

Company: Noble Energy Inc.

Well: Wells Ranch State A36-649

Field: Wattenberg

County: Weld State: Colorado

Neutron Porosity Log

NPOR-GR

HGNS

County:	Weld			
Field:	Wattenberg			
Location:	NESE S31 T6N R63W			
Well:	Wells Ranch State A36-649			
Company:	Noble Energy Inc.			
Location:		NESE S31 T6N R63W	Elev.:	K.B. 4681.00 ft
		SHL: 2641' FNL 50' FEL		G.L. 4657.00 ft
		LAT: 40.442 / LONG: -104.472		D.F. 4680.00 ft
Permanent Datum:		Ground Level	Elev.:	4657.00 f
Log Measured From:		Kelly Bushing	24.00 ft	above Perm.Datum
Drilling Measured From:		Kelly Bushing		
API Serial No.	Section:	Township:	Range:	
05-123-41514	31	6N	63W	
Logging Date	24-Jul-2015			

Run Number	ONE	
Depth Driller	7061.00 ft	
Schlumberger Depth	7061.00 ft	
Bottom Log Interval	6336.00 ft	
Top Log Interval	50.00 ft	
Casing Fluid Type	Water	
Salinity		
Density	8.34 lbm/gal	
Fluid Level	8.00 ft	
BIT/CASING/TUBING STRING		
Bit Size	8.75 in	
From	846.00 ft	
To	7061.00 ft	
Casing/Tubing Size	7 in	
Weight	26 lbm/ft	
Grade	N/A	
From	0.00 ft	
To	7061.00 ft	
Max Recorded Temperatures	208 degF	
Logger on Bottom	24-Jul-2015	11:30:00
Unit Number	3022	Ft. Morgan, CO
Recorded By	Michel Lapointe	
Witnessed By		

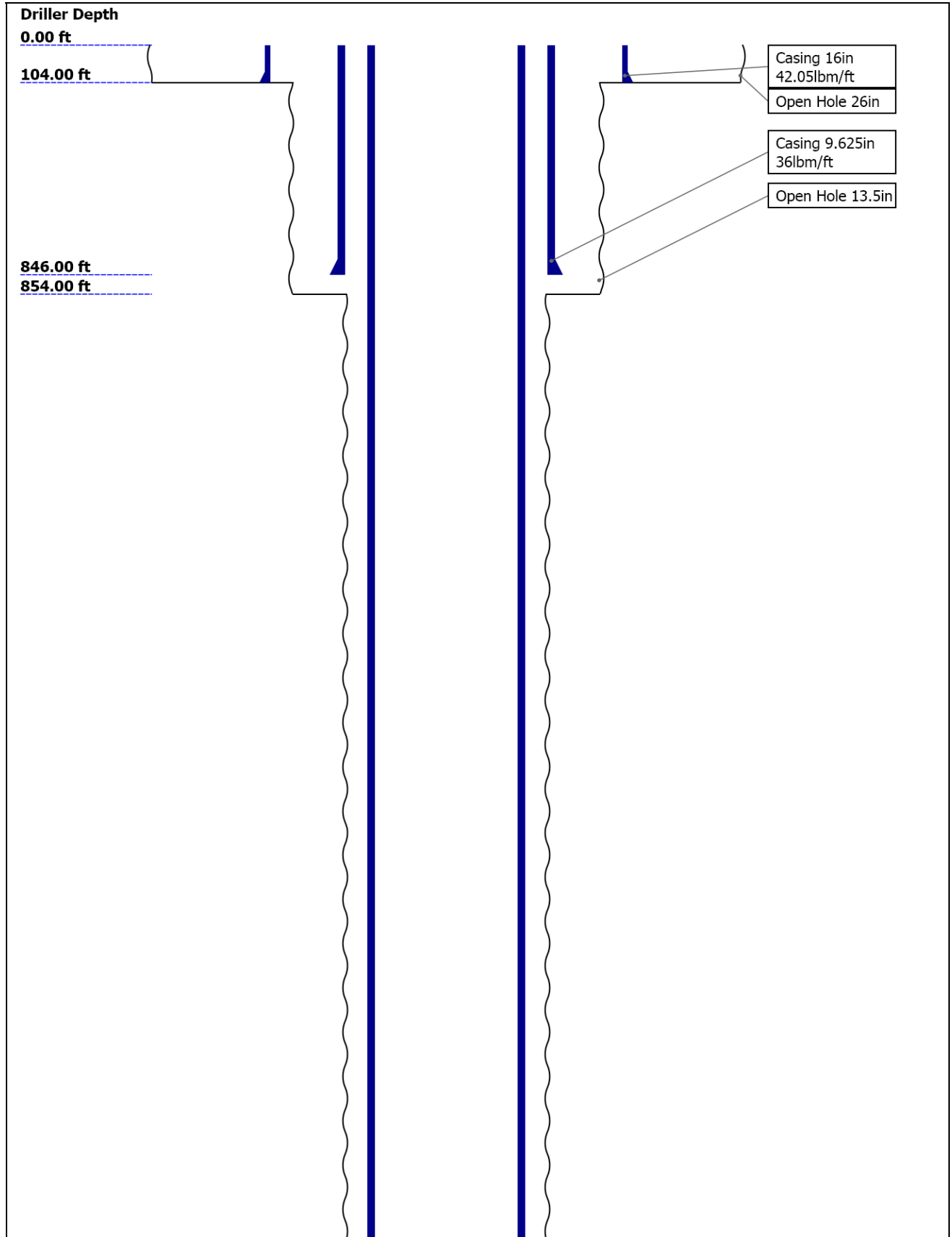
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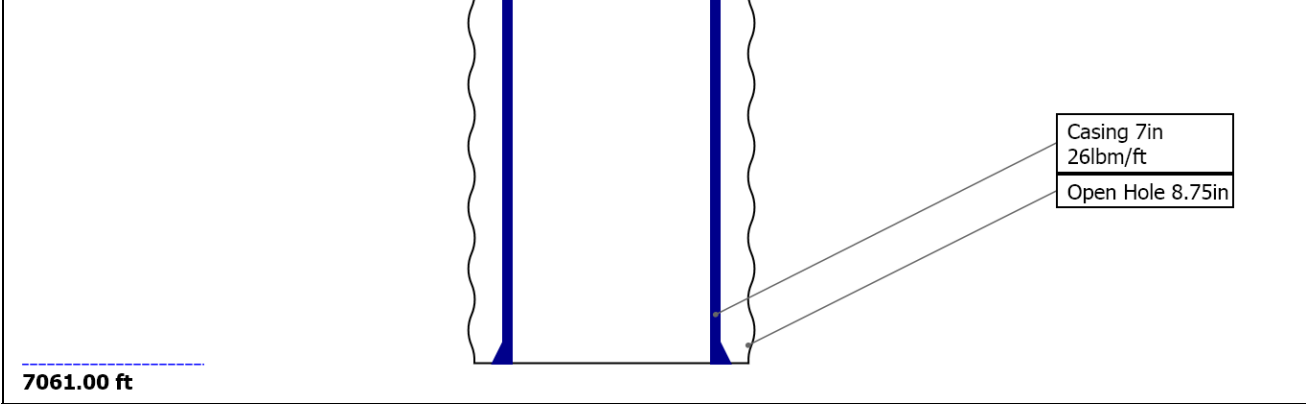
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Well Sketch





Borehole Size/Casing/Tubing Record

Bit						
Bit Size (in)	26	13.5	8.75			
Top Driller (ft)	0	104	854			
Top Logger (ft)	0	104	846			
Bottom Driller (ft)	104	854	7061			
Bottom Logger (ft)	104	846	7061			
Casing						
Size (in)	16	9.625	7			
Weight (lbm/ft)	42.05	36	26			
Inner Diameter (in)	15.511	8.921	6.276			
Grade	N/A	N/A	N/A			
Top Driller (ft)	0	0	0			
Top Logger (ft)	0	0	0			
Bottom Driller (ft)	104	846	7061			
Bottom Logger (ft)	104	846	7061			

Operational Run Summary

Parameter (unit)	ONE					
Date Log Started	24-Jul-2015					
Time Log Started	11:00:46					
Date Log Finished	24-Jul-2015					
Time Log Finished	13:15:37					
Top Log Interval (ft)						
Bottom Log Interval (ft)						
Total Depth (ft)	6336.00					
Max Hole Deviation (deg)						
Azimuth of Max Deviation (deg)						
Bit Size (in)	8.750					
Logging Unit Number	3022					
Logging Unit Location	Ft. Morgan, CO					
Recorded By	Michel Lapointe					

Borehole Fluids

Parameter(unit)	ONE					
Fluid Type	Water					
Fluid Name	Water					
Max Recorded Temperatures (degF)	208					
Source of Sample						
Salinity (ppm)	0					
Density (lbm/gal)	8.34					
Funnel Viscosity (s)						
Fluid Loss (cm3)						
PH						
Date/Time Circulation Stopped	NaN					
Date Logger on Bottom	24-Jul-2015					
Time Logger on Bottom	11:30:00					
Source RMF						
RMC						
RM @ Meas Temp (ohm.m@degF)	0.2 @ 68					
RMF @ Meas Temp (ohm.m@degF)	0.15 @ 68					
RMC @ Meas Temp (ohm.m@degF)						
RM @ BHT (ohm.m@degF)	0.07 @ 208					
RMF @ BHT (ohm.m@degF)	0.05 @ 208					
RMC @ BHT (ohm.m@degF)	NaN @ 208					
Total Solid (%)						
High Gravity Solids (%)						

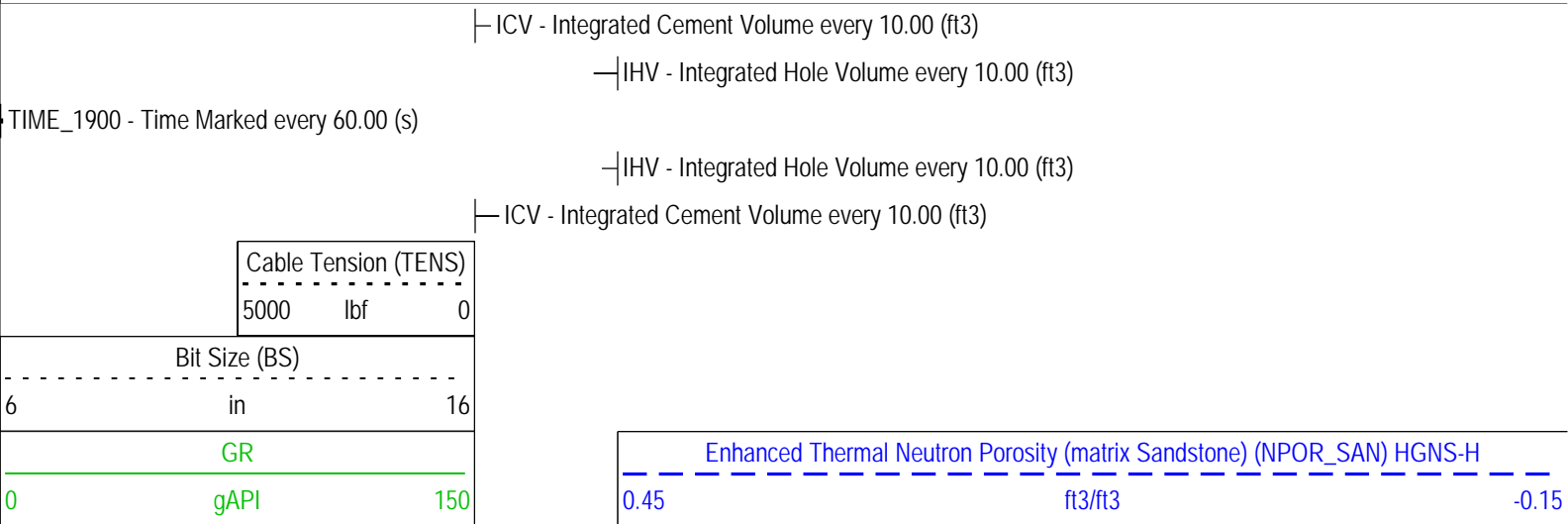
Remarks and Equipment Summary

ONE: Toolstring		ONE: Remarks	
Equip name LEH-QT:2491 LEH-QT:2491	Length 15.78	MP name	Offset
		1. TOOLS RAN AS PER TOOLSKETCH.	
		2. CNL-GR LOGGED FROM POINT OF REFUSAL TO SURFACE.	
		3. LOGS CORRELATED TO DOWNLOG, REFERENCED TO KB.	
DTC-H:8794 ECH-KC:9373 DTC-H:8794	12.87	CTEM HV	11.97 0.00
		TelStatus	9.87
		ToolStatus	9.87
		Temperature	9.84
HGNS-H:4779 HGNS:3826 NPV-N NSR-F:5138 HMCA-H HGNS-H:4779 HACCZ-H:5736	9.87	GR	9.12
		4. TOOLS STOPPED MOVING DOWN AT 6336 FEET. LOGGED OUT FROM THIS DEPTH TO SURFACE.	
		5. TOOLS PULLED TIGHT AT 6253 FEET. PULLED 3550 LBS AT SURFACE TO PULL FREE. DID NOT HIT ANYTHING AT THIS DEPTH RUNNING IN.	
		6. LOGGED REPEAT PASS FROM 1150-850 FEET INSTEAD OF RETURNING PAST TIGHT SPOT AT 6253 FEET.	
		CNL Porosity	2.79
		HGNS	0.46
		HMCA	0.46

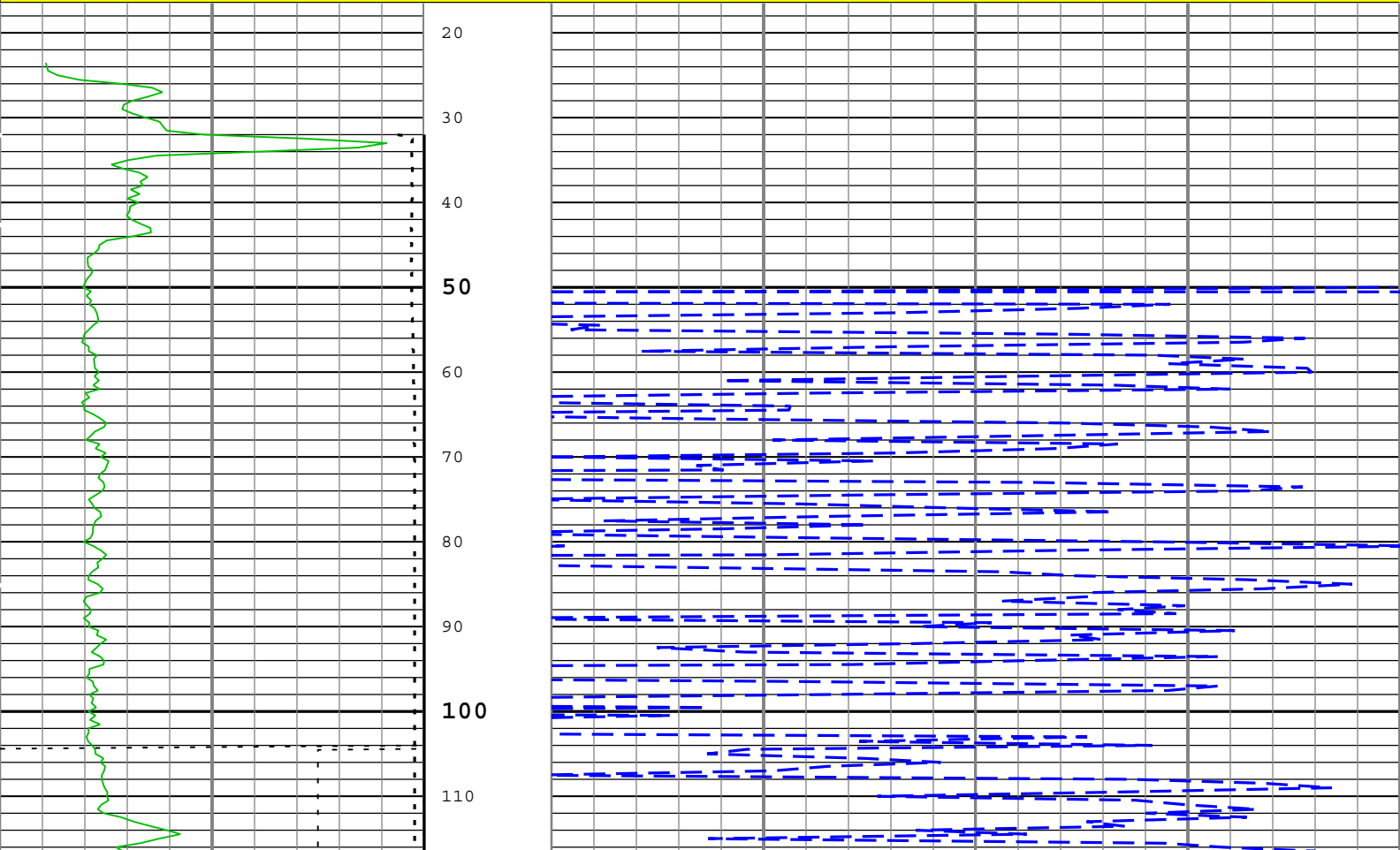
<div><div><div><div><div><div></div><div>0.46</div></div><div><div>Accelerometer</div><div>0.00</div></div></div><div><div><div></div><div>0.46</div></div><div><div>BNS-STD</div><div>0.46</div></div></div><div><div><div></div><div>TOOL_ZERO</div></div><div>Lengths are in ft</div><div>Maximum Outer Diameter = 3.375 in</div><div>Line: Sensor Location, Value: Gating Offset</div><div>All measurements are relative to TOOL_ZERO</div></div></div></div></div>											
Depth Summary											
			ONE								
Depth Measuring Device											
Type		IDW-JA									
Serial Number		7234									
Calibration Date		13-FEB-2015									
Calibrator Serial Number											
Calibration Cable Type		7-39PL-XS									
Wheel Correction 1		-4									
Wheel Correction 2		-2									
Tension Device											
Type		CMTD-B/A									
Serial Number		1109									
Calibration Date		13-Jul-2015									
Calibrator Serial Number		441435A									
Number of Calibration Points		10									
Calibration Root Mean Square Error		31									
Calibration Peak Error		72									
Logging Cable											
Type		7-39P-LXS									
Serial Number		3022									
Length		12000.00 ft									
Conveyance Type		Wireline									
Rig Type		Rigless									
ONE:Depth Control Parameters					Depth Control Remarks						
Log Sequence		First Log In the Well			SCHLUMBERGER DEPTH CONTROL POLICY FOLLOWED.						
Rig Up Length At Surface					PRIMARY DEPTH MEASUREMENT = IDW.						
Rig Up Length At Bottom					SECONDARY DEPTH CONTROL = Z-CHART.						
Rig Up Length Correction					LOGS DEPTH CORRELATED TO DOWNLOG, REFERENCED TO ZERO AT KB.						
Stretch Correction		2.83 ft									
Tool Zero Check At Surface											
ONE											
Integration Summary											
Output Channel(s)		Output Description		Input Parameter		Output Value		Unit			
ICV		Integrated Cement Volume		GCSE_UP_PASS, FCD		0		ft3			
IHV		Integrated Hole Volume		GCSE_UP_PASS		0		ft3			
Software Version											
Acquisition System						Version					
Maxwell 2014 SP3						5.3.45427.3100					
Pass Summary											
Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	DSC Mode	Depth Shift	Include Parallel Data		
ONE	Log[2]:Up	Up	31.95 ft	6336.60 ft	24-Jul-2015 11:28:18 AM	24-Jul-2015 12:54:13 PM	ON	2.82 ft	No		

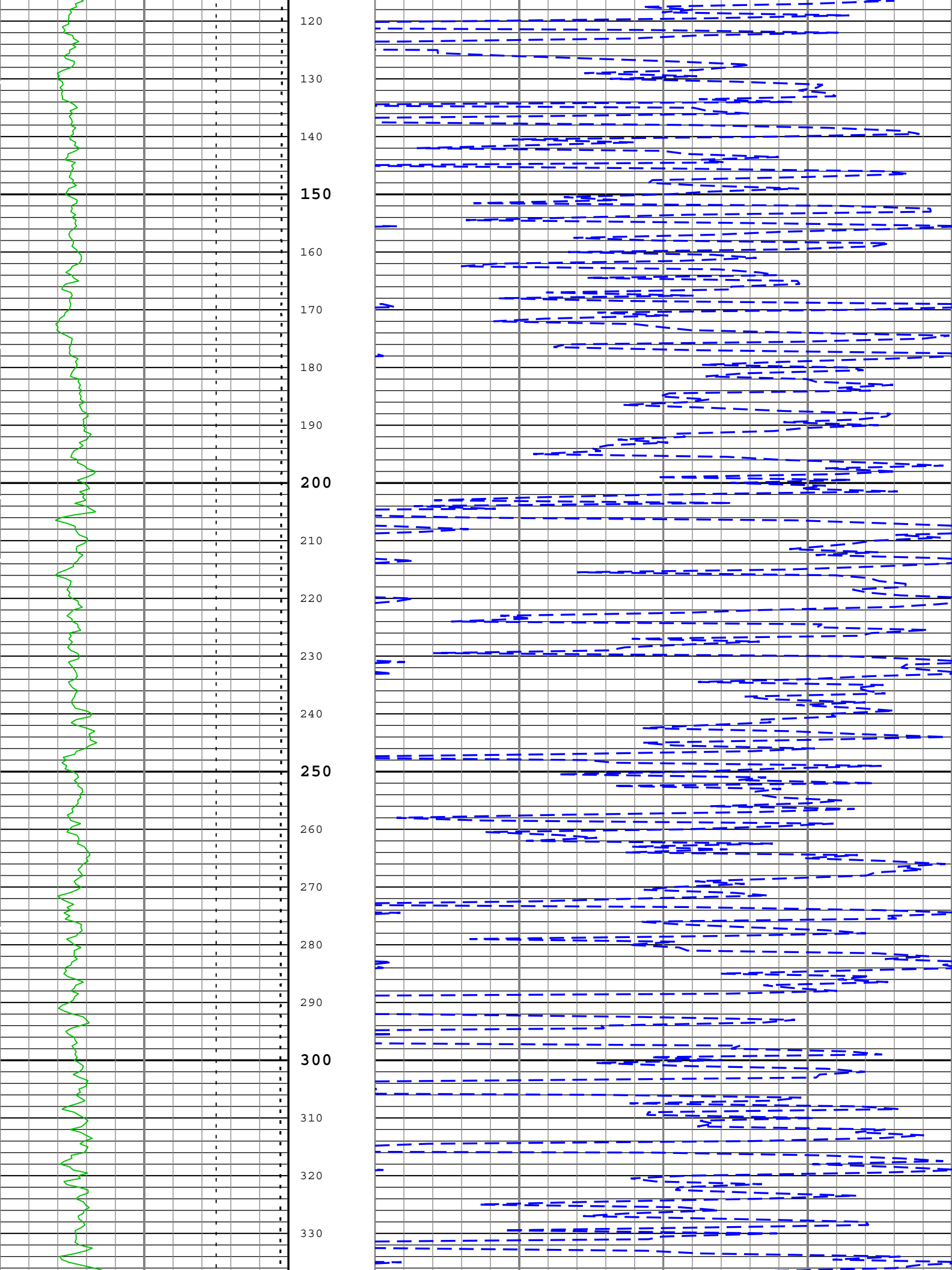
Description: MCFL processing LQC for Platform Express Format: Log (SURFACE-CASING) Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth Creation Date: 24-Jul-2015 13:20:18

