HALLIBURTON

SPECTRAL DENSITY DUAL SPACED NEUTRON LOG

COMPANY MERIT ENERGY COMPANY, LLC
WELL LCSLU 108 (WSW)
FIELD/BLOCK BIG SKY
COUNTY GRANT STATE KANSAS

COMPANY **MERIT ENERGY COMPANY, LLC**
WELL **LCSLU 108 (WSW)**
FIELD/BLOCK **BIG SKY**
COUNTY **GRANT** STATE **KANSAS**

API No. 15067218410000
Location 238' FWL & 2596' FNL
SE SE SE NW

Sect. 10 Twp. 29S Rge. 38W

Other Services:
GTET
DSNT
SDLT
BSAT
ACRT

Permanent Datum	GL	Elev. 3112.0 ft	Elev.: K.B. 3125.0 ft
Log measured from	KB	, 3125.0 ft above perm. Datum	D.F. 3125.0 ft
Drilling measured from	KB		G.L. 3112.0 ft

Date		17-Oct-17					
Run No.		ONE					
Depth - Driller		6603.0 ft					
Depth - Logger		6601.0 ft					
Bottom - Logged Interval		6601.0 ft					
Top - Logged Interval		3630.0 ft					
Casing - Driller		8.625 in	@ 1449.0 ft	@		@	
Casing - Logger		1448.0 ft					
Bit Size		7.875 in		@		@	
Type Fluid in Hole		Water Based Mud					
Density	Viscosity	9.1 ppg	50.00 s/qt				
PH	Fluid Loss	10.50 pH	5.6 cptm				
Source of Sample		FLOWLINE					
Rm @ Meas. Temperature		0.88 ohmm	@ 75.00 degF	@		@	
Rmf @ Meas. Temperature		0.68 ohmm	@ 75.00 degF	@		@	
Rmc @ Meas. Temperature		1.01 ohmm	@ 75.00 degF	@		@	
Source Rmf	Rmc	MEAS	MEAS				
Rm @ BHT		0.64 ohmm	@ 144.0 degF	@		@	
Time Since Circulation		05:52 hr					
Time on Bottom		18-Oct-17 02:07					
Max. Rec. Temperature		144.00 degF	@ 6601.0 ft	@		@	
Equipment	Location	12156883	EL RENO, OK				
Recorded By		MICHAEL RICHTER					
Witnessed By		MARTIN LANGE		TROY FOWLER			

Fold here

Service Ticket No.: 904370552 API No.: 15067218410000 PGM Version: WL INSITE R5.0.5 (Build 8)

CHANGE IN MUD TYPE OR ADDITIONAL SAMPLE

	Sample No.						
Date							
Depth-Driller							
Type Fluid in Hole							
Density	Viscosity						
Ph	Fluid Loss						
Source of Sample							
Rm @ Meas. Temp		@	@	@	@	@	@
Rmf @ Meas. Temp.		@	@	@	@	@	@
Rmc @ Meas. Temp.		@	@	@	@	@	@
Source Rmf	Rmc						
Rm @ BHT		@	@	@	@	@	@
Rmf @ BHT		@	@	@	@	@	@
Rmc @ BHT		@	@	@	@	@	@

RESISTIVITY SCALE CHANGES

	Type Log	Depth	Scale Up Hole	Scale Down Hole

RESISTIVITY EQUIPMENT DATA

	Run No.	Tool Type & No.	Pad Type	Tool Pos.	Other
	ONE	ACRT	NONE	CENT	N/A
		I-11055059			
		S-11038385			

EQUIPMENT DATA

	GAMMA		ACOUSTIC			DENSITY			NEUTRON		
					Matrix			Matrix			Matrix
Run No.	ONE	Run No.	ONE	Run No.		ONE	Run No.		ONE	Run No.	
Serial No.	11021139	Serial No.	10939049	Serial No.		10809130	Serial No.		11020487	Serial No.	
Model No.	GTET	Model No.	BSAT	Model No.		SDLT	Model No.		DSNT	Model No.	
Diameter	3.625"	No. of Cent.	2	Diameter		6.0"	Diameter		3.625"	Diameter	
Detector Model No.	GTET	Spacing	0.5"	Log Type		GAM-GAM	Log Type		NEU-NEU	Log Type	
Type	SCINT			Source Type		Cs-137	Source Type		Am241Be	Source Type	
Length	8"	LSA [Y/N]		Serial No.		5155GW	Serial No.		DSN-436	Serial No.	
Distance to Source	N/A	FWDA [Y/N]		Strength		1.5 Ci	Strength		15 Ci	Strength	

LOGGING DATA

	GENERAL				GAMMA		ACOUSTIC		DENSITY		NEUTRON			
					Scale		Scale		Scale		Scale		Matrix	
Run No.	Depth From	Depth To	Speed ft/min		L	R	L	R	L	R	L	R		
ONE	TD	CSG	REC		0	150	30	-10	30	-10	30	-10	2.71 g/cc	LIME
													47.6 us/ft	

DIRECTIONAL INFORMATION

Maximum Deviation	@	KOP	@

CLIENT REPORTED VERTICAL WELL

Remarks: GTET-DSNT-SDLT-BSAT-ACRT

ANNULAR HOLE VOLUME CALCULATED FOR 5.5 INCH CASING

DETAILED SECTION LOGGED TO 3,630 FT AS PER CLIENT REQUEST

CHLORIDES REPORTED AT 1000 PPM

NO POST-CALS COMPLETED AS PER CLIENT REQUEST

RIG: DUKE DRILLING RIG 9

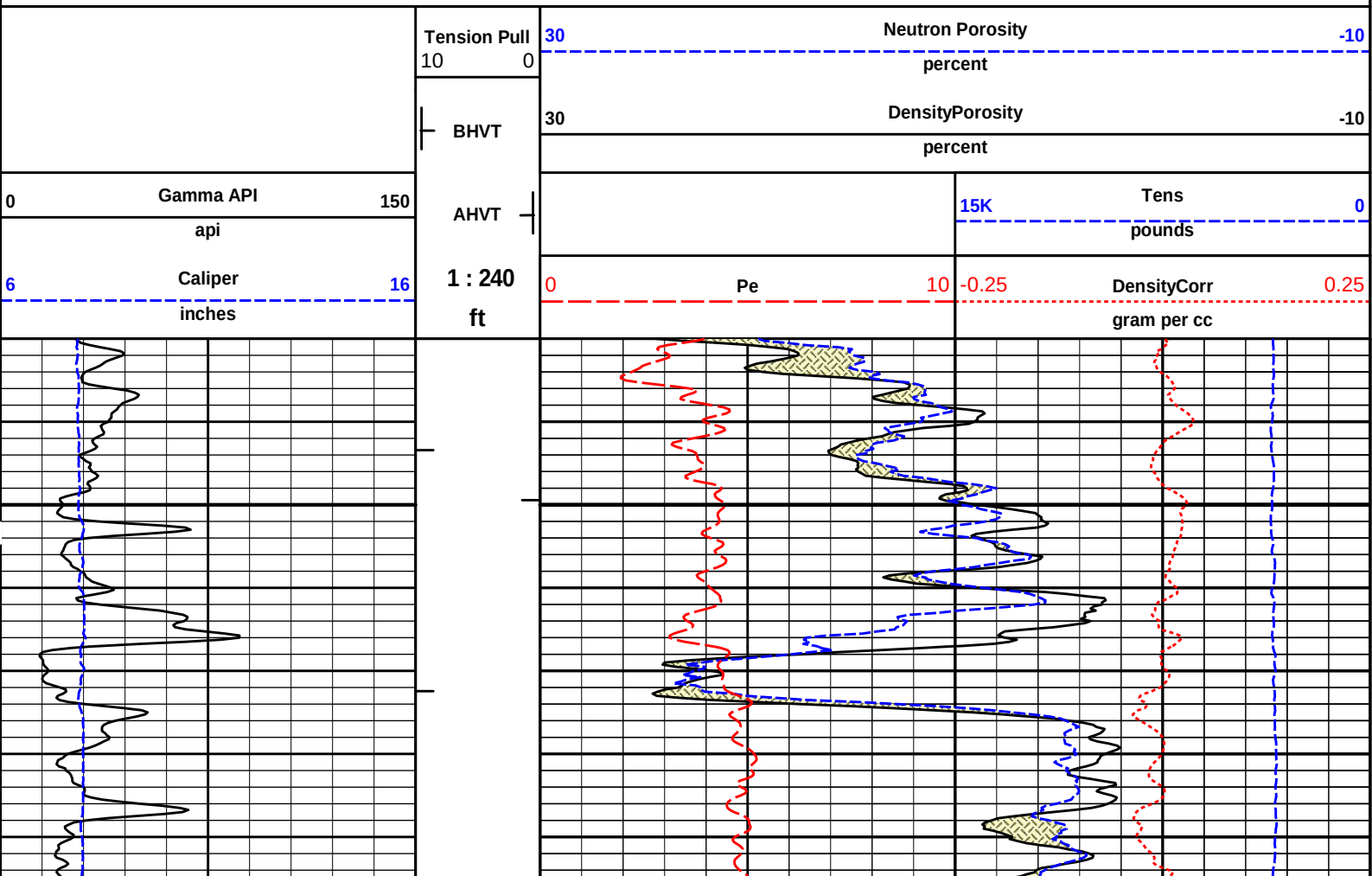
CREW: K. FITZPATRICK, R. BLANKENSHIP

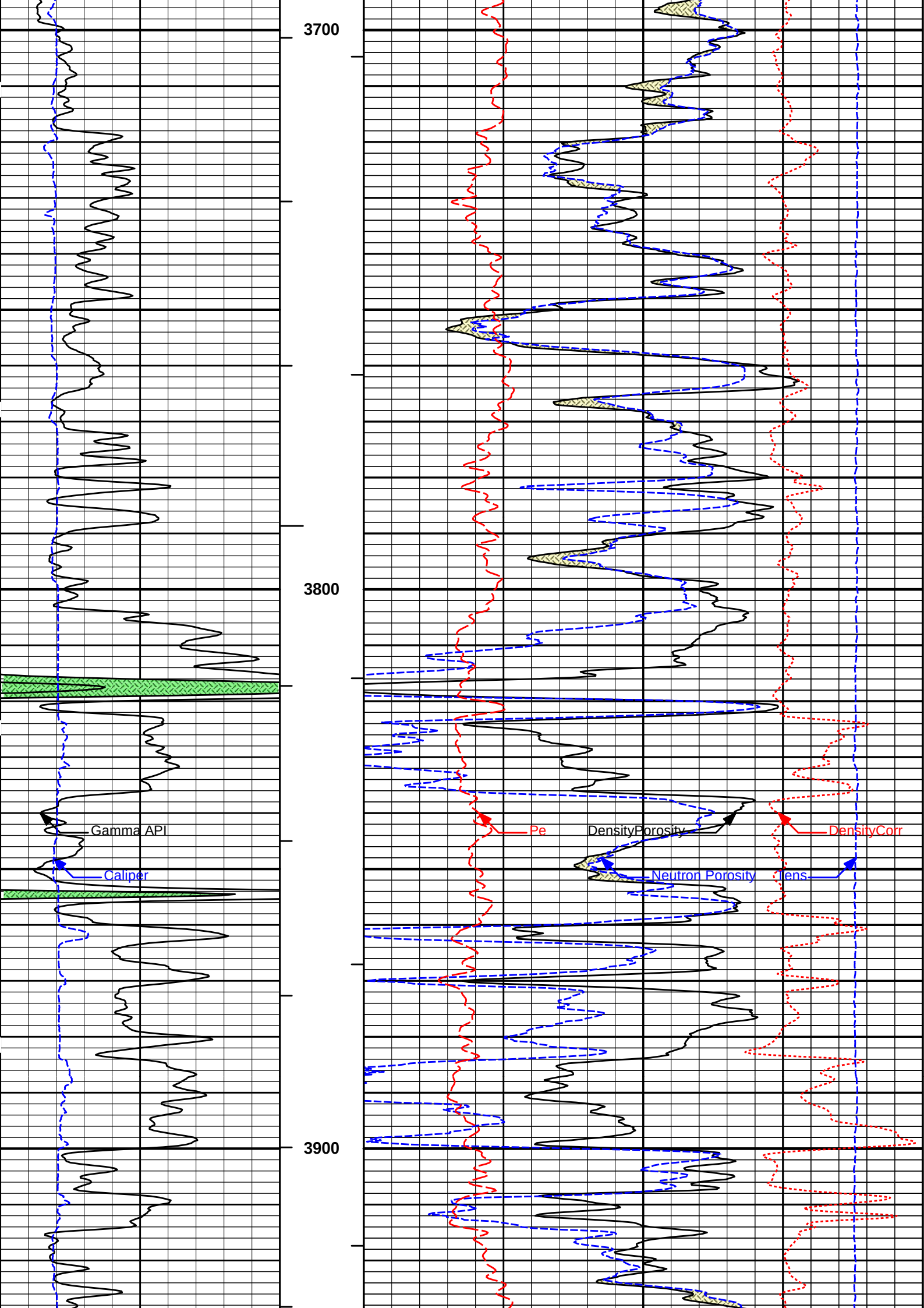
THANK YOU FOR CHOOSING HALLIBURTON ENERGY SERVICES -- EL RENO, OK -- 405.278.9685

HALLIBURTON

Plot Time: 18-Oct-17 04:00:44
Plot Range: 3630 ft to 6607.5 ft
Data: MERIT_LCSLU 108\Well Based\PORO
Plot File: \\PORO\1_Poro_5_mainx

