

ARRAY COMPENSATED  
TRUE RESISTIVITY  
SPECTRAL DENSITY  
DUAL SPACED NEUTRON

Fold here

## LOGGING DATA

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	7500	REC	0	200				20	0	2.68	20	0	SAND
ONE	7500	7218	REC	0	200				20	0	2.71	20	0	LIME
ONE	7218	CSG	REC	0	200				20	0	2.68	20	0	SAND
DIRECTIONAL INFORMATION														
Maximum Deviation @									KOP @					
Remarks: RWCH-GTET-DSNT-SDLT-ACRT RUN IN COMBINATION.														
ANNULAR HOLE VOLUME CALCULATED USING 4.5-INCH PRODUCTION CASING.														
TENSION PULLS, WASHOUTS AND BOREHOLE RUGOSITY AFFECT LOG RESPONSE.														
DSNT DECENTRALIZER NOT RUN AT CLIENT'S REQUEST.														
YOUR CREW: A. AXE, M. BURNETT														
RIG: ENSIGN 7														
THANK YOU FOR USING HALLIBURTON LOGGING SERVICES - BRIGHTON, CO - (303) 825-4346														
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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
7218.00					
	DSNT	NLIT	Neutron Lithology	Limestone	
	SDLT Pad	DMA	Formation Density Matrix	2.710	g/cc
7500.00					
	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	9.600	ppg
	SHARED	WAGT	Weighting Agent	Natural	
	SHARED	BSAL	Borehole salinity	1000.00	ppm
	SHARED	FSAL	Formation Salinity NaCl	0.00	ppm
	SHARED	KPCT	Percent K in Mud by Weight?	0.00	%
	SHARED	RMUD	Mud Resistivity	1.000	ohmm
	SHARED	TRM	Temperature of Mud	98.7	degF
	SHARED	CSD	Logging Interval is Cased?	No	
	SHARED	ICOD	AHV Casing OD	4.500	in
	SHARED	ST	Surface Temperature	40.0	degF
	SHARED	TD	Total Well Depth	7655.00	ft
	SHARED	BHT	Bottom Hole Temperature	210.0	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	
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	1.50	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: THORNTON_13-22\0001 TRIPLE_WHITE_SLICKIDLE				Date: 13-Apr-13 15:14:35



Plot Time: 13-Apr-13 15:32:17

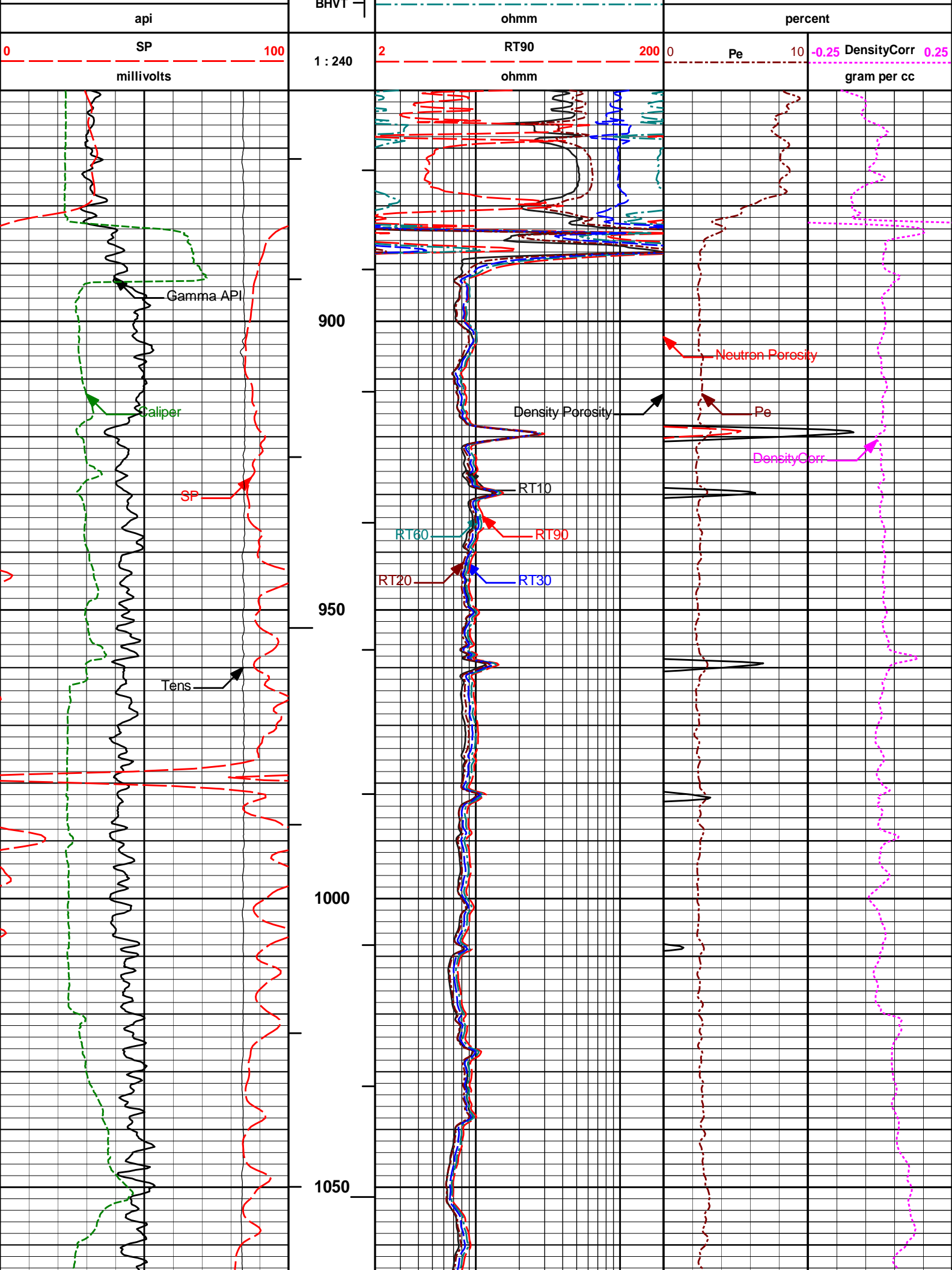
Plot Range: 860 ft to 7660 ft

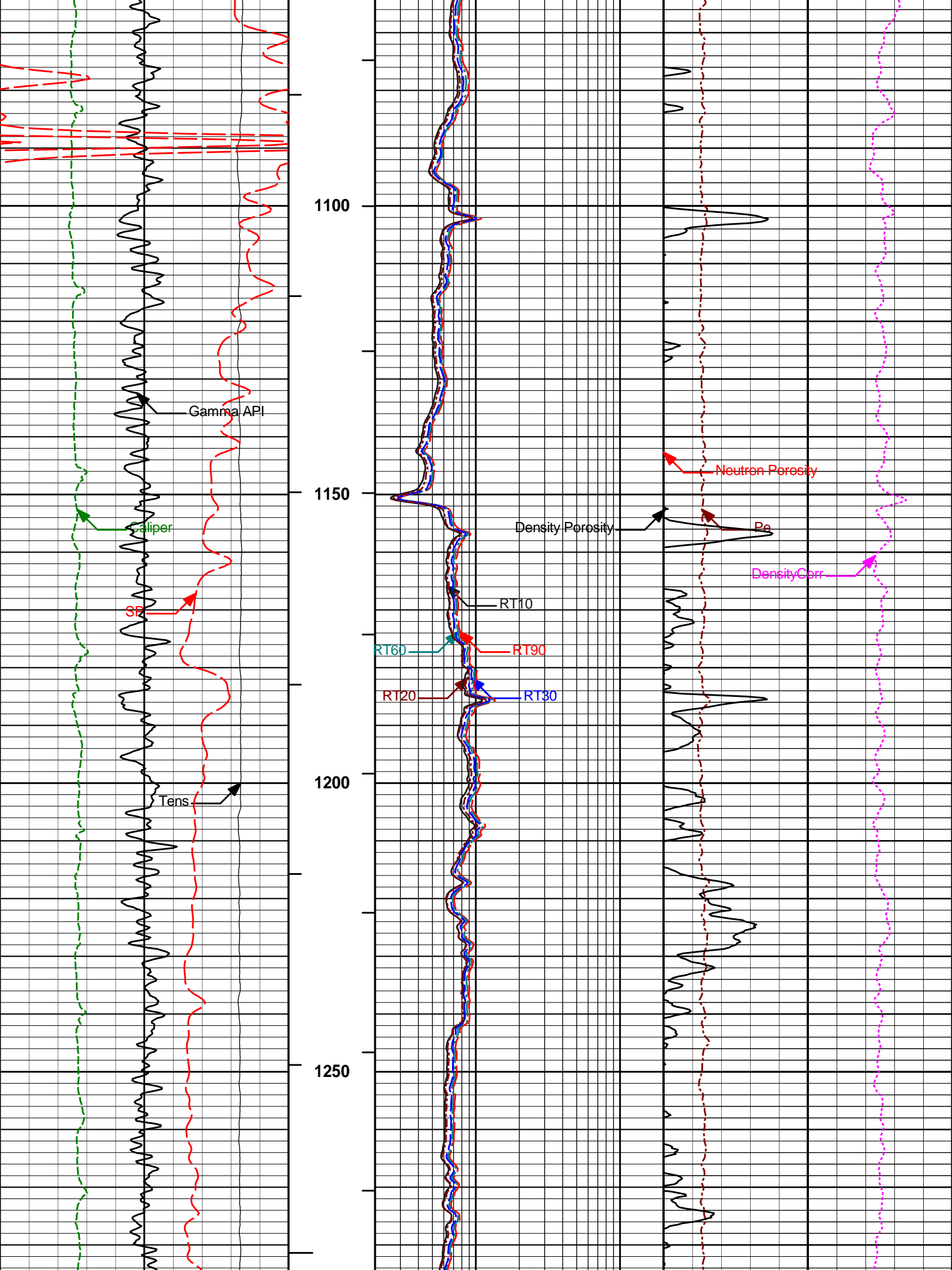
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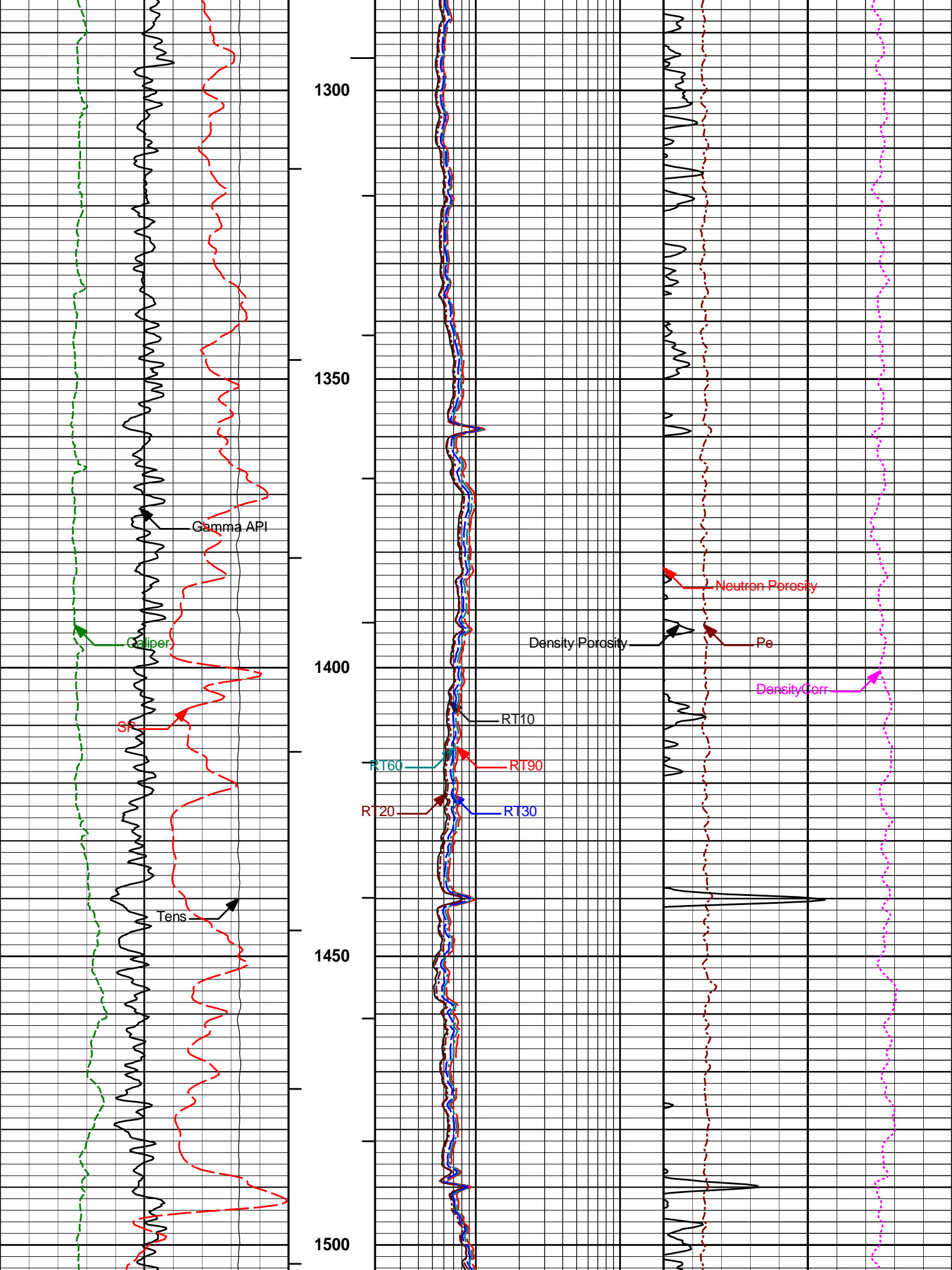
Plot File: \\COMP\MAIN

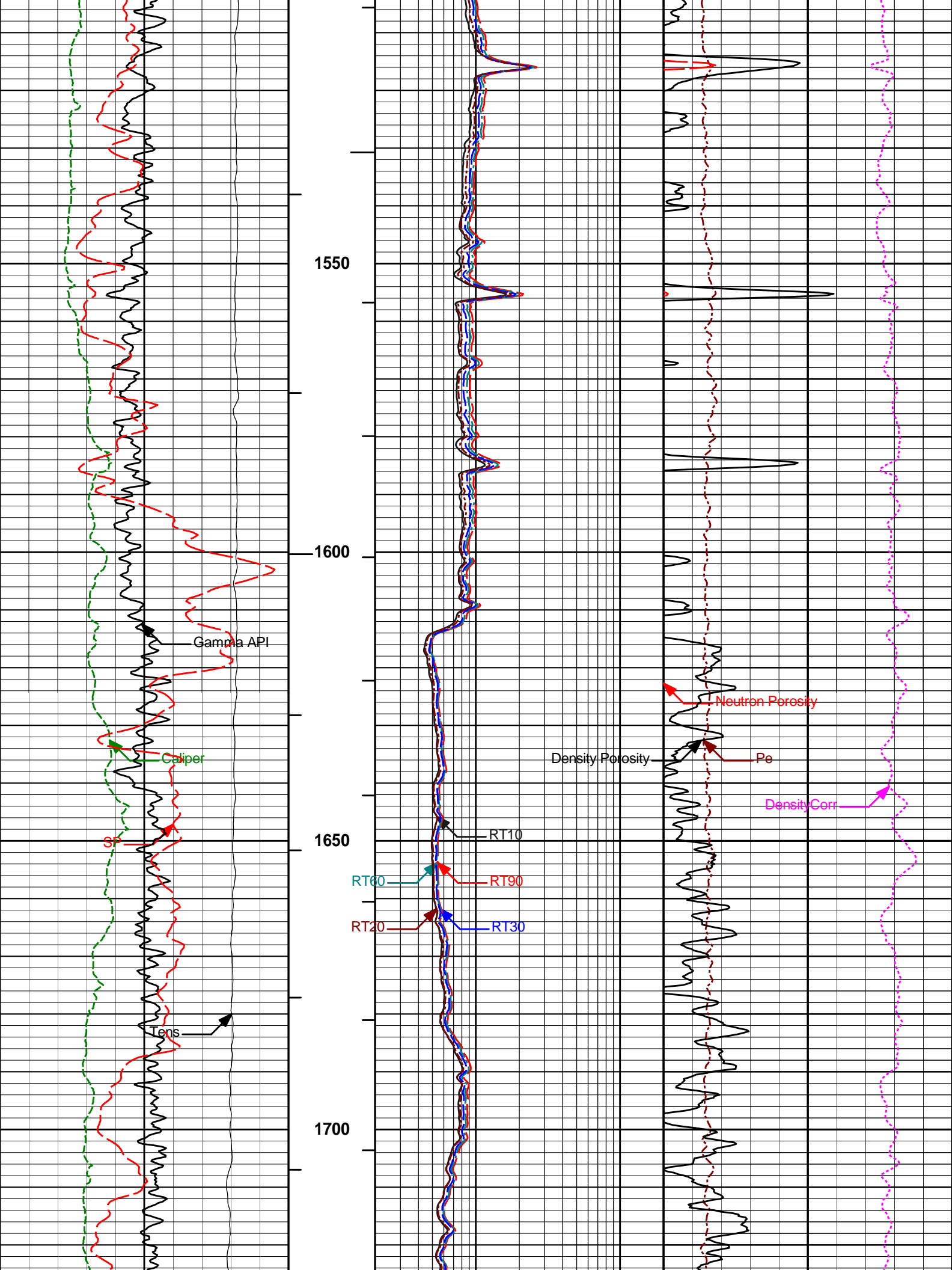
MAIN PASS 5" = 100'

