

# Schlumberger

**Company: Battelle Pacific Northwest Lab**

**Well: Wallula Basalt Pilot #1**

**Field: Wildcat**

**County: Walla Walla**

**State: Washington**

**PLATFORM EXPRESS  
ARRAY INDUCTION / NEUTRON / DENSITY  
GR / SP / MCFL**

County: Walla Walla  
Field: Wildcat  
Location: SOUTHWEST 1/4 OF SECTION  
Well: Wallula Basalt Pilot #1  
Company: Battelle Pacific Northwest Lab

<b>LOCATION</b>		SOUTHWEST 1/4 OF SECTION 10		Elev.: K.B. 5.50 ft
				G.L.
				D.F.
Permanent Datum:	GROUND LEVEL	Elev.:	above Perm. Datum	
Log Measured From:	FLANGE TOP			
Drilling Measured From:	KELLY BUSHING			
API Serial No.	Section 10	Township 7	Range 31E	

	Run 1	Run 2	Run 3
Logging Date			
Run Number			
Depth Driller			
Schlumberger Depth			
Bottom Log Interval			
Top Log Interval			
Casing Driller Size @ Depth			
Casing Schlumberger			
Bit Size			
Type Fluid In Hole			
Density			
Fluid Loss			
Source Of Sample			
RM @ Measured Temperature			
RMF @ Measured Temperature			
RMC @ Measured Temperature			
Source RMF			
RM @ MRT			
RMF @ MRT			
Maximum Recorded Temperatures			
Circulation Stopped			
Logger On Bottom			
Unit Number			
Recorded By			
Witnessed By			

Logging Date	18-Apr-2009		
Run Number	TWO		
Depth Driller	4105 ft		
Schlumberger Depth	4105 ft		
Bottom Log Interval	4103 ft		
Top Log Interval	1108 ft		
Casing Driller Size @ Depth	14,000 in @ 1108 ft		
Casing Schlumberger	1108 ft		
Bit Size	12.250 in		
Type Fluid In Hole	FRESH WATER		
Density	8.4 lbm/gal		
Fluid Loss	PH		
Source Of Sample	MUD TANK		
RM @ Measured Temperature	23.100 ohm.m @ 64 degF		
RMF @ Measured Temperature	@ @		
RMC @ Measured Temperature	@ @		
Source RMF	RMC		
RM @ MRT	@ @		
RMF @ MRT	@ @		
Maximum Recorded Temperatures			
Circulation Stopped	Time		
Logger On Bottom	18-Apr-2009		10:35
Unit Number	3152 SACRAMENTO		
Recorded By	BEN GRAU		
Witnessed By	CHARLOTTE SULLIVAN		

Logging Date			
Run Number			
Depth Driller			
Schlumberger Depth			
Bottom Log Interval			
Top Log Interval			
Casing Driller Size @ Depth			
Casing Schlumberger			
Bit Size			
Type Fluid In Hole			
Density			
Fluid Loss			
Source Of Sample			
RM @ Measured Temperature			
RMF @ Measured Temperature			
RMC @ Measured Temperature			
Source RMF			
RM @ MRT			
RMF @ MRT			
Maximum Recorded Temperatures			
Circulation Stopped	Time		
Logger On Bottom			
Unit Number	Location		
Recorded By			
Witnessed By			

**DISCLAIMER**  
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**OTHER SERVICES1**  
 OS1:  
 OS2:  
 OS3:  
 OS4:  
 OS5:

**OTHER SERVICES2**  
 OS1:  
 OS2:  
 OS3:  
 OS4:  
 OS5:

**REMARKS: RUN NUMBER 1**  
 TOOL STRING RAN AS PER TOOL SKETCH  
 BOWSPRING RAN ON NEUTRON TOOL  
 MATRIX: LIMESTONE  
 DENSITY: 2.71 G/CC  
 ICV CALCULATED USING FCD = 9.625"  
 TOOLS RAN AT 1800 FT/HR  
 PLATFORM EXPRESS DATA MERGED  
 THANK YOU FOR USING SCHLUMBERGER!!

**REMARKS: RUN NUMBER 2**

RUN 1		
SERVICE ORDER #:	AZJT00051	
PROGRAM VERSION:	17C0-154	
FLUID LEVEL:		
LOGGED INTERVAL	START	STOP

RUN 2		
SERVICE ORDER #:		
PROGRAM VERSION:		
FLUID LEVEL:		
LOGGED INTERVAL	START	STOP

## EQUIPMENT DESCRIPTION

**RUN 1**

**SURFACE EQUIPMENT**  
 WITM (EDTS)-A

GSR-U/Y  
 NCT-B  
 CNB-AB  
 NCS-VB


**RUN 2**


**SURFACE EQUIPMENT**  
 WITM (EDTS)-A

GSR-U/Y  
 NCT-B  
 CNB-AB  
 NCS-VB

**DOWNHOLE EQUIPMENT**

LEH-QT  
 LEH-QT

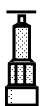

31.5



28.6

MDSB\_EDTC  
 Mud Tempe

**DOWNHOLE EQUIPMENT**

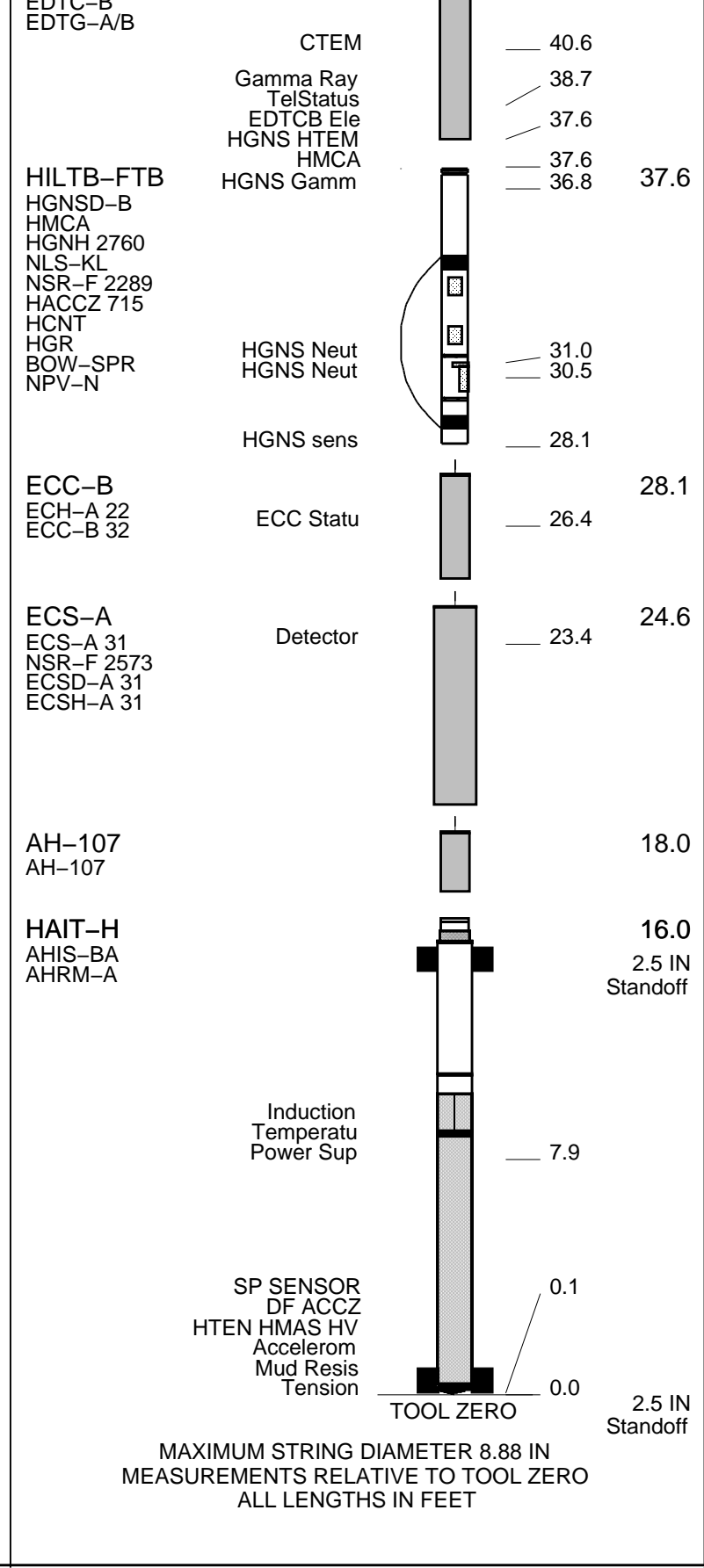
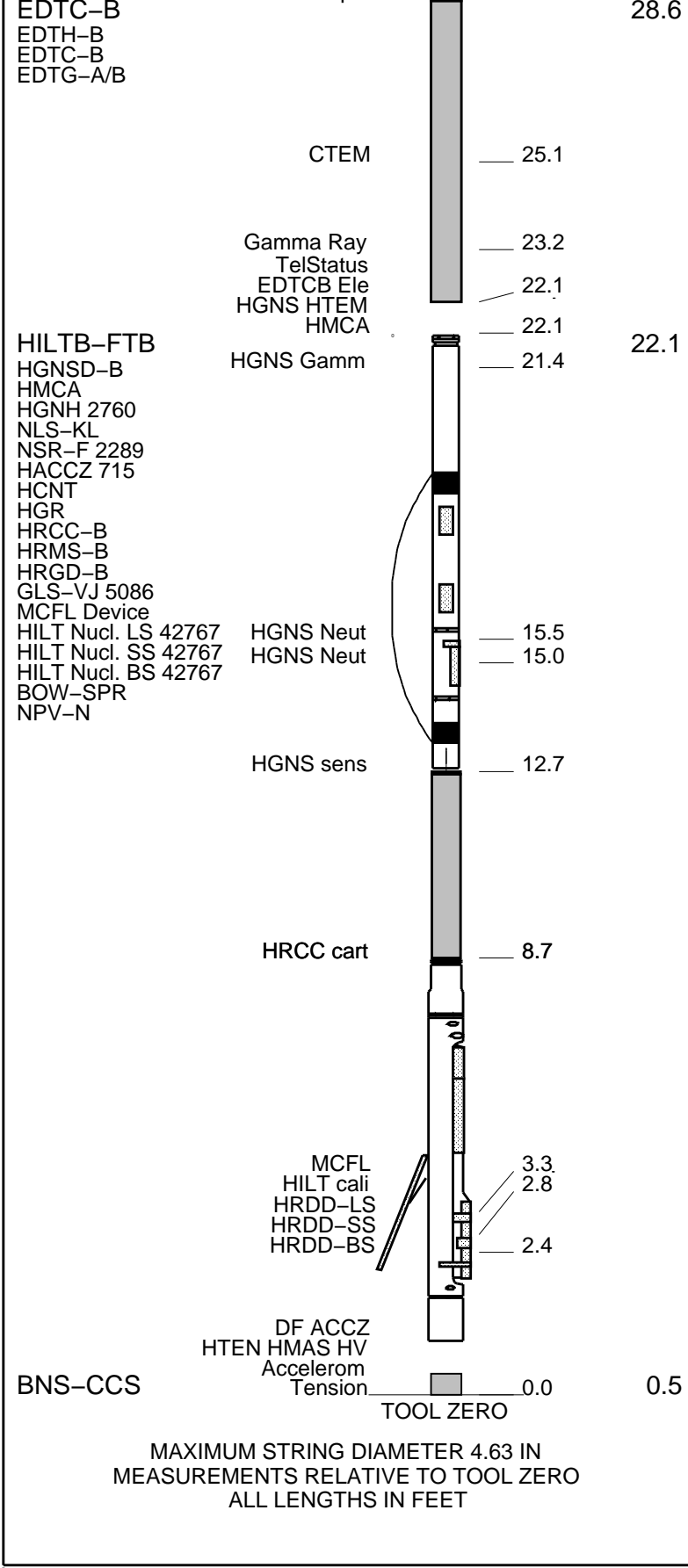
LEH-QT  
 LEH-QT


47.0

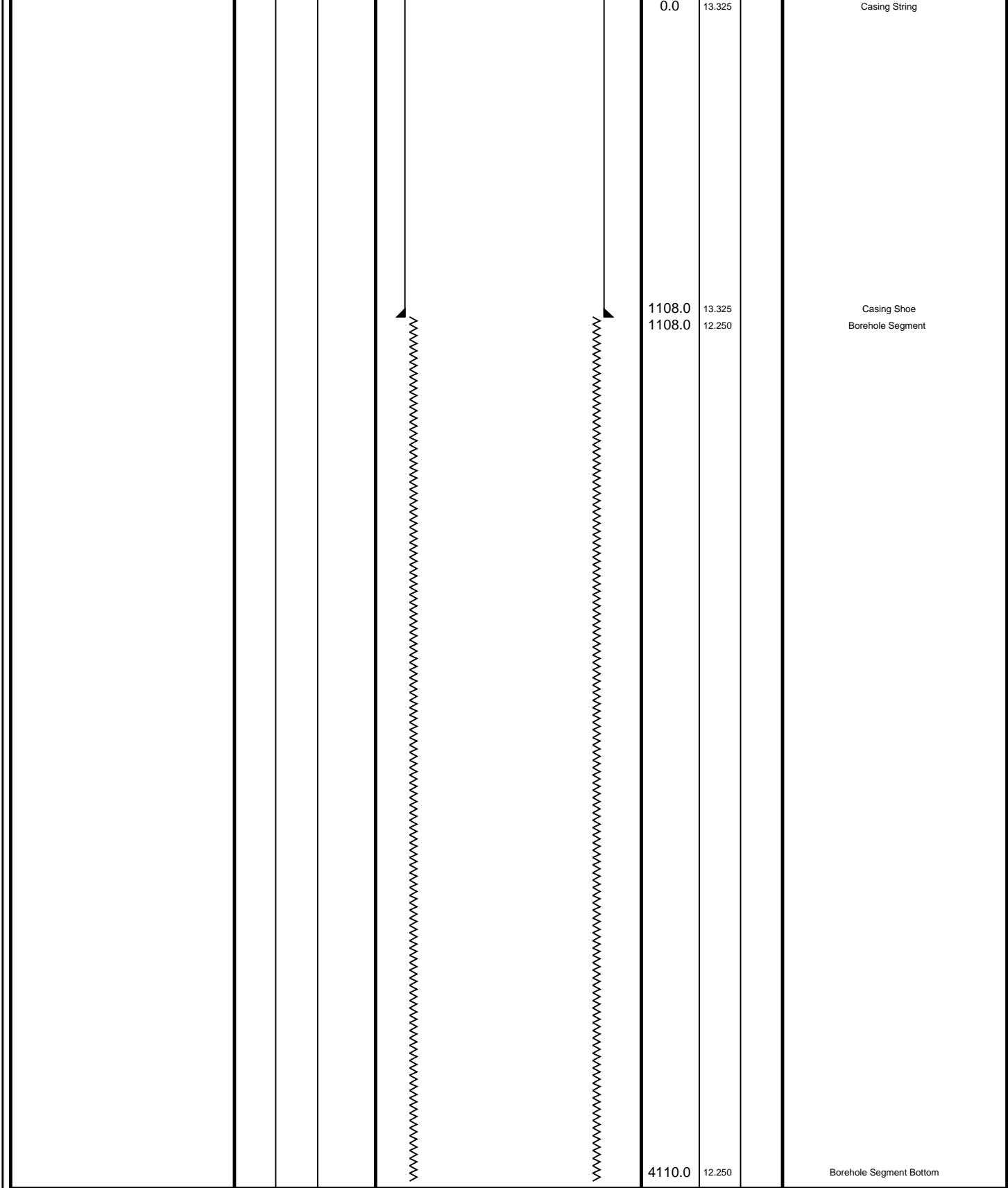

44.1

MDSB\_EDTC  
 Mud Tempe

EDTC-B  
 EDTH-B  
 EDTC-B



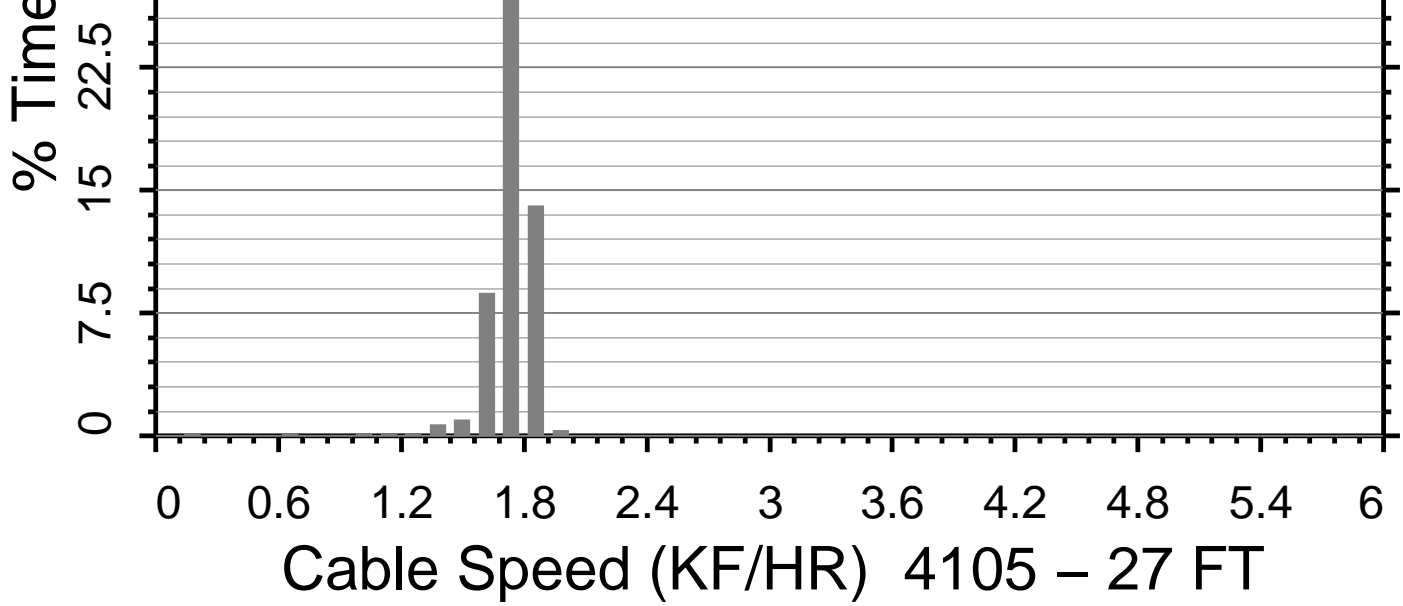
Production String	(in)	(ft)	Well Schematic	(ft)	(in)	Casing String
	OD	ID		MD	MD	



ALL DEPTHS ARE DRILLERS DEPTHS

Sequence # 041 (Apr 18 20:56:55 2009)





**Schlumberger**

**MAIN PASS 2 IN=100 FT**

MAXIS Field Log

**Input DLIS Files**

DEFAULT	MERGE_TLD_MCFL_CNL_036	FN:1	PRODUCER	18-Apr-2009 19:54	4104.0 FT	27.0 FT
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**Output DLIS Files**

DEFAULT	AIT_TLD_MCFL_CNL_041PUP	FN:39	PRODUCER	18-Apr-2009 20:53	4105.0 FT	27.5 FT
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**Integrated Hole/Cement Volume Summary**

Hole Volume = 3083.21 F3  
 Cement Volume = 1568.71 F3 (assuming 9.63 IN casing O.D.)  
 Computed from 4105.0 FT to 1108.0 FT using data channel(s) HCAL