5 INCH MAIN LOG

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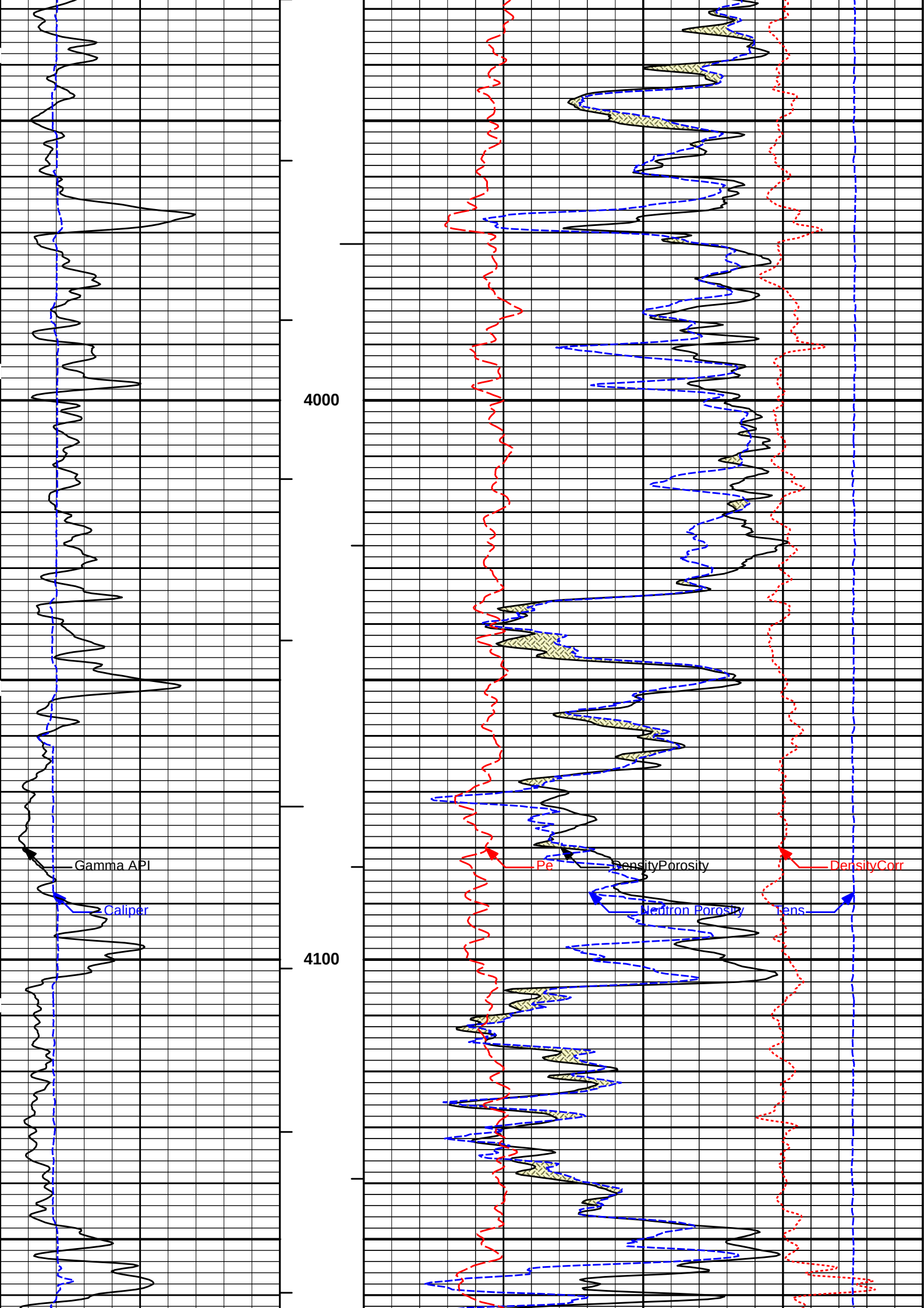
Caliper
Pe
DensityPorosity
DensityCorr
Neutron Porosity
Tens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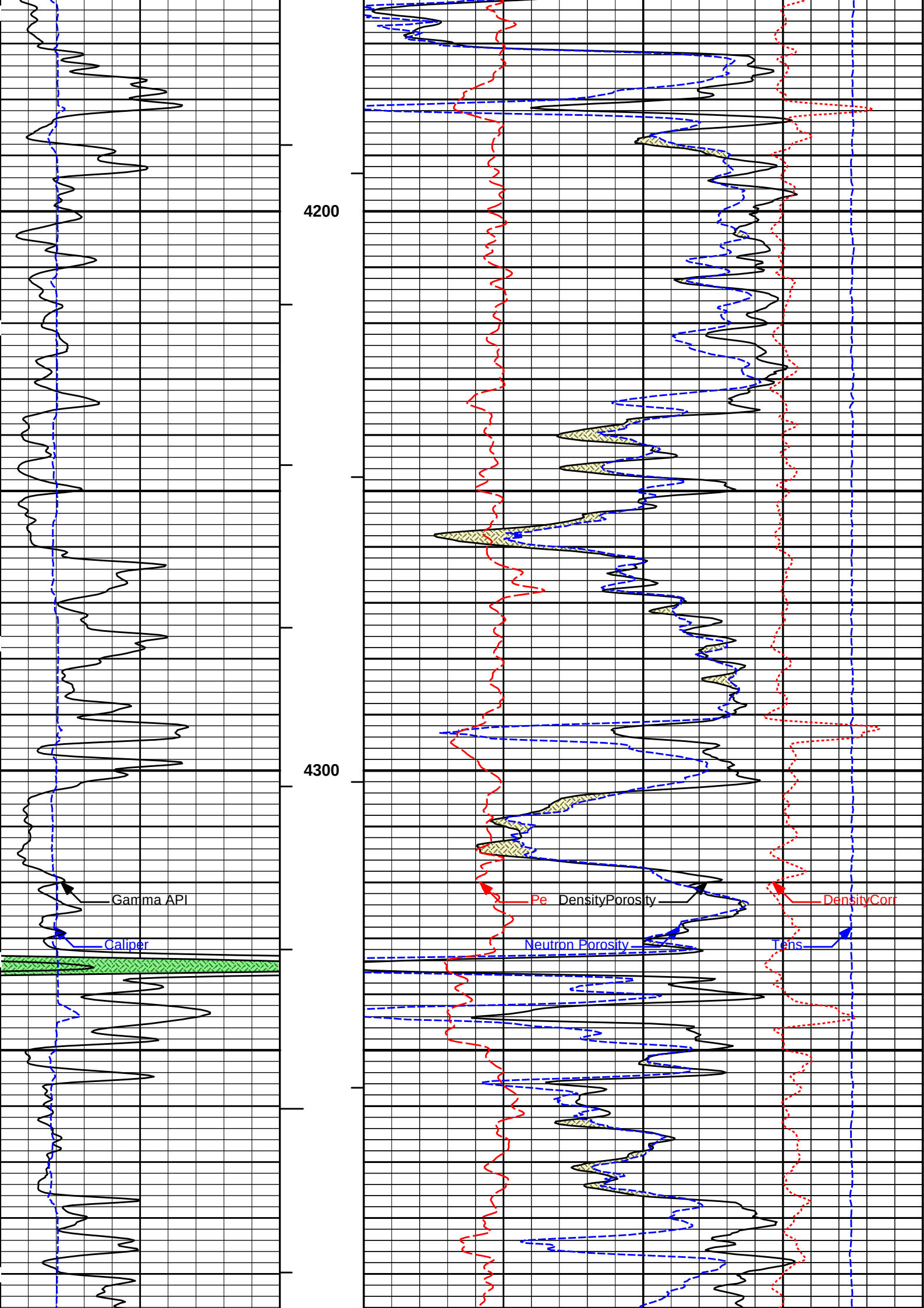
DensityCorr
Tens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Neutron Porosity
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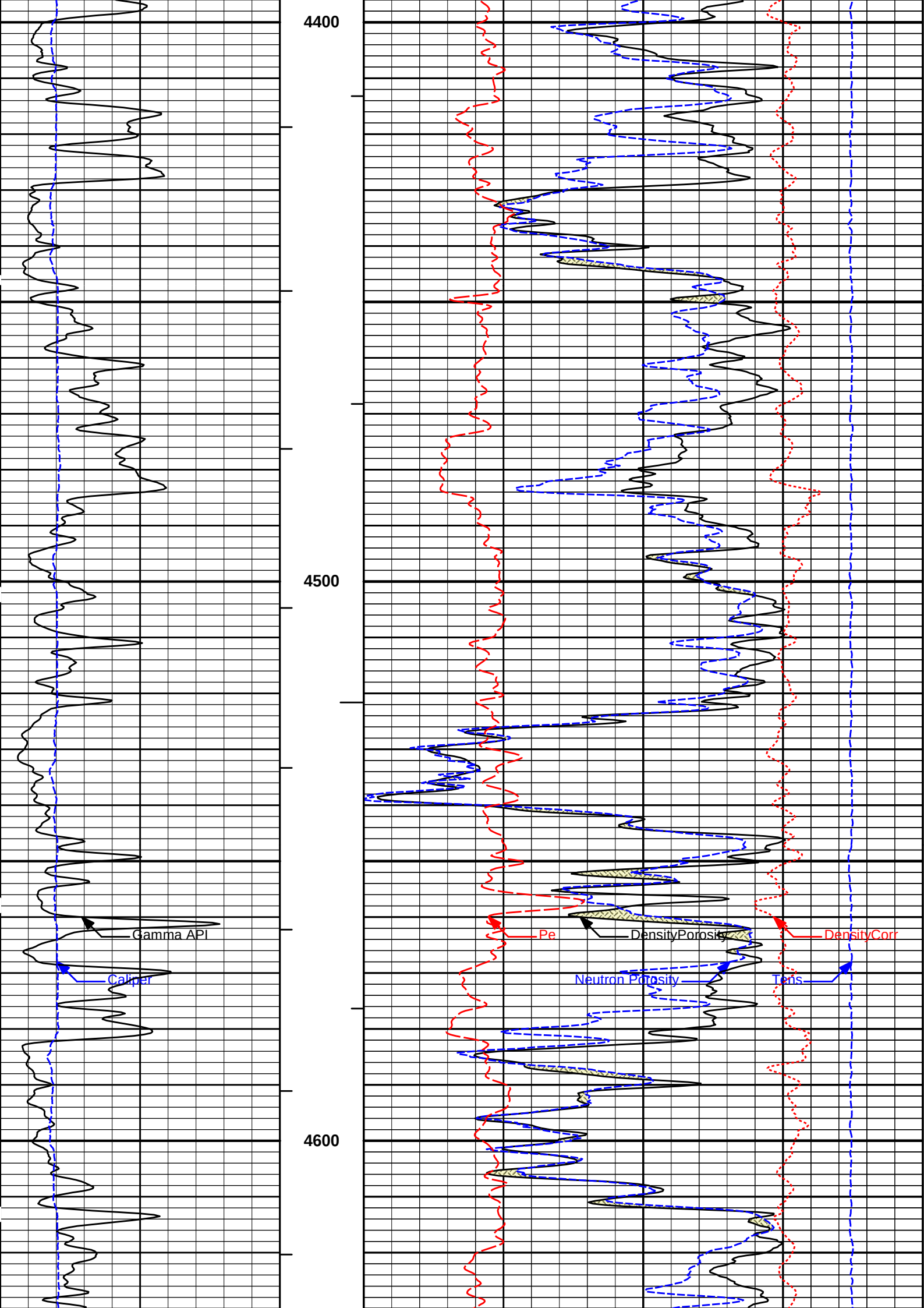
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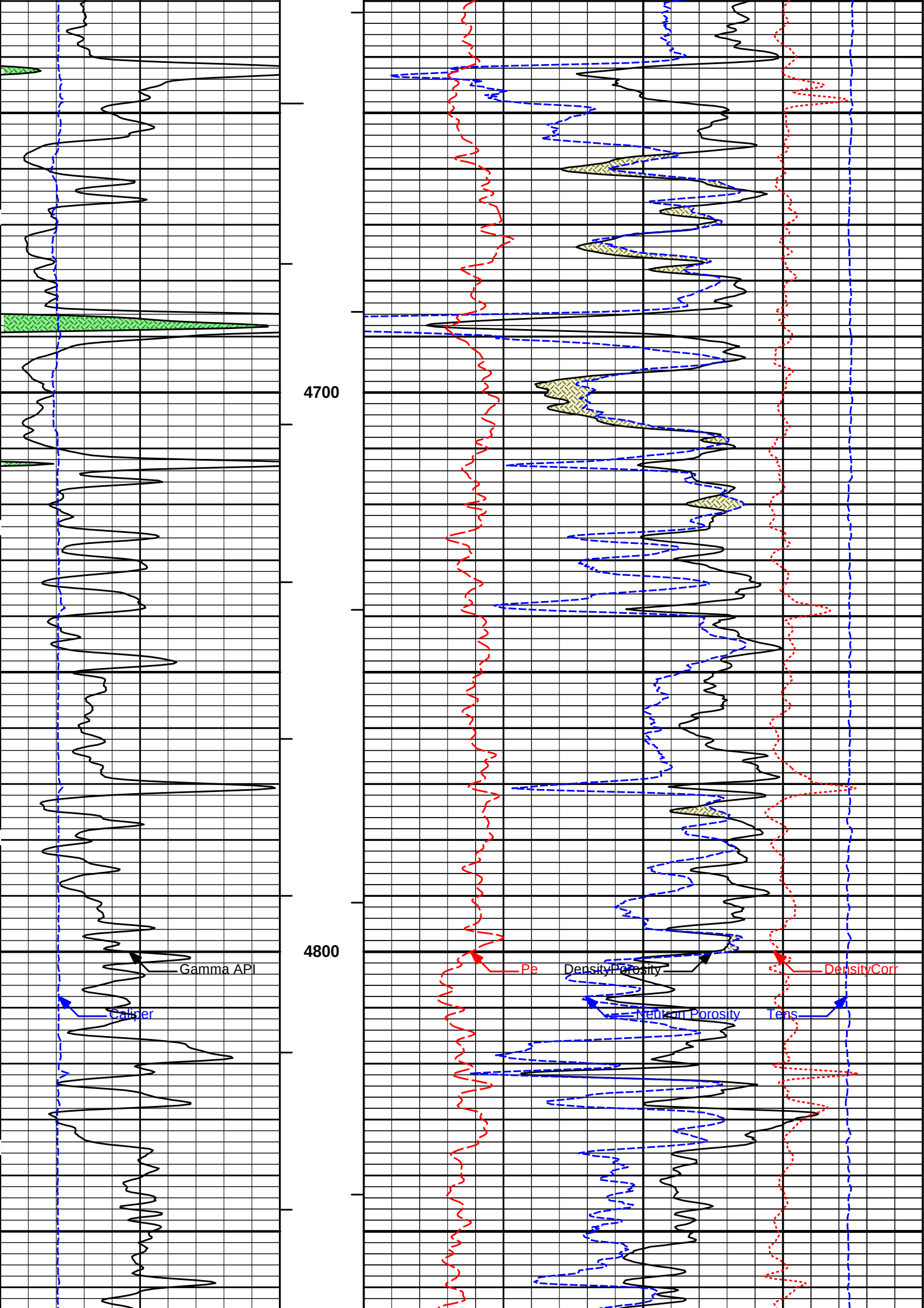
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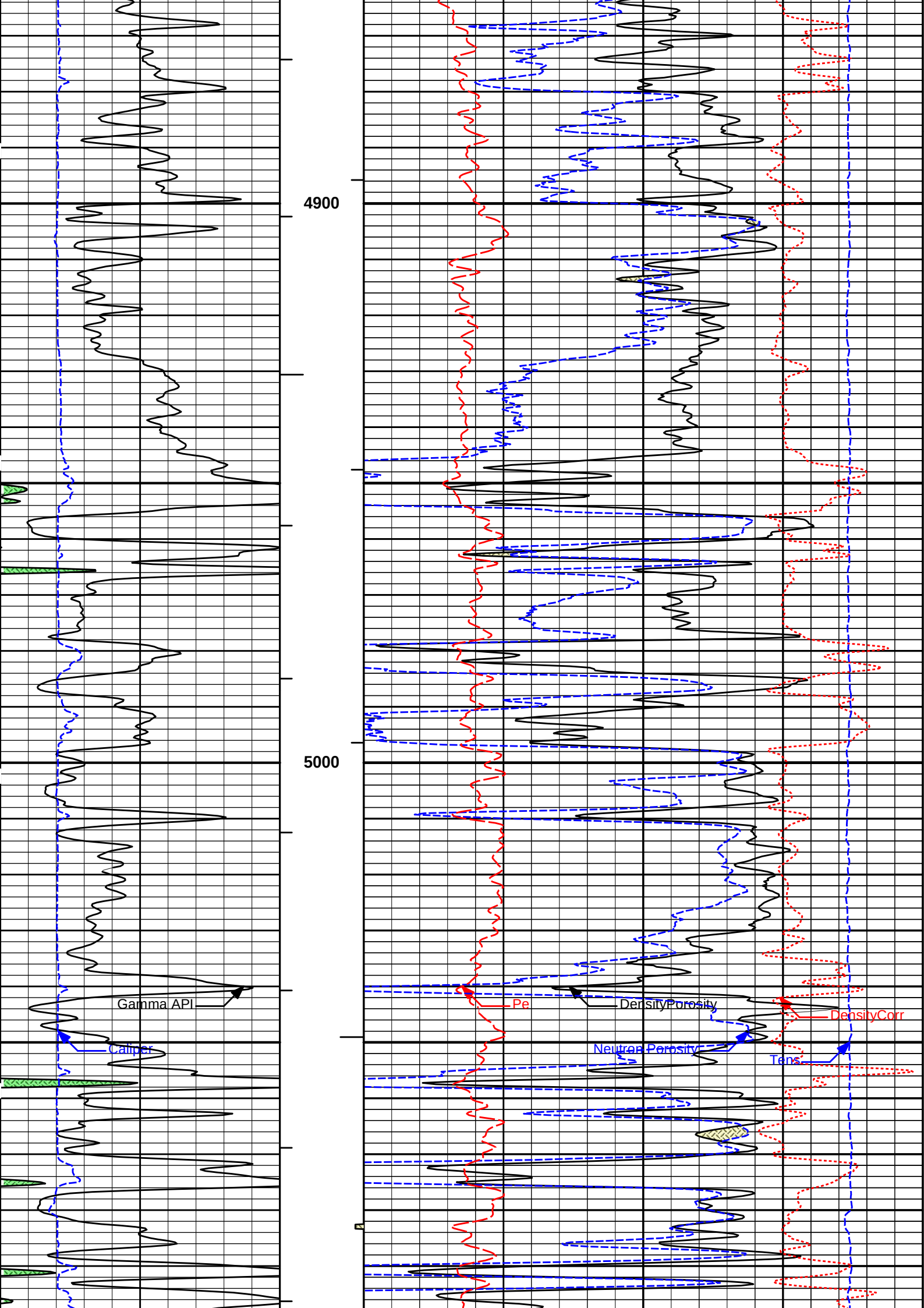
Tens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DensityCorr
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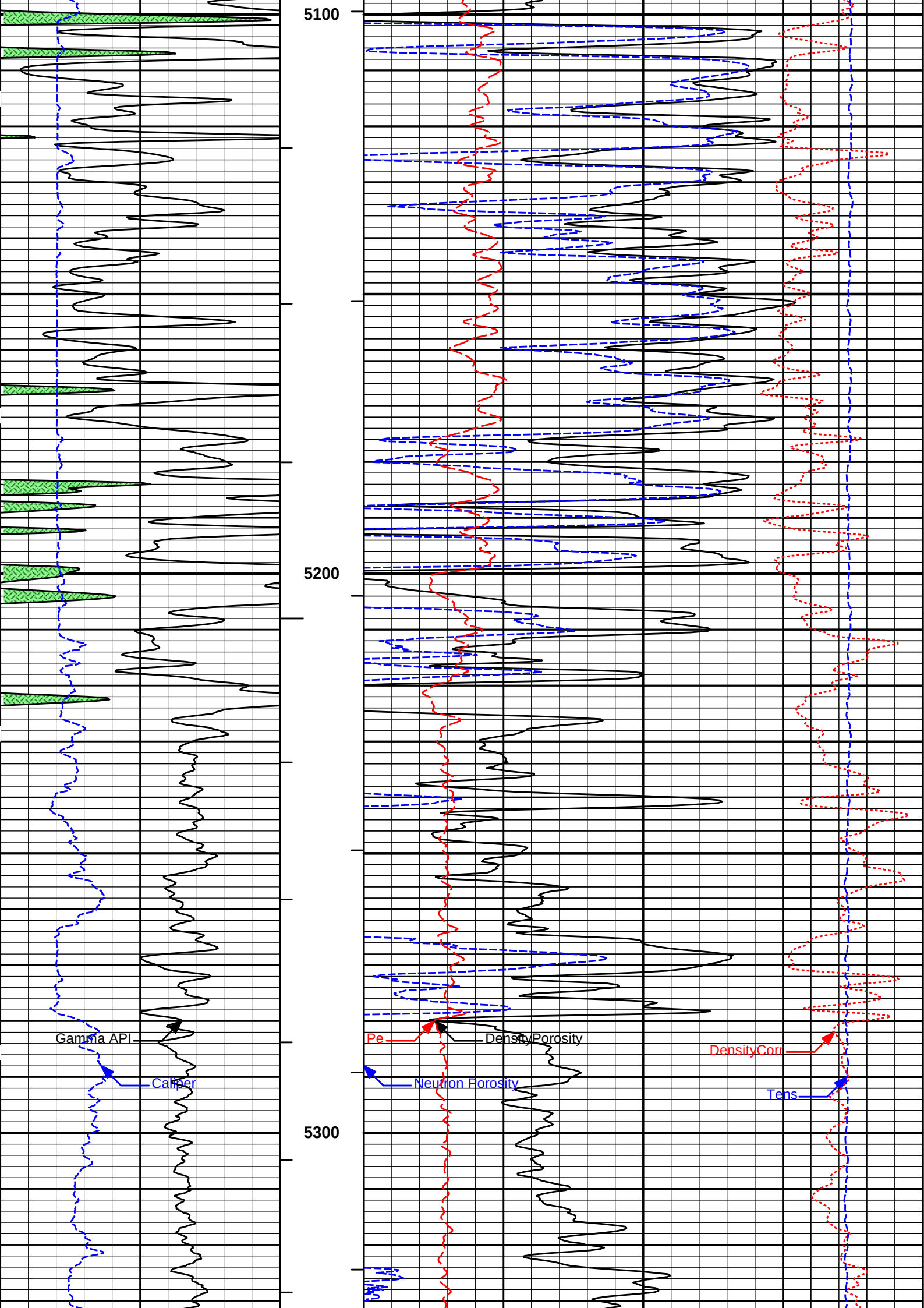
Tens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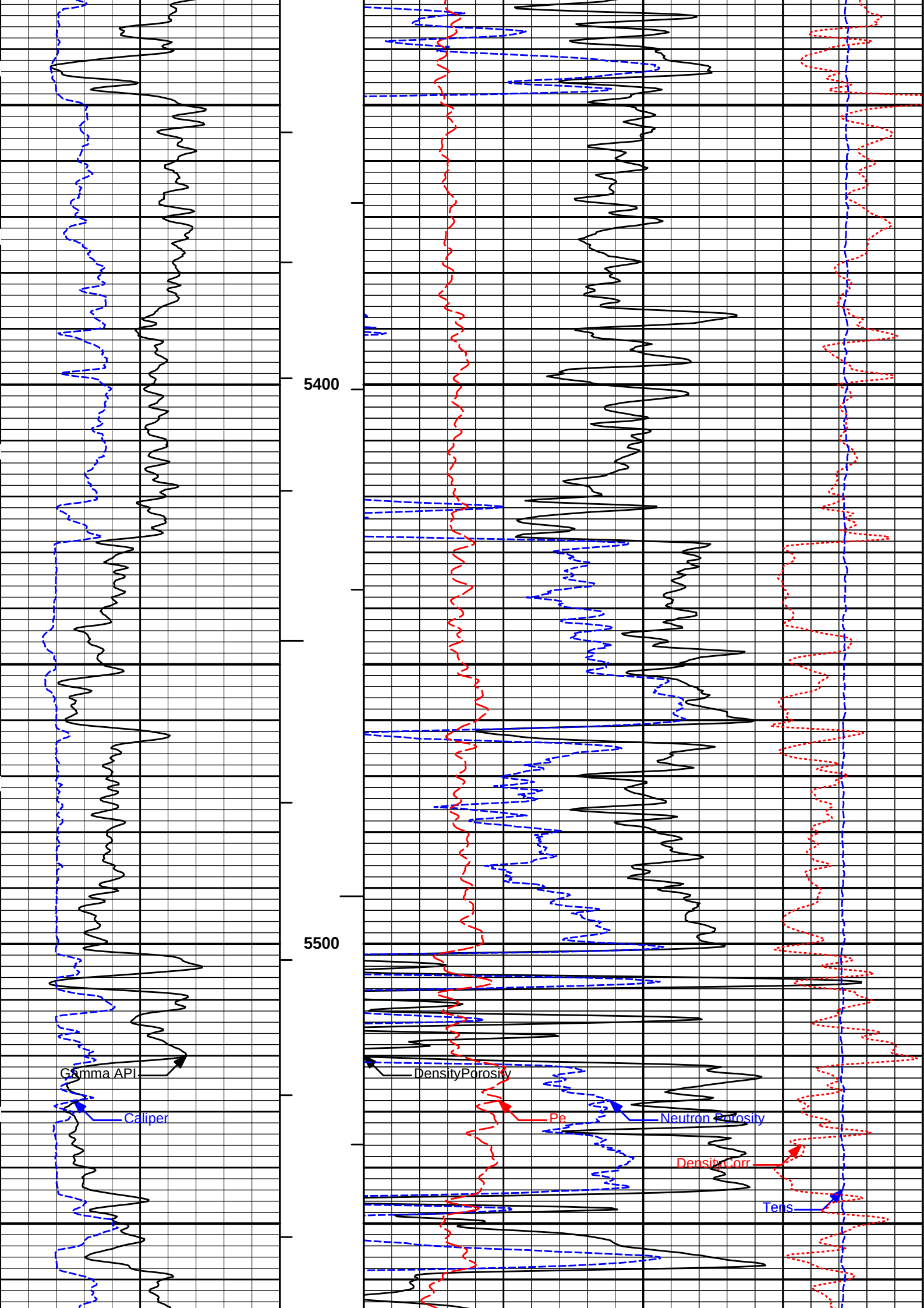
Tens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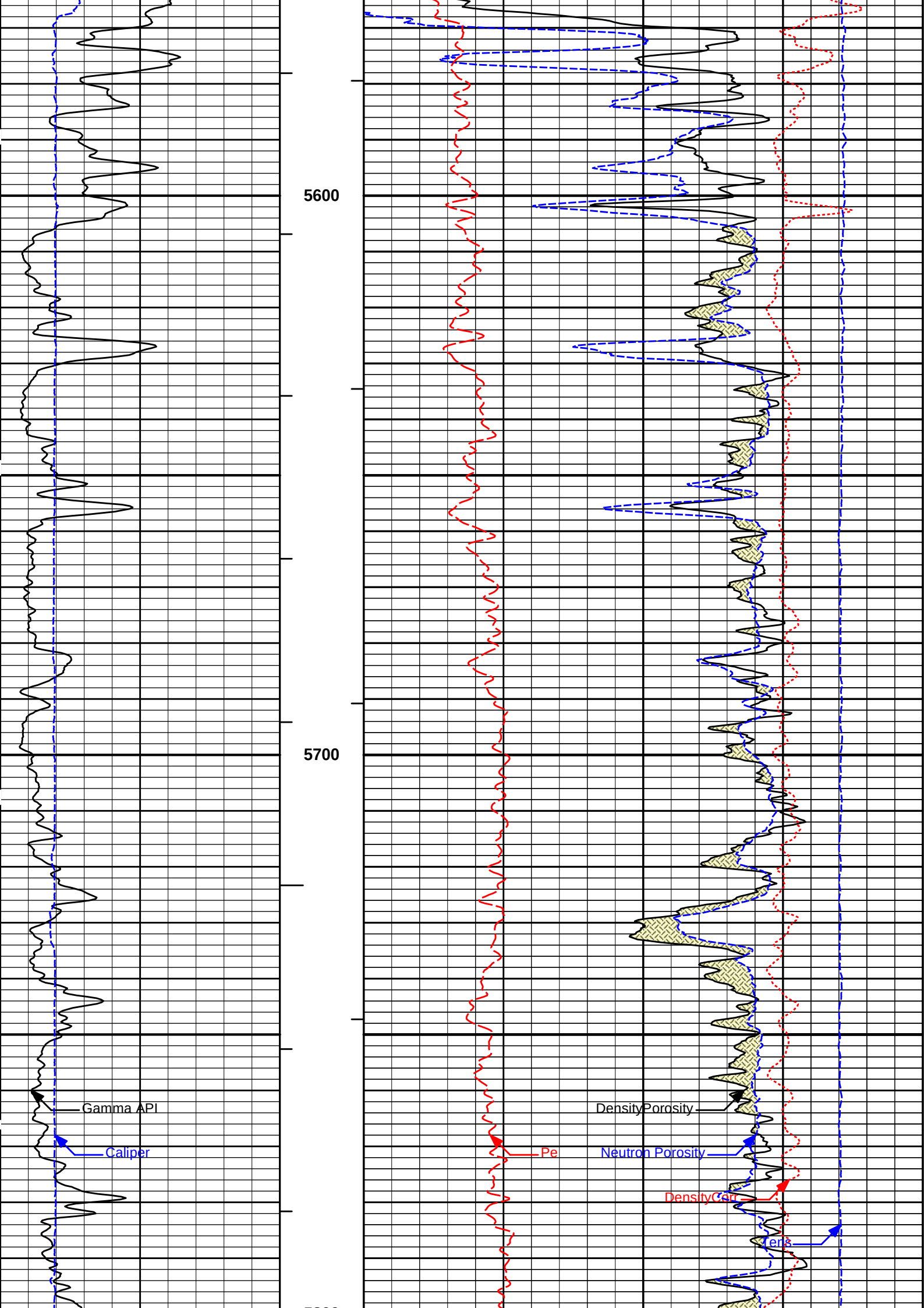
Pe
Neutron Porosity
DensityCorr
Tens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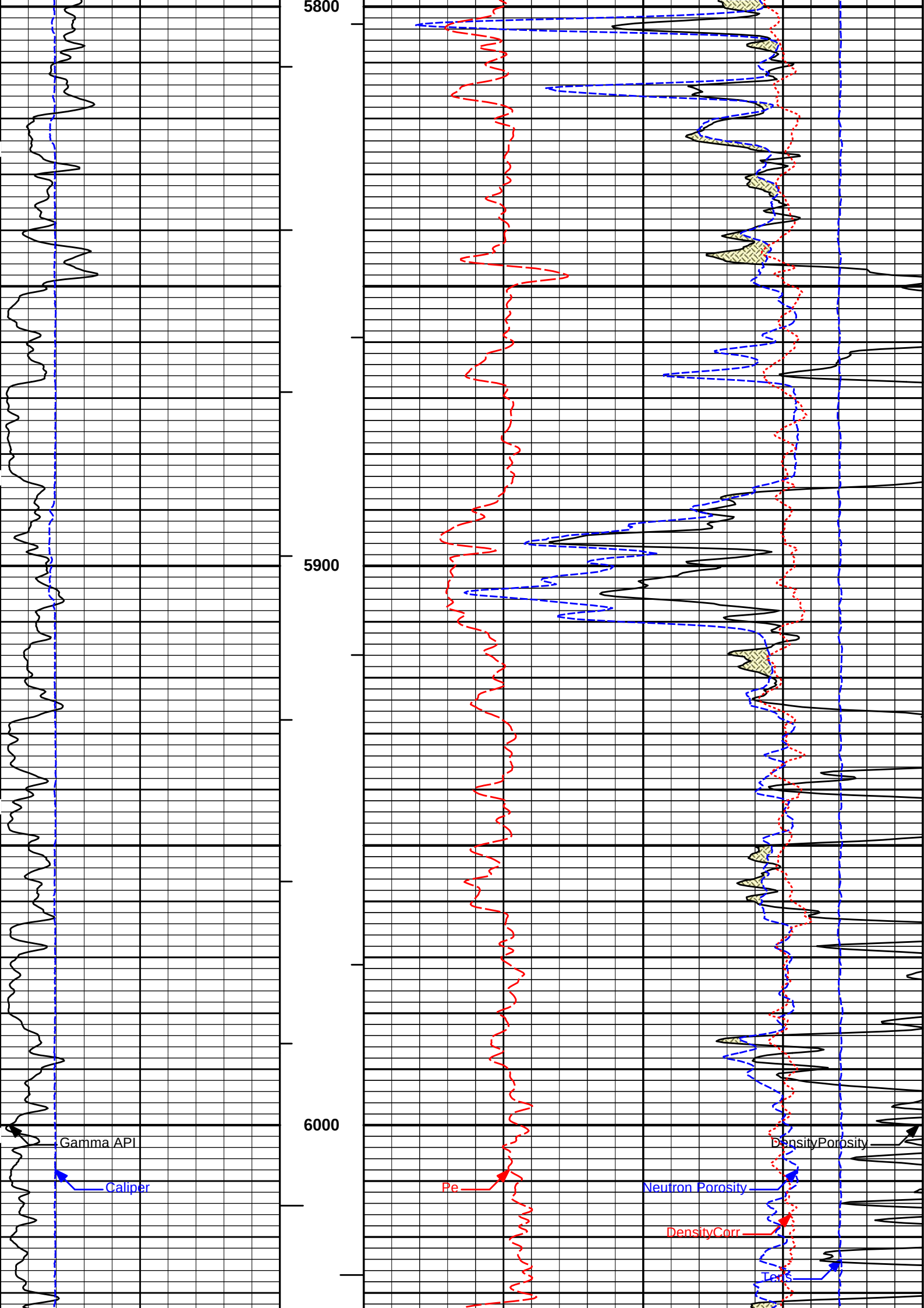
DensityCorr
Vens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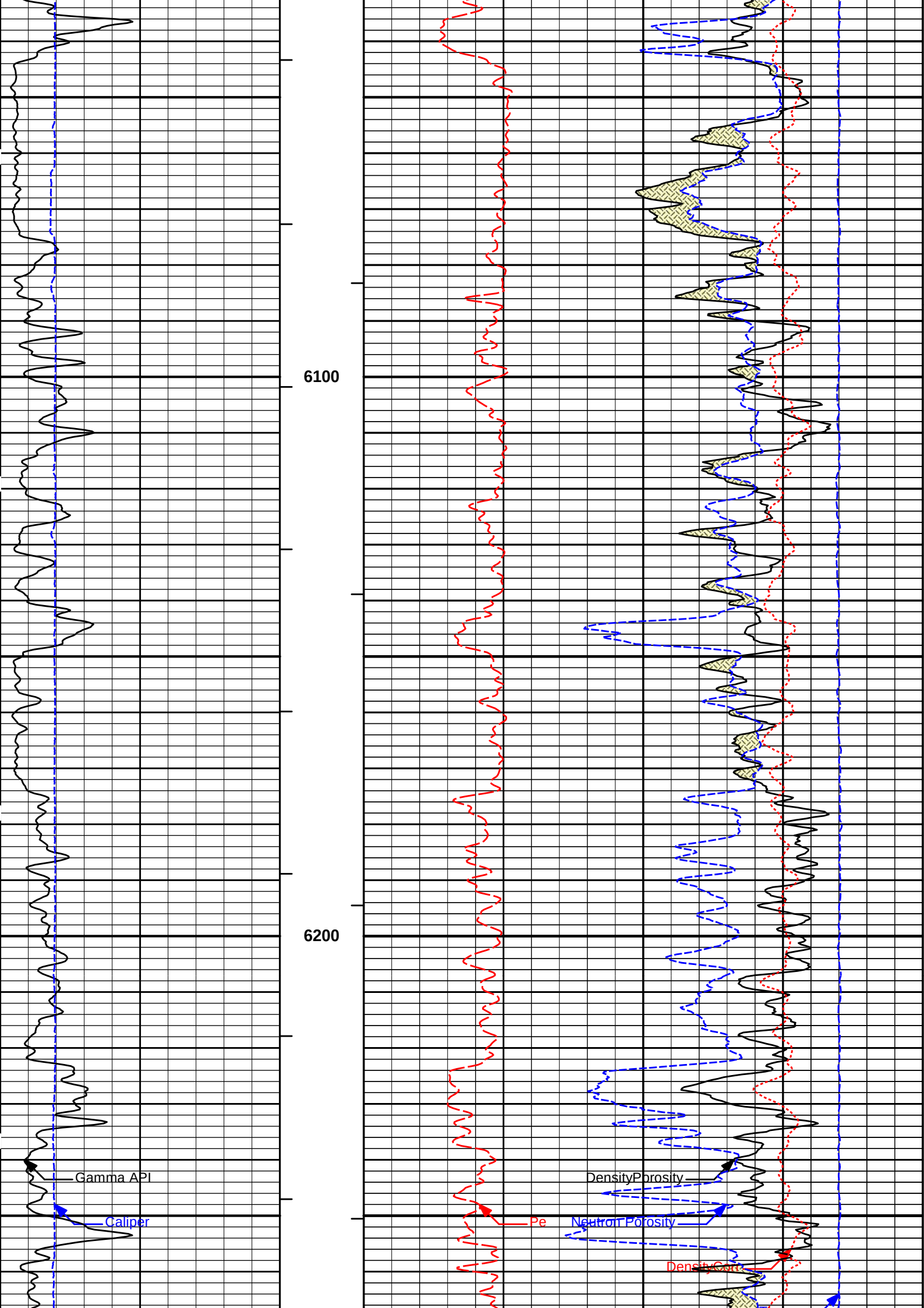
DensityPorosity
DensityCorr
Tens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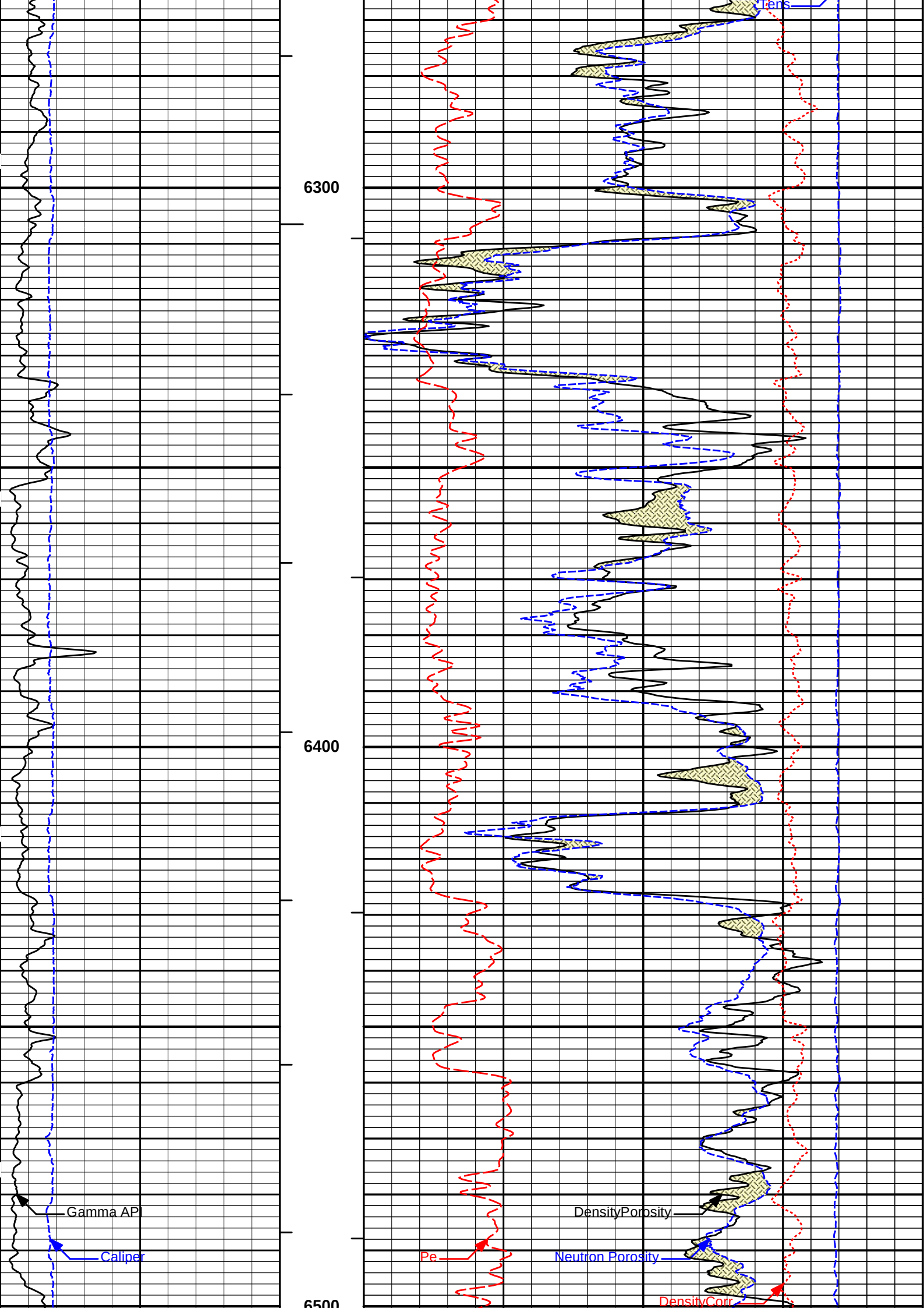
DensityPorosity
NeutronPorosity
DensityCorr