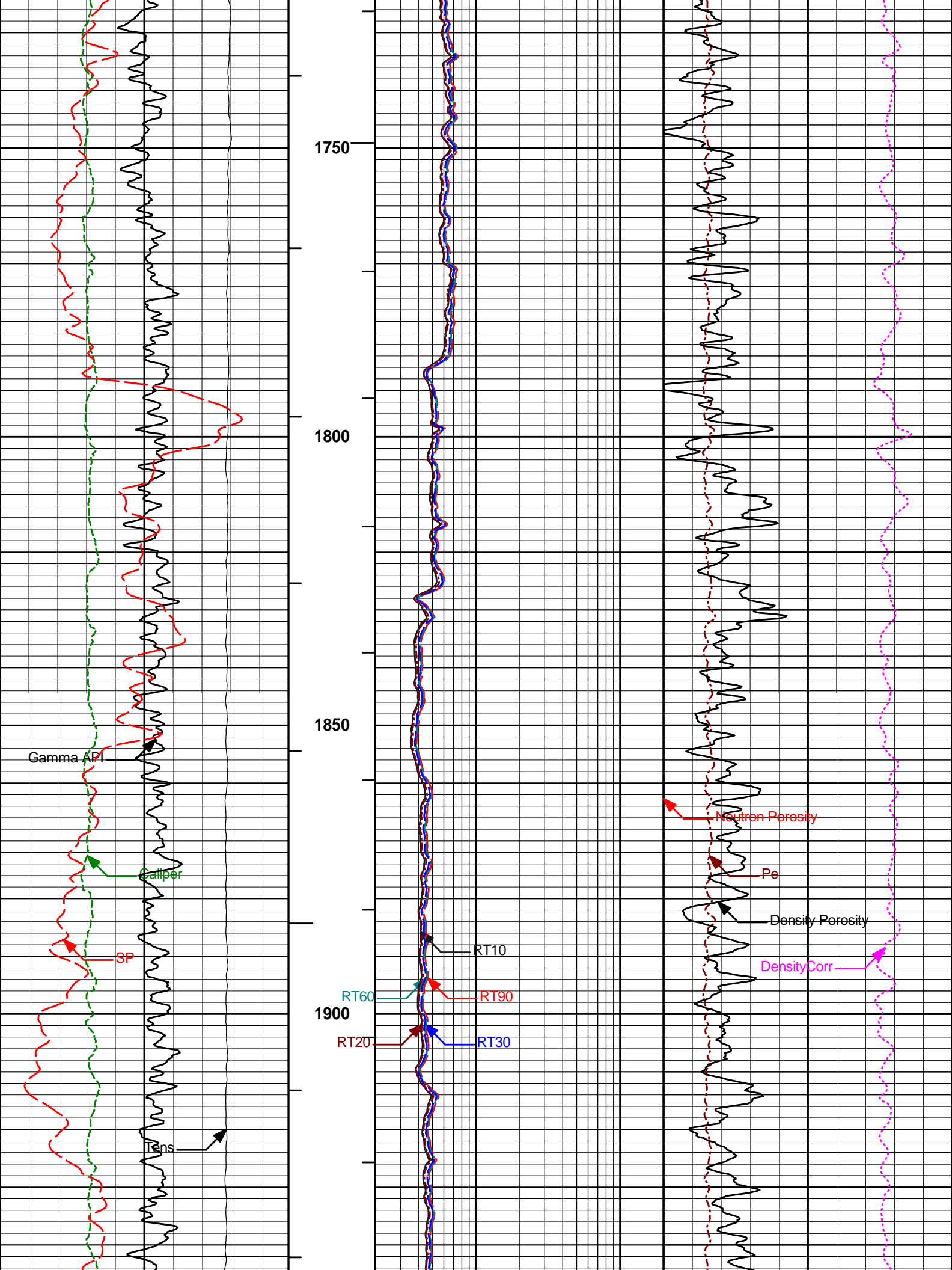
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					ohmm				
				2	RT20	200			
<div><div>6</div><div>Caliper</div><div>16</div></div>			<div><div>—</div><div>inches</div></div>	2	RT30	200	20	Neutron Porosity	0
					ohmm		percent		
<div><div>0</div><div>Gamma API</div><div>200</div></div>				<div><div>—</div><div>Density</div></div>	2	RT60	200	20	Density Porosity