**OP System Version: 17C0-154**

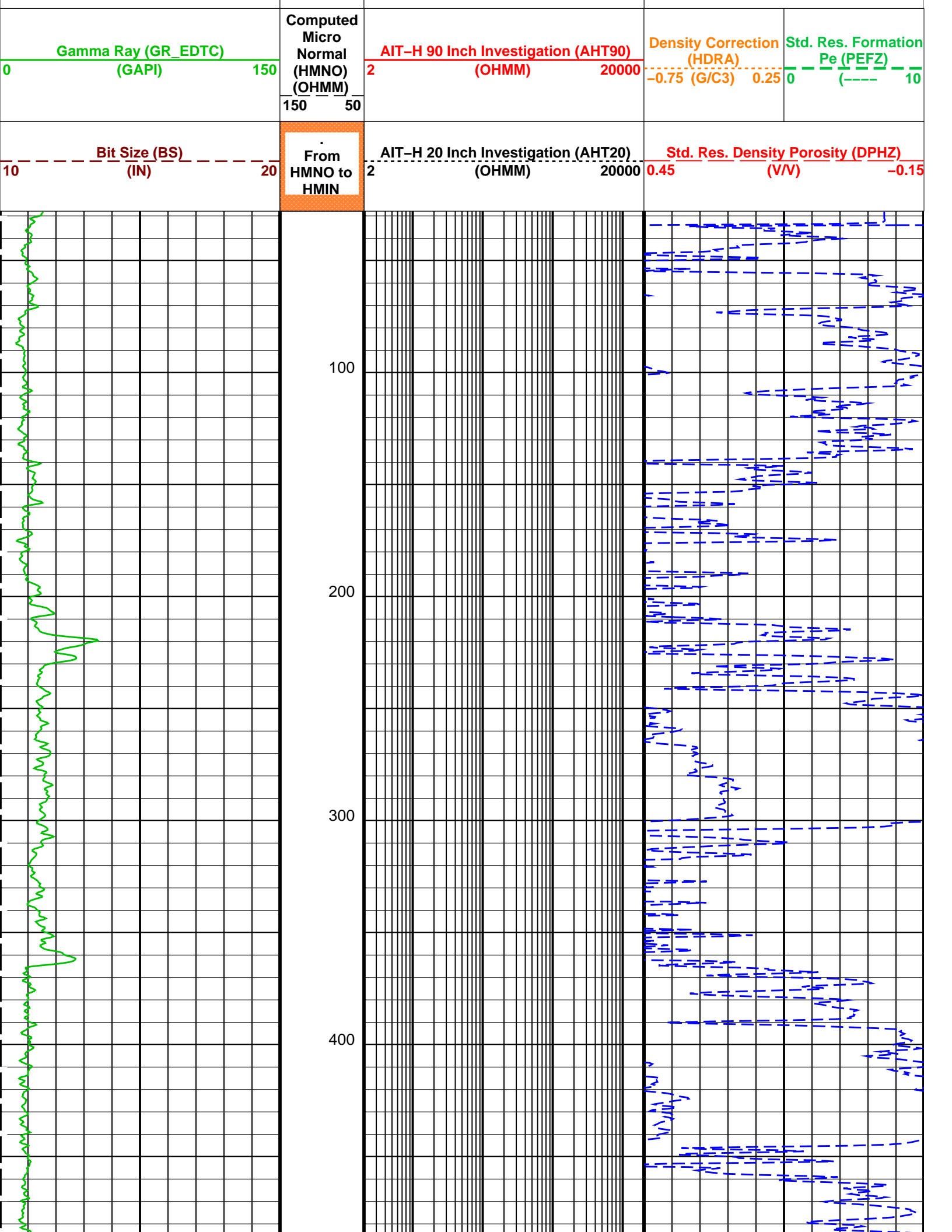
HAIT-H	SRPC-3779-Q1_2009_OP17	HILTB-FTB	SRPC-3779-Q1_2009_OP17
EDTC-B	17C0-154		

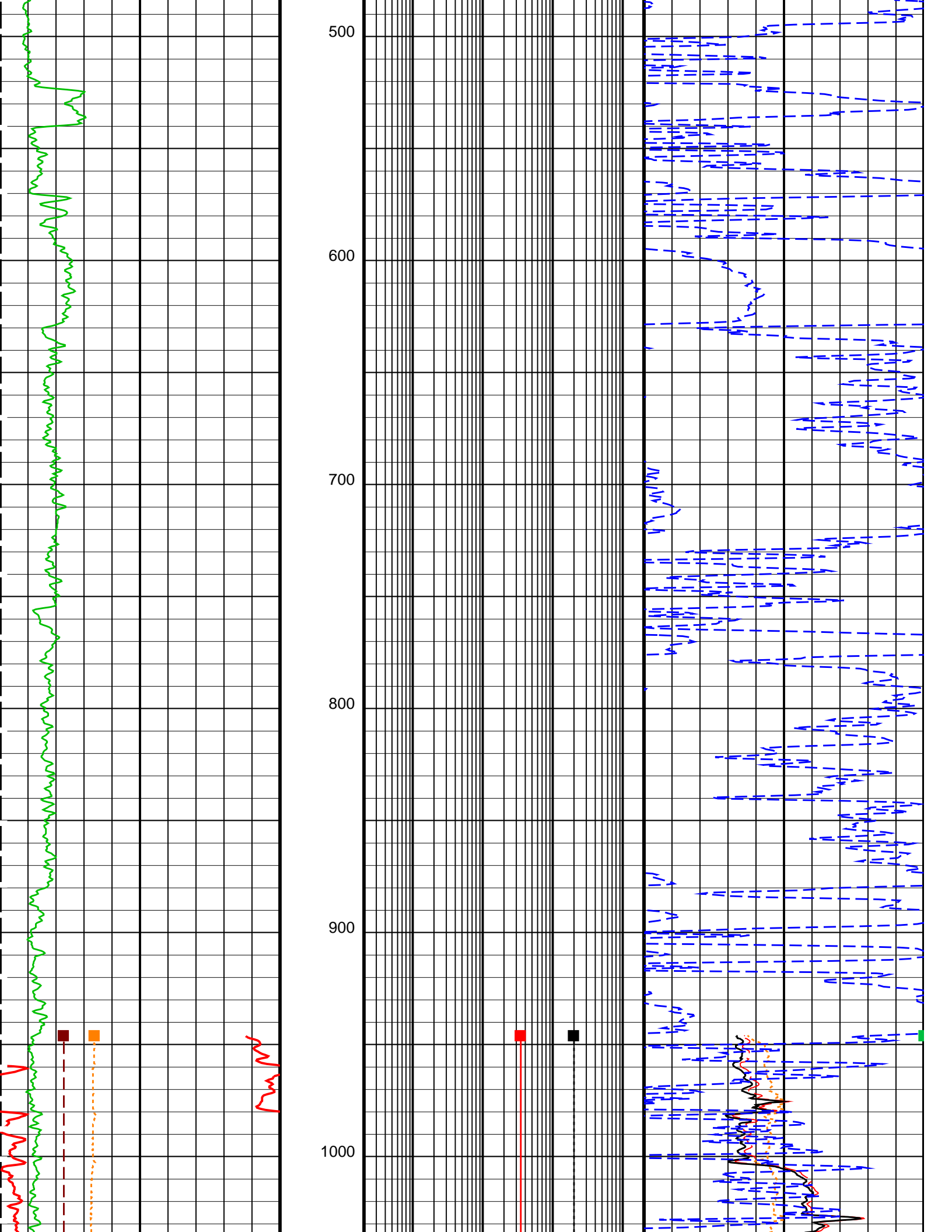
**PIP SUMMARY**

┌ Integrated Hole Volume Major Pip Every 100 F3  
 └ Integrated Cement Volume Major Pip Every 100 F3

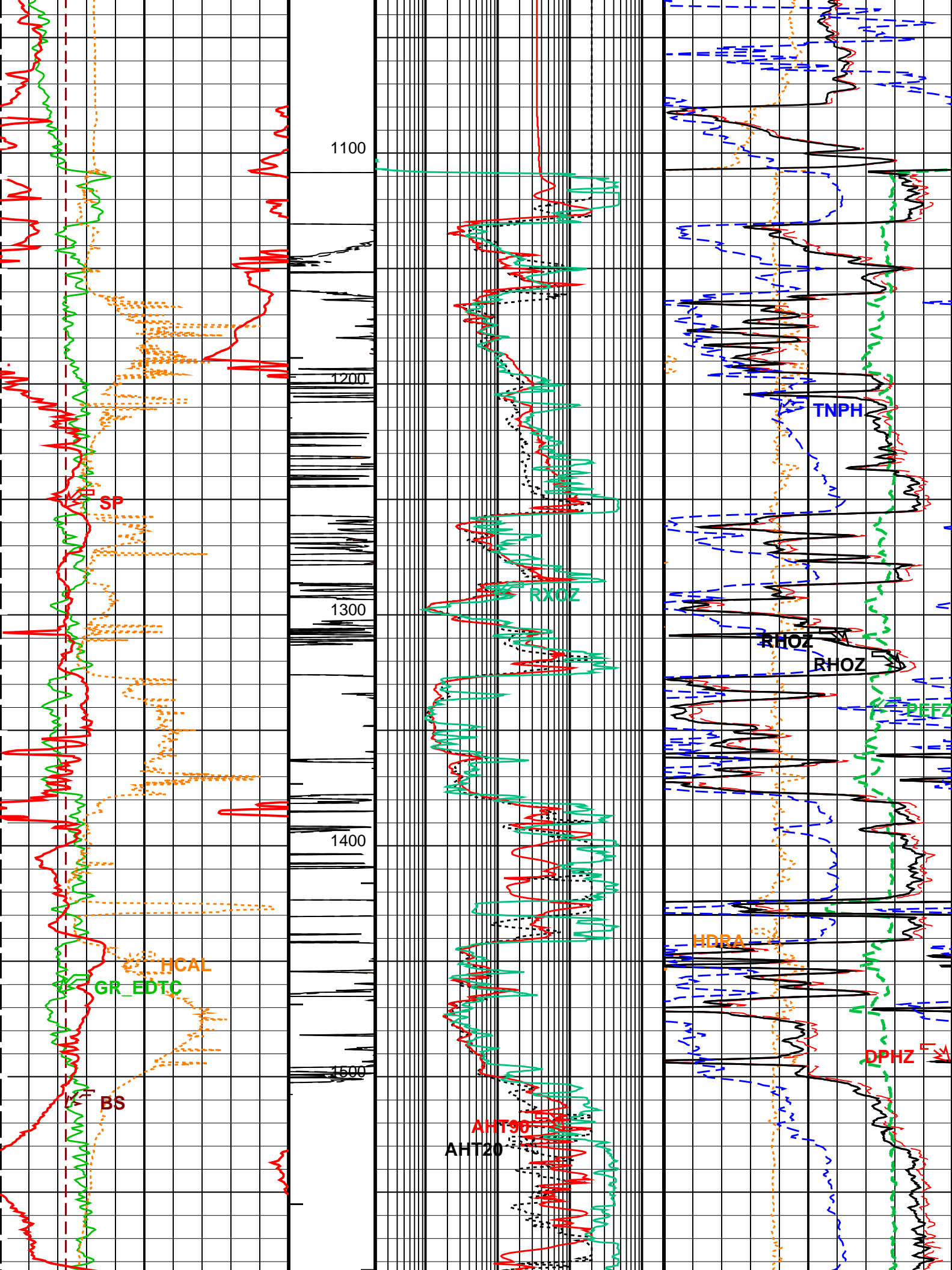
Time Mark Every 60 S

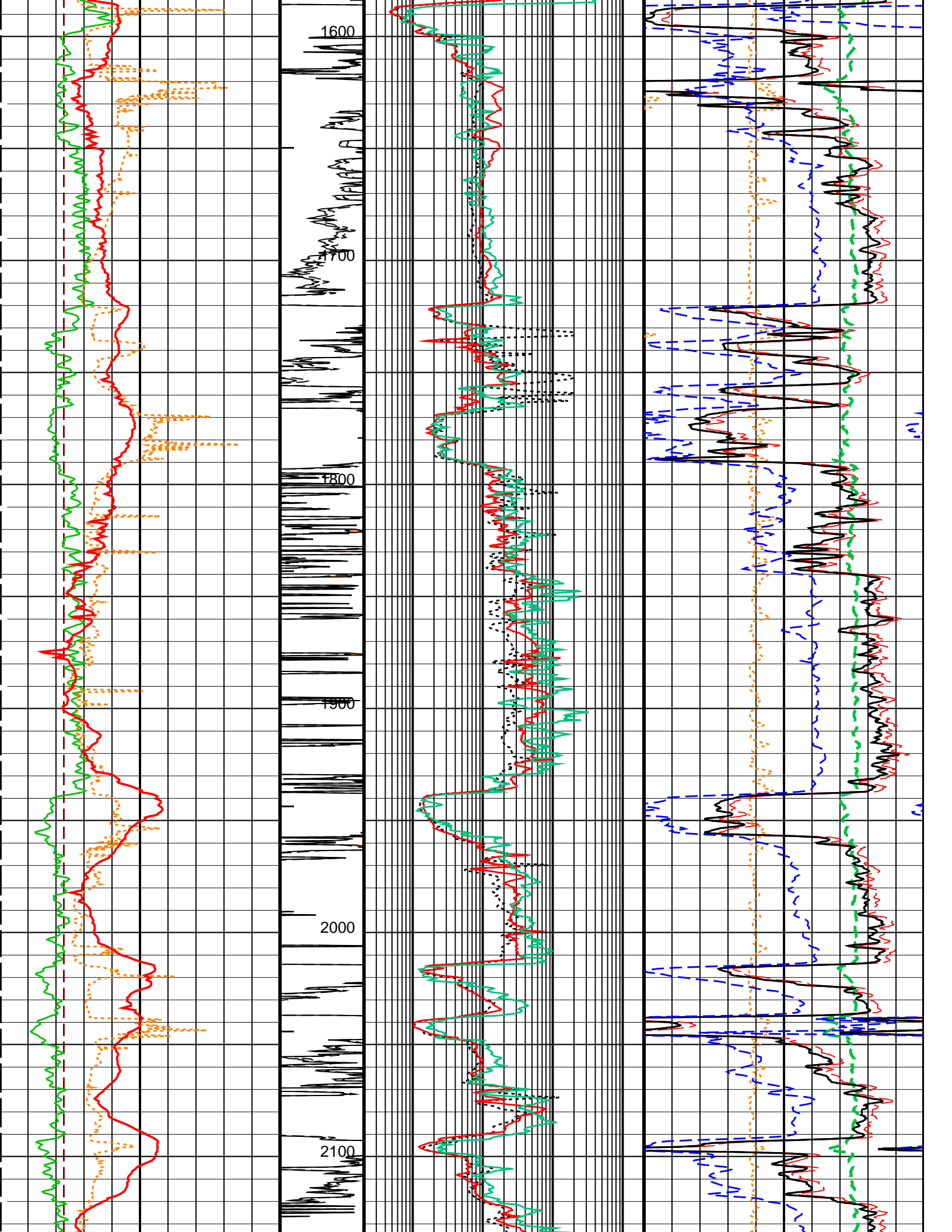
<p>SP (SP) (MV) 0</p>		<p>Env.Corr.Thermal Neutron Porosity (TNPH) (V/V) 0.45 -0.15</p>	
<p>HILT Caliper (HCAL) (IN) 10 20</p>		<p>Std. Res. Invaded Zone Resistivity (RXOZ) (OHMM) 20000</p>	
<p>Computed Micro Inverse (HMIN) (OHMM) 150 50</p>		<p>Std. Res. Formation Density (RHOZ) (G/C3) 2 3</p>	