Trans
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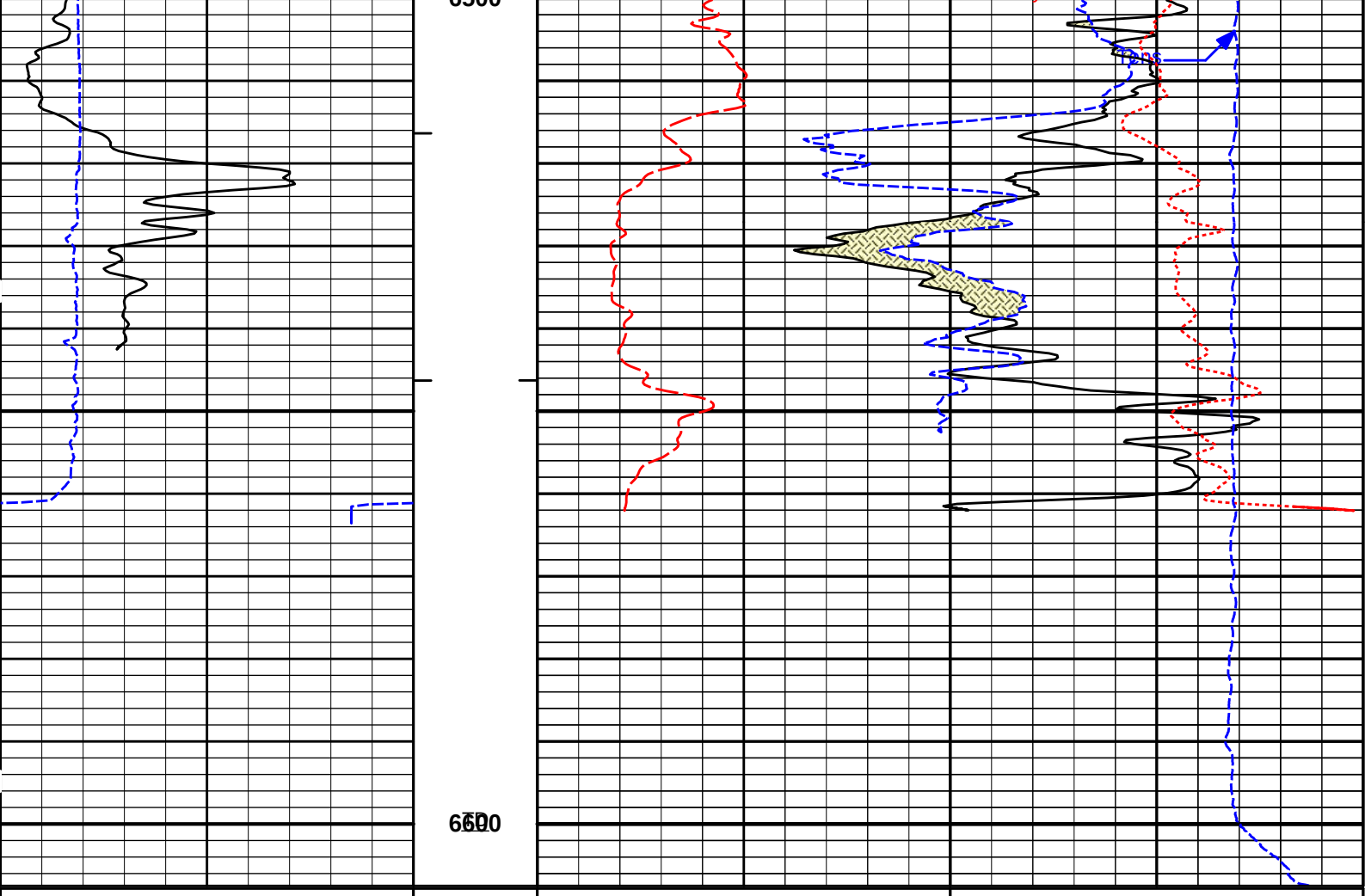
Gamma API
Caliper
Pe
DensityPorosity
Neutron Porosity
DensityCorr