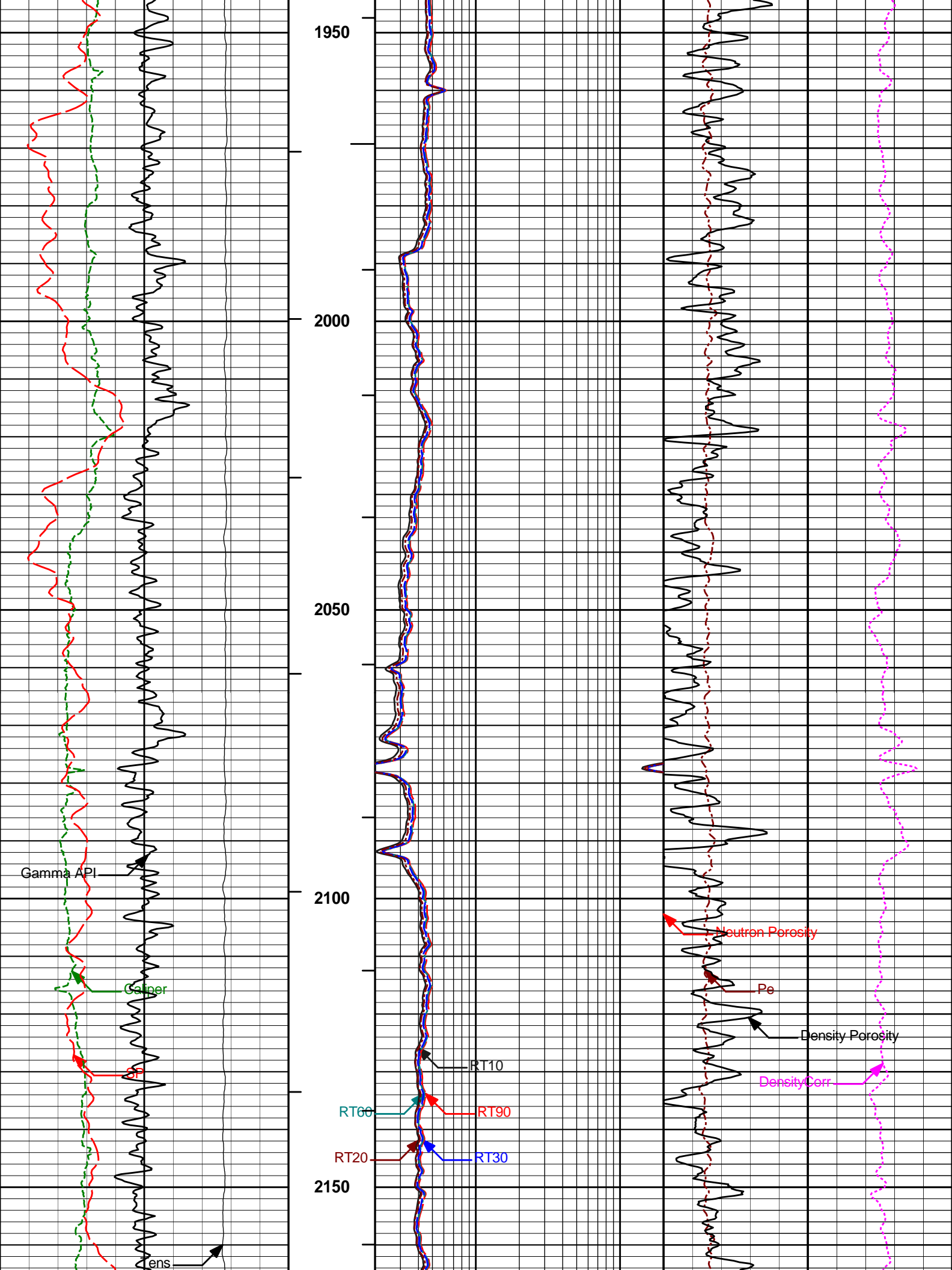


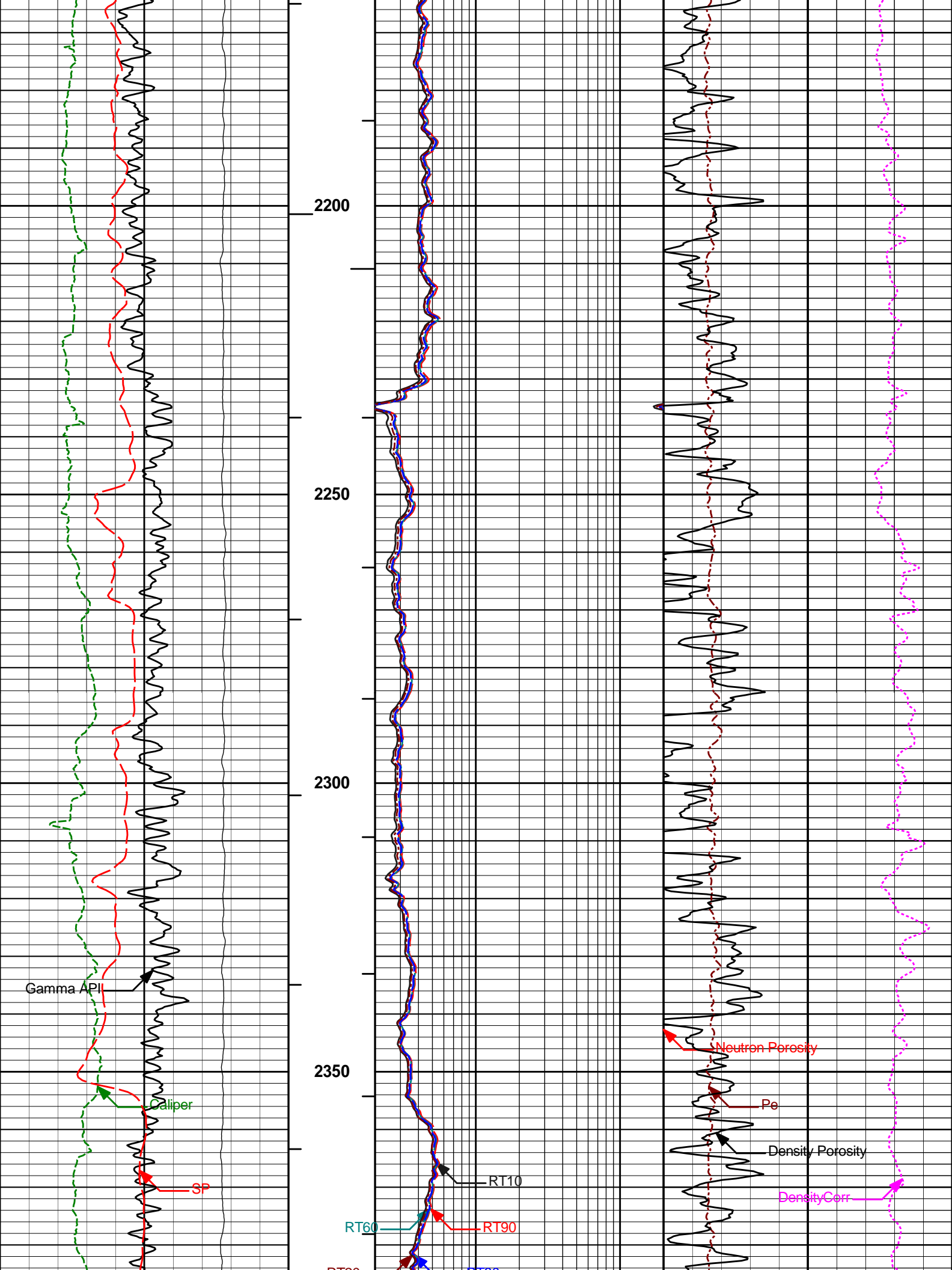


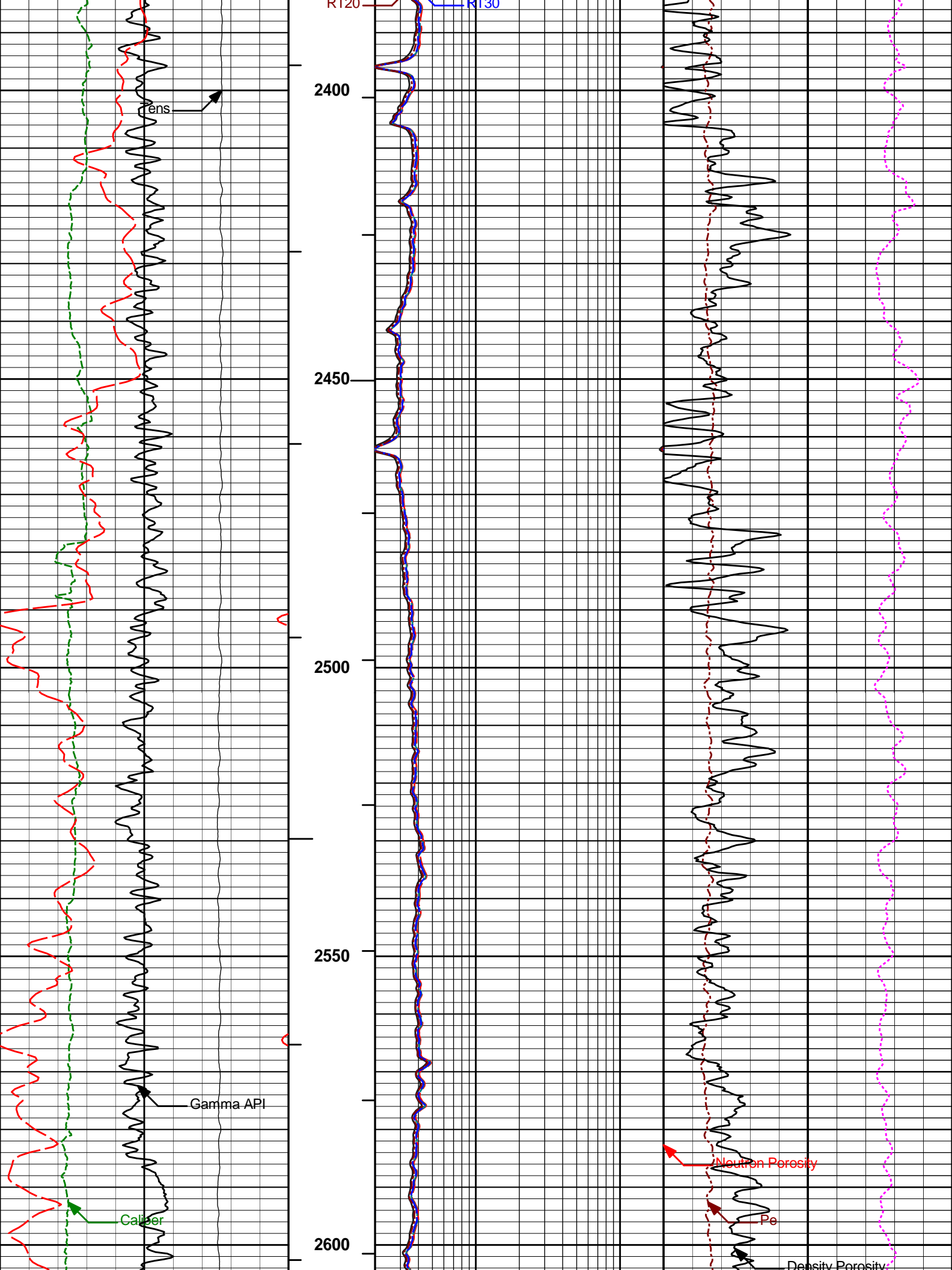


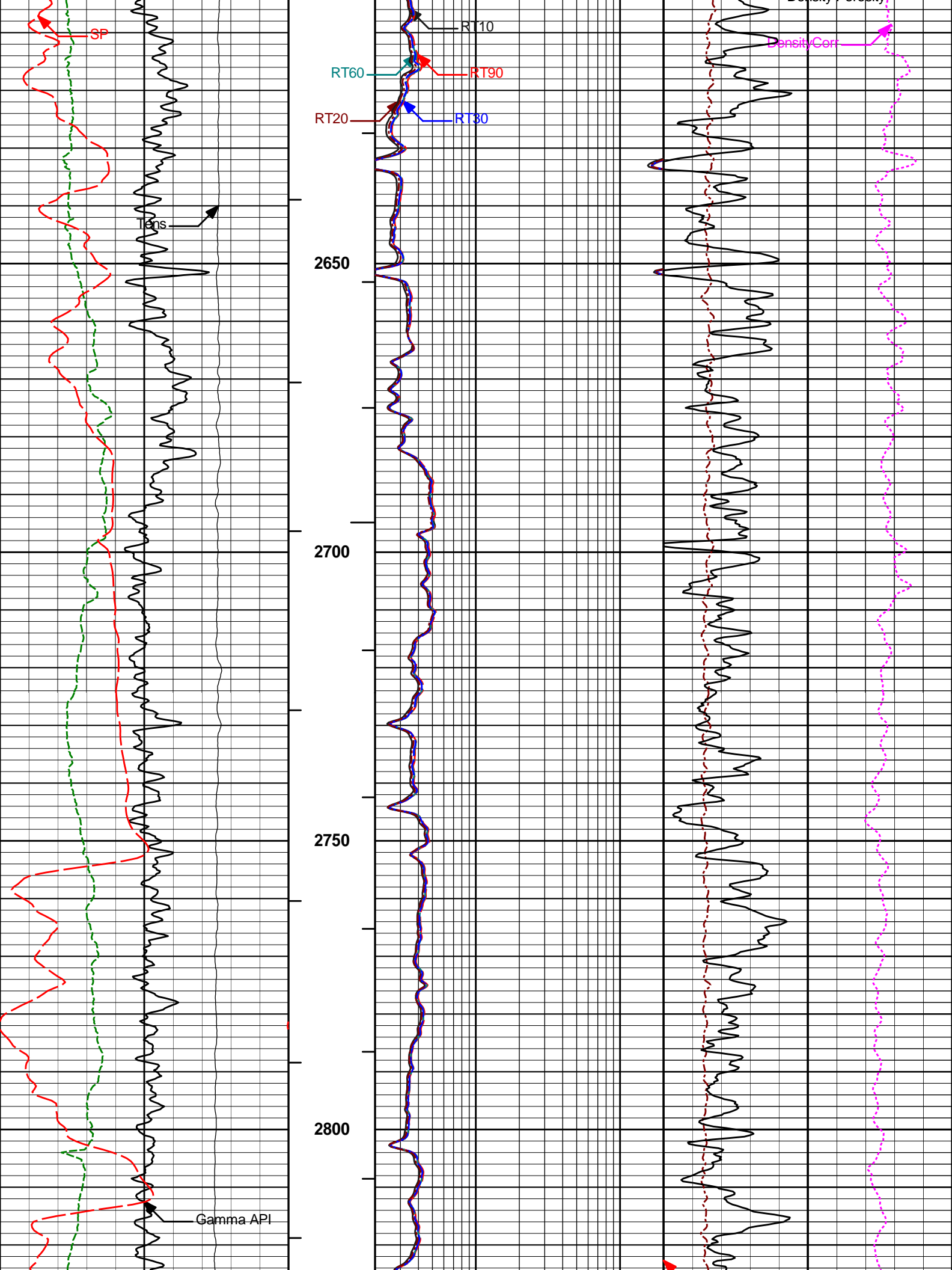


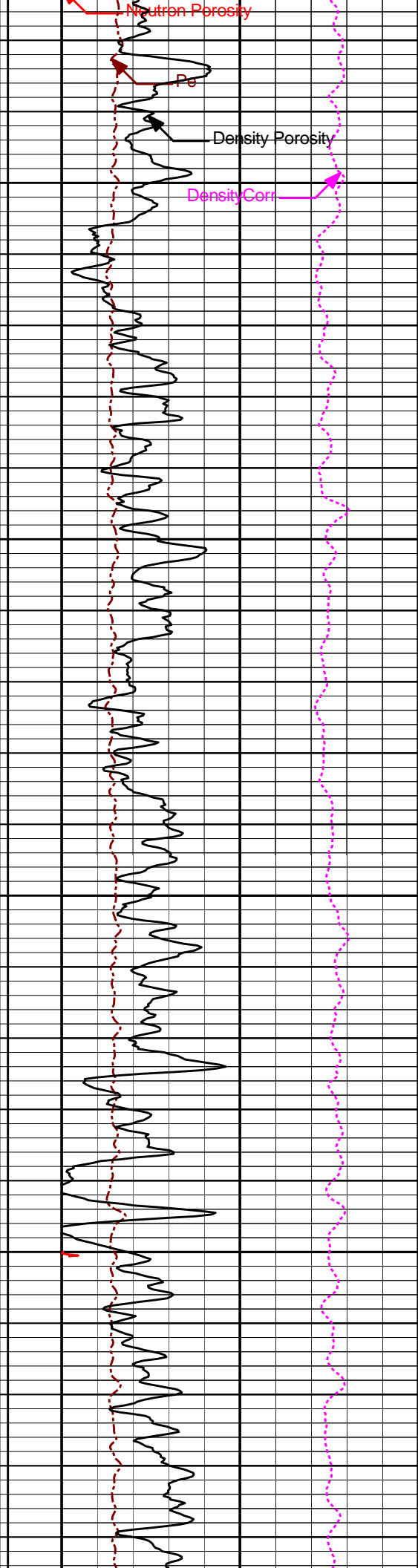
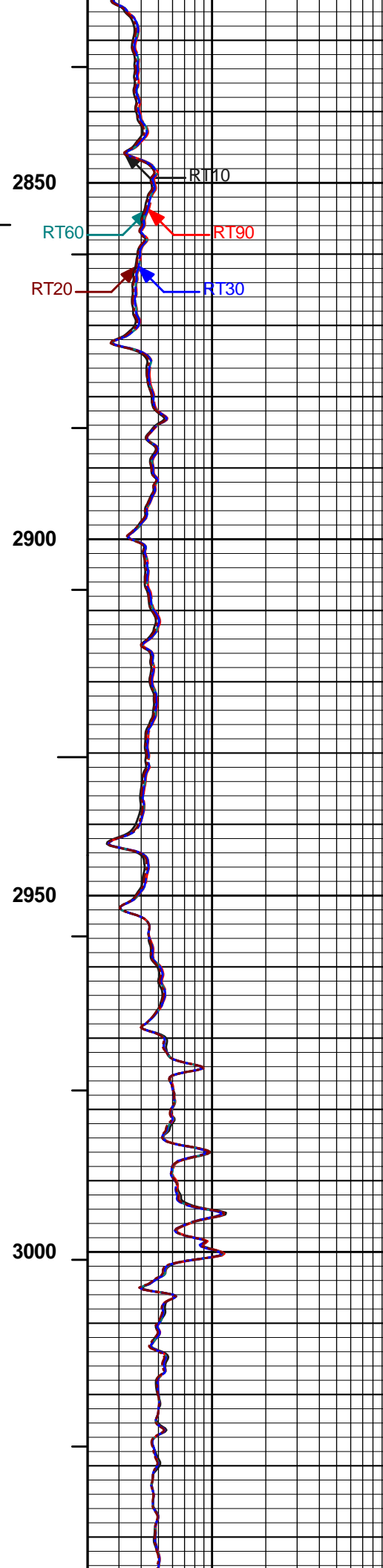
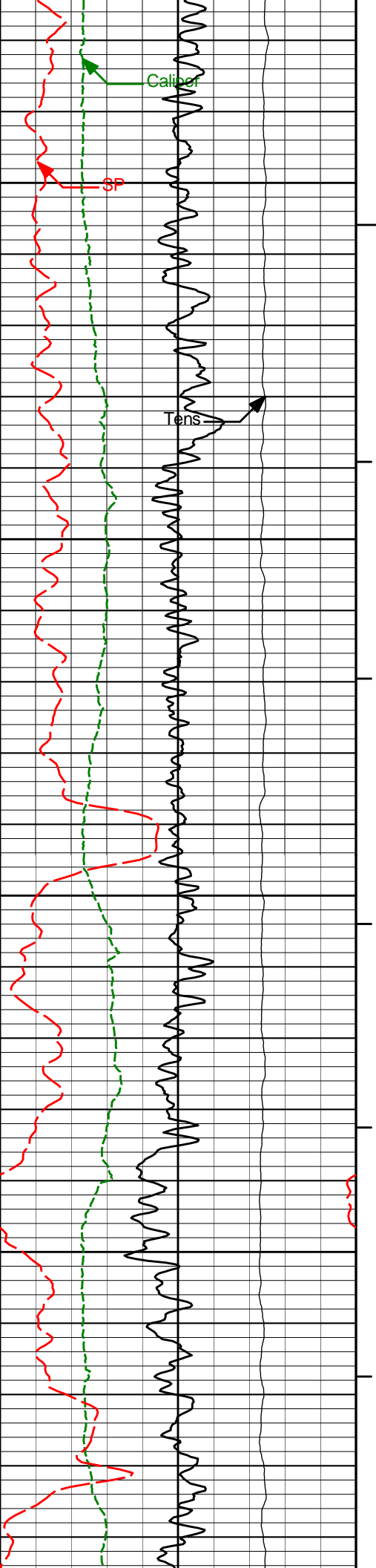


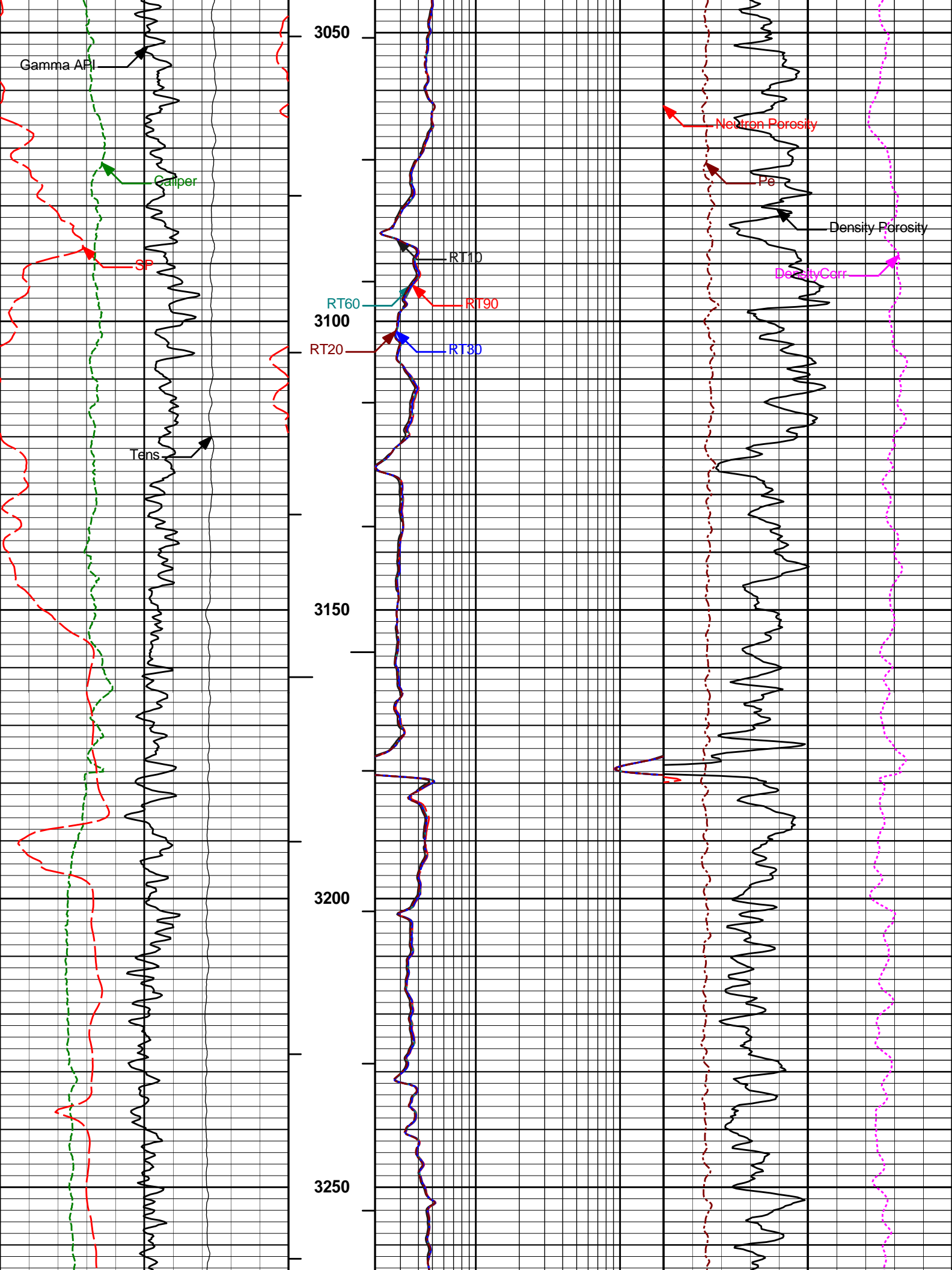


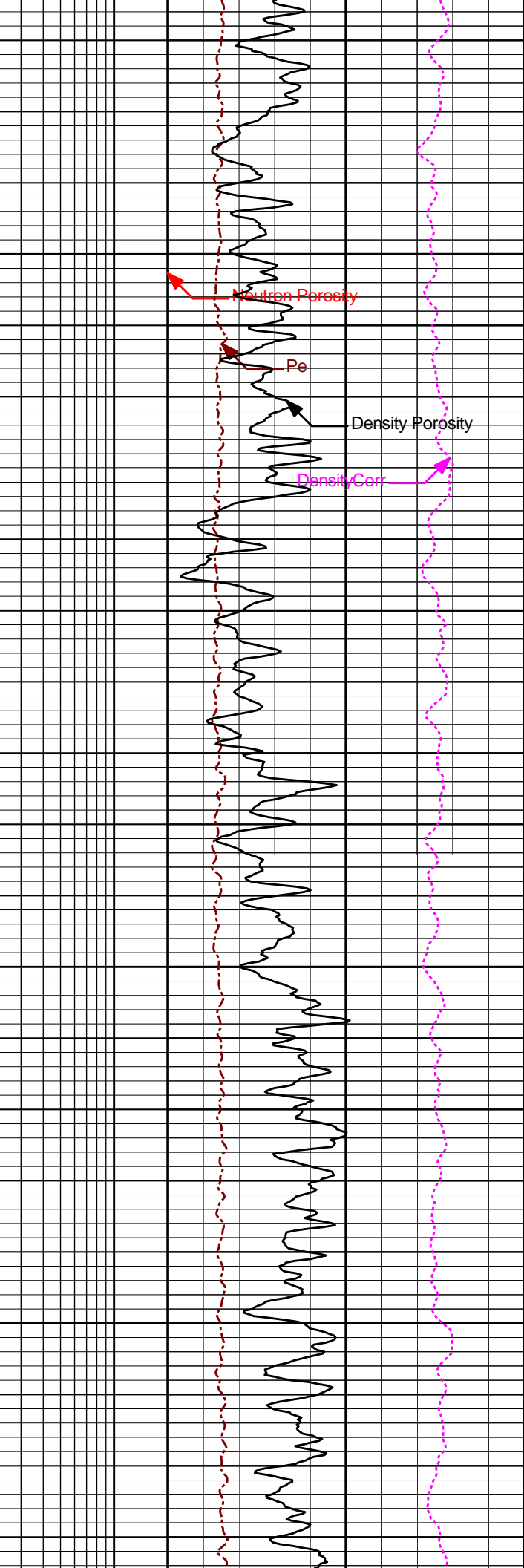
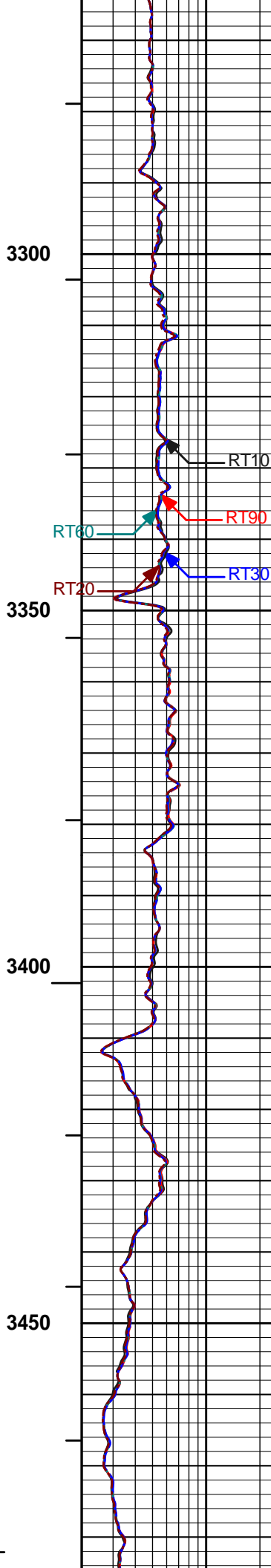
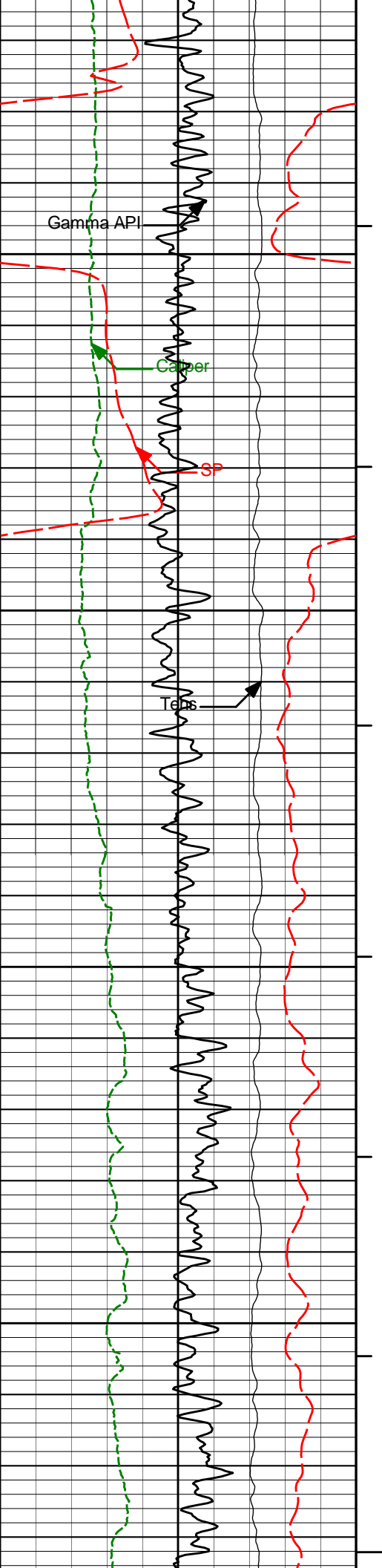


