Schlumberger

Company: Noble Energy Inc

Well: Wells Ranch AE32-675

Field: Wattenberg

County: Weld State: Colorado

Platform Express

Neutron Porosity

County: Weld
Field: Wattenberg
Location: NWNW Sec. 32, T6N, R62W
Well: Wells Ranch AE32-675
Company: Noble Energy Inc

Location:				
NWNW Sec. 32, T6N, R62W		Elev.:	K.B.	4771.00 ft
SHL: 614' FNL x 650' FWL			G.L.	4747.00 ft
Lat: 40.448750/ Long: -104.354230			D.F.	4770.00 ft
Permanent Datum:	Ground Level	Elev.:	4747.00 f	
Log Measured From:	Kelly Bushing	24.00 ft	above Perm.Datum	
Drilling Measured From:	Kelly Bushing			

API Serial No.	Section:	Township:	Range:
05-123-41732	32	6N	62W

Logging Date	04-Nov-2015		
Run Number	Run 1		
Depth Driller	6890.00 ft		
Schlumberger Depth	6890.00 ft		
Bottom Log Interval	6703.00 ft		
Top Log Interval	24.00 ft		
Casing Fluid Type	Brine		
Salinity			
Density	8.4 lbm/gal		
Fluid Level	0.00 ft		
BIT/CASING/TUBING STRING			
Bit Size	8.75 in		
From	638.00 ft		
To	6890.00 ft		
Casing/Tubing Size	7 in		
Weight	26 lbm/ft		
Grade	P110		
From	0.00 ft		
To	6880.20 ft		
Max Recorded Temperatures	218.9 degF		
Logger on Bottom Time	04-Nov-2015	14:40:00	
Unit Number Location:	9115	Ft. Morgan, CO	
Recorded By	Aleksei Bekhterev		
Witnessed By	Bill Mansfield		

Disclaimer

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12. Calibration Report
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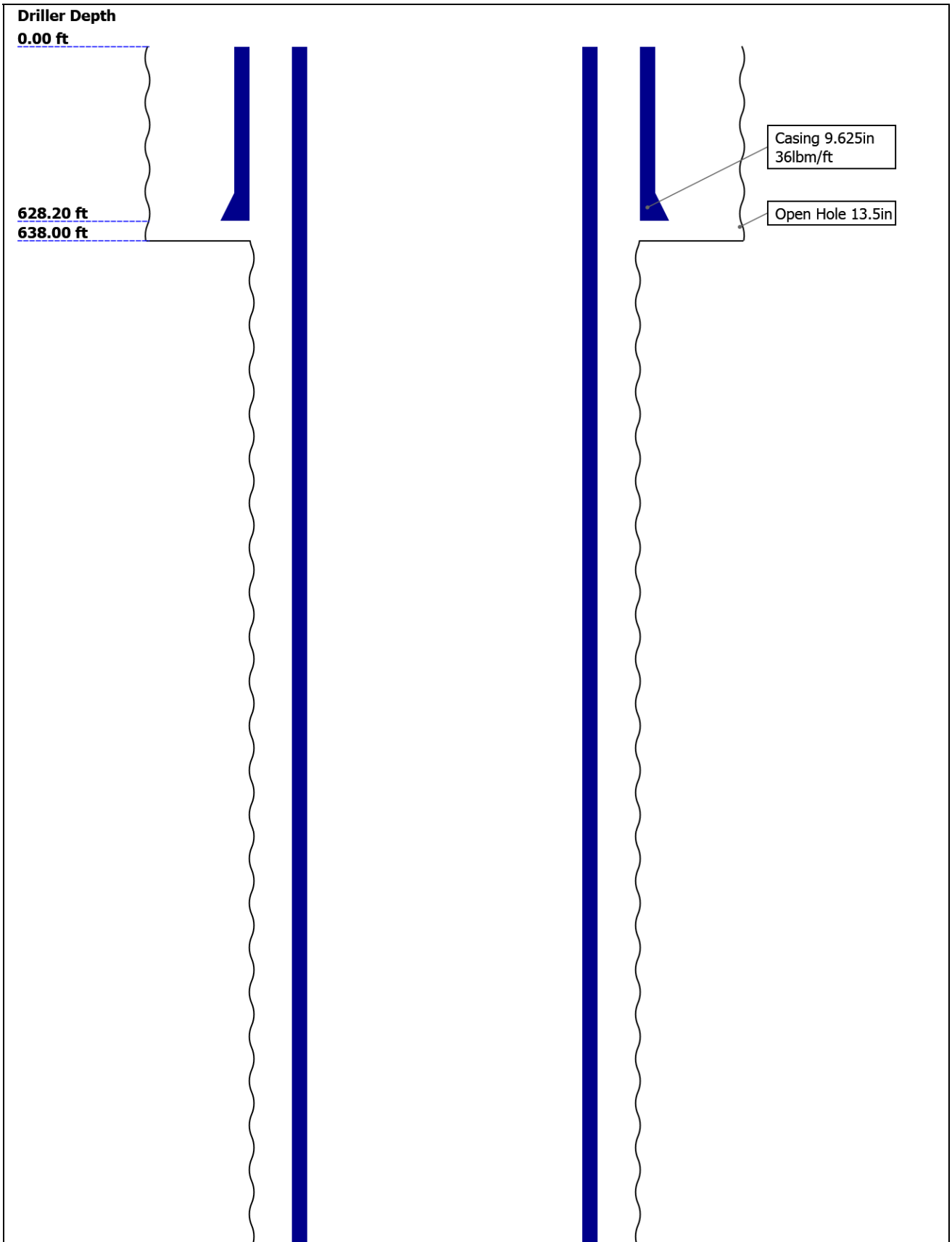
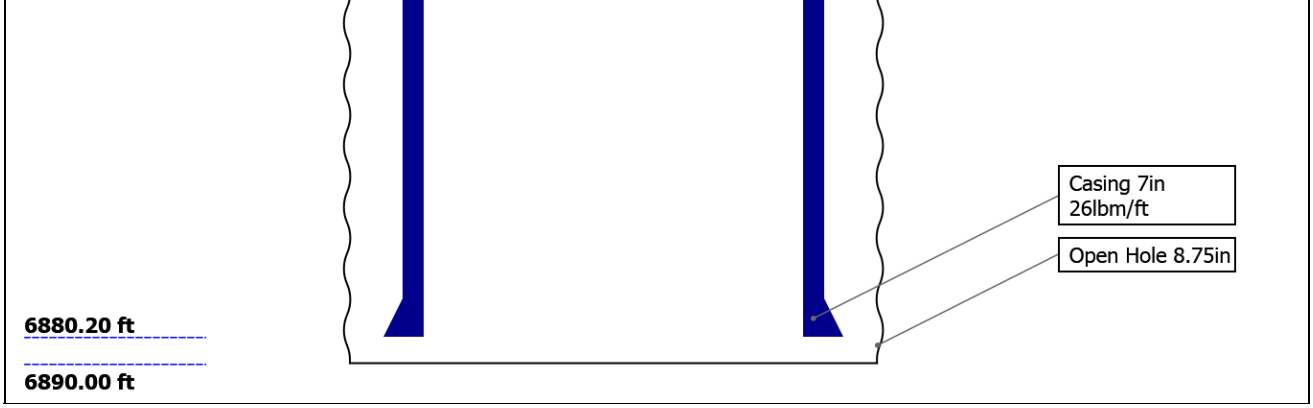
Well Sketch





Borehole Size/Casing/Tubing Record

Bit						
Bit Size (in)	13.5	8.75				
Top Driller (ft)	0	638				
Top Logger (ft)	0	638				
Bottom Driller (ft)	638	6890				
Bottom Logger (ft)	638	6890				
Casing						
Size (in)	9.625	7				
Weight (lbm/ft)	36	26				
Inner Diameter (in)	8.921	6.276				
Grade	J55	P110				
Top Driller (ft)	0	0				
Top Logger (ft)	0	0				
Bottom Driller (ft)	628.2	6880.2				
Bottom Logger (ft)	628.2	6880.2				

Operational Run Summary

Parameter (unit)	Run 1					
Date Log Started	04-Nov-2015					
Time Log Started	14:16:04					
Date Log Finished	04-Nov-2015					
Time Log Finished	18:52:53					
Top Log Interval (ft)	24.00					
Bottom Log Interval (ft)	6703.00					
Total Depth (ft)						
Max Hole Deviation (deg)	0.00					
Azimuth of Max Deviation (deg)	0.00					
Bit Size (in)	8.750					
Logging Unit Number	9115					
Logging Unit Location	Ft. Morgan, CO					
Recorded By	Aleksei Bekhterev					

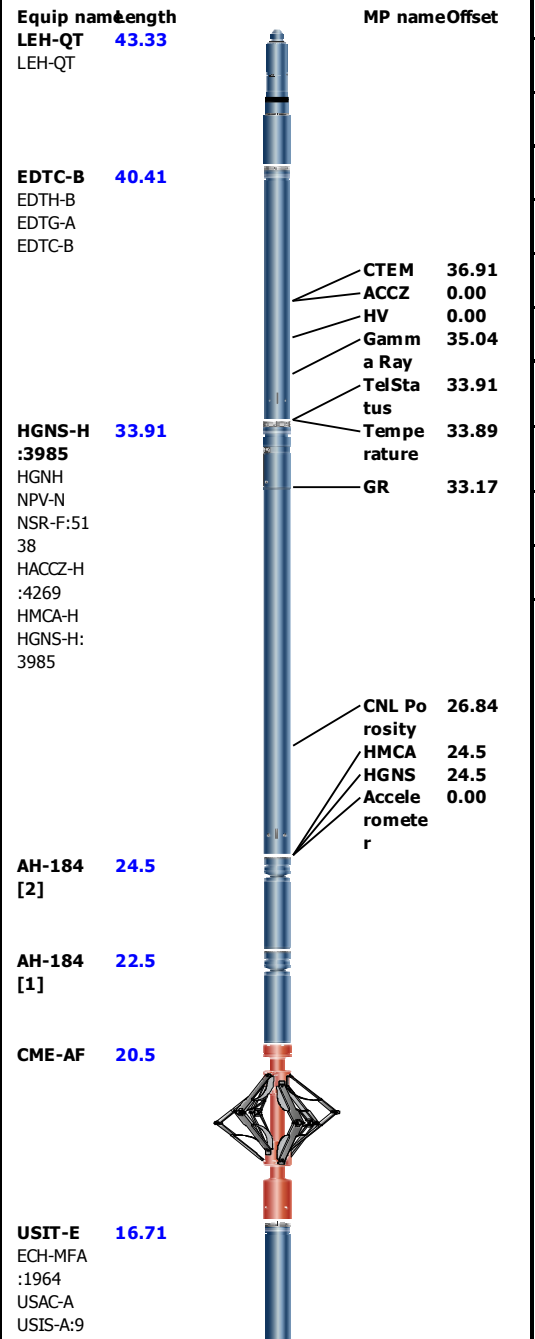
Witnessed By	Bill Mansfield					
Service Order Number	CY37-00150					

Borehole Fluids

Parameter(unit)	Run 1					
Fluid Type	Water					
Fluid Name	Brine					
Max Recorded Temperatures (degF)	218.9					
Salinity (ppm)	0					
Density (lbm/gal)	8.4					
Date Logger on Bottom	04-Nov-2015					
Time Logger on Bottom	14:40:00					
Total Solid (%)						
High Gravity Solids (%)						

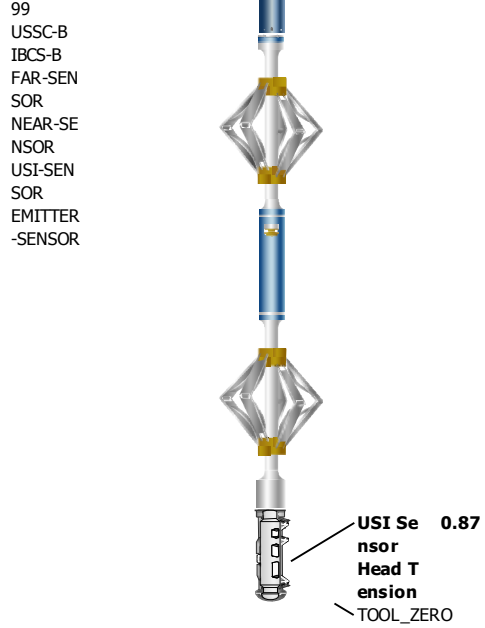
Remarks and Equipment Summary

Run 1: Toolstring



Run 1: Remarks

Run 1: Remarks
Toolstring ran as per tool sketch
12 ppg Flex Seal, 15.8 ppg Tail cement
Repeat pass is done with 0 psi
Main pass is done with 2500 psi
Temperature at the bottom: 218.9 degF
Top of cement: 760 ft
Log started 30 ft above top of the liner (6703 ft)
Data affected by high deviation at TD-6180 ft section
Casing anomaly observed from 760' to 490'. Repeated at high resolution
Crew: Jake Jump, Jay Musgrave
Thank you for choosing Schlumberger Wireline!



Lengths are in ft
Maximum Outer Diameter = 4.472 in
Line: Sensor Location, Value: Gating Offset
All measurements are relative to TOOL_ZERO

Depth Summary

	Run 1		
Depth Measuring Device			
Type	IDW-B		
Serial Number			
Calibration Date			
Calibrator Serial Number			
Calibration Cable Type			
Wheel Correction 1	0		
Wheel Correction 2	0		
Tension Device			
Type	CMTD-B/A		
Serial Number			
Calibration Date			
Calibrator Serial Number			
Number of Calibration Points	0		
Logging Cable			
Type	7-46A-XS		
Serial Number			
Length	12000.00 ft		
Conveyance Type	Wireline		
Rig Type	Crane		

Run 1:Depth Control Parameters		Depth Control Remarks
Log Sequence	First Log In the Well	All Schlumberger depth policies followed
Rig Up Length At Surface		IDW used as primary depth device
Rig Up Length At Bottom		Z-chart used as secondary depth reference
Rig Up Length Correction		
Stretch Correction		
Tool Zero Check At Surface		

Tool Zero Check At Surface

Run 1

5" Triple Combo

Software Version

Acquisition System	Version
Maxwell 2016	6.0.52439.3100

Pass Summary

Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	DSC Mode	Depth Shift	Include Parallel Data
Run 1	Main[3]:Up	Up	70.33 ft	6709.52 ft	04-Nov-2015 3:29:07 PM	04-Nov-2015 6:16:32 PM	ON	5.72 ft	Yes

