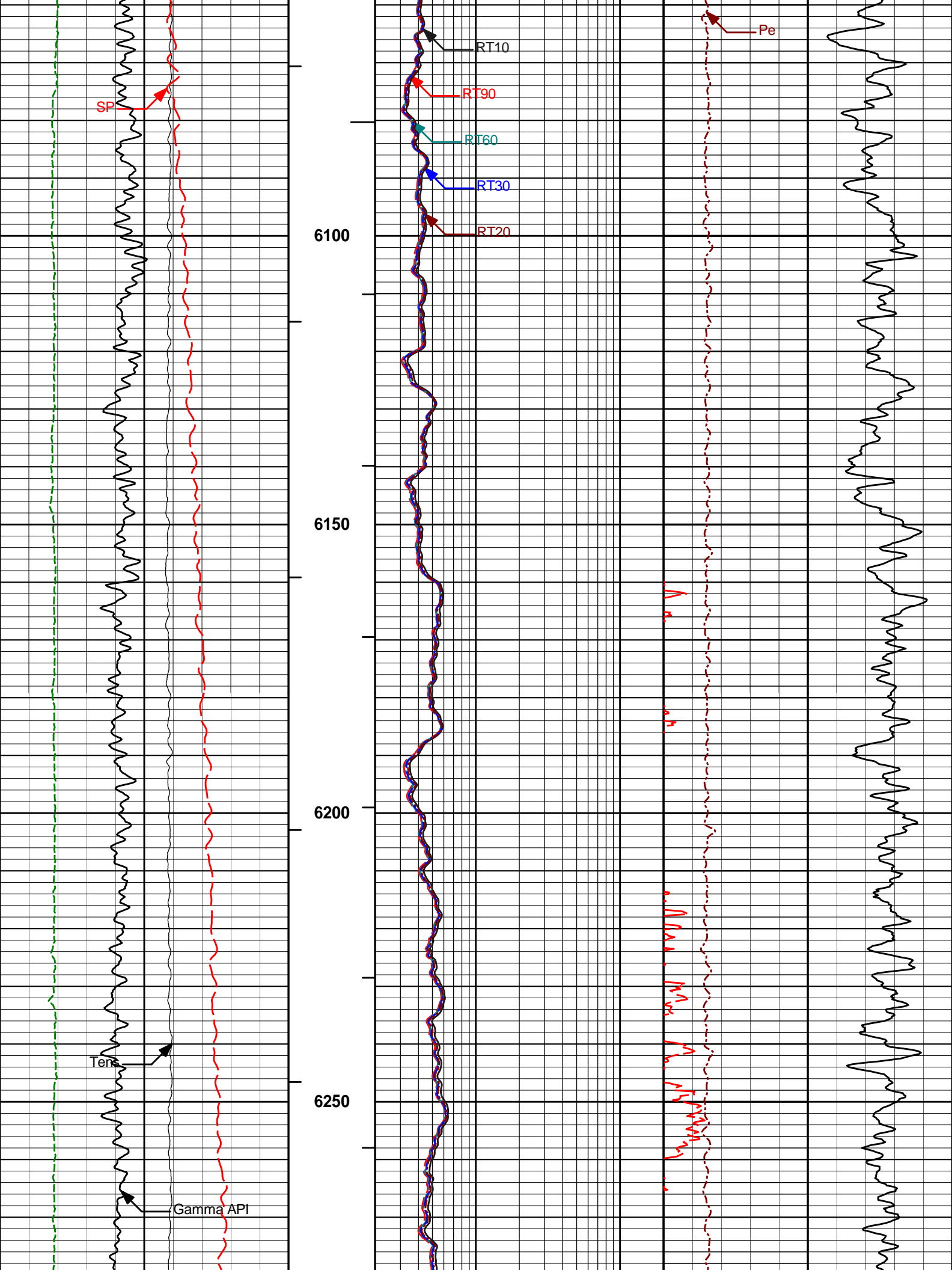


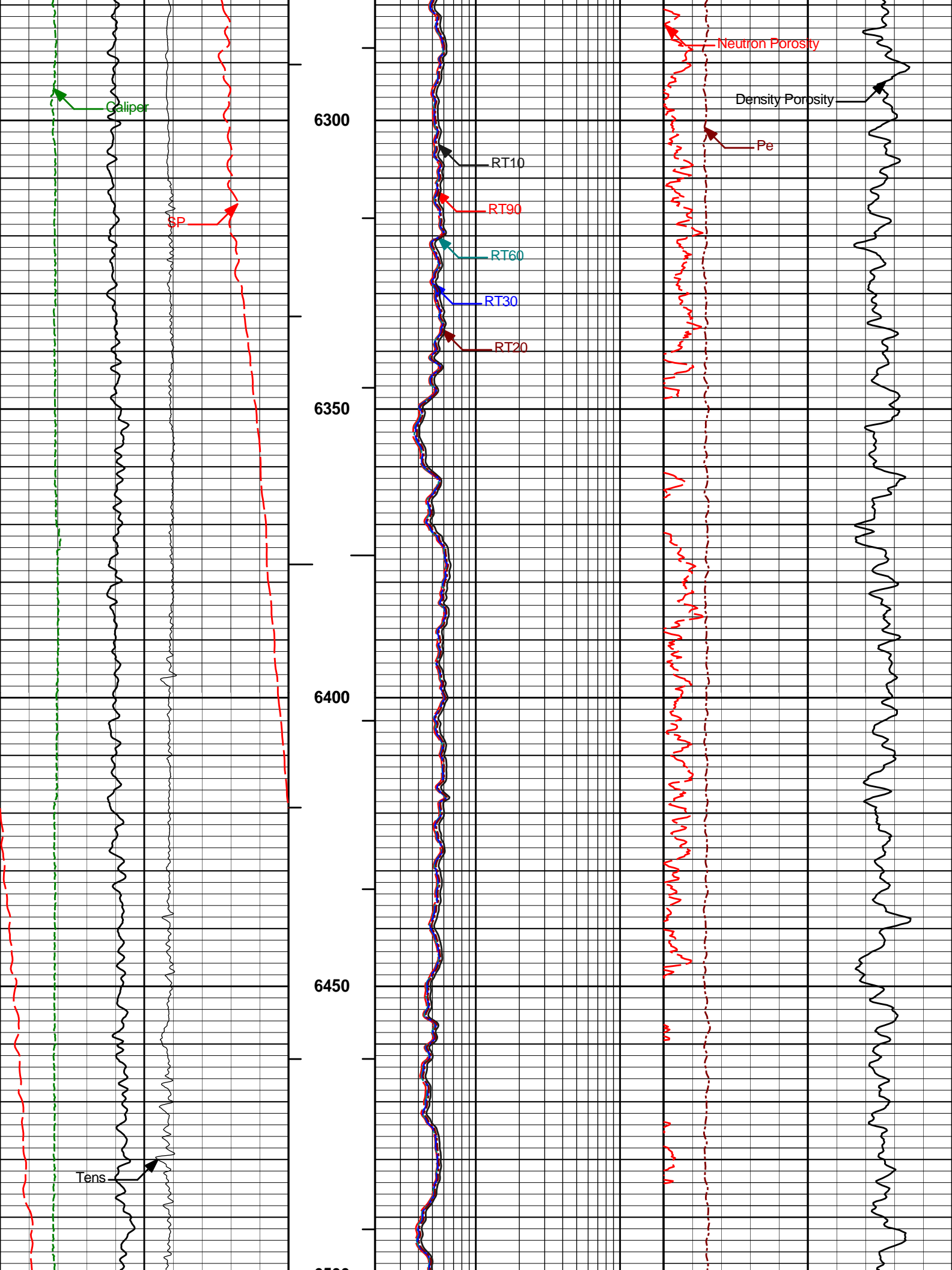