6 Caliper 16	1 : 240	0 Pe 10
inches	ft	
0 Gamma API 150	AHVT	
api		
	BHVT	30 DensityPorosity -10
		percent
	Tension Pull	30 Neutron Porosity -10
	10 0	percent

-0.25 DensityCorr 0.25
gram per cc
15K Tens 0
pounds

HALLIBURTON

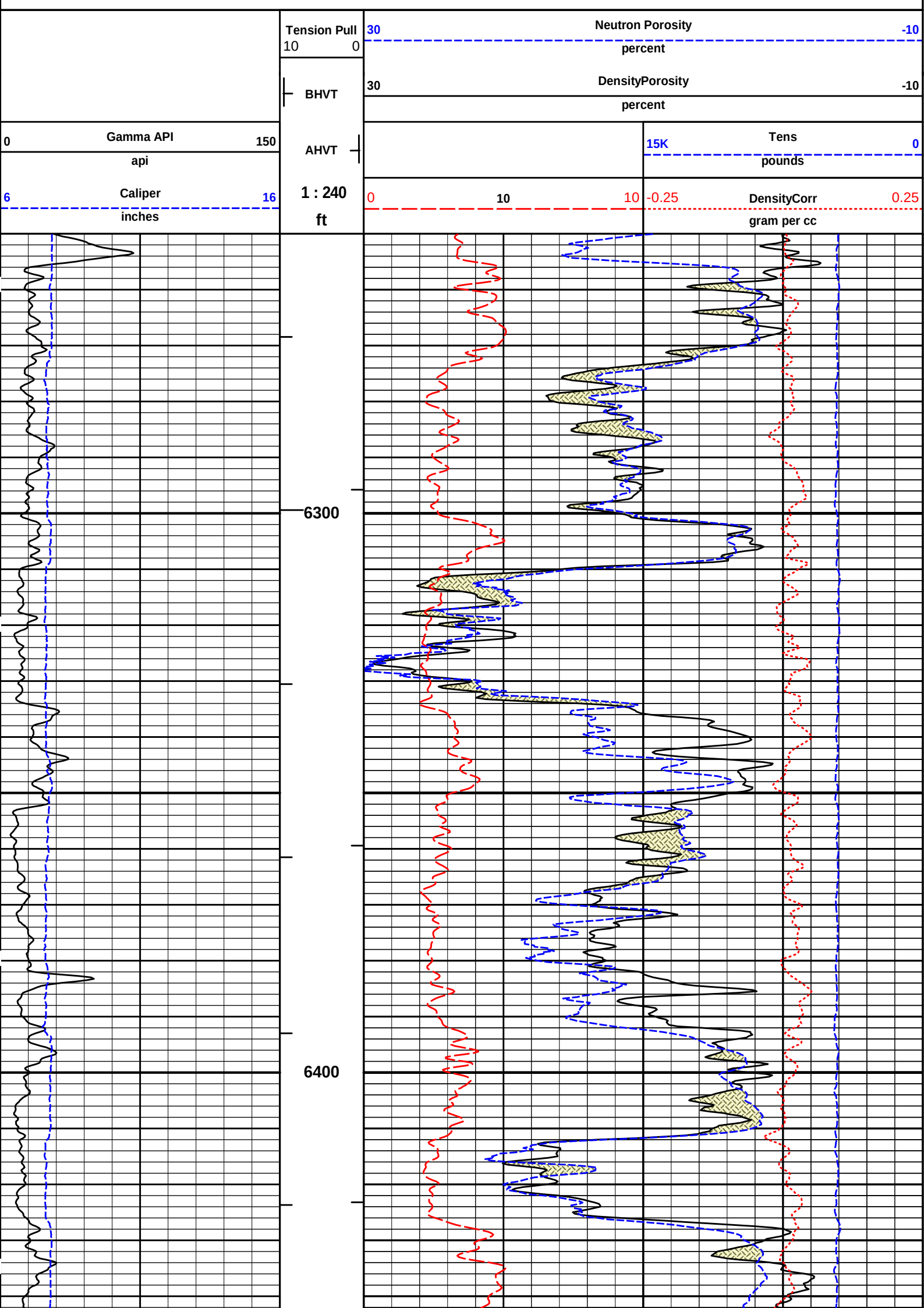
Plot Time: 18-Oct-17 04:00:47
Plot Range: 3630 ft to 6607.5 ft
Data: MERIT_LCSLU 108\Well Based\PORO\
Plot File: \\PORO\1_Poro_5_mainx

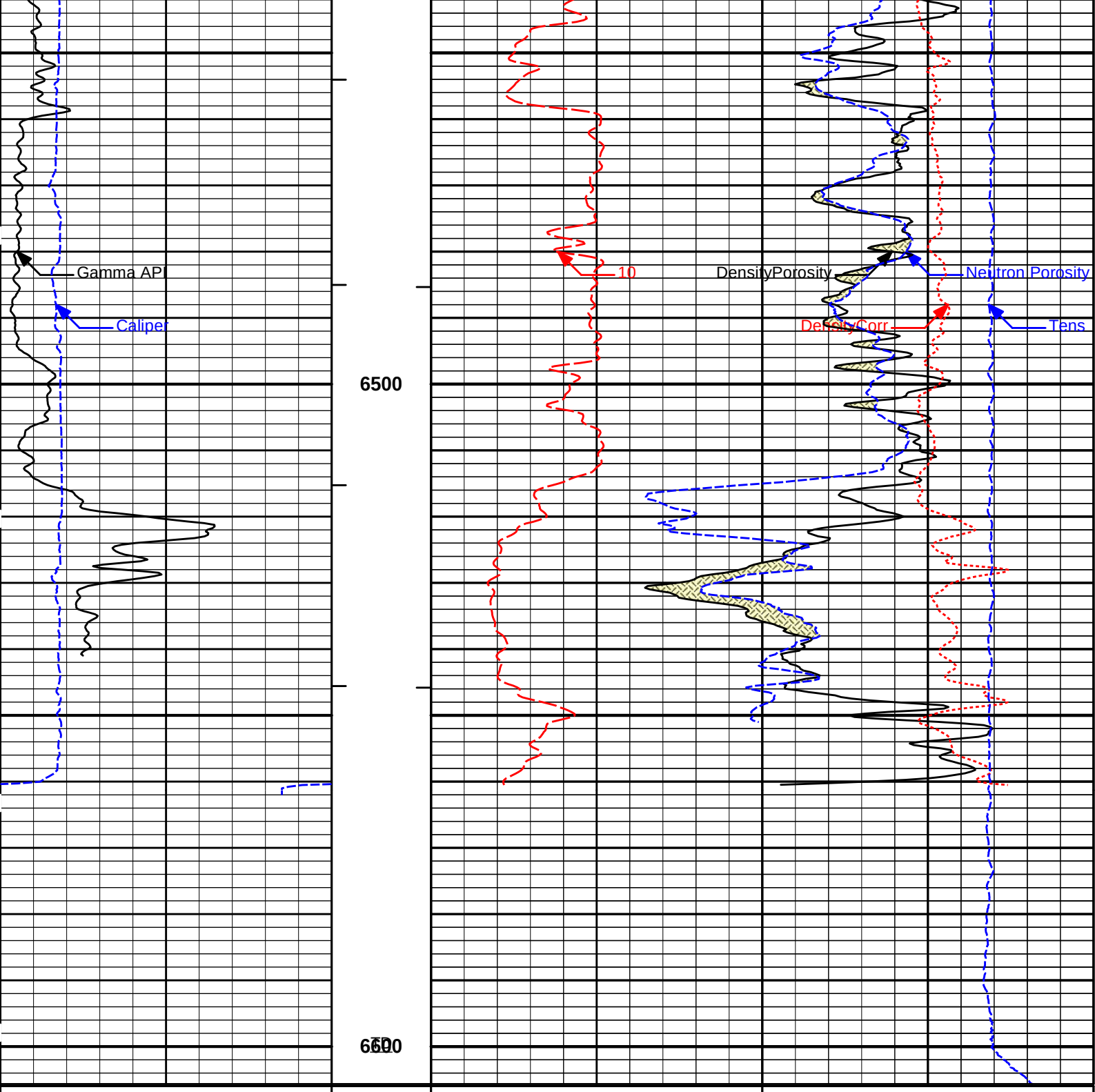
5 INCH MAIN LOG

HALLIBURTON

Plot Time: 18-Oct-17 04:00:47
Plot Range: 6250 ft to 6605.67 ft
Data: MERIT_LCSLU 108\Well Based\REPEAT\
Plot File: \\PORO\1_Poro_5_rptx

REPEAT SECTION


Tension Pull
10
0
BHVT
AHVT
1 : 240
ft
Neutron Porosity
30
-10
percent
DensityPorosity
30
-10
percent
Tens
15K
0
pounds
Gamma API
0
150
api
Caliper
6
16
inches
0
10
10
-0.25
DensityCorr
0.25
gram per cc
6300
6400



6 Caliper 16	1 : 240	0 10 10
inches	ft	
0 Gamma API 150	AHVT	
api		
	BHVT	
	Tension Pull	
	10 0	

-0.25 DensityCorr 0.25	
gram per cc	
15K Tens 0	
pounds	
30 DensityPorosity -10	
percent	
30 Neutron Porosity -10	
percent	

HALLIBURTON

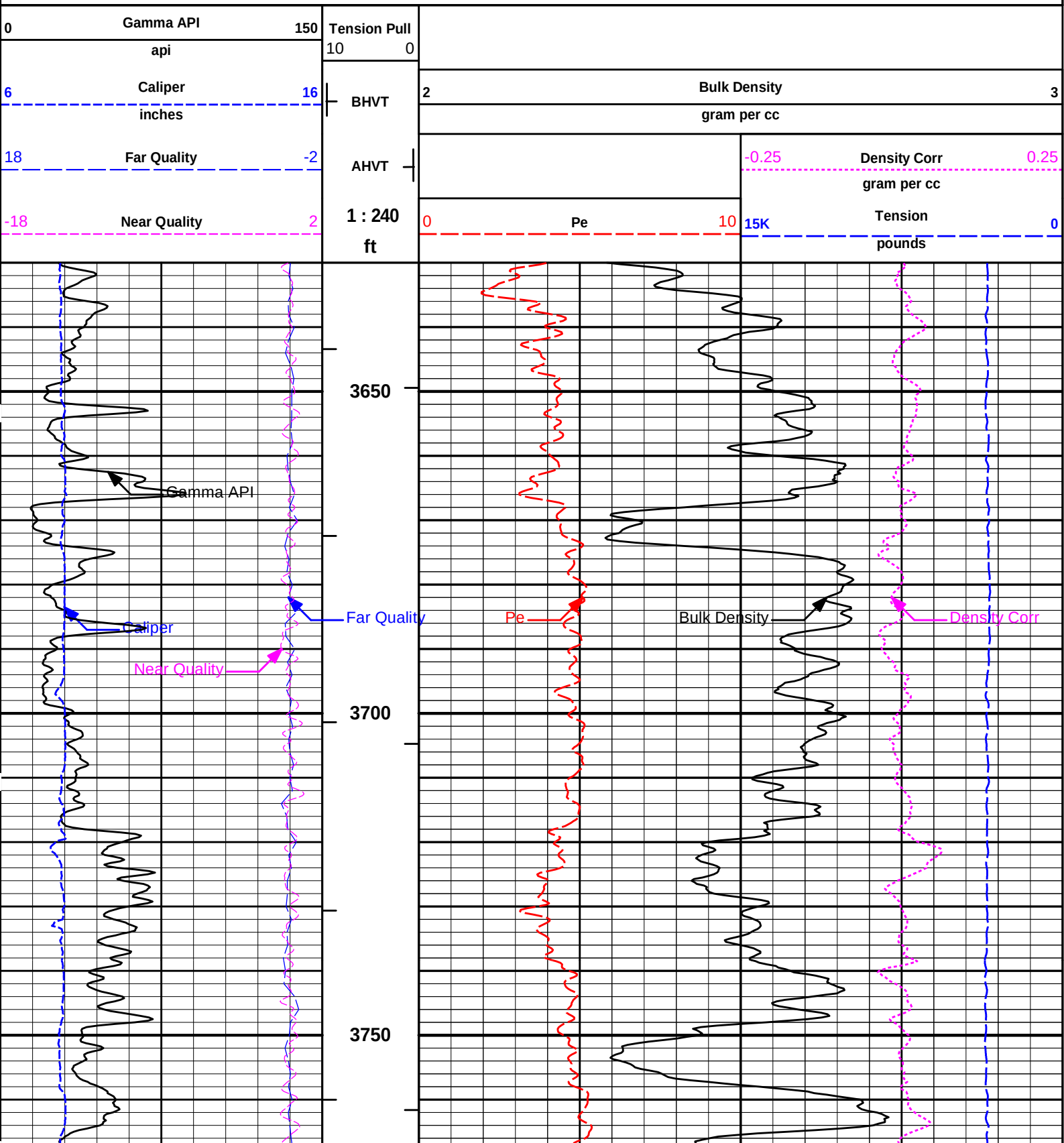
Plot Time: 18-Oct-17 04:00:49
Plot Range: 6250 ft to 6605.67 ft
Data: MERIT_LCSLU 108\Well Based\REPEAT\
Plot File: \\PORO\1_Poro_5_rptx

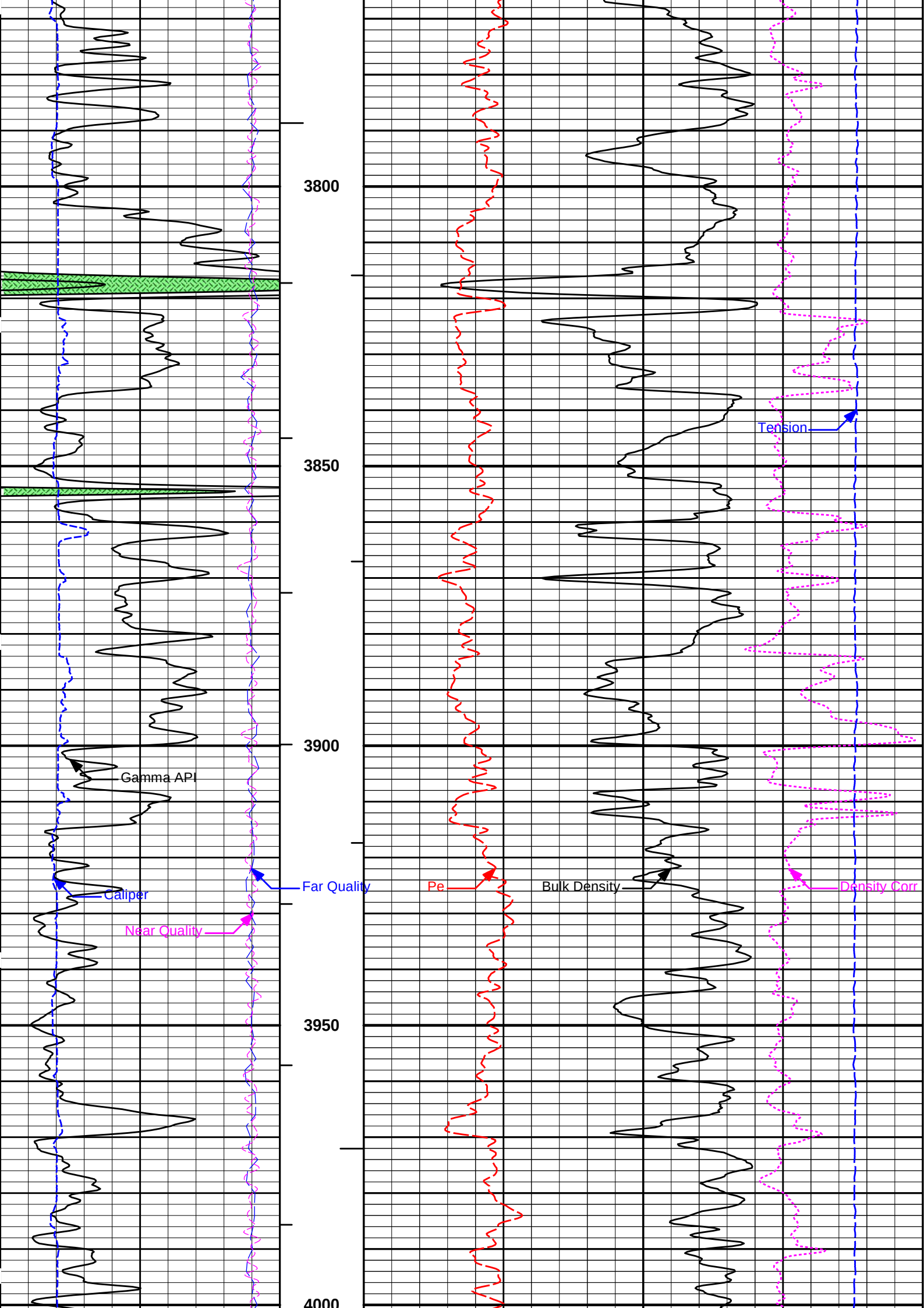
REPEAT SECTION

HALLIBURTON

Plot Time: 18-Oct-17 04:00:49
Plot Range: 3630 ft to 6607.5 ft
Data: MERIT_LCSLU 108\Well Based\PORO\
Plot File: \\PORO\1_Bulk_5_mainx