All depths are referenced to toolstring zero

Log

Company:Noble Energy Inc Well:Wells Ranch AE32-675

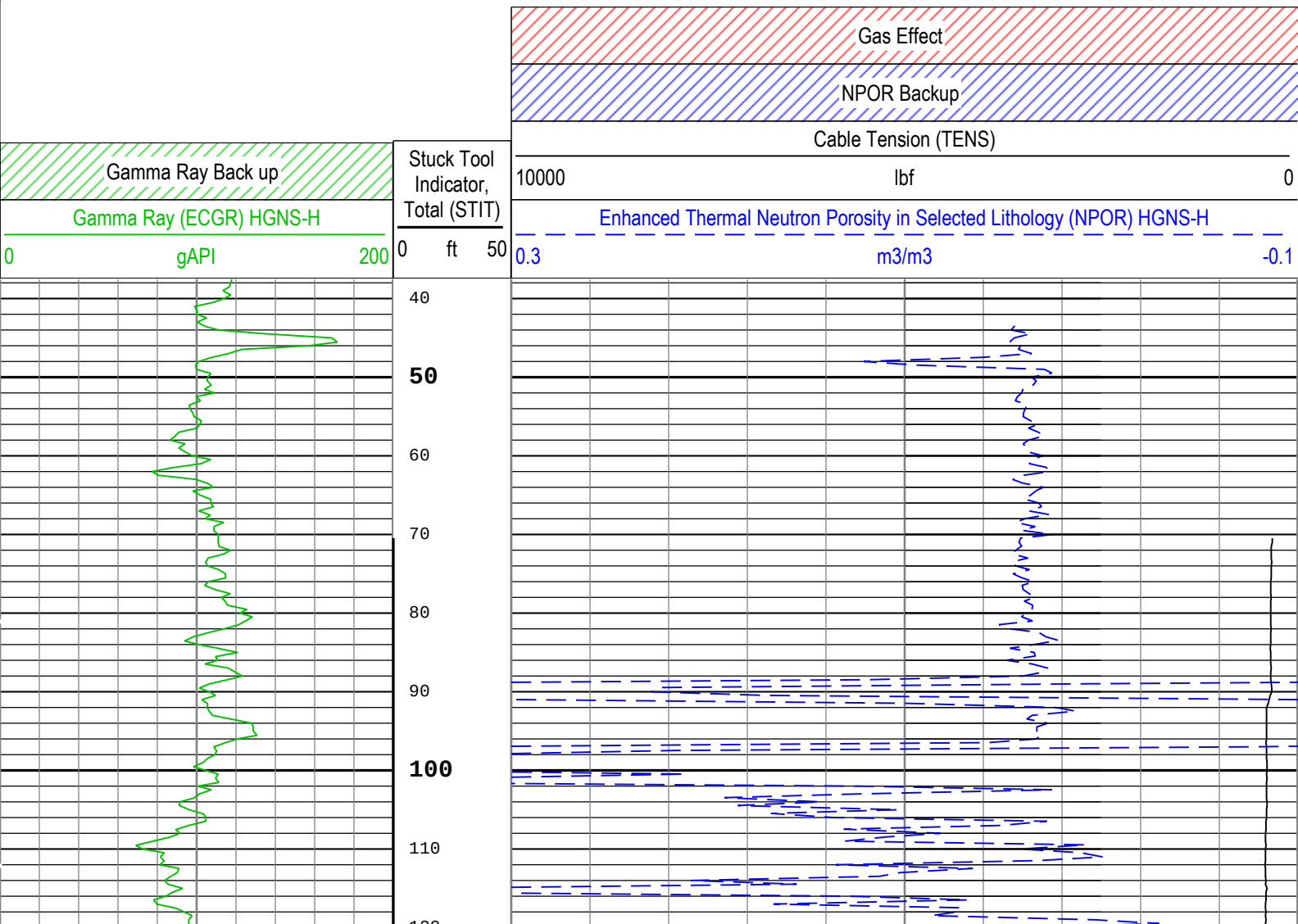
Run 1: Main[3]:Up:S009

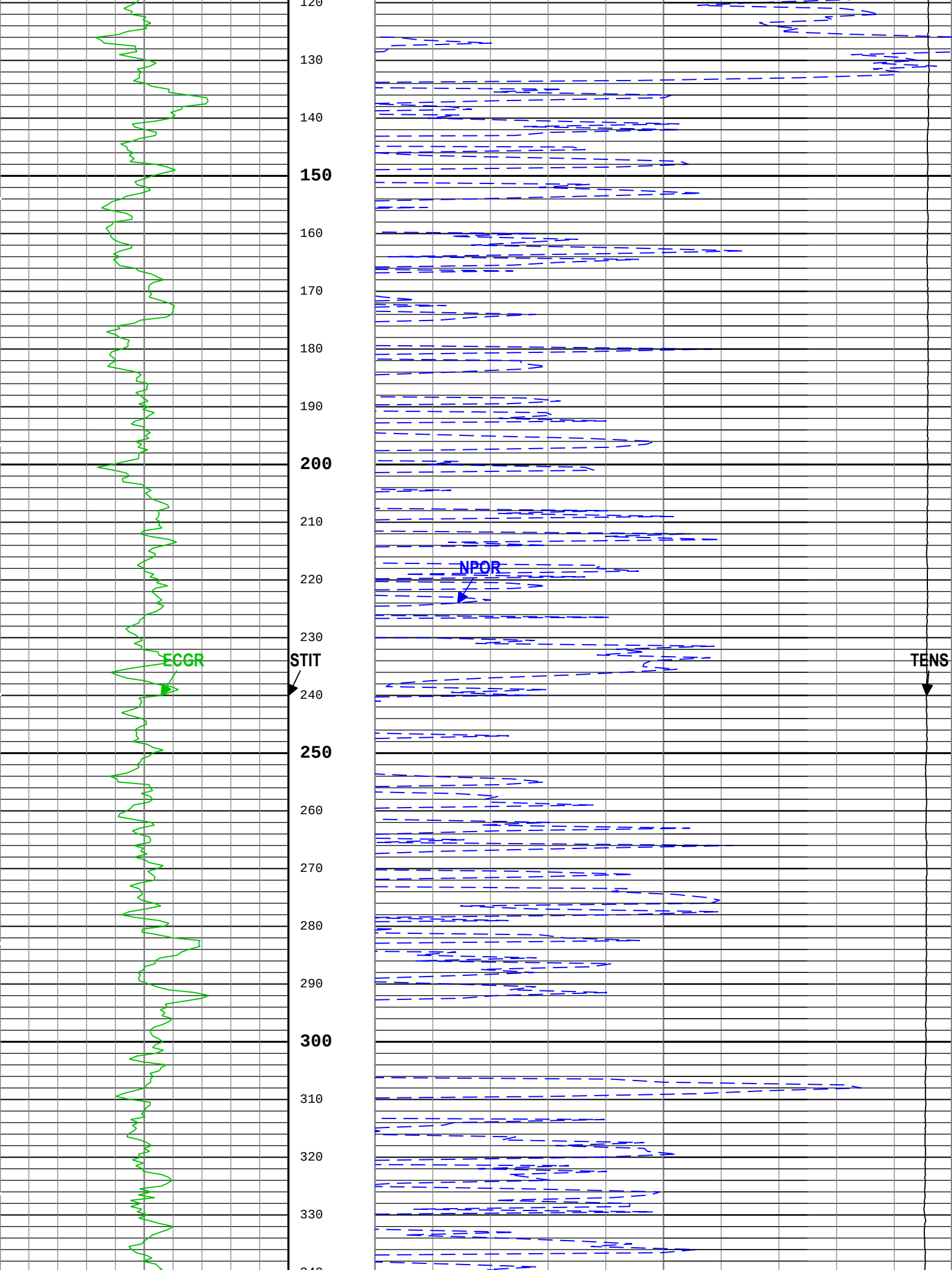
Description: HGNS standard resolution porosities for Platform Express Format: Log (KM 5in Triple Combo) Index Scale: 5 in per 100 ft Index Unit: ft

Index Type: Measured Depth Creation Date: 04-Nov-2015 19:19:06

Channel	Source	Sampling
GR	HGNS-H:HGNS-H:HGNS-H	6in
NPOR	HGNS-H:HGNS-H:HGNS-H	6in
STIT	DepthCorrection	6in
TENS	WLWorkflow	6in
TIME_1900	WLWorkflow	0.1in

TIME_1900 - Time Marked every 60.00 (s)