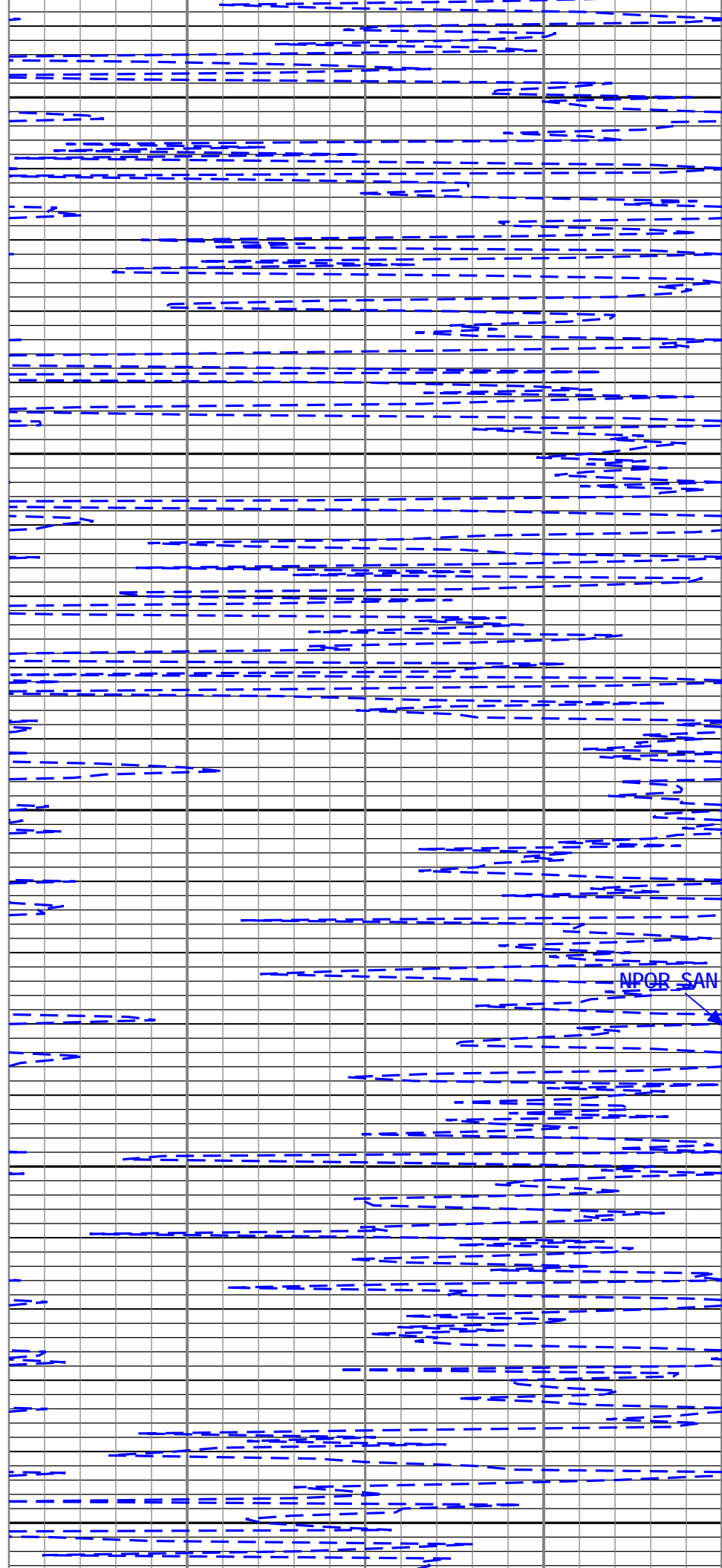
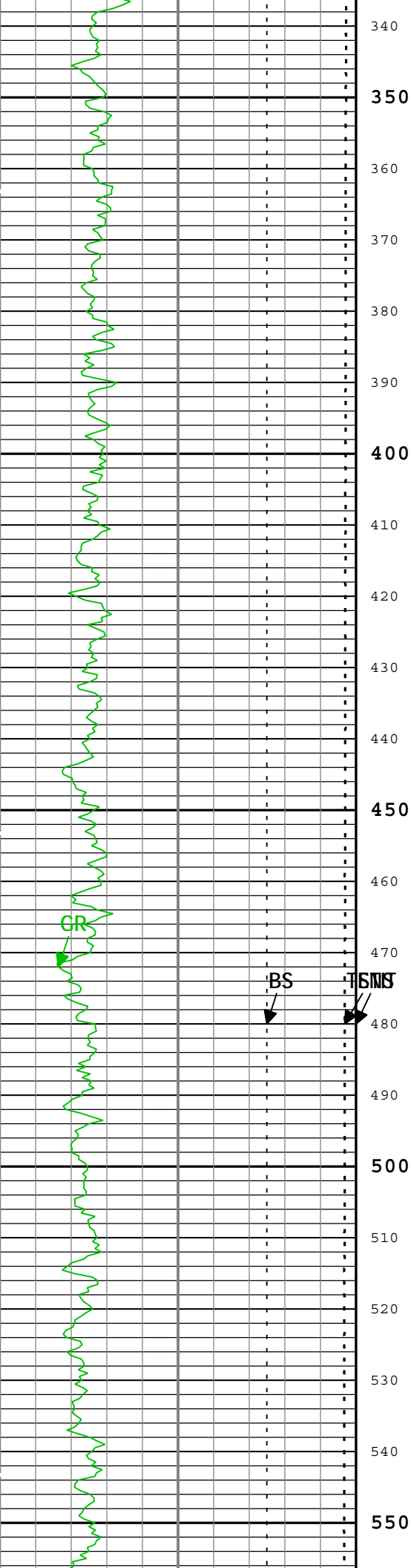
Channel	Source	Sampling
BS	Borehole	6in
GR_CAL	HGNS-H:HGNS-H:HGNS-H	6in
ICV	Borehole	6in
IHV	Borehole	6in
NPOR_SAN	HGNS-H:HGNS-H:HGNS-H	6in
STIT	DepthCorrection	6in
TENS	WLWorkflow	1in
TIME_1900	WLWorkflow	0.1in

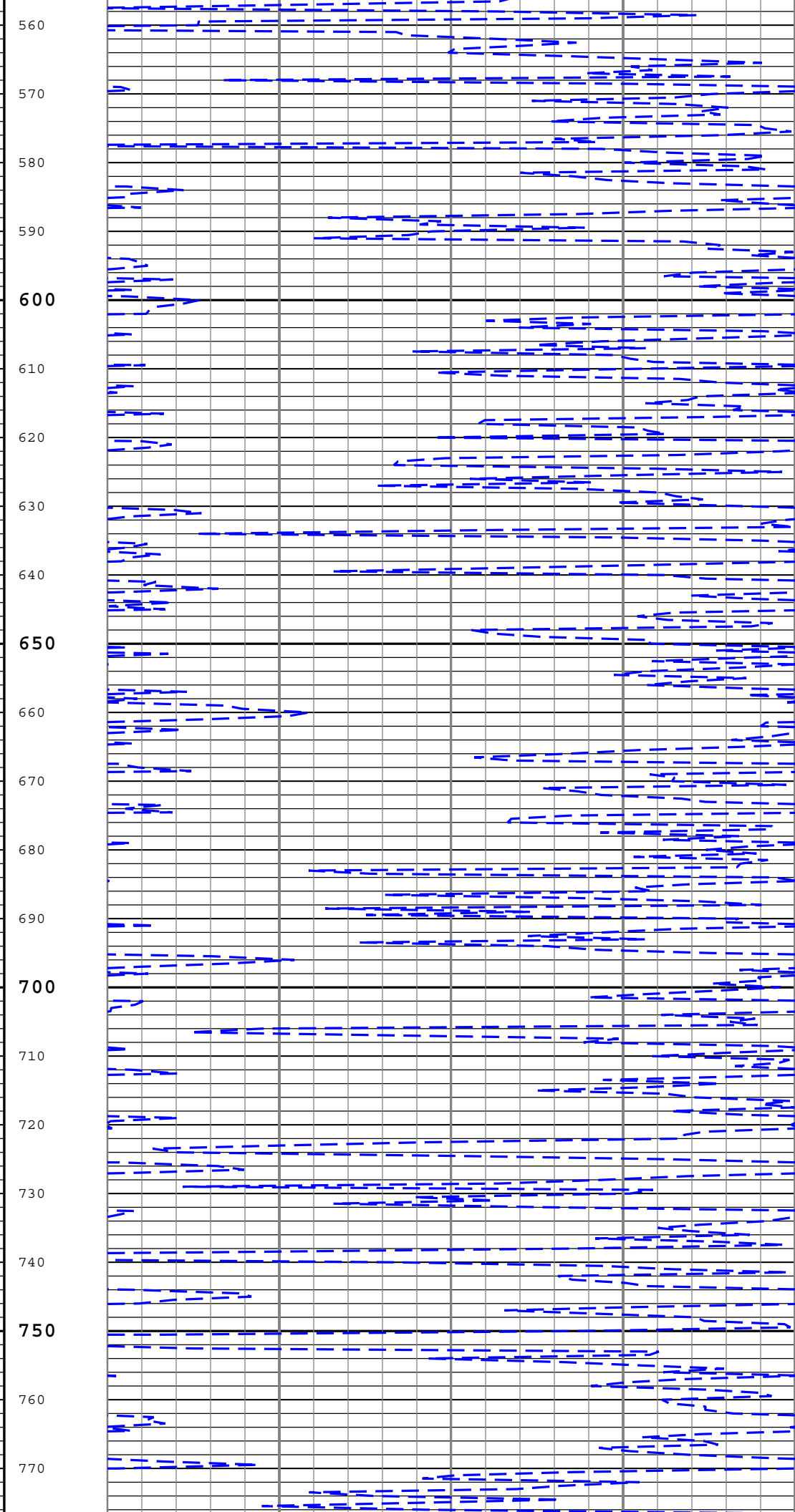
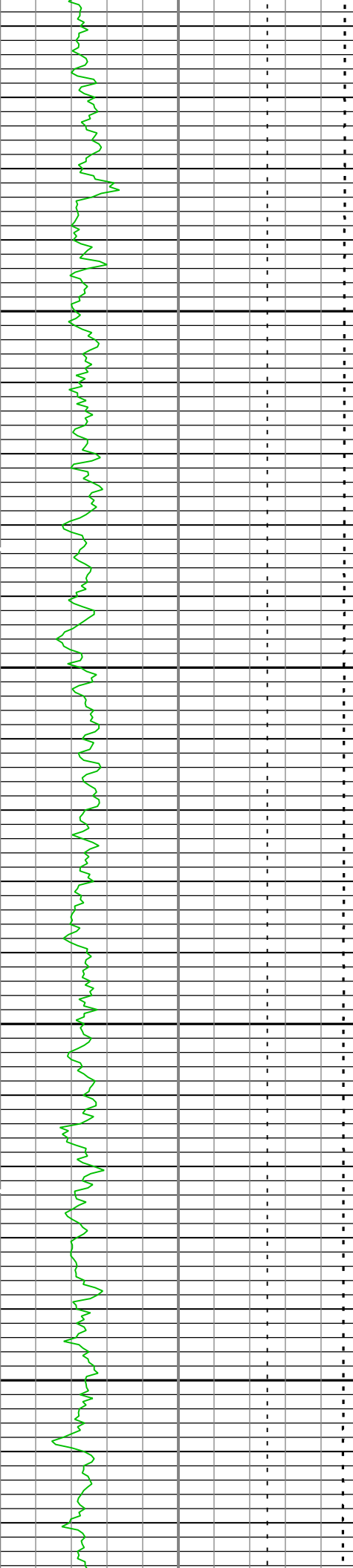


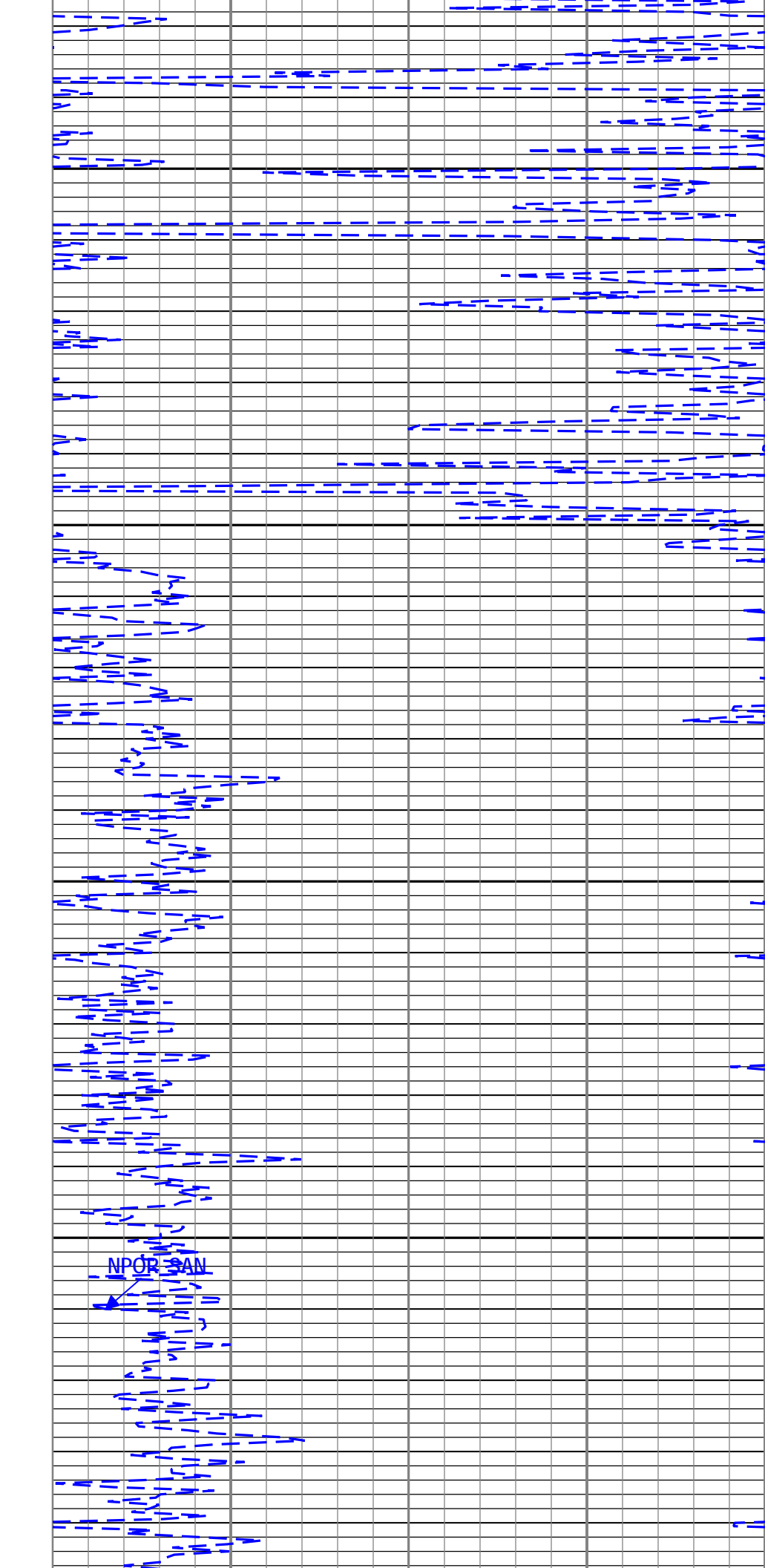
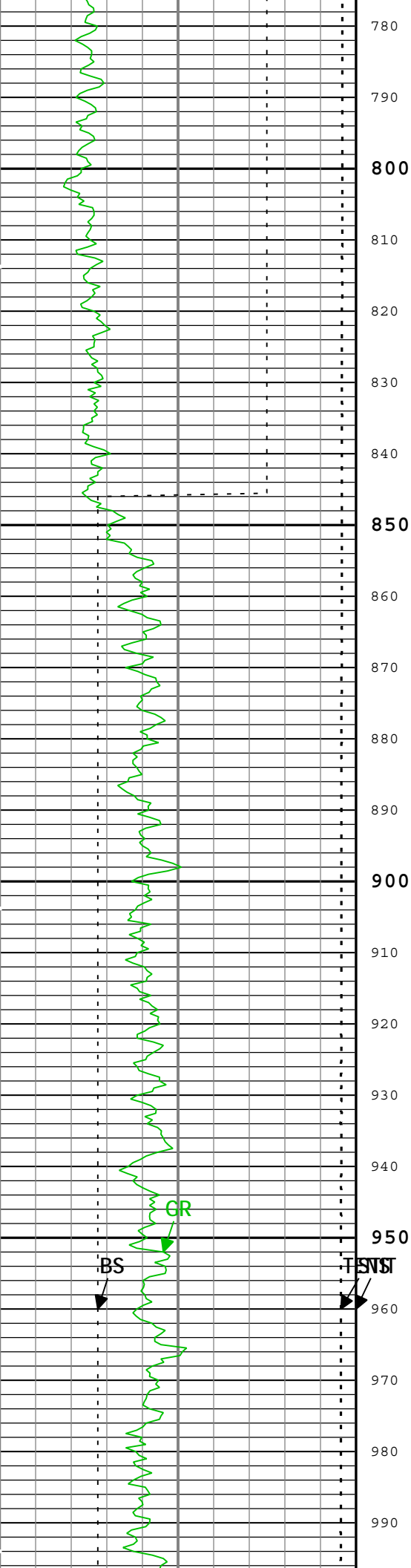
MAIN PASS: GR-CNL TO SURFACE, BS = SURFACE BS, BHS = CASED