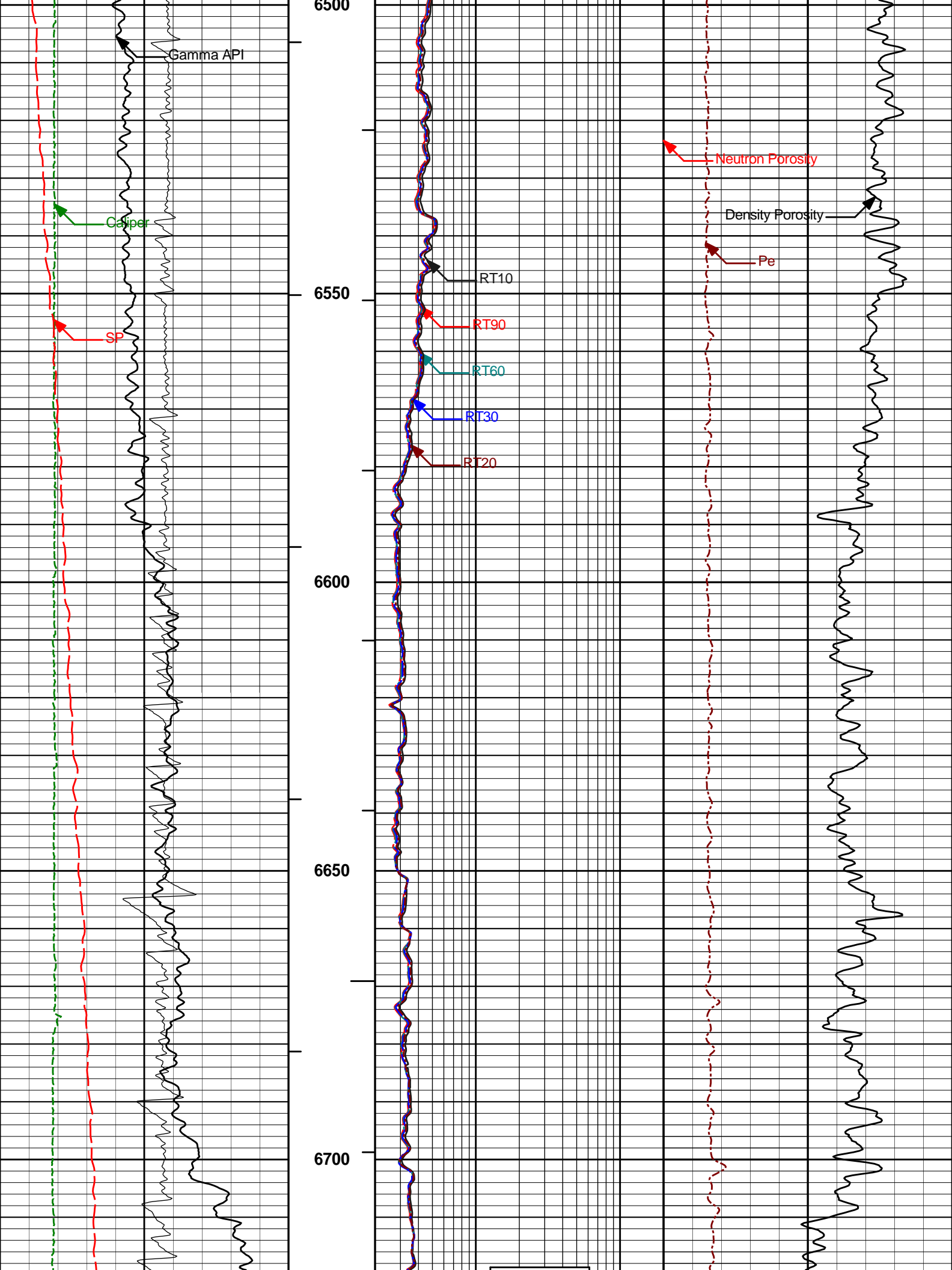


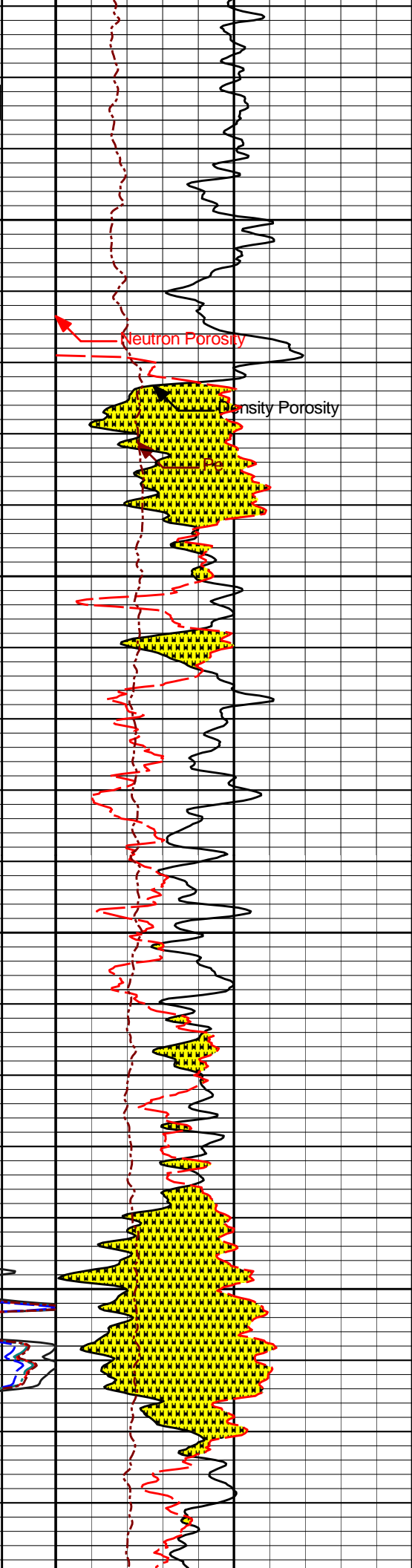