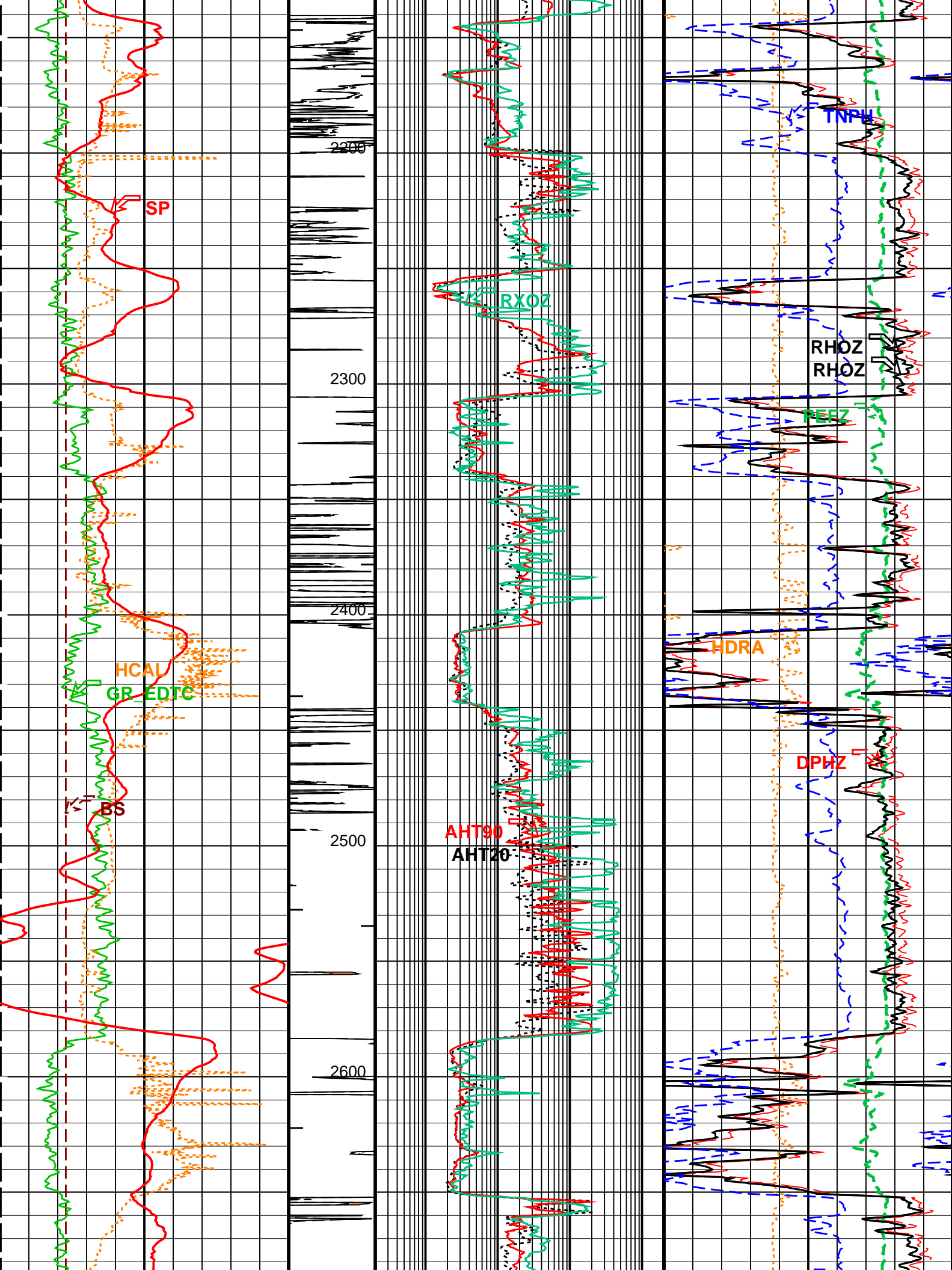


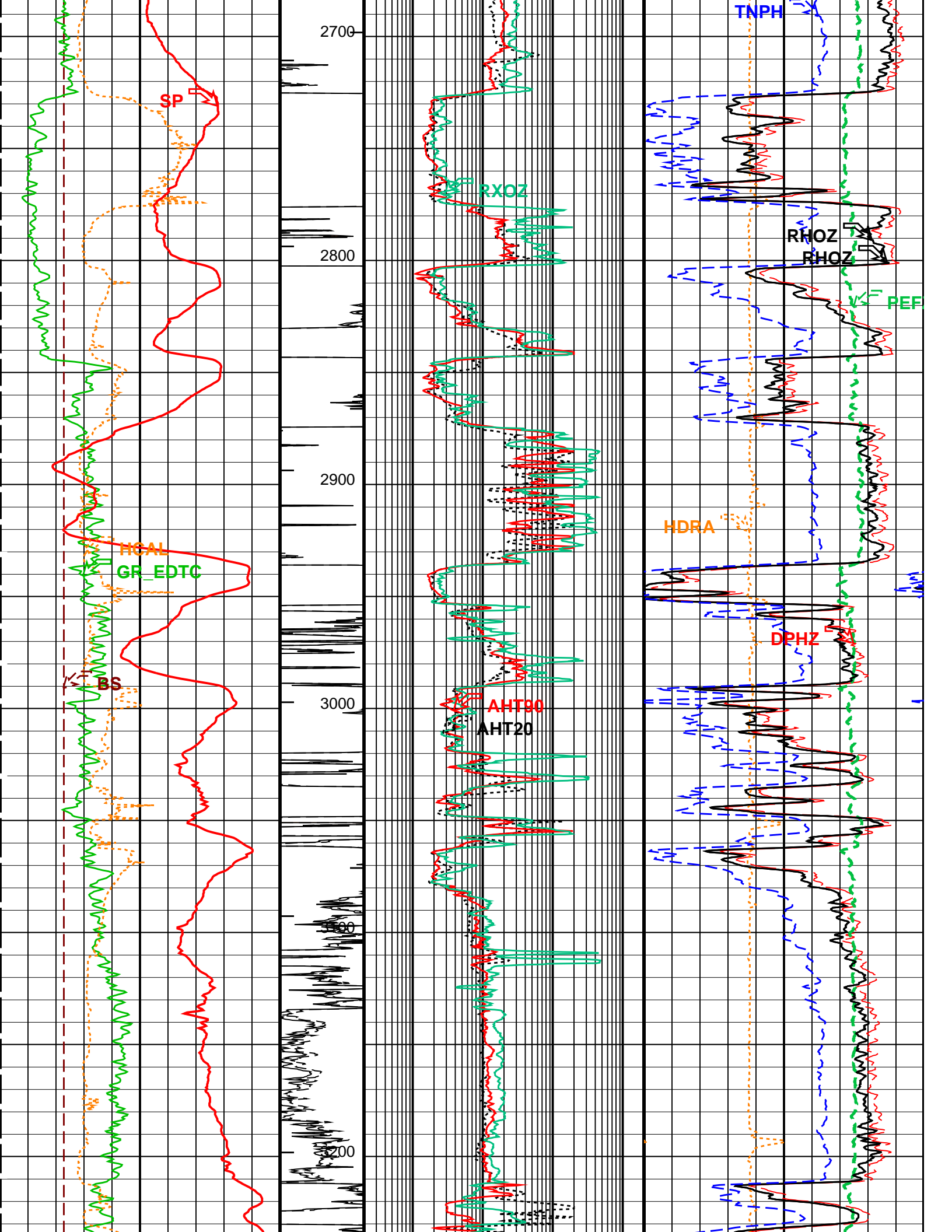


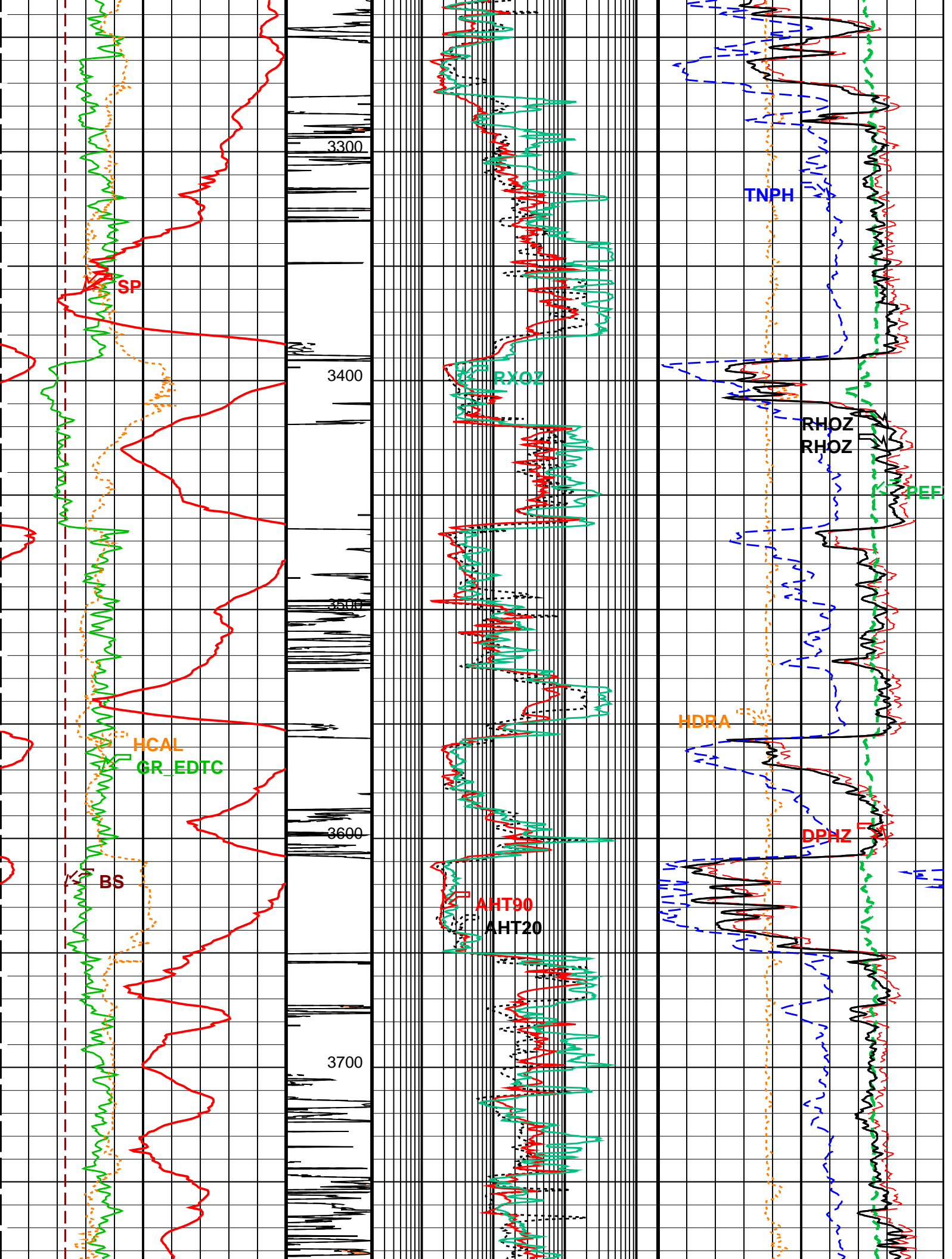


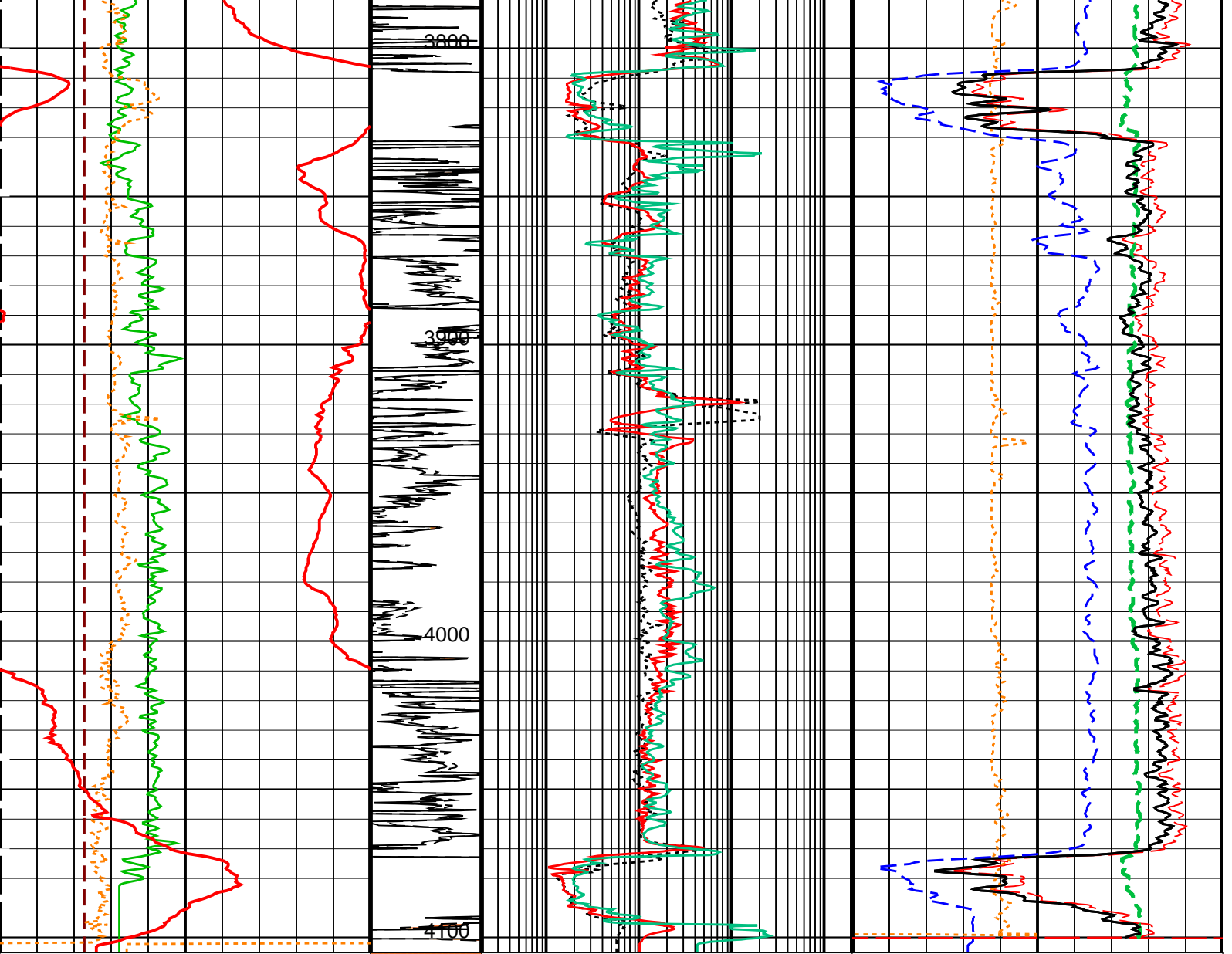












10	Bit Size (BS) (IN)	20	From HMNO to HMIN	2	AIT-H 20 Inch Investigation (AHT20) (OHMM)	20000	0.45	Std. Res. Density Porosity (DPHZ) (V/V)	-0.15		
0	Gamma Ray (GR_EDTC) (GAPI)	150	Computed Micro Normal (HMNO) (OHMM)	150	50	2	20000	Density Correction (HDRA) (G/C3)	0.25	Std. Res. Formation Pe (PEFZ) (----)	10
10	HILT Caliper (HCAL) (IN)	20	Computed Micro Inverse (HMIN) (OHMM)	150	50	2	20000	Std. Res. Invaded Zone Resistivity (RXOZ) (OHMM)		Std. Res. Formation Density (RHOZ) (G/C3)	3
-100	SP (SP) (MV)	0						Env. Corr. Thermal Neutron Porosity (TNPH) (V/V)			-0.15

PIP SUMMARY

- ┆ Integrated Hole Volume Major Pip Every 100 F3
- ┆ Integrated Cement Volume Major Pip Every 100 F3

Time Mark Every 60 S

Format: 2in Vertical Scale: 2" per 100'

Graphics File Created: 18-Apr-2009 20:53

HAIT-H EDTC-B	SRPC-3779-Q1_2009_OP17 17C0-154	HILTB-FTB	SRPC-3779-Q1_2009_OP17
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**Input DLIS Files**

DEFAULT	MERGE_TLD_MCFL_CNL_036	FN:1	PRODUCER	18-Apr-2009 19:54	4104.0 FT	27.0 FT
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**Output DLIS Files**

DEFAULT	AIT_TLD_MCFL_CNL_041PUP	FN:39	PRODUCER	18-Apr-2009 20:53		
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**MAIN PASS 5 IN=100 FT**

MAXIS Field Log

**Input DLIS Files**

DEFAULT	MERGE_TLD_MCFL_CNL_036	FN:1	PRODUCER	18-Apr-2009 19:54	4104.0 FT	27.0 FT
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**Output DLIS Files**

DEFAULT	AIT_TLD_MCFL_CNL_041PUP	FN:39	PRODUCER	18-Apr-2009 20:53	4105.0 FT	27.5 FT
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**Integrated Hole/Cement Volume Summary**

Hole Volume = 3083.21 F3  
 Cement Volume = 1568.71 F3 (assuming 9.63 IN casing O.D.)  
 Computed from 4105.0 FT to 1108.0 FT using data channel(s) HCAL

**OP System Version: 17C0-154**

HAIT-H EDTC-B	SRPC-3779-Q1_2009_OP17 17C0-154	HILTB-FTB	SRPC-3779-Q1_2009_OP17
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**Changed Parameter Summary**

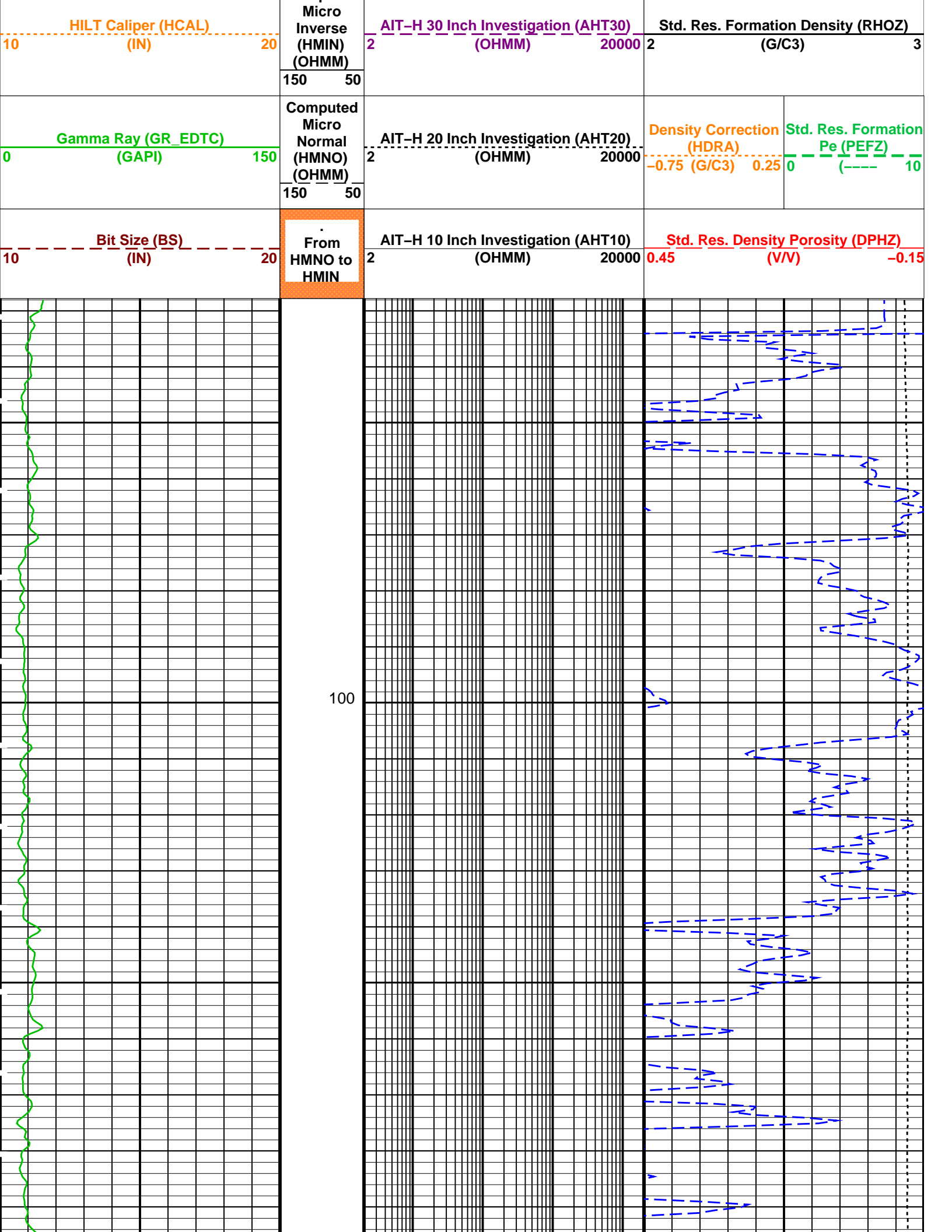
DLIS Name	New Value	Previous Value	Depth & Time
CCCO	YES	NO	1100.5 20:54:48

**PIP SUMMARY**

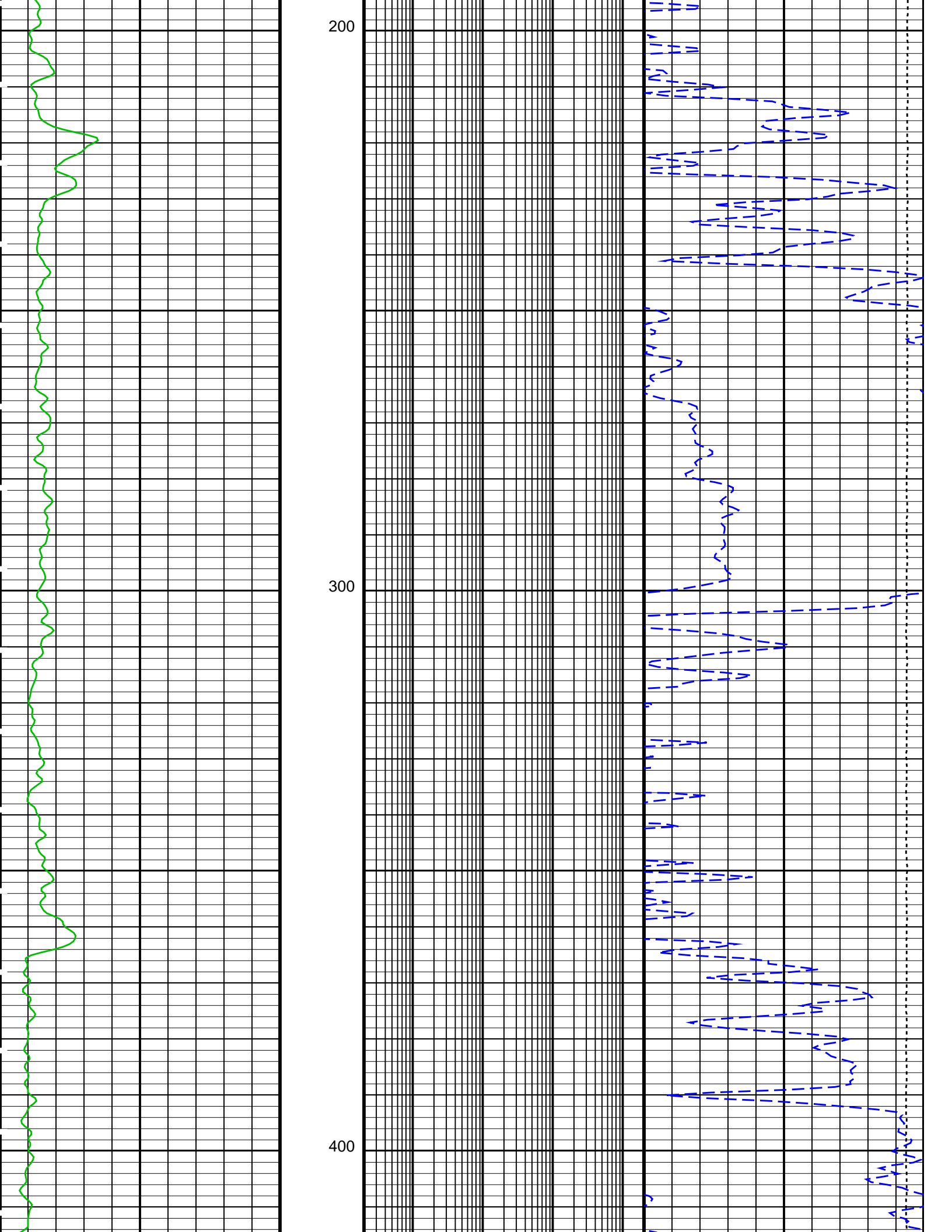
- ├ Integrated Hole Volume Major Pip Every 100 F3
- └ Integrated Cement Volume Major Pip Every 100 F3