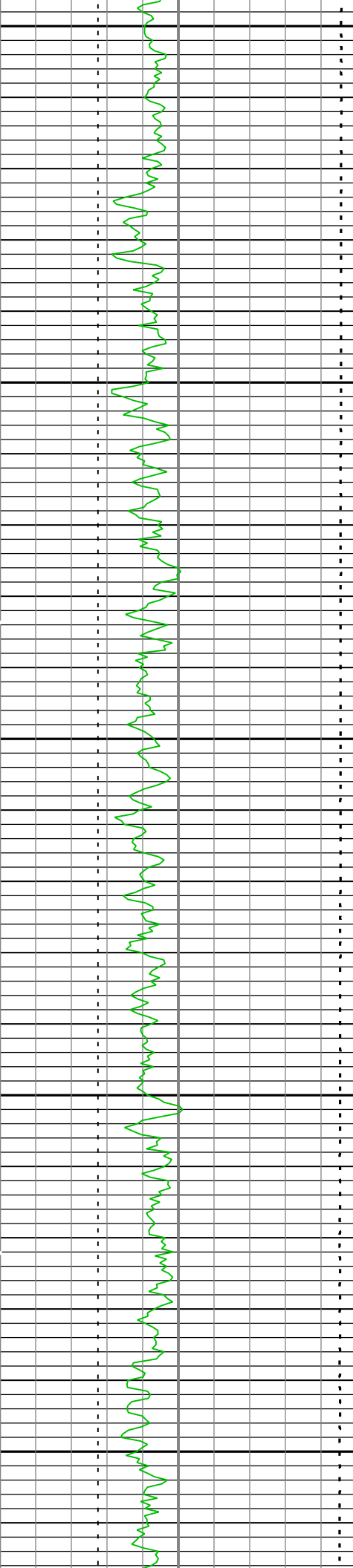




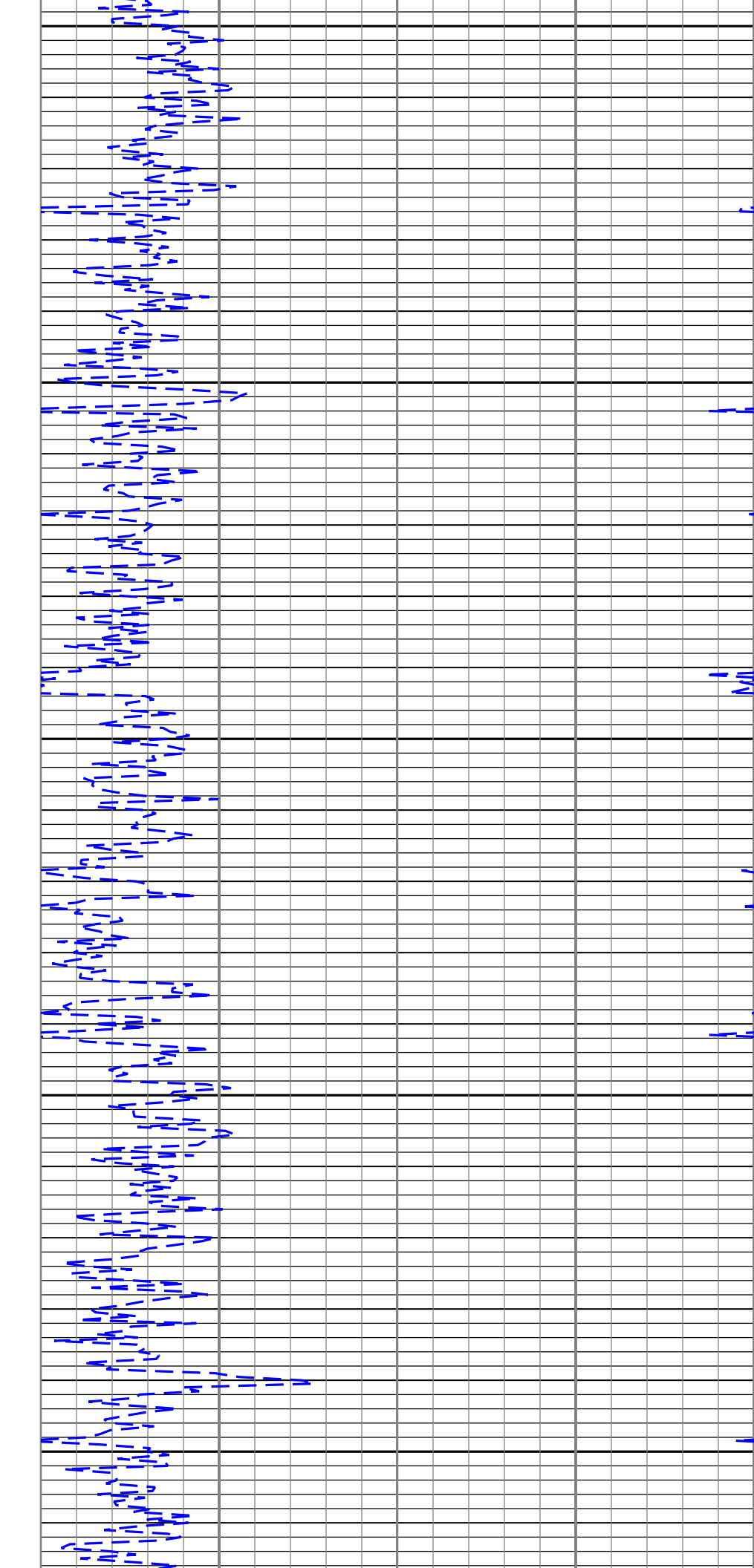


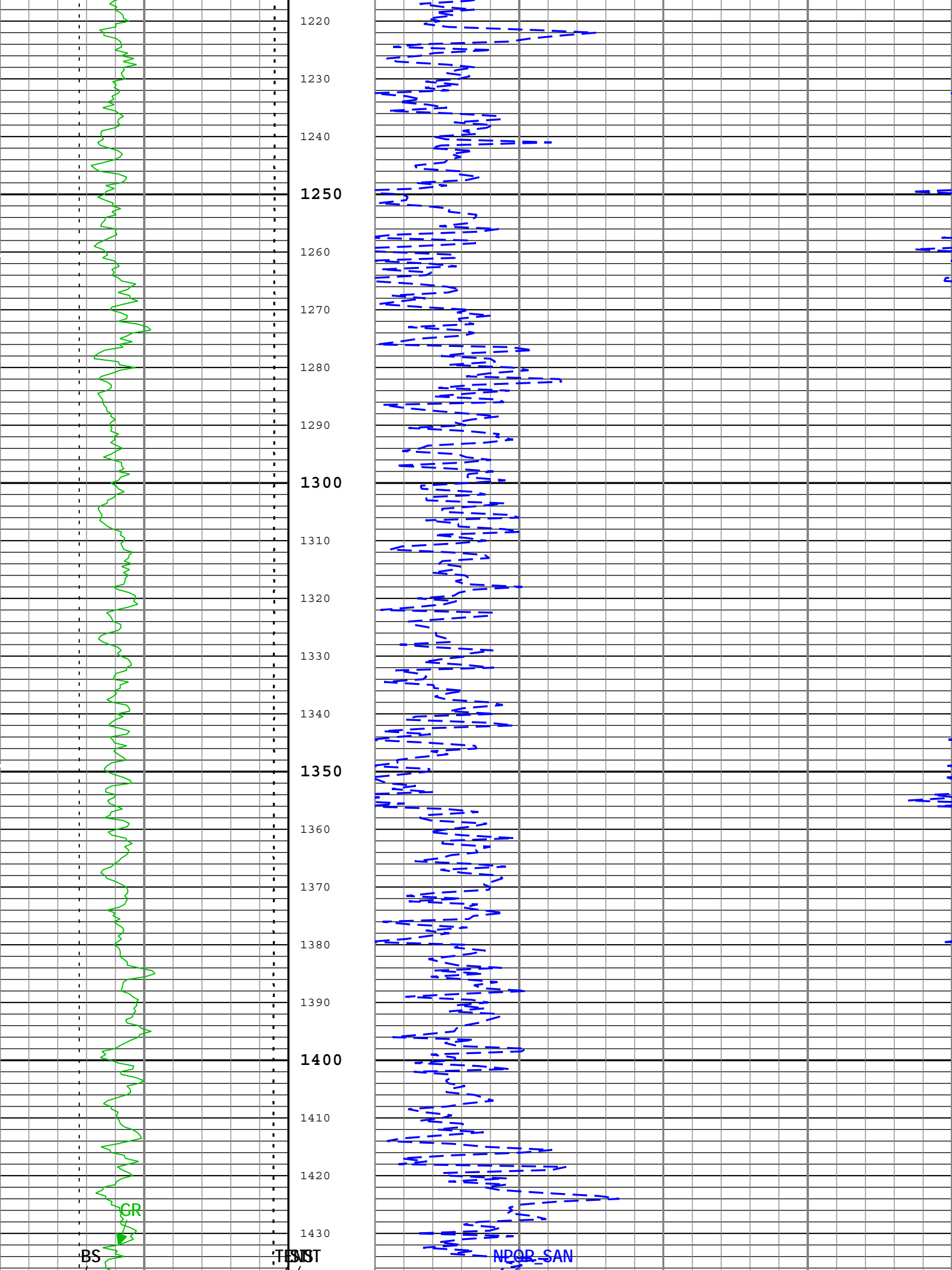


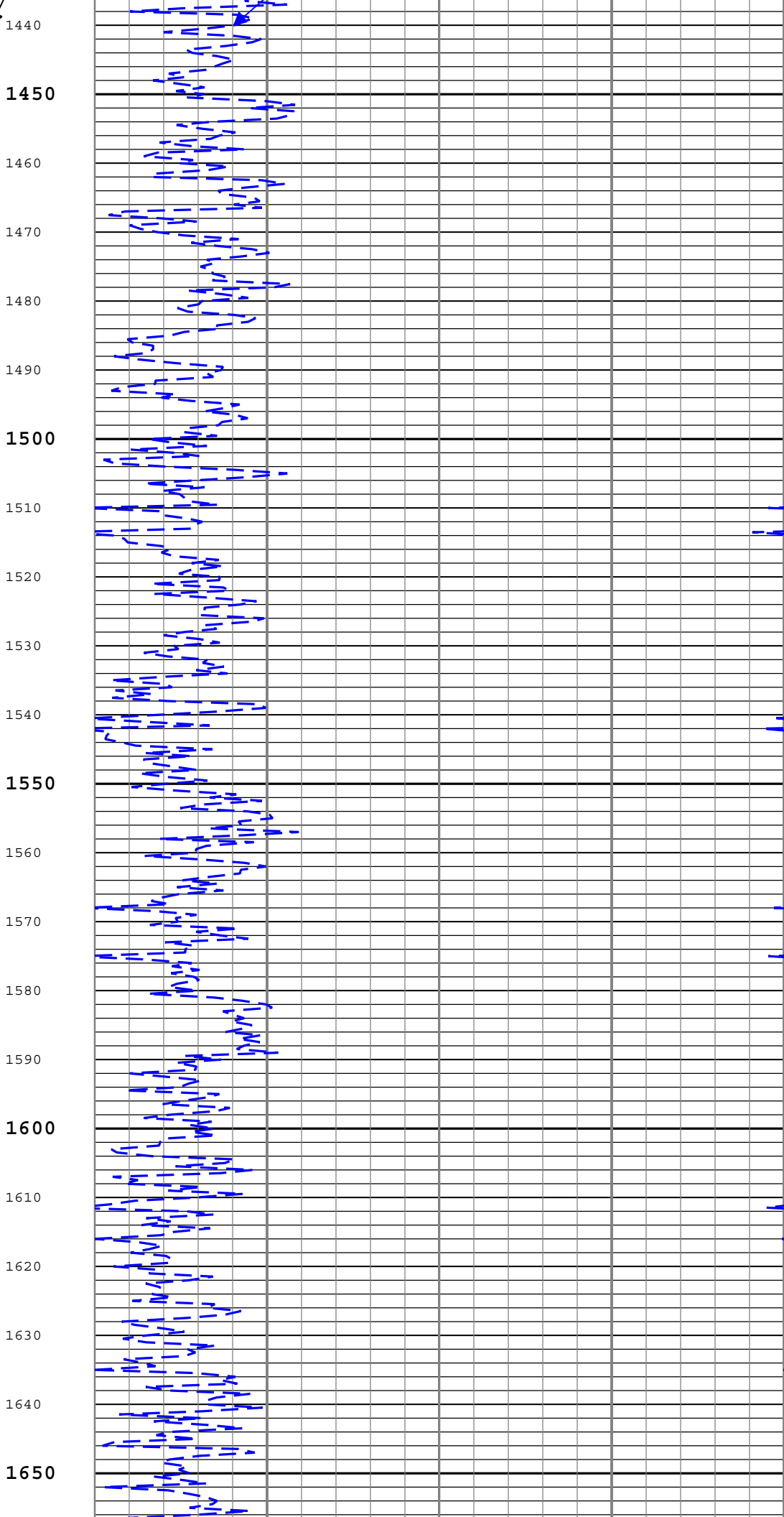
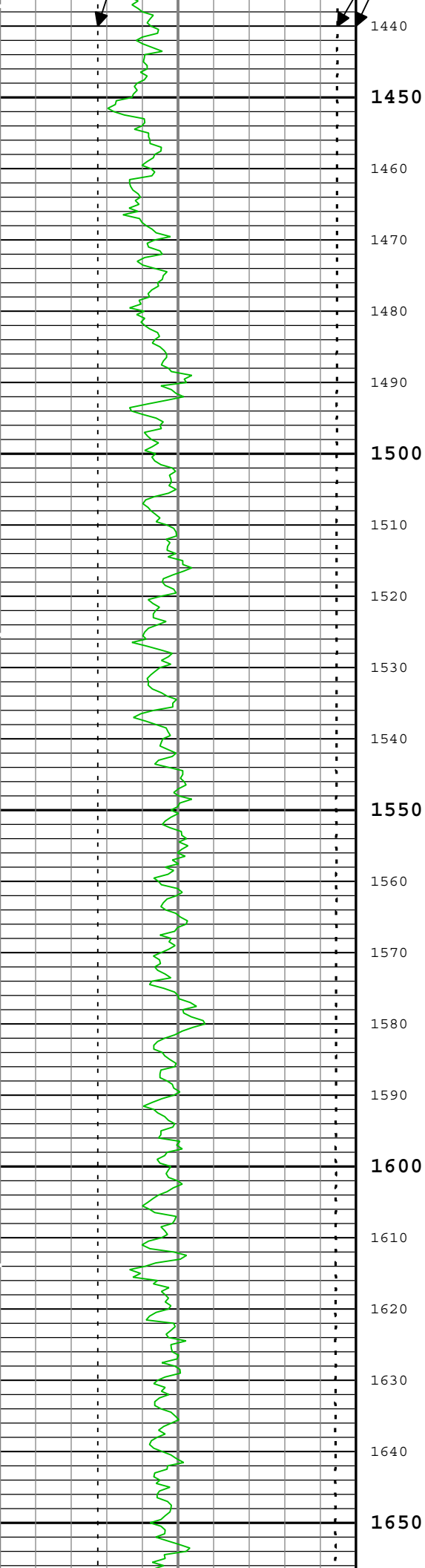


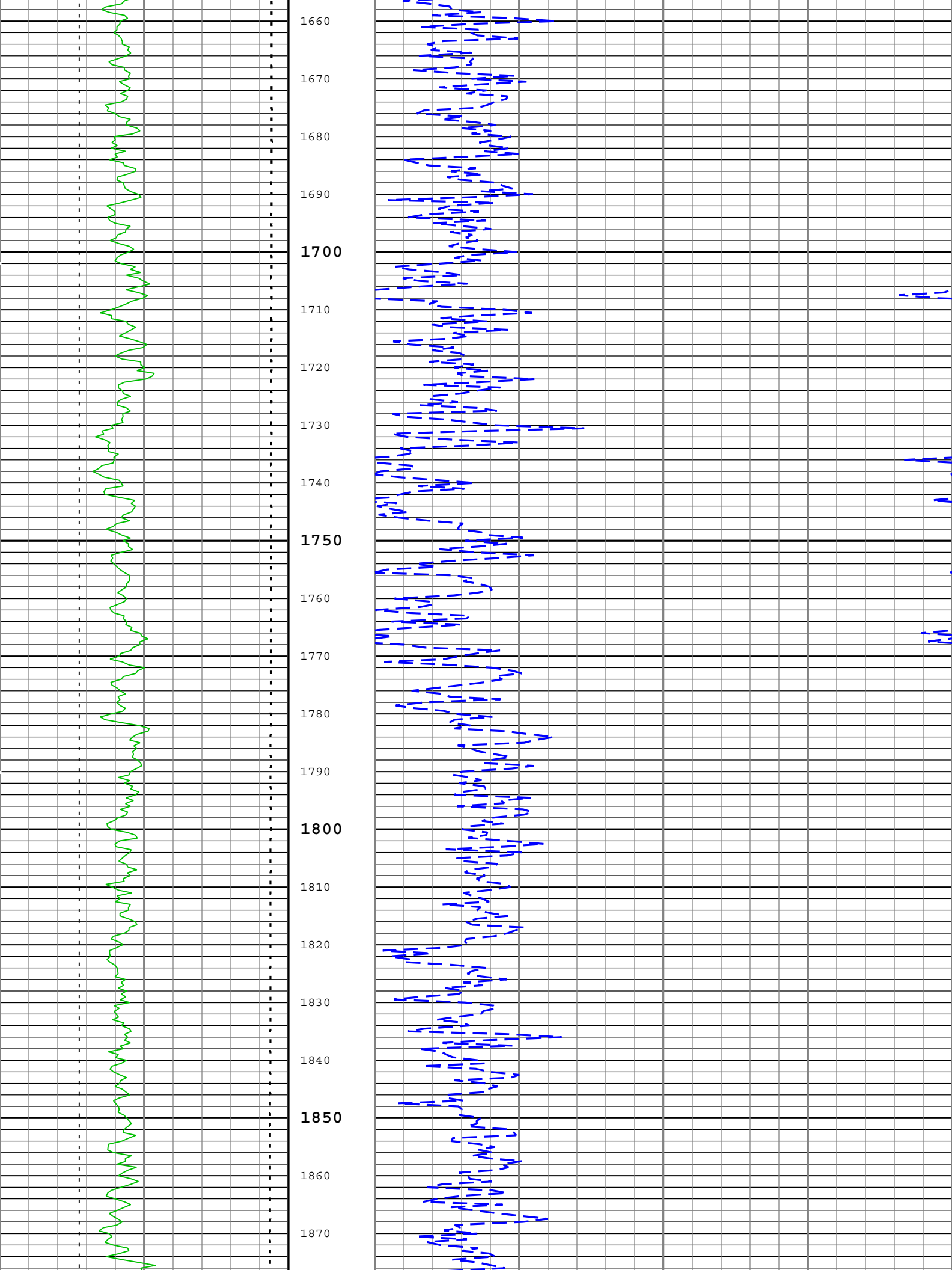


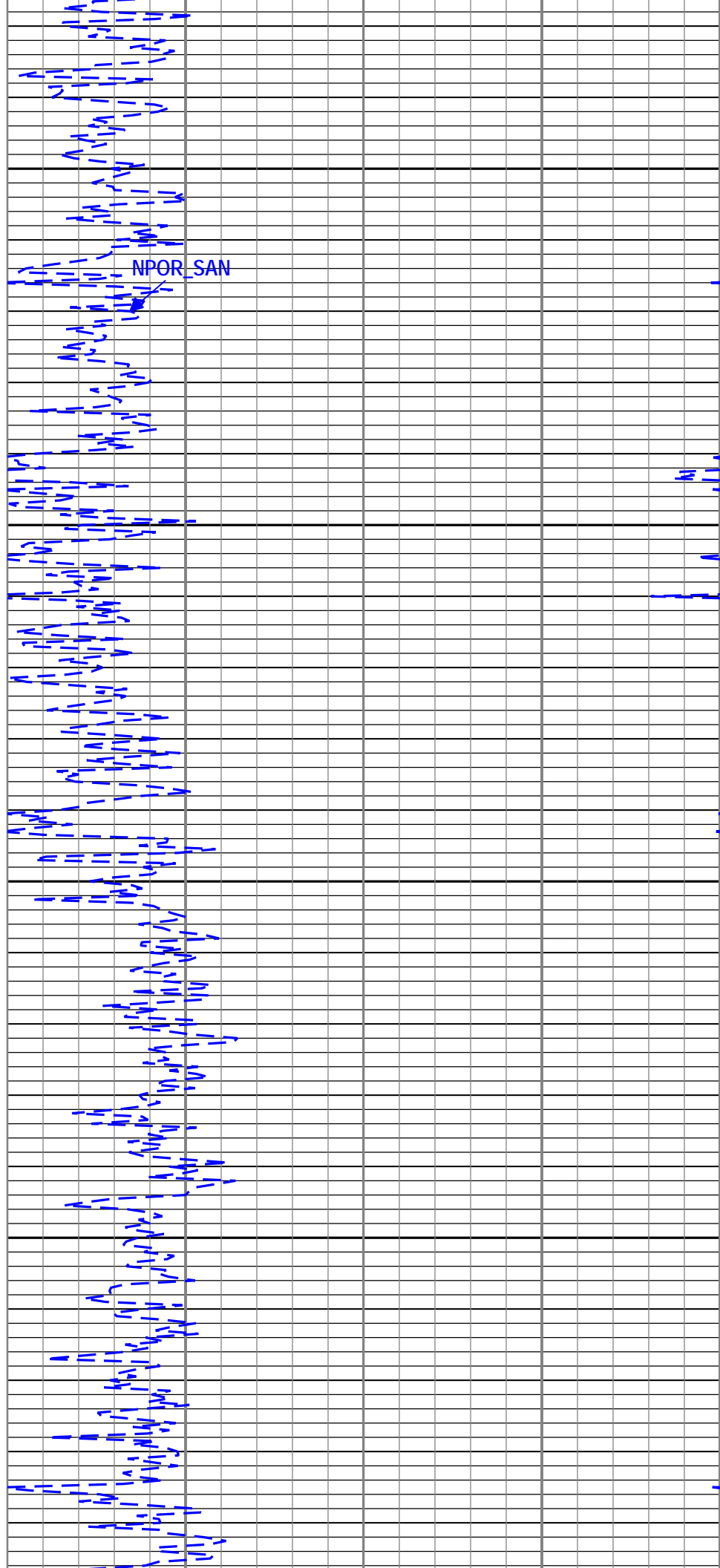
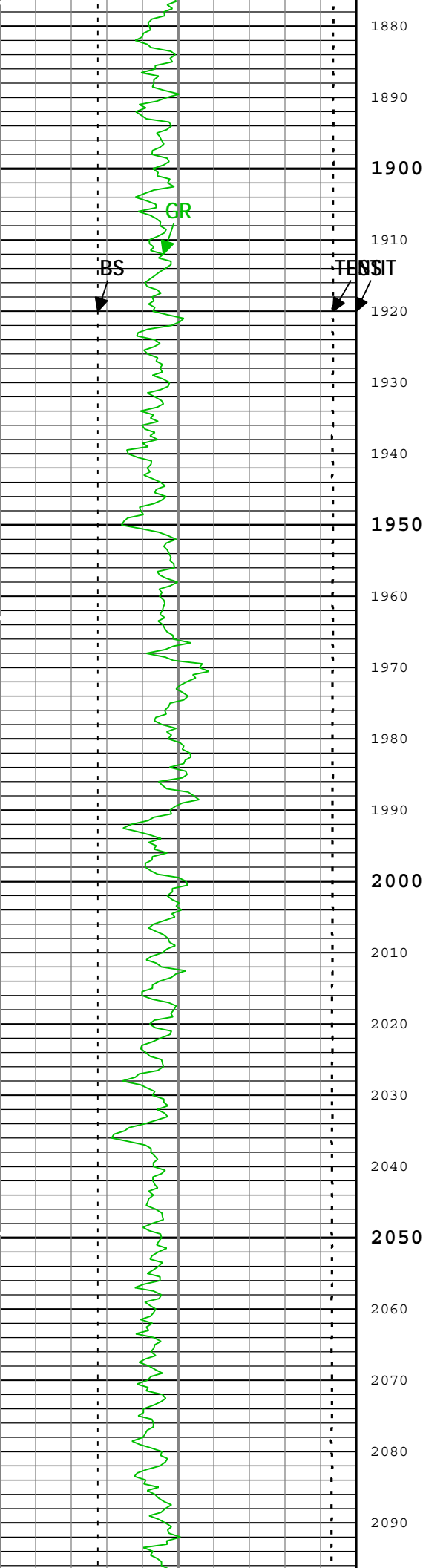
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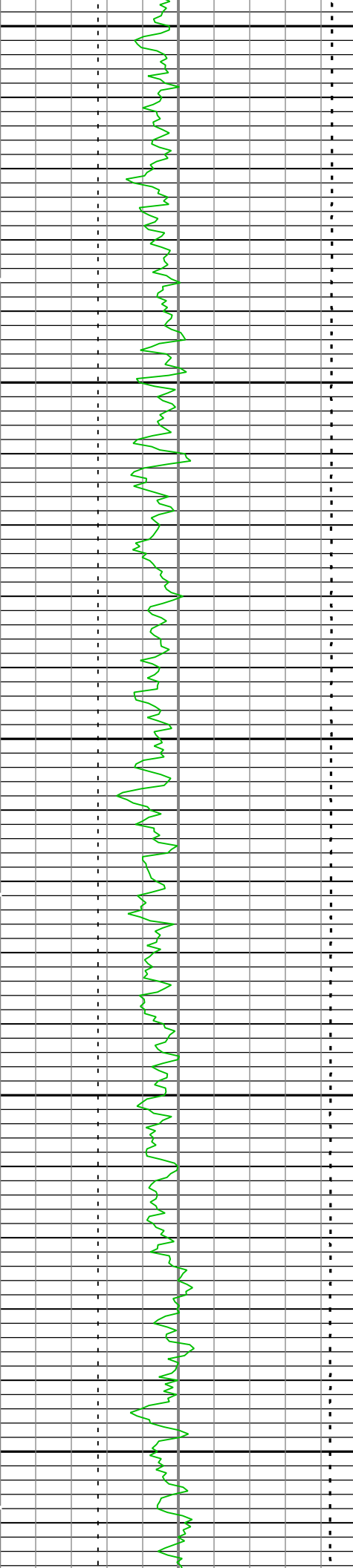