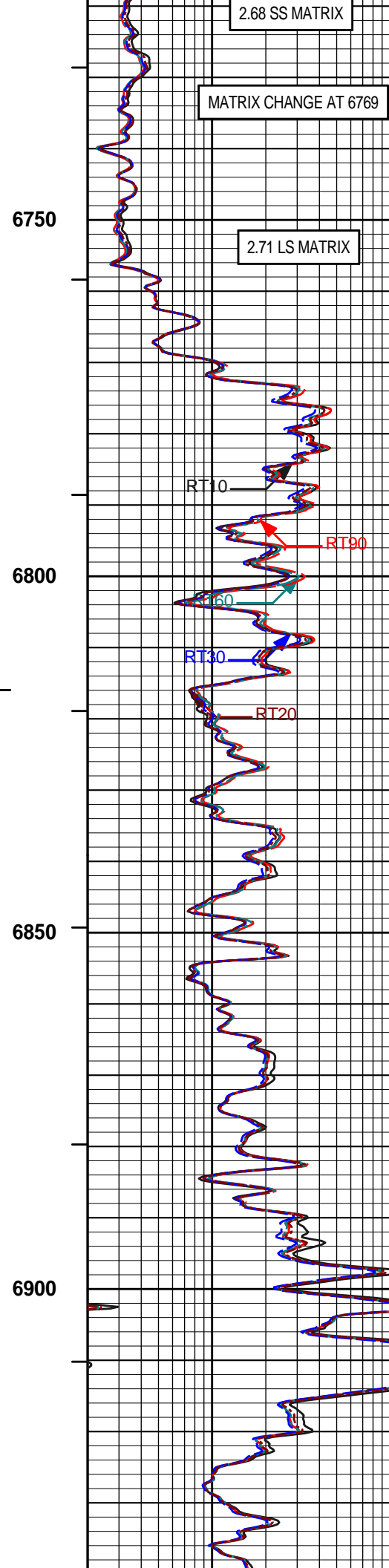
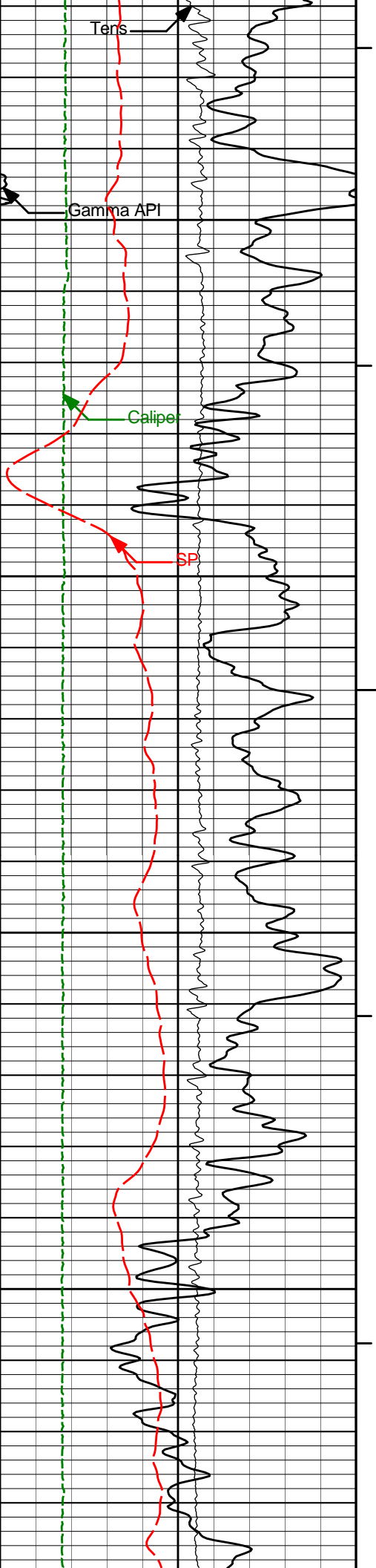