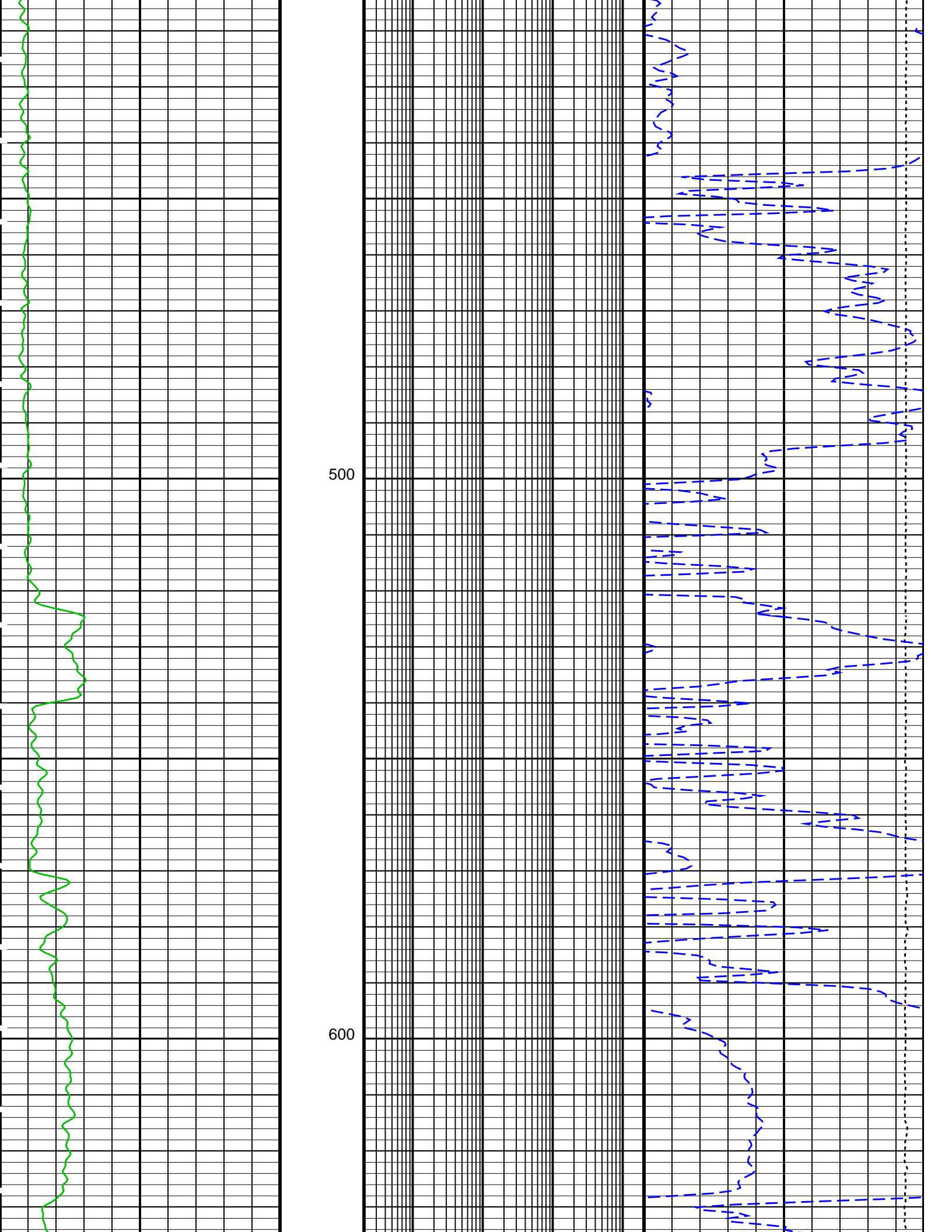
Time Mark Every 60 S

	Std. Res. Invaded Zone Resistivity (RXOZ)	
	2 (OHMM) 20000	
	AIT-H 90 Inch Investigation (AHT90)	Env.Corr.Thermal Neutron Porosity (TNPH)
	2 (OHMM) 20000	0.45 (V/V) -0.15
SP (SP) -100 (MV) 0	AIT-H 60 Inch Investigation (AHT60)	Tension (TENS)
	2 (OHMM) 20000	10000 (LBF) 0
Computed		



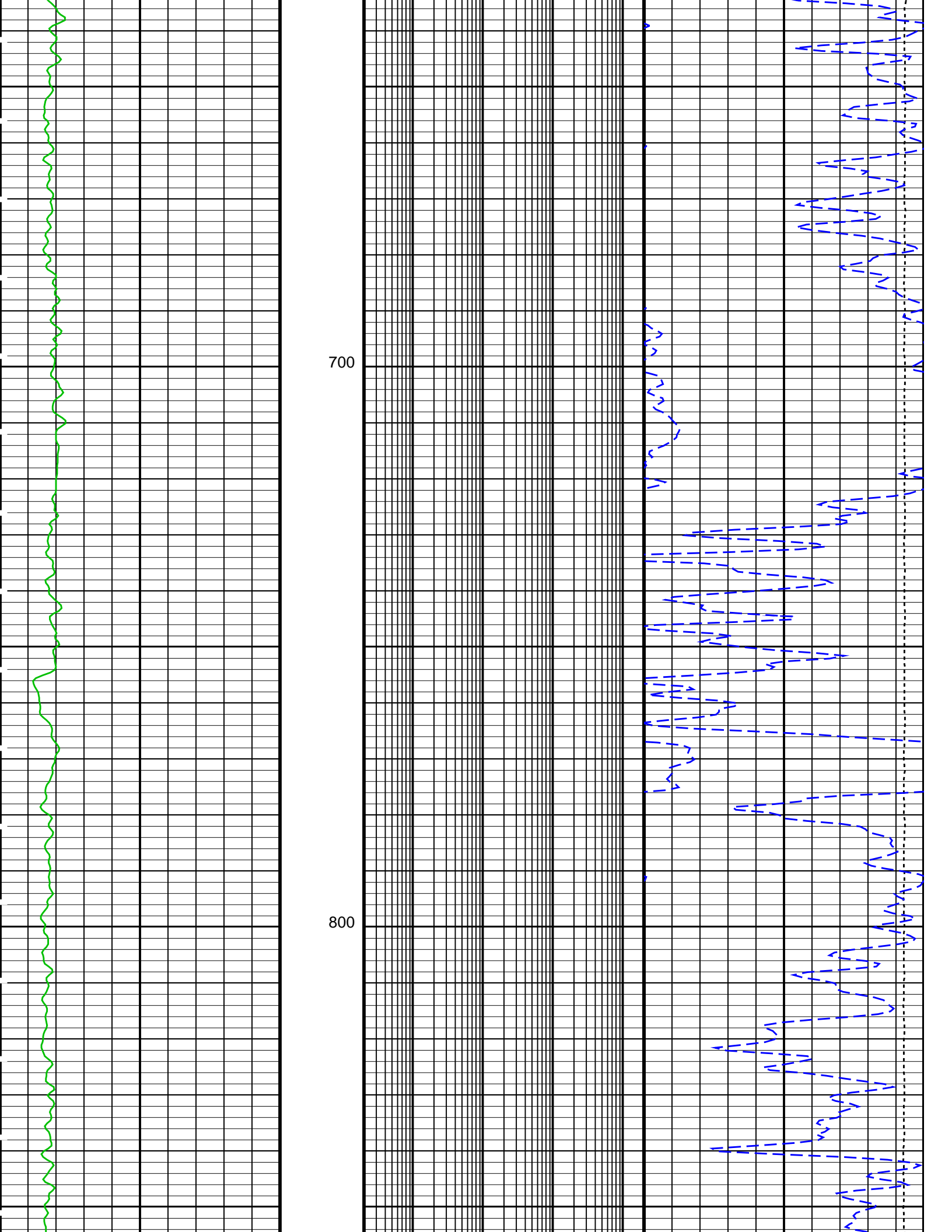


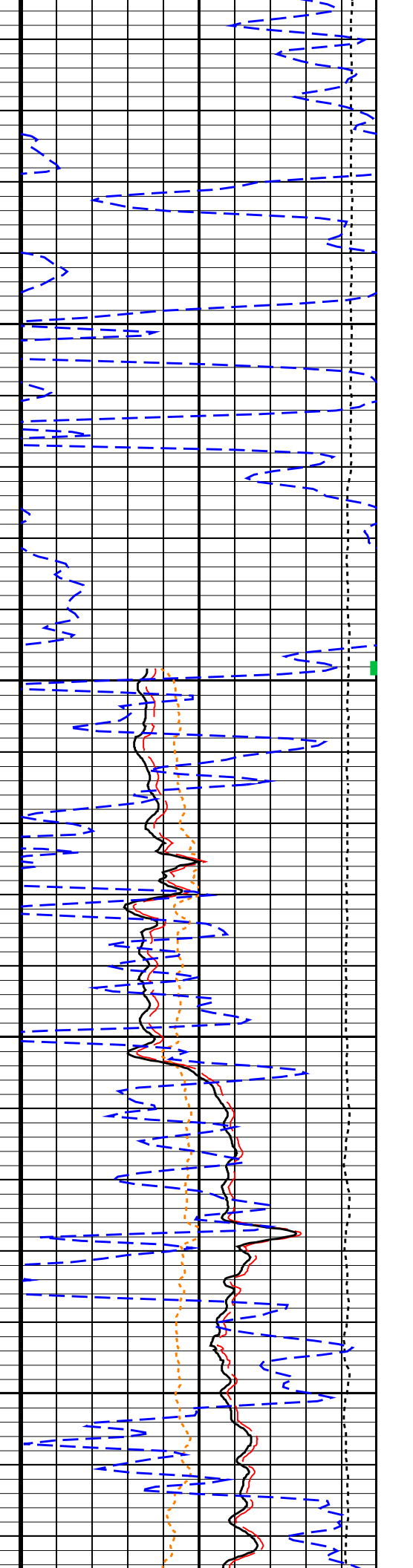
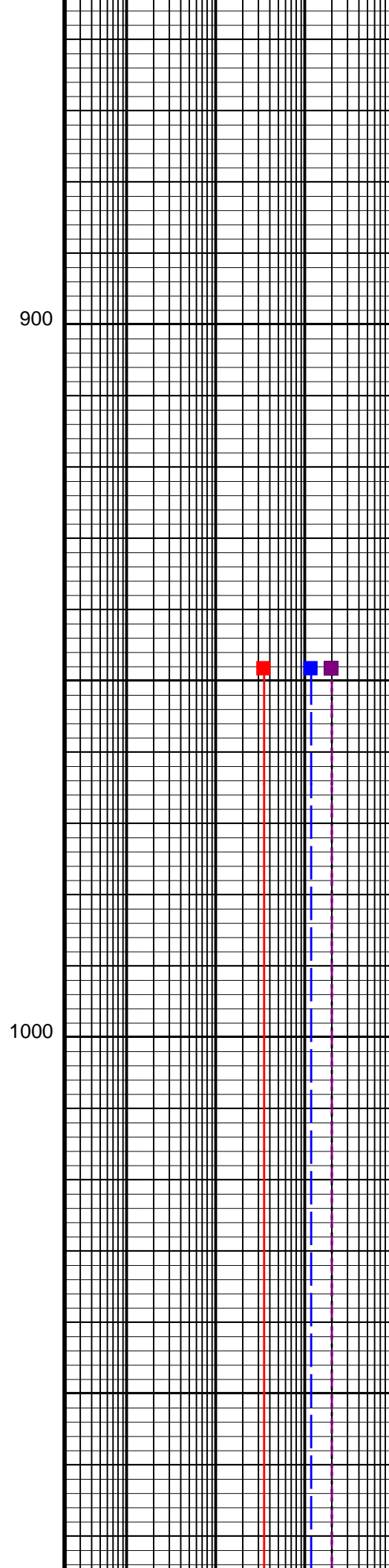
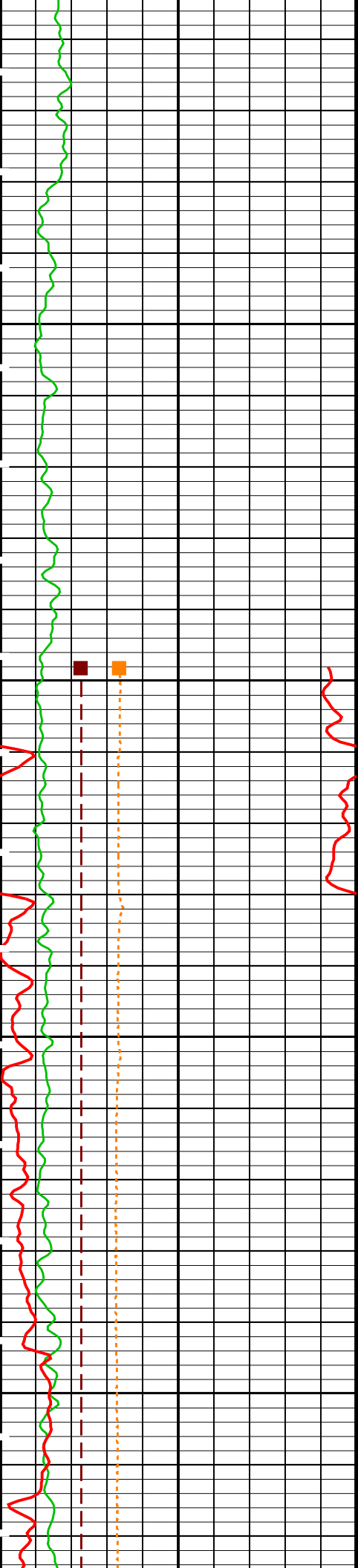