5 INCH MAIN LOG

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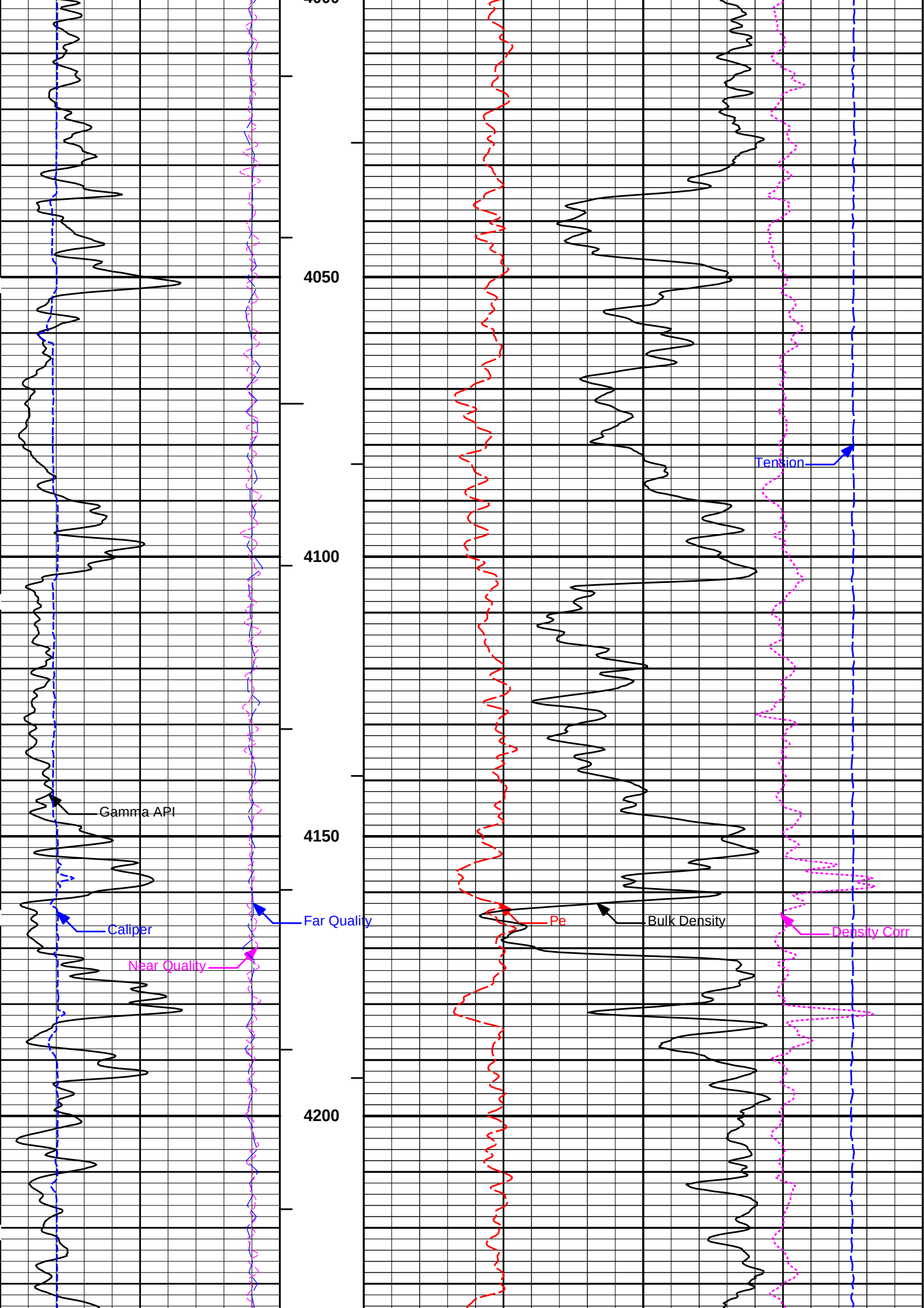
Far Quality
Pe
Bulk Density
Tension
Density Corr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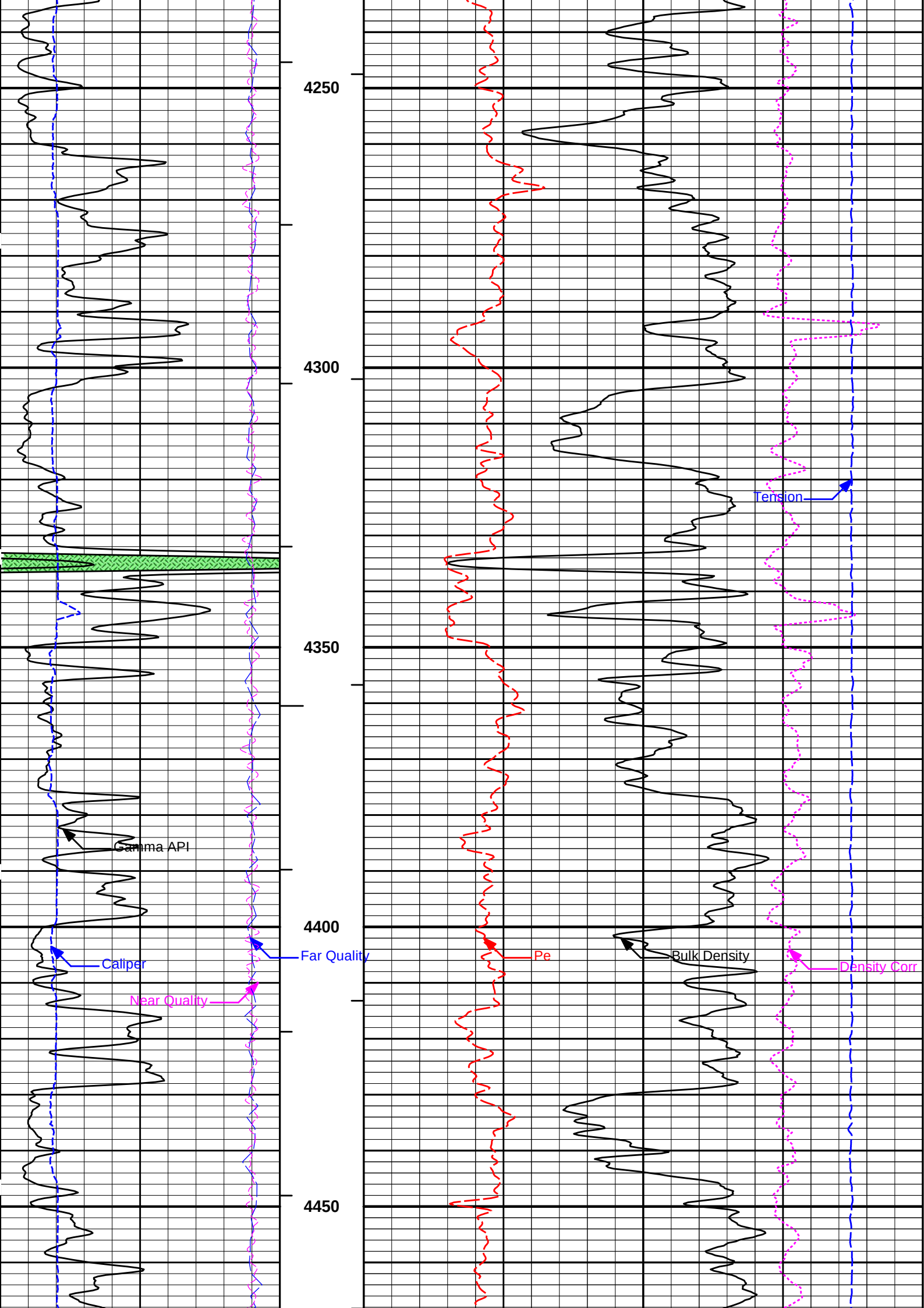
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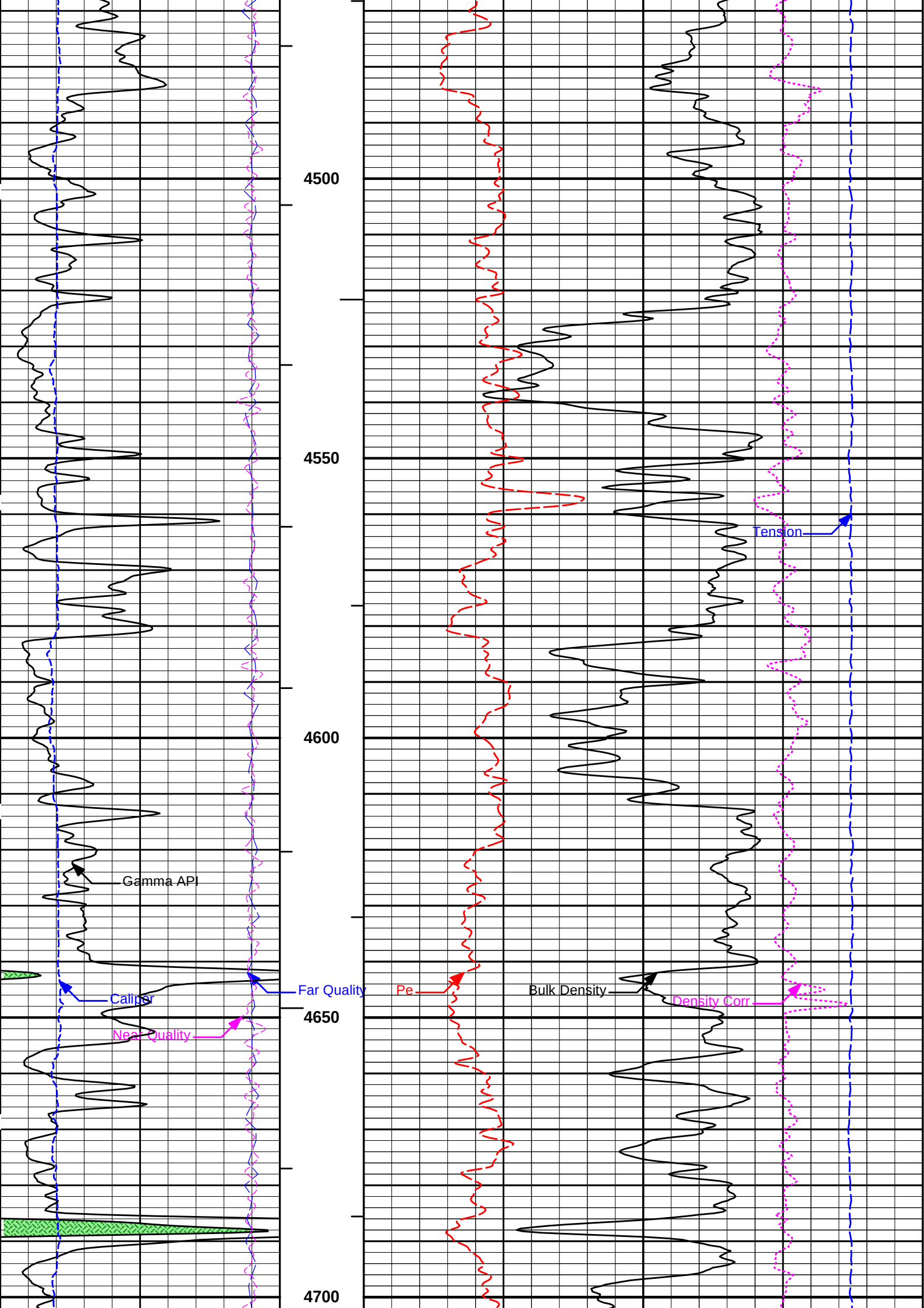
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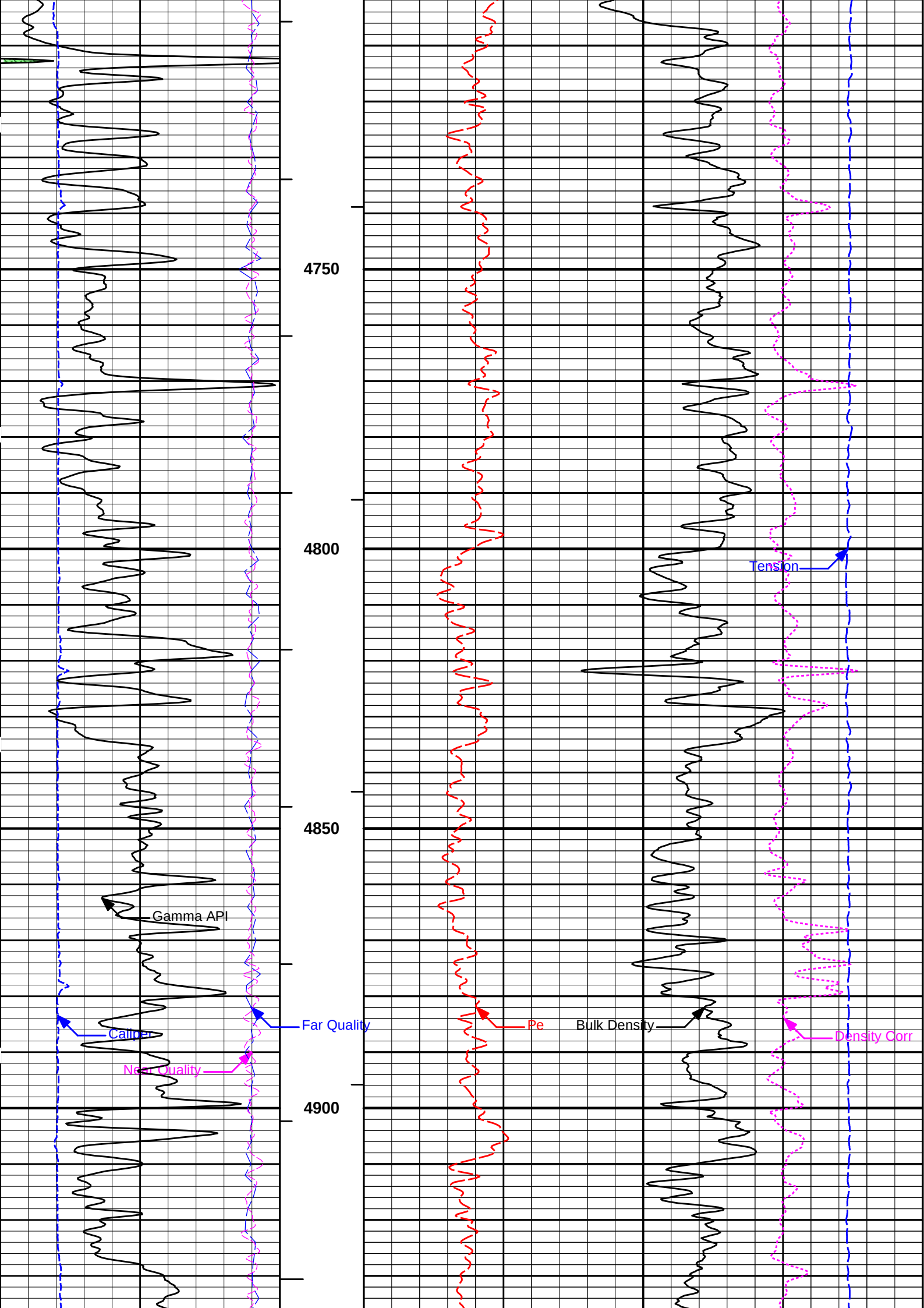
Tension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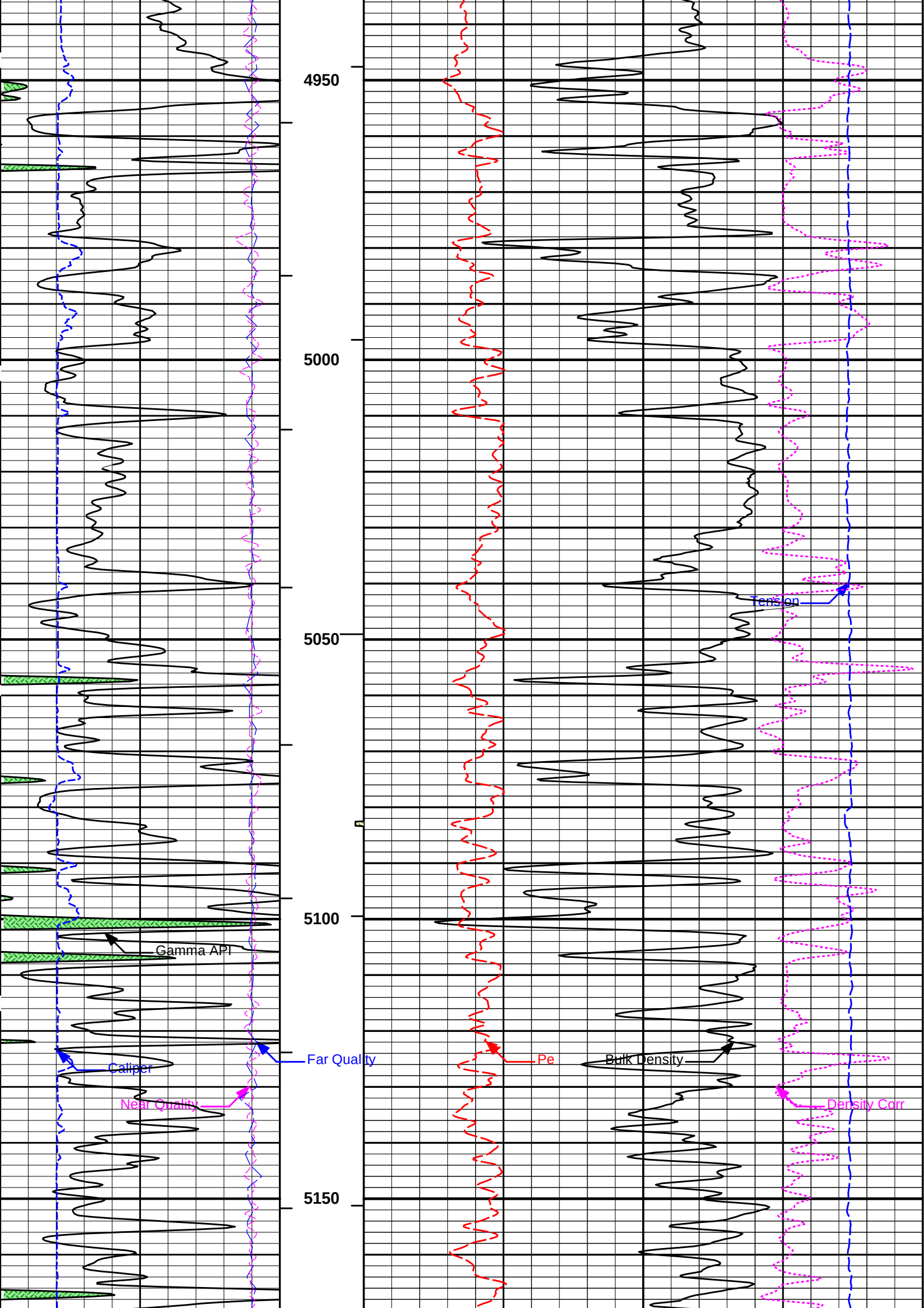
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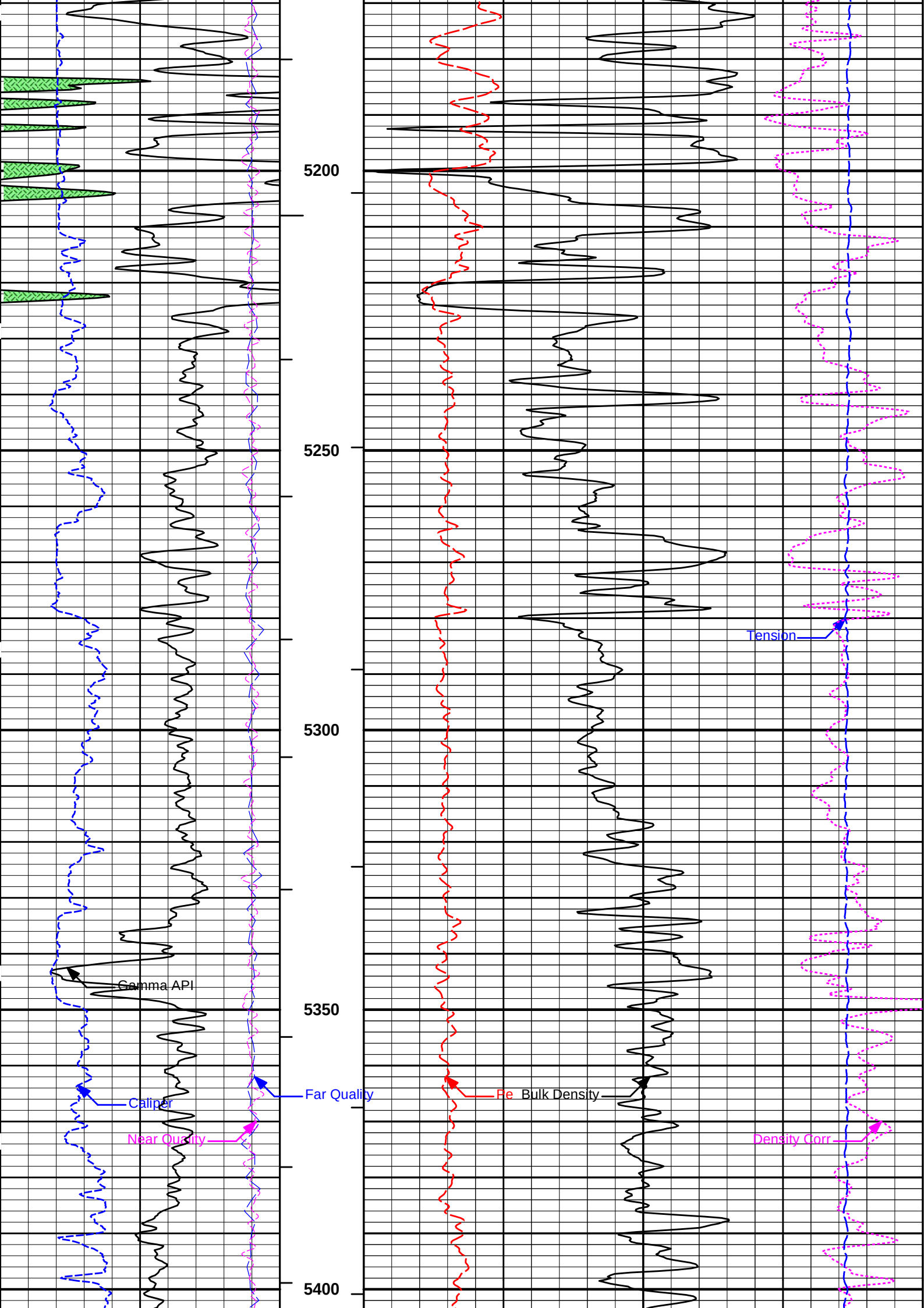
Tension
Density Corr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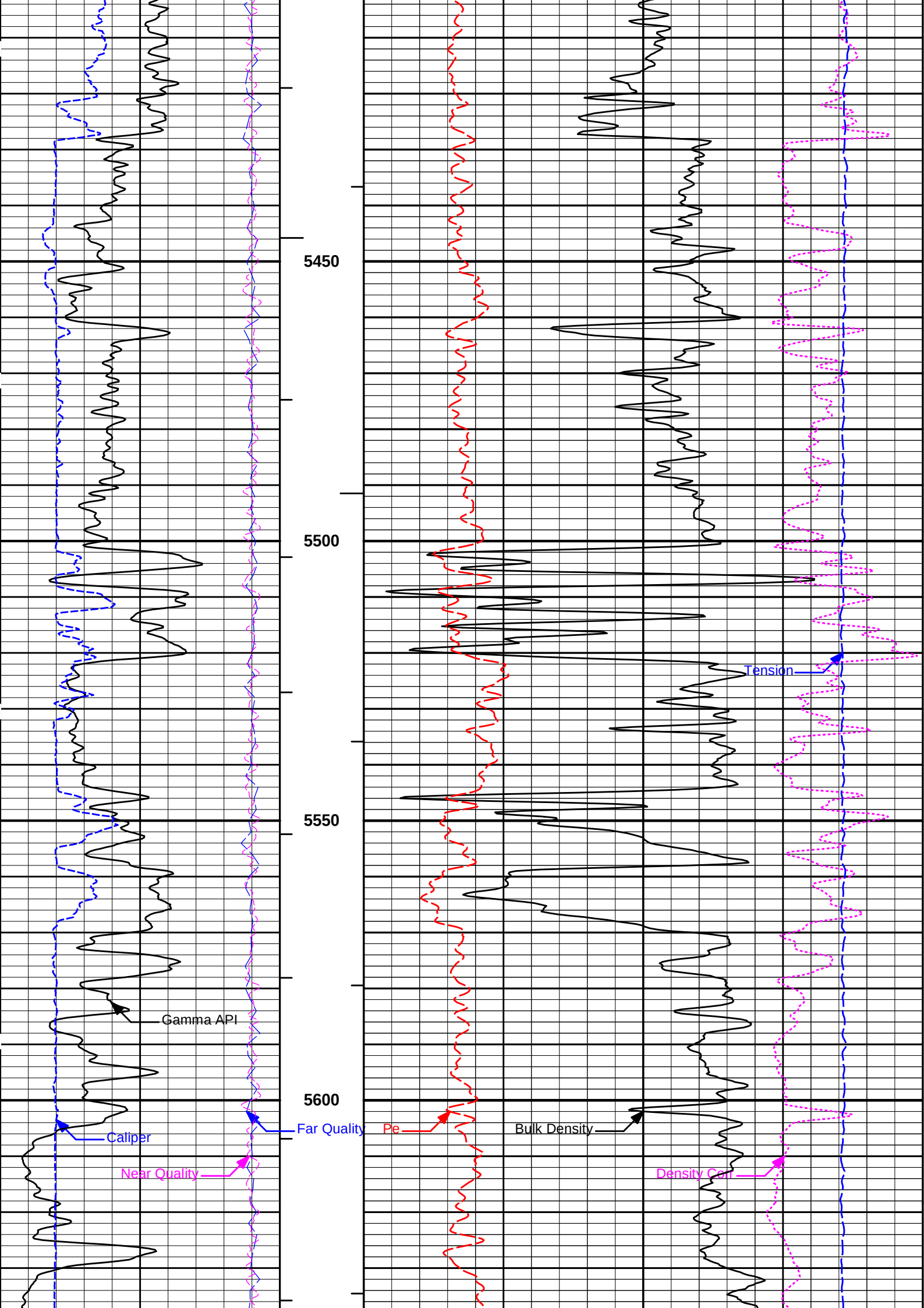