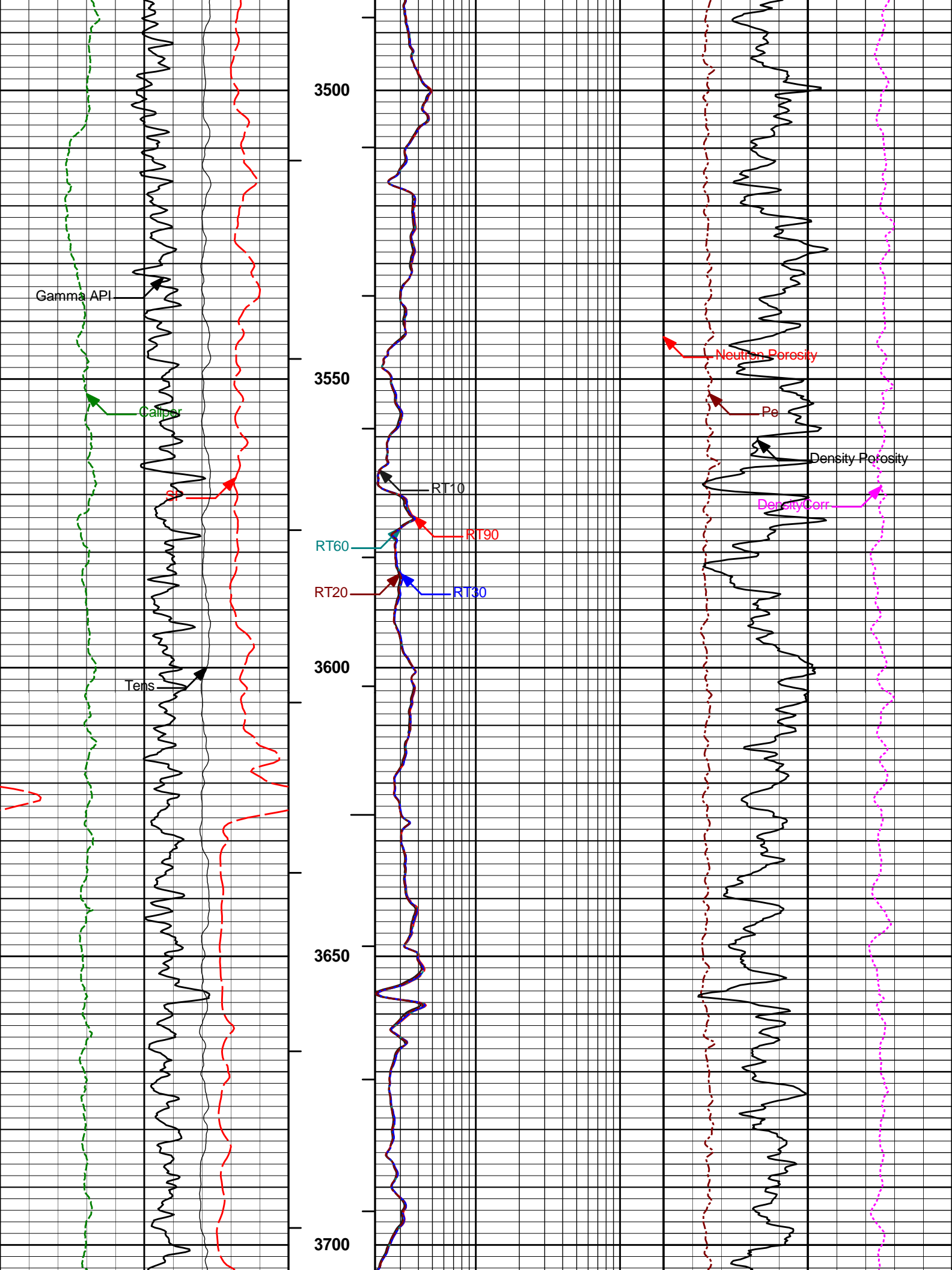




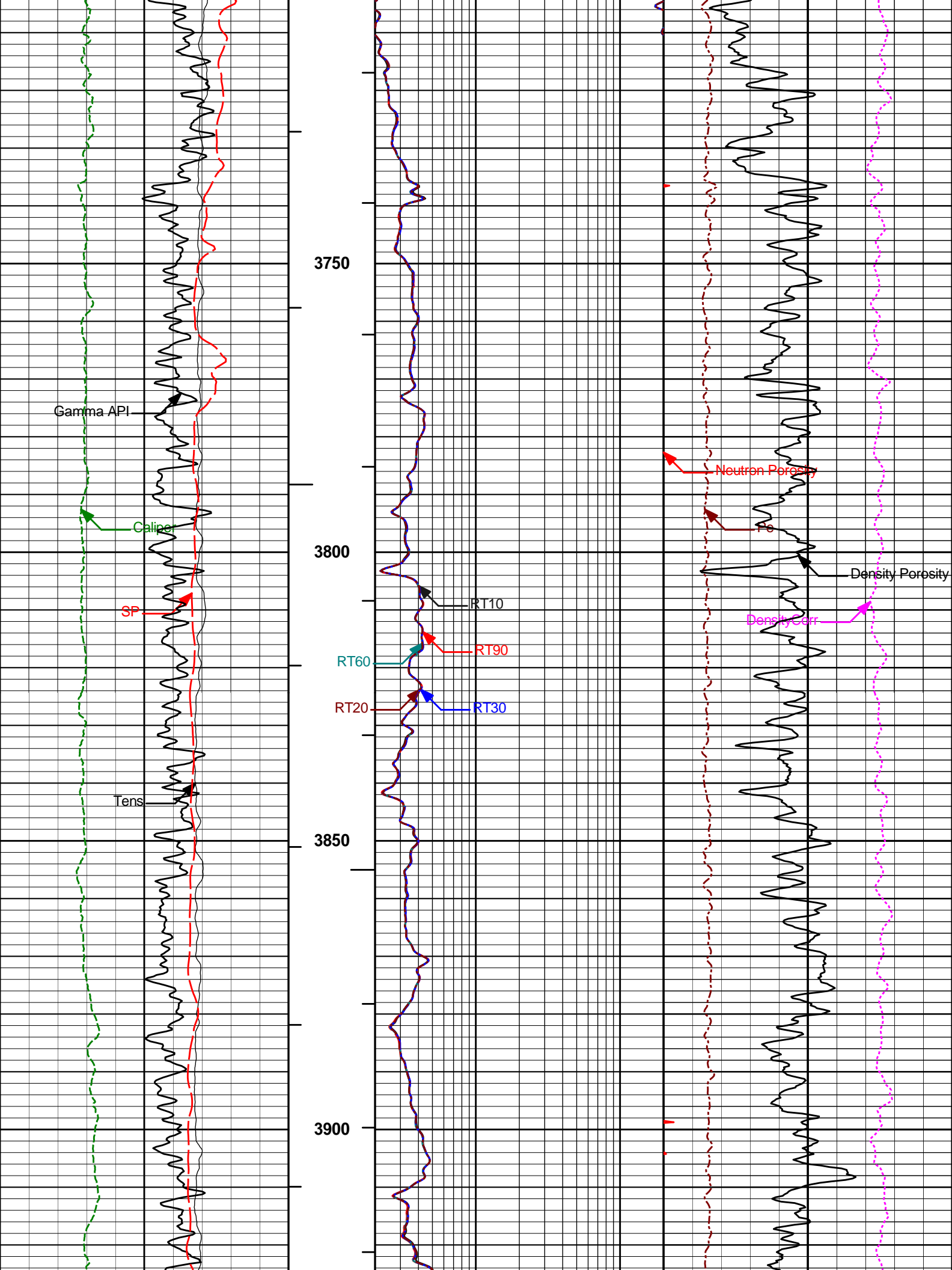


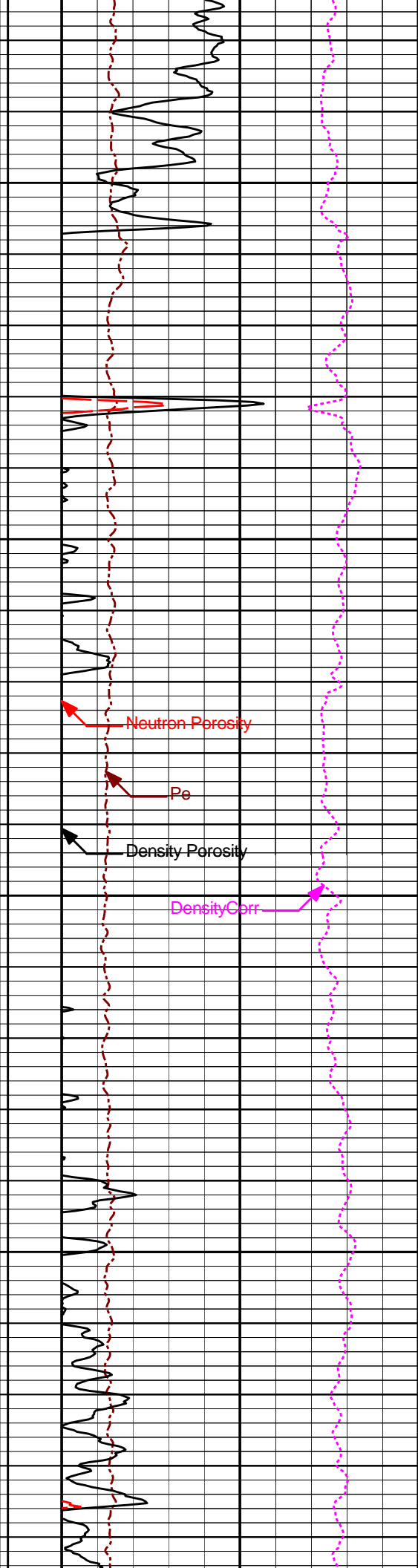
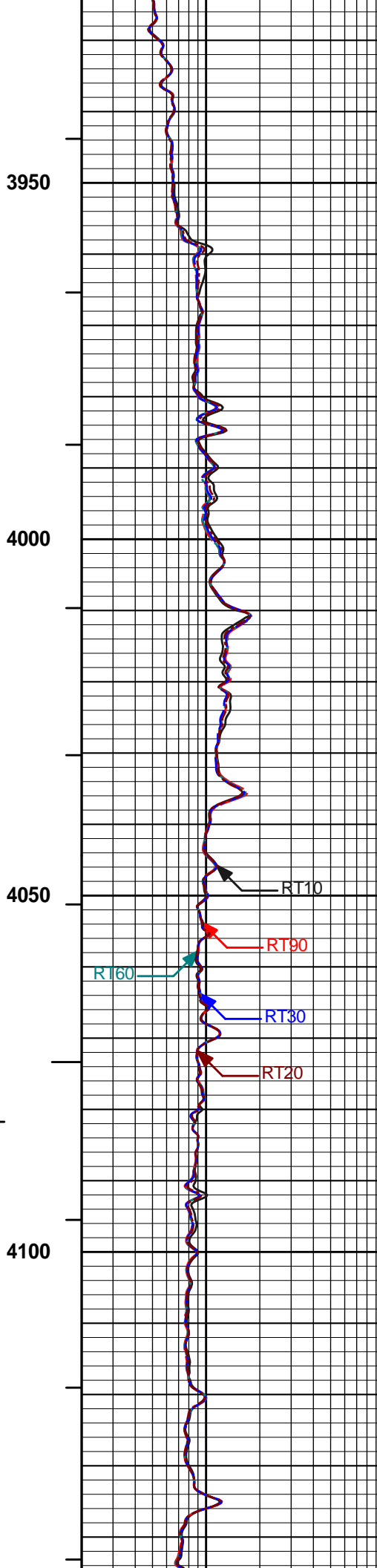
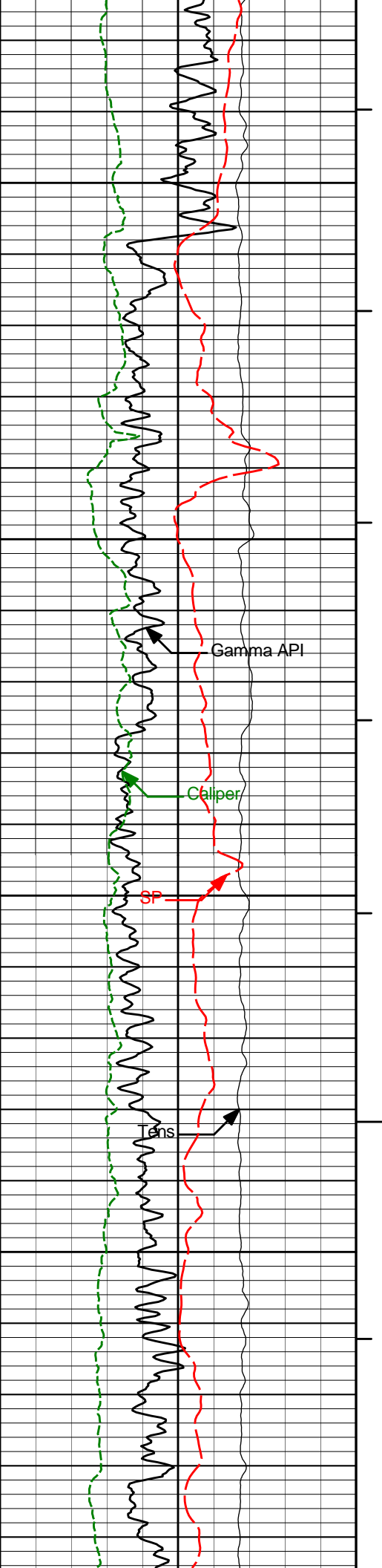