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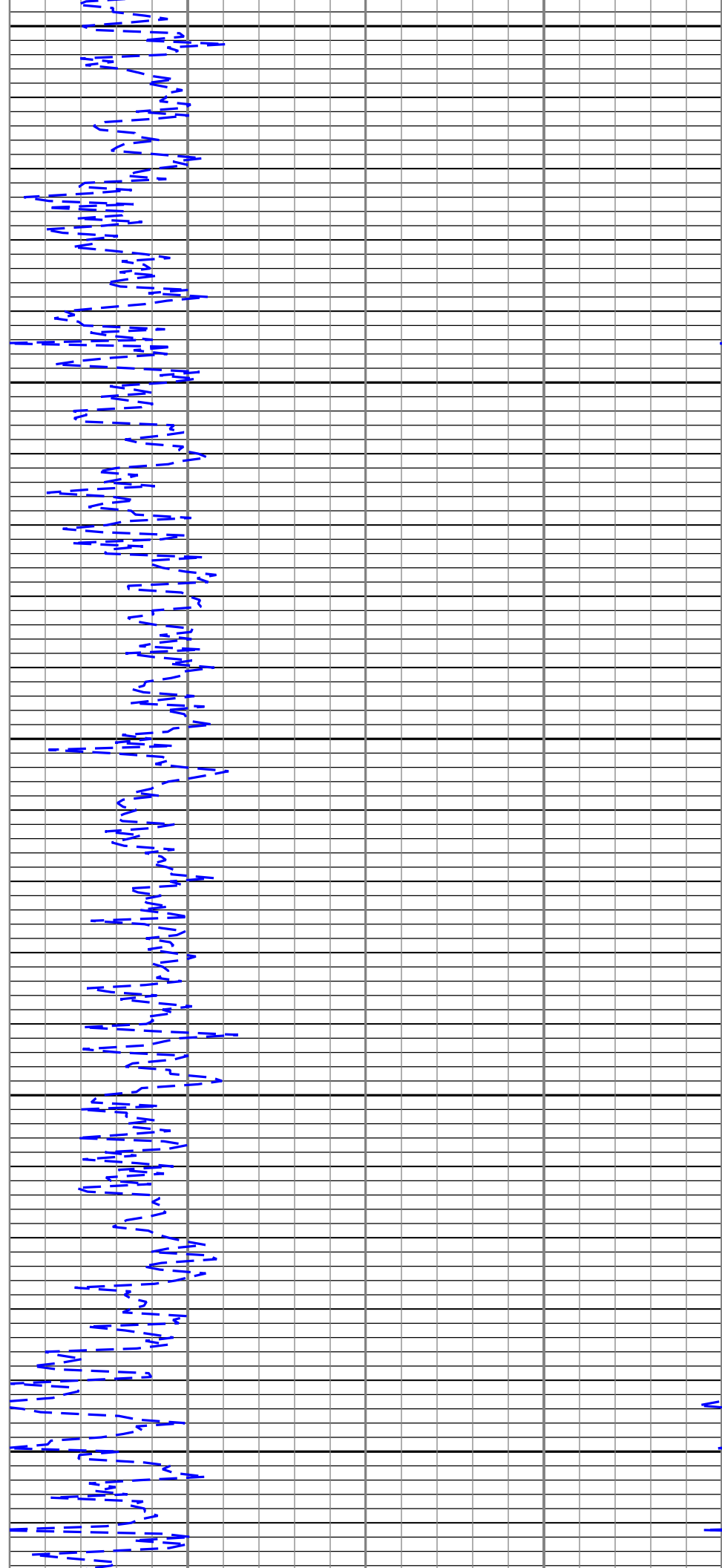
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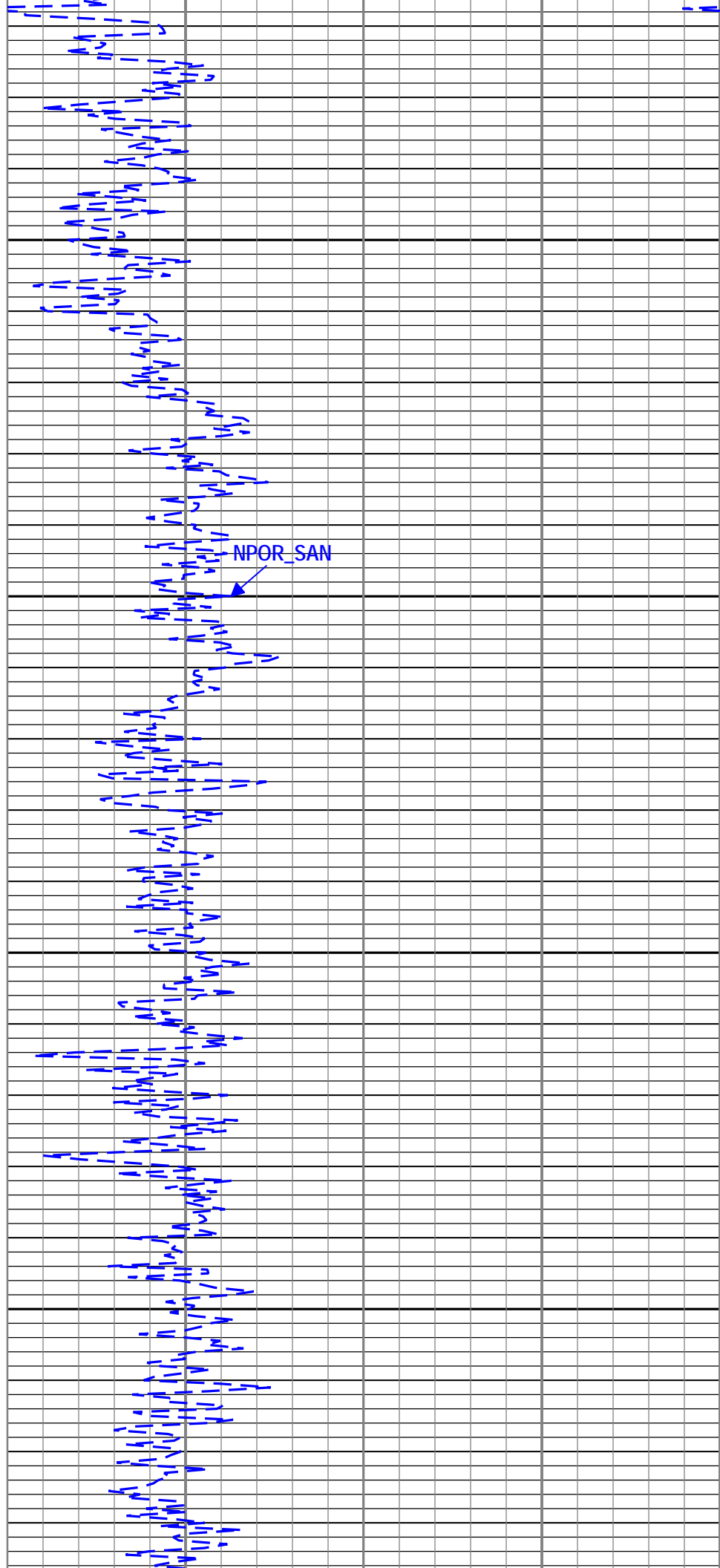
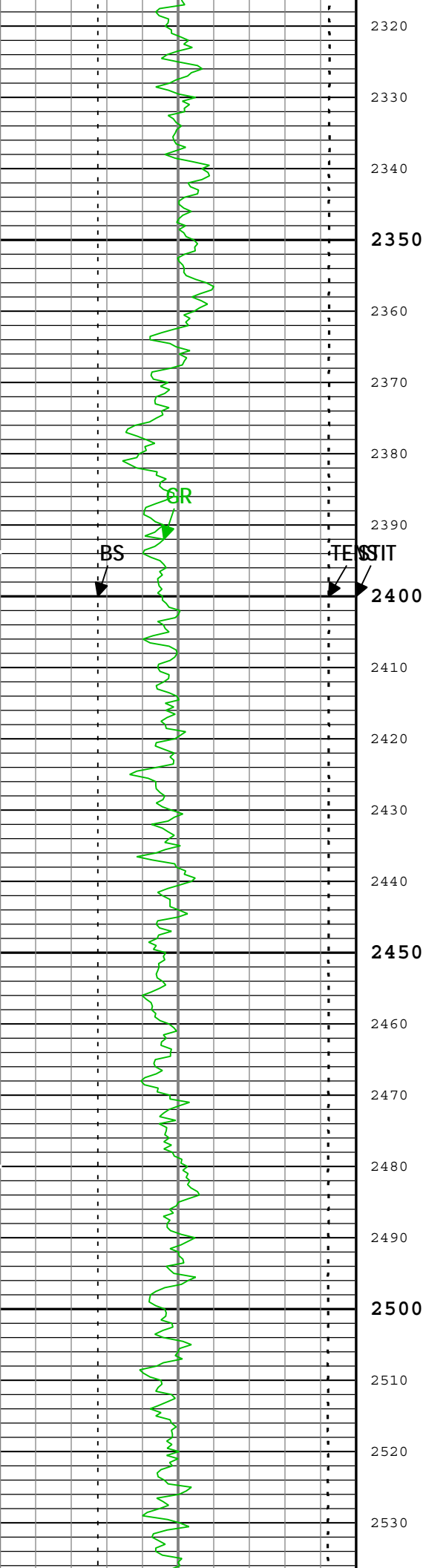
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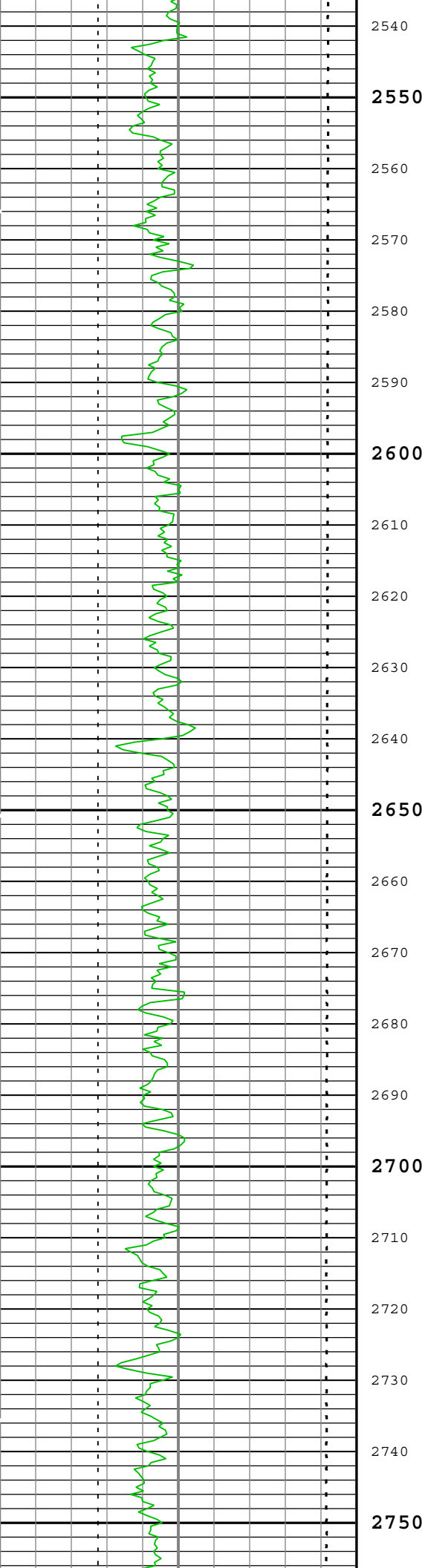
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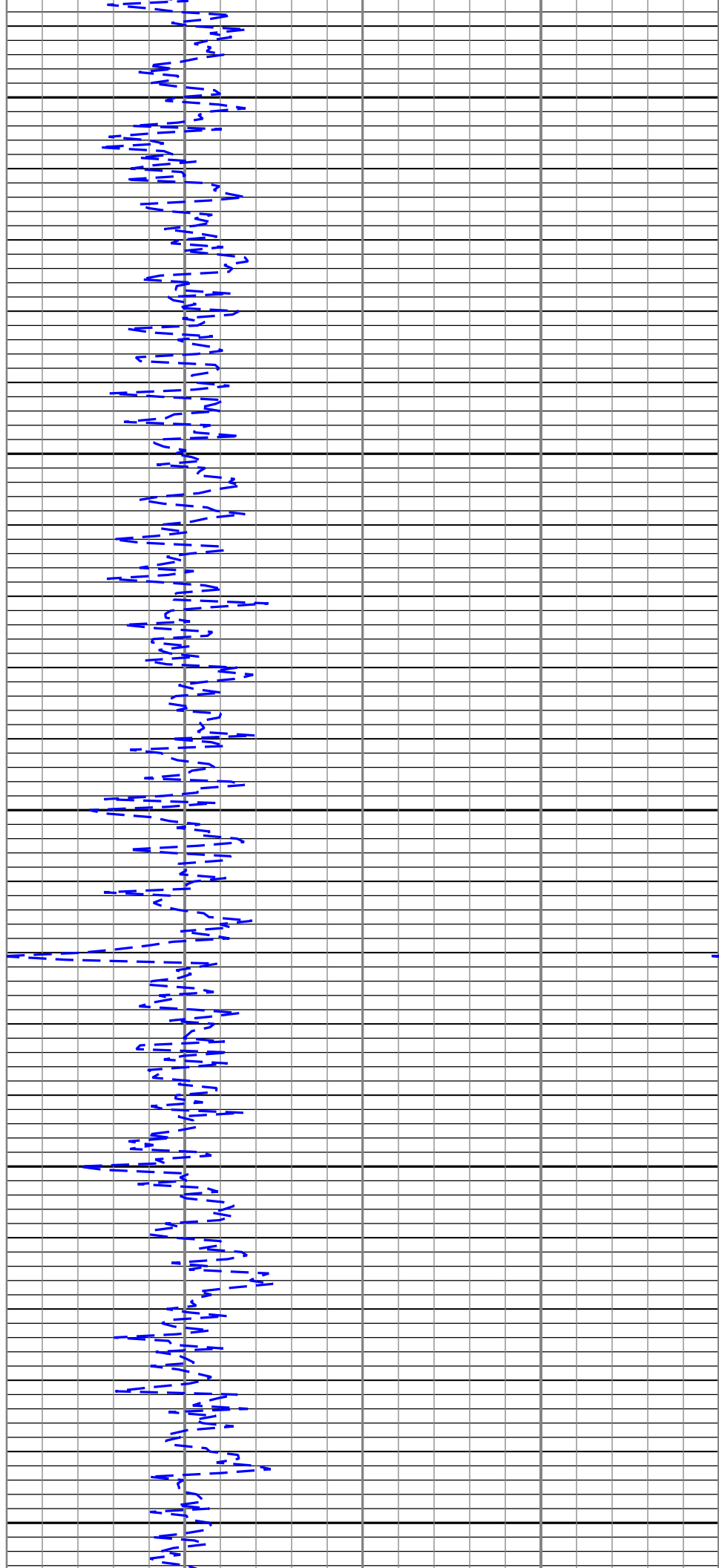
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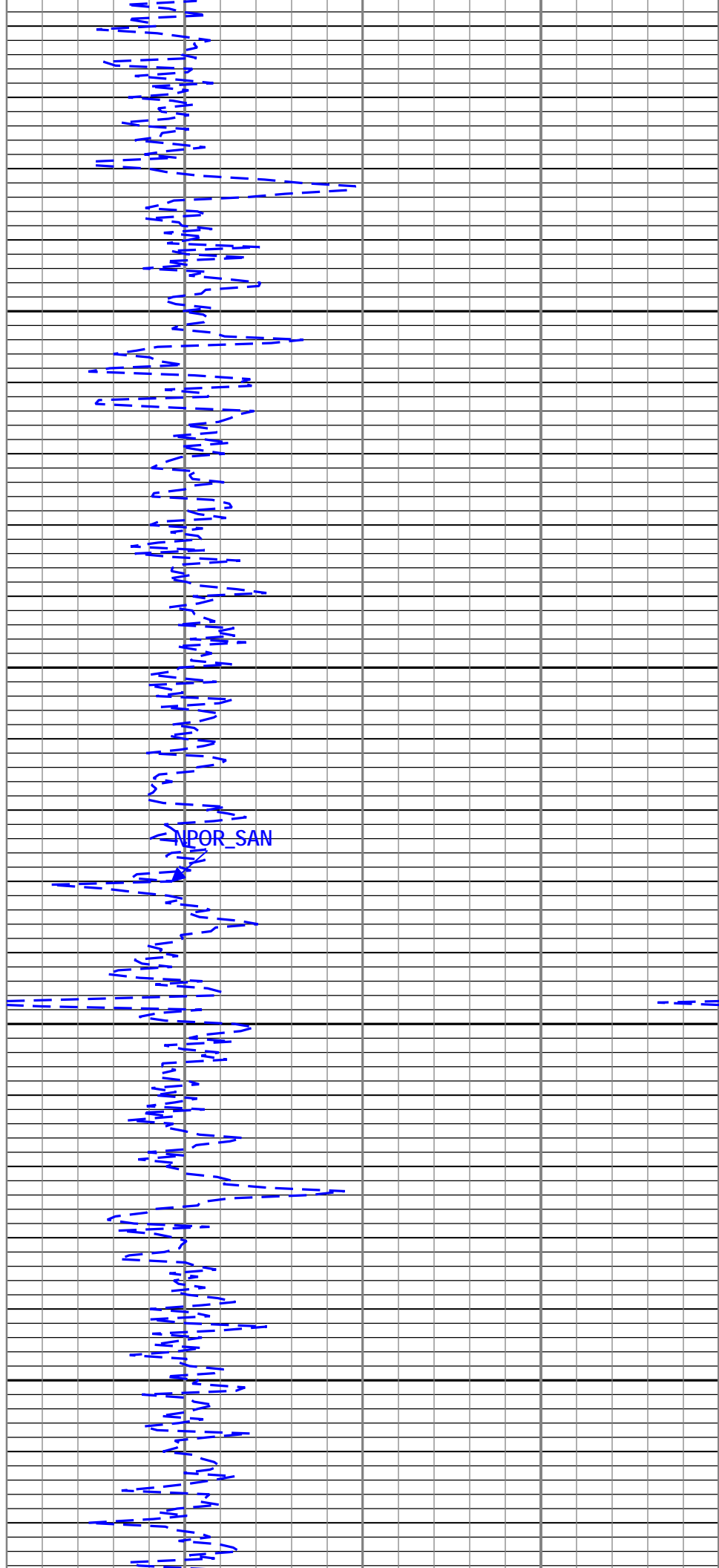
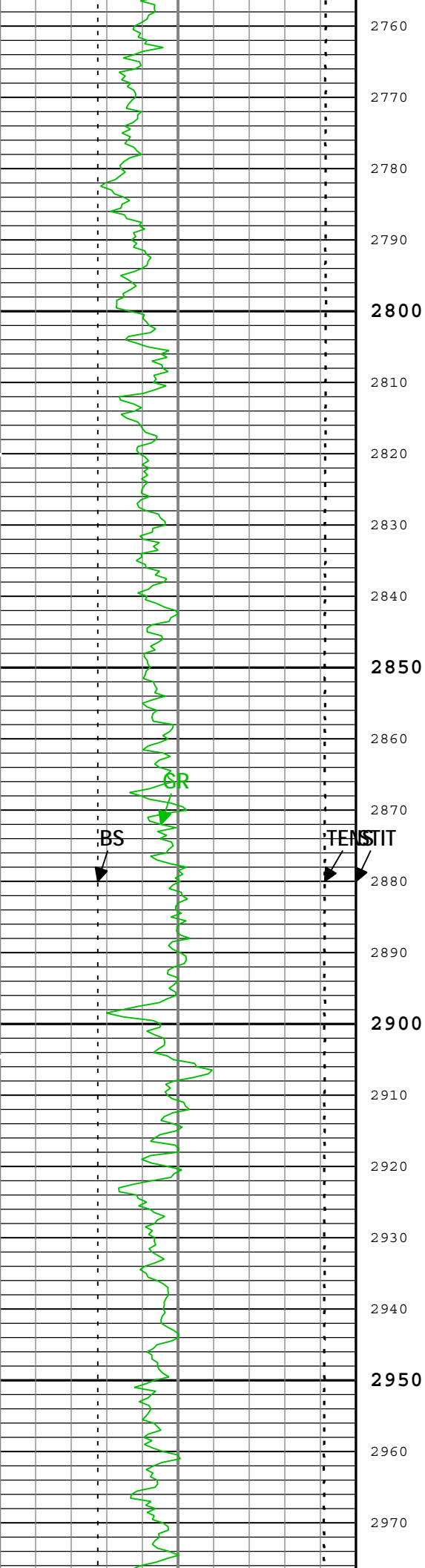
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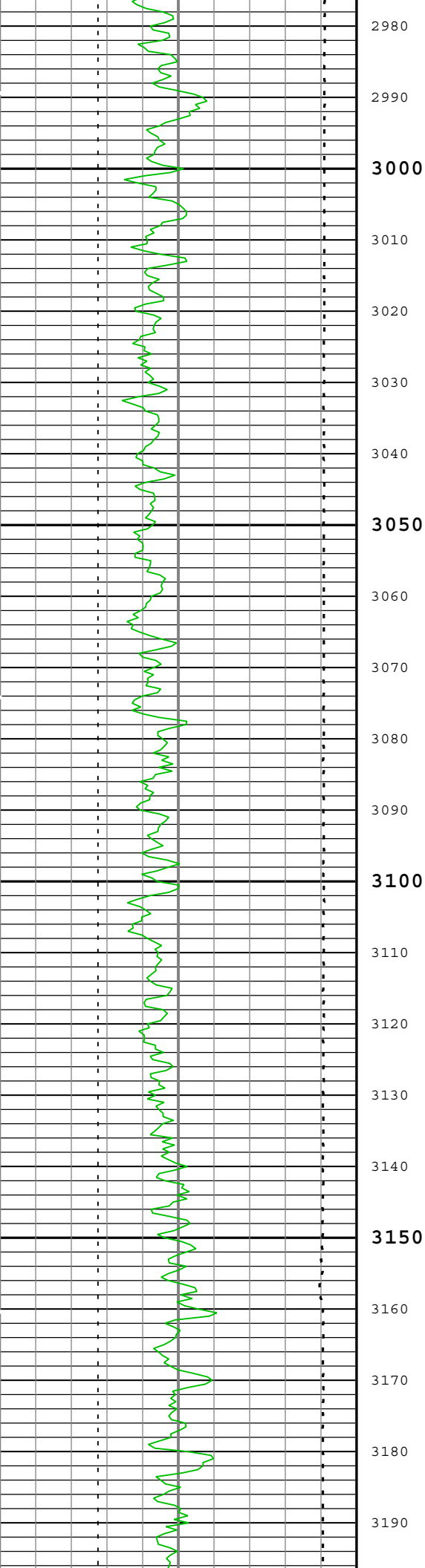
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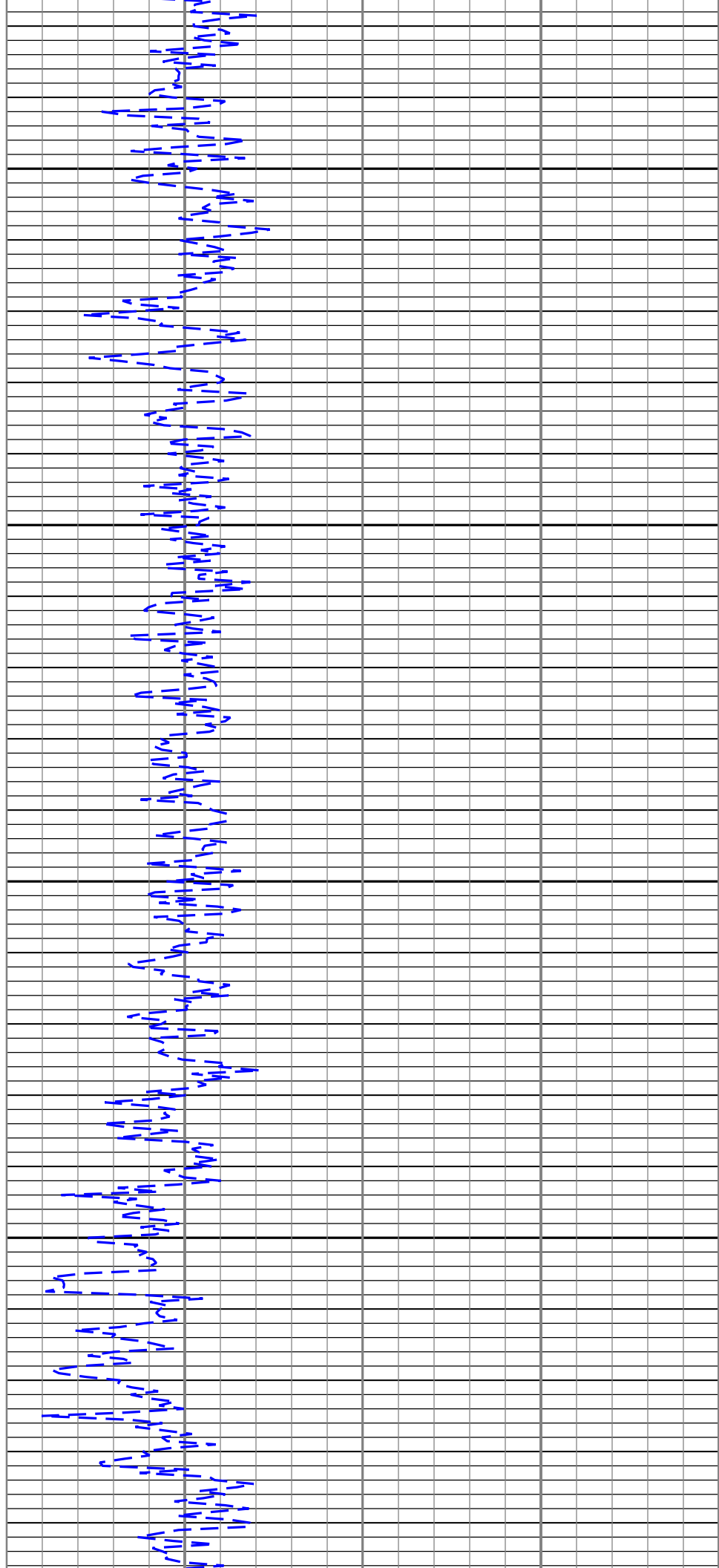
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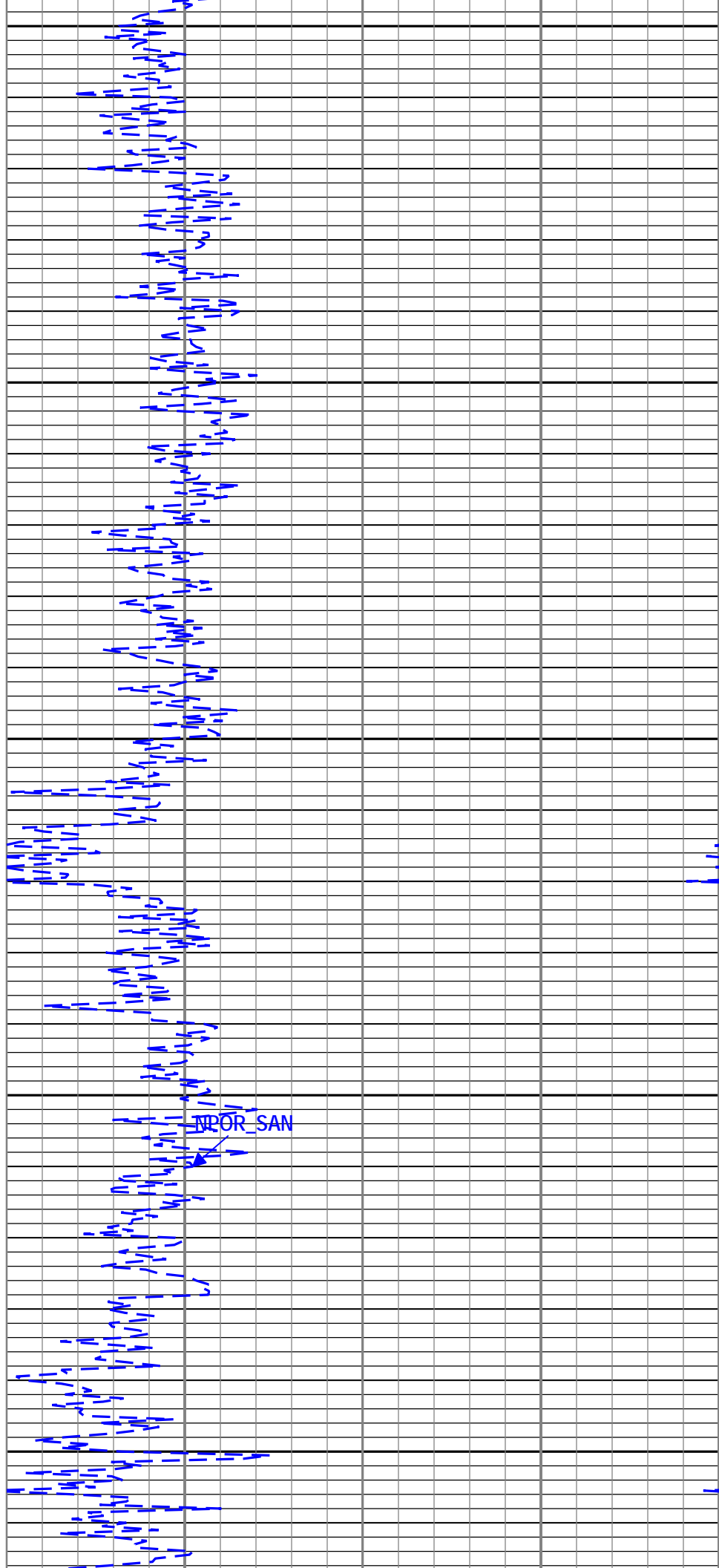
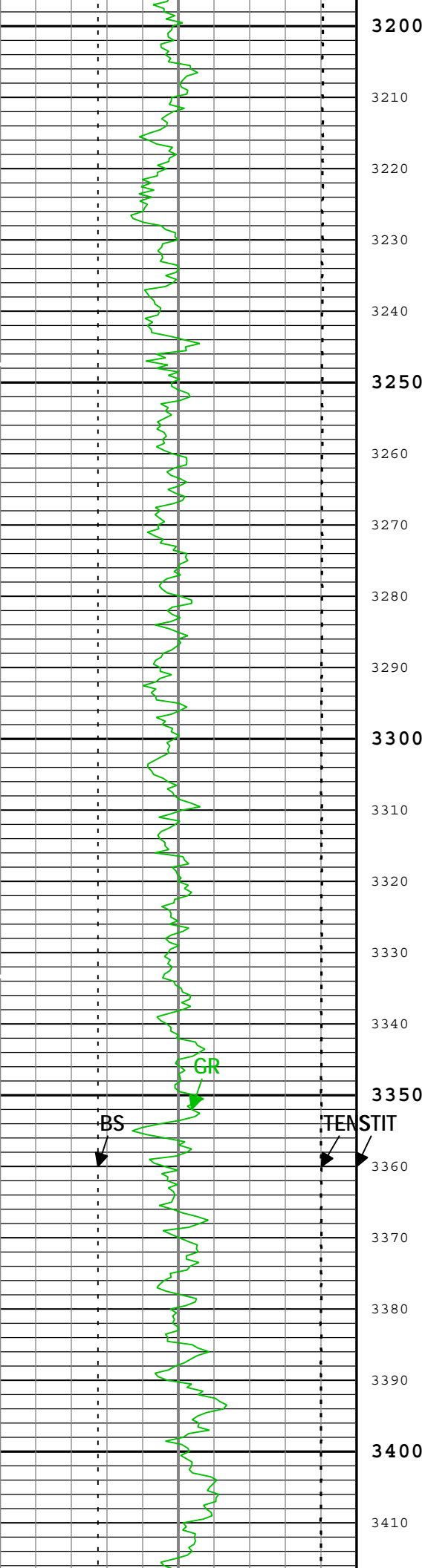
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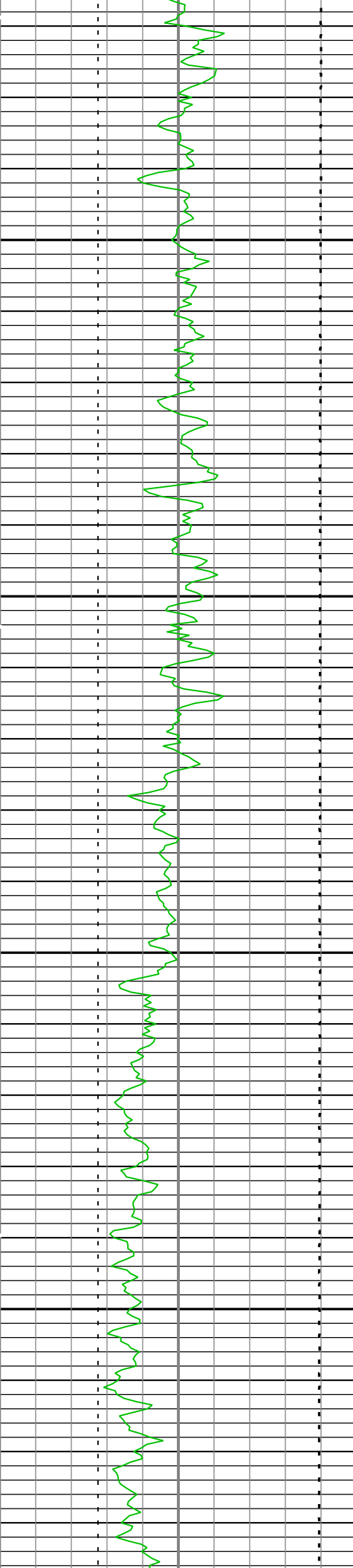
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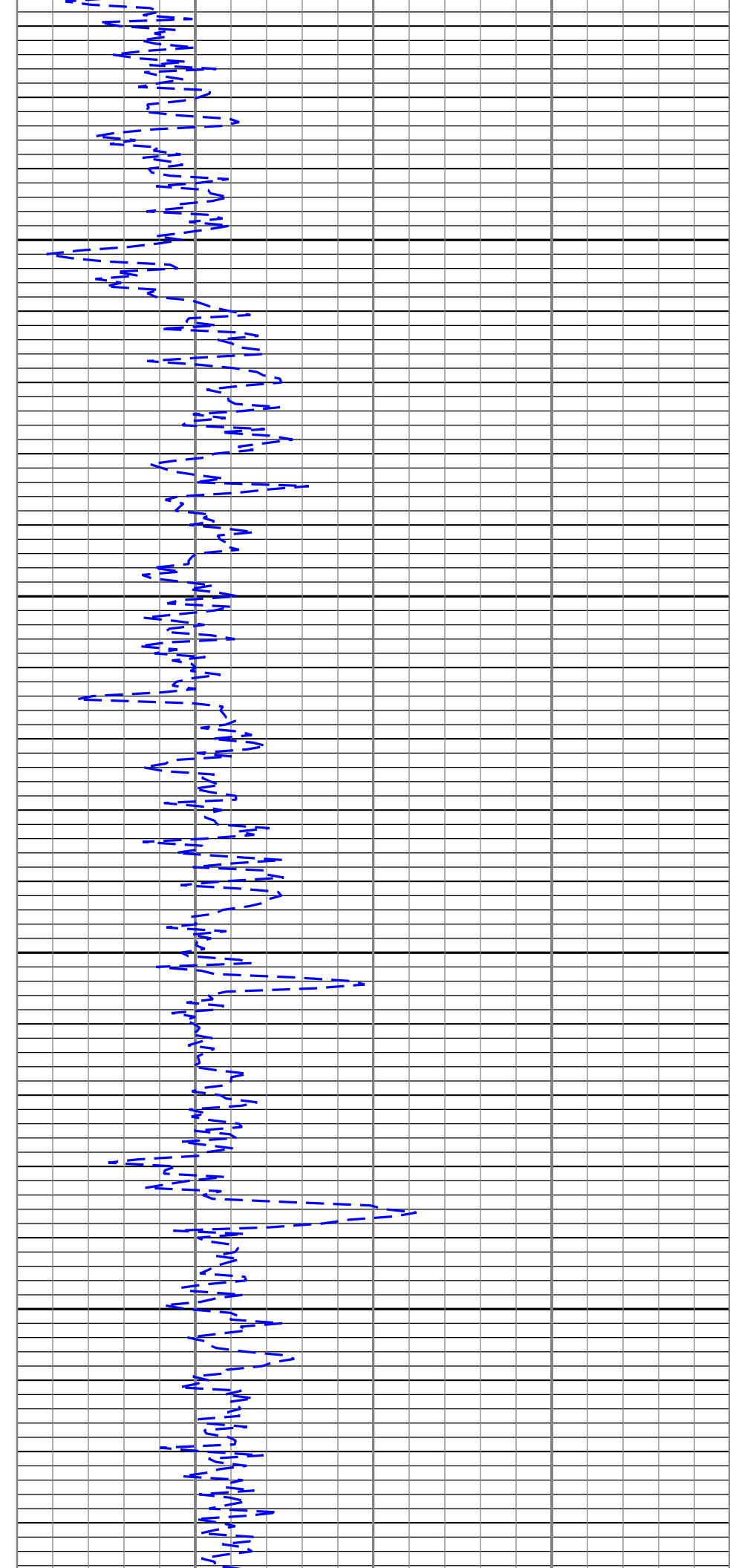
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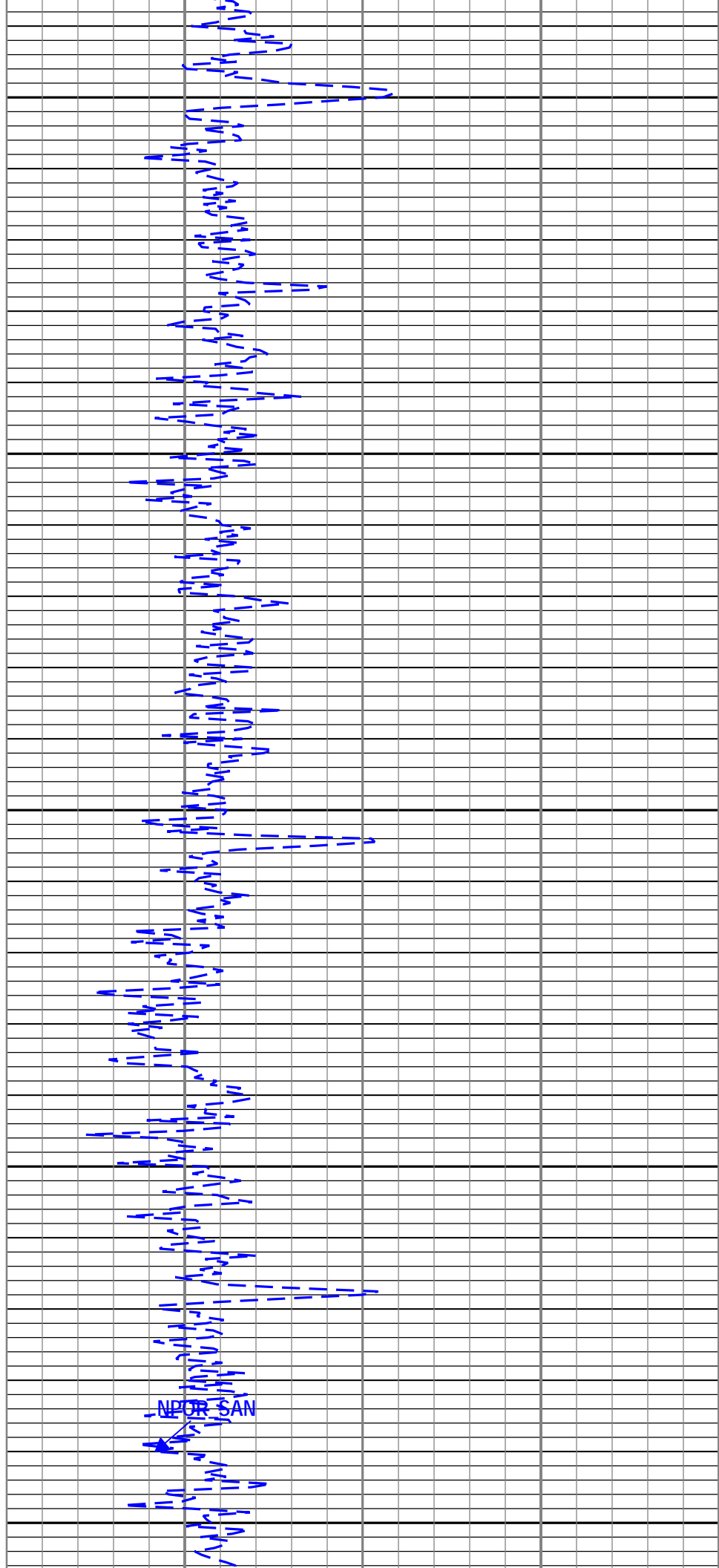
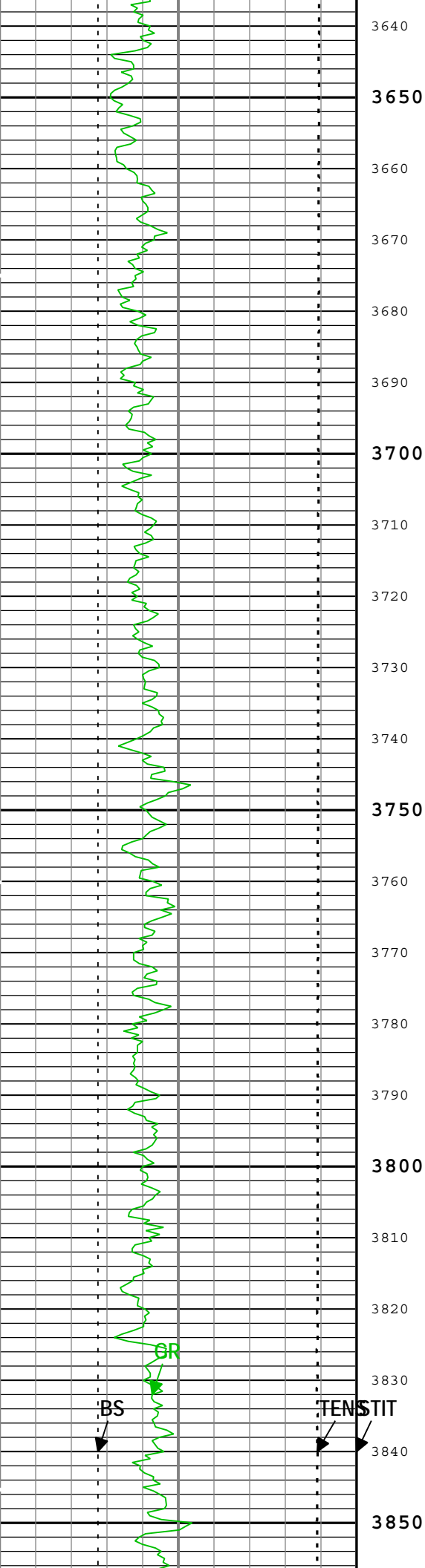