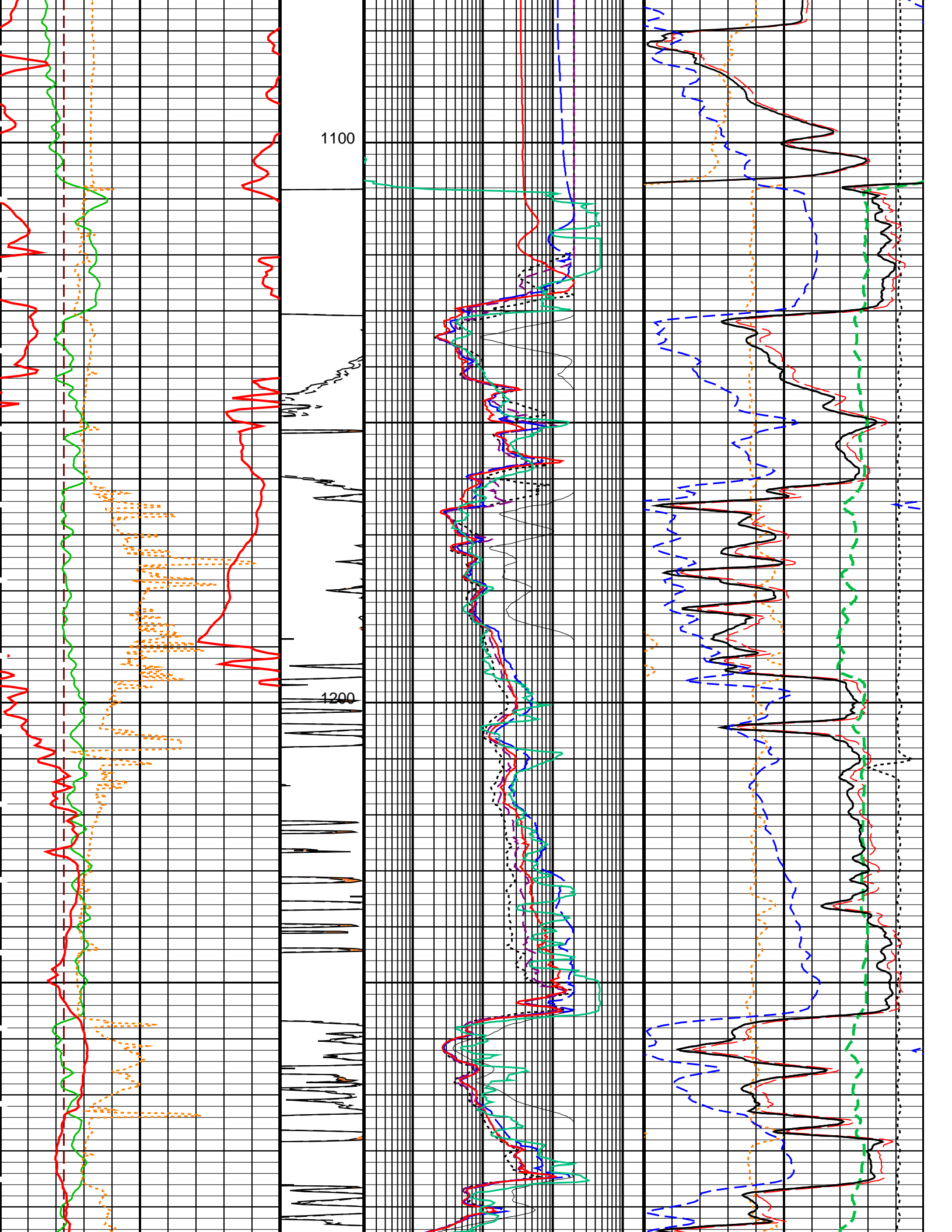


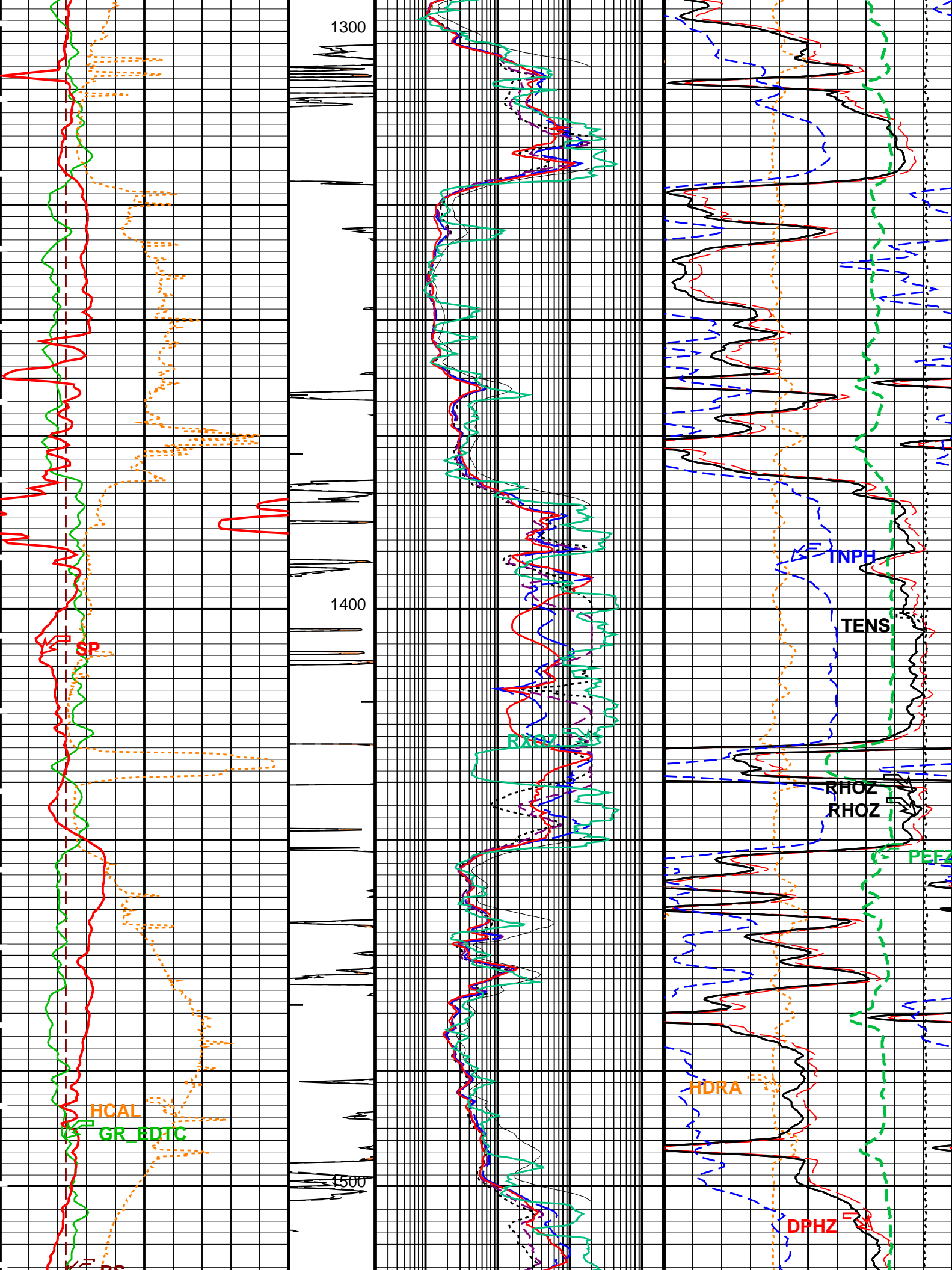
500

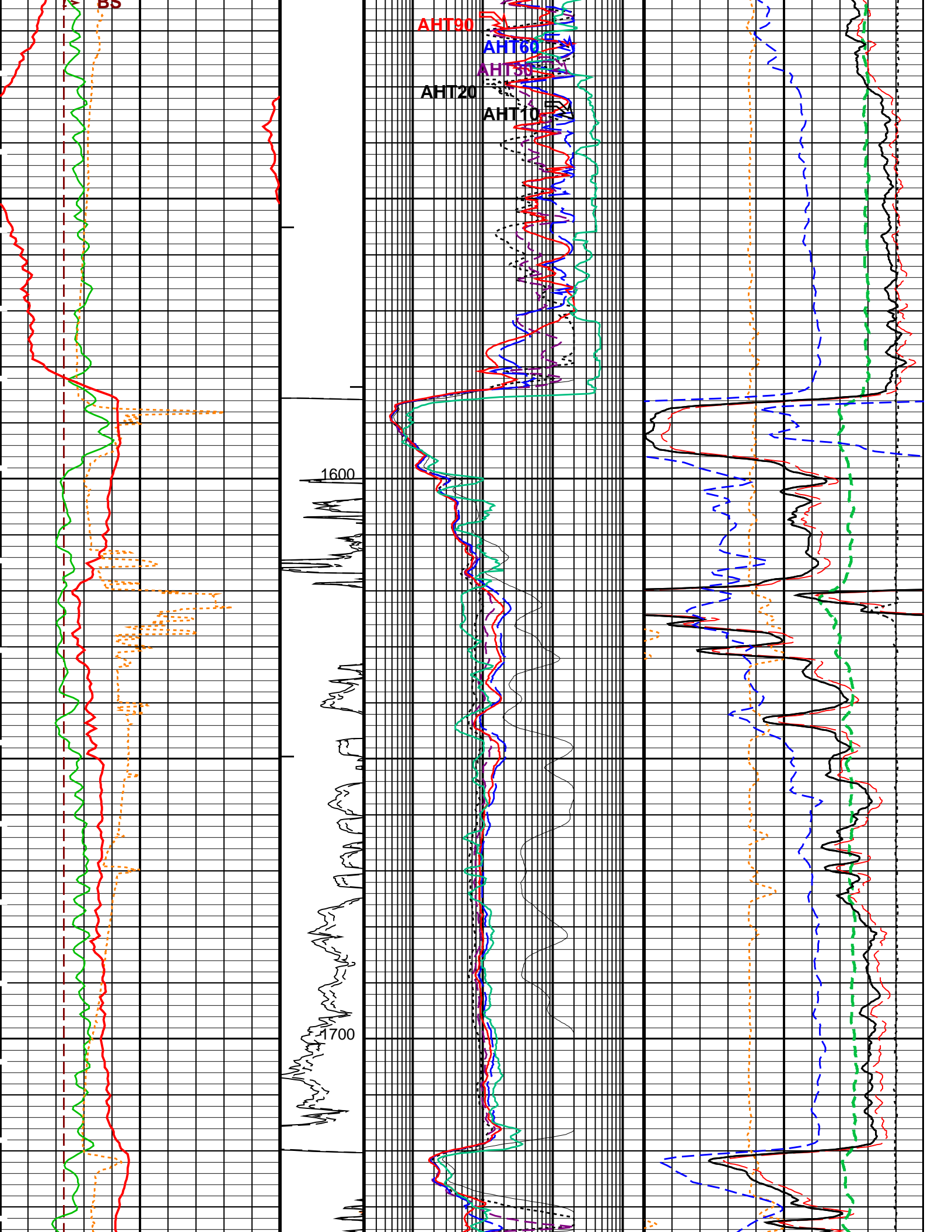
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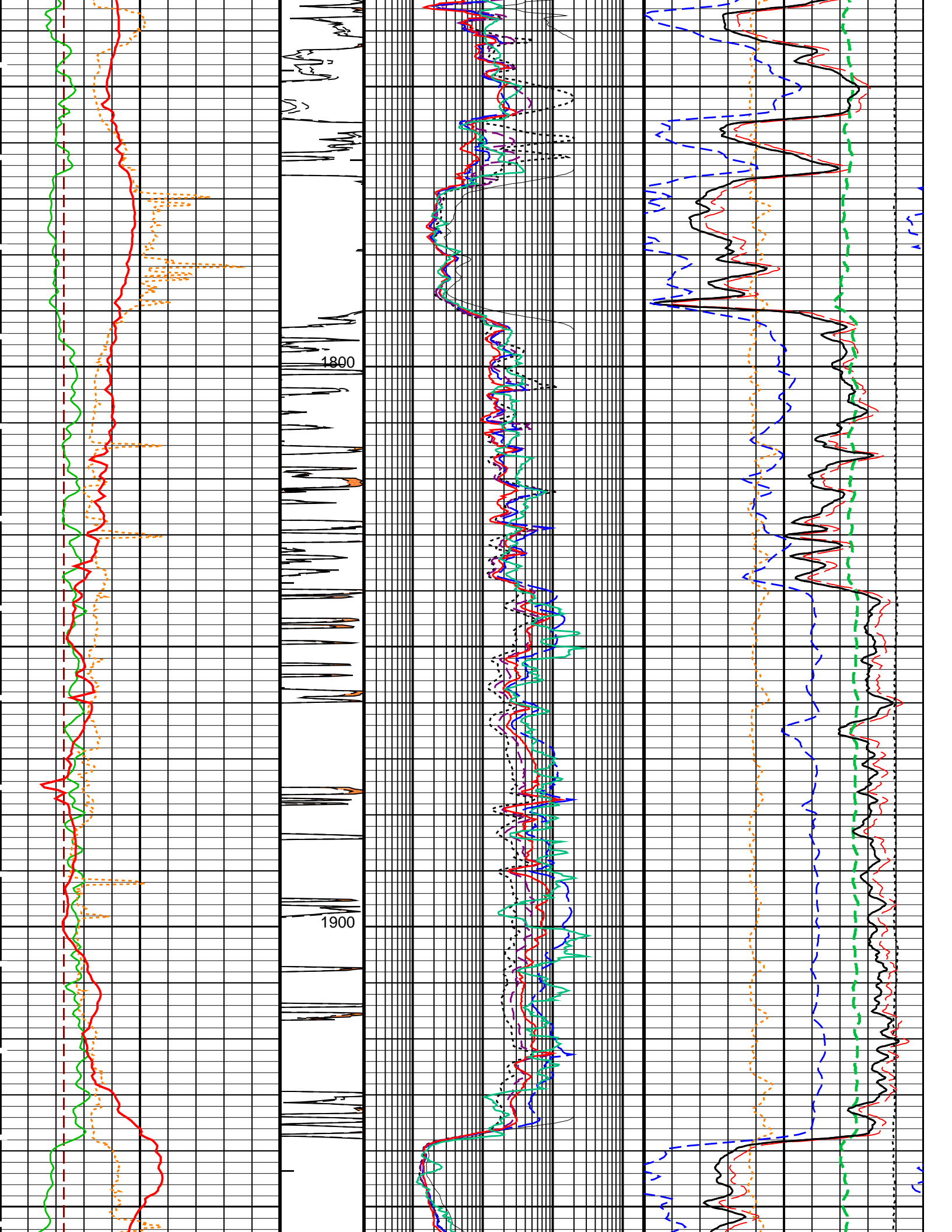