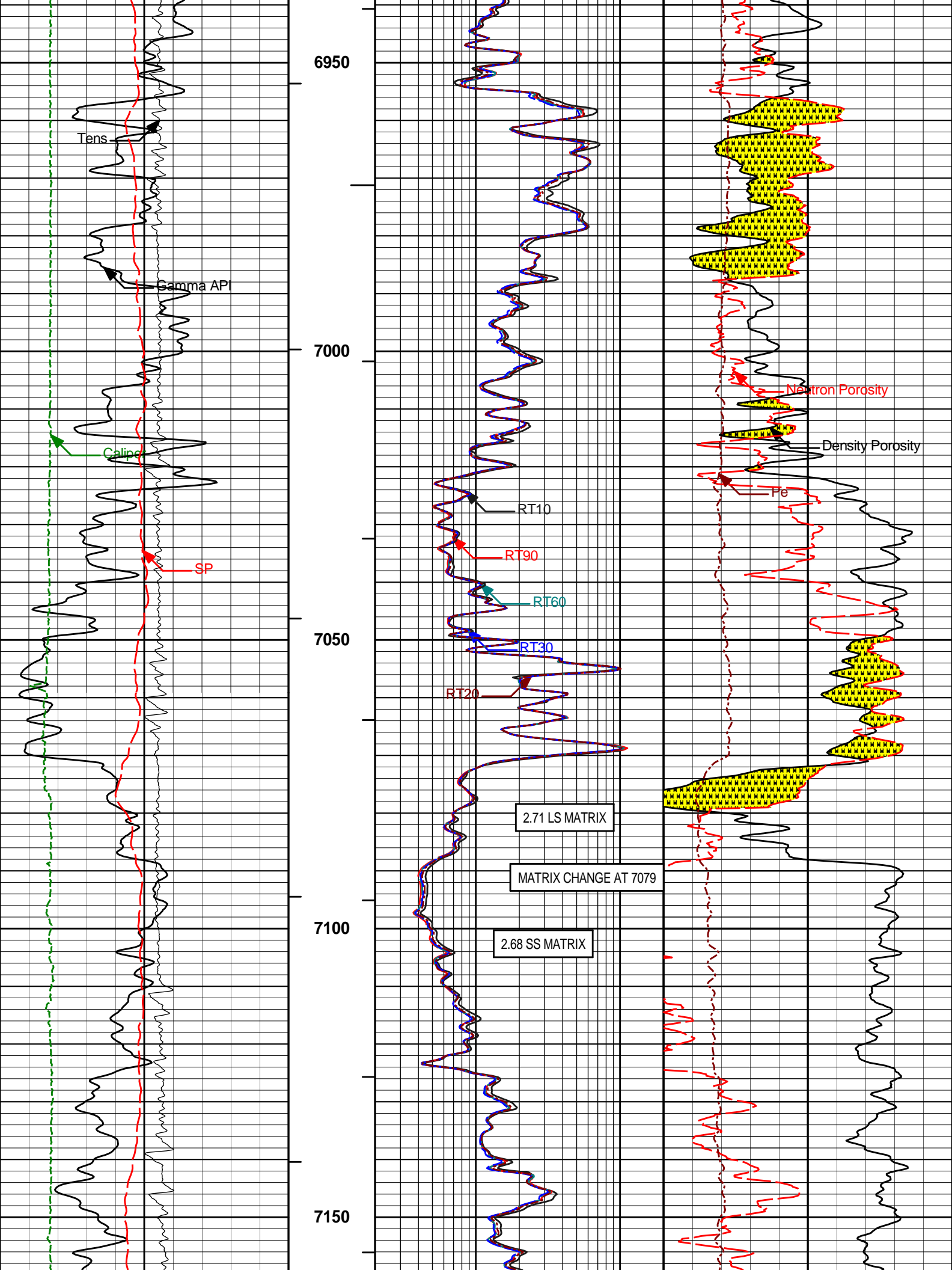


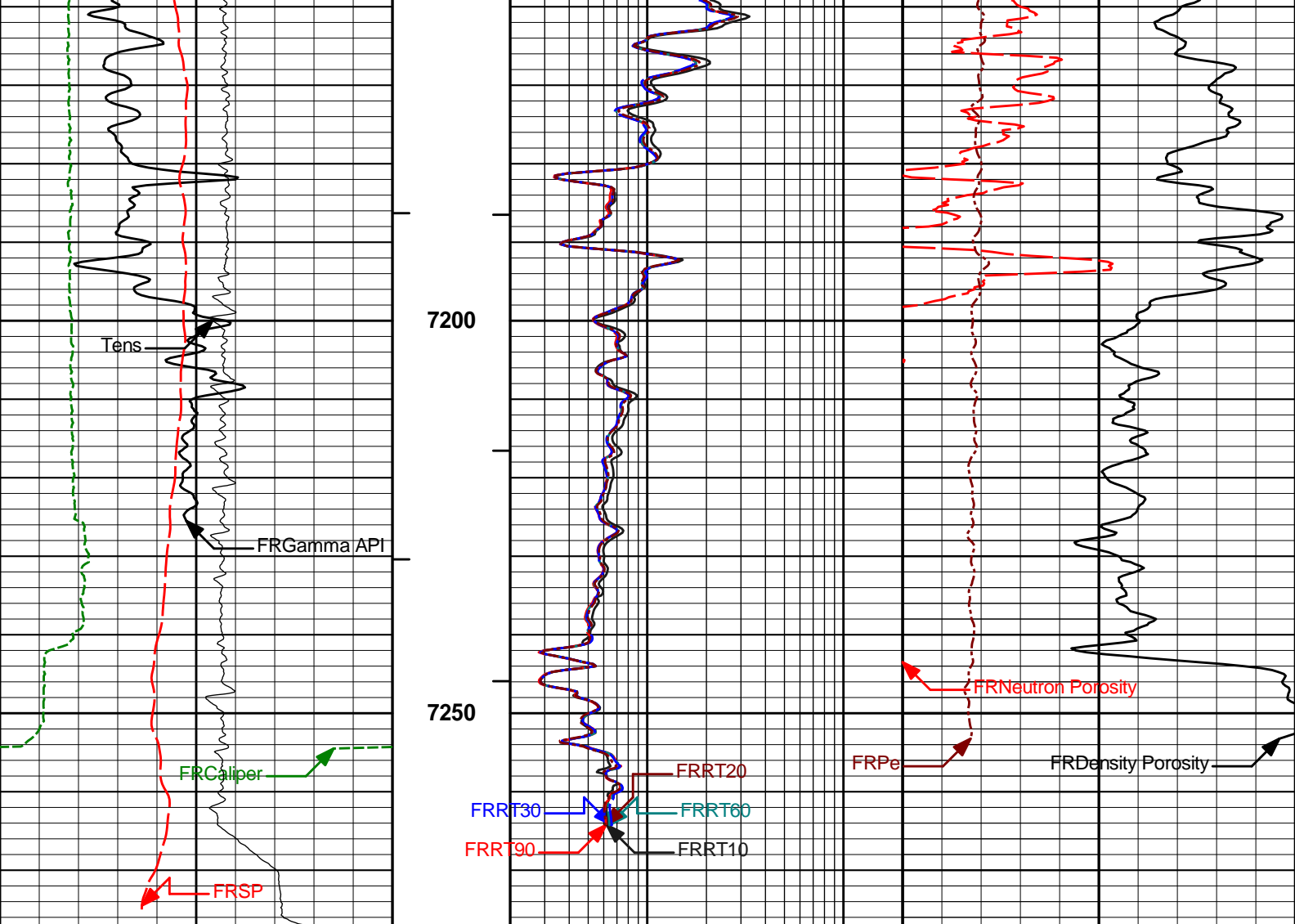












0	SP	100	1 : 240	2	RT90	200	0	Pe	10
	millivolts				ohmm				
0	Gamma API	250	BHVT	2	RT60	200	20	Density Porosity	0
	api				ohmm			percent	
6	Caliper	16	AHVT	2	RT30	200	20	Neutron Porosity	0
	inches				ohmm			percent	
10K	Tens	0		2	RT20	200			
	pounds				ohmm				
				2	RT10	200			
					ohmm				

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Plot Time: 04-Aug-12 18:07:39  
 Plot Range: 600 ft to 7277.17 ft  
 Data: LORENZ\_F22\_17\Well Based\DAQ-0001-002.01\  
 Plot File: \COMP\MAIN

MAIN PASS 5" = 100'

**HALLIBURTON**

# CALIBRATION REPORT

## NATURAL GAMMA RAY TOOL SHOP CALIBRATION

Tool Name: GTET - 11215095

Reference Calibration Date: 05-Jul-12 09:48:54

Engineer: A. ZWALI

Calibration Date: 04-Aug-12 11:02:10

Software Version: WL INSITE R3.6.0 (Build 3)

Calibration Version: 1

Calibrator Source S/N: TB289

Calibrator API Reference:243.00 api

Equivalent Calibrator API Reference:247.3 api

Measurement	Measured	Calibrated	Units
Background	67.6	71.6	api
Background + Calibrator	296.9	314.6	api
Calibrator	247.0	243.0	api

## NATURAL GAMMA RAY TOOL FIELD CALIBRATION

Tool Name: GTET - 11215095

Reference Calibration Date: 04-Aug-12 11:02:10

Engineer: A. ZWALI

Calibration Date: 04-Aug-12 11:11:39

Software Version: WL INSITE R3.6.0 (Build 3)

Calibration Version: 1

Calibrator Source S/N: TB289

Calibrator API Reference:243.00 api

Equivalent Calibrator API Reference:247.3 api

Field Verification	Shop	Field	Units
Background	71.6	71.3	api
Background + Calibrator	314.6	312.3	api
Calibrator	243.0	241.0	api

Shop	Field	Difference	Tolerance
243.0	241.0	2.0	+/- 9.00

## CSNG-FS SHOP CALIBRATION

Tool Name: CSNG - 10846351

Reference Calibration Date: 10-Jun-12 19:00:17

Engineer: A. ZWALI

Calibration Date: 05-Jul-12 10:27:51

Software Version: WL INSITE R3.6.0 (Build 3)

Calibration Version: 1

Source SN: TB289

TITANIUM CASE	Measured	Calibrated	Units
60 KEV Peak Channel #	48.0	48.0	Channel #
239 KEV Peak Channel #	23.6	23.6	Channel #