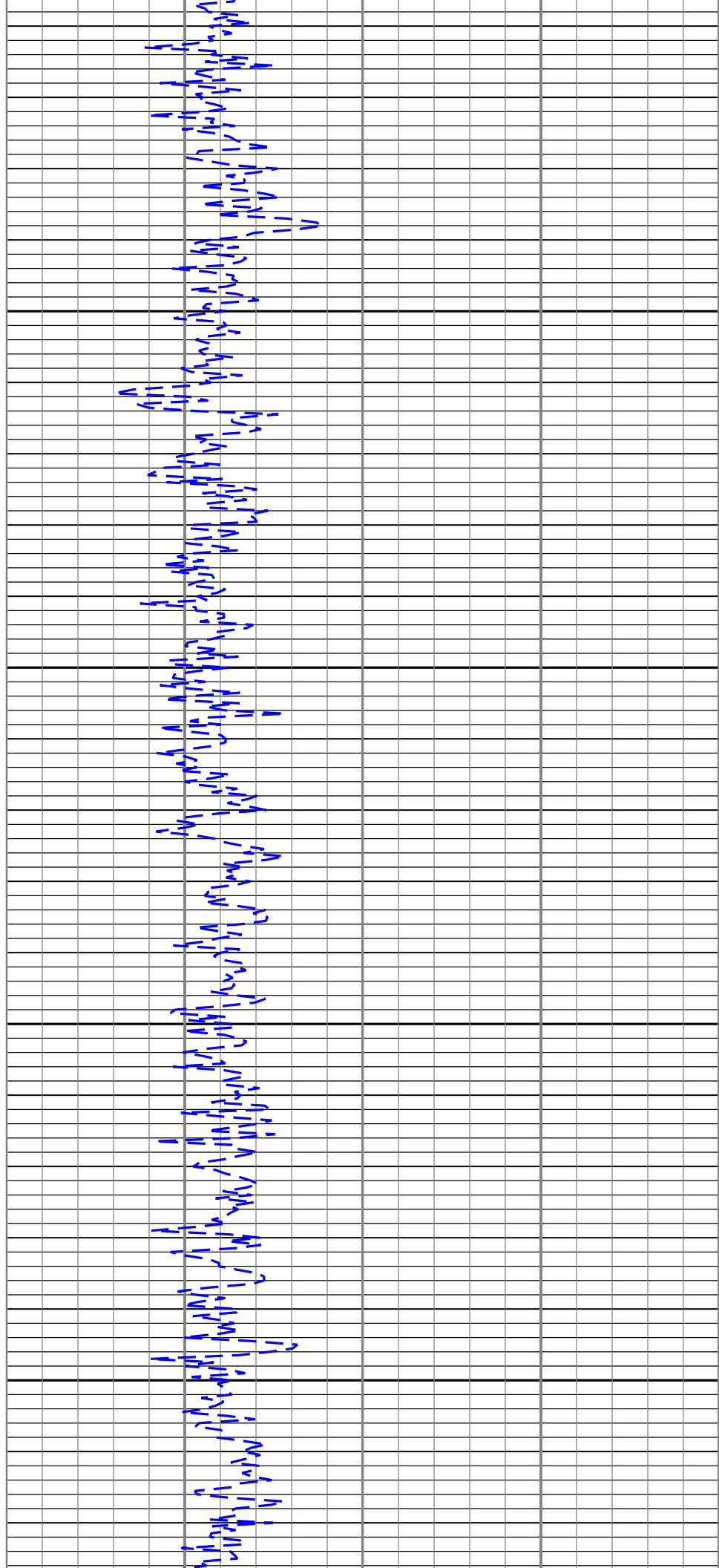
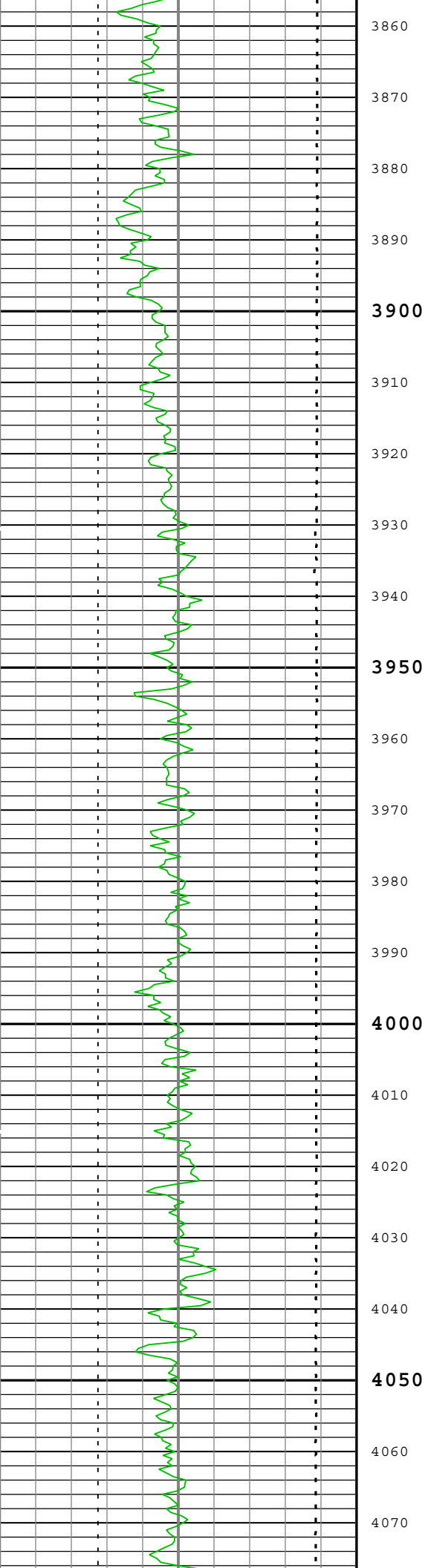