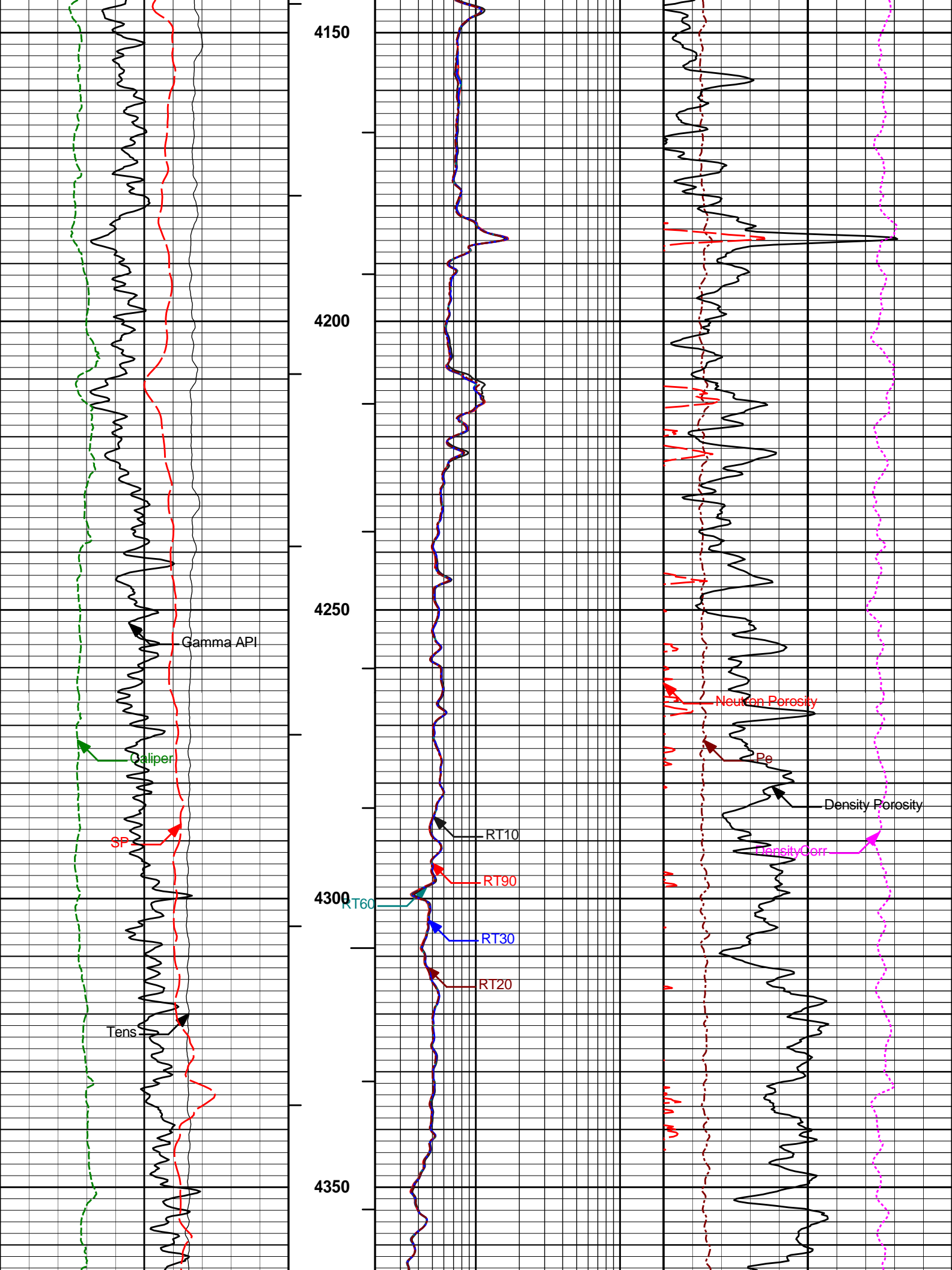


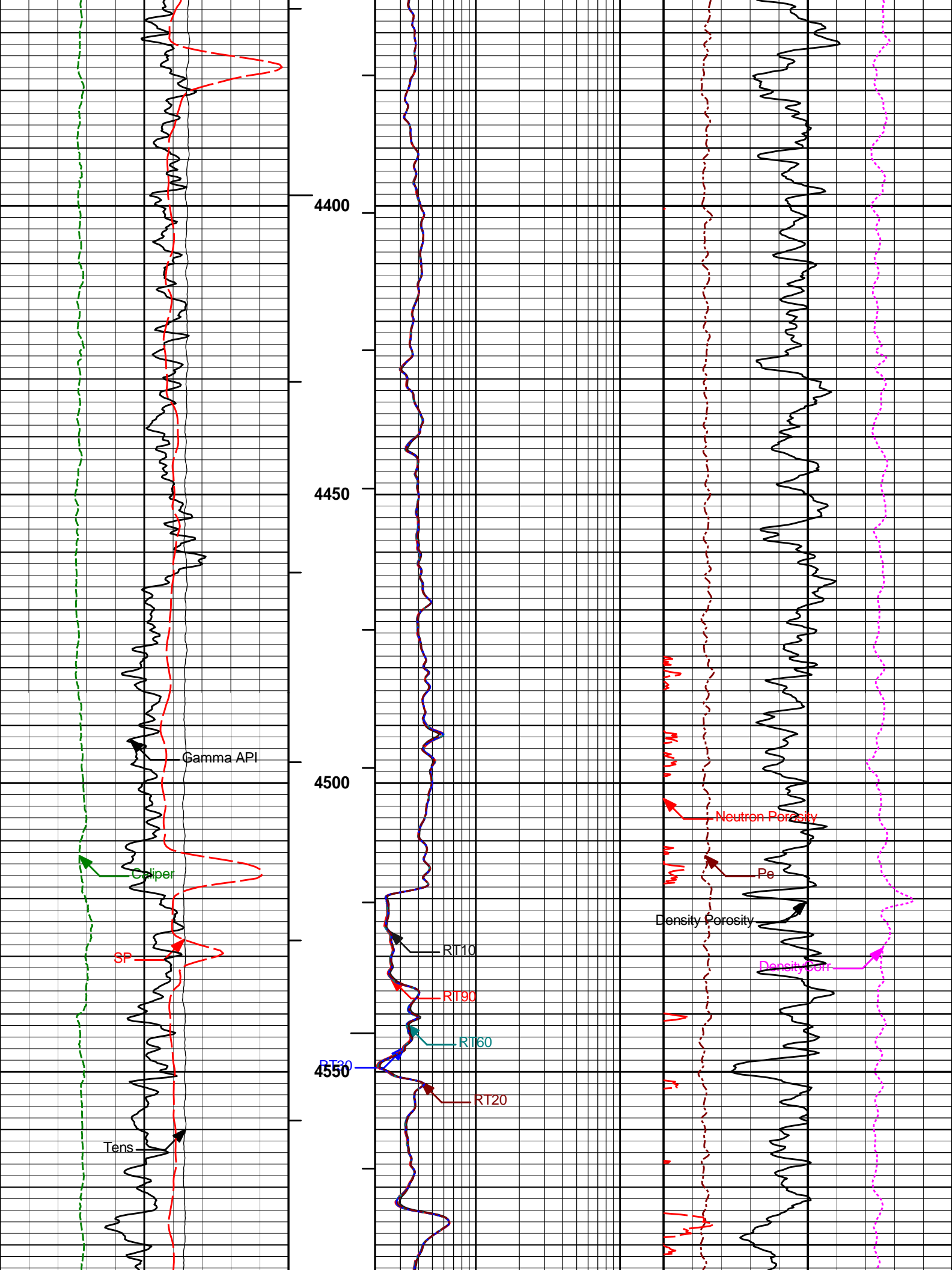


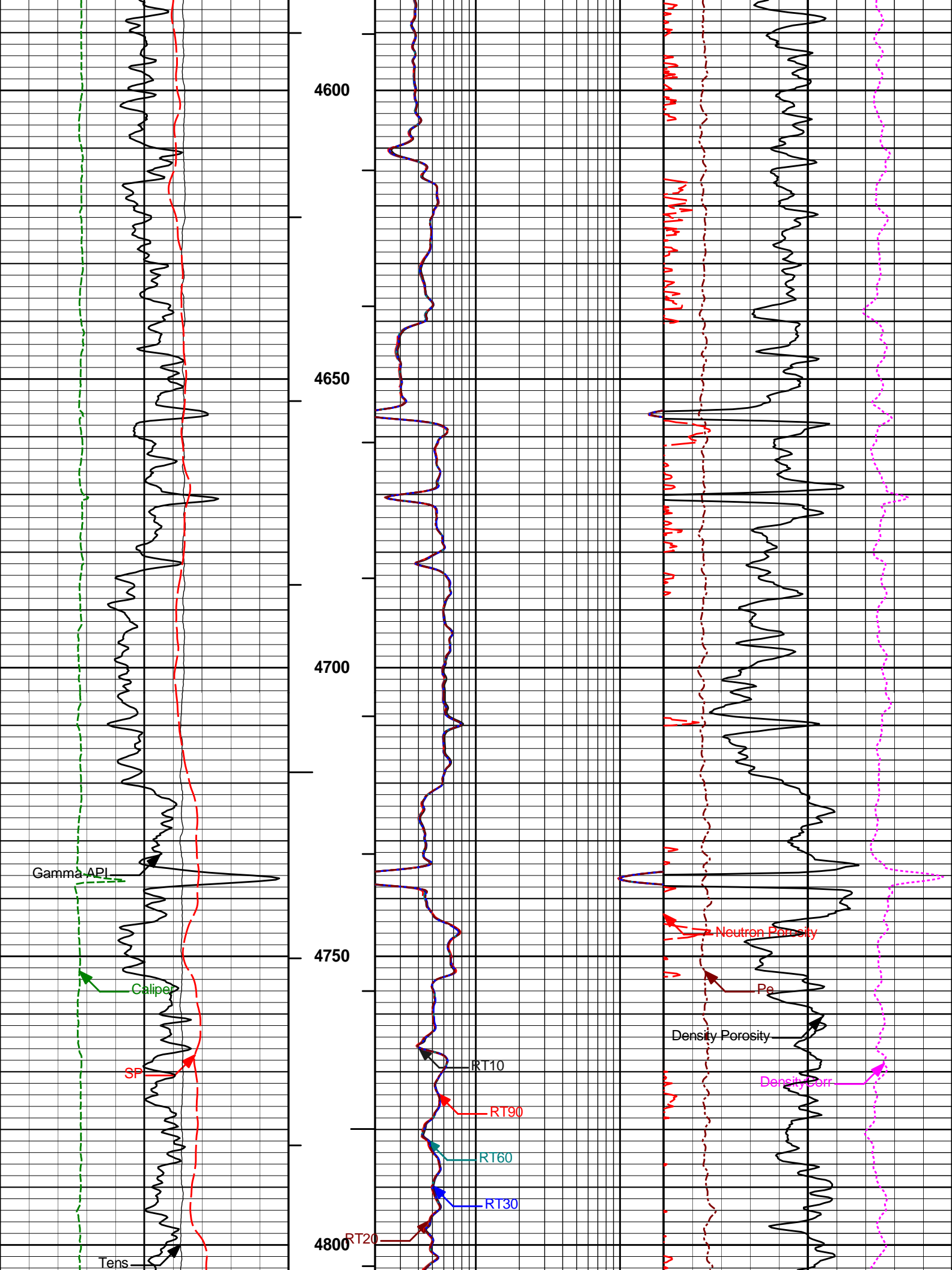


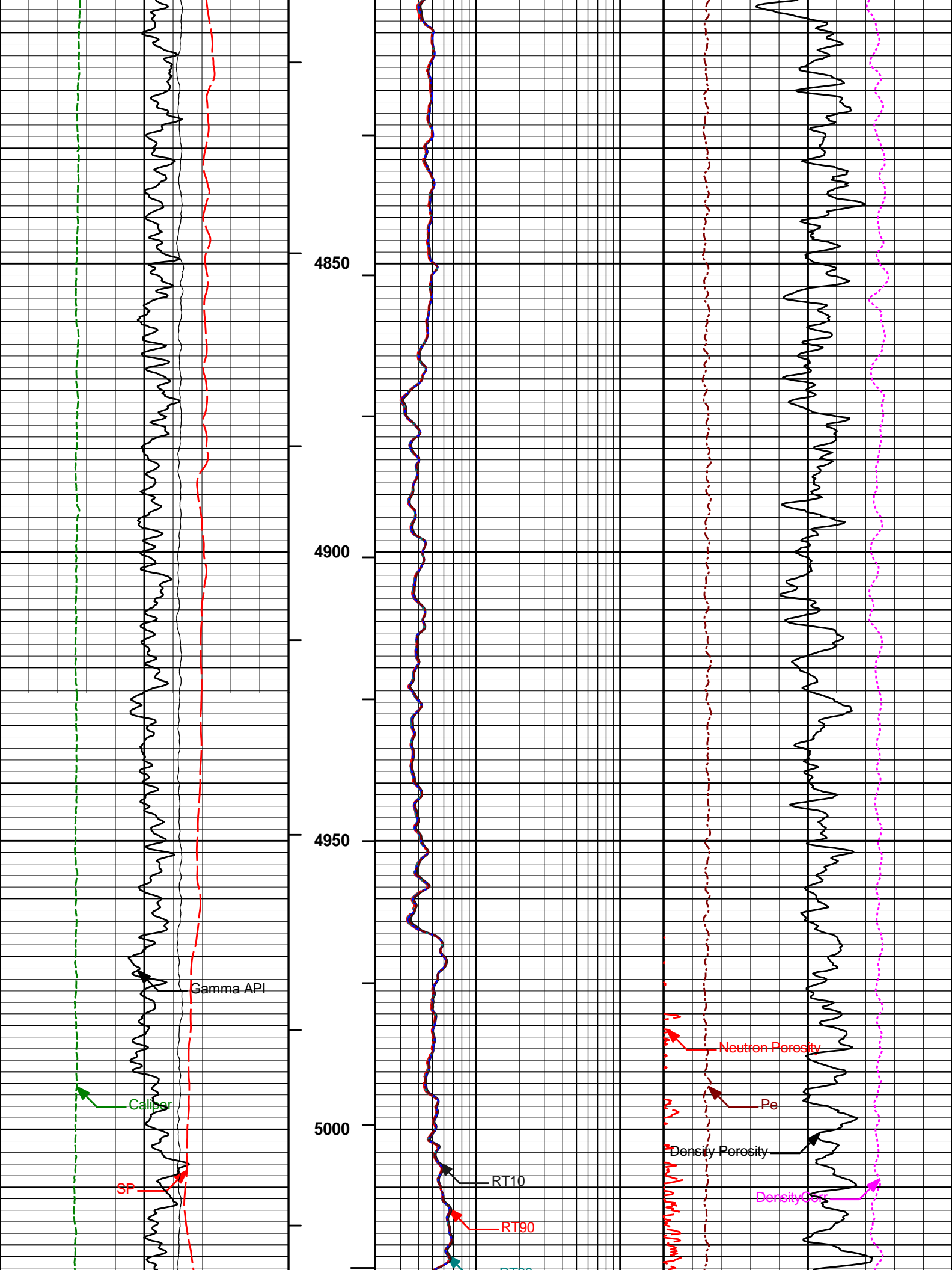


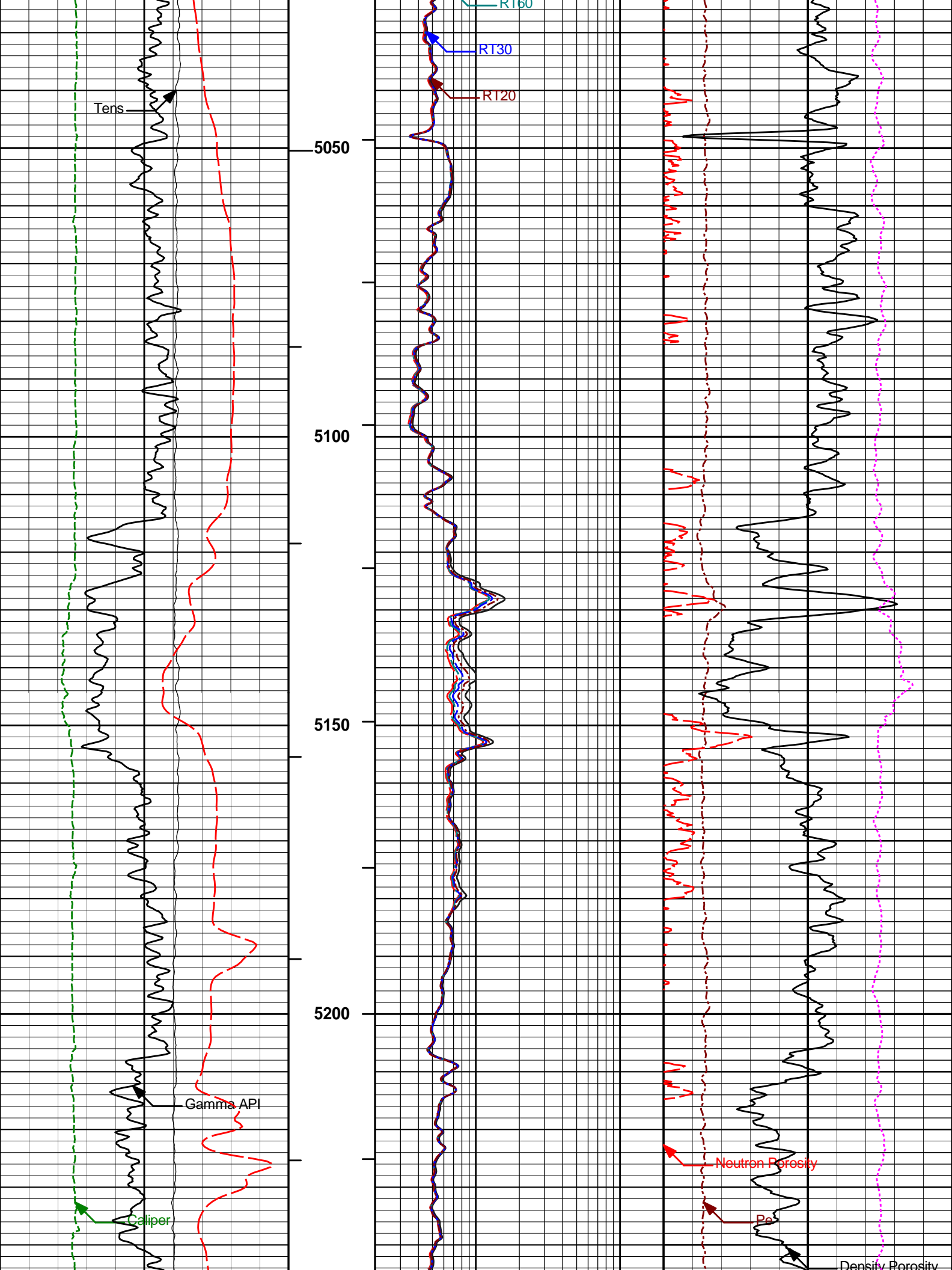


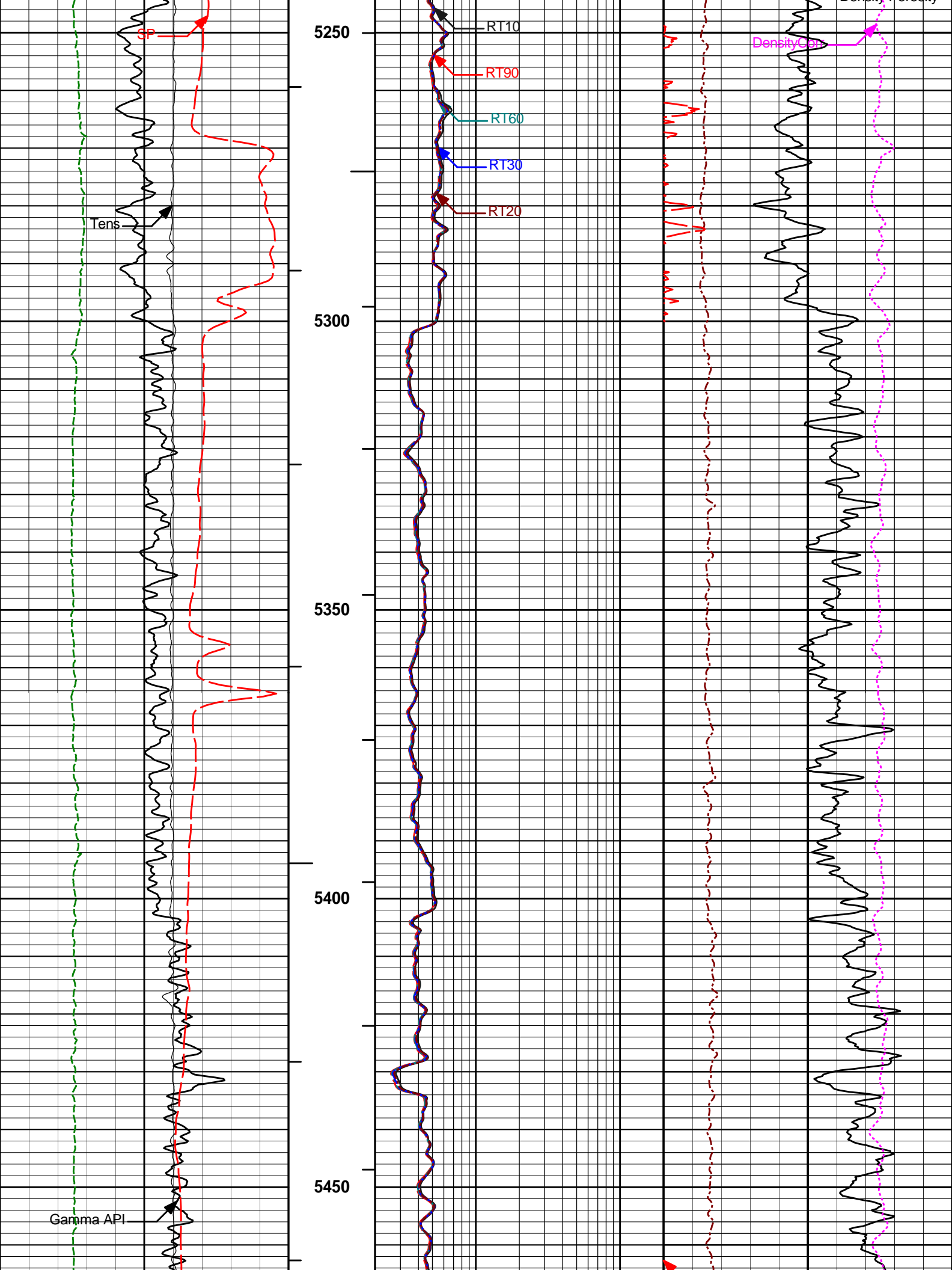