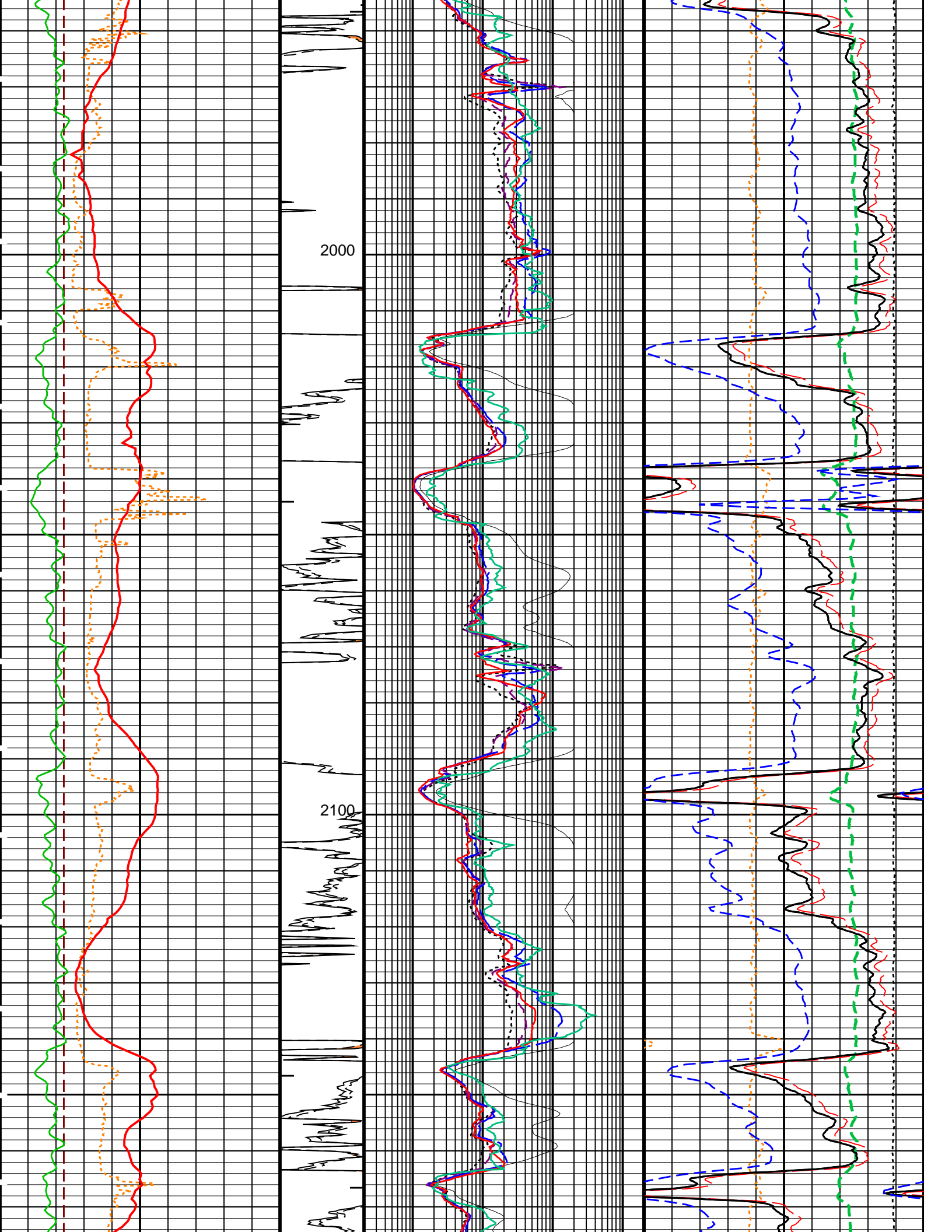


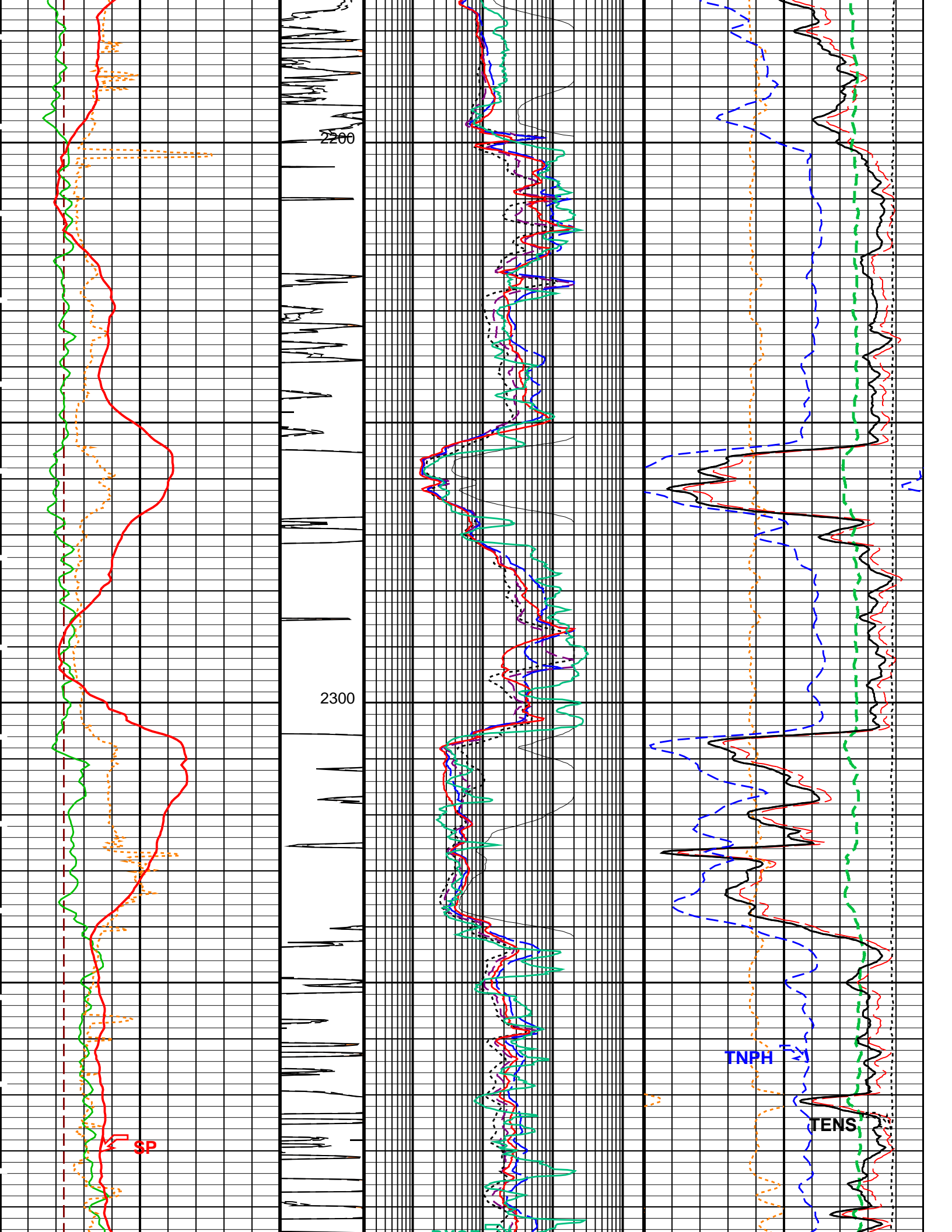


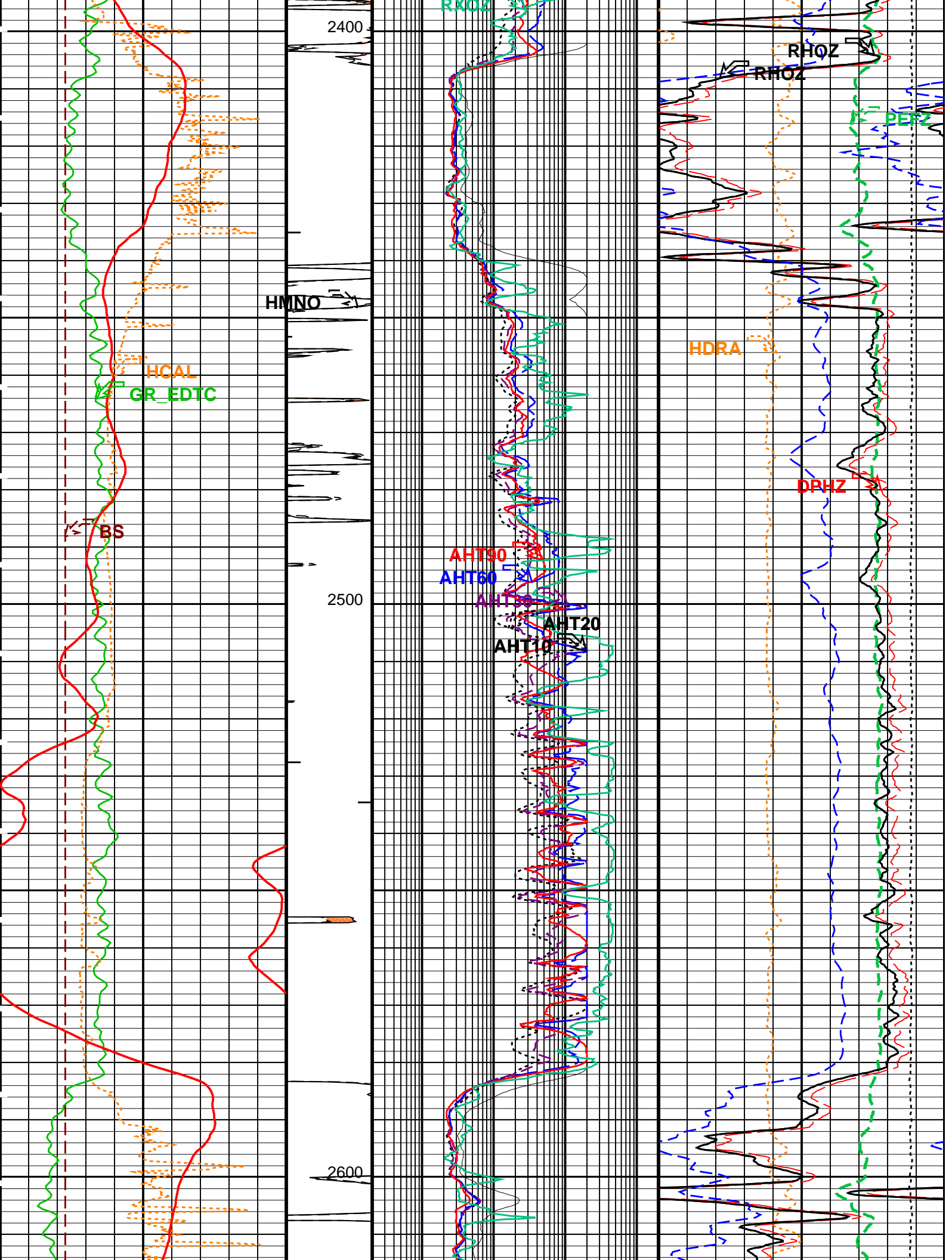


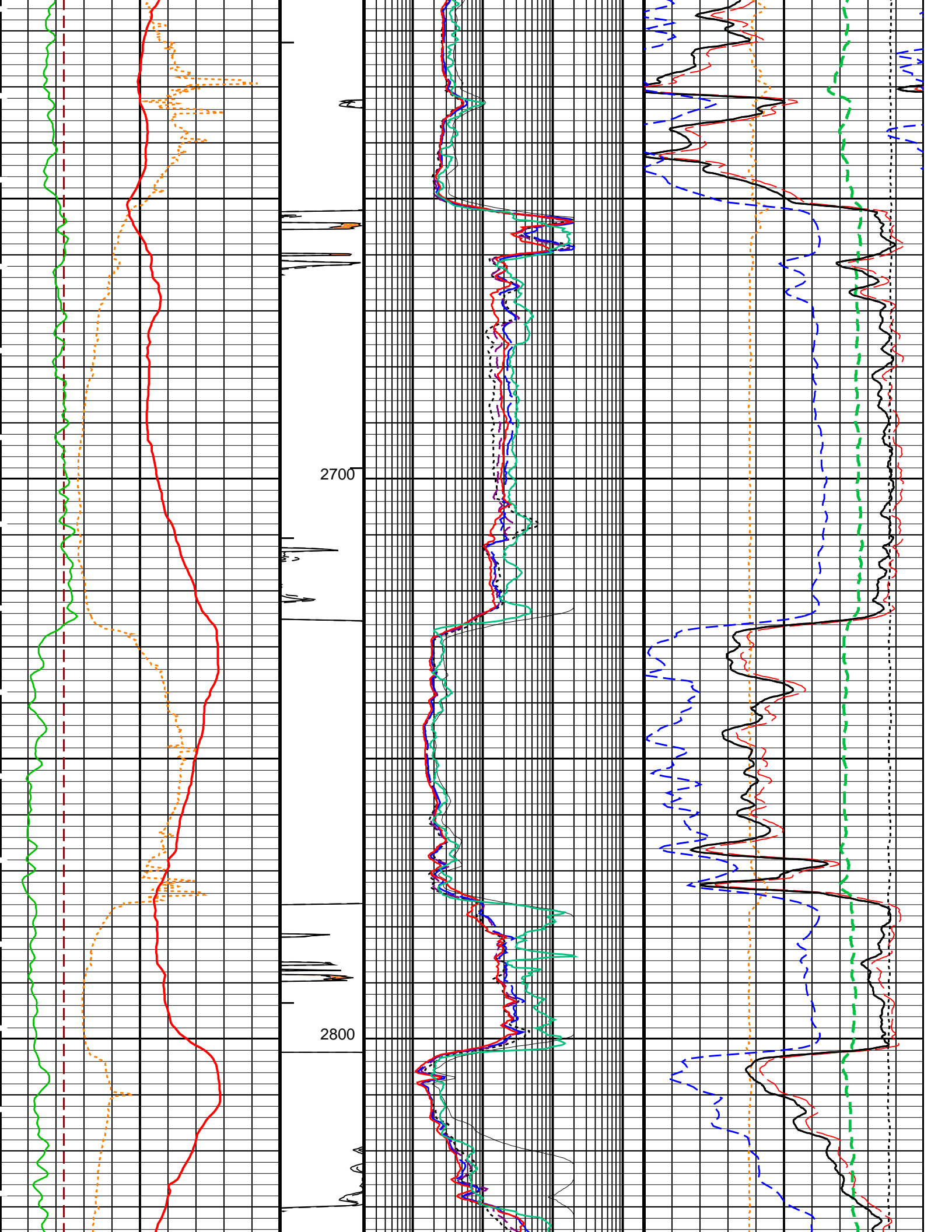


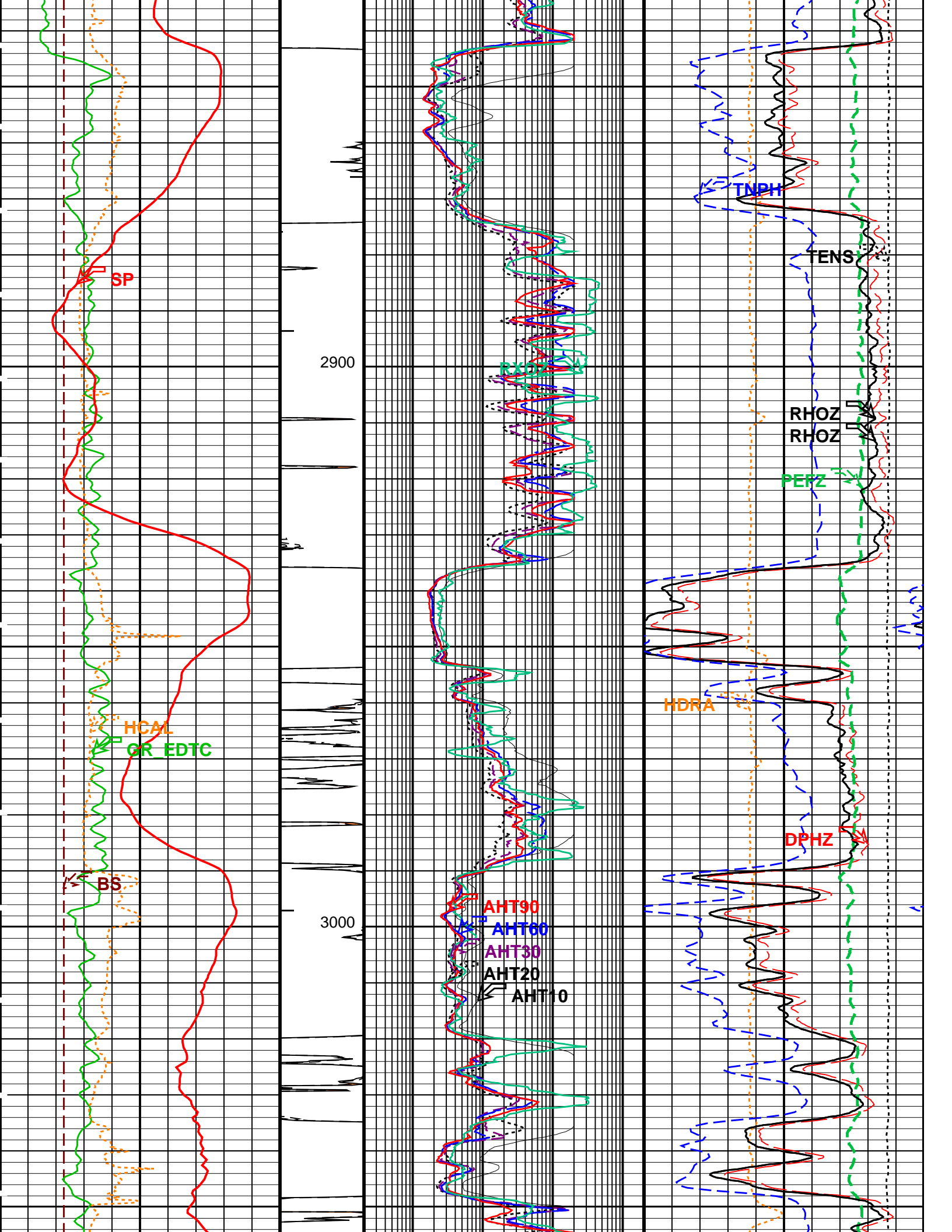


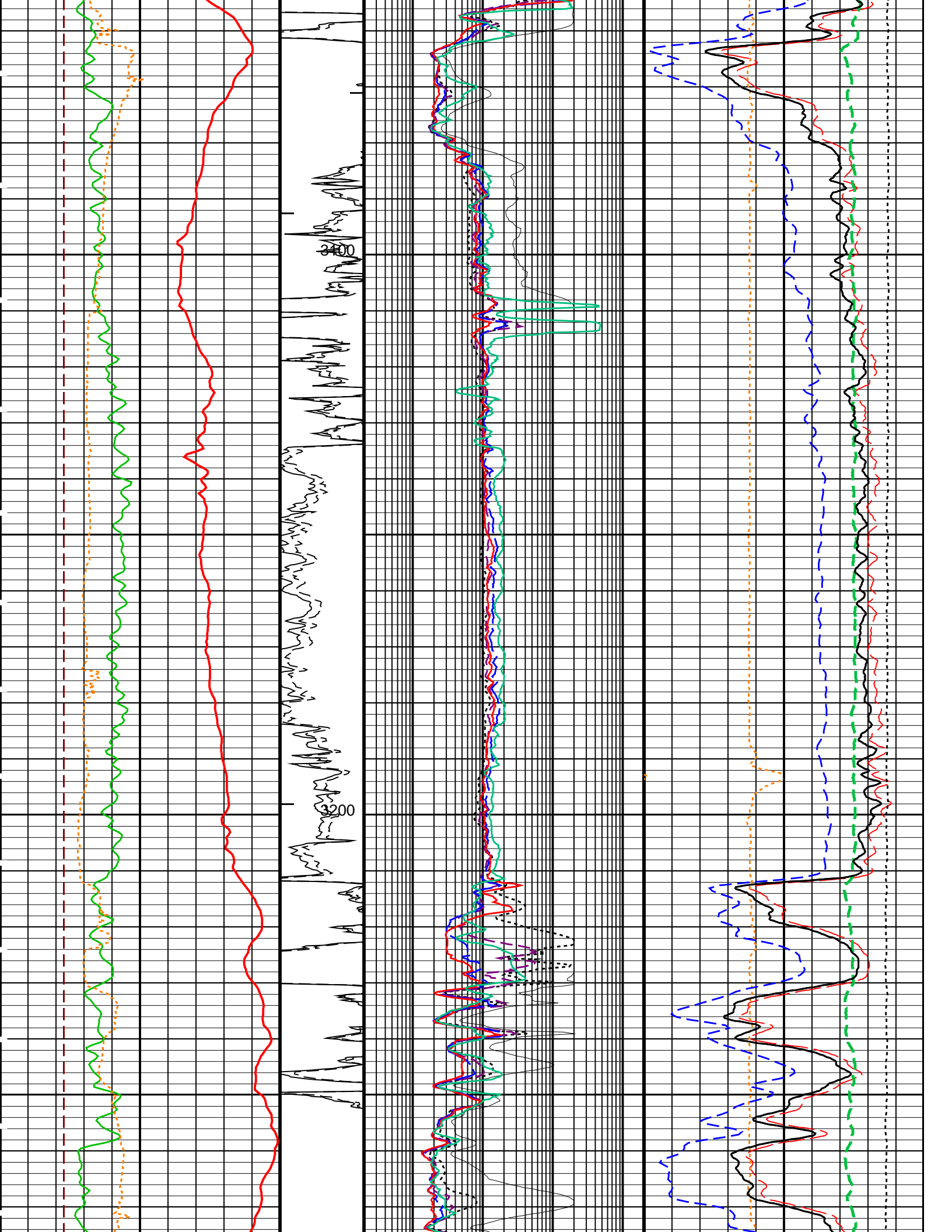


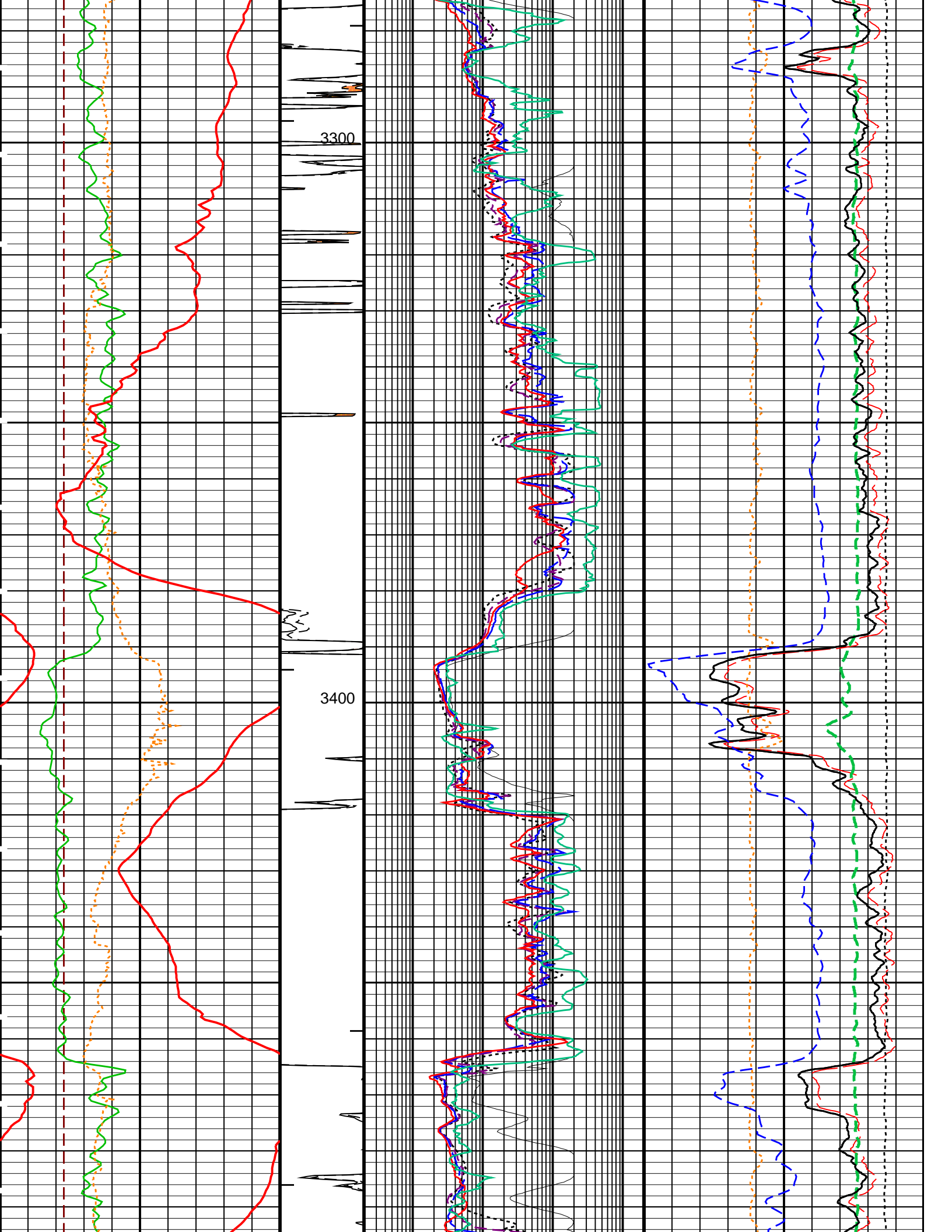


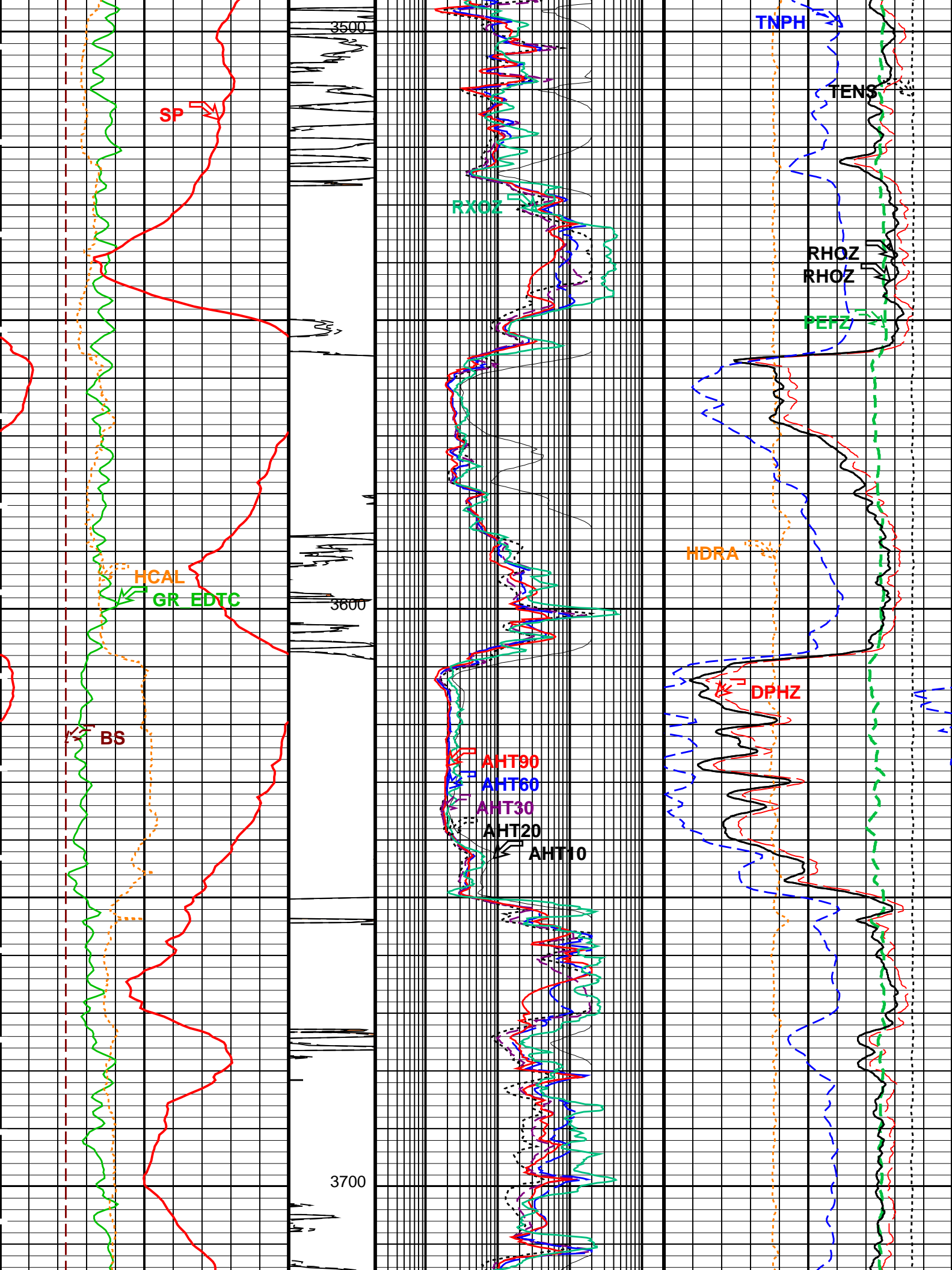




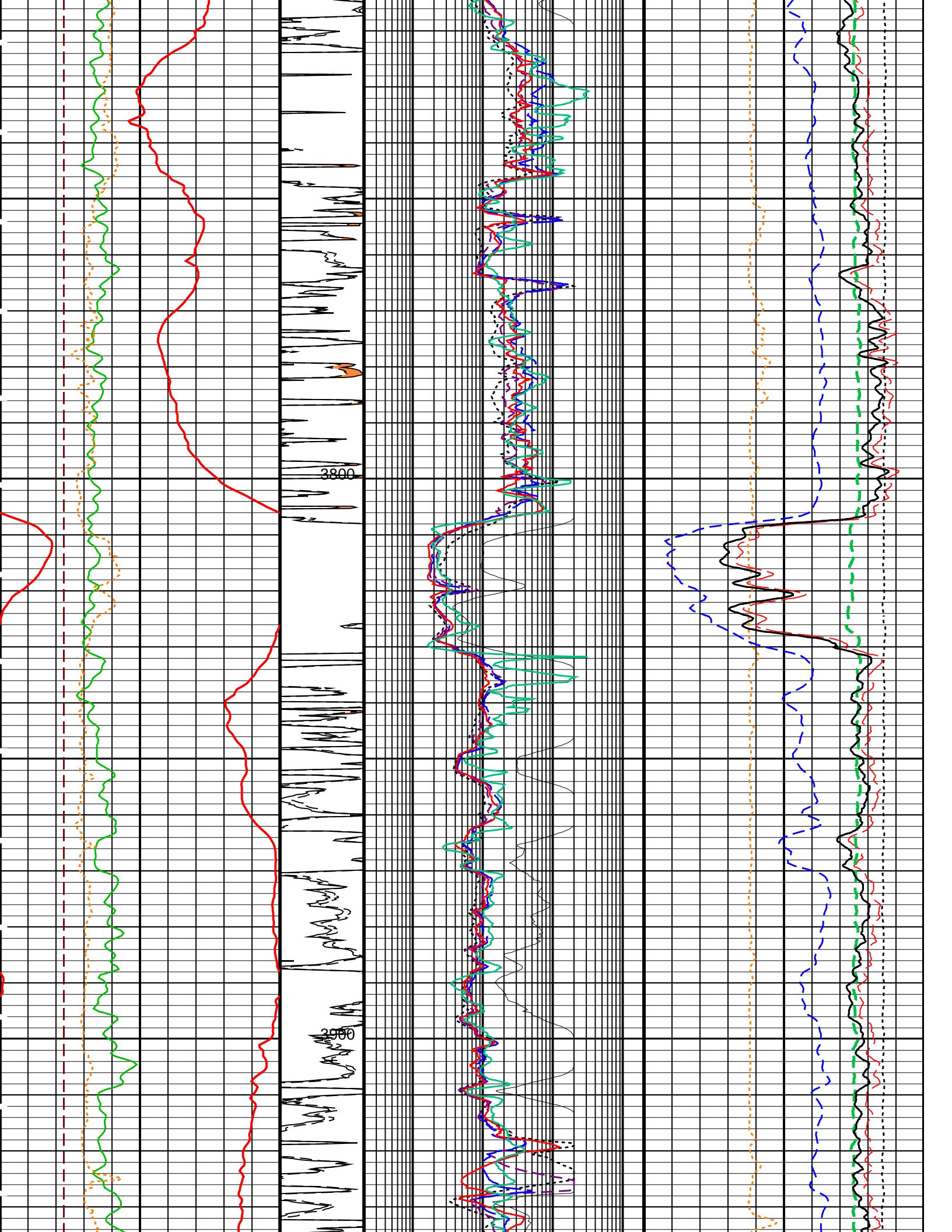


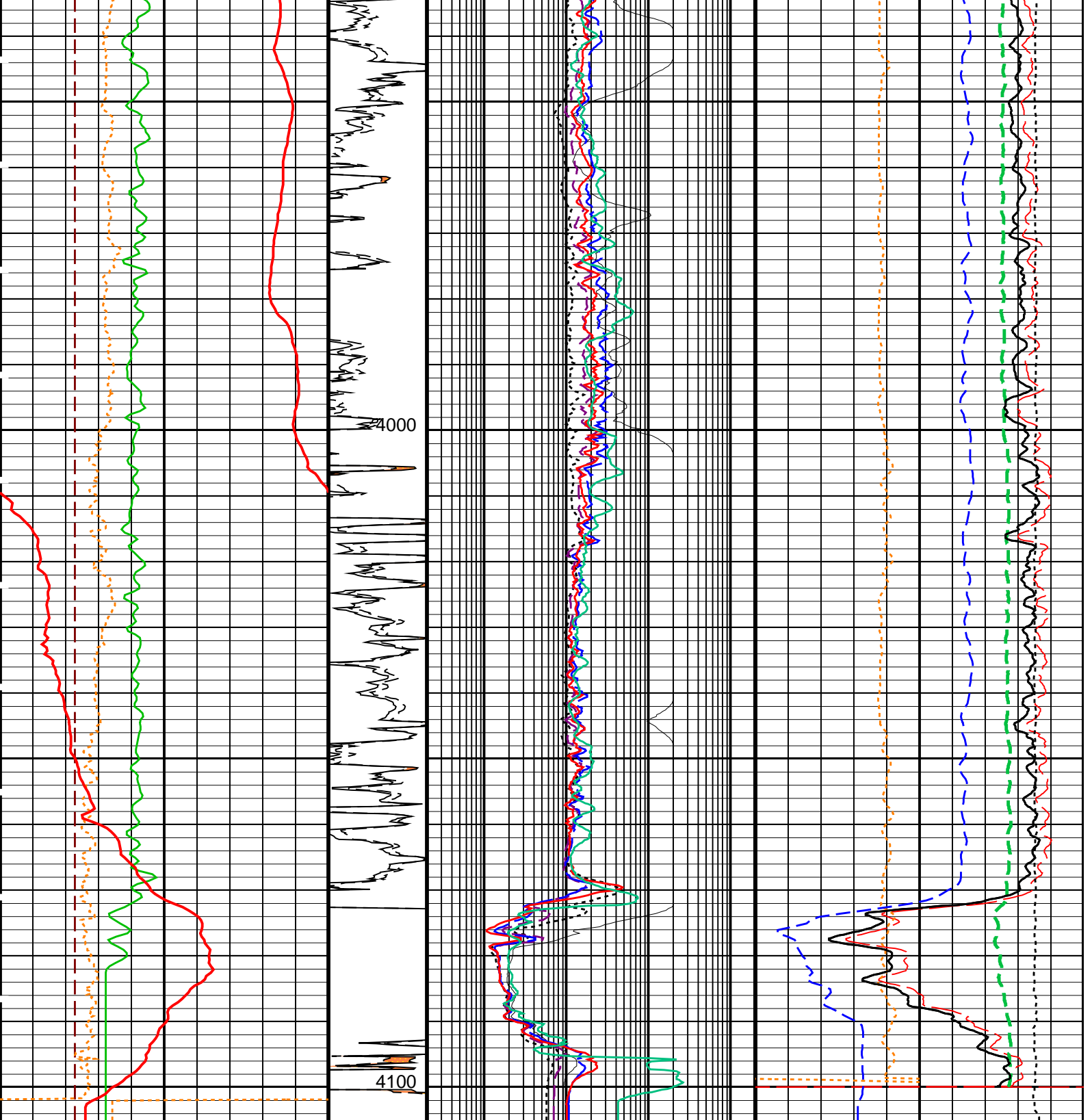












<p>Bit Size (BS) (IN)</p> <p>10 20</p>	<p>From HMNO to HMIN</p>	<p>AIT-H 10 Inch Investigation (AHT10) (OHMM)</p> <p>2 20000</p>	<p>Std. Res. Density Porosity (DPHZ) (V/V)</p> <p>0.45 -0.15</p>	
<p>Gamma Ray (GR_EDTC) (GAPI)</p> <p>0 150</p>	<p>Computed Micro Normal (HMNO) (OHMM)</p> <p>150 50</p>	<p>AIT-H 20 Inch Investigation (AHT20) (OHMM)</p> <p>2 20000</p>	<p>Density Correction (HDRA) -0.75 (G/C3) 0.25</p>	<p>Std. Res. Formation Pe (PEFZ) 0 10</p>
<p>HILT Caliper (HCAL) (IN)</p> <p>10 20</p>	<p>Computed Micro Inverse (HMIN)</p>	<p>AIT-H 30 Inch Investigation (AHT30) (OHMM)</p> <p>2 20000</p>	<p>Std. Res. Formation Density (RHOZ) (G/C3)</p> <p>2 3</p>	

	(OHMM)	150	50		
<b>SP (SP)</b>				<b>AIT-H 60 Inch Investigation (AHT60)</b>	<b>Tension (TENS)</b>
<b>-100</b>	<b>(MV)</b>	<b>0</b>		<b>2 (OHMM) 20000</b>	<b>10000 (LBF) 0</b>
				<b>AIT-H 90 Inch Investigation (AHT90)</b>	<b>Env.Corr.Thermal Neutron Porosity</b>
				<b>2 (OHMM) 20000</b>	<b>(TNPH) (V/V) -0.15</b>
				<b>Std. Res. Invaded Zone Resistivity (RXOZ)</b>	
				<b>2 (OHMM) 20000</b>	

**PIP SUMMARY**

- └ Integrated Hole Volume Major Pip Every 100 F3
- └ Integrated Cement Volume Major Pip Every 100 F3

Time Mark Every 60 S

**Parameters**

DLIS Name	Description	Value
<b>HAIT-H: Array Induction Tool - H</b>		
AHBHM	Array Induction Borehole Correction Mode	2_ComputeStandoff
AHBHV	Array Induction Borehole Correction Code Version Number	900
AHBLM	Array Induction Basic Logs Mode	6_One_Two_and_Four
AHBLV	Array Induction Basic Logs Code Version Number	223
AHCDE	Array Induction Casing Detection Enable	Yes
AHCEN	Array Induction Tool Centering Flag (in Borehole)	Eccentered
AHFRSV	Array Induction Response Set Version for Four ft Resolution	41.70.24.20
AHMRF	Array Induction Mud Resistivity Factor	1
AHORSV	Array Induction Response Set Version for One ft Resolution	41.70.24.20
AHRFV	Array Induction Radial Profiling Code Version Number	701
AHRPV	Array Induction Radial Parametrization Code Version Number	232
AHSTA	Array Induction Tool Standoff	2.5 IN
AHTRSV	Array Induction Response Set Version for Two ft Resolution	41.70.24.20
BHS	Borehole Status	OPEN
BHT	Bottom Hole Temperature (used in calculations)	212 DEGF
FEXP	Form Factor Exponent	2
FNUM	Form Factor Numerator	1
GCSE	Generalized Caliper Selection	HCAL
GDEV	Average Angular Deviation of Borehole from Normal	0 DEG
GGRD	Geothermal Gradient	0.01 DF/F
GRSE	Generalized Mud Resistivity Selection	AITH_RESIST
GTSE	Generalized Temperature Selection	LINEAR_ESTIMATE
MATR	Rock Matrix for Neutron Porosity Corrections	LIMESTONE
SHT	Surface Hole Temperature	68 DEGF
SPNV	SP Next Value	0 MV
<b>HILTB-FTB: High resolution Integrated Logging Tool-DTS</b>		
BHFL	Borehole Fluid Type	WATER
BHFL_TLD	HILT Nuclear Mud Base	WATER
BHS	Borehole Status	OPEN
BHT	Bottom Hole Temperature (used in calculations)	212 DEGF
BSCO	Borehole Salinity Correction Option	NO
CCCO	Casing & Cement Thickness Correction Option	NO
DHC	Density Hole Correction	BS
FD	Fluid Density	1 G/C3
FEXP	Form Factor Exponent	2
FNUM	Form Factor Numerator	1
FSAL	Formation Salinity	-50000 PPM
FSCO	Formation Salinity Correction Option	NO
GCLF	Germany Coal-like Formation Option	NO
GCSE	Generalized Caliper Selection	HCAL
GDEV	Average Angular Deviation of Borehole from Normal	0 DEG
GGRD	Geothermal Gradient	0.01 DF/F
GRSE	Generalized Mud Resistivity Selection	AITH_RESIST
GTSE	Generalized Temperature Selection	LINEAR_ESTIMATE
HSCO	Hole Size Correction Option	YES
MATR	Rock Matrix for Neutron Porosity Corrections	LIMESTONE
MCCO	Mud Cake Correction Option	NO
MCOR	Mud Correction	NATU
MDEN	Matrix Density	2.71 G/C3
MPOF	MCFL Processing Operation Mode	ON
MWCO	Mud Weight Correction Option	NO
NAAC	HRDD APS Activation Correction	OFF
NMT	HILT Nuclear Mud Type	NOBARITE
NPRM	HRDD Processing Mode	StdRes
NSAR	HRDD Depth Sampling Rate	1 IN
PTCO	Pressure/Temperature Correction Option	NO
SDAT	Standoff Data Source	SOCN

SHT	Surface Hole Temperature	68	DEGF
SOCN	Standoff Distance	0.125	IN
SOCO	Standoff Correction Option	YES	
<b>EDTC-B: Enhanced DTS Cartridge</b>			
BHFL	Borehole Fluid Type	WATER	
BHS	Borehole Status	OPEN	