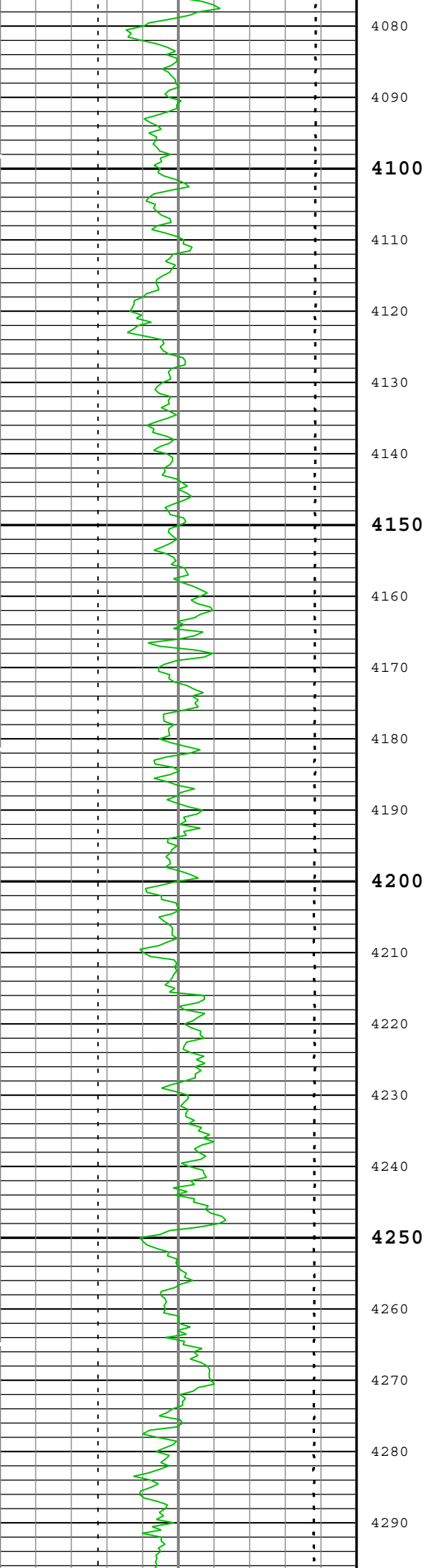


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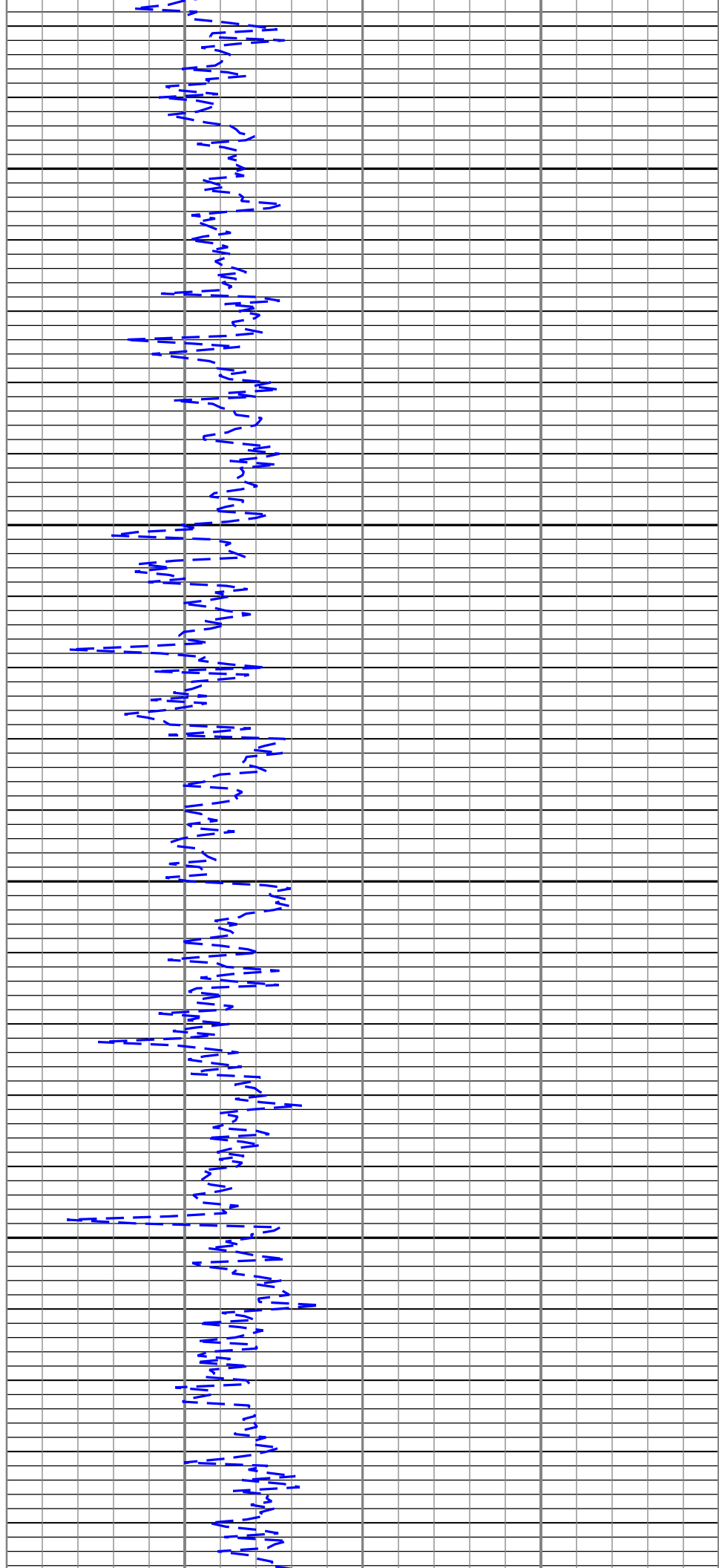
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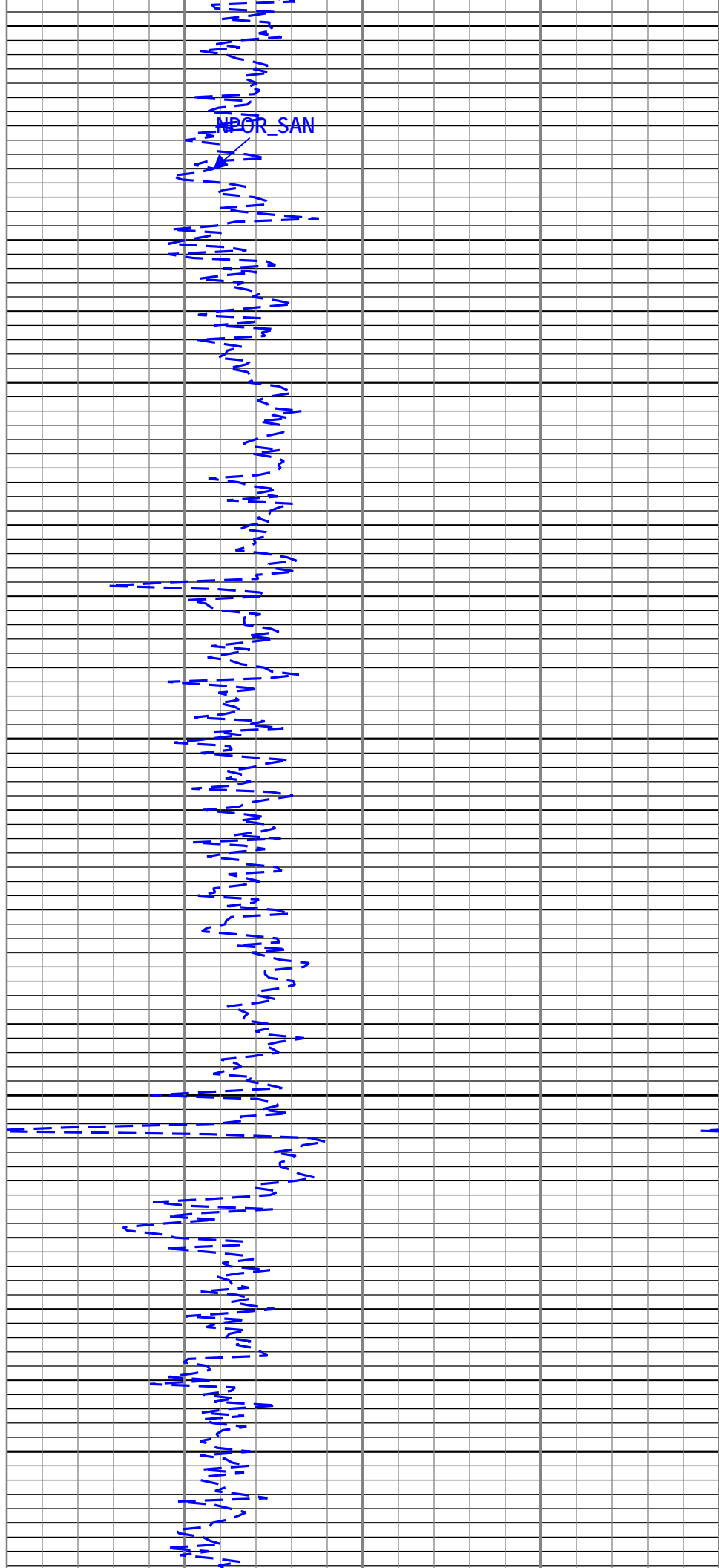
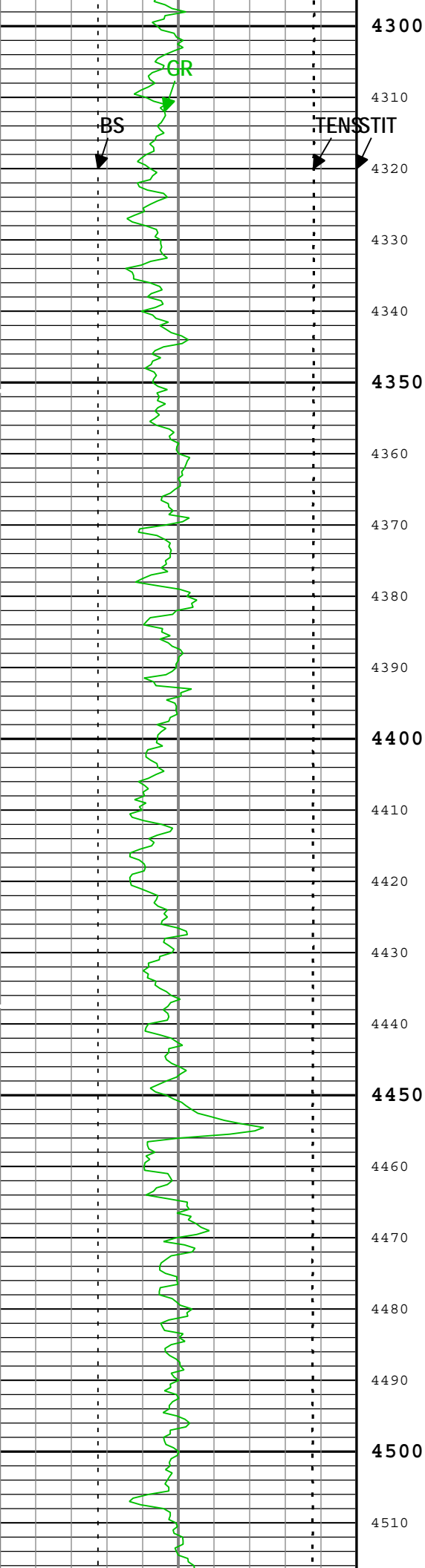
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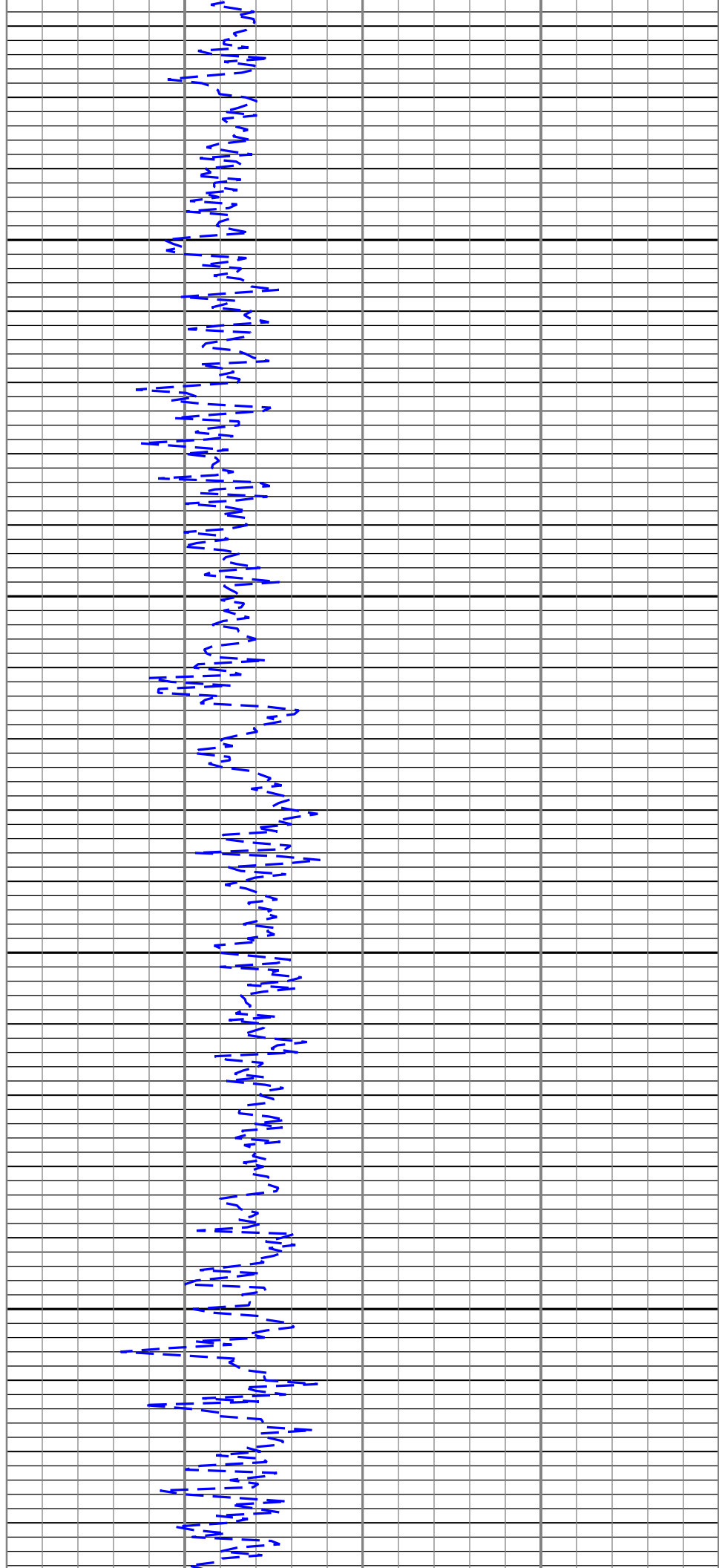
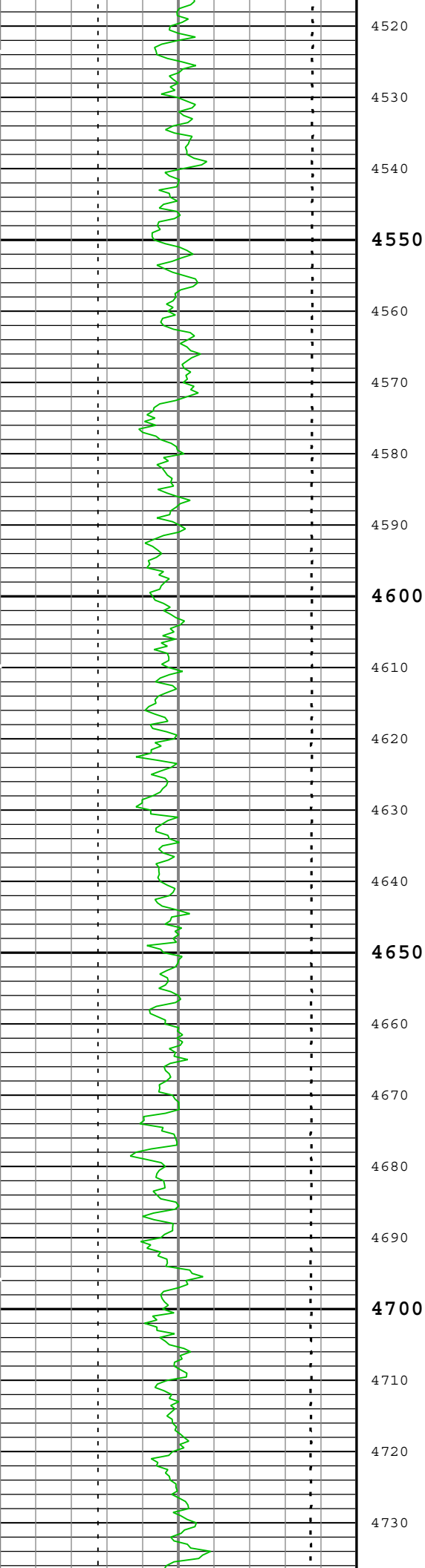
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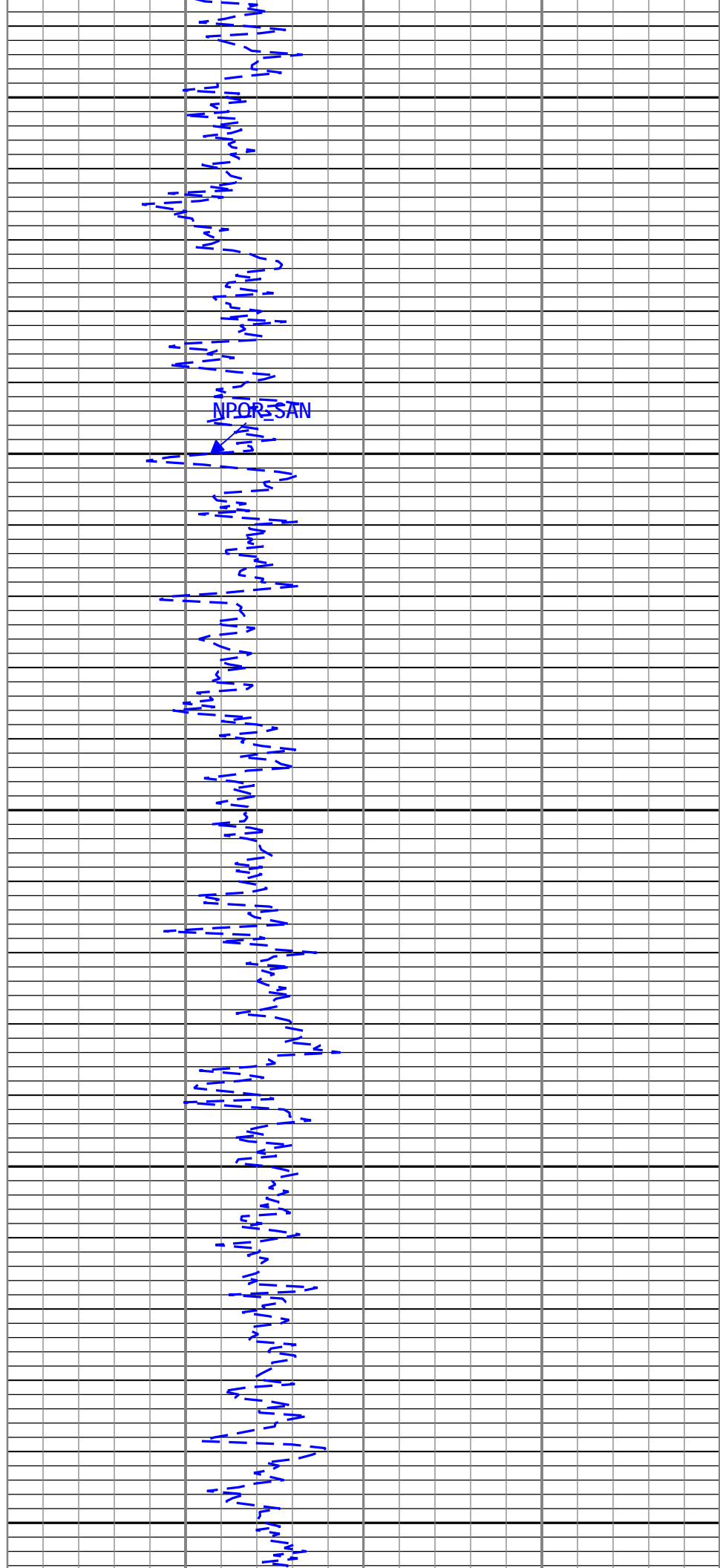
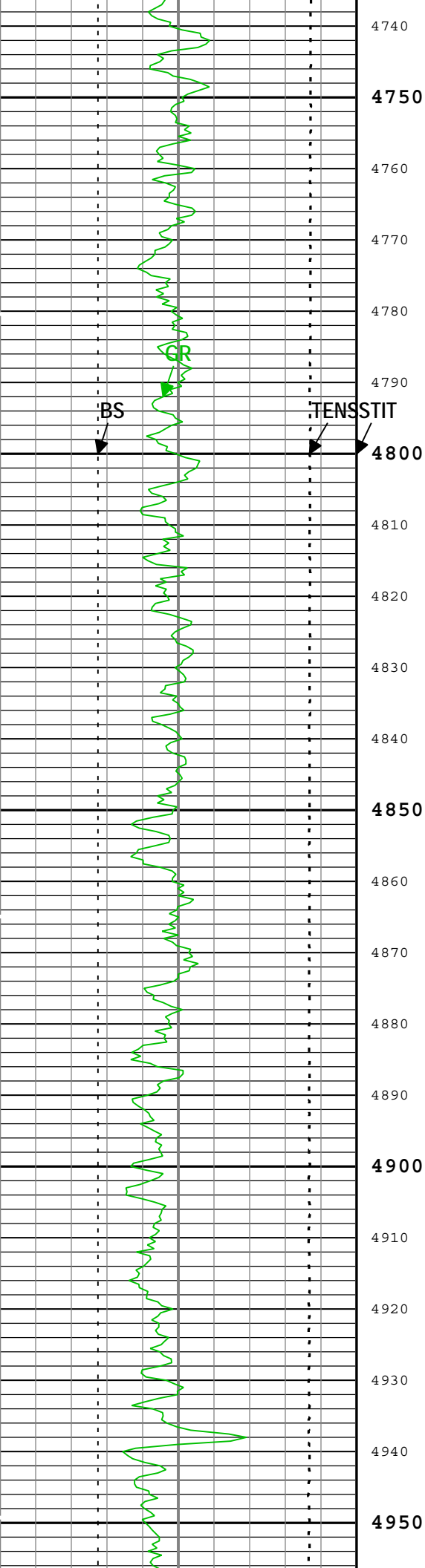
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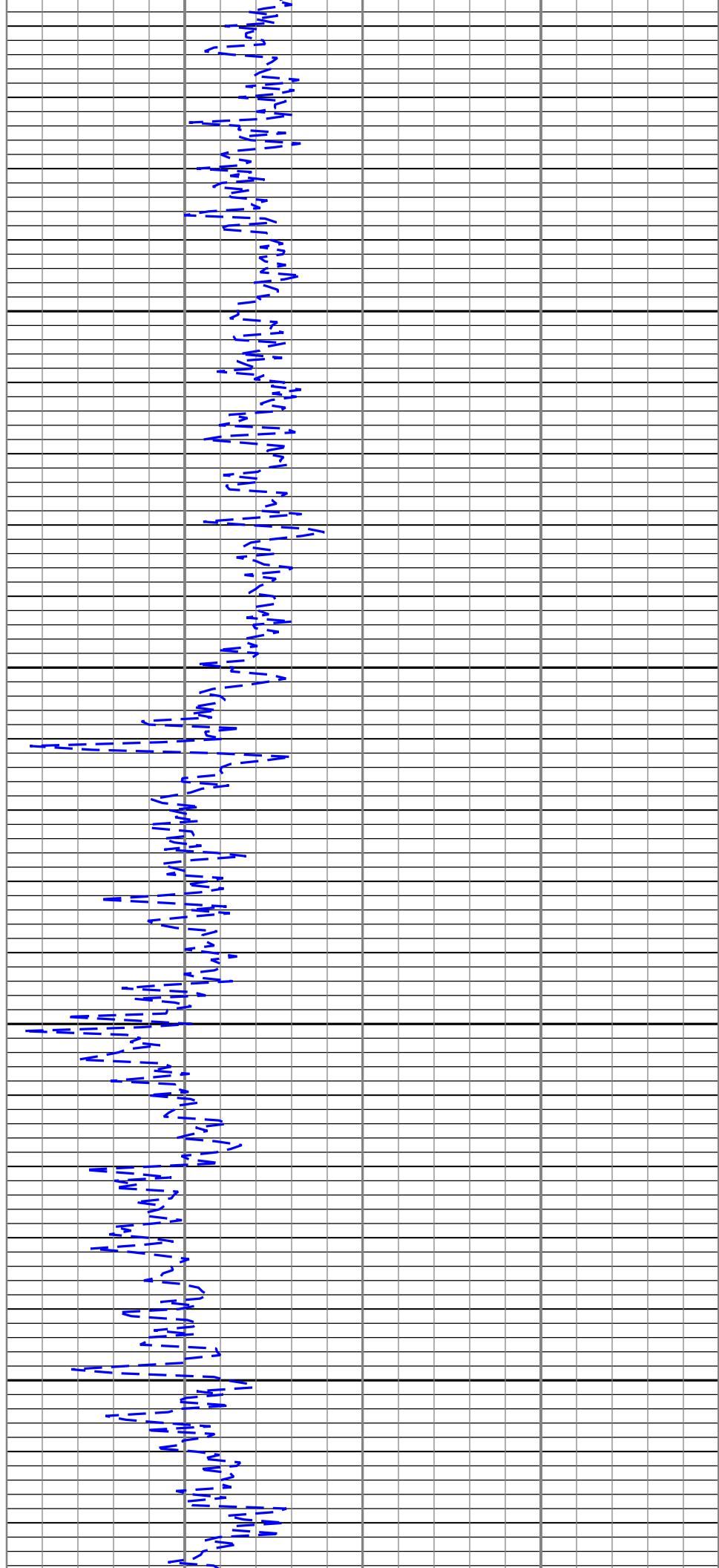
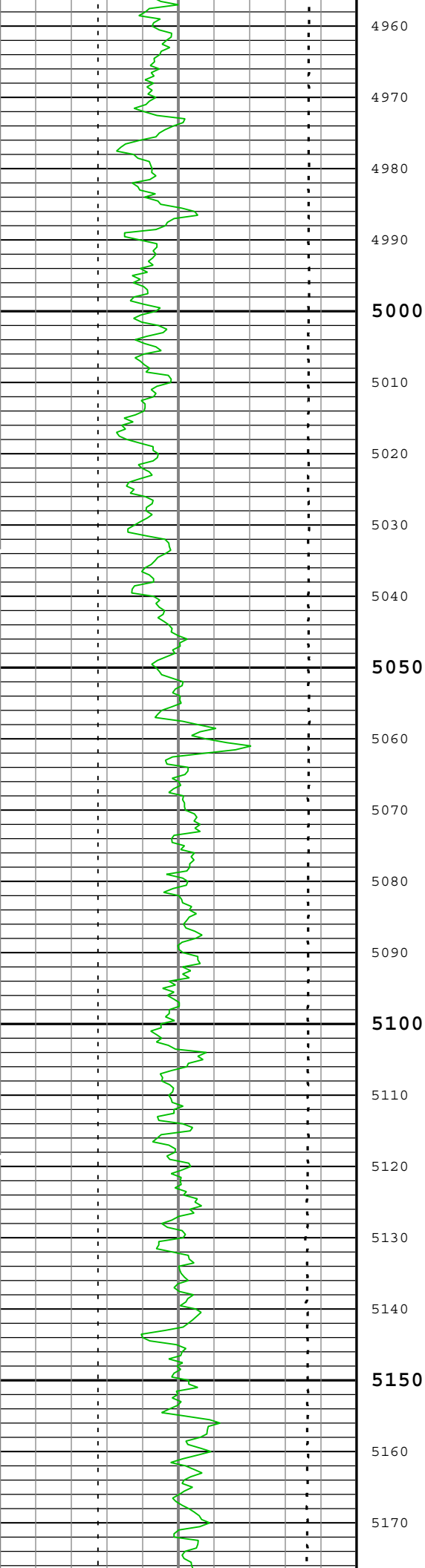
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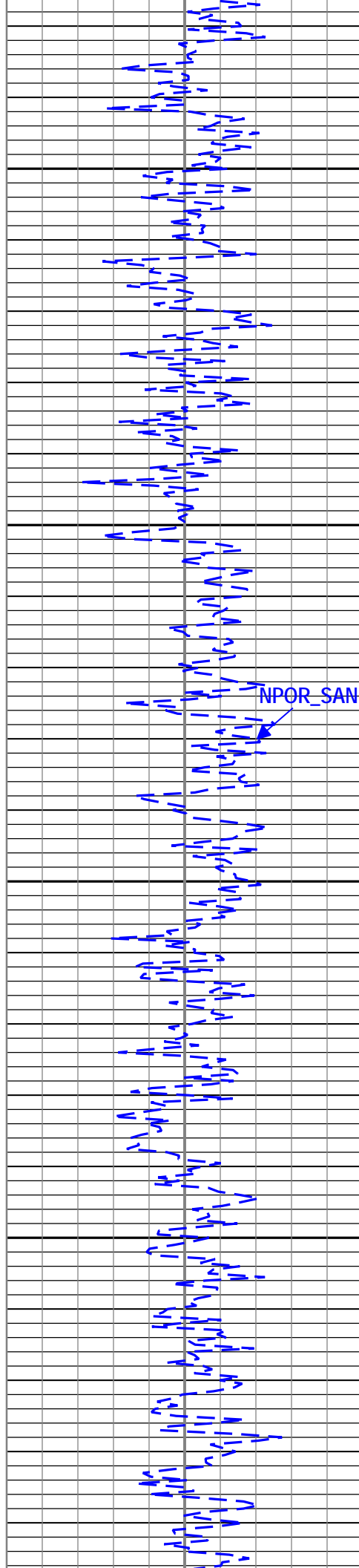
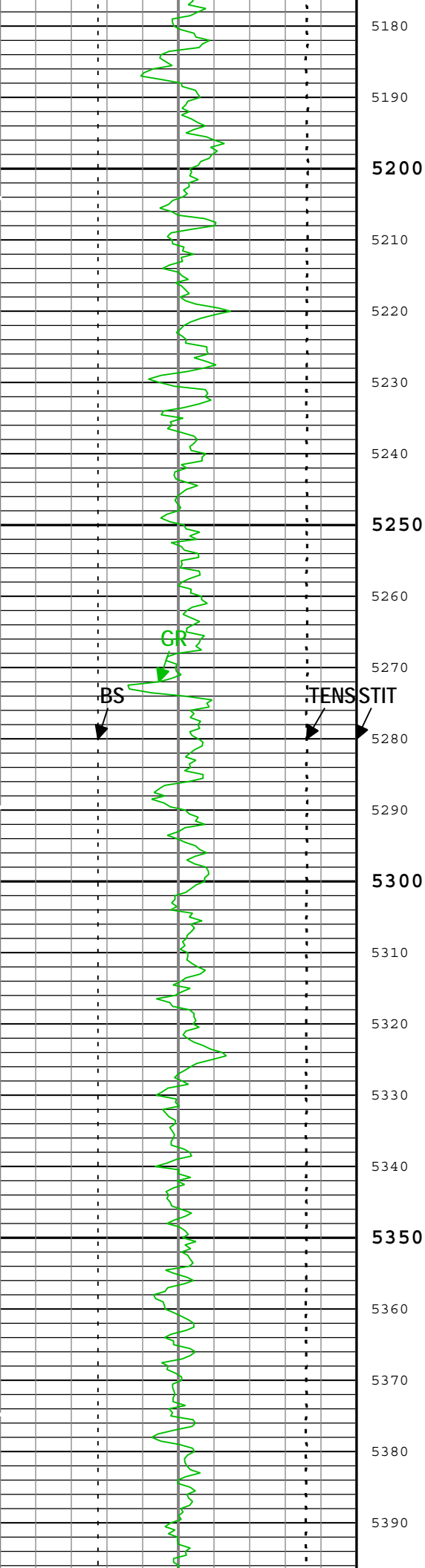