583 KEV Peak Channel #	52.9	52.8	Channel #
2614 KEV Peak Channel #	218.2	218.0	Channel #
Calibrate Temperature	115.0	102.2	degF

Pass/Fail Summary	Centroid
239 KEV Peak	Passed
583 KEV Peak	Passed
2614 KEV Peak	Passed

Blanket Reference Value: 243.00 API

Calibrator Value: 276.0 API

Counts	Units	Measured	Calibrated	Units
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Thorium Blanket	1809.1	CPS	324.9	337.0	API
Background	327.8	CPS	63.7	61.1	API
Gamma Ray Gain: 0.94					
Expected Gain Range: 0.85 - 1.15					
Gamma Gain Check: Passed					

CSNG-FS FIELD CALIBRATION					
Tool Name:	CSNG - 10846351			Reference Calibration Date:	05-Jul-12 10:27:51
Engineer:	A. ZWALI			Calibration Date:	04-Aug-12 11:11:48
Software Version:	WL INSITE R3.6.0 (Build 3)			Calibration Version:	1
Source SN:					

TITANIUM CASE	Shop	Field	Units
60 KEV Peak Channel #	48.0	48.0	Channel #
239 KEV Peak Channel #	23.6	23.7	Channel #
583 KEV Peak Channel #	52.8	53.2	Channel #
2614 KEV Peak Channel #	218.0	218.8	Channel #
Calibrate Temperature	102.2	74.2	degF

Pass/Fail Summary	Centroid
239 KEV Peak	Passed
583 KEV Peak	Passed
2614 KEV Peak	Passed

Blanket Reference Value: 243.00 API

Calibrator Value: 276.0 API

	Counts	Units	Measured	Calibrated	Units
Thorium Blanket	1785.9	CPS	337.0	334.5	API
Background	312.5	CPS	61.1	58.5	API

Gamma Ray Gain: 0.94

Expected Gain Range: 0.85 - 1.15

Gamma Gain Check: Passed

DUAL SPACED NEUTRON SHOP CALIBRATION					
Tool Name:	DSNT - 11277440			Reference Calibration Date:	05-Jul-12 16:14:12
Engineer:	A. ZWALI			Calibration Date:	05-Jul-12 16:33:00
Software Version:	WL INSITE R3.6.0 (Build 3)			Calibration Version:	1

Logging Source S/N: DSN430			
Tank Serial Number: 11068236			
Reference value assigned to Tank: 53.720			
Snow Block S/N: BRIGHTON SNOW BLOCK			
Calibration Tank Water Temperature: 100 degF			
Min. Tool Housing Outside Diameter: 3.625 in			
CALIBRATION CONSTANTS			
Measurement	Prev. Value	New Value	Control Limit On New Value
Gain:	0.997	1.001	0.900 - 1.100
WATER TANK SUMMARY (Horizontal Water Tank)			