BHT	Bottom Hole Temperature (used in calculations)	212	DEGF
BSCO	Borehole Salinity Correction Option	NO	
CCCO	Casing & Cement Thickness Correction Option	NO	
FSCO	Formation Salinity Correction Option	NO	
GCSE	Generalized Caliper Selection	HCAL	
GDEV	Average Angular Deviation of Borehole from Normal	0	DEG
GGRD	Geothermal Gradient	0.01	DF/F
GRSE	Generalized Mud Resistivity Selection	AITH_RESIST	
GTSE	Generalized Temperature Selection	LINEAR_ESTIMATE	
HSCO	Hole Size Correction Option	YES	
MATR	Rock Matrix for Neutron Porosity Corrections	LIMESTONE	
MCCO	Mud Cake Correction Option	NO	
MCOR	Mud Correction	NATU	
MWCO	Mud Weight Correction Option	NO	
PTCO	Pressure/Temperature Correction Option	NO	
SDAT	Standoff Data Source	SOCN	
SHT	Surface Hole Temperature	68	DEGF
SOCN	Standoff Distance	0.125	IN
SOCO	Standoff Correction Option	YES	
<b>HOLEV: Integrated Hole/Cement Volume</b>			
BHS	Borehole Status	OPEN	
BHT	Bottom Hole Temperature (used in calculations)	212	DEGF
FCD	Future Casing (Outer) Diameter	9.625	IN
GCSE	Generalized Caliper Selection	HCAL	
GDEV	Average Angular Deviation of Borehole from Normal	0	DEG
GGRD	Geothermal Gradient	0.01	DF/F
GRSE	Generalized Mud Resistivity Selection	AITH_RESIST	
GTSE	Generalized Temperature Selection	LINEAR_ESTIMATE	
HVCS	Integrated Hole Volume Caliper Selection	HCAL	
MATR	Rock Matrix for Neutron Porosity Corrections	LIMESTONE	
SHT	Surface Hole Temperature	68	DEGF
<b>STI: Stuck Tool Indicator</b>			
TDL	Total Depth - Logger	4105.00	FT
<b>System and Miscellaneous</b>			
BS	Bit Size	12.250	IN
BSAL	Borehole Salinity	-50000.00	PPM
CSIZ	Current Casing Size	14.000	IN
CWEI	Casing Weight	54.57	LB/F
DO	Depth Offset for Playback	0.0	FT
FLEV	Fluid Level	-50000.00	FT
MST	Mud Sample Temperature	64.20	DEGF
PP	Playback Processing	NORMAL	
RMFS	Resistivity of Mud Filtrate Sample	-50000.0000	OHMM
TD	Total Depth	4105	FT

Format: 5in Vertical Scale: 5" per 100' Graphics File Created: 18-Apr-2009 20:53

### OP System Version: 17C0-154

HAIT-H SRPC-3779-Q1\_2009\_OP17 HILTB-FTB SRPC-3779-Q1\_2009\_OP17  
EDTC-B 17C0-154

#### Input DLIS Files

DEFAULT MERGE\_TLD\_MCFL\_CNL\_036 FN:1 PRODUCER 18-Apr-2009 19:54 4104.0 FT 27.0 FT

#### Output DLIS Files

DEFAULT AIT\_TLD\_MCFL\_CNL\_041PUP FN:39 PRODUCER 18-Apr-2009 20:53



**CALIBRATIONS**

Calibration and Check Summary

Measurement	Nominal	Master	Before	After	Change	Limit	Units
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Array Induction Tool – H Wellsite Calibration – Electronics Calibration Check – Thru Cal Mag. & Phase

Master: 3–Apr–2009 13:11 Before: 15–Apr–2009 13:52

Thru Cal Magnitude – 0	0	0.6141	0.6131	N/A	N/A	N/A	V
Thru Cal Magnitude – 1	0	1.259	1.257	N/A	N/A	N/A	V
Thru Cal Magnitude – 2	0	0.6241	0.6233	N/A	N/A	N/A	V
Thru Cal Magnitude – 3	0	0.7106	0.7090	N/A	N/A	N/A	V
Thru Cal Magnitude – 4	0	1.329	1.326	N/A	N/A	N/A	V
Thru Cal Magnitude – 5	0	1.927	1.925	N/A	N/A	N/A	V
Thru Cal Magnitude – 6	0	1.927	1.925	N/A	N/A	N/A	V
Thru Cal Magnitude – 7	0	1.403	1.399	N/A	N/A	N/A	V
Phase – 0	0	62.61	61.20	N/A	N/A	N/A	DEG
Phase – 1	0	61.48	60.06	N/A	N/A	N/A	DEG
Phase – 2	0	57.90	56.46	N/A	N/A	N/A	DEG
Phase – 3	0	57.08	55.65	N/A	N/A	N/A	DEG
Phase – 4	0	50.88	49.43	N/A	N/A	N/A	DEG
Phase – 5	0	49.26	47.78	N/A	N/A	N/A	DEG
Phase – 6	0	49.25	47.78	N/A	N/A	N/A	DEG
Phase – 7	0	48.55	46.92	N/A	N/A	N/A	DEG

Array Induction Tool – H Wellsite Calibration – Electronics Calibration Check – Auxilliary

Master: 3–Apr–2009 13:11 Before: 15–Apr–2009 13:52

Array Induction SPA Plus	990.5	992.0	991.4	N/A	N/A	N/A	MV
Array Induction SPA Zero	0	-0.1742	-0.1706	N/A	N/A	N/A	MV
Array Induction Temperature PI	0.9150	0.9190	0.9185	N/A	N/A	N/A	V
Array Induction Temperature Ze	0	-0.0001754	-0.0001748	N/A	N/A	N/A	V

Array Induction Tool – H Wellsite Calibration – Test Loop Gain Correction

Master: 3–Apr–2009 13:11

Test Loop Gain Magnitude – 0	0	1.012	N/A	N/A	N/A	N/A	V
Test Loop Gain Magnitude – 1	0	1.011	N/A	N/A	N/A	N/A	V
Test Loop Gain Magnitude – 2	0	1.015	N/A	N/A	N/A	N/A	V
Test Loop Gain Magnitude – 3	0	1.013	N/A	N/A	N/A	N/A	V
Test Loop Gain Magnitude – 4	0	0.9961	N/A	N/A	N/A	N/A	V
Test Loop Gain Magnitude – 5	0	0.9851	N/A	N/A	N/A	N/A	V
Test Loop Gain Magnitude – 6	0	0.9975	N/A	N/A	N/A	N/A	V
Test Loop Gain Magnitude – 7	0	1.013	N/A	N/A	N/A	N/A	V
Phase – 0	0	0.4950	N/A	N/A	N/A	N/A	DEG
Phase – 1	0	0.4842	N/A	N/A	N/A	N/A	DEG
Phase – 2	0	-0.04337	N/A	N/A	N/A	N/A	DEG
Phase – 3	0	-0.03414	N/A	N/A	N/A	N/A	DEG
Phase – 4	0	-0.1990	N/A	N/A	N/A	N/A	DEG
Phase – 5	0	-0.1044	N/A	N/A	N/A	N/A	DEG
Phase – 6	0	0.2068	N/A	N/A	N/A	N/A	DEG
Phase – 7	0	-0.1309	N/A	N/A	N/A	N/A	DEG