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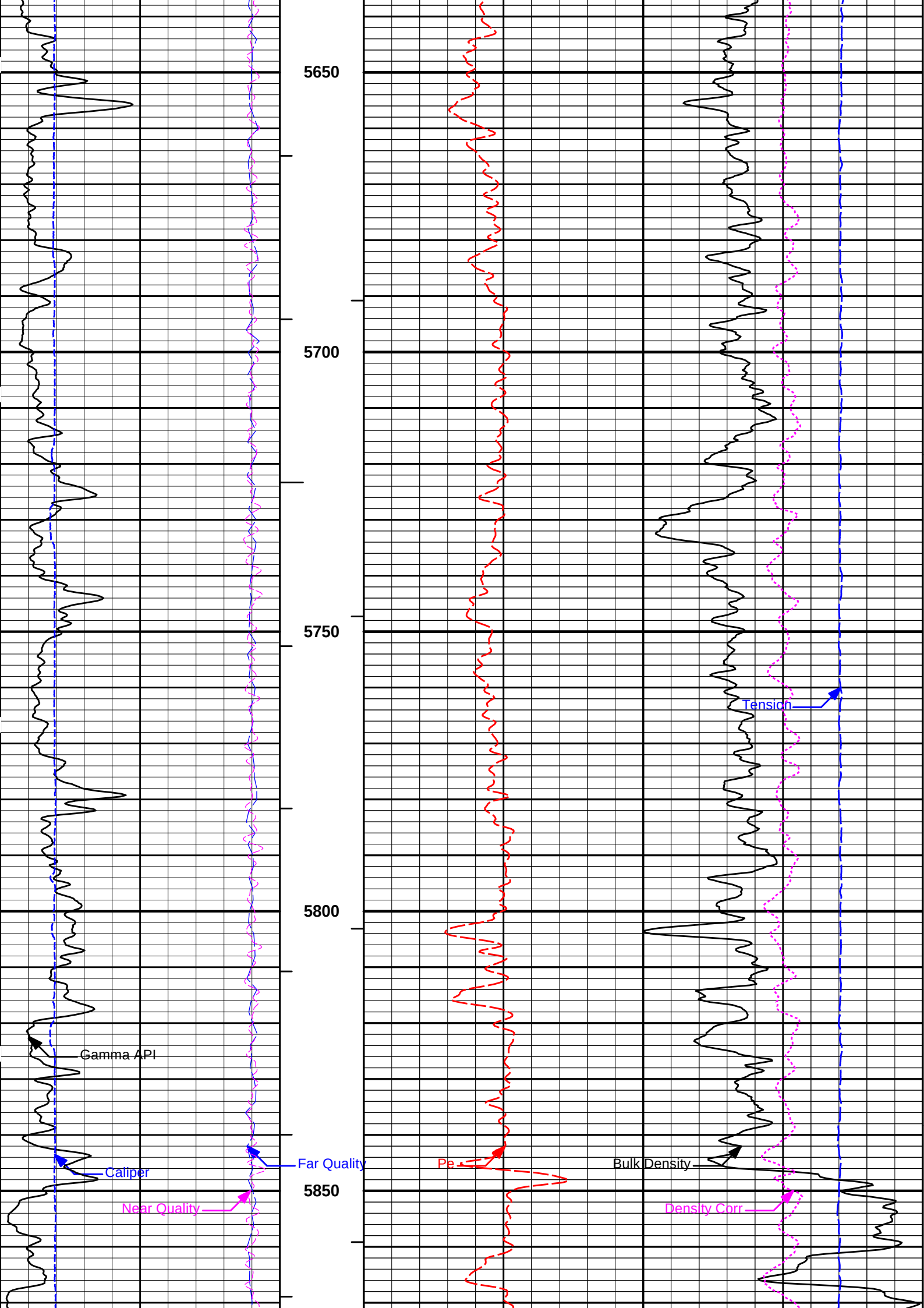
Density Corr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Tension
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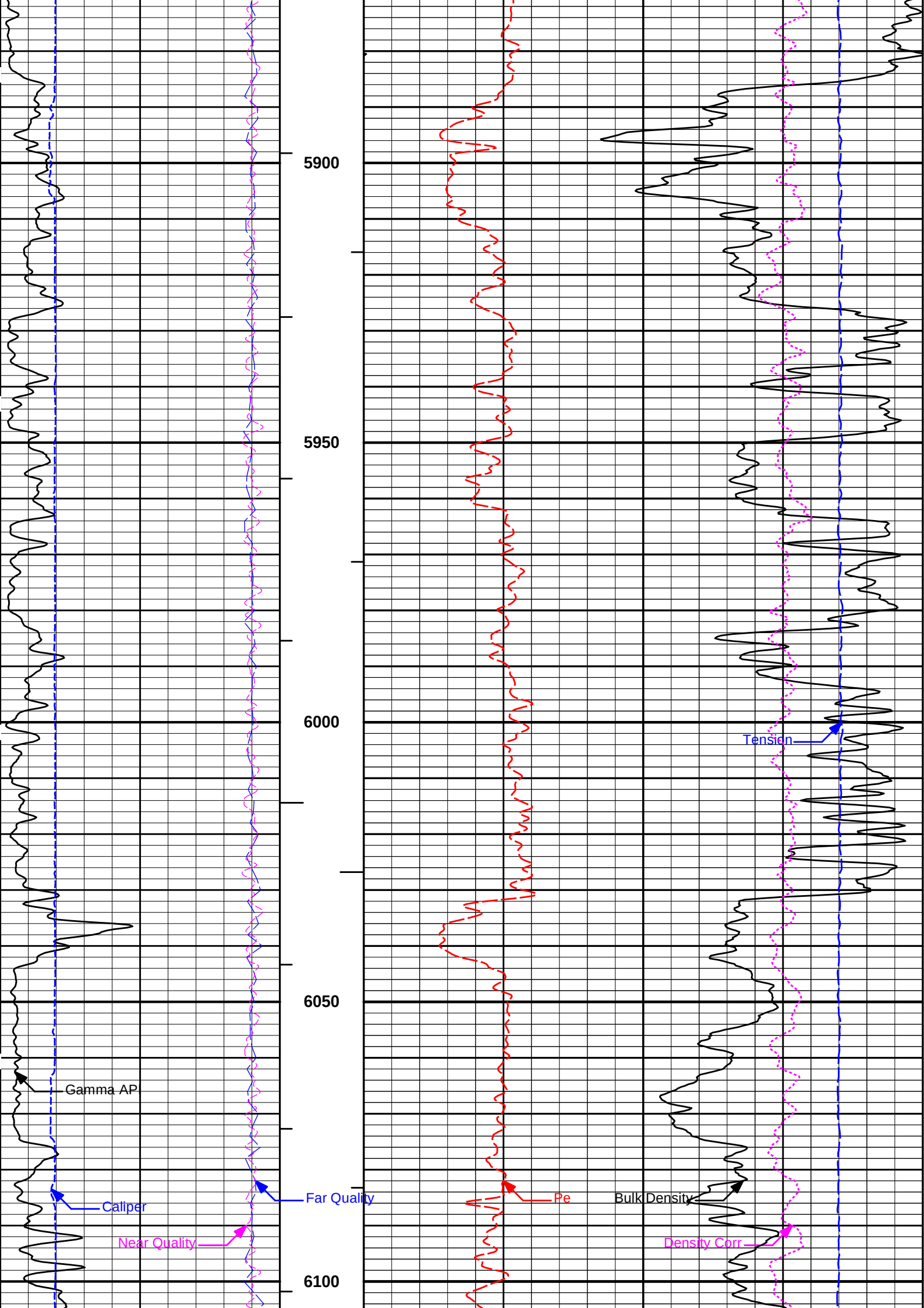
Density Corr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Bulk Density
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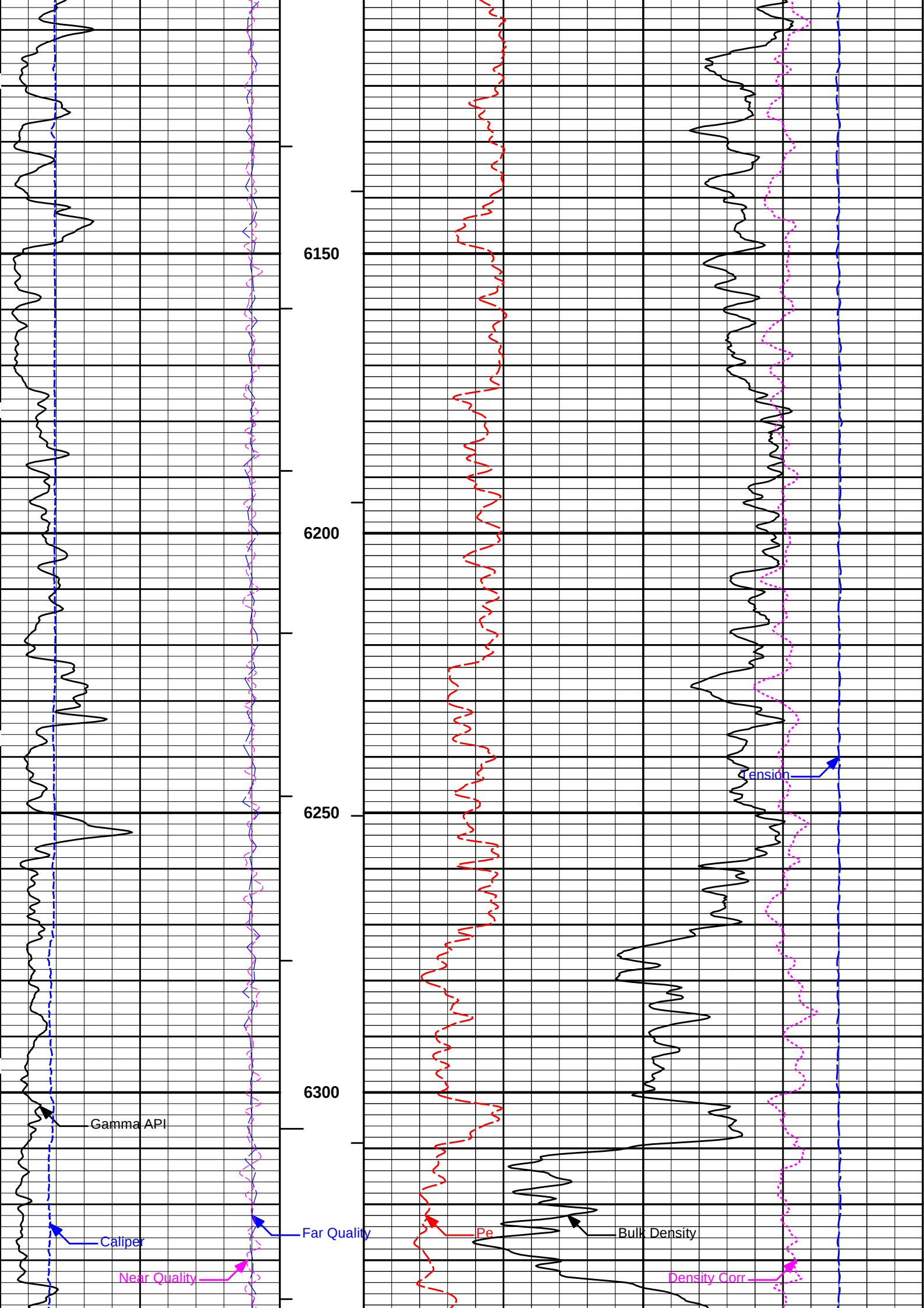
Tension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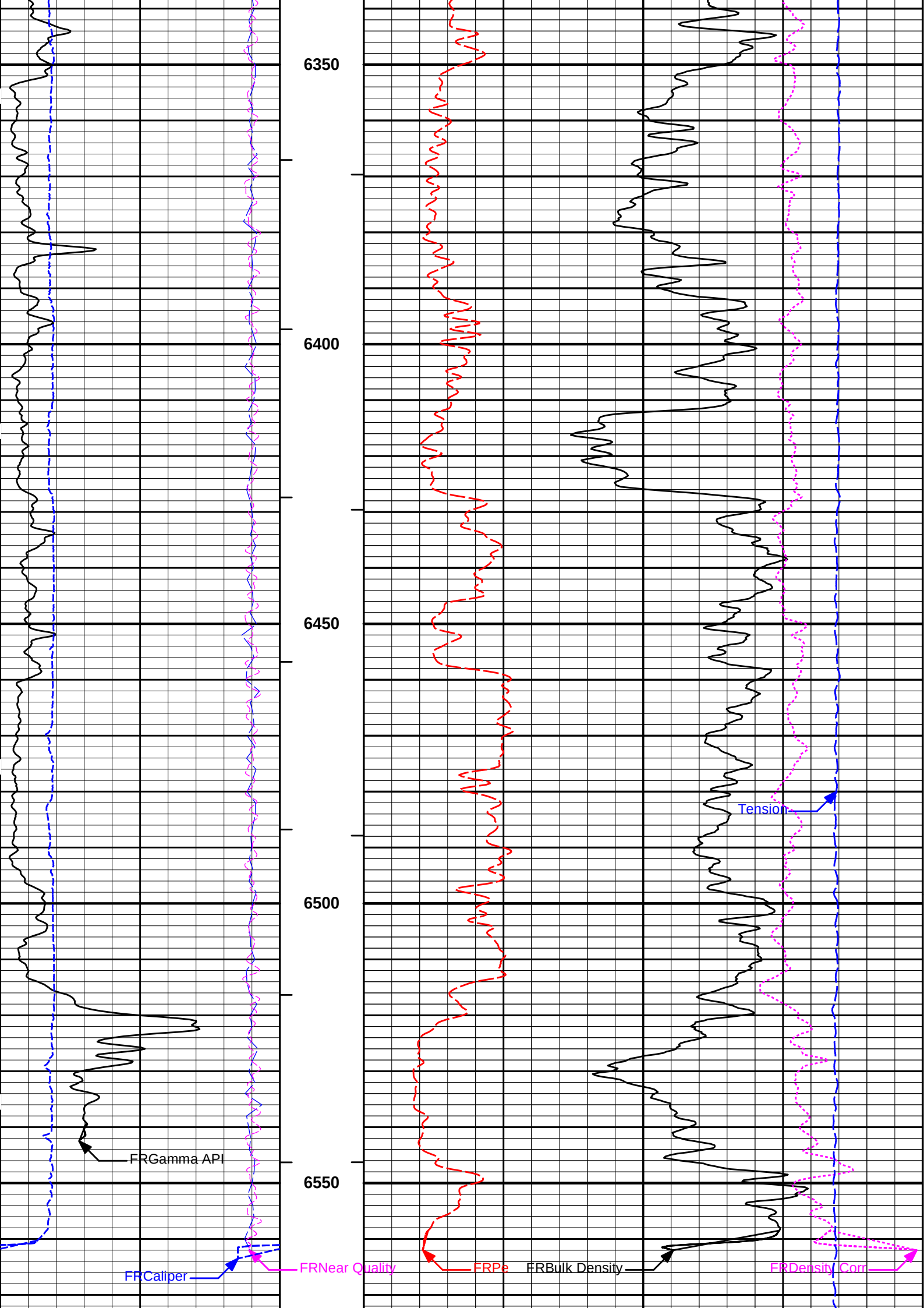
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FRBulk Density
Tension
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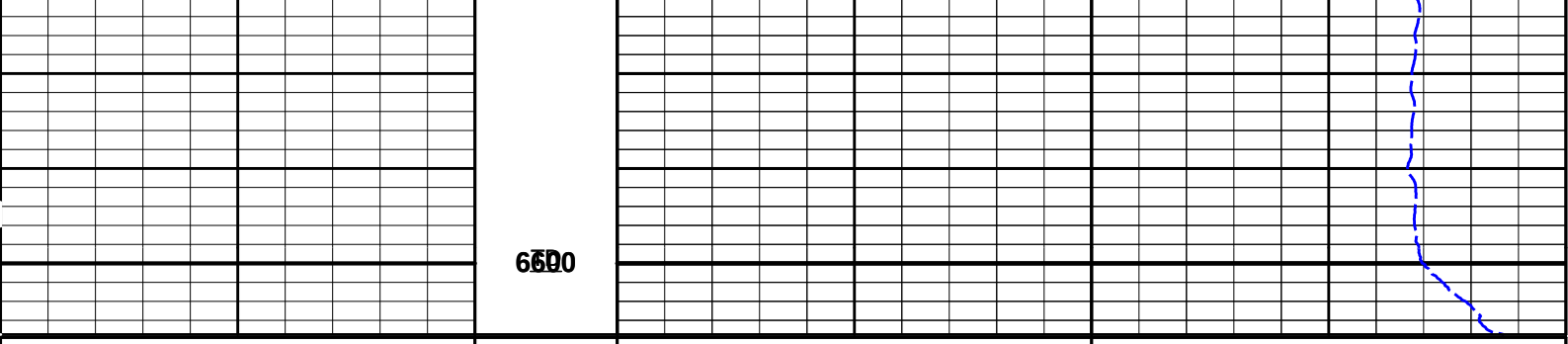