Measurement	Current Reading (Previous Coef.)	Calibrated (New Coef.)	Change	Control Limit On Change
Porosity (decp):	0.2214	0.2224	0.0010	+/- 0.0020
Calibrated Ratio:	10.08	10.11	0.033	+/- 0.050

VERIFIER		
Measurement	Value	Control Limit
Snow-Block Porosity (decp):	0.0791	0.02000 - 0.09000

PASS/FAIL SUMMARY	
Background Check:	Passed
Gain-Range Check:	Passed
Snow-Block Check:	Passed

DUAL SPACED NEUTRON FIELD CALIBRATION			
Tool Name:	DSNT - 11277440	Reference Calibration Date:	05-Jul-12 16:33:00
Engineer:	A. ZWALI	Calibration Date:	04-Aug-12 11:35:27
Software Version:	WL INSITE R3.6.0 (Build 3)	Calibration Version:	1

Logging Source S/N: DSN430  
Snow Block S/N: BRIGHTON SNOW BLOCK

NEUTRON FIELD-CHECK SUMMARY				
	Shop	Field	Difference	Control Limit On Change
Snow-Block Porosity (decp):	0.0791	0.0861	0.0070	+/- 0.0150

PASS/FAIL SUMMARY	
Block Change Check:	Passed
Snow Block Stat Check:	Passed
Temperature Check:	Passed

DENSITY CALIPER SHOP CALIBRATION			
Tool Name:	SDLT - 10951319	Reference Calibration Date:	05-Jul-12 18:20:30
Engineer:	A. ZWALI	Calibration Date:	05-Jul-12 18:25:05
Software Version:	WL INSITE R3.6.0 (Build 3)	Calibration Version:	1
Host Tool Name:	DSNT - 11277440		

CALIBRATION COEFFICIENTS			
Measurement	Previous Value	New Value	Control Limit On New Value
Pad Offset	-2250.29	-2162.92	-7000.00 - -1000.00
Pad Gain	0.0003747	0.0003710	0.000200 - 0.000600
Arm Offset	-2138.05	-1813.84	-5000.00 - 3000.00
Arm Gain	0.0005512	0.0005176	0.000300 - 0.000700
Arm Power	-0.000007454	-0.000005683	-0.000010000 - 0.000010000

The ring diameter is computed from: DIAMETER = PAD EXTENSION + ARM EXTENSION + TOOL DIAMETER  
Tool Diameter: 4.50 in

CALIBRATION RINGS				
Measurement	Current Reading (Previous Coeff.)	Calibrated (New Coeff.)	Change	Control Limit On New Value
PAD EXTENSION:				
Small Ring (in)	1.99	2.00	0.01	+/- 0.20
Medium Ring (in)	3.75	3.75	0.00	+/- 0.20
RING DIAMETER:				

Small Ring (in)	6.41	6.50	0.09	+/- 0.20
Medium Ring (in)	8.24	8.25	0.01	+/- 0.20
Large Ring (in)	15.00	15.00	0.00	+/- 0.20

PASS/FAIL SUMMARY

Calibration-Coefficients Range Check:	Passed
Ring-Measurement Check:	Passed

PASS/FAIL SUMMARY

Calibration-Coefficients Range Check:	Passed
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SPECTRAL DENSITY SHOP CALIBRATION

Tool Name:	SDLT Pad - 10809123	Reference Calibration Date:	05-Jul-12 17:27:59
Engineer:	A. ZWALI	Calibration Date:	05-Jul-12 17:49:44
Software Version:	WL INSITE R3.6.0 (Build 3)	Calibration Version:	1

Logging Source S/N: 5256 GW		
Aluminum Block S/N: 63066	Density: 2.602g/cc	Pe: 3.100
Magnesium Block S/N: BRIGHTON MAGNESIUM BLOCK	Density: 1.691g/cc	Pe: 2.650

DENSITY CALIBRATION SUMMARY

Measurement	Previous Value	New Value	Control Limit
Near Bar Gain	1.0991	1.0729	0.90 - 1.10
Near Dens Gain	1.0395	1.0207	0.90 - 1.10
Near Peak Gain	1.0328	1.0208	0.90 - 1.10
Near Lith Gain	1.0440	1.0143	0.90 - 1.10
Far Bar Gain	1.0127	1.0062	0.90 - 1.10
Far Dens Gain	1.0007	0.9965	0.90 - 1.10
Far Peak Gain	0.9935	0.9864	0.90 - 1.10
Far Lith Gain	0.9682	0.9641	0.90 - 1.10
Near Bar Offset	-0.7471	-0.5042	NONE
Near Dens Offset	-0.1718	-0.0029	NONE
Near Peak Offset	-0.0154	0.0864	NONE
Near Lith Offset	-0.0646	0.1786	NONE
Far Bar Offset	-0.1221	-0.0622	NONE
Far Dens Offset	-0.0314	0.0076	NONE
Far Peak Offset	0.0122	0.0718	NONE
Far Lith Offset	0.1937	0.2275	NONE
Near Bar Background	825.49	824.81	700 - 1450
Near Dens Background	273.06	272.57	230 - 480
Near Peak Background	117.95	117.22	100 - 210
Near Lith Background	145.69	144.62	125 - 260
Far Bar Background	523.50	527.42	450 - 900
Far Dens Background	202.85	203.50	175 - 345
Far Peak Background	79.66	79.73	70 - 140
Far Lith Background	82.35	83.66	75 - 145

CALIBRATION BLOCK SUMMARY

Measurement	Current Reading (Previous Coef)	Calibrated (New Coef)	Change	Control Limit On Change
MAGNESIUM				
Density (g/cc)	1.688	1.691	0.003	+/- 0.015
Pe	2.605	2.615	0.010	+/- 0.150

ALUMINUM				
Density (g/cc)	2.600	2.601	0.001	+/- 0.01500
Pe	3.069	3.075	0.006	+/- 0.150

TOOL SUMMARY				
Measurement	Near Detector		Far Detector	
	Value	Control Limits	Value	Control Limits
QUALITY				
Background	-0.0005	+/- 0.0110	0.0010	+/- 0.0140
Magnesium Block	0.0008	+/- 0.0110	0.0002	+/- 0.0140
Aluminum Block	0.0003	+/- 0.0110	0.0004	+/- 0.0140
Resolution	9.41	6.00 - 11.50	9.82	6.00 - 11.50
Internal Verifier(B+D+P+L)	1359	1200 - 2700	894	800 - 1700