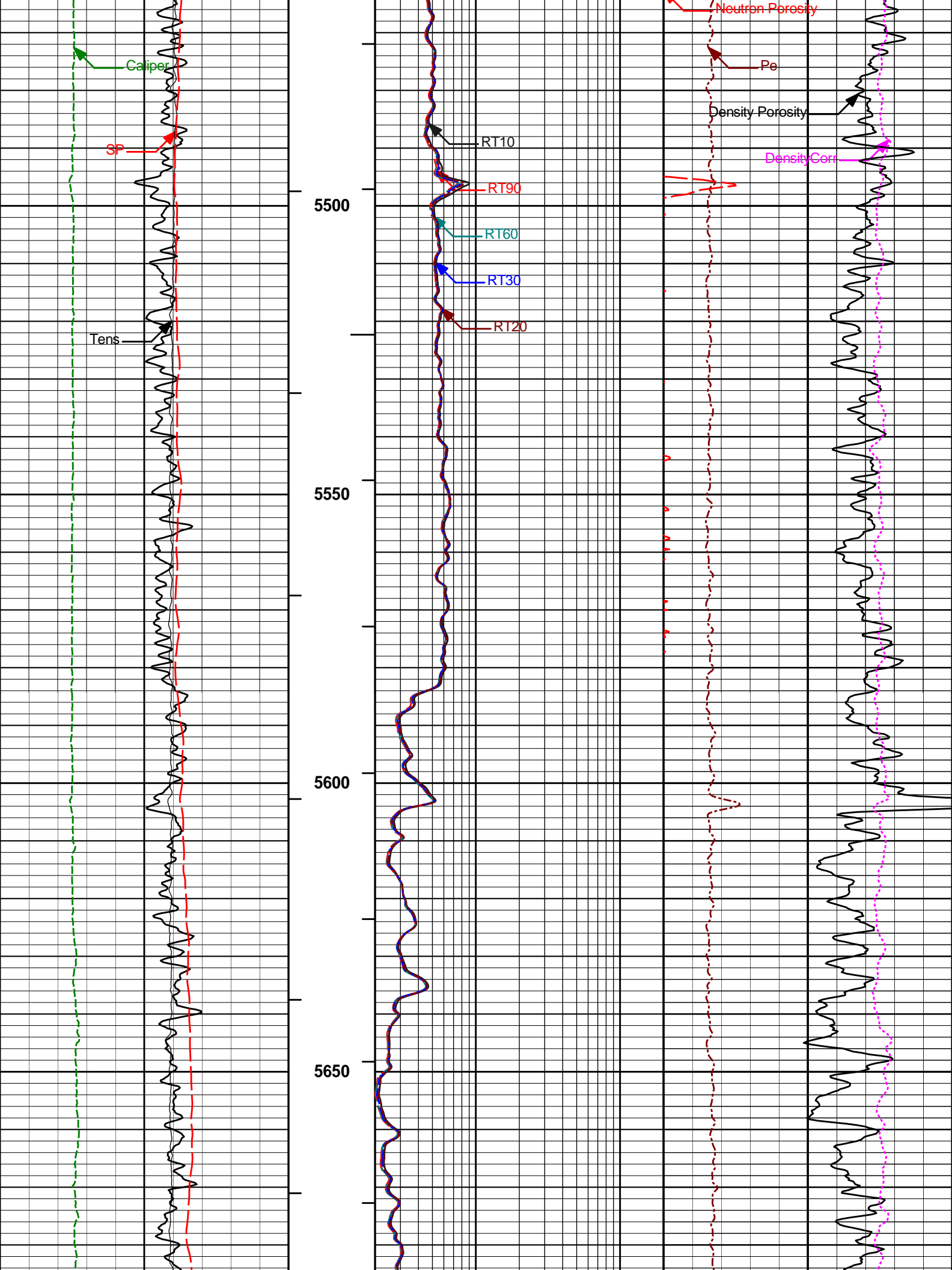


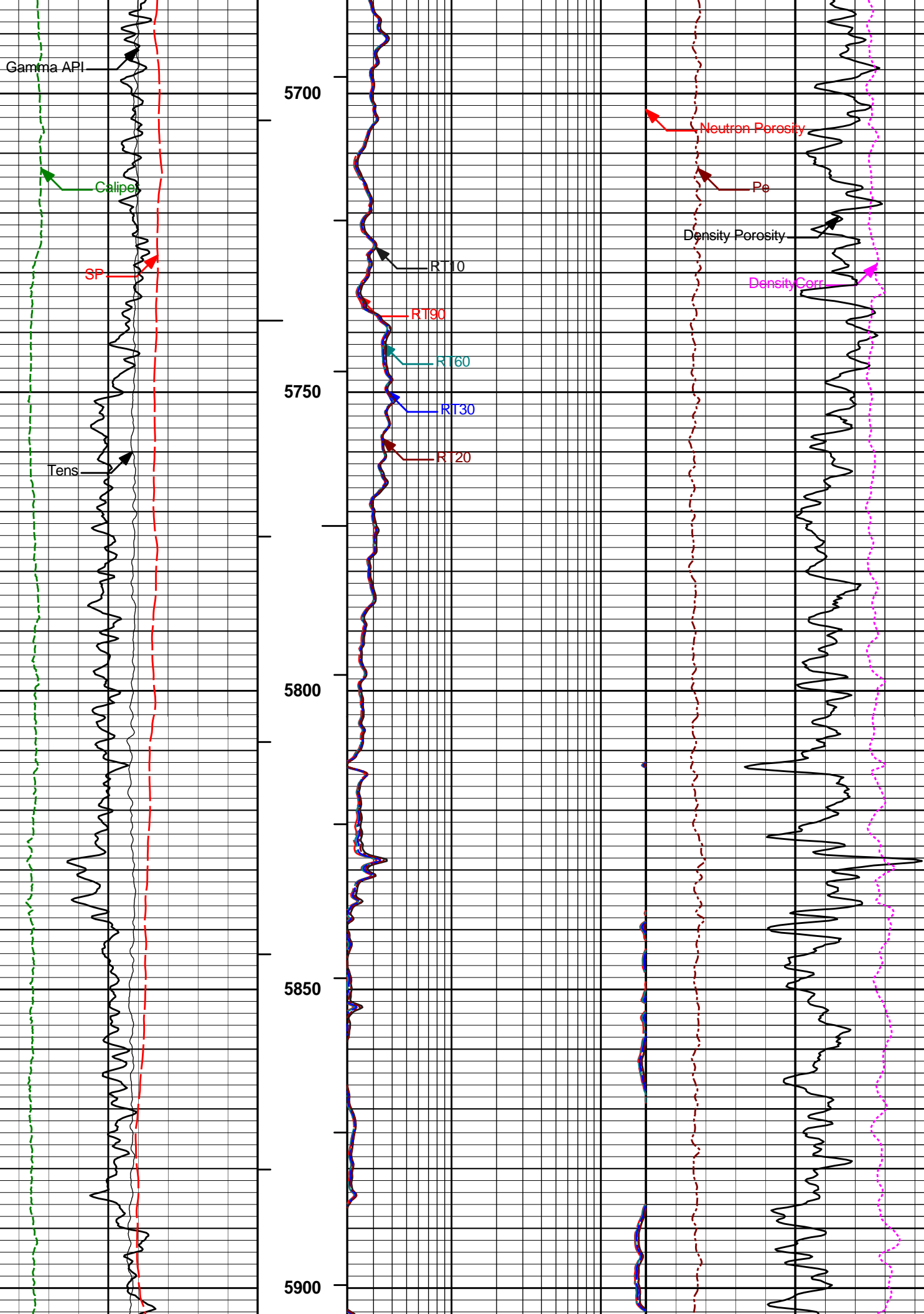


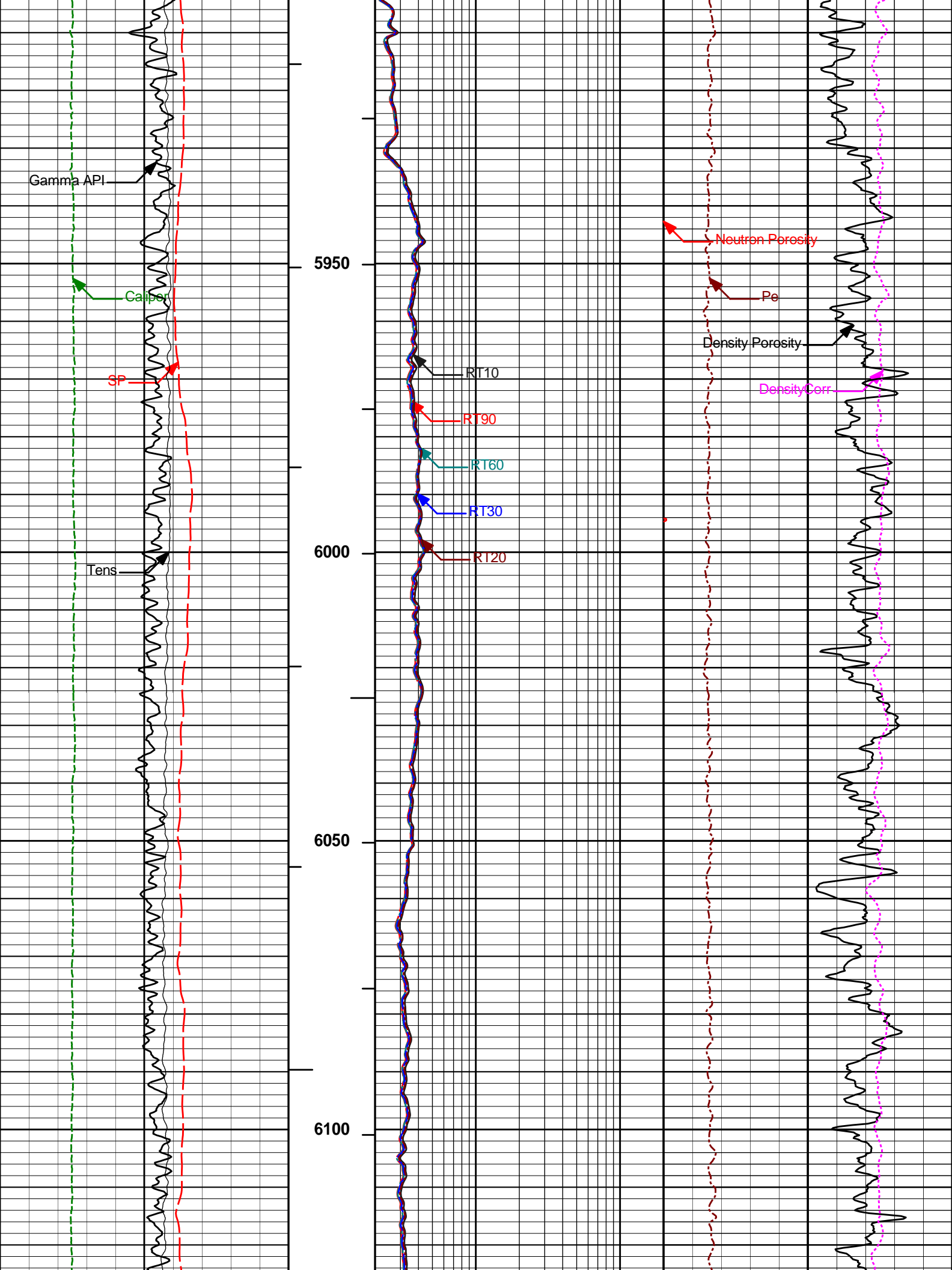


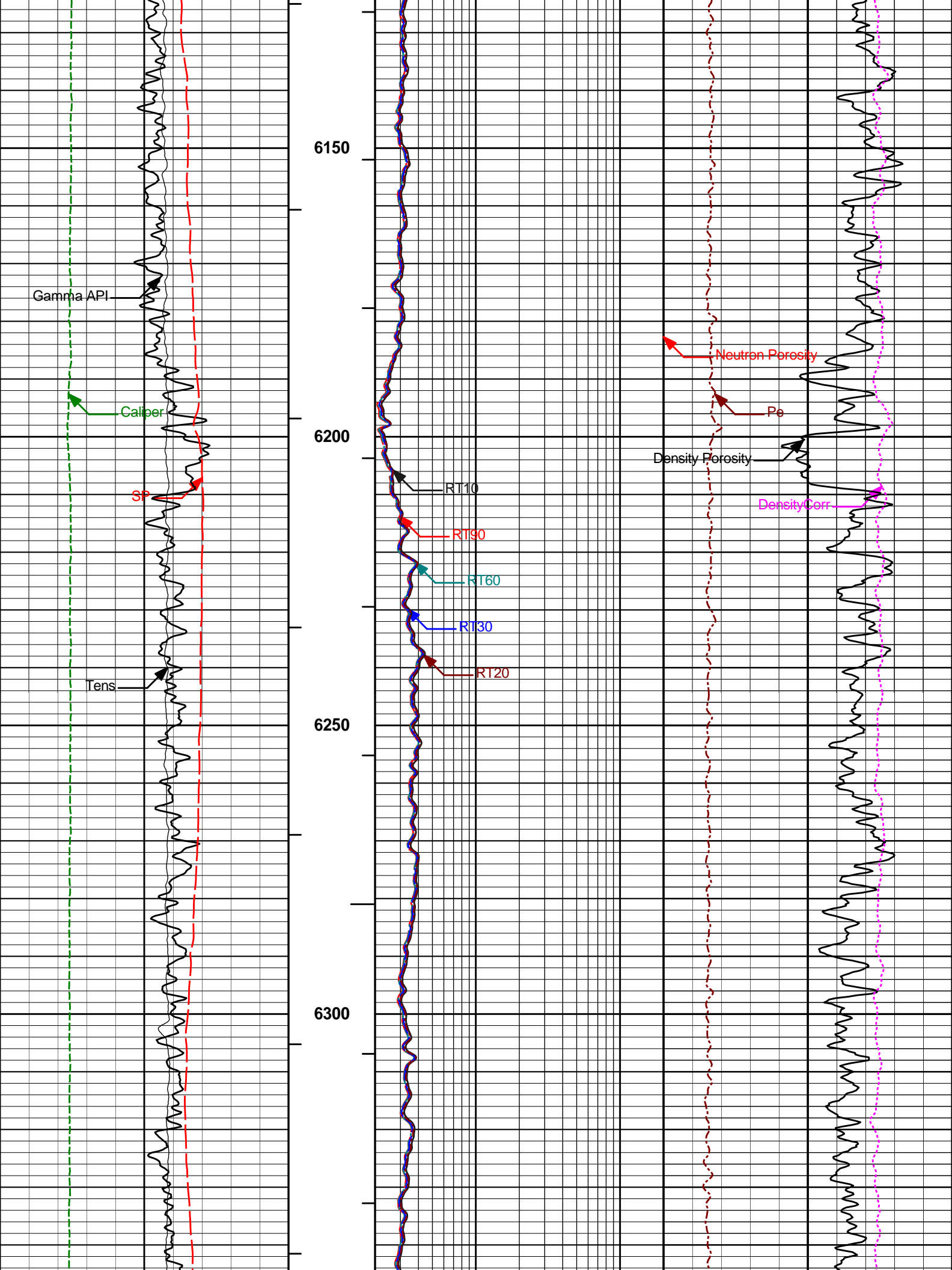


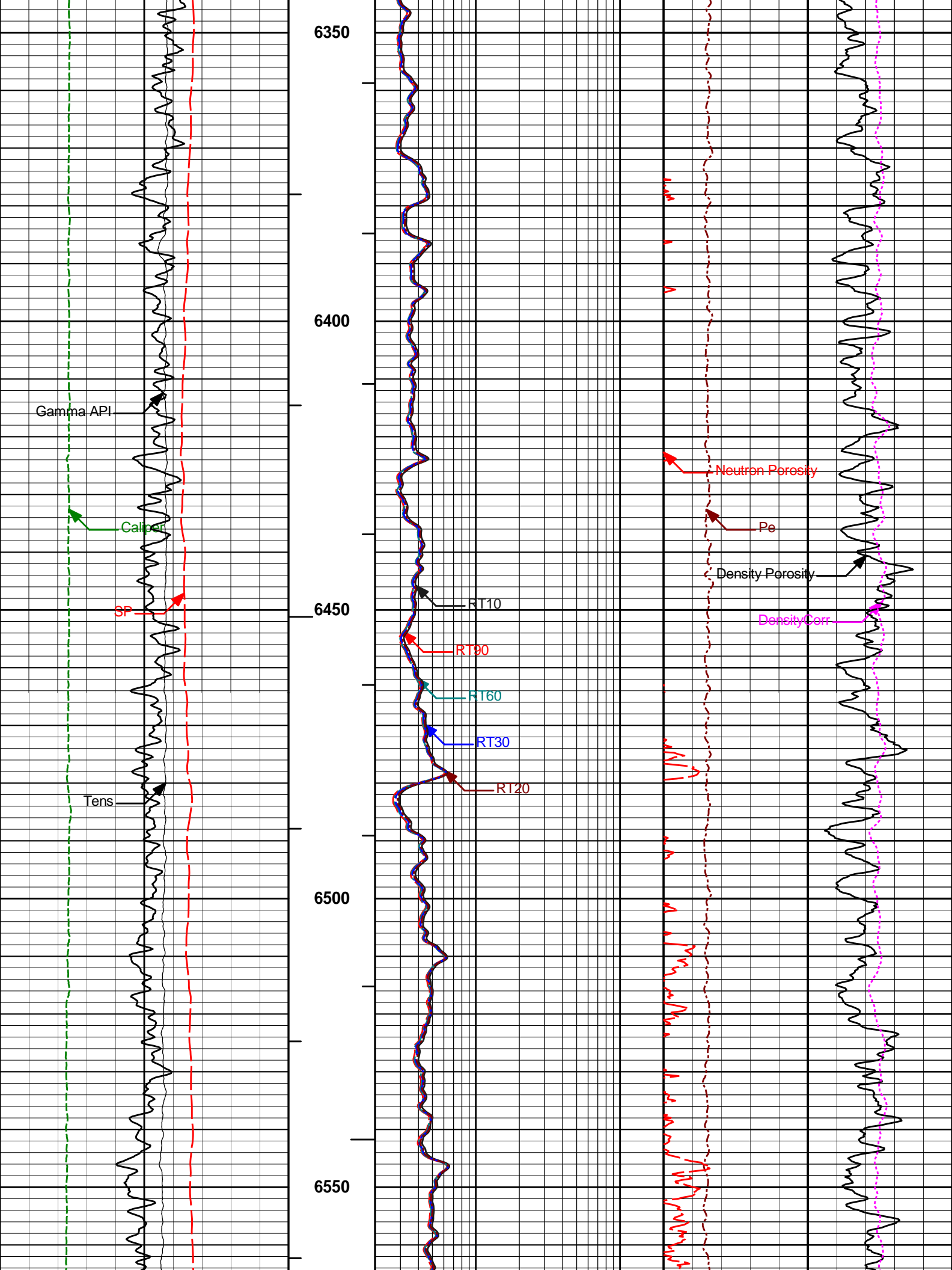


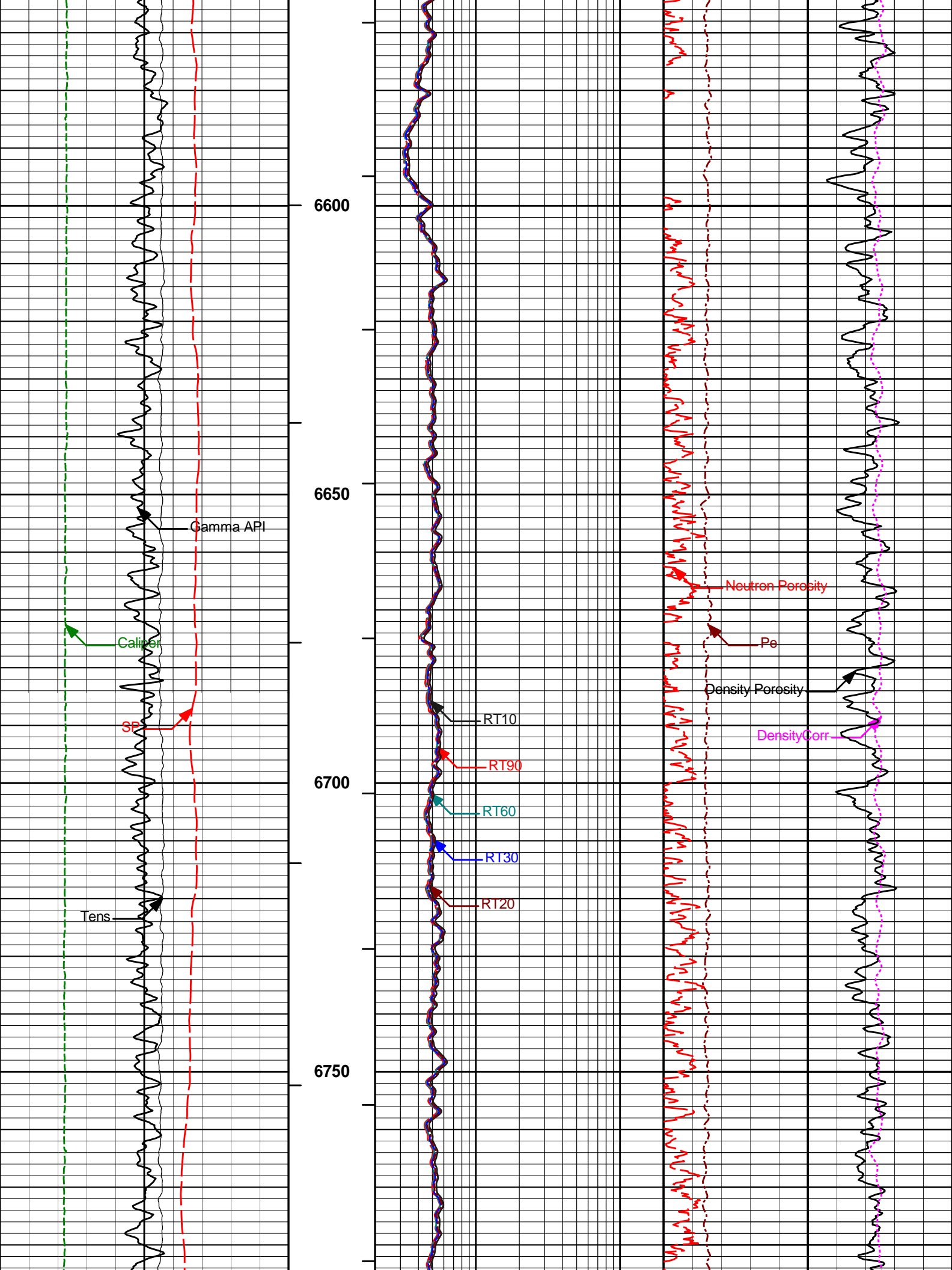


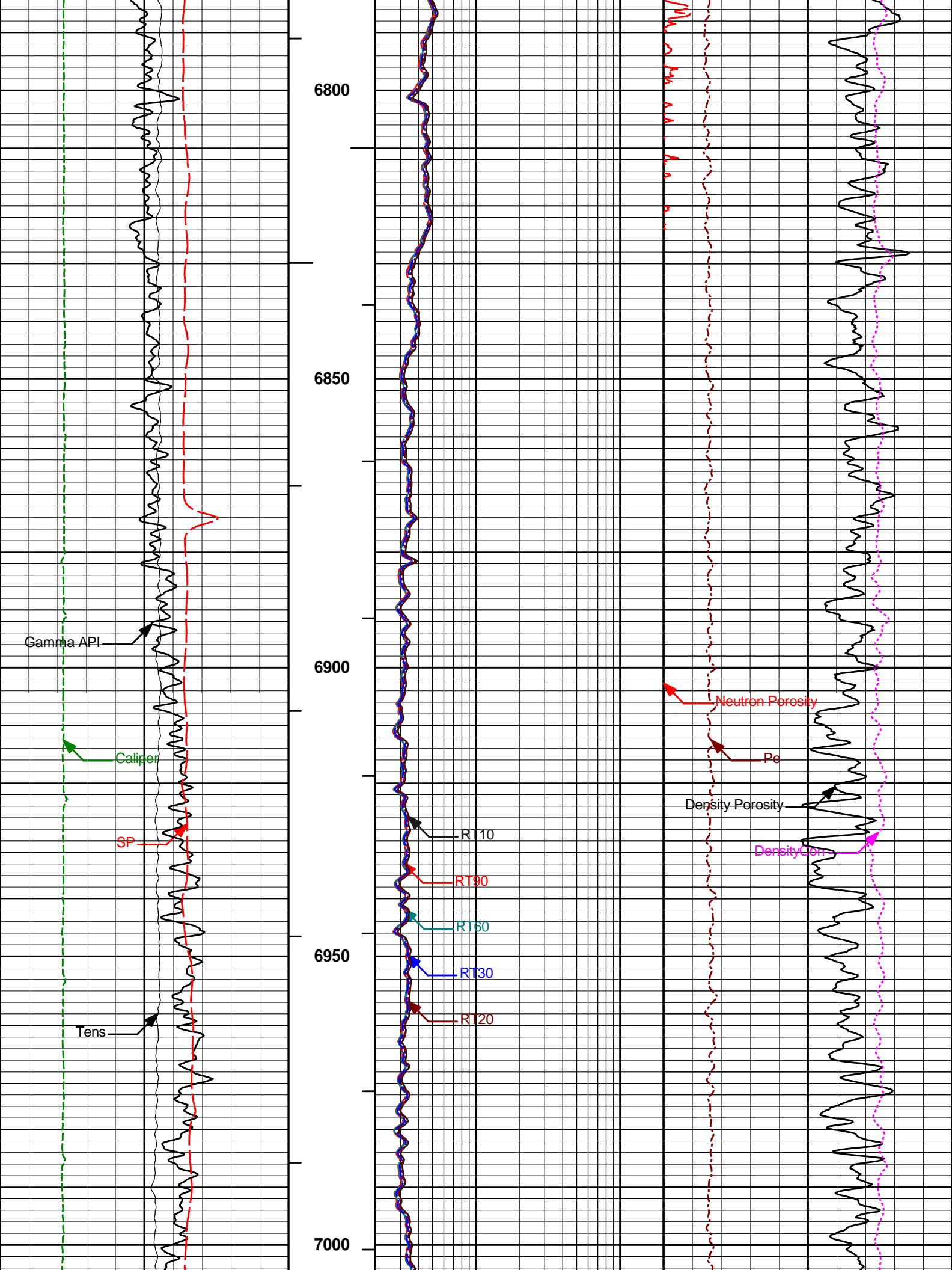