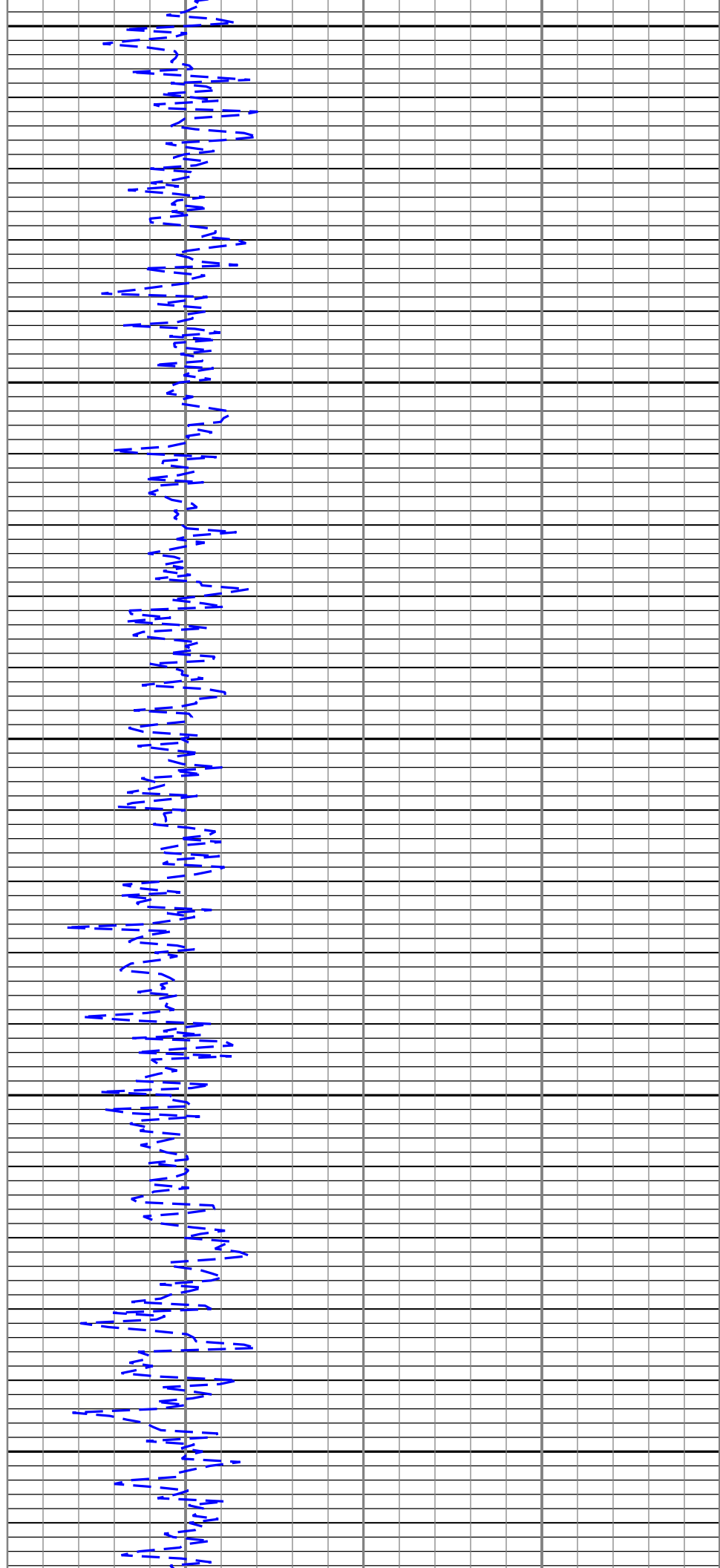
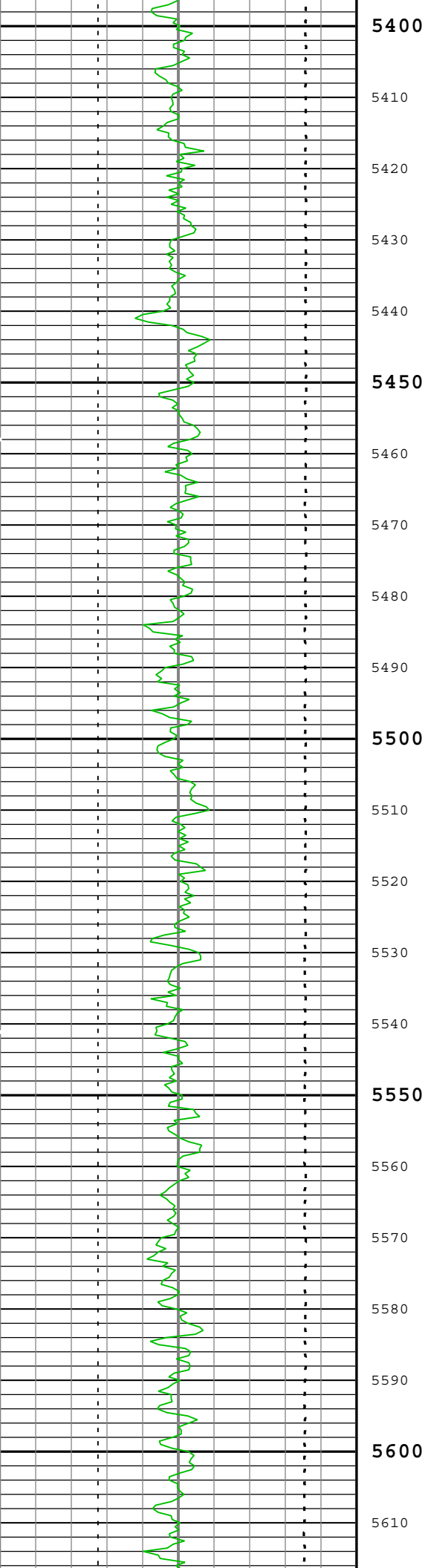


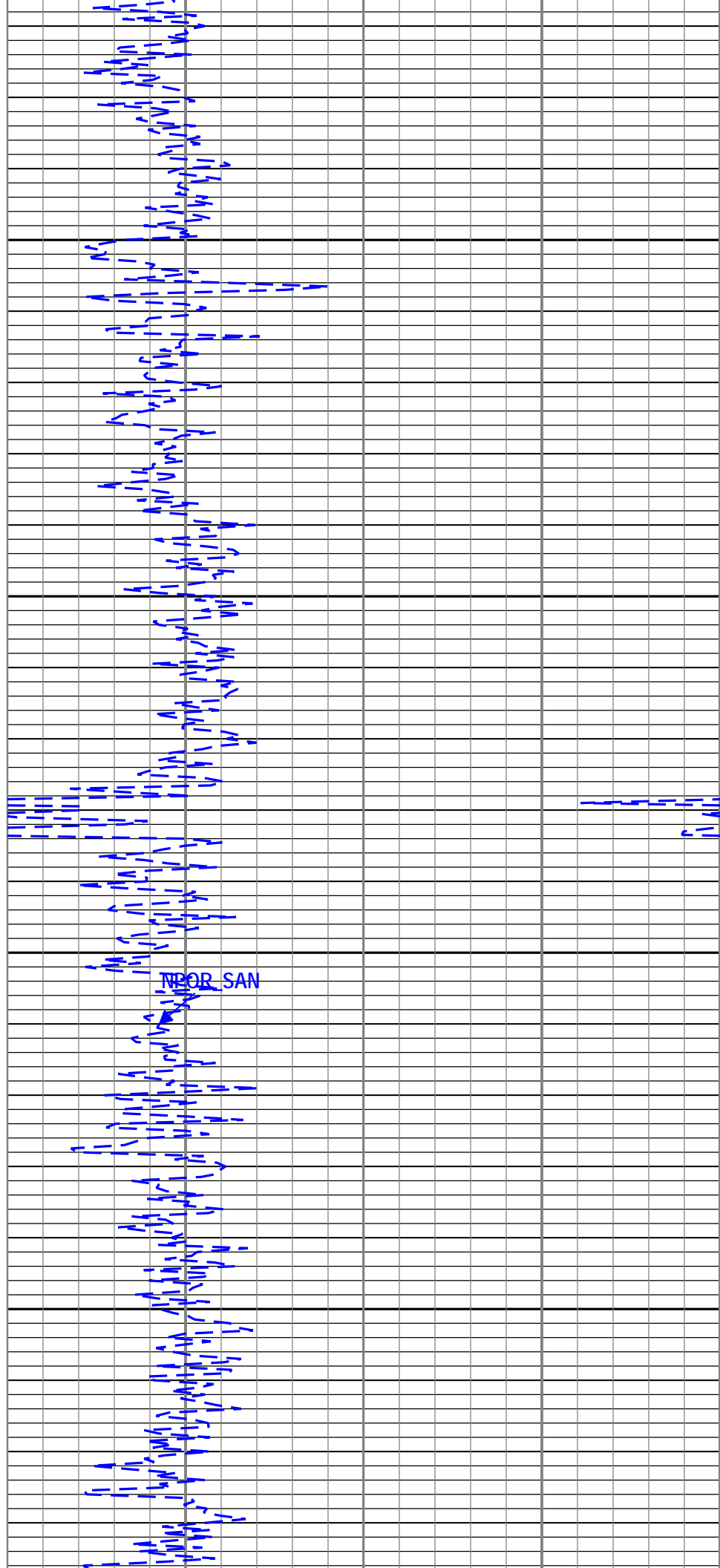
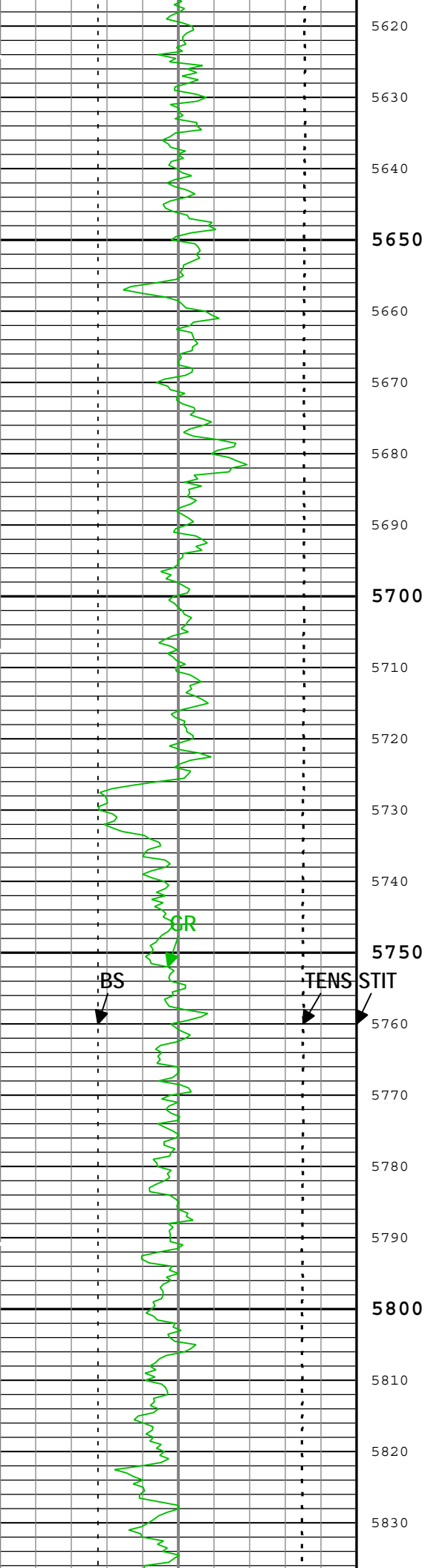