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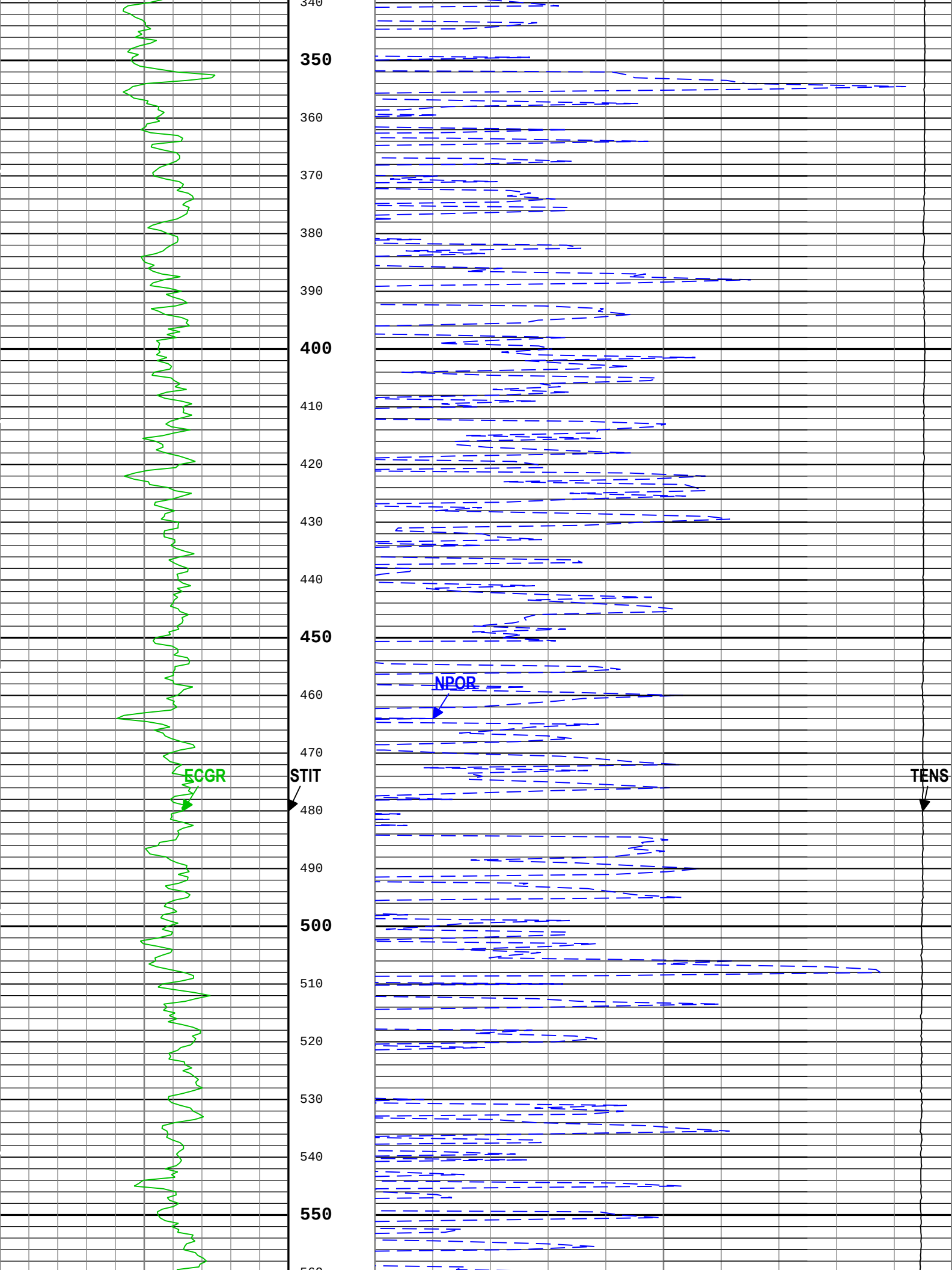
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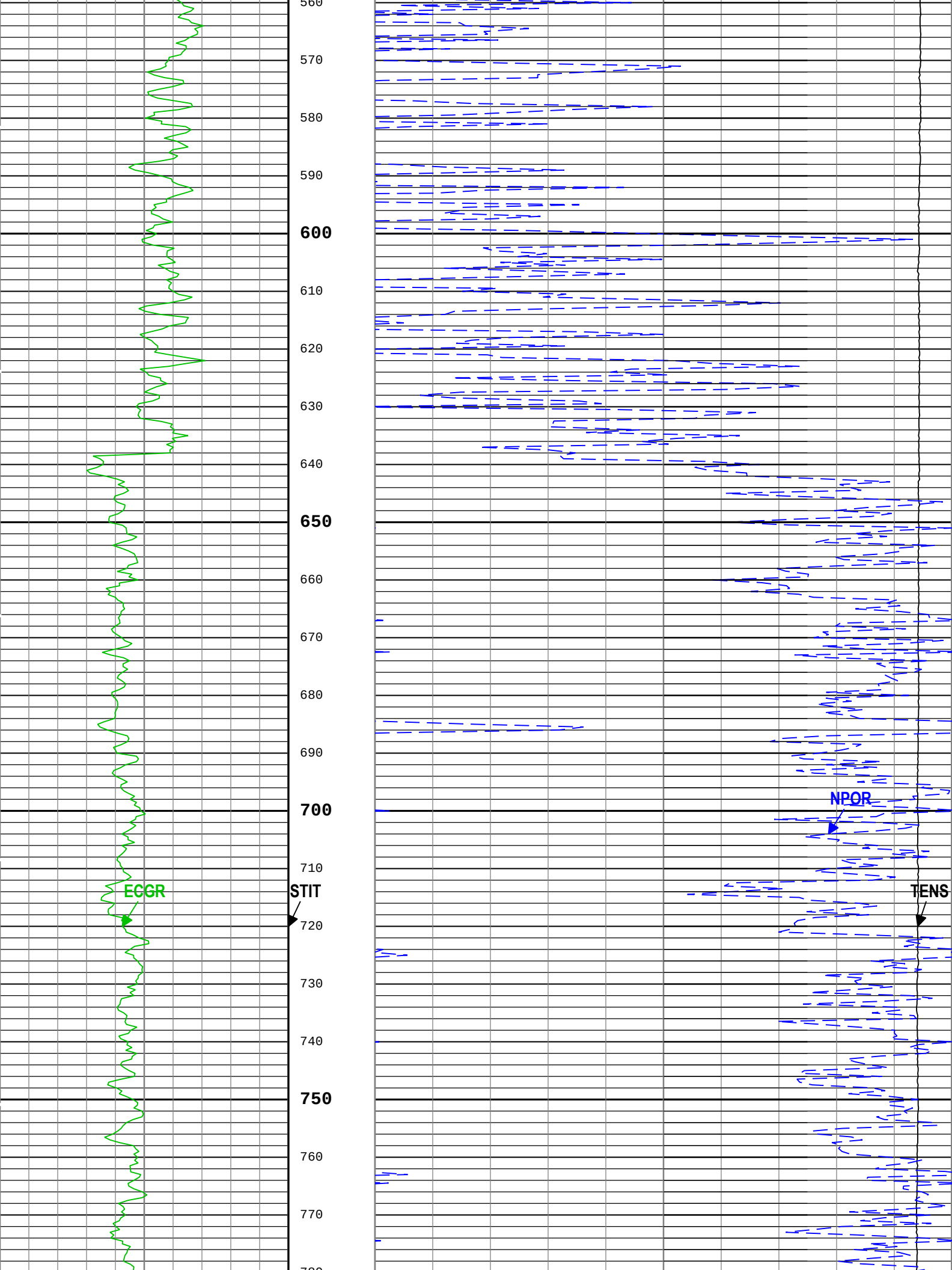
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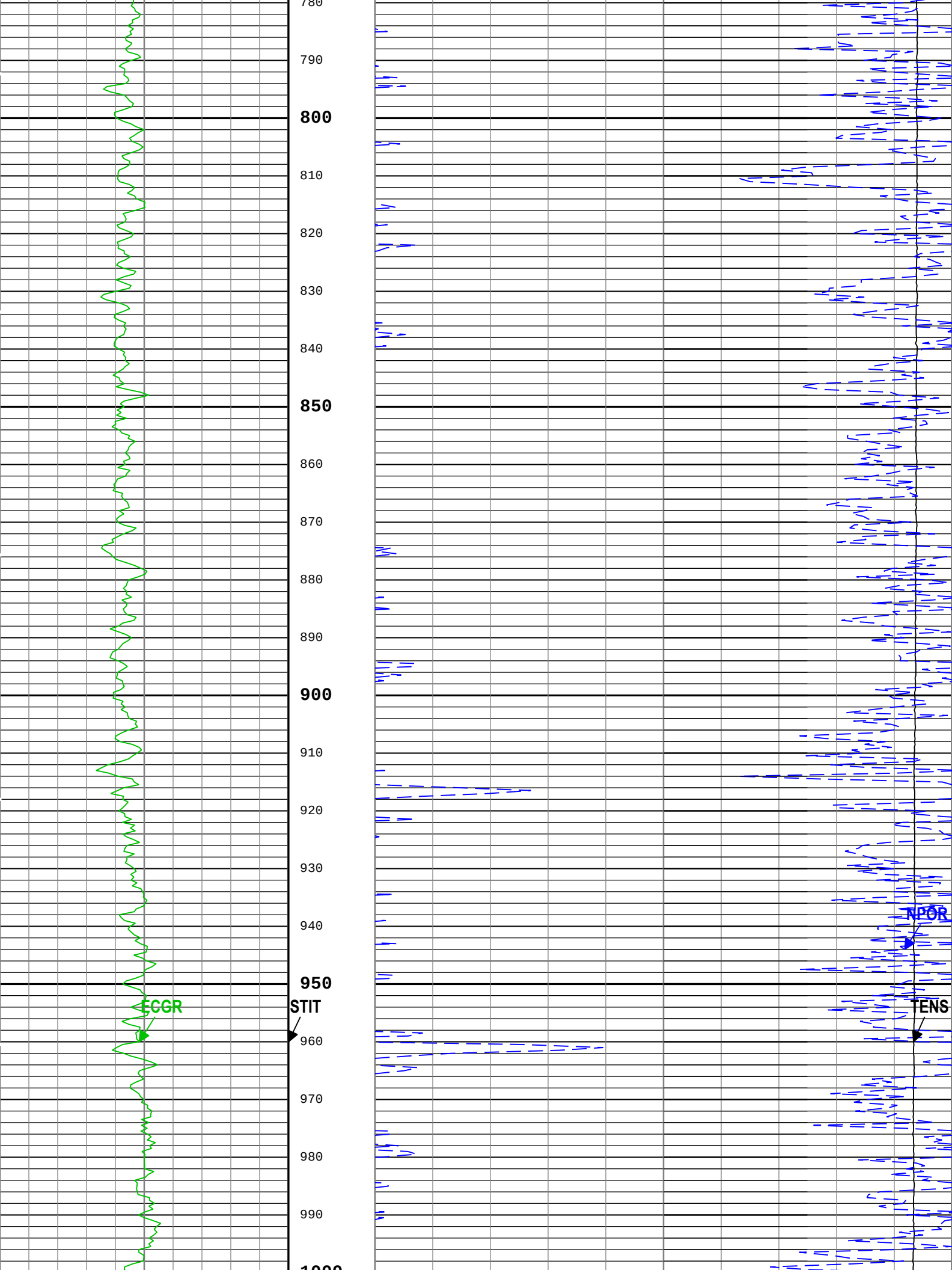
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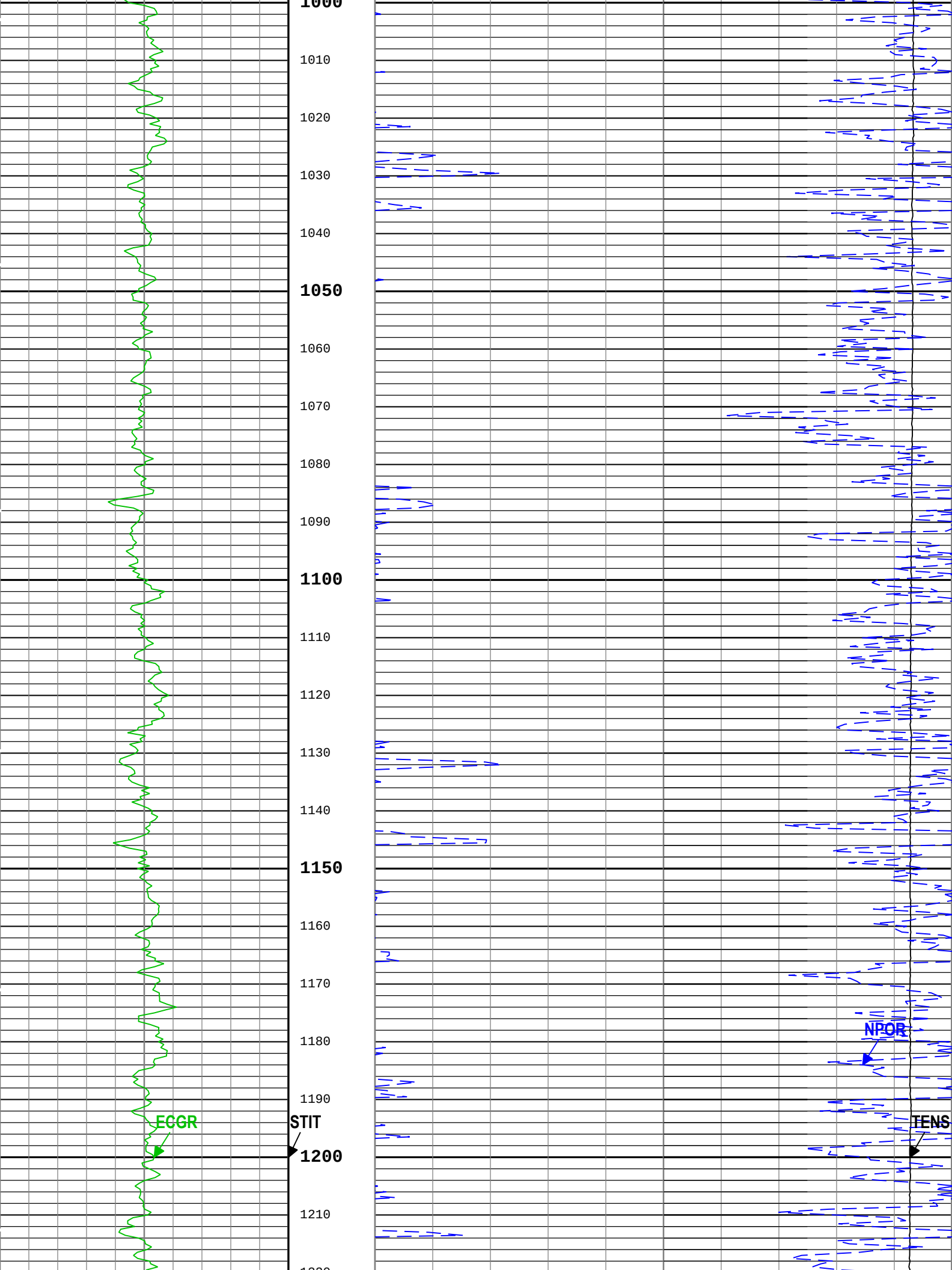
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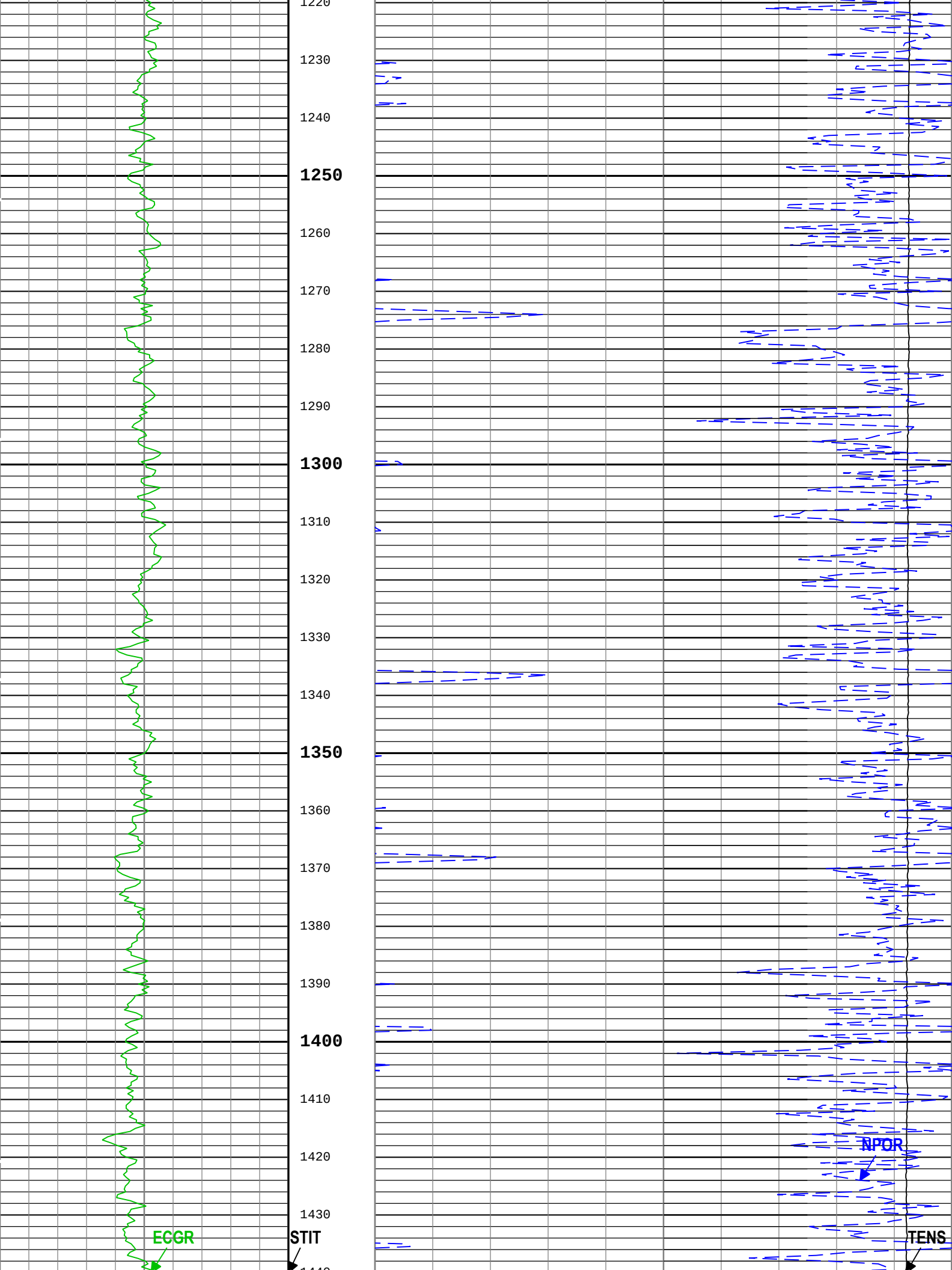
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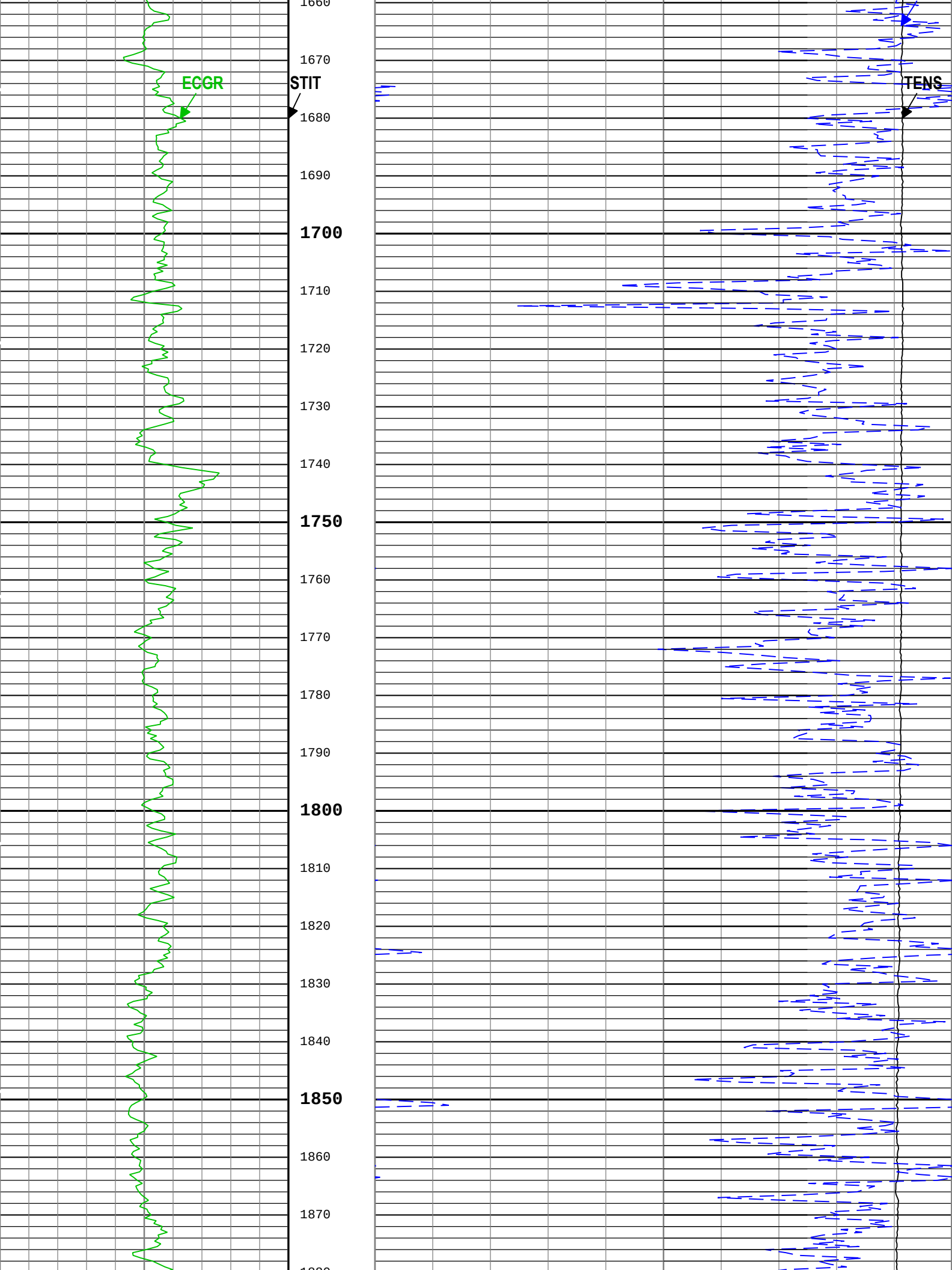
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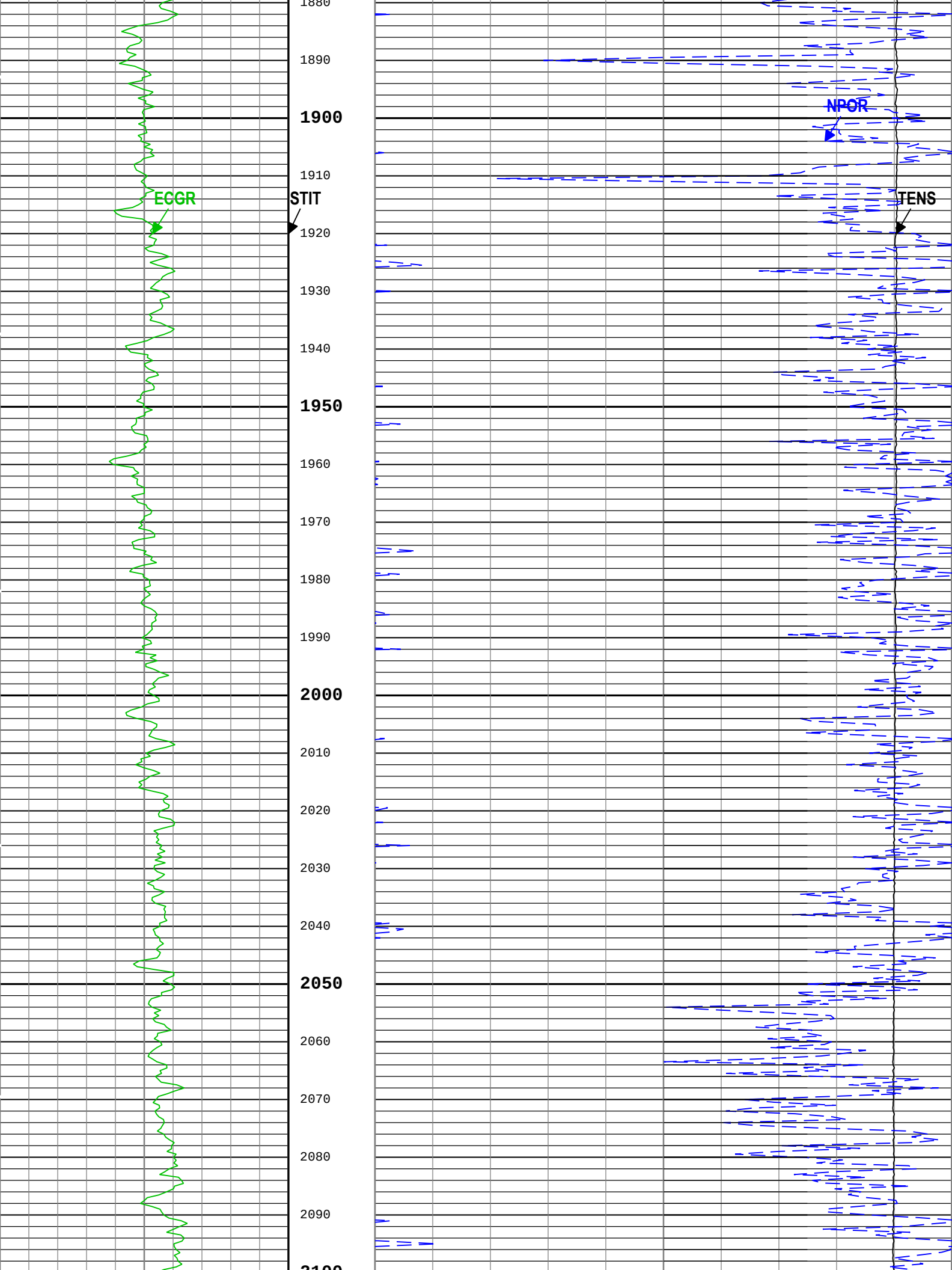
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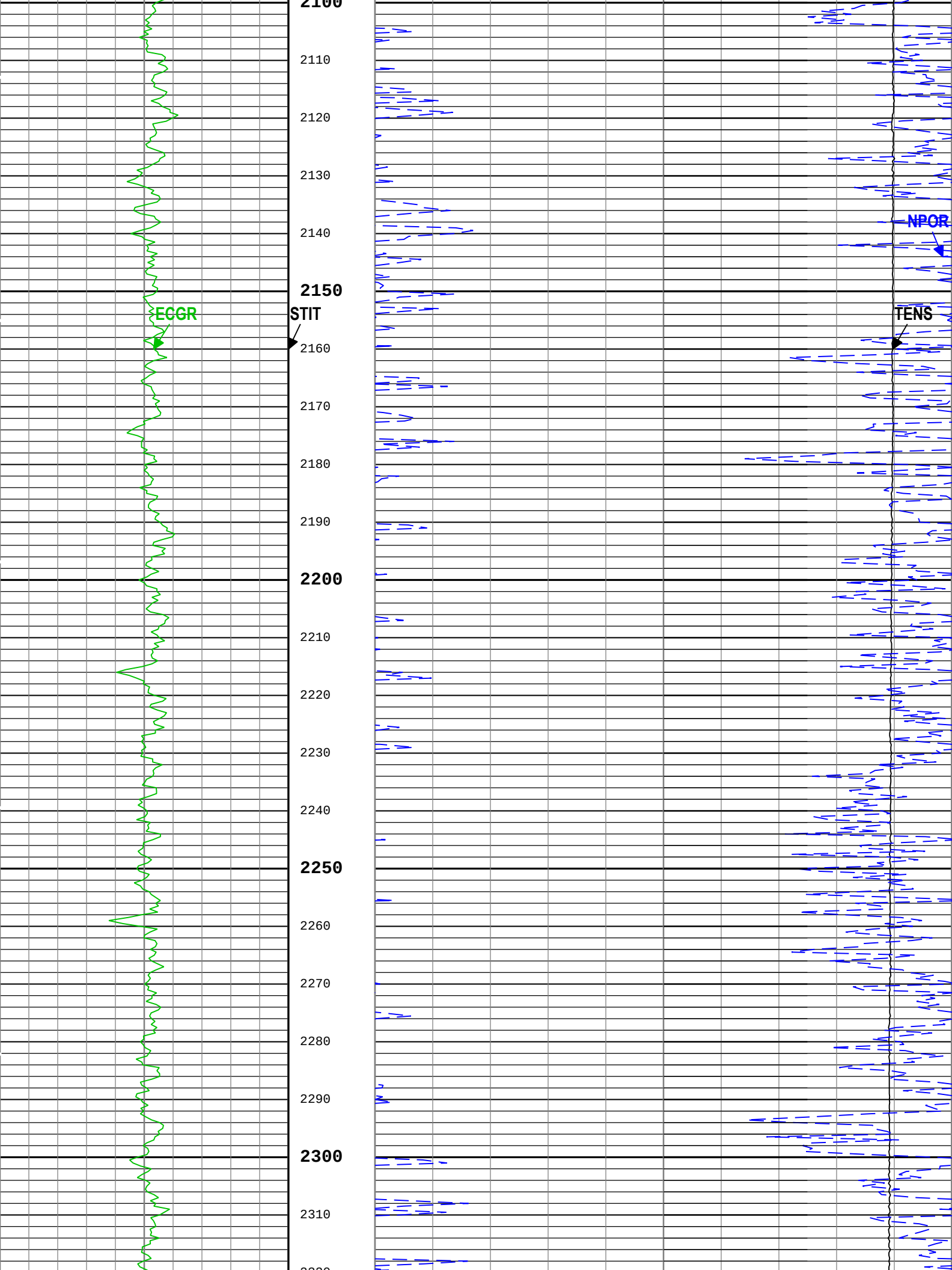