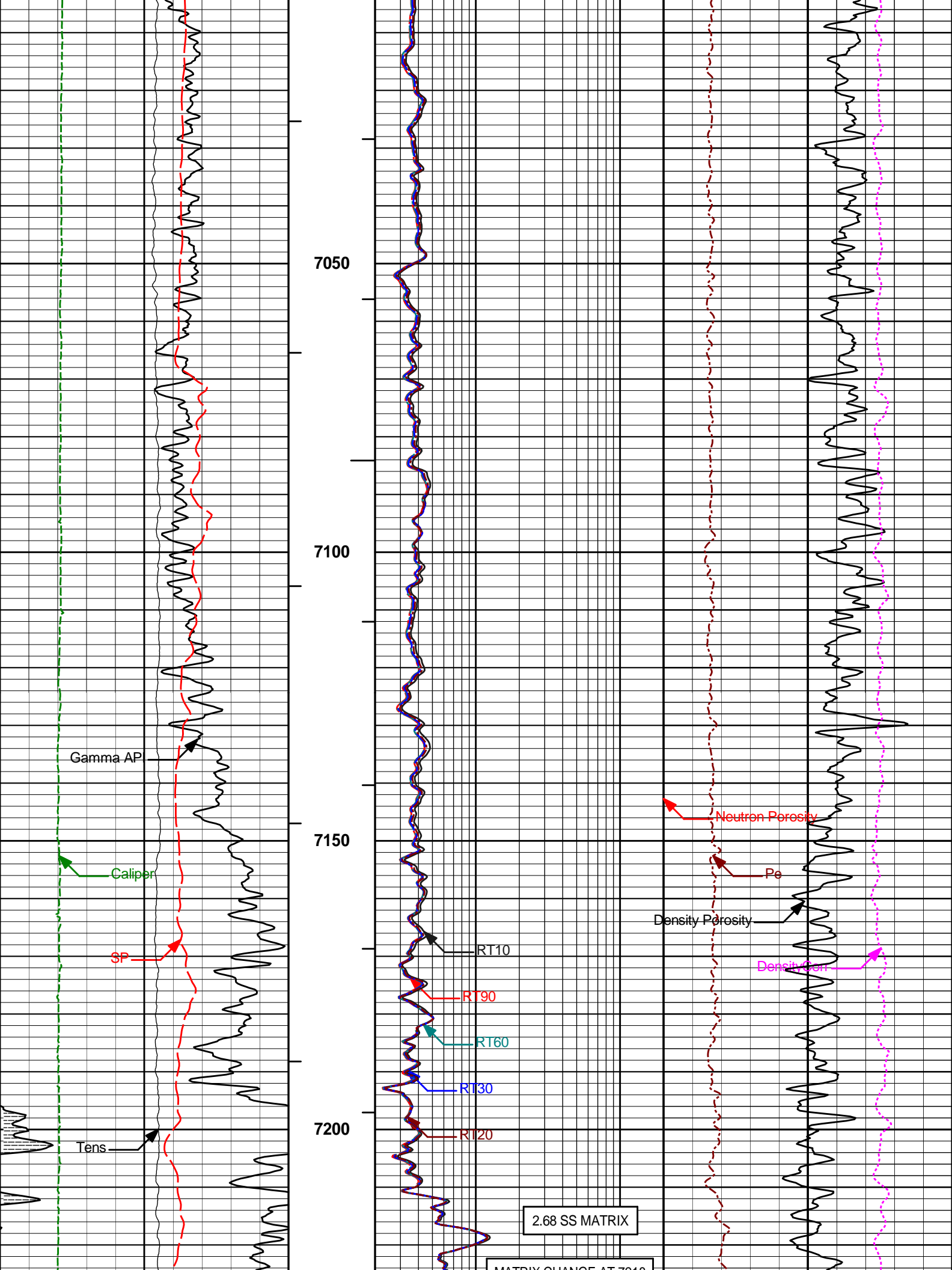




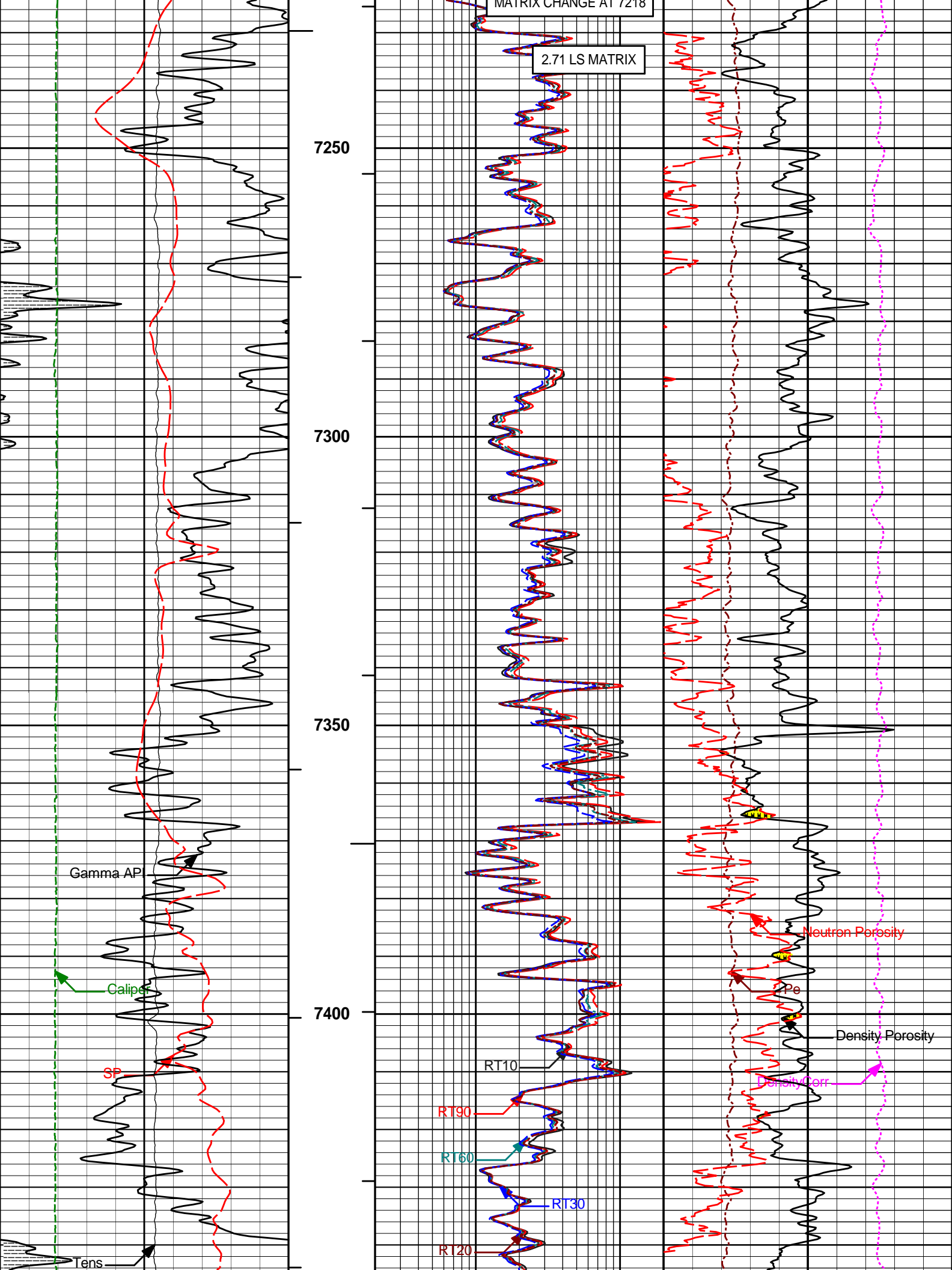


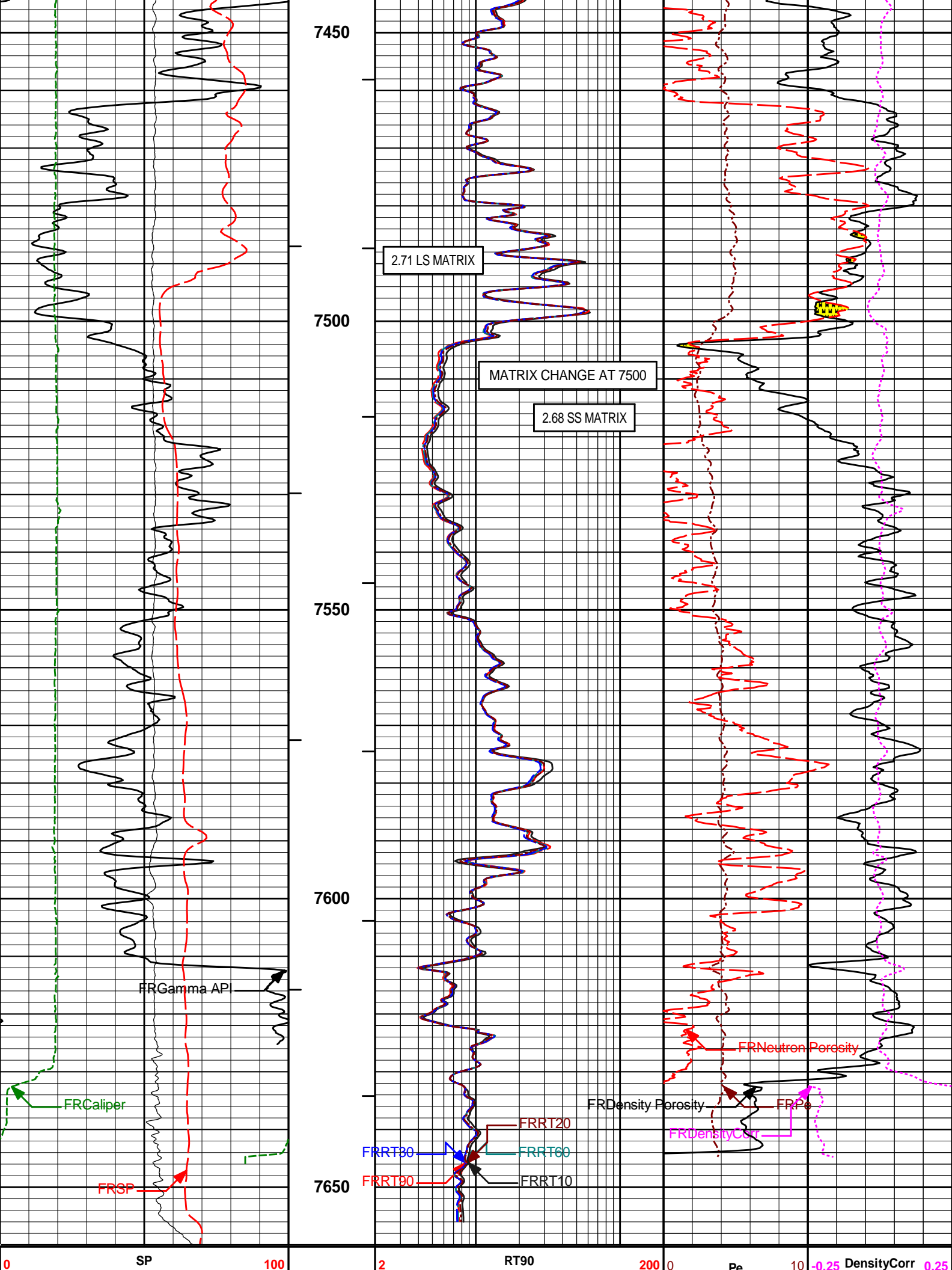




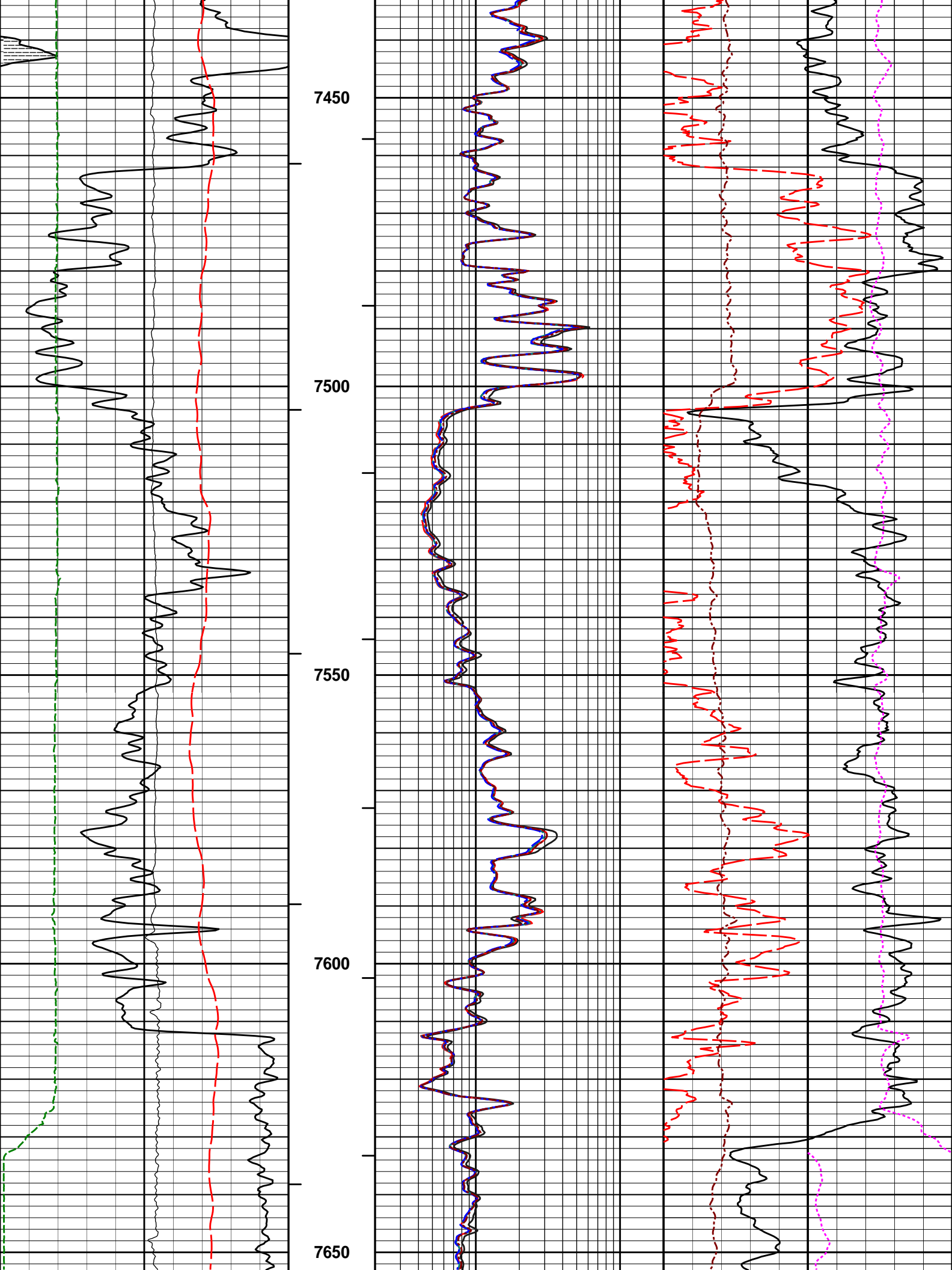


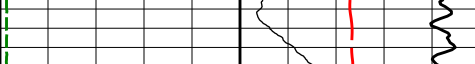
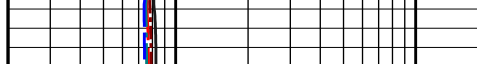