PASS/FAIL SUMMARY	
Background Quality Check:	Passed
Background Range Check:	Passed
Background Resolution Check:	Passed
Background Verification Check:	Passed
Magnesium Quality Check:	Passed
Aluminum Quality Check:	Passed
Gains Check:	Passed
Changes in Calibration Blocks:	Passed

### SPECTRAL DENSITY FIELD CHECK

Tool Name:	SDLT Pad - 10809123	Reference Calibration Date:	05-Jul-12 17:49:44
Engineer:	A. ZWALI	Calibration Date:	04-Aug-12 11:48:33
Software Version:	WL INSITE R3.6.0 (Build 3)	Calibration Version:	1

Pad Temperature: 78.2 degF

DENSITY FIELD CALIBRATION SUMMARY				
Measurement	Shop	Field	Change	Control Limit +/-
Near (B+D+P+L) cps	1359.216	1357.613	-1.603	14.904
Far (B+D+P+L) cps	894.312	894.505	0.193	16.278
Near Resolution	9.41	9.57	0.160	0.50
Far Resolution	9.82	9.84	0.020	1.00

PASS/FAIL SUMMARY	
Bkg Quality Check:	Passed
Bkg Resolution Check:	Passed
Bkg Verification Check:	Passed

### SDLT CALIPER FIELD CALIBRATION

Tool Name:	SDLT - 10951319	Reference Calibration Date:	05-Jul-12 18:25:05
Engineer:	A. ZWALI	Calibration Date:	04-Aug-12 11:26:02
Software Version:	WL INSITE R3.6.0 (Build 3)	Calibration Version:	1

MEASURED CALIPER VALUES				
Measurement	Shop	Field	Change	Control Limit On New Value
Pad Extension	3.75	3.74	-0.01	+/- 0.10
Ring Diameter	8.25	8.38	0.13	+/- 0.15


PASS/FAIL SUMMARY									
Pad Extension Check:				Passed					
Diameter Check:				Passed					
ARRAY COMPENSATED TRUE RESISTIVITY SHOP CALIBRATION									
Tool Name: ACRt Sonde - E5787-S5797				Reference Calibration Date: 27-Apr-12 19:50:20					
Engineer: J. PINKETT				Calibration Date: 02-Jul-12 19:07:19					
Software Version: WL INSITE R3.6.0 (Build 3)				Calibration Version: 1					
Host Tool Name: ACRt Instrument - E5787_5797									
TYPICAL GAIN RANGE									
Subarray	R12KHz			R36KHz			R72KHz		
	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper
A1 (80")	0.95	1.01	1.05	0.95	1.01	1.05	0.95	1.01	1.05
A2 (50")	0.95	1.01	1.05	0.95	1.01	1.05	0.95	1.01	1.05
A3 (29")	0.95	1.01	1.05	0.95	1.01	1.05	0.95	1.01	1.05
A4 (17")	0.95	1.00	1.05	0.95	1.00	1.05	0.95	1.00	1.05
A5 (10")	N/A	N/A	N/A	0.95	1.00	1.05	0.95	1.00	1.05
A6 (6")	N/A	N/A	N/A	0.95	0.99	1.05	0.95	0.99	1.05
TYPICAL SONDE OFFSET RANGE									
Subarray	R12KHz			R36KHz			R72KHz		
	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper
A1 (80")	-5	-4.90	2	-6	-5.05	-2	-8	-5.78	-2
A2 (50")	-7	-1.84	0	-7	-3.31	0	-7	-4.39	0
A3 (29")	-27	-17.40	-9	-9	-4.42	-3	-7	-3.25	-1
A4 (17")	-180	-120.32	-60	-45	-35.46	-15	-39	-27.03	-13
A5 (10")	N/A	N/A	N/A	-150	-94.04	-50	-80	-48.66	-10
A6 (6")	N/A	N/A	N/A	175	305.24	525	90	154.16	270
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	1.82		2.0					
72K	1.0	1.15		2.0					
PASS/FAIL SUMMARY									
GAIN RANGE CHK					PASS				
SONDE OFFSET RANGE CHK					PASS				
Tx CURRENT GAIN					PASS				
Rmud VERIFICATION					PASS				
TOOL OK TO LOG									
CALIBRATION SUMMARY									
Sensor	Shop	Field	Post	Difference	Tolerance	Units			
GTET-11215095									
Gamma Ray Calibrator	243.0	241.0	-----	2.0	+/- 9.00	api			
CSNG-10846351									
60 KEV Peak Channel #	48.0	48.0	-----	0.0	-----	Channel #			
239 KEV Peak Channel #	23.6	23.7	-----	-0.1	-----	Channel #			
583 KEV Peak Channel #	52.8	52.2	-----	0.6	-----	Channel #			