HALLIBURTON

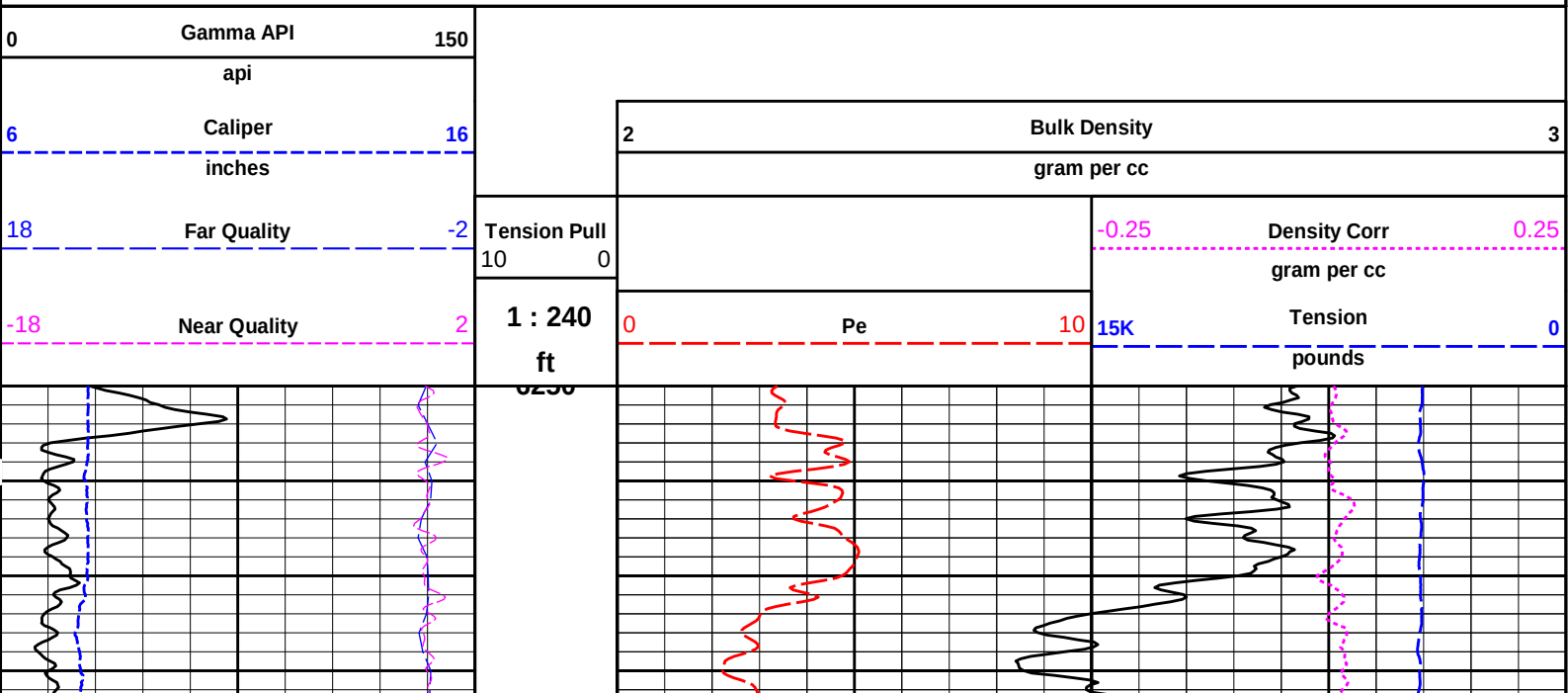
Plot Time: 18-Oct-17 04:00:55
Plot Range: 3630 ft to 6607.5 ft
Data: MERIT_LCSLU 108\Well Based\PORO\
Plot File: \\PORO\1_Bulk_5_mainx

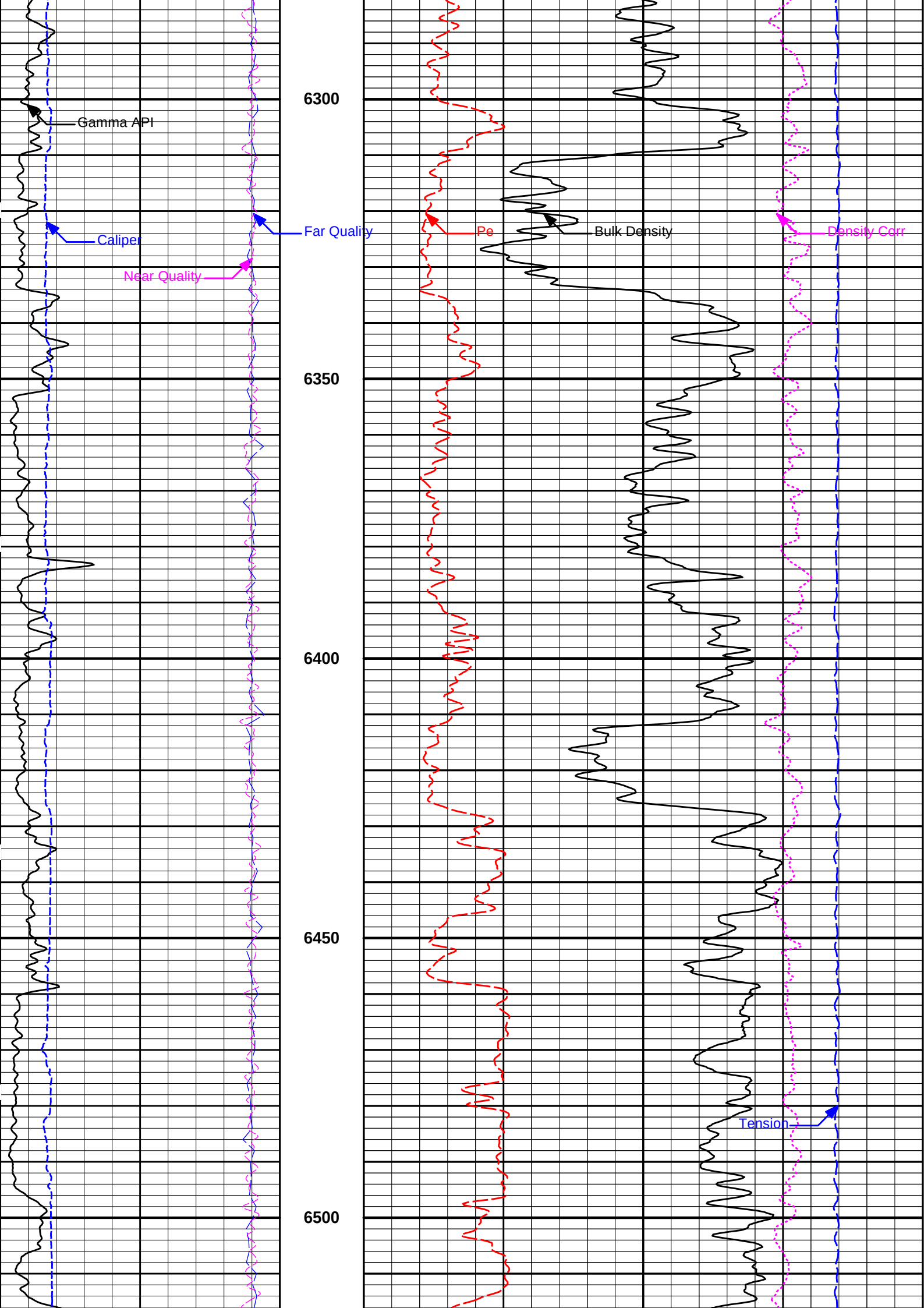
5 INCH MAIN LOG

HALLIBURTON

Plot Time: 18-Oct-17 04:00:56
Plot Range: 6250 ft to 6605.67 ft
Data: MERIT_LCSLU 108\Well Based\REPEAT\
Plot File: \\PORO\1_Bulk_5_rptx

REPEAT SECTION

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6350
6400
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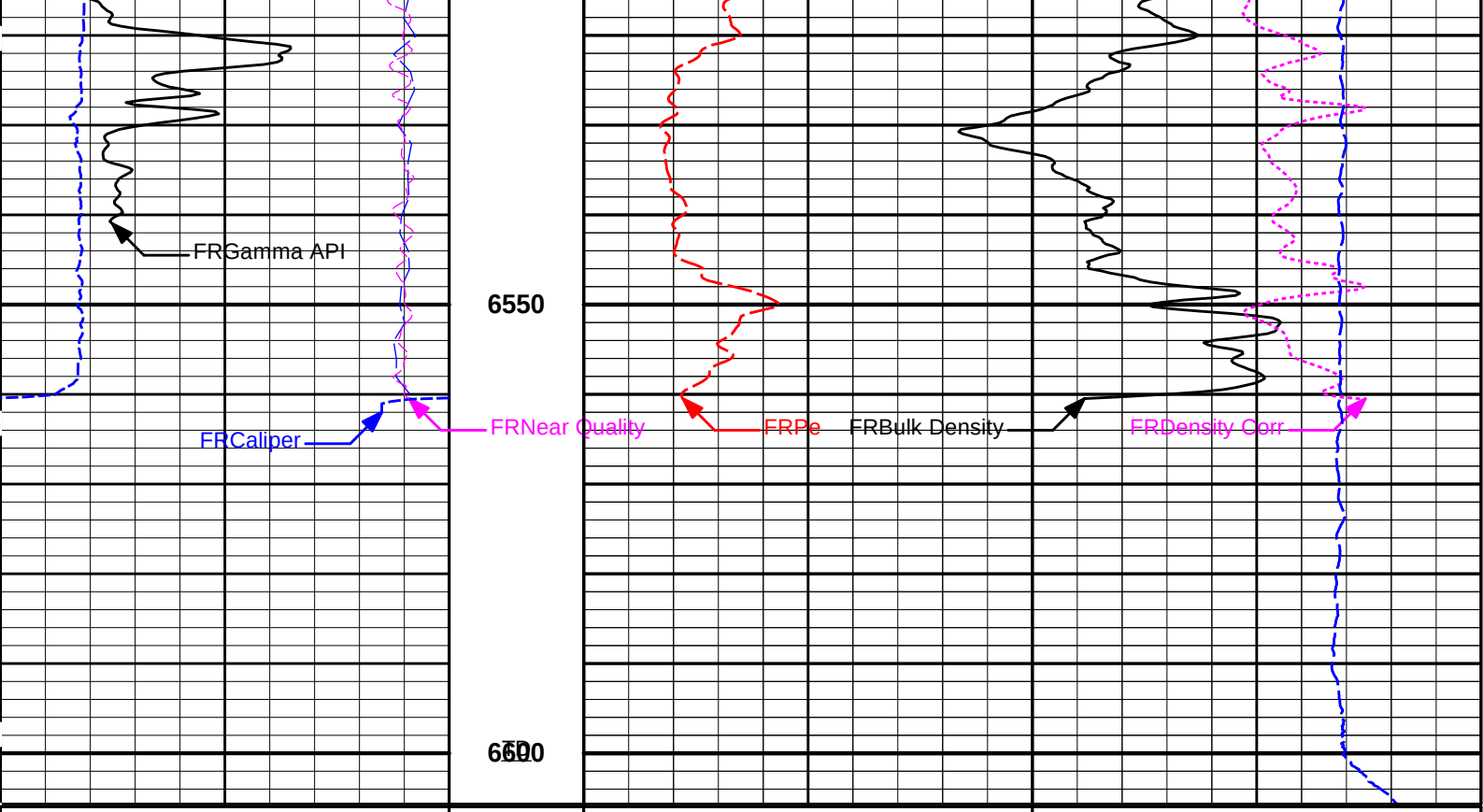
Caliper
Near Quality
Far Quality
Pe
Bulk Density
Density Corr
Tension



HALLIBURTON

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Plot File: \\PORO\1_Bulk_5_rptx

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	9.100	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	0.700	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	6603.00	ft
SHARED	BHT	Bottom Hole Temperature	145.0	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	Density	
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	Gradient	
DSNT	DNTT	Top Zone Temperature Value	75.0	degF
DSNT	DNBT	DSN Bottom Zone Temperature Value	145.0	degF
DSNT	DTDT	Top Depth for Temperature Gradient Calculation (Measured Depth)	0	ft
DSNT	DBDT	Bottom Zone Temperature Depth (Measured Depth)	6603	ft
DSNT	DPRS	DSN Pressure Correction Type	Gradient	
DSNT	DNTP	DSN Top Zone Pressure Value	14.70	psia
DSNT	DNBP	DSN Bottom Zone Pressure Value	3125.00	psia
DSNT	DTDP	Top Depth for Pressure Gradient Calculation (Measured Depth)	0	ft
DSNT	DNDP	Bottom Zone Pressure Depth (Measured Depth)	6603	ft
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	

SDLT Pad	BHSM	Borehole Size Source Tool	SDLT	
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	1.19	in
ACRt Sonde	TCS1	Temperature Correction Source	FP Lwr & FP Upr	
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	SDLT	
ACRt Sonde	MBFL	Apply Corkscrew Effect?	No	

BOTTOM

Data: MERIT_LCSLU 108\0001 GTET-DSN-SDL-FLX-BSAT-ACRT\IDLE **Date: 18-Oct-17 02:57:13**

HALLIBURTON

CALIBRATION REPORT

NATURAL GAMMA RAY TOOL SHOP CALIBRATION

Tool Name:	**GTET - 11021139**	**Reference Calibration Date:**	**23-Sep-17 12:22:06**
Engineer:	**WHITLOCK**	**Calibration Date:**	**06-Oct-17 11:06:34**
Software Version:	**WL INSITE R5.0.5 (Build 8)**	**Calibration Version:**	**1**

Calibrator Source S/N: TB79
Calibrator API Reference:222.00 api
Equivalent Calibrator API Reference:225.9 api

Measurement	Measured	Calibrated	Units
Background	25.7	25.8	api
Background + Calibrator	250.7	251.7	api
Calibrator	225.0	225.9	api

NATURAL GAMMA RAY TOOL FIELD CALIBRATION

Tool Name:	**GTET - 11021139**	**Reference Calibration Date:**	**06-Oct-17 11:06:34**
Engineer:	**WHITLOCK**	**Calibration Date:**	**06-Oct-17 11:10:24**
Software Version:	**WL INSITE R5.0.5 (Build 8)**	**Calibration Version:**	**1**

Calibrator Source S/N: TB79
Calibrator API Reference:222.00 api
Equivalent Calibrator API Reference:225.9 api

Field Verification	Shop	Field	Units
Background	25.8	24.9	api
Background + Calibrator	251.7	254.1	api
Calibrator	225.9	229.3	api

Shop	Field	Difference	Tolerance
225.9	229.3	-3.4	+/- 9.00

DUAL SPACED NEUTRON SHOP CALIBRATION

Tool Name:	**DSNT - 11020487**	**Reference Calibration Date:**	**05-Jun-17 14:14:28**
Engineer:	**MICHAEL RICHTER**	**Calibration Date:**	**03-Aug-17 01:56:12**
Software Version:	**WL INSITE R5.0.5 (Build 8)**	**Calibration Version:**	**1**

Logging Source S/N: DSN-436
Tank Serial Number: EL RENO
Reference value assigned to Tank: 56.100
Snow Block S/N: 12156883
Calibration Tank Water Temperature: 72 degF
Min. Tool Housing Outside Diameter: 3.625 in

CALIBRATION CONSTANTS

Measurement	Prev. Value	New Value	Control Limit On New Value
Gain:	0.99837	0.99685	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):	0.2363	0.2358	0.0005	+/- 0.0020
Calibrated Ratio:	10.5757	10.5596	0.016	+/- 0.050

VERIFIER

Measurement	Value	Control Limit
Snow-Block Porosity (decp):	0.0746	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 - 11020487**	**Reference Calibration Date:**	**03-Aug-17 01:56:12**
Engineer:	**WHITLOCK**	**Calibration Date:**	**06-Oct-17 10:54:23**
Software Version:	**WL INSITE R5.0.5 (Build 8)**	**Calibration Version:**	**1**

Logging Source S/N: DSN-436
Snow Block S/N: 12156883

NEUTRON FIELD-CHECK SUMMARY

	Shop	Field	Difference	Control Limit On Change
Snow-Block Porosity (decp):	0.0746	0.0623	-0.0122	+/- 0.0150