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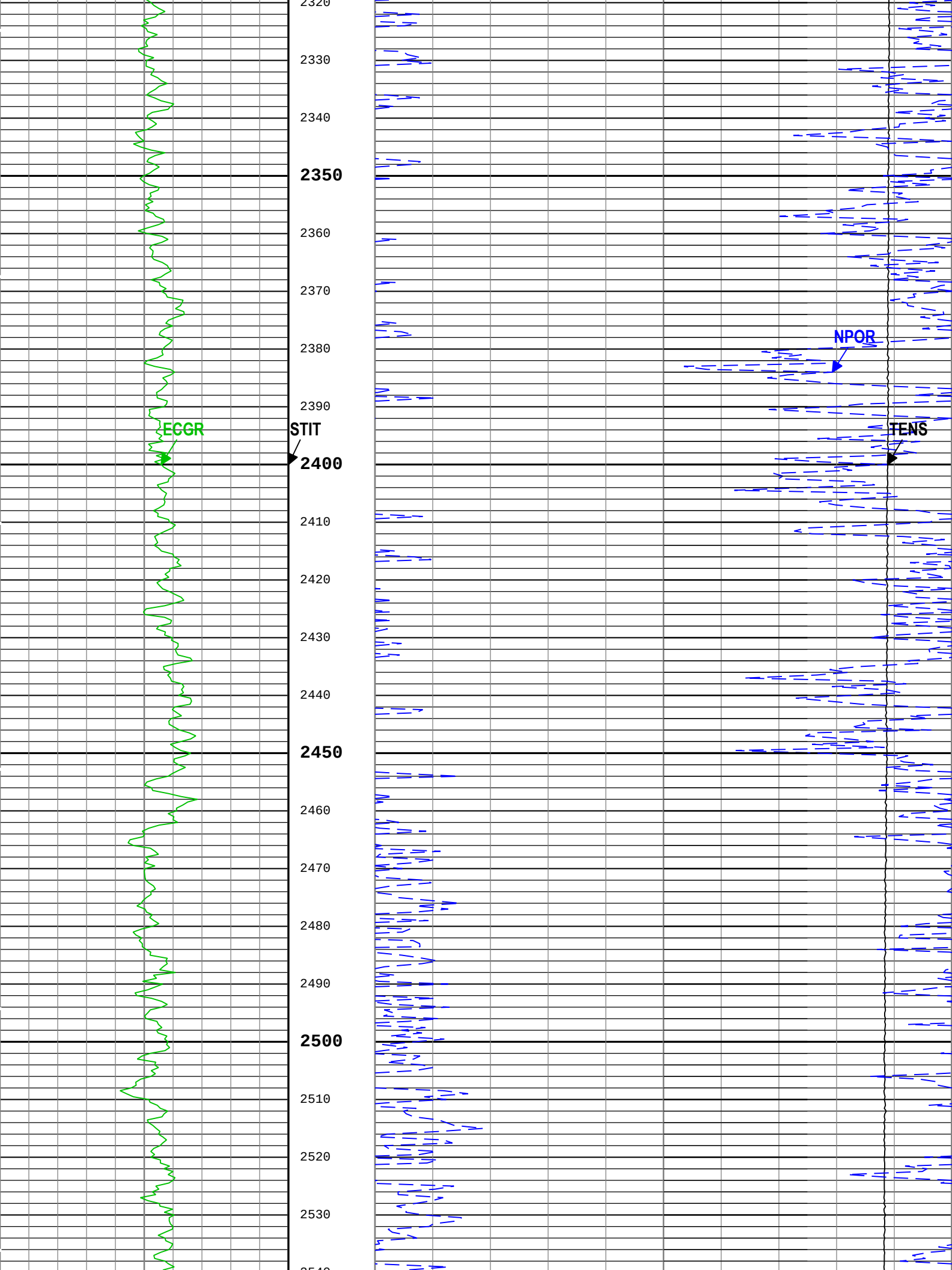
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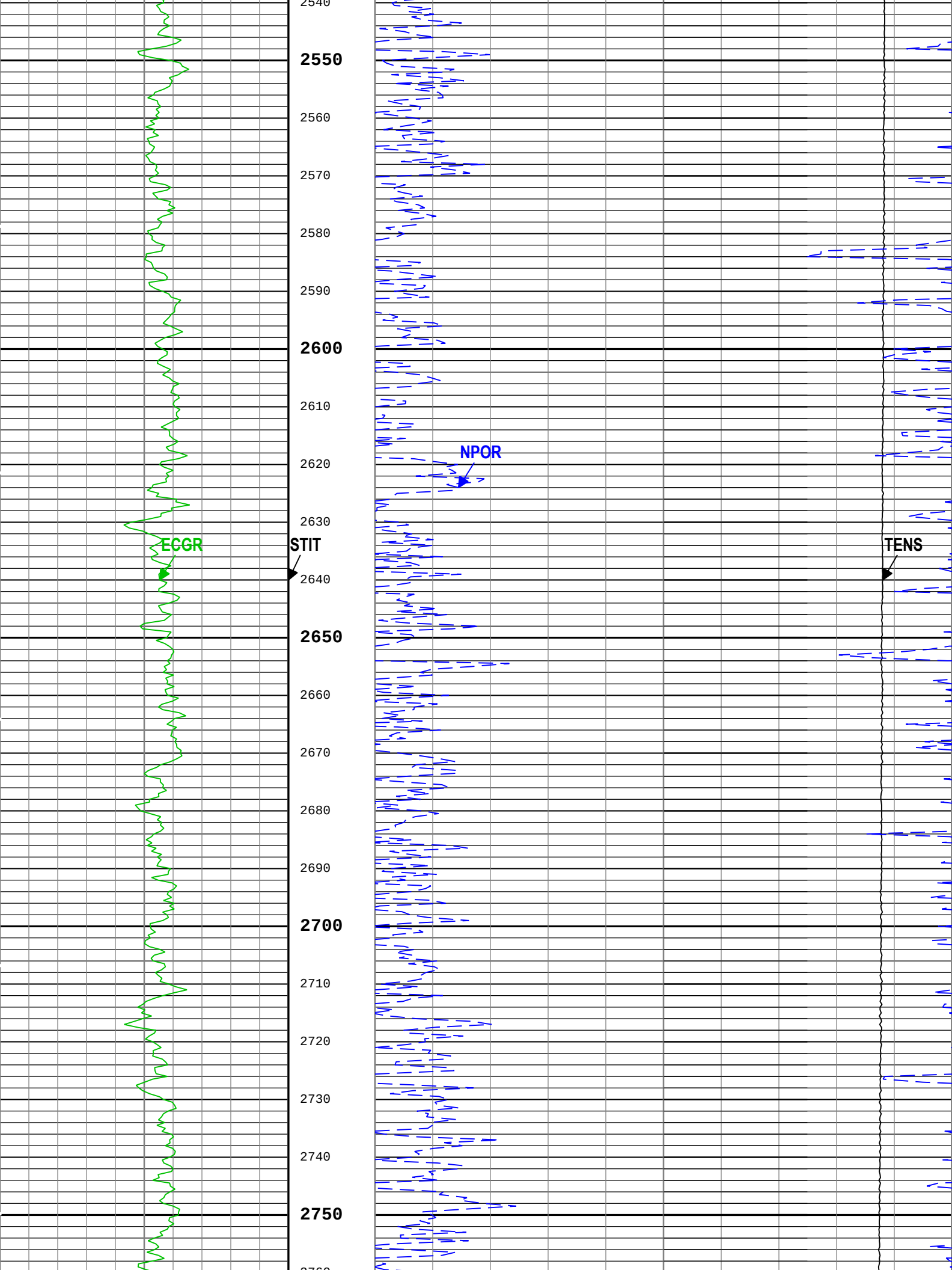
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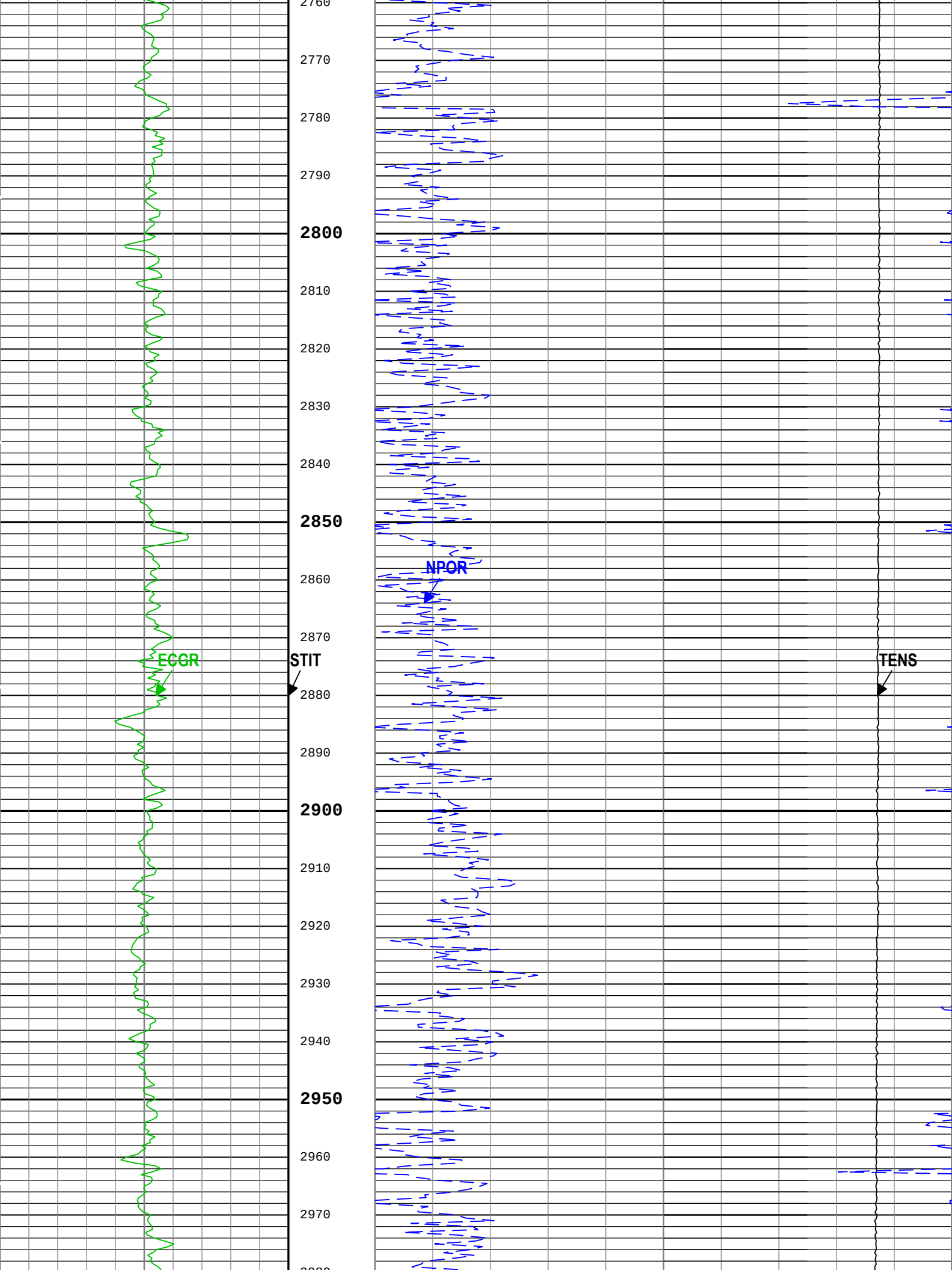
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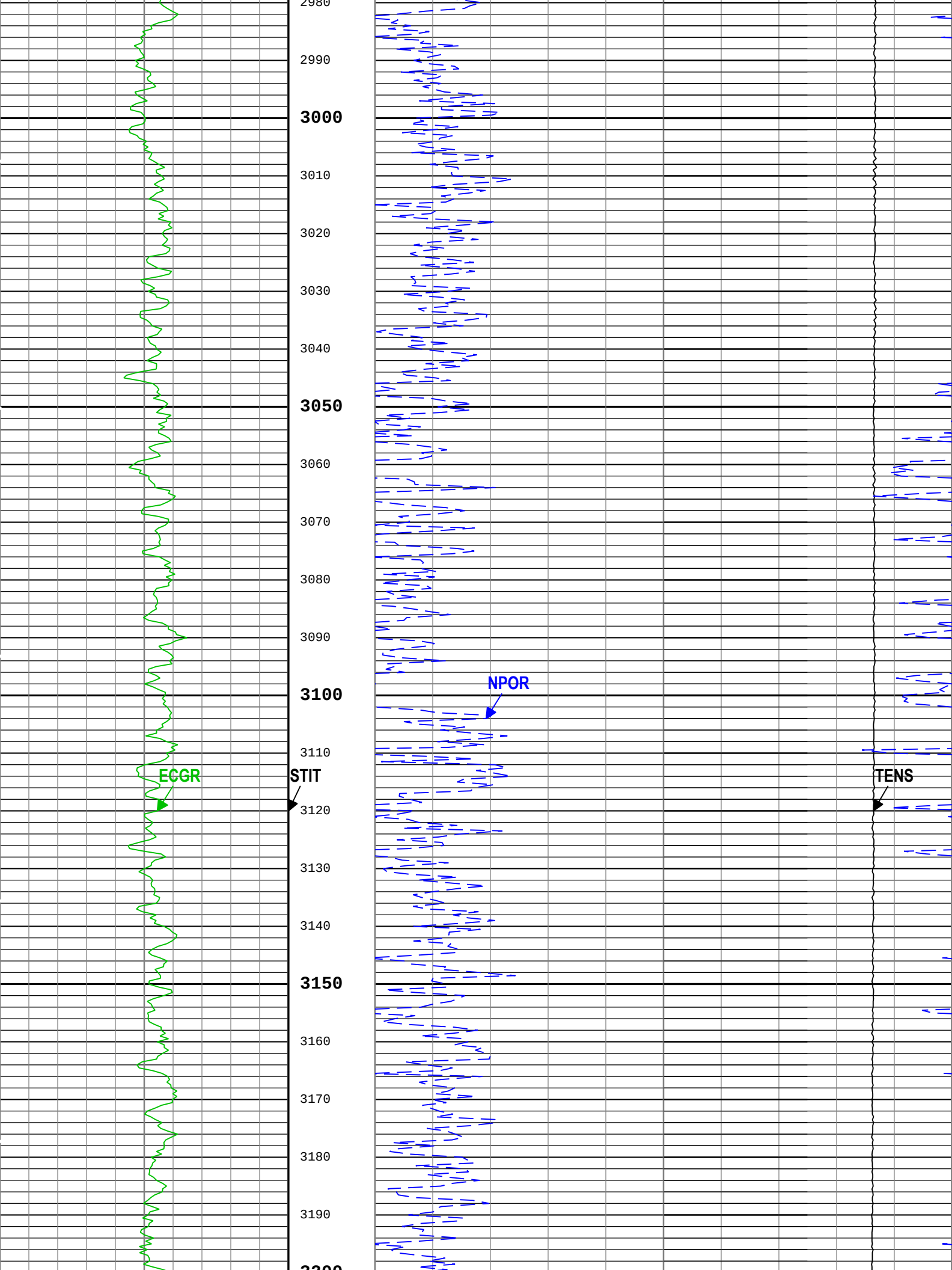
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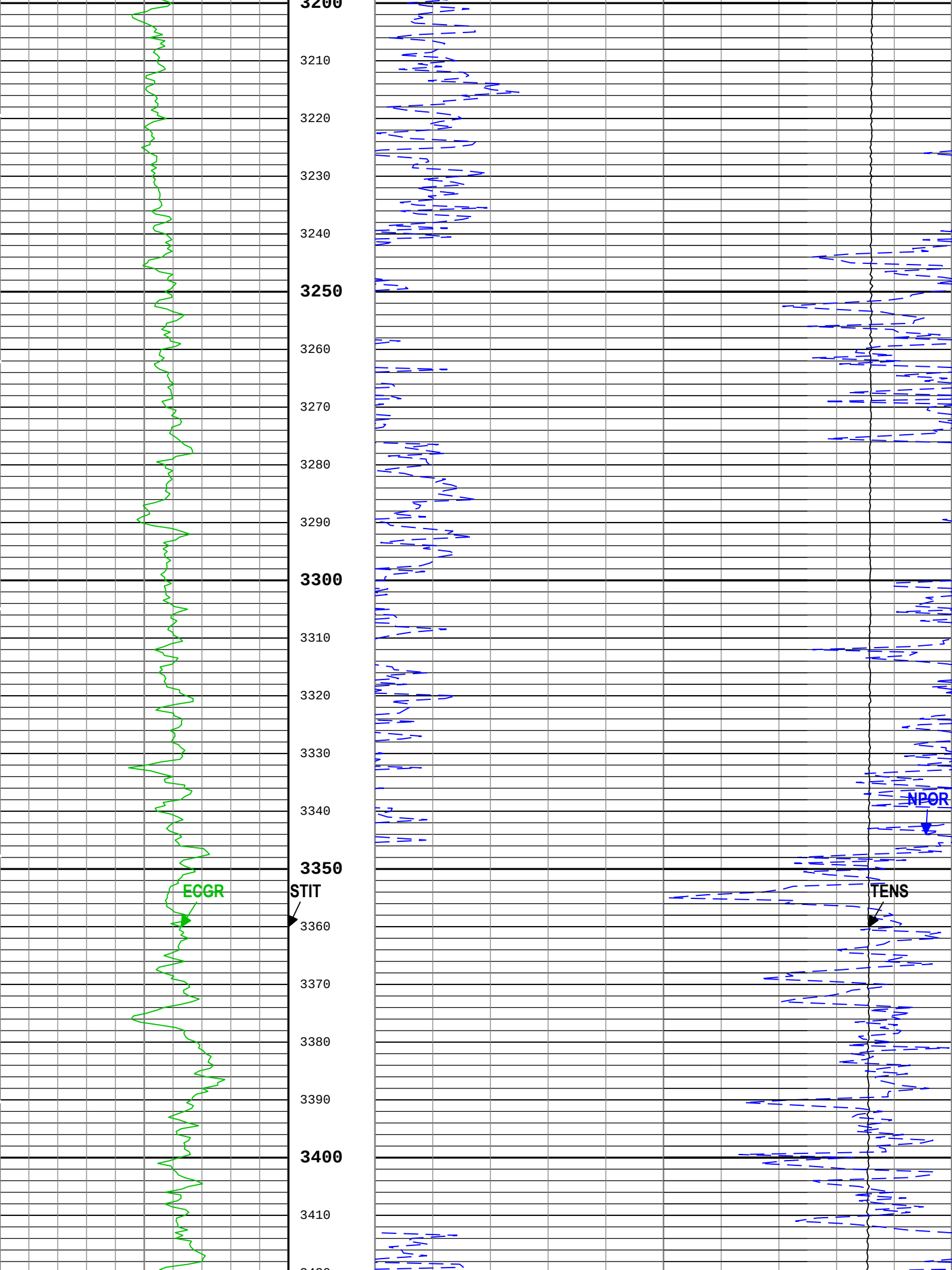
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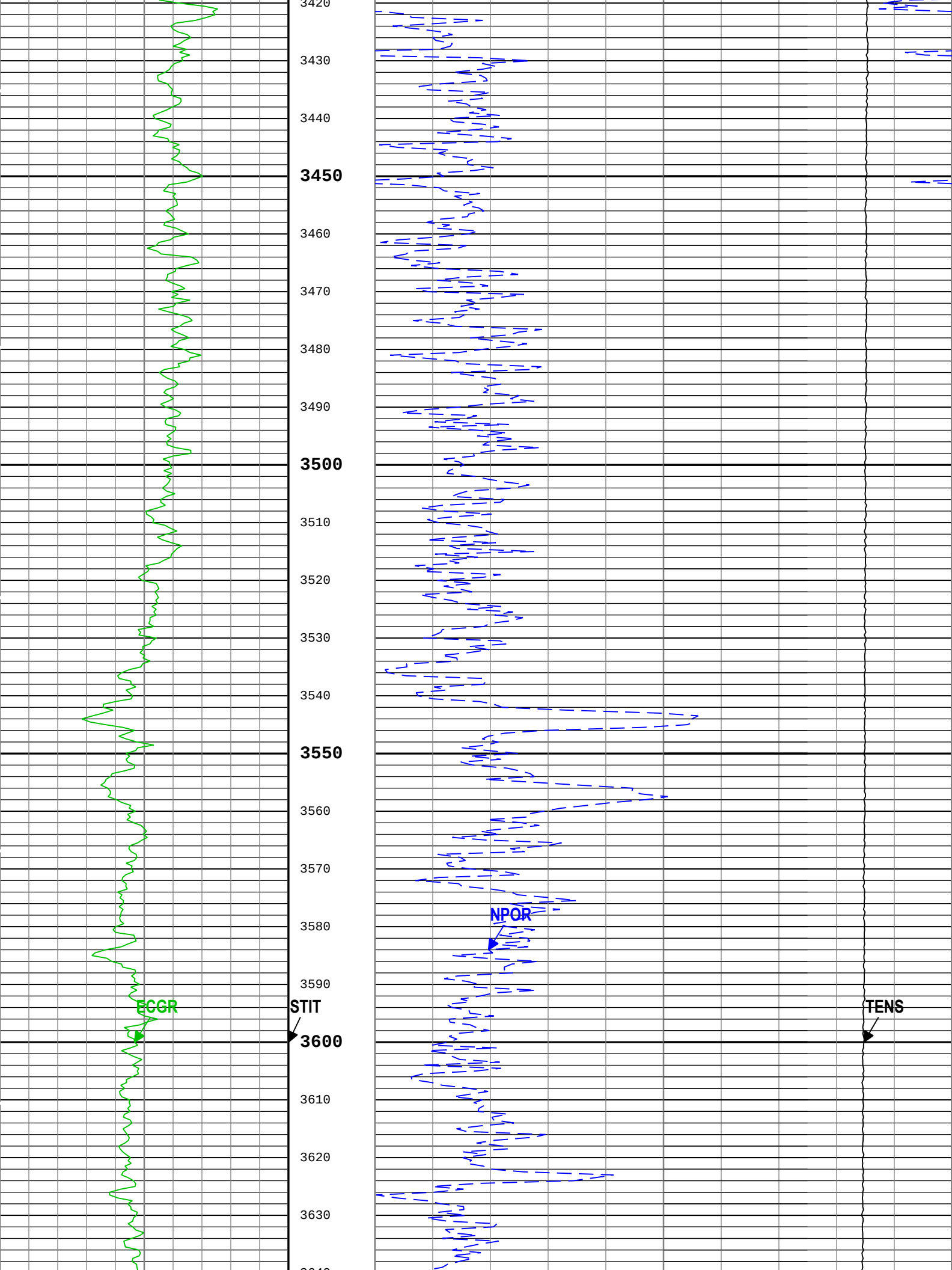
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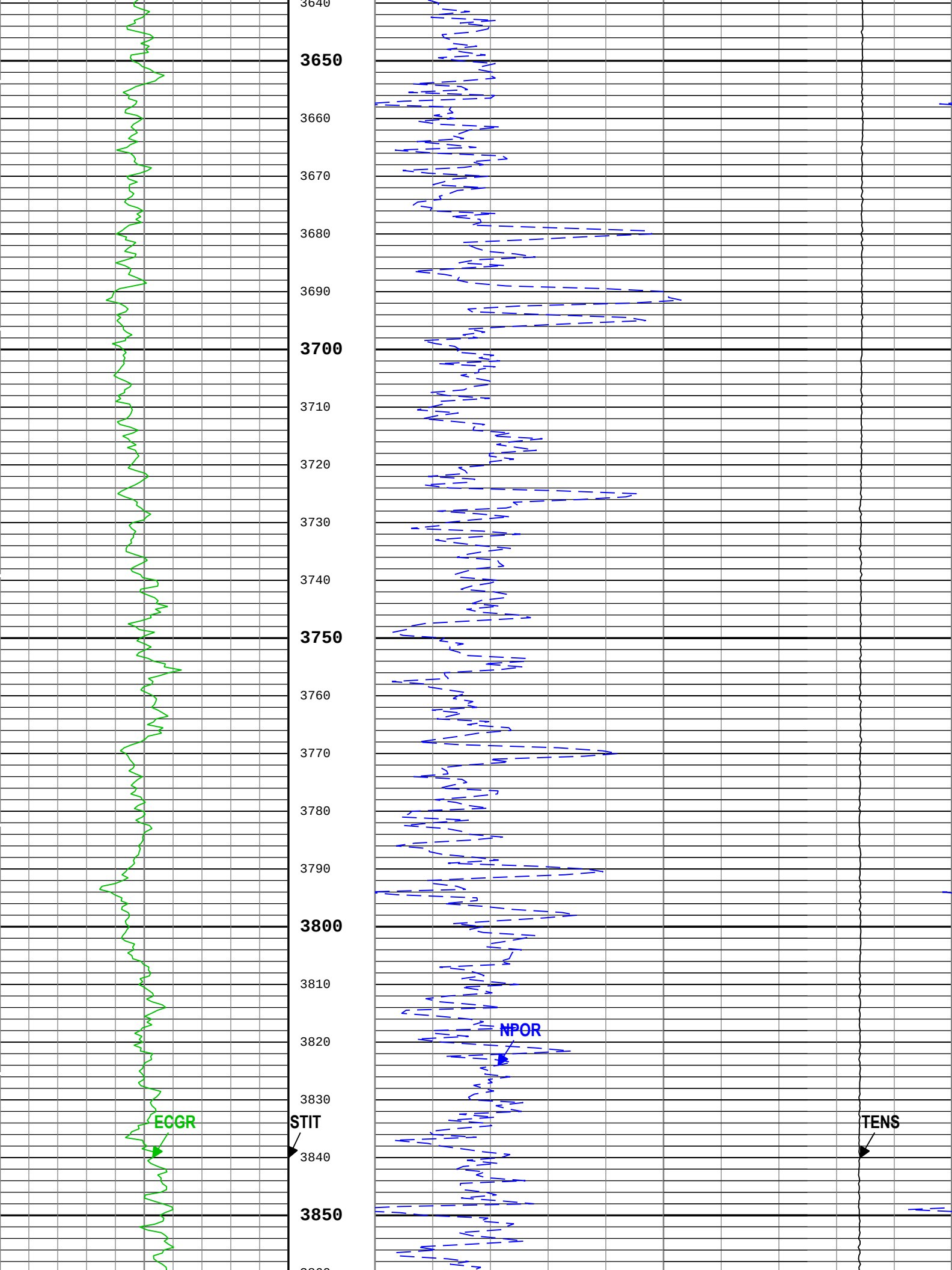