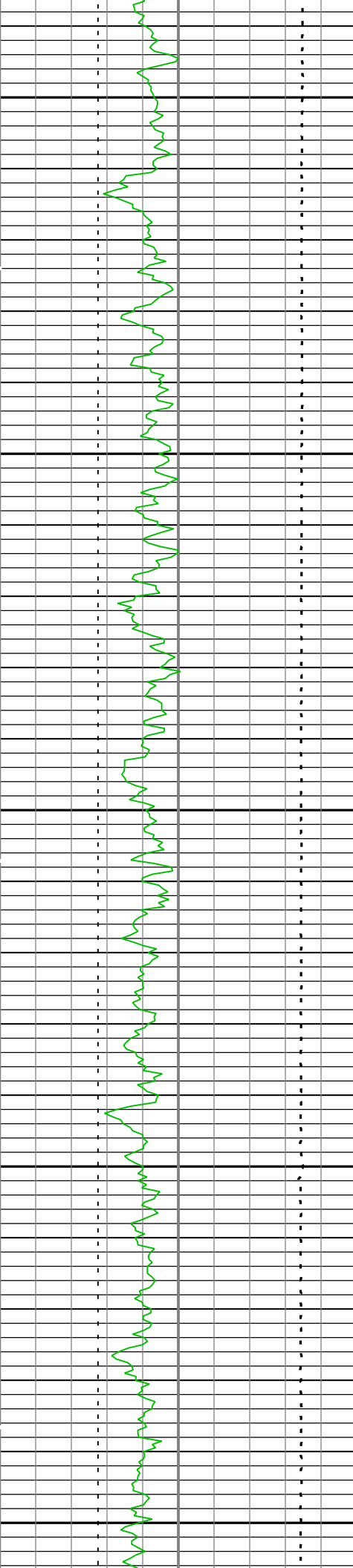












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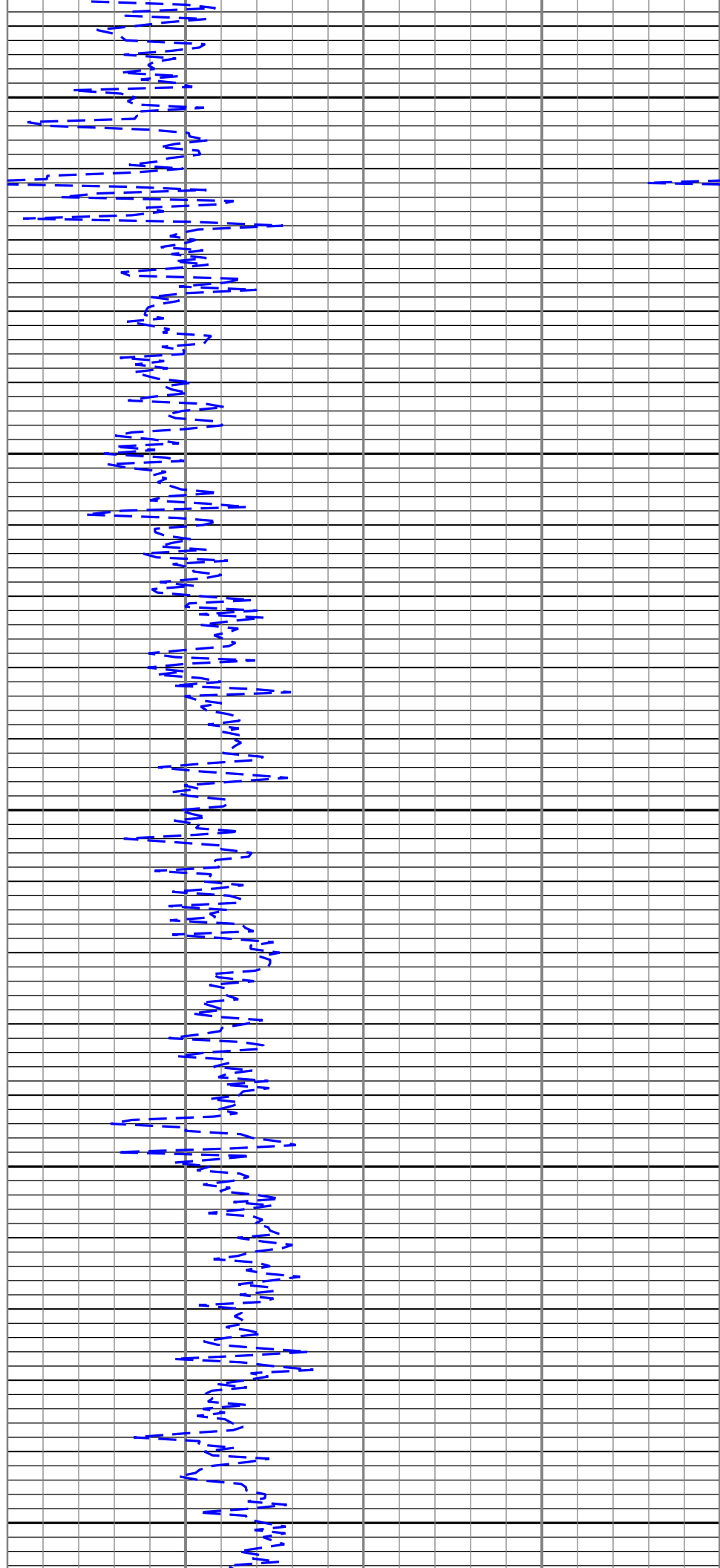
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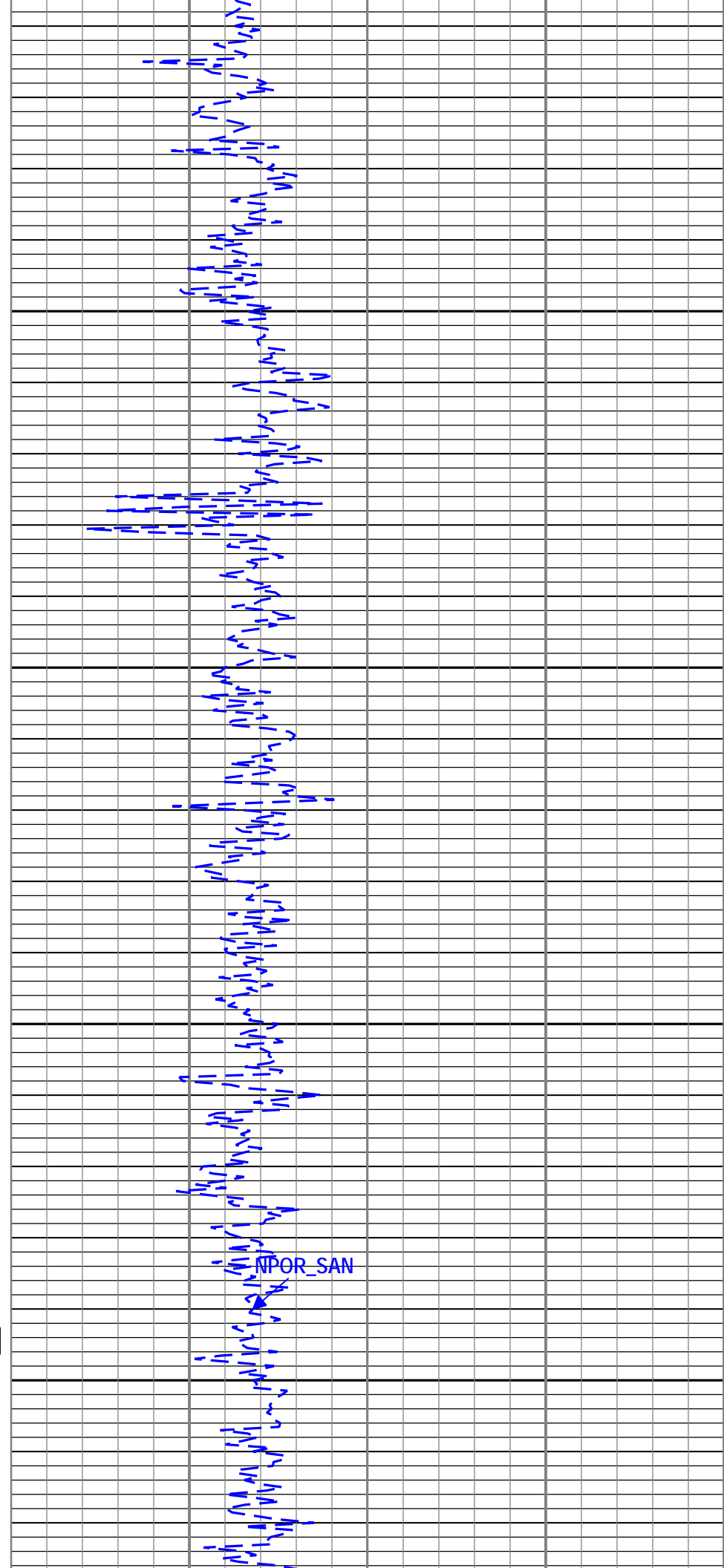
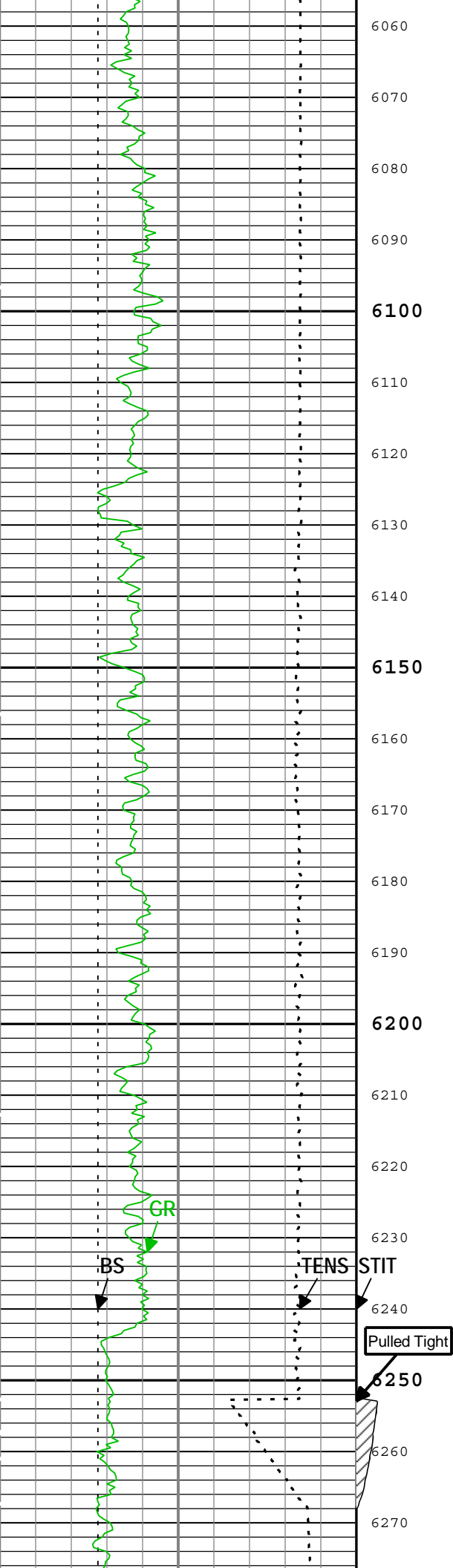
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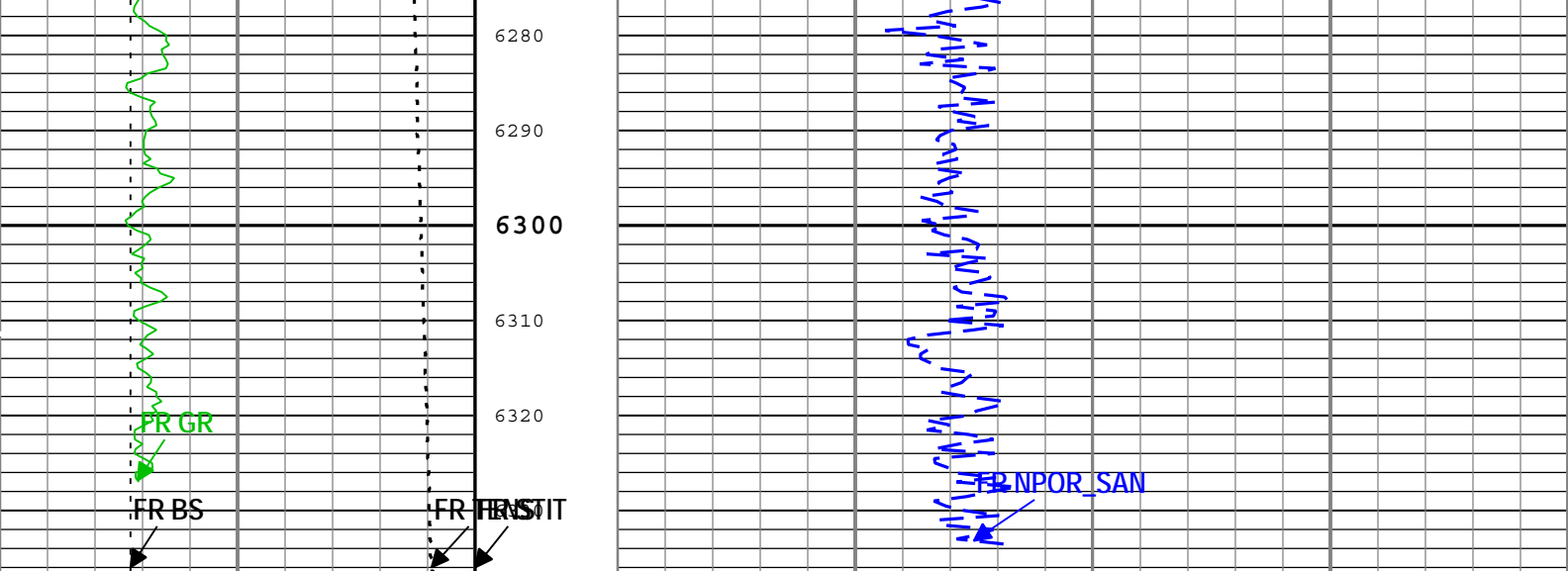
6030

6040

6050







MAIN PASS: GR-CNL TO SURFACE, BS = SURFACE BS, BHS = CASED

Bit Size (BS)		
6	in	16
GR		
0	gAPI	150
Cable Tension (TENS)		
5000	lbf	0

Enhanced Thermal Neutron Porosity (matrix Sandstone) (NPOR_SAN) HGNS-H		
0.45	ft3/ft3	-0.15

—ICV - Integrated Cement Volume every 10.00 (ft3)
—IHV - Integrated Hole Volume every 10.00 (ft3)
TIME_1900 - Time Marked every 60.00 (s)
—IHV - Integrated Hole Volume every 10.00 (ft3)
—ICV - Integrated Cement Volume every 10.00 (ft3)

Description: MCFL processing LQC for Platform Express Format: Log (SURFACE-CASING) Index Scale: 5 in per 100 ft Index Unit: ft Index Type:
Measured Depth Creation Date: 24-Jul-2015 13:20:18

Channel Processing Parameters

ONE: Parameters

Parameter	Description	Tool	Value	Unit
ISSBAR	Barite Mud Presence Flag	Borehole	No	
BHS	Borehole Status (Open or Cased Hole)	Borehole	Cased	
BHT	Bottom Hole Temperature	Borehole	208	degF
BS	Bit Size	WLSESSION	Depth Zoned	in
BSAL	Borehole Salinity	Borehole	0	ppm
CBLO	Casing Bottom (Logger)	WLSESSION	7061	ft
CCCO	Casing & Cement Thickness Correction Option	HGNS-H	Yes	
CSODDRL	Casing Outer Diameter - Zoned along driller depths	WLSESSION	7	in
DC_MODE	Depth Correction Mode	DepthCorrection	Real-time	
DFD	Drilling Fluid Density	Borehole	8.34	lbm/gal
DFT	Drilling Fluid Type	Borehole	Water	
DFT_WATER	Drilling Fluid Water Type	Borehole	Water	
FSAL	Formation Salinity	Borehole	0	ppm
GCSE_DOWN_PASS	Generalized Caliper Selection for WL Log Down Passes	Borehole	BS	
GCSE_UP_PASS	Generalized Caliper Selection for WL Log Up Passes	Borehole	BS	
GRSE	Generalized Mud Resistivity Selection, from Measured or Computed Mud Resistivity	Borehole	REMS	
GTSE	Generalized Temperature Selection, from Measured or Computed Temperature	Borehole	CTEM	

HSCO	Hole Size Correction Option	HGNS-H	Yes	
MATR	Rock Matrix for Neutron Porosity Corrections	Borehole	SANDSTONE	
MFST	Mud Filtrate Sample Temperature	Borehole	68	degF
MST	Mud Sample Temperature	Borehole	68	degF
RMFS	Resistivity of Mud Filtrate Sample	Borehole	0.15	ohm.m
RMS	Resistivity of Mud Sample	Borehole	0.2	ohm.m
SOCO	Standoff Correction Option	HGNS-H	Yes	
TD	Total Measured Depth	Borehole	6336	ft

Depth Zone Parameters

Parameter	Value	Start (ft)	Stop (ft)
BS	26	16.5	104
BS	13.5	104	846
BS	8.75	846	6336.58

All depth are actual.

Tool Control Parameters

ONE: Parameters

Parameter	Description	Tool	Value	Unit
HMCA_BOARD_TYPE	HMCA Board Type	HGNS-H	1	
MAX_LOG_SPEED	Toolstring Maximum Logging Speed	WLSESSION	3600	ft/h

ONE

Pass Summary

Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	DSC Mode	Depth Shift	Include Parallel Data
ONE	Log[2]:Up	Up	31.95 ft	6336.60 ft	24-Jul-2015 11:28:18 AM	24-Jul-2015 12:54:13 PM	ON	2.82 ft	No
ONE	Log[3]:Up	Up	647.74 ft	1155.07 ft	24-Jul-2015 12:58:45 PM	24-Jul-2015 1:04:54 PM	ON	3.12 ft	No

All depths are referenced to toolstring zero

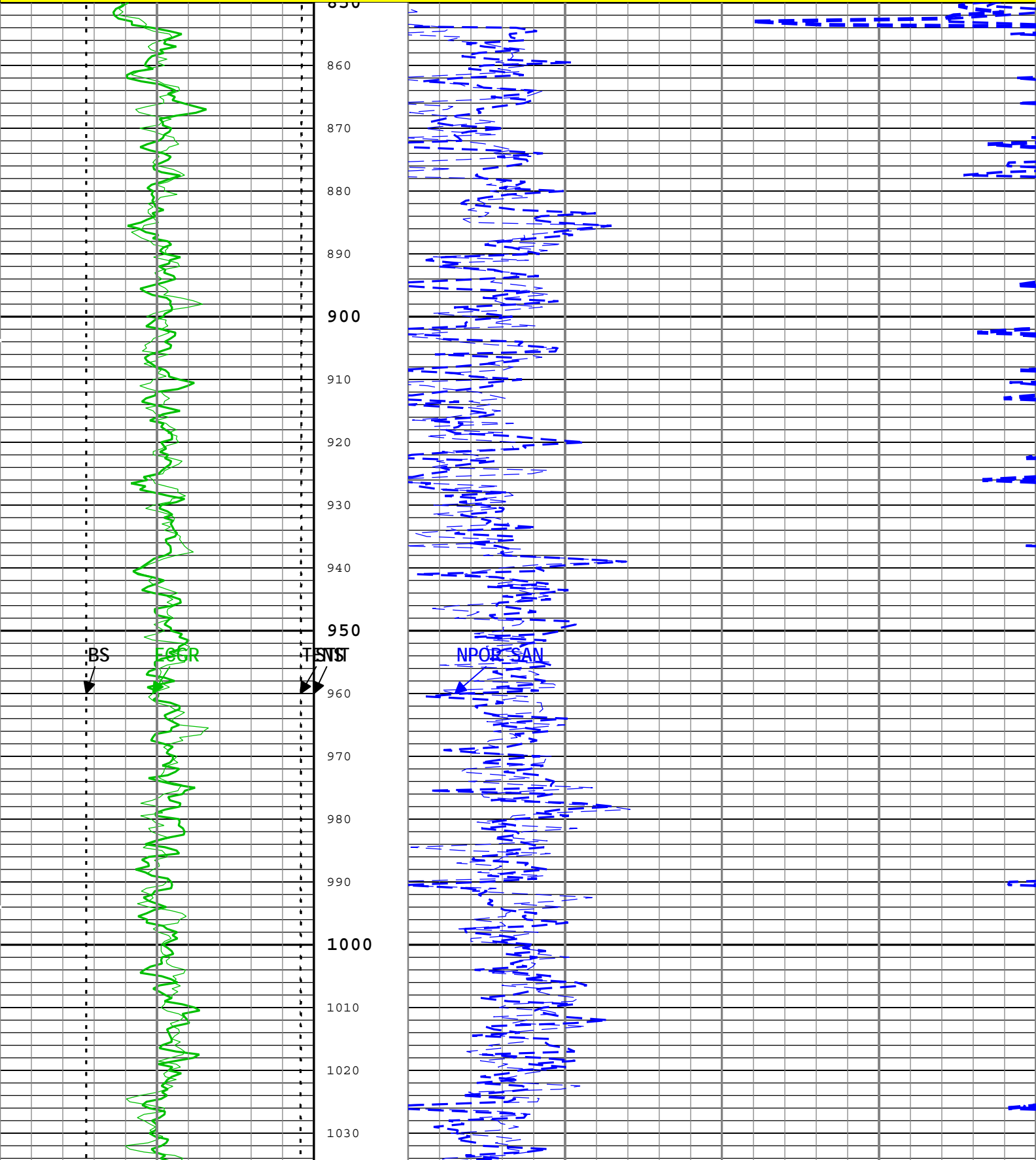
Log	Company:Noble Energy Inc. Well:Wells Ranch State A36-649 ONE: Log[2]:Up:S008
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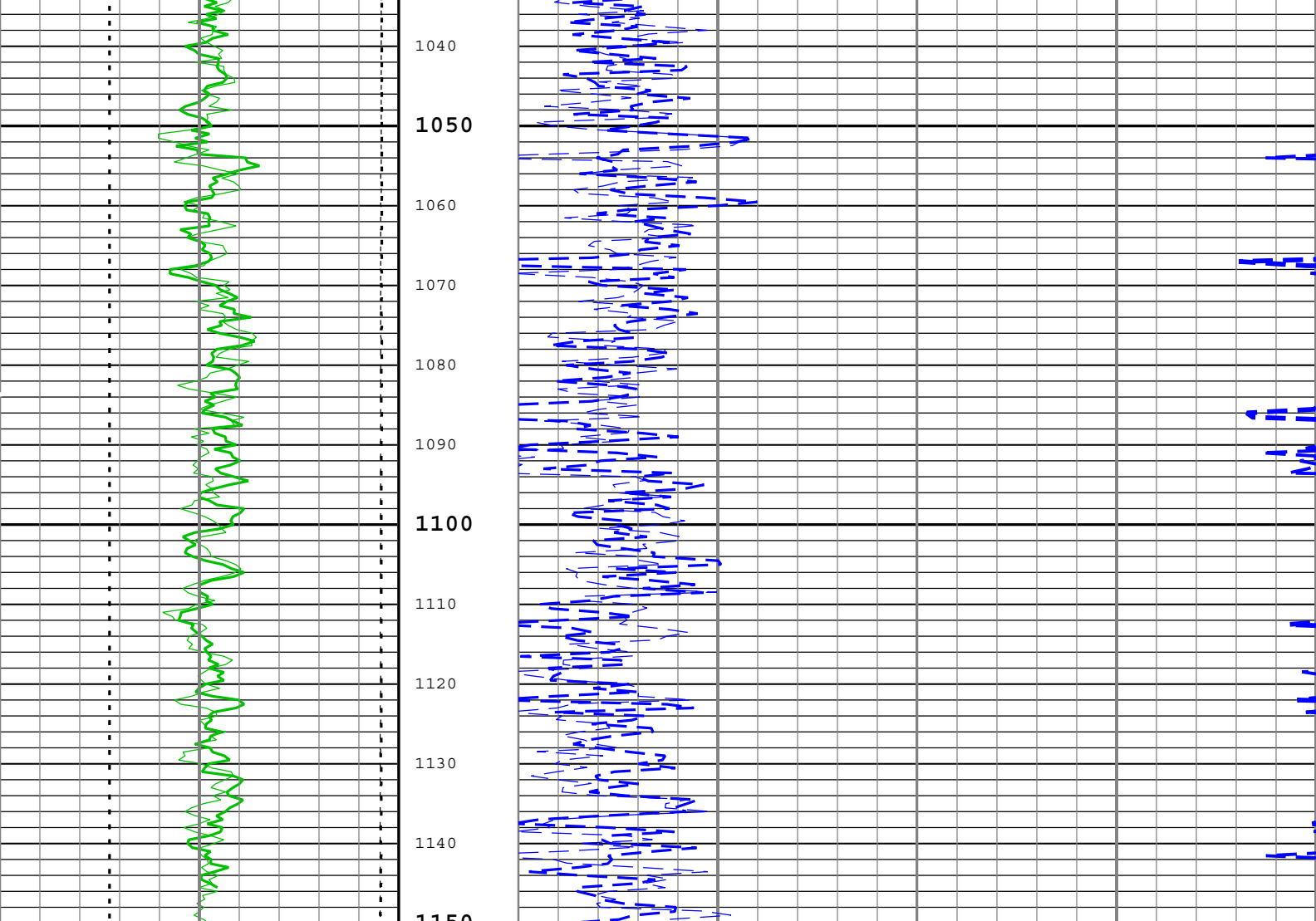
Description: MCFL processing LOC for Platform Express Format: Log (SURFACE-CASING RA) Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth Creation Date: 24-Jul-2015 13:20:21

<div> <div>ICV - Integrated Cement Volume every 10.00 (ft3)</div> <div> <div>IHV - Integrated Hole Volume every 10.00 (ft3)</div> <div>IHV - Integrated Hole Volume every 10.00 (ft3)</div> </div> </div>		TIME_1900 - Time Marked every 60.00 (s)		<div> <div>ICV - Integrated Cement Volume every 10.00 (ft3)</div> <div> <div>Main To Repeat</div> <div>Repeat To Main</div> <div>Cable Tension (TENS)</div> <div>5000 lbf 0</div> </div> </div>		<div> <div>Main To Repeat</div> <div>Repeat To Main</div> <div>Gamma Ray (ECGR) HGNS-H</div> </div>		Main To Repeat	
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0	gAPI	150	Repeat	
Main To Repeat			Repeat To Main	Main To Repeat
Repeat To Main			Stuck Tool Indicator, Total (STIT)	Repeat To Main
Bit Size (BS)			Enhanced Thermal Neutron Porosity (matrix Sandstone) (NPOR_SAN) HGNS-H	
6	in	16	0	ft 50
			0.45	ft3/ft3
				-0.15

REPEAT ANALYSIS: GR-CNL TO SURFACE, BS = SURFACE BS, BHS = CASED





REPEAT ANALYSIS: GR-CNL TO SURFACE, BS = SURFACE BS, BHS = CASED

Main To Repeat Repeat To Main Gamma Ray (ECGR) HGNS-H 0gAPI150		Main To Repeat Repeat To Main Repeat To Main Stuck Tool Indicator, Total (STIT) 0ft50	Main To Repeat Repeat To Main Enhanced Thermal Neutron Porosity (matrix Sandstone) (NPOR_SAN) HGNS-H 0.45ft3/ft3-0.15
Main To Repeat Repeat To Main Bit Size (BS) 6in16			
Main To Repeat Repeat To Main Cable Tension (TENS) 5000lbf0			


TIME_1900 - Time Marked every 60.00 (s)

— ICHV - Integrated Cement Volume every 10.00 (ft3)

— ICHV - Integrated Hole Volume every 10.00 (ft3)

— ICHV - Integrated Hole Volume every 10.00 (ft3)

— ICHV - Integrated Cement Volume every 10.00 (ft3)

Company:	Noble Energy Inc.	
Well:	Wells Ranch State A36-649	
Field:	Wattenberg	
County:	Weld	
State:	Colorado	
Neutron Porosity Log		
NPOR-GR		
HGNS		