PASS/FAIL SUMMARY

Block Change Check:	Passed
Snow Block Stat Check:	Passed
Temperature Check:	Passed

DENSITY CALIPER SHOP CALIBRATION

Tool Name:	**SDLT - 11014296**	**Reference Calibration Date:**	**06-Nov-16 12:09:13**
Engineer:	**MICHAEL RICHTER**	**Calibration Date:**	**15-Mar-17 09:33:53**
Software Version:	**WL INSITE R5.0.5 (Build 8)**	**Calibration Version:**	**1**
Host Tool Name:	**DSNT - 11020487**		

CALIBRATION COEFFICIENTS

Measurement	Previous Value	New Value	Control Limit On New Value
Pad Offset	-4335.63	-4512.85	-7000.00 - -1000.00
Pad Gain	0.0003910	0.0004190	0.0002000 - 0.0006000

Arm Offset	-3121.03	-2559.45	-5000.00 - 3000.00
Arm Gain	0.0005117	0.0005078	0.000300 - 0.000700
Arm Power	-0.000003980	-0.000003959	-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)	1.94	2.00	0.06	+/- 0.20
Medium Ring (in)	3.57	3.75	0.18	+/- 0.20
RING DIAMETER:				
Small Ring (in)	6.31	6.50	0.19	+/- 0.20
Medium Ring (in)	8.08	8.25	0.17	+/- 0.20
Large Ring (in)	14.92	15.00	0.08	+/- 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 - 11014296 **Reference Calibration Date:** 15-Mar-17 09:33:53

Engineer: WHITLOCK **Calibration Date:** 04-Oct-17 10:11:22

Software Version: WL INSITE R5.0.5 (Build 8) **Calibration Version:** 1

MEASURED CALIPER VALUES				
Measurement	Shop	Field	Change	Control Limit On New Value
Pad Extension	3.75	3.84	0.09	+/- 0.10
Ring Diameter	8.25	8.31	0.06	+/- 0.15

PASS/FAIL SUMMARY	
Pad Extension Check:	Passed
Diameter Check:	Passed

MICRO LOG SHOP CALIBRATION

Tool Name: Microlog Pad - 11014296 **Reference Calibration Date:** 03-Aug-17 02:26:45

Engineer: WHITLOCK **Calibration Date:** 06-Oct-17 11:43:41

Software Version: WL INSITE R5.0.5 (Build 8) **Calibration Version:** 1

Host Tool Name: DSNT - 11020487

CALIBRATION COEFFICIENT SUMMARY					
Measurement	Micro Log Normal		Micro Log Lateral		
	Measured	Calibrated	Measured	Calibrated	Units
Tool Zero	-0.43	-0.13	0.01	-0.00	ohmm
Calibration Point #1	-0.31	0.00	0.01	0.00	ohmm
Calibration Point #2	19.73	20.00	19.97	20.00	ohmm
Internal Reference	19.55	19.82	19.97	20.00	ohmm

Measurement	Micro Log Normal Tool Value	Micro Log Lateral Tool Value	Units
Tool Zero	0.08	0.12	V
Calibration Point #1	33.72	1.57	V
Calibration Point #2	5375.96	6898.02	V
Internal Reference	5327.65	6899.00	V

MICRO LOG FIELD CHECK

Tool Name:	**Microlog Pad - 11014296**	**Reference Calibration Date:**	**06-Oct-17 11:43:41**
Engineer:	**WHITLOCK**	**Calibration Date:**	**06-Oct-17 11:44:30**
Software Version:	**WL INSITE R5.0.5 (Build 8)**	**Calibration Version:**	**1**

Measurement	Micro Log Normal		Micro Log Lateral		
	Shop	Field	Shop	Field	Units
Tool Zero	-0.13	-0.13	-0.00	-0.00	ohmm
Internal Reference	19.82	19.82	20.00	20.01	ohmm

Summary				
Signal	Shop	Field	Difference	Tolerence
Microlog Normal	19.82	19.82	0.00	+/- 0.80
Microlog Lateral	20.00	20.01	-0.01	+/- 0.80

SPECTRAL DENSITY SHOP CALIBRATION

Tool Name:	**SDLT Pad - 10809130**	**Reference Calibration Date:**	**25-May-17 12:11:12**
Engineer:	**MICHAEL RICHTER**	**Calibration Date:**	**03-Aug-17 02:19:19**
Software Version:	**WL INSITE R5.0.5 (Build 8)**	**Calibration Version:**	**1**

Logging Source S/N: 5155GW

Aluminum Block S/N: EL RENO — Density: 2.581g/cc — Pe: 3.170

Magnesium Block S/N: EL RENO MG — Density: 1.687g/cc — Pe: 2.594

DENSITY CALIBRATION SUMMARY			
Measurement	Previous Value	New Value	Control Limit
Near Bar Gain	1.0466	0.9648	0.90 - 1.10
Near Dens Gain	1.0202	0.9664	0.90 - 1.10
Near Peak Gain	1.0587	0.9808	0.90 - 1.10
Near Lith Gain	1.0474	0.9899	0.90 - 1.10
Far Bar Gain	1.0144	1.0063	0.90 - 1.10
Far Dens Gain	1.0018	0.9910	0.90 - 1.10
Far Peak Gain	0.9968	0.9885	0.90 - 1.10
Far Lith Gain	0.9703	0.9595	0.90 - 1.10
Near Bar Offset	-0.1512	0.5881	NONE
Near Dens Offset	0.0840	0.5517	NONE
Near Peak Offset	-0.2272	0.4091	NONE
Near Lith Offset	-0.1986	0.2702	NONE
Far Bar Offset	0.0686	0.1331	NONE
Far Dens Offset	0.1508	0.2380	NONE
Far Peak Offset	0.1449	0.2044	NONE
Far Lith Offset	0.2786	0.3450	NONE
Near Bar Background	815.93	813.79	700 - 1450
Near Dens Background	269.20	265.74	230 - 480
Near Peak Background	115.80	115.36	100 - 210
Near Lith Background	146.10	144.32	125 - 260
Far Bar Background	479.68	477.53	450 - 900
Far Dens Background	184.50	185.37	175 - 345
Far Peak Background	72.51	72.20	70 - 140
Far Lith Background	76.60	75.50	75 - 145

CALIBRATION BLOCK SUMMARY				
Measurement	Current Reading (Previous Coef)	Calibrated (New Coef)	Change	Control Limit On Change
MAGNESIUM				
Density (g/cc)	1.689	1.687	-0.002	+/- 0.015

Pe	2.521	2.561	0.040	+/- 0.150
ALUMINUM				
Density (g/cc)	2.574	2.580	0.006	+/- 0.01500
Pe	3.085	3.134	0.049	+/- 0.150

TOOL SUMMARY				
Measurement	Near Detector		Far Detector	
	Value	Control Limits	Value	Control Limits
QUALITY				
Background	0.0002	+/- 0.0110	-0.0029	+/- 0.0140
Magnesium Block	-0.0013	+/- 0.0110	-0.0010	+/- 0.0140
Aluminum Block	-0.0009	+/- 0.0110	-0.0014	+/- 0.0140
Resolution	8.91	6.00 - 11.50	9.49	6.00 - 11.50
Internal Verifier(B+D+P+L)	1339	1200 - 2700	811	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 - 10809130 **Reference Calibration Date:** 03-Aug-17 02:19:19

Engineer: WHITLOCK **Calibration Date:** 06-Oct-17 11:43:04

Software Version: WL INSITE R5.0.5 (Build 8) **Calibration Version:** 1

Pad Temperature: 78.1 degF

DENSITY FIELD CALIBRATION SUMMARY				
Measurement	Shop	Field	Change	Control Limit +/-
Near (B+D+P+L) cps	1339.219	1336.718	-2.501	14.801
Far (B+D+P+L) cps	810.608	811.972	1.364	15.737
Near Resolution	8.91	8.90	-0.010	0.50
Far Resolution	9.49	9.48	-0.010	1.00

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

BSAT FIELD CASING CHECK

Tool Name: BSAT - 10939049 **Calibration Date:** 30-Mar-17 10:01:32

Engineer: HARRIS

Software Version: WL INSITE R5.0.5 (Build 8) **Calibration Version:** 1

Pre-Log Check	Check Depth	Shop	Field	Difference	Tolerance	Units
Delta-T Compensated	147.01	57.00	56.56	0.4400	1.00	uspf

ARRAY COMPENSATED TRUE RESISTIVITY SHOP CALIBRATION

Tool Name: ACRt Sonde - 11038385 **Reference Calibration Date:** 12-Sep-17 13:48:00

Engineer: JORGE ORLANDO PEREZ **Calibration Date:** 12-Sep-17 13:58:19

Software Version: WL INSITE R5.0.5 (Build 8) **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	1.0395	1.05	0.95	1.0229	1.05	0.95	1.0146	1.05
A2 (50")	0.95	1.0409	1.05	0.95	1.0225	1.05	0.95	1.0165	1.05
A3 (29")	0.95	1.0384	1.05	0.95	1.0194	1.05	0.95	1.0115	1.05
A4 (17")	0.95	1.0343	1.05	0.95	1.0133	1.05	0.95	1.0069	1.05
A5 (10")	N/A	N/A	N/A	0.95	1.0083	1.05	0.95	0.9989	1.05
A6 (6")	N/A	N/A	N/A	0.95	1.0000	1.05	0.95	0.9929	1.05

SONDE OFFSET

Subarray	R12KHz	R36KHz	R72KHz
	(mmho/m)	(mmho/m)	(mmho/m)
A1 (80")	0.702	-4.637	-5.501
A2 (50")	-0.771	-4.034	-5.172
A3 (29")	-13.230	-3.699	-3.350
A4 (17")	-110.240	-33.969	-26.356
A5 (10")	N/A	-83.665	-41.621
A6 (6")	N/A	333.771	173.557

TRANSMITTER CURRENT GAIN

Signal	Lower	R	Upper
12K	0.6	0.90	1.3
36K	1.0	1.36	2.0
72K	1.0	1.62	2.0

R-MUD VERIFICATION

Signal	Lower (ohm-m)	Measured (ohm-m)	Upper (ohm-m)
Mud Cell	0.95	1.00	1.05

PASS/FAIL SUMMARY

GAIN RANGE CHK	PASS
SONDE OFFSET CHK	PASS

TOOL OK TO LOG

CALIBRATION SUMMARY

Sensor	Shop	Field	Post	Difference	Tolerance	Units
GTET-11021139						
Gamma Ray Calibrator	225.9	229.3	----------	-3.4	+/- 9.00	api
DSNT-11020487						
Snow-Block Porosity	0.0746	0.0623	----------	0.0123	+/- 0.0150	decp
SDLT-11014296						
Pad Extension	3.75	3.84	----------	-0.09	+/-0.10	in
Ring Diameter	8.25	8.31	----------	-0.06	+/-0.15	in
Microlog Pad-11014296						
MicroLog Normal	19.82	19.82	----------	0.00	+/-0.80	ohmm
MicroLog Lateral	20.00	20.01	----------	-0.01	+/-0.80	ohmm
SDLT Pad-10809130						
Near(B+D+P+L)	1339.219	1336.718	----------	2.501	+/-14.801	cps
Far(B+D+P+L)	810.608	811.972	----------	-1.364	+/-15.737	cps
ACRt Sonde-11038385						
Mud Cell	1.00	----------	----------	0	----------	ohm-m

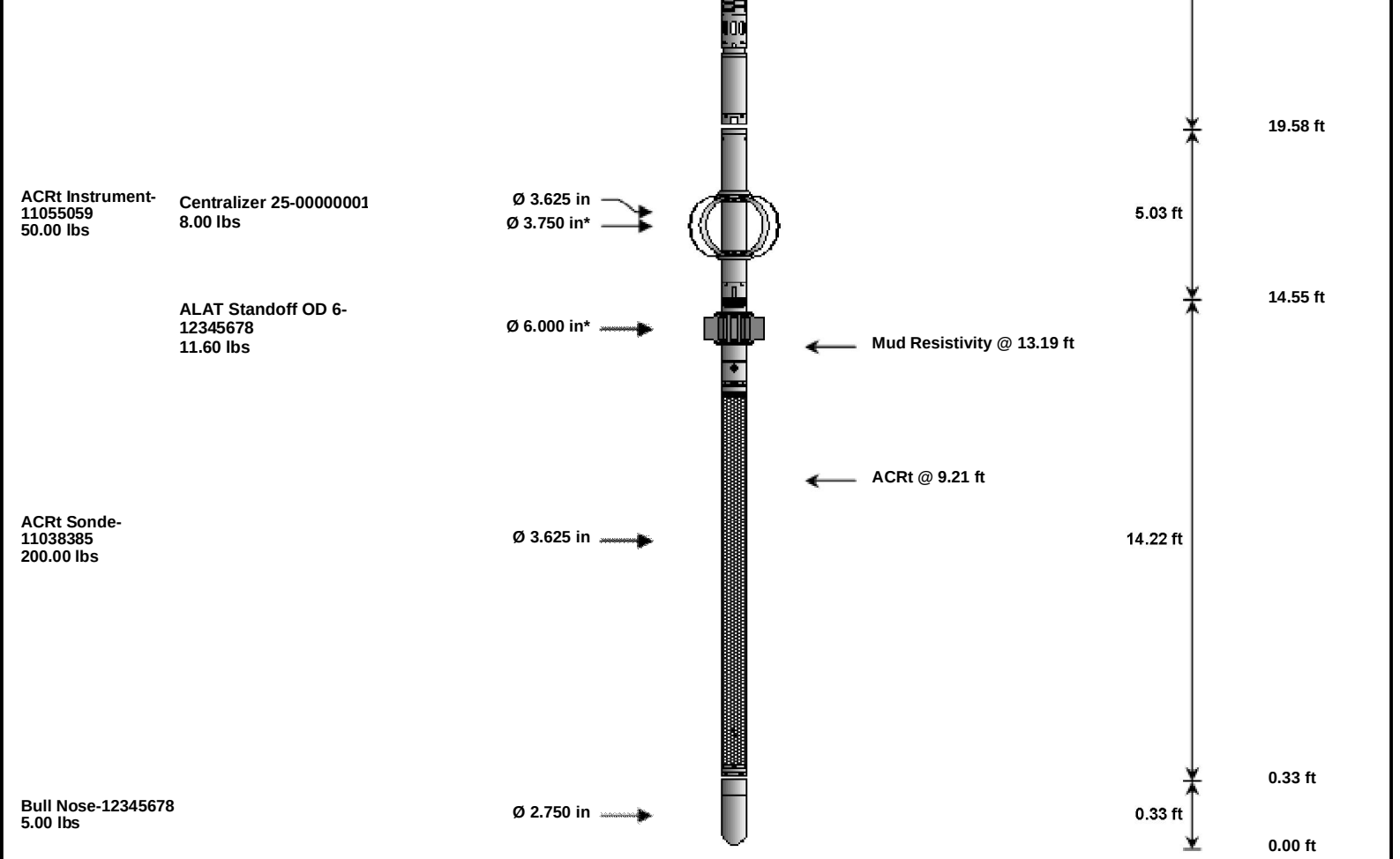
Data: MERIT_LCSLU 108\0001 GTET-DSN-SDL-FLX-BSAT-ACRT\IDLE **Date: 18-Oct-17 02:57:28**

HALLIBURTON

TOOL STRING DIAGRAM REPORT

TOOL STRING DIAGRAM REPORT

Description	Overbody Description	O.D.	Diagram	Sensors @ Delays	Length	Accumulated Length
				Temperature @ 76.74 ft		76.99 ft
CH_HOS_I 37.50 lbs		Ø 2.750 in			2.25 ft	
		Ø 2.750 in				74.74 ft
XOHD-11021555 20.00 lbs		Ø 3.625 in			0.95 ft	
						73.79 ft
SP Sub-10904995 60.00 lbs		Ø 3.625 in		SP @ 72.01 ft	3.74 ft	
				Z-Accelerometer @ 69.60 ft		70.05 ft
GTET-11021139 165.00 lbs		Ø 3.625 in			8.52 ft	
				GammaRay @ 63.99 ft		
						61.53 ft
	DSN Decentralizer-11023947 6.60 lbs	Ø 5.000 in*				
DSNT-11020487 174.00 lbs		Ø 3.625 in			9.69 ft	
				DSN Far @ 54.59 ft		
				DSN Near @ 53.84 ft		
						51.84 ft
	SDLT Pad-10809130 65.00 lbs					
SDLT-11014296 360.00 lbs	Microlog Pad-11014296 8.00 lbs	Ø 4.500 in			10.81 ft	
		Ø 4.500 in*		Microlog @ 44.03 ft		
		Ø 4.750 in*		SDL Caliper @ 43.84 ft		
	RAM-Cs137-10948154 1.00 lbs	Ø 0.800 in*		SDL @ 43.83 ft		
						41.03 ft
IQ Flex-10973274 140.00 lbs		Ø 3.625 in			5.67 ft	
						35.36 ft
	Centralizer 25-00000002 8.00 lbs	Ø 3.750 in*				
BSAT-10939049 300.00 lbs		Ø 3.625 in		Receiver Array @ 26.84 ft	15.77 ft	
				Sonic Receivers @ 26.84 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	2.25		74.74	300.00
XOHD	Hostile to Dits Cross Over	11021555	20.00	0.95		73.79	300.00
SP	SP Sub	10904995	60.00	3.74		70.05	300.00
GTET	Gamma Telemetry Tool	11021139	165.00	8.52		61.53	60.00
DSNT	Dual Spaced Neutron	11020487	174.00	9.69		51.84	60.00
DCNT	DSN Decentralizer	11023947	6.60	5.13	*	55.17	300.00
SDLT	Spectral Density Tool	11014296	360.00	10.81		41.03	60.00
SDLP	Density Insite Pad	10809130	65.00	2.55	*	43.24	60.00
Cs137	Logging Source, SDLT-I, 1.78 Ci - Cs137	10948154	1.00	0.80	*	43.47	300.00
MICP	Microlog Pad	11014296	8.00	1.00	*	43.53	60.00
IQF	IQ Flex tool	10973274	140.00	5.67		35.36	300.00
BSAT	Borehole Sonic Array Tool	10939049	300.00	15.77		19.58	60.00
OBCEN	Centralizer - 25 in. Overbody	00000002	8.00	2.08	*	32.44	300.00
ACRt	Array Compensated True Resistivity Instrument Section	11055059	50.00	5.03		14.55	120.00
OBCEN	Centralizer - 25 in. Overbody	00000001	8.00	2.08	*	15.70	300.00
ACRt	Array Compensated True Resistivity Sonde Section	11038385	200.00	14.22		0.33	120.00
ALATS	Array Laterolog Tool OD 6 Standoff	12345678	11.60	1.00	*	13.19	60.00
BLNS	Bull Nose	12345678	5.00	0.33		0.00	300.00
Total			**1,619.70**	**76.99**			

* Not included in Total Length and Length Accumulation.

Data: MERIT_LCSLU 108\0001 GTET-DSN-SDL-FLX-BSAT-ACRT\IDLE **Date: 18-Oct-17 02:56:43**

COMPANY	**MERIT ENERGY COMPANY, LLC**		
WELL	**LCSLU 108 (WSW)**		
FIELD	**BIG SKY**		
COUNTY	**GRANT**	STATE	**KANSAS**

HALLIBURTON

SPECTRAL DENSITY DUAL SPACED NEUTRON

HALLIBURTON

DUAL SPACED NEUTRON
LOG