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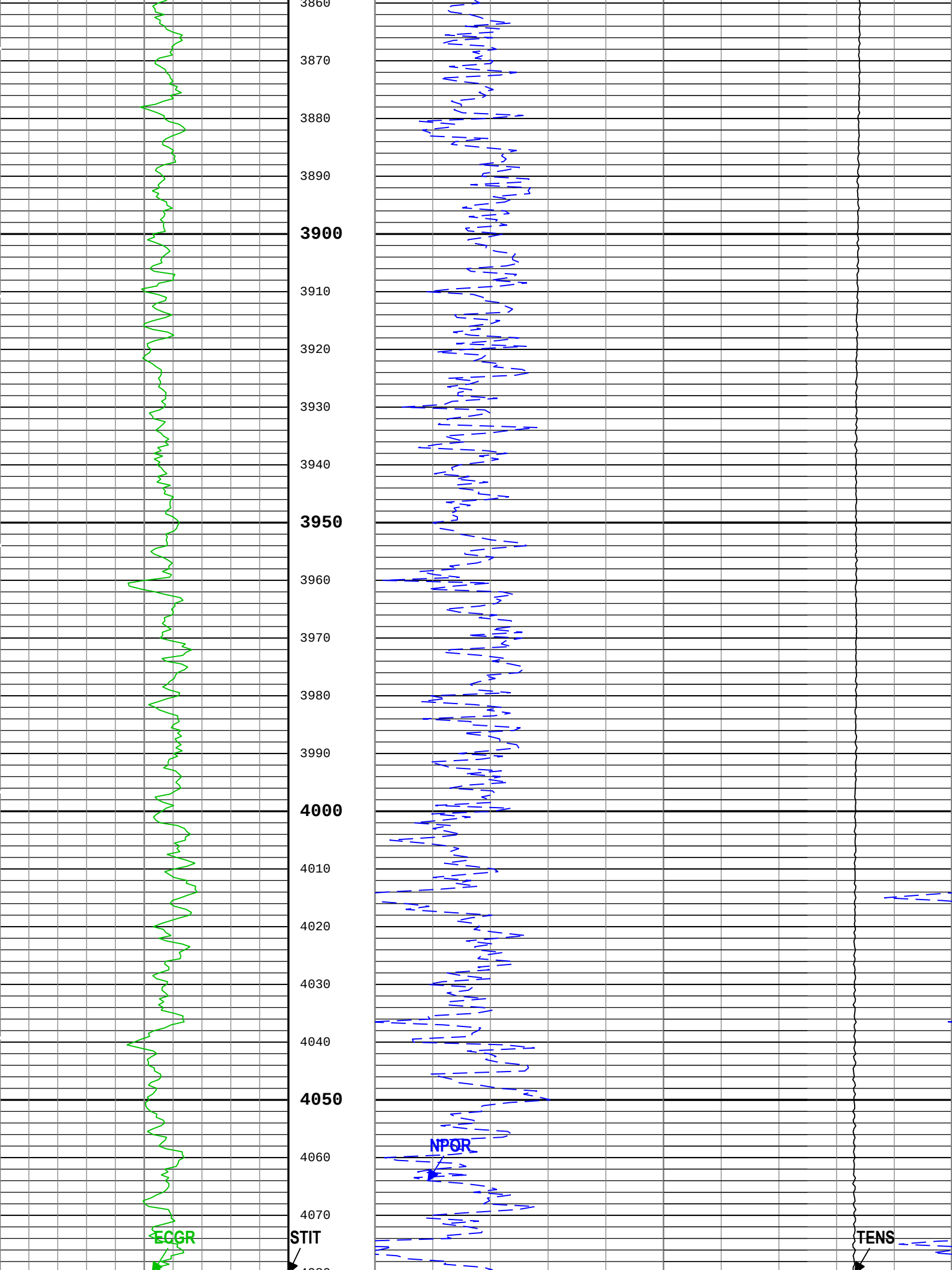
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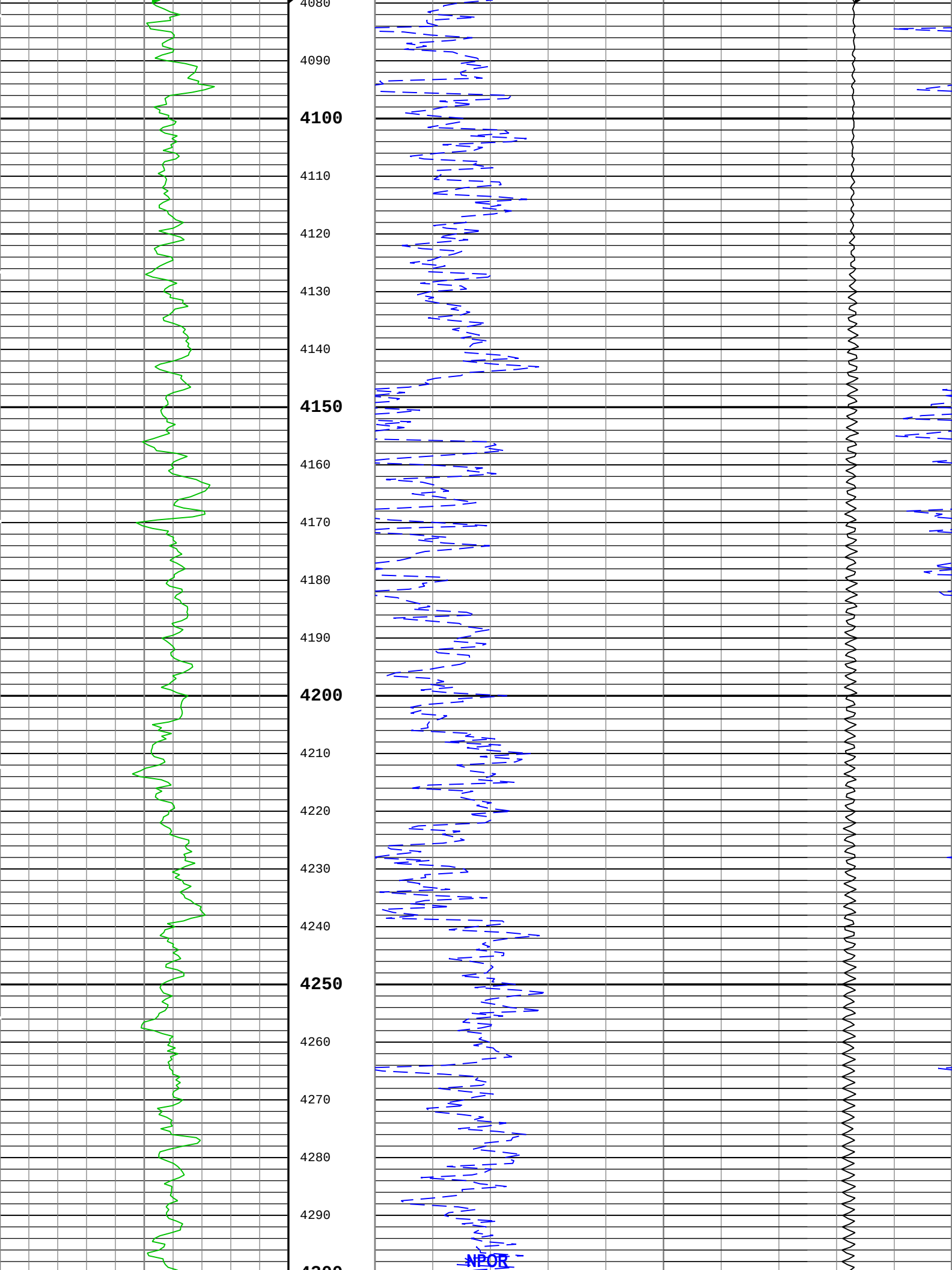
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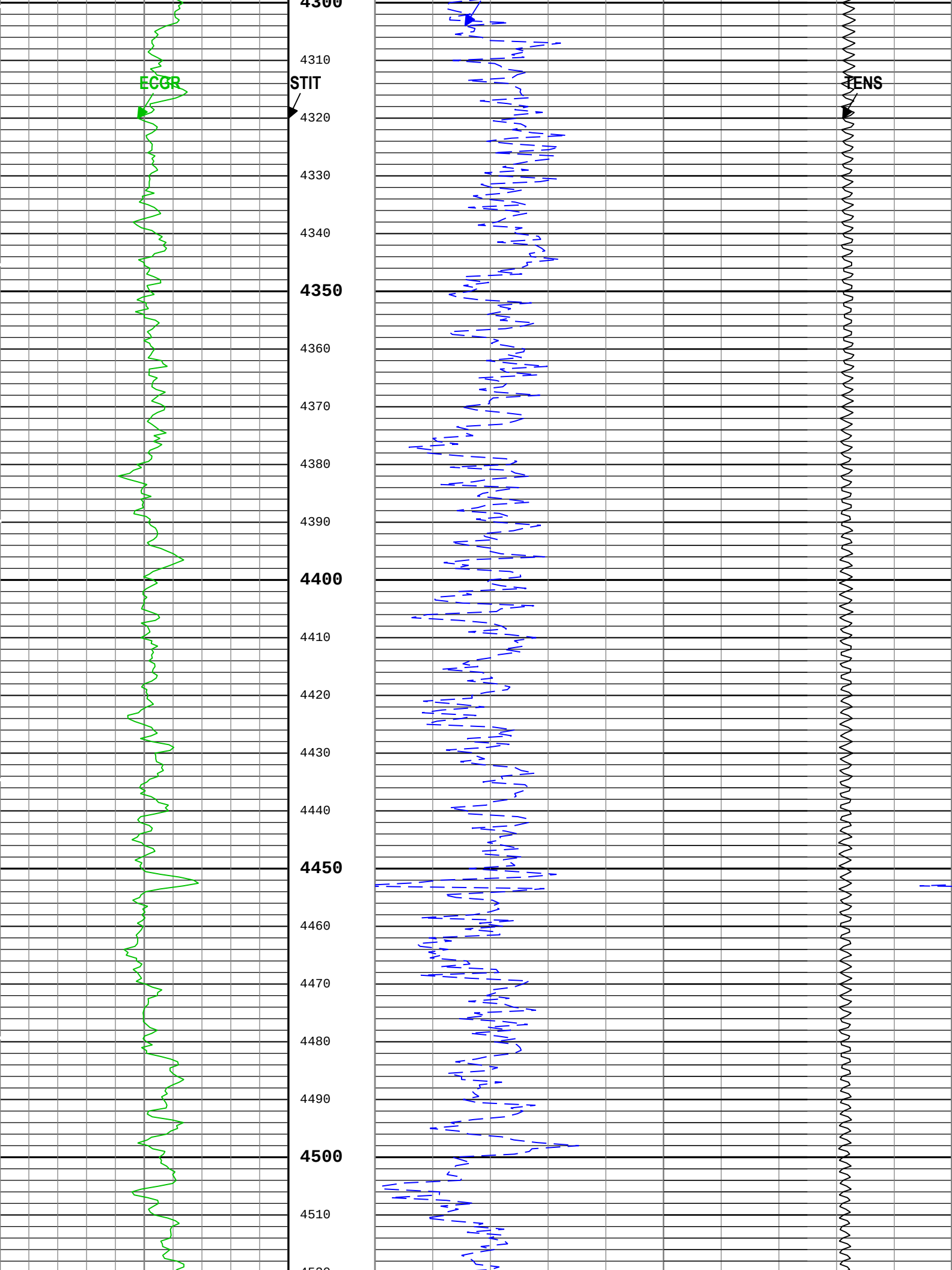
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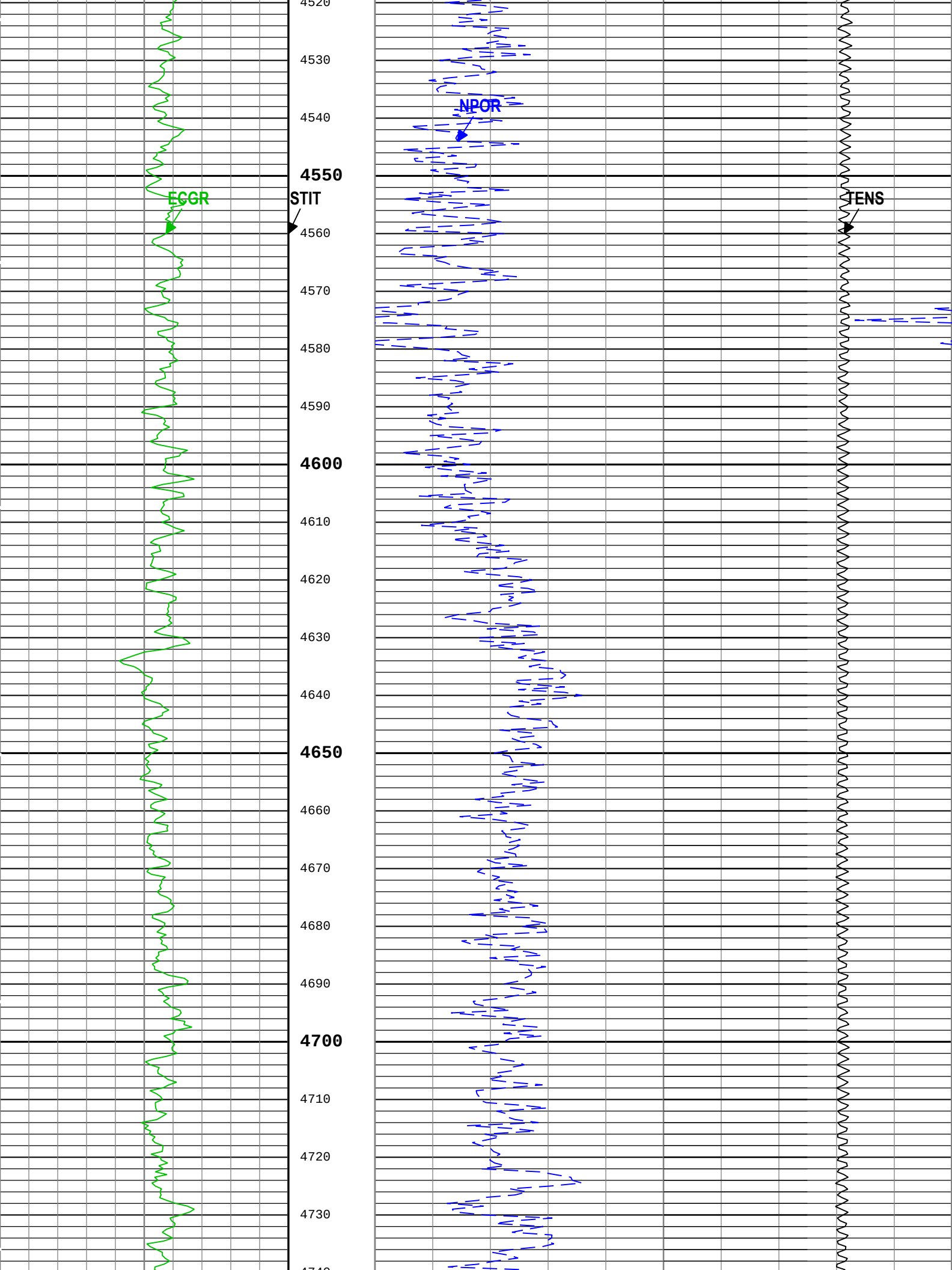
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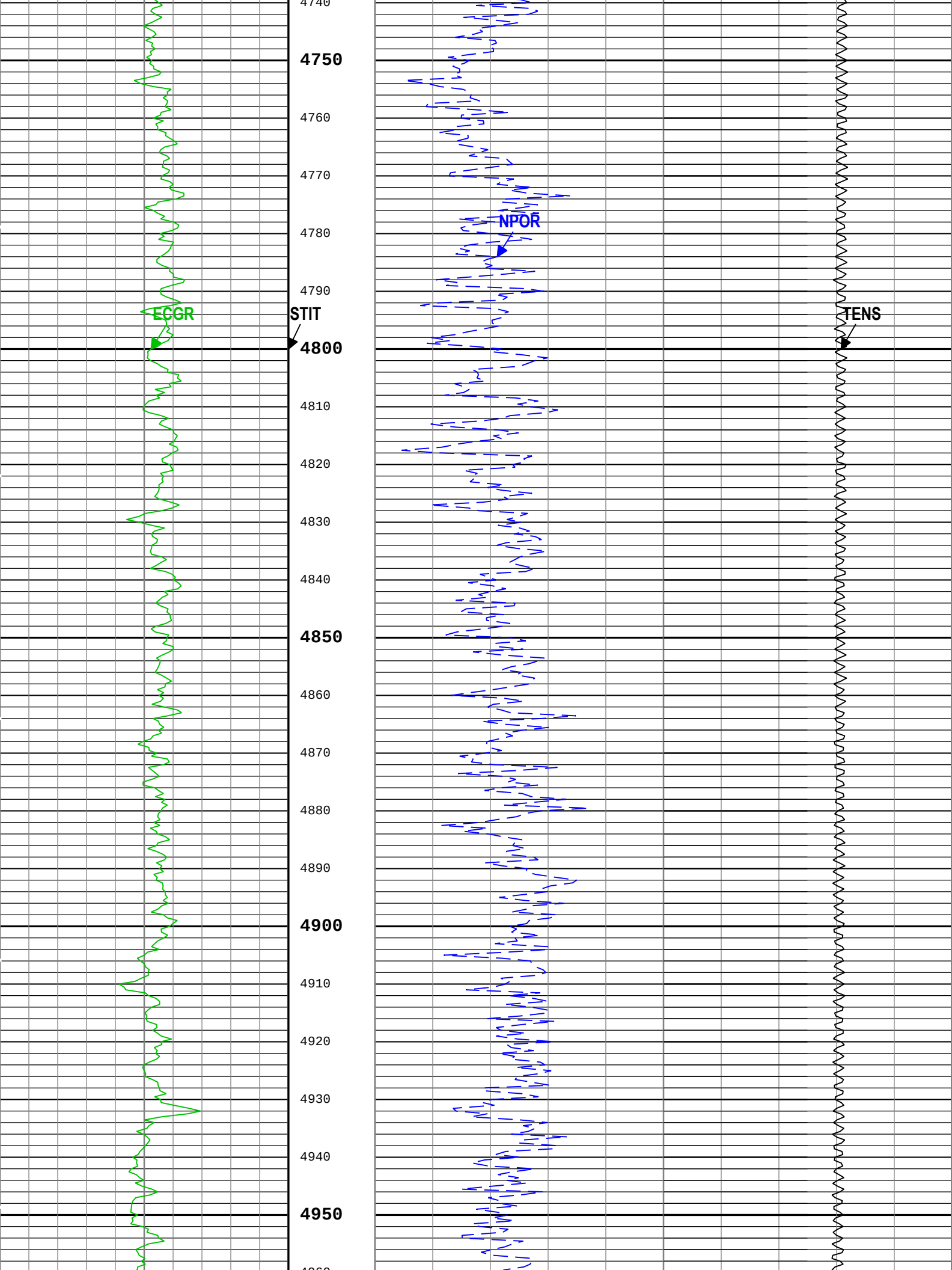
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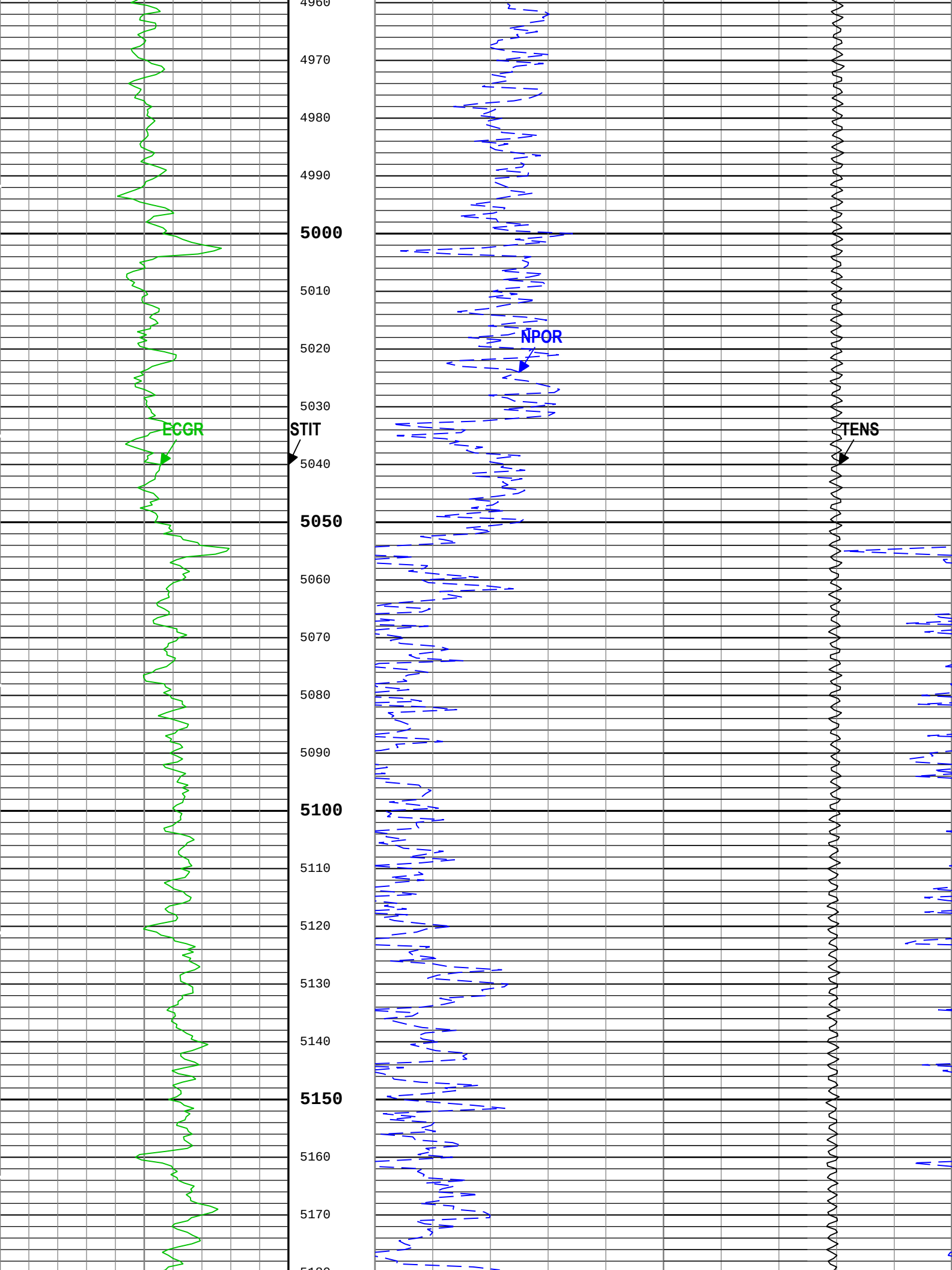
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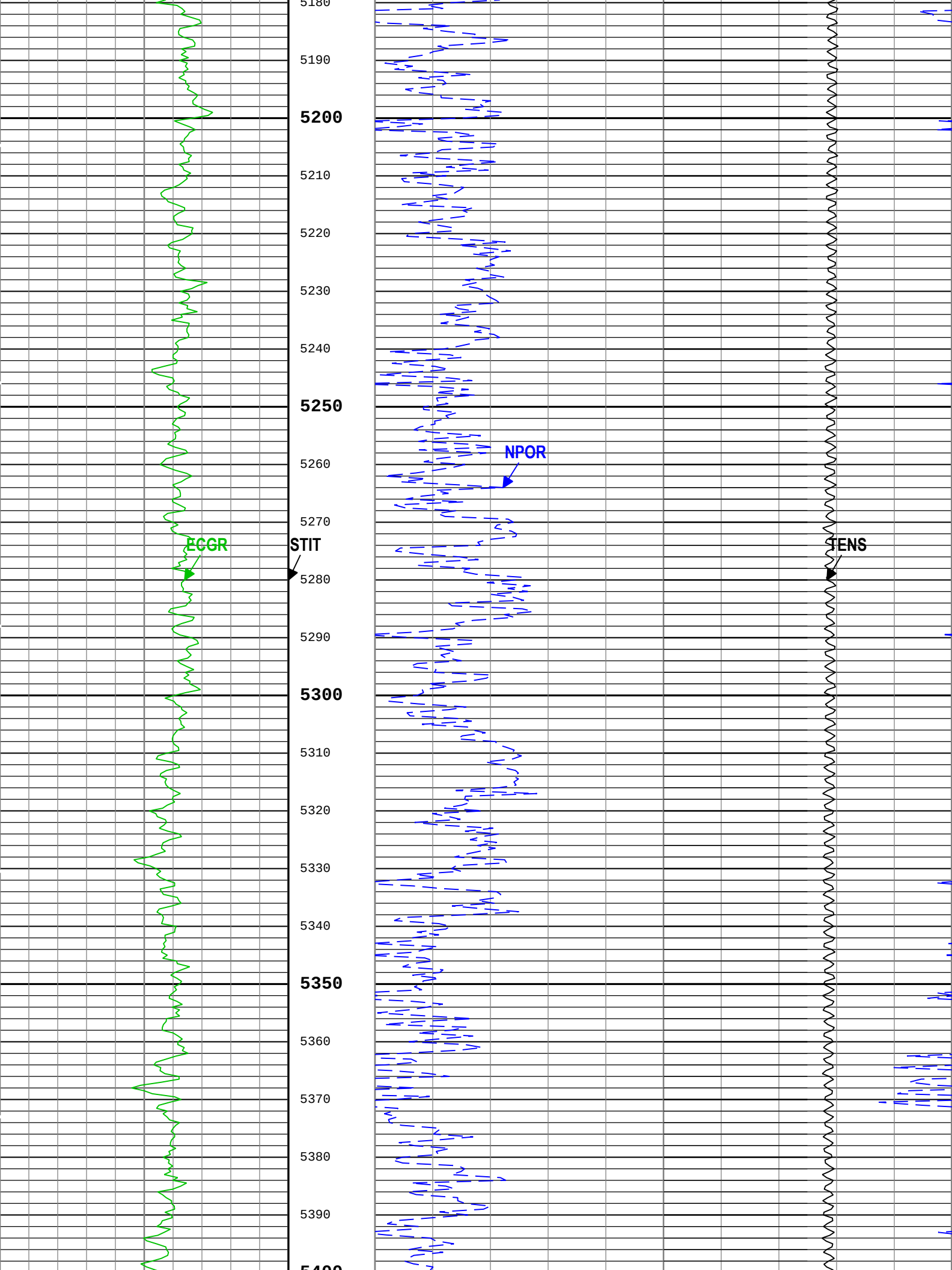
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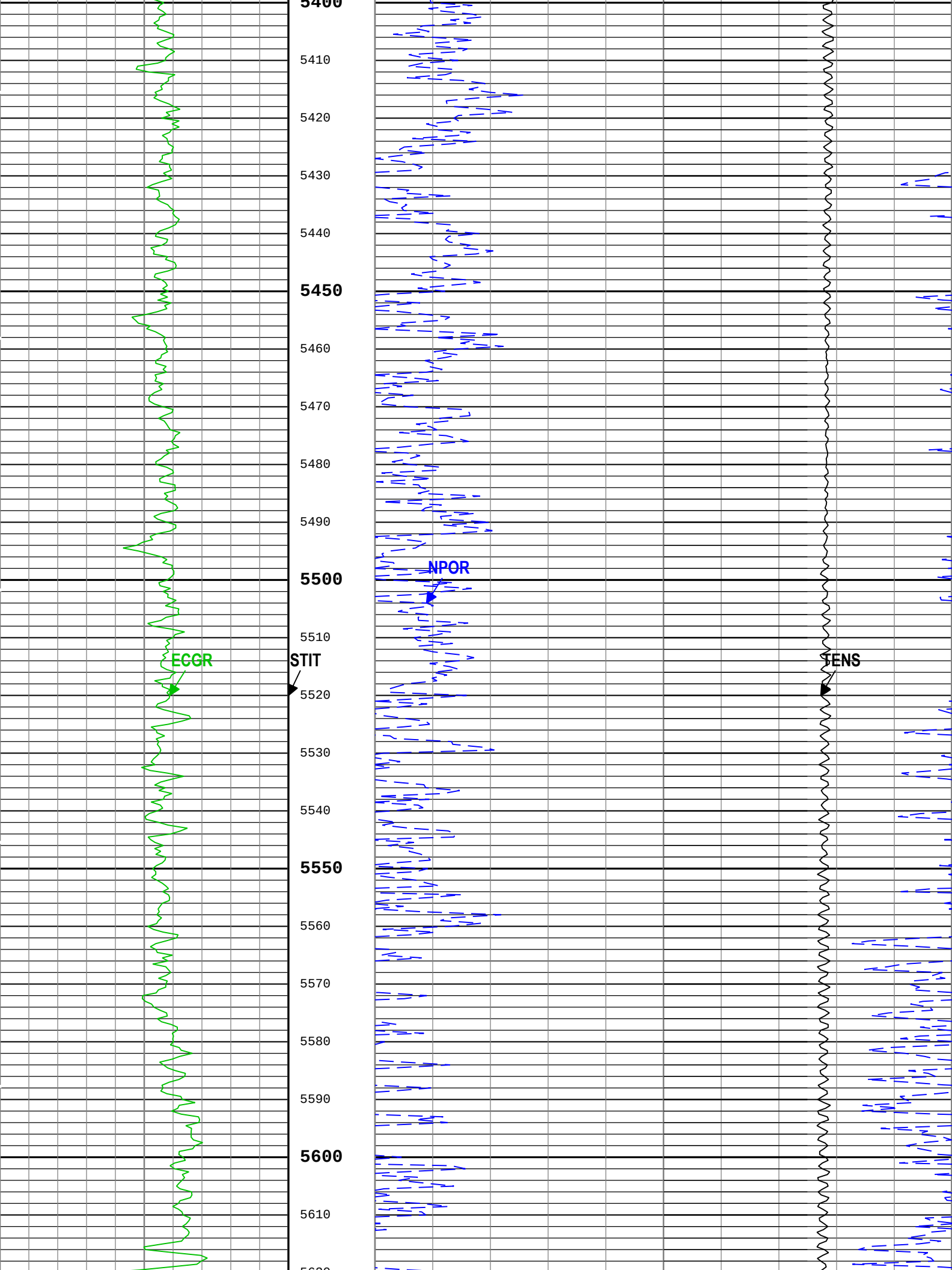