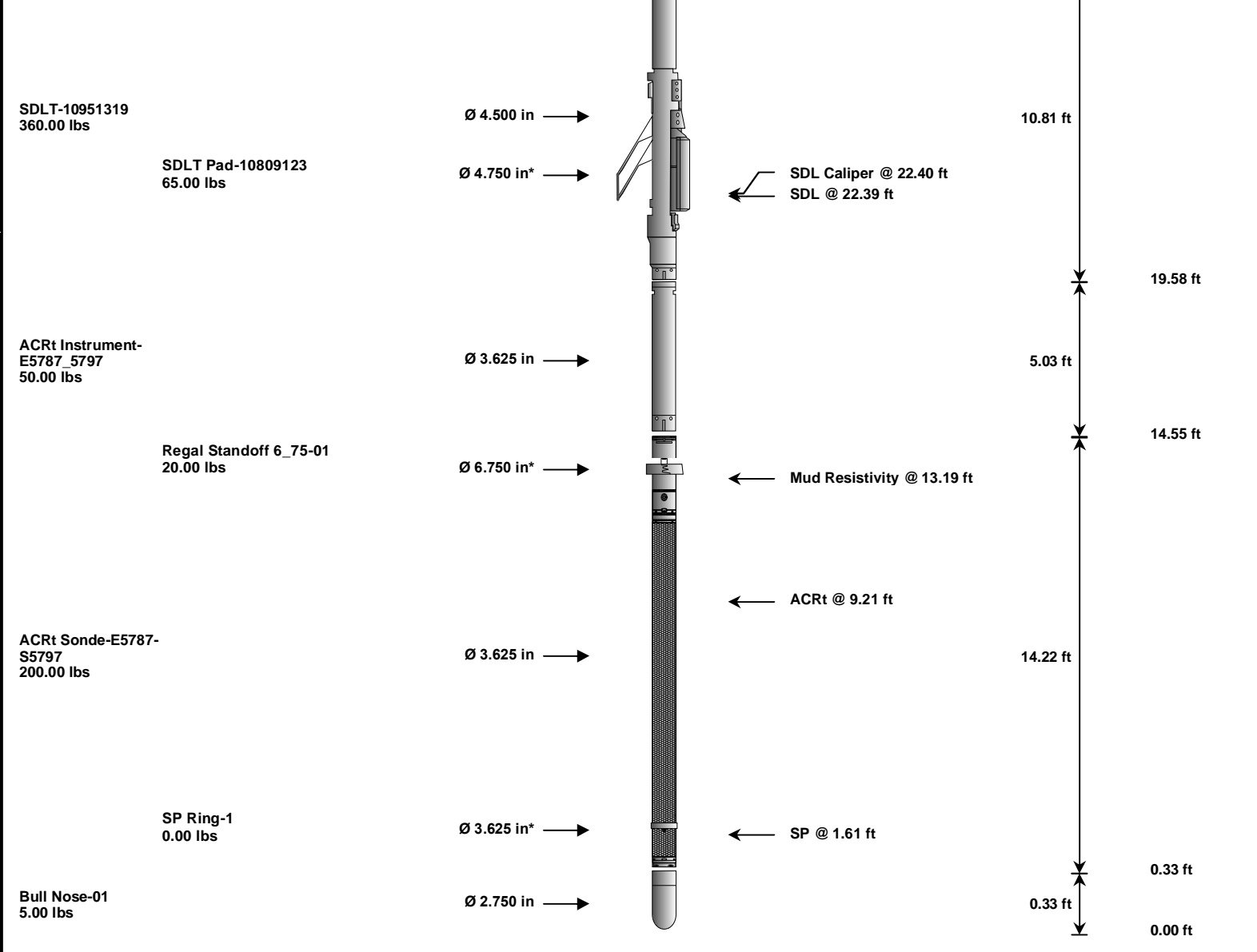


363 KEV Peak Channel #	32.6	33.2	-----	-0.4	-----	Channel #
2614 KEV Peak Channel #	218.0	218.8	-----	-0.8	-----	Channel #
<b>DSNT-11277440</b>						
Snow-Block Porosity	0.0791	0.0861	-----	-0.0070	+/- 0.0150	decg
<b>SDLT-10951319</b>						
Pad Extension	3.75	3.74	-----	0.01	+/-0.10	in
Ring Diameter	8.25	8.38	-----	-0.13	+/-0.15	in
<b>SDLT Pad-10809123</b>						
Near(B+D+P+L)	1359.216	1357.613	-----	1.603	+/-14.904	cps
Far(B+D+P+L)	894.312	894.505	-----	-0.193	+/-16.278	cps
<b>ACRt Sonde-E5787-S5797</b>						
Mud Cell	1.00	-----	-----	0.00	-----	ohm-m
Data: LORENZ_F22__17\0001 NOBLE_TC-CSNG\IDLE						Date: 04-Aug-12 14:54:13

**HALLIBURTON**

## TOOL STRING DIAGRAM REPORT

Description	Overbody Description	O.D.	Diagram	Sensors @ Delays	Length	Accumulated Length
RWCH-A094 135.00 lbs		Ø 3.625 in →		← Load Cell @ 59.34 ft ← BH Temperature @ 58.77 ft	6.25 ft	63.02 ft
GTET-11215095 165.00 lbs		Ø 3.625 in →		← GammaRay @ 50.71 ft	8.52 ft	56.77 ft
CSNG-10846351 114.00 lbs	UnivWearRing3.6- 10846351 5.00 lbs	Ø 4.200 in* Ø 3.625 in →		← CSNG @ 42.62 ft	8.17 ft	48.25 ft
DSNT-11277440 174.00 lbs		Ø 3.625 in →		← DSN Far @ 33.15 ft ← DSN Near @ 32.40 ft	9.69 ft	40.08 ft
						30.40 ft



Mnemonic	Tool Name	Serial Number	Weight (lbs)	Length (ft)	Accumulated Length (ft)	Max. Log. Speed (fpm)
RWCH	Releasable Wireline Cable Head	A094	135.00	6.25	56.77	300.00
GTET	Gamma Telemetry Tool	11215095	165.00	8.52	48.25	60.00
CSNG	Compensated Spectral Natural Gamma	10846351	114.00	8.17	40.08	15.00
UWR3P6	Universal Wear Ring 3 5-8 inch	10846351	5.00	0.35	44.16	300.00
DSNT	Dual Spaced Neutron	11277440	174.00	9.69	30.40	60.00
SDLT	Spectral Density Tool	10951319	360.00	10.81	19.58	60.00
SDLP	Density Insite Pad	10809123	65.00	2.55	21.79	60.00
ACRt	Array Compensated True Resistivity Instrument Section	E5787_5797	50.00	5.03	14.55	300.00
ACRt	Array Compensated True Resistivity Sonde Section	E5787-S5797	200.00	14.22	0.33	300.00
SP	SP Ring	1	0.00	0.25	1.61	300.00
RSOF	Regal Standoff 6.75in	01	20.00	0.52	13.25	300.00
BLNS	Bull Nose	01	5.00	0.33	0.00	300.00
<b>Total</b>			<b>1,293.00</b>	<b>63.02</b>		
* Not included in Total Length and Length Accumulation.						
Data: LORENZ_F22__17\0001 NOBLE_TC-CSNG\IDLE						Date: 04-Aug-12 13:04:00

COMPANY	NOBLE ENERGY INC
WELL	LORENZ F22-17D
FIELD	WATTENBERG

COUNTY	WELD	STATE	CO
<b>HALLIBURTON</b>		SPECTRAL DENSITY DUAL SPACED NEUTRON ARRAY COMPENSATED TRUE RESISTIVITY	