		1 : 240				
0	SP millivolts		2	RT90 ohmm	0	Pe gram per cc
0	Gamma API api	BHVT	2	RT60 ohmm	20 Density Porosity percent	
6	Caliper inches		2	RT30 ohmm	20 Neutron Porosity percent	
10K	Tens pounds	AHVT	2	RT20 ohmm		
			2	RT10 ohmm		

<b>HALLIBURTON</b>		Plot Time: 13-Apr-13 15:32:25 Plot Range: 7395 ft to 7660 ft Data: THORNTON_13-22\Well Based\REPEAT\ Plot File: \\COMP\REPEAT
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REPEAT SECTION 5" = 100'
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<b>HALLIBURTON</b>
<b>CALIBRATION REPORT</b>

<b>NATURAL GAMMA RAY TOOL SHOP CALIBRATION</b>			
<b>Tool Name:</b>	<b>GTET - 11294346</b>	<b>Reference Calibration Date:</b>	<b>15-Feb-13 09:43:52</b>
<b>Engineer:</b>	<b>J. PINKETT</b>	<b>Calibration Date:</b>	<b>22-Mar-13 08:13:40</b>
<b>Software Version:</b>	<b>WL INSITE R3.8.4 (Build 5)</b>	<b>Calibration Version:</b>	<b>1</b>
Calibrator Source S/N: TB-290 Calibrator API Reference:230.00 api Equivalent Calibrator API Reference:234.0 api			
<b>Measurement</b>	<b>Measured</b>	<b>Calibrated</b>	<b>Units</b>
Background	72.9	72.0	api
Background + Calibrator	309.8	306.0	api
Calibrator	236.9	234.0	api

<b>NATURAL GAMMA RAY TOOL FIELD CALIBRATION</b>			
<b>Tool Name:</b>	<b>GTET - 11294346</b>	<b>Reference Calibration Date:</b>	<b>22-Mar-13 08:13:40</b>
<b>Engineer:</b>	<b>C. CRADDOCK</b>	<b>Calibration Date:</b>	<b>12-Apr-13 17:04:15</b>
<b>Software Version:</b>	<b>WL INSITE R3.8.4 (Build 5)</b>	<b>Calibration Version:</b>	<b>1</b>
Calibrator Source S/N: TB-290 Calibrator API Reference:230.00 api Equivalent Calibrator API Reference:234.0 api			
<b>Field Verification</b>	<b>Shop</b>	<b>Field</b>	<b>Units</b>
Background	72.0	75.6	api
Background + Calibrator	306.0	304.6	api
Calibrator	234.0	229.0	api

	Shop	Field	Difference	Tolerance
	234.0	229.0	5.0	+/- 9.00
DUAL SPACED NEUTRON SHOP CALIBRATION				
Tool Name:	DSNT - 11219332	Reference Calibration Date:	22-Mar-13 09:59:10	
Engineer:	J. PINKETT	Calibration Date:	22-Mar-13 10:13:07	
Software Version:	WL INSITE R3.8.4 (Build 5)	Calibration Version:	1	
Logging Source S/N: DSN-430 Tank Serial Number: 11068236 Reference value assigned to Tank: 53.720 Snow Block S/N: 37526 Calibration Tank Water Temperature: 58 degF Min. Tool Housing Outside Diameter: 3.625 in				
CALIBRATION CONSTANTS				
Measurement	Prev. Value	New Value	Control Limit On New Value	
Gain:	0.977	0.974	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):	0.2232	0.2223	0.0008	+/- 0.0020
Calibrated Ratio:	10.14	10.11	0.028	+/- 0.050
VERIFIER				
Measurement	Value	Control Limit		
Snow-Block Porosity (decp):	0.0789	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 - 11219332	Reference Calibration Date:	22-Mar-13 10:13:07	
Engineer:	C. CRADDOCK	Calibration Date:	12-Apr-13 17:14:43	
Software Version:	WL INSITE R3.8.4 (Build 5)	Calibration Version:	1	
Logging Source S/N: DSN-430 Snow Block S/N: 37526				
NEUTRON FIELD-CHECK SUMMARY				
	Shop	Field	Difference	Control Limit On Change
Snow-Block Porosity (decp):	0.0789	0.0641	-0.0147	+/- 0.0150
PASS/FAIL SUMMARY				
Block Change Check:		Passed		
Snow Block Stat Check:		Passed		
Temperature Check:		Passed		
DENSITY CALIPER SHOP CALIBRATION				
Tool Name:	SDLT - 11014271	Reference Calibration Date:	15-Feb-13 11:59:38	

Engineer:	J. PINKETT	Calibration Date:	22-Mar-13 09:30:44
Software Version:	WL INSITE R3.8.4 (Build 5)	Calibration Version:	1
Host Tool Name:	DSNT - 11219332		
CALIBRATION COEFFICIENTS			
Measurement	Previous Value	New Value	Control Limit On New Value
Pad Offset	-3507.56	-3144.06	-7000.00 - -1000.00
Pad Gain	0.0003719	0.0003662	0.000200 - 0.000600
Arm Offset	-3785.84	-3975.62	-5000.00 - 3000.00
Arm Gain	0.0005246	0.0005314	0.000300 - 0.000700
Arm Power	-0.000002091	-0.000002693	-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)	1.90	2.00	0.10 +/- 0.20
Medium Ring (in)	3.67	3.75	0.08 +/- 0.20
RING DIAMETER:			
Small Ring (in)	6.44	6.50	0.06 +/- 0.20
Medium Ring (in)	8.18	8.25	0.07 +/- 0.20
Large Ring (in)	14.96	15.00	0.04 +/- 0.20
PASS/FAIL SUMMARY			
Calibration-Coefficients Range Check:		Passed	
Ring-Measurement Check:		Passed	
PASS/FAIL SUMMARY			
Calibration-Coefficients Range Check:		Passed	
SDLT CALIPER FIELD CALIBRATION			
Tool Name:	SDLT - 11014271	Reference Calibration Date:	22-Mar-13 09:30:44
Engineer:	C. CRADDOCK	Calibration Date:	12-Apr-13 17:08:23
Software Version:	WL INSITE R3.8.4 (Build 5)	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	8.26	0.01 +/- 0.15
PASS/FAIL SUMMARY			
Pad Extension Check:		Passed	
Diameter Check:		Passed	
SPECTRAL DENSITY SHOP CALIBRATION			
Tool Name:	SDLT Pad - 11816600	Reference Calibration Date:	22-Mar-13 08:31:23
Engineer:	J. PINKETT	Calibration Date:	22-Mar-13 08:52:14
Software Version:	WL INSITE R3.8.4 (Build 5)	Calibration Version:	1
Logging Source S/N: 5256GW			
Aluminum Block S/N: 63066	Density: 2.590g/cc		Pe: 3.120
Magnesium Block S/N: 12345	Density: 1.691g/cc		Pe: 2.650

# DENSITY CALIBRATION SUMMARY

Measurement	Previous Value	New Value	Control Limit
Near Bar Gain	1.0817	1.0616	0.90 - 1.10
Near Dens Gain	1.0322	1.0096	0.90 - 1.10
Near Peak Gain	1.0162	0.9973	0.90 - 1.10
Near Lith Gain	0.9845	0.9727	0.90 - 1.10
Far Bar Gain	0.9992	0.9979	0.90 - 1.10
Far Dens Gain	0.9867	0.9839	0.90 - 1.10
Far Peak Gain	0.9808	0.9800	0.90 - 1.10
Far Lith Gain	0.9657	0.9648	0.90 - 1.10
Near Bar Offset	-0.6723	-0.4869	NONE
Near Dens Offset	-0.1843	0.0157	NONE
Near Peak Offset	-0.0261	0.1320	NONE
Near Lith Offset	0.2283	0.3255	NONE
Far Bar Offset	0.0508	0.0621	NONE
Far Dens Offset	0.1655	0.1900	NONE
Far Peak Offset	0.1991	0.2057	NONE
Far Lith Offset	0.2998	0.3070	NONE
Near Bar Background	1025.20	1024.21	700 - 1450
Near Dens Background	340.91	342.18	230 - 480
Near Peak Background	149.51	149.06	100 - 210
Near Lith Background	182.61	183.23	125 - 260
Far Bar Background	655.86	656.41	450 - 900
Far Dens Background	256.28	256.53	175 - 345
Far Peak Background	101.89	102.23	70 - 140
Far Lith Background	105.45	104.74	75 - 145

# CALIBRATION BLOCK SUMMARY

Measurement	Current Reading (Previous Coef)	Calibrated (New Coef)	Change	Control Limit On Change
MAGNESIUM				
Density (g/cc)	1.693	1.691	-0.002	+/- 0.015
Pe	2.592	2.600	0.008	+/- 0.150
ALUMINUM				
Density (g/cc)	2.588	2.590	0.002	+/- 0.01500
Pe	3.066	3.077	0.011	+/- 0.150

# TOOL SUMMARY

Measurement	Near Detector		Far Detector	
	Value	Control Limits	Value	Control Limits
QUALITY				
Background	-0.0005	+/- 0.0110	0.0004	+/- 0.0140
Magnesium Block	-0.0002	+/- 0.0110	-0.0018	+/- 0.0140
Aluminum Block	-0.0007	+/- 0.0110	0.0001	+/- 0.0140
Resolution	8.58	6.00 - 11.50	8.79	6.00 - 11.50
Internal Verifier(B+D+P+L)	1699	1200 - 2700	1120	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 - 11816600	Reference Calibration Date:	22-Mar-13 08:52:14
Engineer:	C. CRADDOCK	Calibration Date:	12-Apr-13 17:03:22
Software Version:	WL INSITE R3.8.4 (Build 5)	Calibration Version:	1

Pad Temperature: 64.7 degF

DENSITY FIELD CALIBRATION SUMMARY				
Measurement	Shop	Field	Change	Control Limit +/-
Near (B+D+P+L) cps	1698.671	1703.204	4.533	16.543
Far (B+D+P+L) cps	1119.907	1122.514	2.607	17.620
Near Resolution	8.58	8.66	0.080	0.50
Far Resolution	8.79	8.87	0.080	1.00

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

ARRAY COMPENSATED TRUE RESISTIVITY SHOP CALIBRATION			
Tool Name:	ACRt Sonde - 11585797	Reference Calibration Date:	29-Nov-12 13:18:43
Engineer:	J. PINKETT	Calibration Date:	01-Apr-13 21:19:13
Software Version:	WL INSITE R3.8.4 (Build 5)	Calibration Version:	1
Host Tool Name:	ACRt Instrument - 11585787		

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	0.99	1.05	0.95	0.99	1.05
A6 (6")	N/A	N/A	N/A	0.95	0.98	1.05	0.95	0.98	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	-3.06	2	-6	-5.14	-2	-8	-6.12	-2
A2 (50")	-7	-2.29	0	-7	-3.50	0	-7	-4.50	0
A3 (29")	-27	-17.11	-9	-9	-4.61	-3	-7	-3.44	-1
A4 (17")	-180	-119.14	-60	-45	-35.44	-15	-39	-27.14	-13
A5 (10")	N/A	N/A	N/A	-150	-95.73	-50	-80	-49.25	-10
A6 (6")	N/A	N/A	N/A	175	307.88	525	90	155.80	270

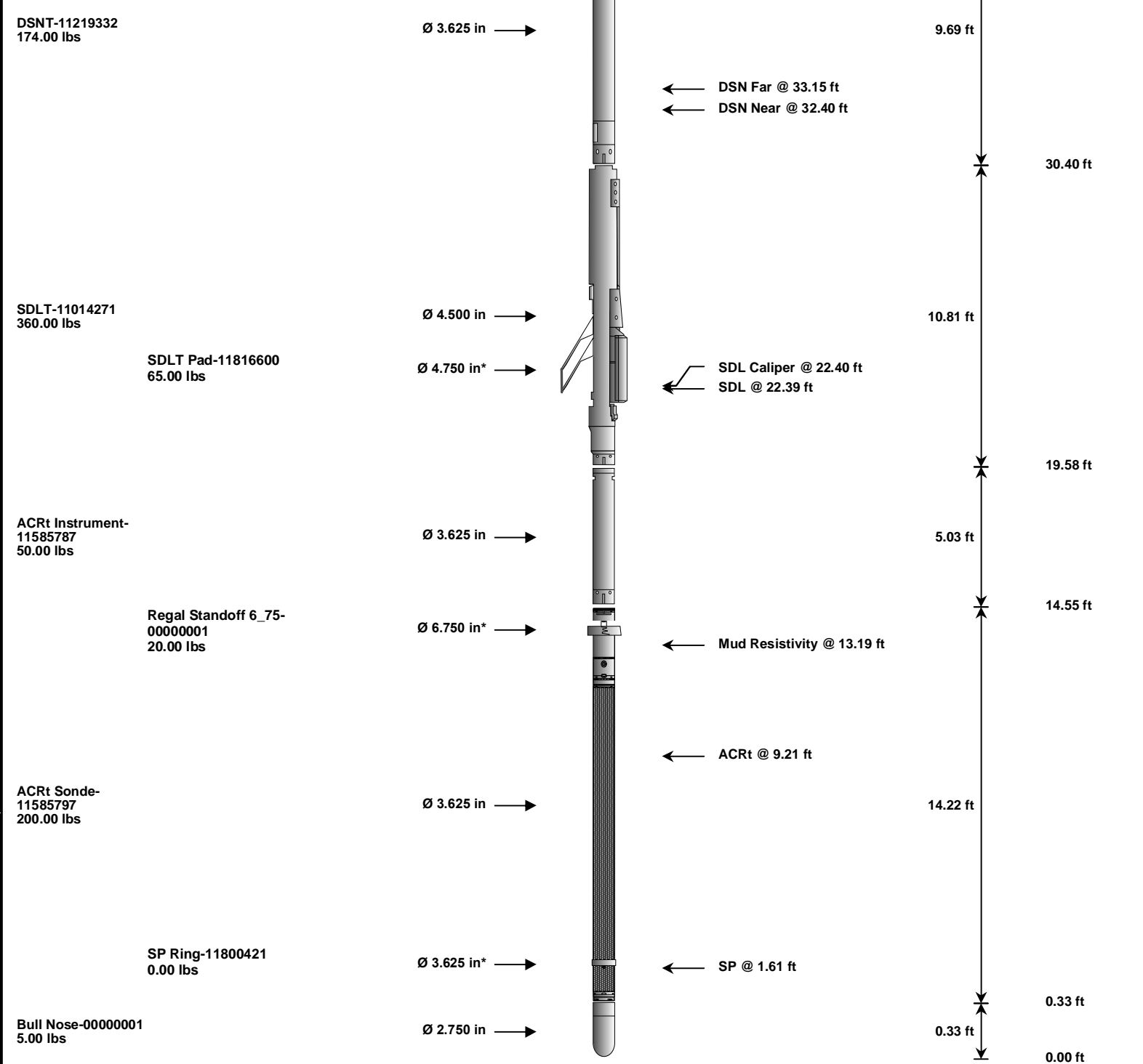
TRANSMITTER CURRENT GAIN				R-MUD VERIFICATION			
	Lower	Measured	Upper		Lower	Measured	Upper

Signal	Lower	R	Upper	Signal	Lower (ohm-m)	measured (ohm-m)	Upper (ohm-m)
12K	0.6	0.85	1.3	Mud Cell	0.95	1.00	1.05
36K	1.0	1.83	2.0				
72K	1.0	1.10	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-11294346						
Gamma Ray Calibrator	234.0	229.0	-----	5.0	+/- 9.00	api
DSNT-11219332						
Snow-Block Porosity	0.0789	0.0641	-----	0.0148	+/- 0.0150	decp
SDLT-11014271						
Pad Extension	3.75	3.74	-----	0.01	+/-0.10	in
Ring Diameter	8.25	8.26	-----	-0.01	+/-0.15	in
SDLT Pad-11816600						
Near(B+D+P+L)	1698.671	1703.204	-----	-4.533	+/-16.543	cps
Far(B+D+P+L)	1119.907	1122.514	-----	-2.607	+/-17.620	cps
ACRt Sonde-11585797						
Mud Cell	1.00	-----	-----	0.00	-----	ohm-m

Data: THORNTON 13-22\0001 TRIPLE WHITE SLICKIDLE	Date: 13-Apr-13 00:47:17
<div>HALLIBURTON</div> <div>TOOL STRING DIAGRAM REPORT</div>	

Description	Overbody Description	O.D.	Diagram	Sensors @ Delays	Length	Accumulated Length
RWCH-11030643 135.00 lbs		Ø 3.625 in →		← Load Cell @ 51.17 ft ← BH Temperature @ 50.60 ft	6.25 ft	54.85 ft
GTET-11294346 165.00 lbs		Ø 3.625 in →		← GammaRay @ 42.54 ft	8.52 ft	48.60 ft
						40.08 ft



COMPANY	BAYSWATER EXPLORATION AND PRODUCTION		
WELL	THORNTON 13-22		
FIELD	WATTENBERG		
COUNTY	WELD	STATE	CO
HALLIBURTON		ARRAY COMPENSATED TRUE RESISTIVITY SPECTRAL DENSITY DUAL SPACED NEUTRON	