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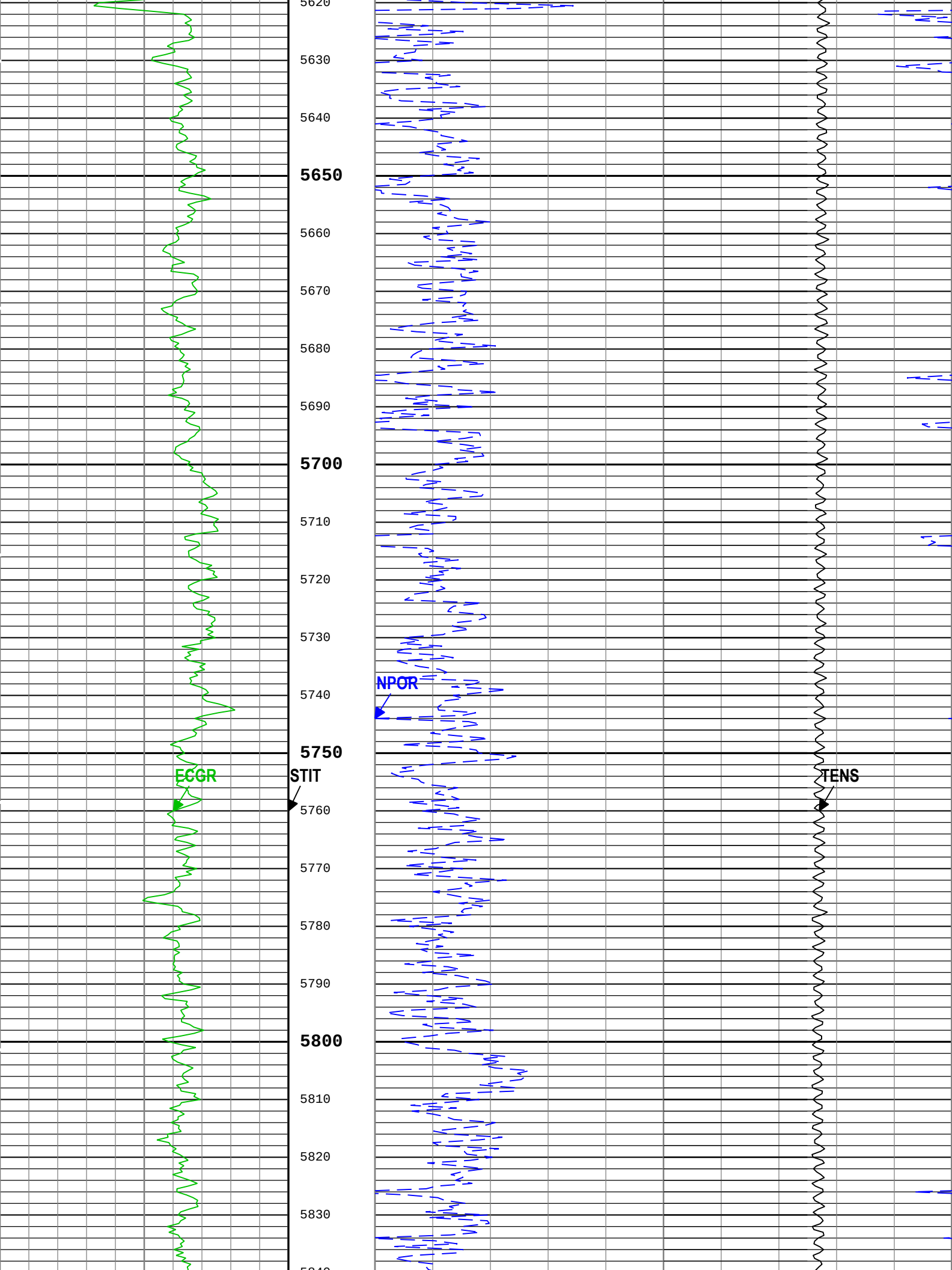
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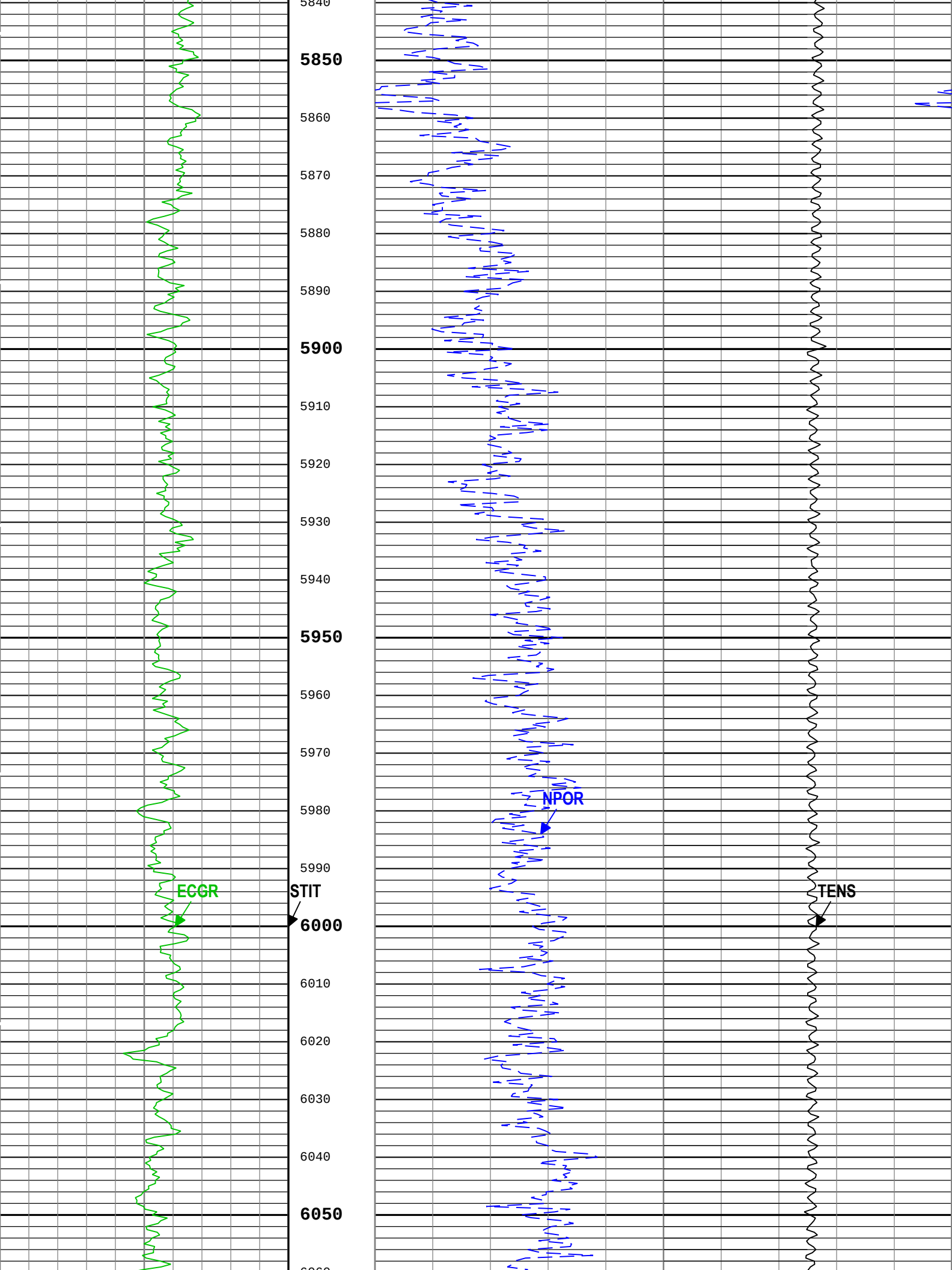
TENS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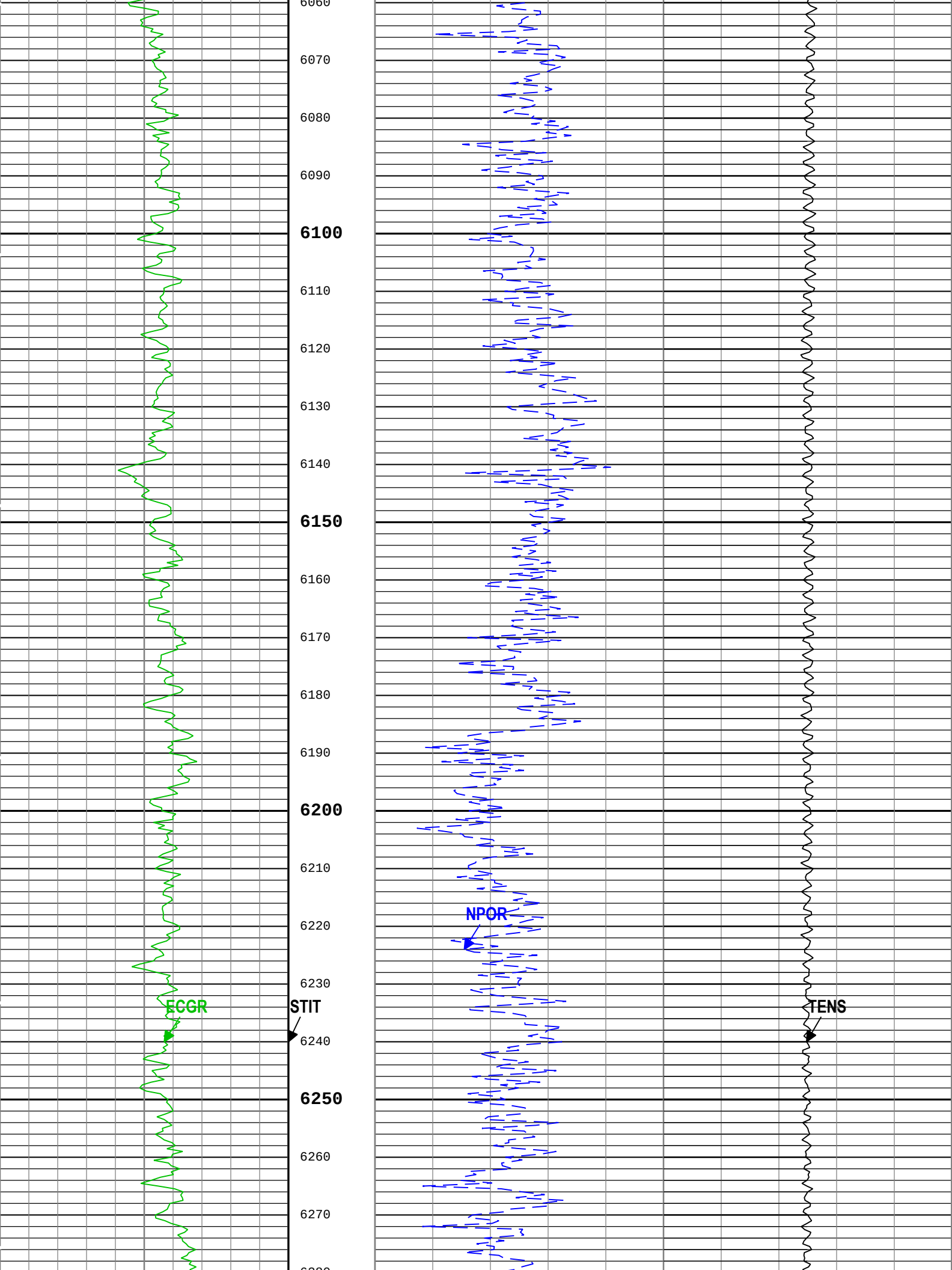
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STIT
NPOR
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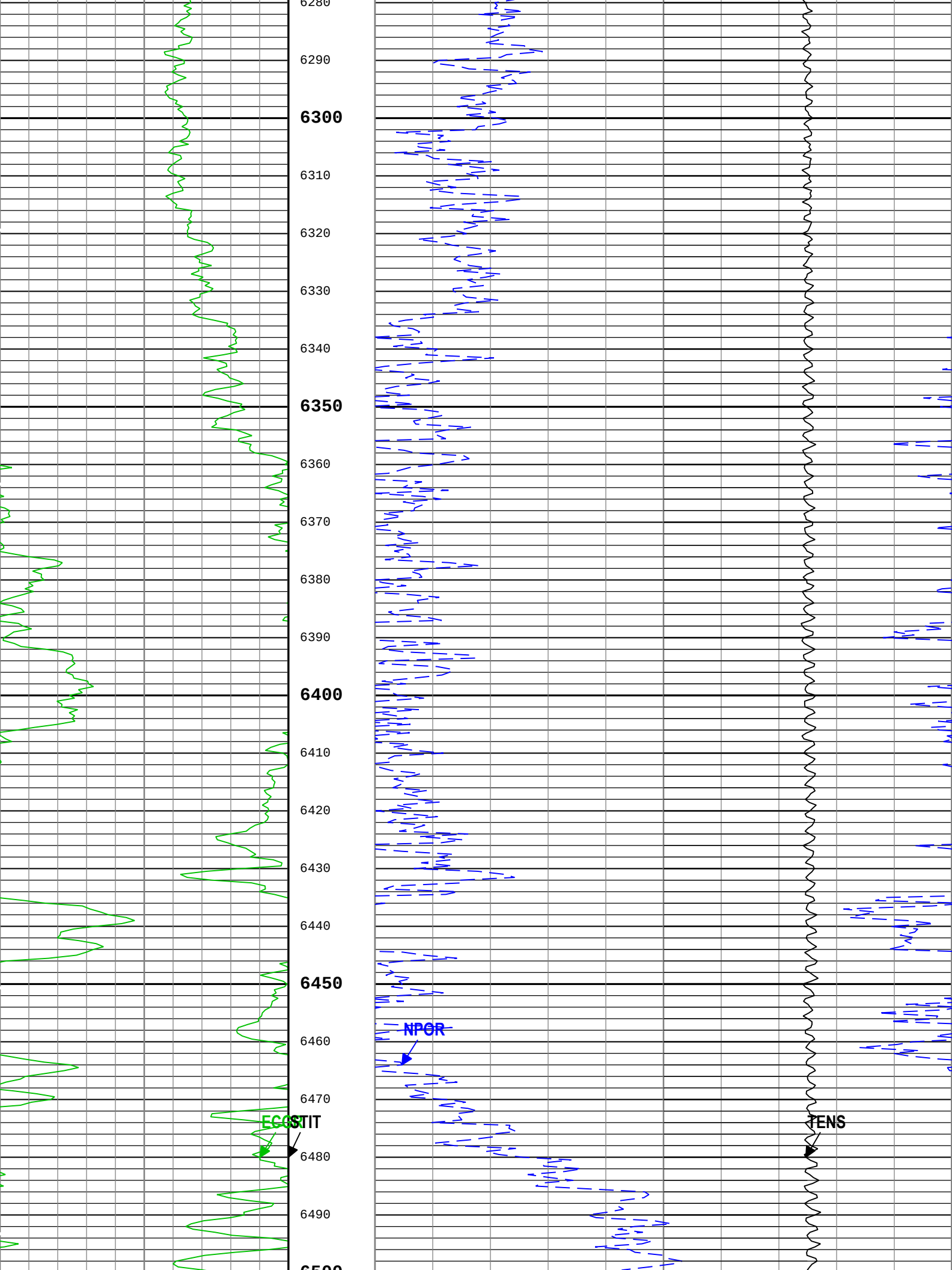
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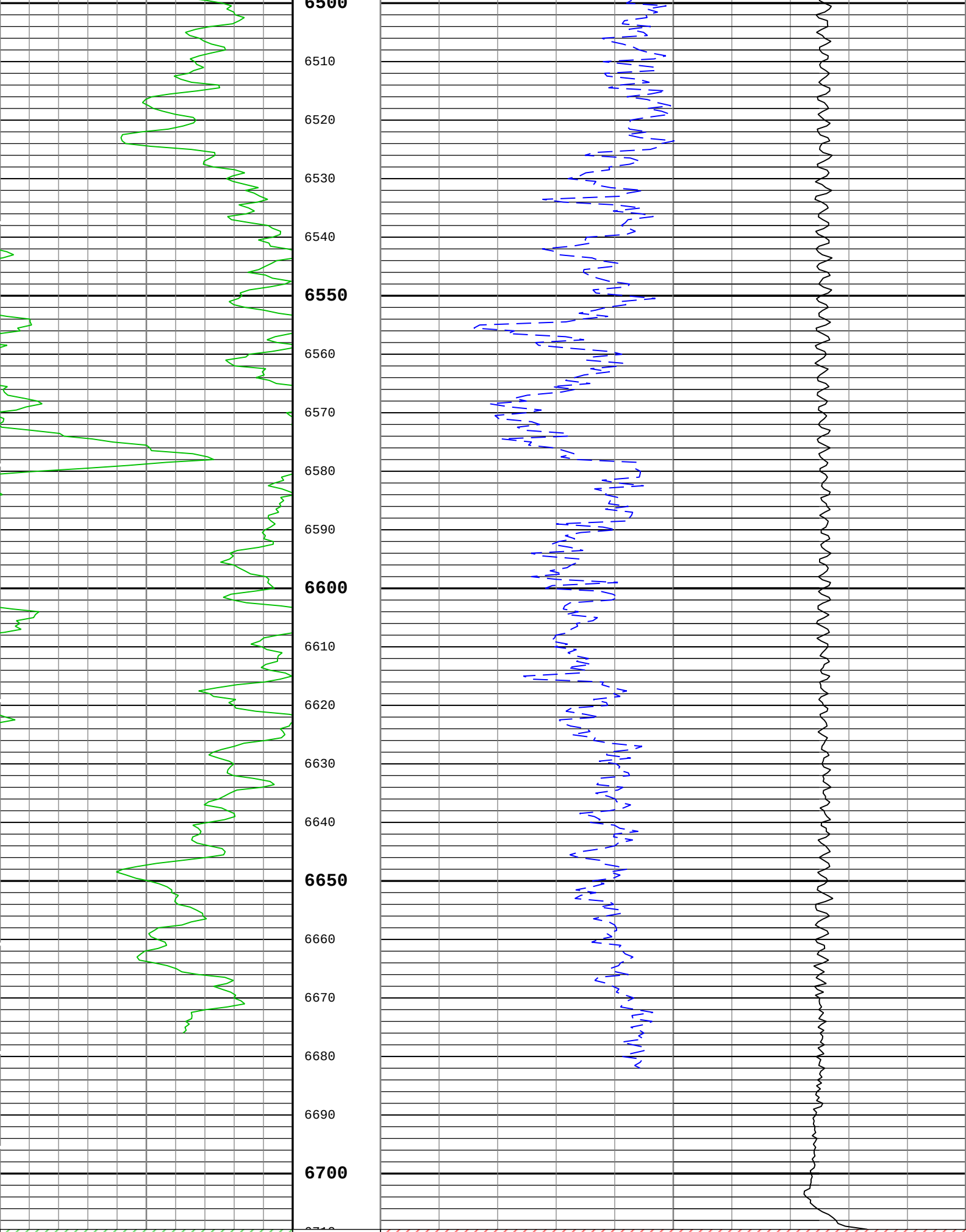
NPOR
ECGSTIT
TENS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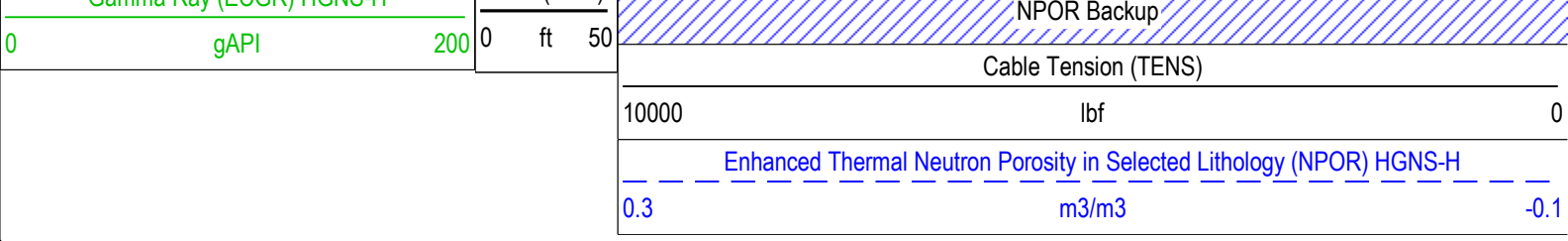
6690
6700
Gamma Ray Back up
Gamma Ray (ECGR) HGNS-H
Stuck Tool Indicator, Total (STIT)
Gas Effect