Array Induction Tool – H Wellsite Calibration – Sonde Error Correction

Master: 3–Apr–2009 13:11

R Sonde Error Correction – 0	0	-114.0	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction – 1	0	149.1	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction – 2	0	114.7	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction – 3	0	58.44	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction – 4	0	25.24	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction – 5	0	13.55	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction – 6	0	8.915	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction – 7	0	-0.8634	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction – 0	0	459.8	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction – 1	0	384.9	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction – 2	0	-135.7	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction – 3	0	43.56	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction – 4	0	-7.536	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction – 5	0	-3.449	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction – 6	0	5.765	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction – 7	0	-3.723	N/A	N/A	N/A	N/A	MM/M

Array Induction Tool – H Wellsite Calibration – Mud Gain Correction

Master: 3–Apr–2009 13:11

Coarse – Mag, Real, Imag – 0	0	1.029	N/A	N/A	N/A	N/A	
Coarse – Mag, Real, Imag – 1	0	1.029	N/A	N/A	N/A	N/A	
Coarse – Mag, Real, Imag – 2	0	1.029	N/A	N/A	N/A	N/A	
Fine – Mag, Real, Imag – 0	0	1.022	N/A	N/A	N/A	N/A	
Fine – Mag, Real, Imag – 1	0	1.022	N/A	N/A	N/A	N/A	
Fine – Mag, Real, Imag – 2	0	1.022	N/A	N/A	N/A	N/A	

High resolution Integrated Logging Tool–DTS Wellsite Calibration – Detector Calibration

Before: 15–Apr–2009 14:08

Gamma Ray Background	30.00	N/A	36.88	N/A	N/A	N/A	GAPI
Gamma Ray (Jig – Bkgd)	165.0	N/A	173.3	N/A	N/A	15.00	GAPI

High resolution Integrated Logging Tool–DTS Wellsite Calibration – Zero Measurement

Master: 5–Feb–2009 9:56 Before: 16–Apr–2009 0:48

CNTC Background	25.87	25.87	26.20	N/A	N/A	3.881	CPS
CFTC Background	27.92	27.92	27.94	N/A	N/A	4.188	CPS

High resolution Integrated Logging Tool–DTS Wellsite Calibration – Ratio Measurement

Master: 5–Feb–2009 9:56

Thermal Near Corr. (Tank)	5800	5444	N/A	N/A	N/A	N/A	CPS
Thermal Far Corr. (Tank)	2400	2287	N/A	N/A	N/A	N/A	CPS
CNTC/CFTC (Tank)	2.159	2.380	N/A	N/A	N/A	N/A	

High resolution Integrated Logging Tool–DTS Wellsite Calibration – Accelerometer Calibration

Before: 18–Apr–2009 9:48

Z–Axis Acceleration	32.19	N/A	32.11	N/A	N/A	N/A	F/S2
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Enhanced DTS Cartridge Wellsite Calibration – EDTC Accelerometer Calibration

Before: 18–Apr–2009 9:48

EDTC Z–Axis Acceleration	32.19	N/A	32.14	N/A	N/A	N/A	F/S2
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Enhanced DTS Cartridge Wellsite Calibration – Detector Calibration

Before: 15–Apr–2009 14:34

Gamma Ray (Jig – Bkg)	159.8	N/A	159.8	N/A	N/A	14.52	GAPI
Gamma Ray (Calibrated)	165.0	N/A	165.0	N/A	N/A	15.00	GAPI

The HGNS Neutron Master Calibration was done with the following parameters :

NCT–B Water Temperature 68.0 DEG.  
 Thermal Housing Size 3.378 IN.  
 NSR–F serial number 2289

Array Induction Tool – H / Equipment Identification

Primary Equipment:  
 Rm/SP Bottom Nose  
 Array Induction Sonde

AHRM – A  
 AHIS – BA

Auxiliary Equipment:

Array Induction Tool – H Wellsite Calibration

Electronics Calibration Check – Thru Cal Mag. & Phase

Idx	Phase	Value	Thru Cal Magnitude V	Nominal	Value	Phase DEG	Nominal
0	Master	0.6141		0.6050	62.61		71.00
	Before	0.6131			61.20		
1	Master	1.259		1.270	61.48		70.00
	Before	1.257			60.06		
2	Master	0.6241		0.6230	57.90		66.00
	Before	0.6233			56.46		
3	Master	0.7106		0.7040	57.08		65.00
	Before	0.7090			55.65		
4	Master	1.329		1.337	50.88		59.00
	Before	1.326			49.43		
5	Master	1.927		1.955	49.26		57.00
	Before	1.925			47.78		
6	Master	1.927		1.955	49.25		57.00
	Before	1.925			47.78		
7	Master	1.403			48.55		

7	Master	1.403		1.415	46.92		53.00
	Before	1.399					
		60.00 % (Minimum)	(Nominal)	140.0 % (Maximum)	Nom -60.00 (Minimum)	(Nominal)	Nom + 60.00 (Maximum)

Master: 3-Apr-2009 13:11      Before: 15-Apr-2009 13:52

Array Induction Tool – H Wellsite Calibration						
Electronics Calibration Check – Auxilliary						
Phase	Array Induction SPA Plus MV	Value	Phase	Array Induction SPA Zero MV	Value	
Master		992.0	Master		-0.1742	
Before		991.4	Before		-0.1706	
	941.0 (Minimum)	990.5 (Nominal)	1040 (Maximum)	-50.00 (Minimum)	0 (Nominal)	50.00 (Maximum)
Phase	Array Induction Temperature Plus V	Value	Phase	Array Induction Temperature Zero V	Value	
Master		0.9190	Master		-0.0001754	
Before		0.9185	Before		-0.0001748	
	0.8700 (Minimum)	0.9150 (Nominal)	0.9600 (Maximum)	-0.05000 (Minimum)	0 (Nominal)	0.05000 (Maximum)

Master: 3-Apr-2009 13:11      Before: 15-Apr-2009 13:52

Array Induction Tool – H Wellsite Calibration							
Test Loop Gain Correction							
Idx	Value	Test Loop Gain Magnitude V			Value	Phase DEG	
0	1.012				0.4950		
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)	-3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
1	1.011				0.4842		
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)	-3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
2	1.015				-0.04337		
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)	-3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
3	1.013				-0.03414		
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)	-3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
4	0.9961				-0.1990		
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)	-3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
5	0.9851				-0.1044		
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)	-3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
6	0.9975				0.2068		
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)	-3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
7	1.013				-0.1309		
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)	-3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)

Master: 3-Apr-2009 13:11

Array Induction Tool – H Wellsite Calibration							
Sonde Error Correction							
Idx	Value	R Sonde Error Correction MM/M			Value	X Sonde Error Correction MM/M	
0	-114.0				459.8		
		-231.0 (Minimum)	-56.00 (Nominal)	119.0 (Maximum)	-2250 (Minimum)	0 (Nominal)	2250 (Maximum)
1	149.1				384.9		
		114.0 (Minimum)	159.0 (Nominal)	204.0 (Maximum)	-625.0 (Minimum)	0 (Nominal)	625.0 (Maximum)
2	114.7				-135.7		
		66.00 (Minimum)	111.0 (Nominal)	156.0 (Maximum)	-350.0 (Minimum)	0 (Nominal)	350.0 (Maximum)
3	58.44				43.56		
		39.00 (Minimum)	64.00 (Nominal)	89.00 (Maximum)	-250.0 (Minimum)	0 (Nominal)	250.0 (Maximum)
4	25.24				-7.536		

23.27	15.00 (Minimum)	25.00 (Nominal)	35.00 (Maximum)	-63.00 (Minimum)	0 (Nominal)	63.00 (Maximum)
5	13.55			-3.449		
	4.000 (Minimum)	14.00 (Nominal)	24.00 (Maximum)	-50.00 (Minimum)	0 (Nominal)	50.00 (Maximum)
6	8.915			5.765		
	5.000 (Minimum)	10.00 (Nominal)	15.00 (Maximum)	-30.00 (Minimum)	0 (Nominal)	30.00 (Maximum)
7	-0.8634			-3.723		
	-5.000 (Minimum)	0 (Nominal)	5.000 (Maximum)	-30.00 (Minimum)	0 (Nominal)	30.00 (Maximum)

Master: 3-Apr-2009 13:11

Array Induction Tool – H Wellsite Calibration								
Mud Gain Correction								
Idx	Value	Coarse – Mag, Real, Imag			Value	Fine – Mag, Real, Imag		
0	1.029				1.022			
		0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)	0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)	
1	1.029				1.022			
		0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)	0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)	
2	1.029				1.022			
		0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)	0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)	

Master: 3-Apr-2009 13:11

Array Induction Tool – H Master Calibration								
Electronics Calibration Check – Thru Cal Mag. & Phase								
Idx	Phase	Value	Thru Cal Magnitude V		Nominal	Value	Phase DEG	Nominal
0	Master	0.6141			0.6050	62.61		71.00
1	Master	1.259			1.270	61.48		70.00
2	Master	0.6241			0.6230	57.90		66.00
3	Master	0.7106			0.7040	57.08		65.00
4	Master	1.329			1.337	50.88		59.00
5	Master	1.927			1.955	49.26		57.00
6	Master	1.927			1.955	49.25		57.00
7	Master	1.403			1.415	48.55		53.00
		60.00 % (Minimum)	(Nominal)	140.0 % (Maximum)		Nom -60.00 (Minimum)	(Nominal)	Nom + 60.00 (Maximum)

Master: 3-Apr-2009 13:11

Array Induction Tool – H Master Calibration							
Electronics Calibration Check – Auxilliary							
Phase	Array Induction SPA Plus MV		Value	Phase	Array Induction SPA Zero MV		
Master			992.0	Master			
	941.0 (Minimum)	990.5 (Nominal)	1040 (Maximum)		-50.00 (Minimum)	0 (Nominal)	50.00 (Maximum)
							-0.1742
Phase	Array Induction Temperature Plus V		Value	Phase	Array Induction Temperature Zero V		
Master			0.9190	Master			
	0.8700 (Minimum)	0.9150 (Nominal)	0.9600 (Maximum)		-0.05000 (Minimum)	0 (Nominal)	0.05000 (Maximum)
							-0.0001754

Master: 3-Apr-2009 13:11

Array Induction Tool – H Master Calibration								
Test Loop Gain Correction								
Idx	Value	Test Loop Gain Magnitude V			Value	Phase DEG		
0	1.012				0.4950			
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)	-3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)	
1	1.011				0.4842			
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)	-3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)	



2	1.015	0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)	-0.04337	-3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		-3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
3	1.013	0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)	-0.03414	-3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		-3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
4	0.9961	0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)	-0.1990	-3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		-3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
5	0.9851	0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)	-0.1044	-3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		-3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
6	0.9975	0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)	0.2068	-3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		-3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
7	1.013	0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)	-0.1309	-3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		-3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)

Master: 3-Apr-2009 13:11

Array Induction Tool – H Master Calibration								
Sonde Error Correction								
Idx	Value	R Sonde Error Correction MM/M			Value	X Sonde Error Correction MM/M		
0	-114.0	-231.0 (Minimum)	-56.00 (Nominal)	119.0 (Maximum)	459.8	-2250 (Minimum)	0 (Nominal)	2250 (Maximum)
		-231.0 (Minimum)	-56.00 (Nominal)	119.0 (Maximum)		-2250 (Minimum)	0 (Nominal)	2250 (Maximum)
1	149.1	114.0 (Minimum)	159.0 (Nominal)	204.0 (Maximum)	384.9	-625.0 (Minimum)	0 (Nominal)	625.0 (Maximum)
		114.0 (Minimum)	159.0 (Nominal)	204.0 (Maximum)		-625.0 (Minimum)	0 (Nominal)	625.0 (Maximum)
2	114.7	66.00 (Minimum)	111.0 (Nominal)	156.0 (Maximum)	-135.7	-350.0 (Minimum)	0 (Nominal)	350.0 (Maximum)
		66.00 (Minimum)	111.0 (Nominal)	156.0 (Maximum)		-350.0 (Minimum)	0 (Nominal)	350.0 (Maximum)
3	58.44	39.00 (Minimum)	64.00 (Nominal)	89.00 (Maximum)	43.56	-250.0 (Minimum)	0 (Nominal)	250.0 (Maximum)
		39.00 (Minimum)	64.00 (Nominal)	89.00 (Maximum)		-250.0 (Minimum)	0 (Nominal)	250.0 (Maximum)
4	25.24	15.00 (Minimum)	25.00 (Nominal)	35.00 (Maximum)	-7.536	-63.00 (Minimum)	0 (Nominal)	63.00 (Maximum)
		15.00 (Minimum)	25.00 (Nominal)	35.00 (Maximum)		-63.00 (Minimum)	0 (Nominal)	63.00 (Maximum)
5	13.55	4.000 (Minimum)	14.00 (Nominal)	24.00 (Maximum)	-3.449	-50.00 (Minimum)	0 (Nominal)	50.00 (Maximum)
		4.000 (Minimum)	14.00 (Nominal)	24.00 (Maximum)		-50.00 (Minimum)	0 (Nominal)	50.00 (Maximum)
6	8.915	5.000 (Minimum)	10.00 (Nominal)	15.00 (Maximum)	5.765	-30.00 (Minimum)	0 (Nominal)	30.00 (Maximum)
		5.000 (Minimum)	10.00 (Nominal)	15.00 (Maximum)		-30.00 (Minimum)	0 (Nominal)	30.00 (Maximum)
7	-0.8634	-5.000 (Minimum)	0 (Nominal)	5.000 (Maximum)	-3.723	-30.00 (Minimum)	0 (Nominal)	30.00 (Maximum)
		-5.000 (Minimum)	0 (Nominal)	5.000 (Maximum)		-30.00 (Minimum)	0 (Nominal)	30.00 (Maximum)

Master: 3-Apr-2009 13:11

Array Induction Tool – H Master Calibration								
Mud Gain Correction								
Idx	Value	Coarse – Mag, Real, Imag			Value	Fine – Mag, Real, Imag		
0	1.029	0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)	1.022	0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)
		0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)		0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)
1	1.029	0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)	1.022	0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)
		0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)		0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)
2	1.029	0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)	1.022	0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)
		0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)		0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)

Master: 3-Apr-2009 13:11

Elemental Capture Spectroscopy Tool / Equipment Identification

Primary Equipment:		
ECS Sonde	ECS – A	31
ECS Detector Package	ECSD – A	31
ECS AmBe Source	NSR – F	2573
Auxiliary Equipment:		
ECS Sonde Housing	ECSH – A	31

Elemental Capture Cartridge – B / Equipment Identification

Primary Equipment:		
ECC Cartridge	ECC – B	32
Auxiliary Equipment:		
ECC Housing	ECH – A	22

High resolution Integrated Logging Tool–DTS / Equipment Identification

Primary Equipment:		
HILT Gamma–Ray Neutron Sonde–DTS	HGNS – B	
HGNS Gamma–Ray Device	HGR –	
HGNS Neutron Detector with Alpha Source	HCNT –	
Z–Axis Accelerometer	HACC –	715
Neutron Logging Source	NLS – KL	
Neutron Source Radioactive	NSR – F	2289
Compensated Neutron Box	CNB – AB	
HTBC Communication Assembly DTS Mode	HMCA –	
Auxiliary Equipment:		
Neutron Calibration Tank	NCT – B	
Gamma Source Radioactive	GSR – U/Y	
HGNS Housing	HGNH –	2760

High resolution Integrated Logging Tool–DTS Wellsite Calibration

Detector Calibration

Phase	Gamma Ray Background GAPI	Value	Phase	Gamma Ray (Jig – Bkgd) GAPI	Value
Before		36.88	Before		173.3
	0 (Minimum) 30.00 (Nominal) 120.0 (Maximum)			157.1 (Minimum) 165.0 (Nominal) 206.3 (Maximum)	

Before: 15–Apr–2009 14:08

High resolution Integrated Logging Tool–DTS Wellsite Calibration

Zero Measurement

Phase	CNTC Background CPS	Value	Phase	CFTC Background CPS	Value
Master		25.87	Master		27.92
Before		26.20	Before		27.94
	5.000 (Minimum) 25.87 (Nominal) 40.00 (Maximum)			5.000 (Minimum) 27.92 (Nominal) 40.00 (Maximum)	

Master: 5–Feb–2009 9:56

Before: 16–Apr–2009 0:48

High resolution Integrated Logging Tool–DTS Wellsite Calibration

Ratio Measurement

Phase	Thermal Near Corr. (Tank) CPS	Value	Phase	Thermal Far Corr. (Tank) CPS	Value	Phase	CNTC/CFTC (Tank)	Value
Master		5444	Master		2287	Master		2.380
	4700 (Minimum) 5800 (Nominal) 6900 (Maximum)			1900 (Minimum) 2400 (Nominal) 2900 (Maximum)			2.120 (Minimum) 2.159 (Nominal) 2.540 (Maximum)	

Master: 5–Feb–2009 9:56

High resolution Integrated Logging Tool–DTS

Wellsite Calibration

Accelerometer Calibration

Phase	Z–Axis Acceleration F/S2	Value
Before		32.11
	31.53 (Minimum) 32.19 (Nominal) 32.84 (Maximum)	

High resolution Integrated Logging Tool-DTS Master Calibration					
Zero Measurement					
Phase	CNTC Background CPS	Value	Phase	CFTC Background CPS	Value
Master		25.87	Master		27.92
	5.000 (Minimum) 25.87 (Nominal) 40.00 (Maximum)			5.000 (Minimum) 27.92 (Nominal) 40.00 (Maximum)	

Master: 5-Feb-2009 9:56

High resolution Integrated Logging Tool-DTS Master Calibration									
Tank Measurement									
Phase	Thermal Near Corr. (Tank) CPS	Value	Phase	Thermal Far Corr. (Tank) CPS	Value	Phase	CNTC/CFTC (Tank)		Value
Master		5444	Master		2287	Master			2.380
	4700 (Minimum) 5800 (Nominal) 6900 (Maximum)			1900 (Minimum) 2400 (Nominal) 2900 (Maximum)			2.120 (Minimum) 2.159 (Nominal) 2.540 (Maximum)		

Master: 5-Feb-2009 9:56

Enhanced DTS Cartridge / Equipment Identification	
Primary Equipment:	
EDTC Gamma Ray Detector	EDTG - A/B
Enhanced DTS Cartridge	EDTC - B
Auxiliary Equipment:	
EDTC Housing	EDTH - B

Enhanced DTS Cartridge Wellsite Calibration		
EDTC Accelerometer Calibration		
Phase	EDTC Z-Axis Acceleration F/S2	Value
Before		32.14
	31.53 (Minimum) 32.19 (Nominal) 32.84 (Maximum)	

Before: 18-Apr-2009 9:48

Enhanced DTS Cartridge Wellsite Calibration									
Detector Calibration									
Phase	Gamma Ray Background GAPI	Value	Phase	Gamma Ray (Jig - Bkg) GAPI	Value	Phase	Gamma Ray (Calibrated) GAPI	Value	
Before		35.72	Before		159.8	Before		165.0	
	0 (Minimum) 30.00 (Nominal) 120.0 (Maximum)			145.2 (Minimum) 159.8 (Nominal) 174.3 (Maximum)			150.0 (Minimum) 165.0 (Nominal) 180.0 (Maximum)		

Before: 15-Apr-2009 14:34

Company: **Battelle Pacific Northwest Lab**

Well: **Wallula Basalt Pilot #1**

Field: **Wildcat**

County: **Walla Walla**

State: **Washington**

**Schlumberger**

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