TIME_1900 - Time Marked every 60.00 (s)

Description: HGNS standard resolution porosities for Platform Express Format: Log (KM 5in Triple Combo) Index Scale: 5 in per 100 ft Index Unit: ft
Index Type: Measured Depth Creation Date: 04-Nov-2015 19:19:06

Channel Processing Parameters

Run 1: 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	218.9	degF
BS	Bit Size	WLSESSION	Depth Zoned	in
BSAL	Borehole Salinity	Borehole	0	ppm
CBLO	Casing Bottom (Logger)	WLSESSION	6880.2	ft
CDEN	Cement Density	HGNS-H	2	g/cm3
CDEN	Cement Density	USIT-E	0	g/cm3
CMTY(U-USIT_CEMT)	Cement Type	USIT-E	Light Cement	
DC_MODE	Depth Correction Mode	DepthCorrection	Real-time	
DFD	Drilling Fluid Density	Borehole	8.4	lbm/gal
DFT	Drilling Fluid Type	Borehole	Water	
DFT_WATER	Drilling Fluid Water Type	Borehole	Brine	
EDF	Elevation of Derrick Floor Above Permanent Datum	WLSESSION	23	ft
EPD	Elevation of Permanent Datum (PDAT) above Mean Sea Level	WLSESSION	4747	ft
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	
GGRD	Geothermal Gradient	Borehole	1	0.01 degF/ft
GRSE	Generalized Mud Resistivity Selection, from Measured or Computed Mud Resistivity	Borehole	REMS	
GTSE	Generalized Temperature Selection, from Measured or Computed Temperature	Borehole	GTEM_LINEST	
HSCO	Hole Size Correction Option	HGNS-H	Yes	
IBC_FRP_OFFSET	IBC Flexural Offset from Free Pipe	USIT-E	-11.83	dB/m
FSOD	USIT IBC Fluid Slowness Fits Casing Outer Diameter	USIT-E	0_OFF	
IBC_FVEL_SEL	IBC Fluid Velocity Selection	USIT-E	Automatic	
IBC_OFFSET_SEL	IBC Flexural Offset Selector	USIT-E	IBC_FRP_OFFSET	
IBC_ZMUD_SEL	IBC Mud Impedance Selection	USIT-E	FreePipe Norm.	
IMAR	Image Rotation	USIT-E	Off	
MATR	Rock Matrix for Neutron Porosity Corrections	Borehole	LIMESTONE	
MFST	Mud Filtrate Sample Temperature	Borehole	68	degF
MST	Mud Sample Temperature	Borehole	68	degF
U-USIT_OCDI	Outer Casing Diameter	USIT-E	0	in
U-USIT_OCSH	Outer Casing Shoe	USIT-E	0	ft
U-USIT_OCWE	Outer Casing Weight	USIT-E	0	lbm/ft
PDAT	Permanent Datum	WLSESSION	GL	
RMFS	Resistivity of Mud Filtrate Sample	Borehole	0.15	ohm.m
RMS	Resistivity of Mud Sample	Borehole	0.2	ohm.m

SHT	Surface Hole Temperature	Borehole	68	degF
SOCO	Standoff Correction Option	HGNS-H	Yes	
HISC	Tool Position: Centered or Eccentered	HGNS-H	Centered	
U-USIT_DFSZ	Drilling Fluid Specific Acoustic Impedance	USIT-E	2.07	Mrayl
U-USIT_UFAO	SIT Flexural Attenuation Offset	USIT-E	-15	dB/m
UFGDE	Fiberglass Density	USIT-E	1.95	g/cm3
UFGPS	Fiberglass Processing Selection	USIT-E	No	
UFGVL	Fiberglass Velocity	USIT-E	9678.48	ft/s
U-USIT_UIAP	IBC Answer Product Enabled	USIT-E	SolidLiquidGasMap	

Depth Zone Parameters

Parameter	Value	Start (ft)	Stop (ft)
BS	13.5	37.5	638
BS	8.75	638	6709.5

All depth are actual.

Tool Control Parameters

Run 1: Parameters

Parameter	Description	Tool	Value	Unit
MAX_LOG_SPEED	Toolstring Maximum Logging Speed	WLSESSION	2700	ft/h
U-USIT_UFWB	Far Receiver Window Begin Time	USIT-E	Time Zoned	us
U-USIT_UFWE	Far Receiver Window End Time	USIT-E	Time Zoned	us
ULOG	Logging Objective	USIT-E	MEASUREMENT	
UMFR	Modulation Frequency	USIT-E	333333	Hz
U-USIT_UNWB	Near Receiver Window Begin Time	USIT-E	Time Zoned	us
U-USIT_UNWE	Near Receiver Window End Time	USIT-E	Time Zoned	us
UPAT	USIT Emission Pattern	USIT-E	Pattern 375 KHz	
UWKM	USIT Working Mode	USIT-E	10 deg at 6.0 in LF	
USIT_DEPTHLOG	Starting Depth Log for Ultrasonics	USIT-E	6703.8	ft
U-USIT_UTAN	Transducer Angles	USIT-E	33_DEG	
VRES	Vertical Resolution	USIT-E	6.0 in	
WINB	Window Begin Time	USIT-E	Time Zoned	us
WINE	Window End Time	USIT-E	Time Zoned	us

Run 1

5" Triple Combo

Pass Summary

Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	DSC Mode	Depth Shift	Include Parallel Data
Run 1	Repeat[2]:Up	Up	6173.71 ft	6706.84 ft	04-Nov-2015 3:08:14 PM	04-Nov-2015 3:21:55 PM	ON	2.86 ft	Yes
Run 1	Main[3]:Up	Up	70.33 ft	6709.52 ft	04-Nov-2015 3:29:07 PM	04-Nov-2015 6:16:32 PM	ON	5.72 ft	Yes

All depths are referenced to toolstring zero

Log

Company:Noble Energy Inc Well:Wells Ranch AE32-675

Run 1: Main[3]:Up:S009

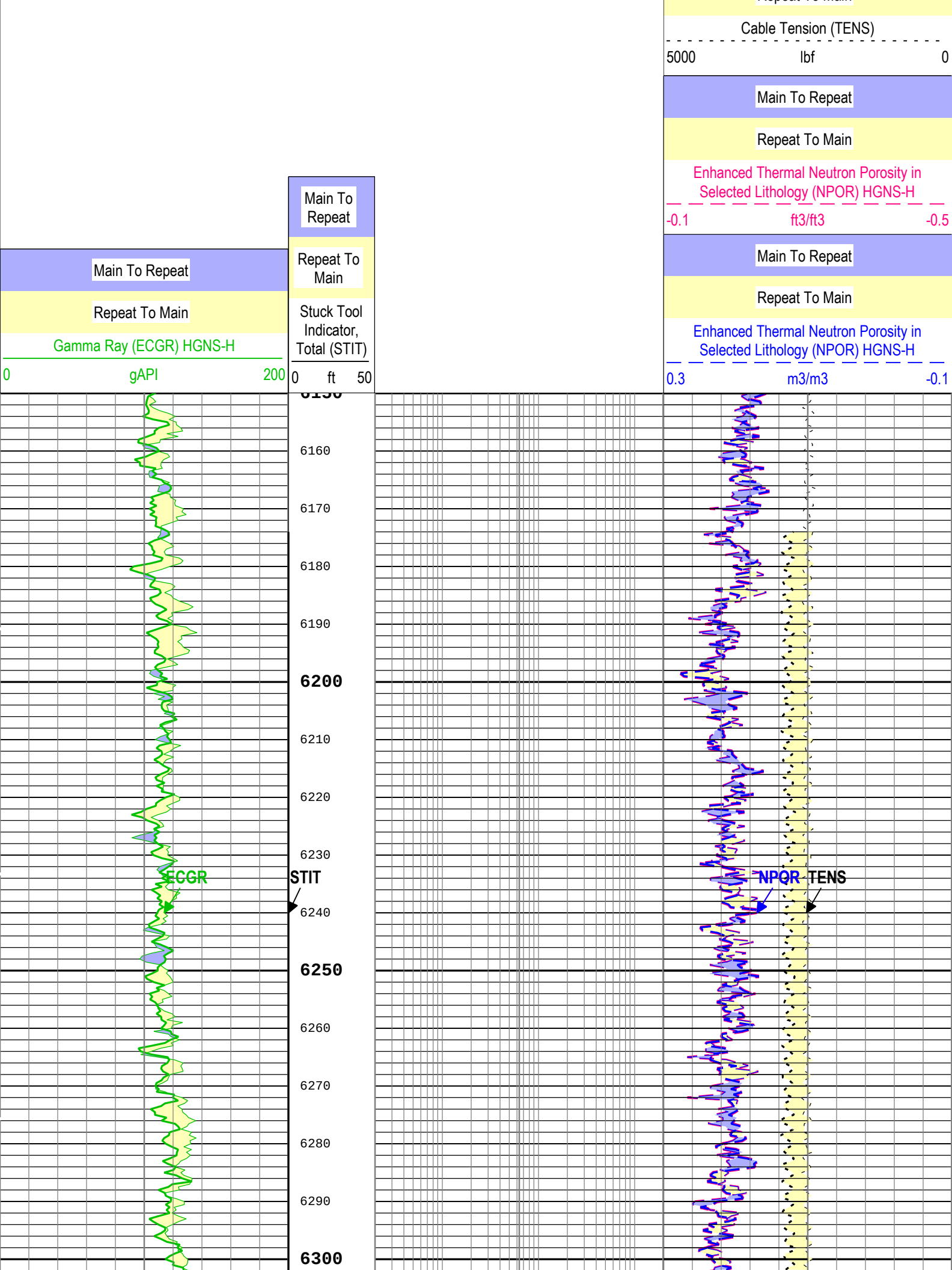
Description: HGNS standard resolution porosities for Platform Express Format: Log (KM 5in Triple Combo RA) Index Scale: 5 in per 100 ft Index Unit: ft

Index Type: Measured Depth Creation Date: 04-Nov-2015 19:19:09

TIME_1900 - Time Marked every 60.00 (s)

Main To Repeat

Repeat To Main


Cable Tension (TENS)
5000
lbf
0
Main To Repeat
Repeat To Main
Enhanced Thermal Neutron Porosity in Selected Lithology (NPOR) HGNS-H
-0.1
ft3/ft3
-0.5
Main To Repeat
Repeat To Main
Enhanced Thermal Neutron Porosity in Selected Lithology (NPOR) HGNS-H
0.3
m3/m3
-0.1
Main To Repeat
Repeat To Main
Stuck Tool Indicator, Total (STIT)
0
ft
50
Main To Repeat
Repeat To Main
Gamma Ray (ECGR) HGNS-H
0
gAPI
200
6160
6170
6180
6190
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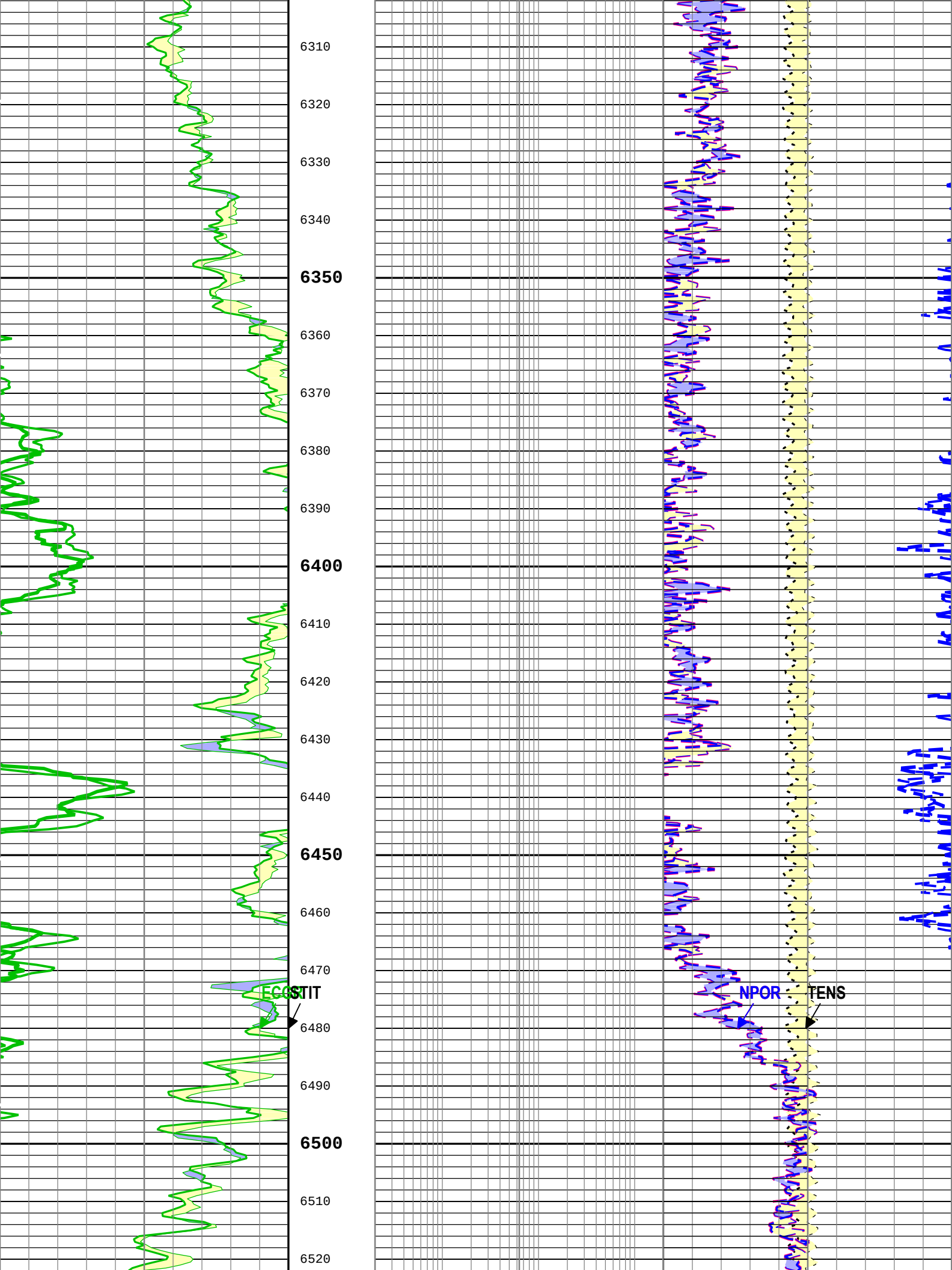
ECGR
STIT
NPOR
TENS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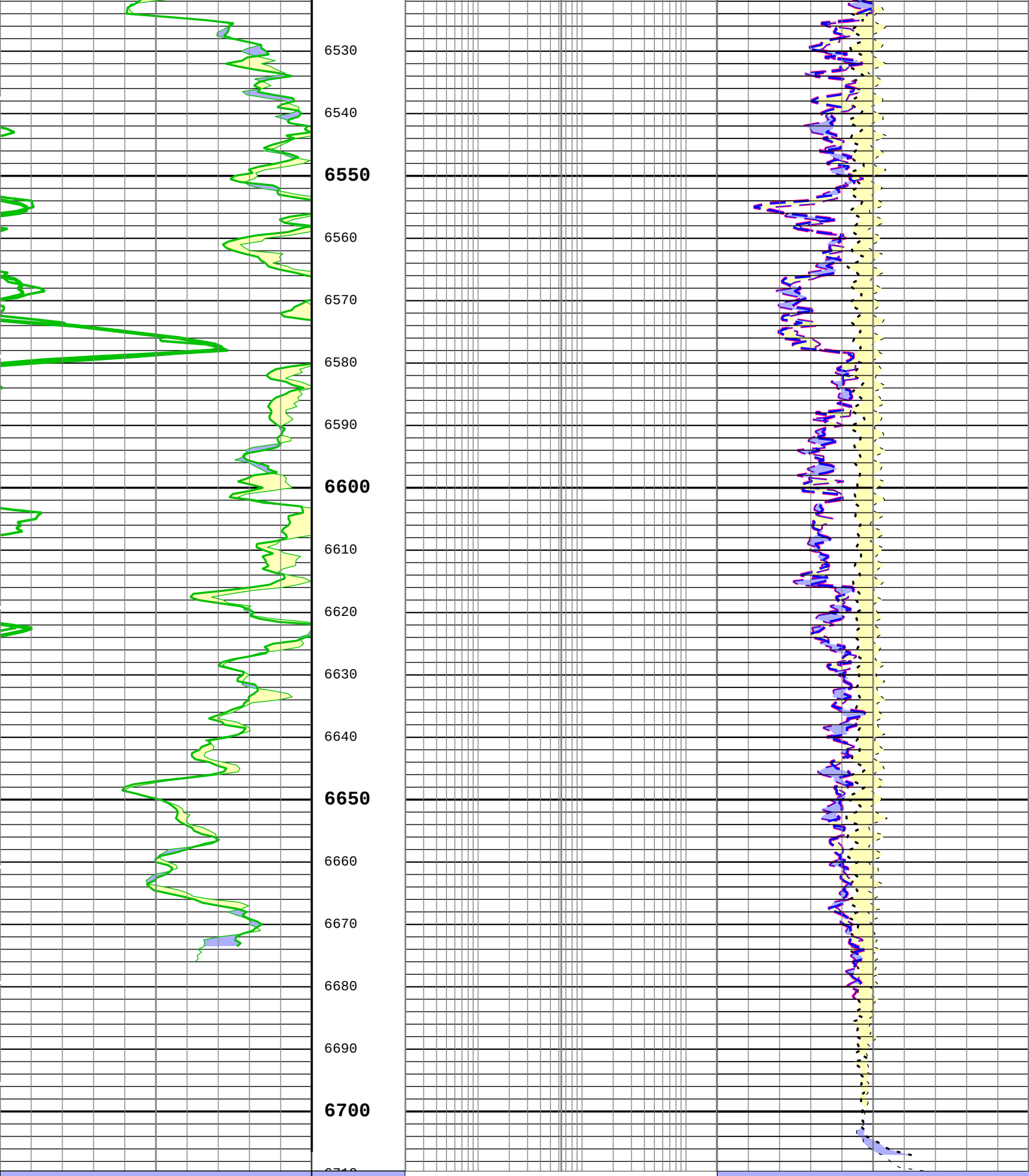


Main To Repeat

Repeat To Main

Gamma Ray (ECGR) HGNS-H

0 gAPI 200

Main To Repeat

Repeat To Main

Stuck Tool Indicator, Total (STIT)

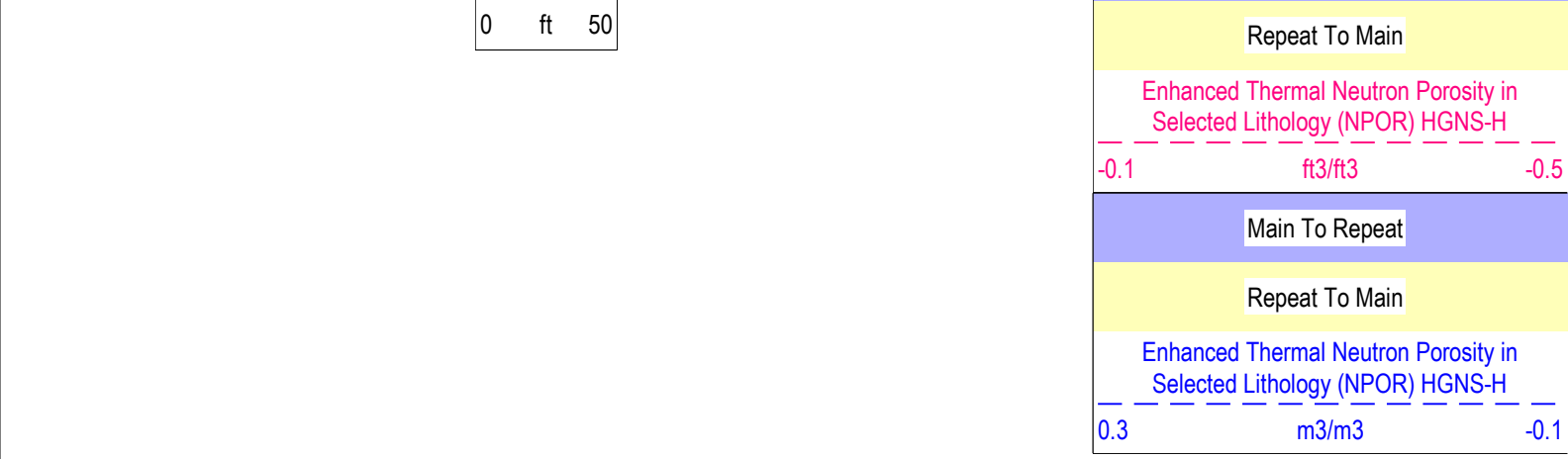
Main To Repeat

Repeat To Main

Cable Tension (TENS)

5000 lbf 0

Main To Repeat



Description: HGNS standard resolution porosities for Platform Express Format: Log (KM 5in Triple Combo RA) Index Scale: 5 in per 100 ft Index Unit: ft
Index Type: Measured Depth Creation Date: 04-Nov-2015 19:19:09

Calibration Report

HGNS-H (HILT Gamma-Ray and Neutron Sonde, 150 degC) Calibration - Run 1

Primary Equipment :

HILT Gamma-Ray and Neutron Sonde, 150 degC	HGNS-H	3985

Auxiliary Equipment :

HGNS Accelerometer, 150 degC	HACCZ-H	4269
AmBe Neutron Logging Source	NSR-F	5138

Calibration Parameter :

Water Temperature (Calibration Tank Water Temperature)	59.5
Housing Size (Thermal Housing Size)	3.37
JIG-BKG (Jig minus background reference)	165

HGNS Accelerometer Calibration - Accelerometer Accumulations

Before (Measured): 14:20:24 04-Nov-2015

Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit
AZ Vertical Measurement	ft/s2	Before	32.2	31.5	32.1	32.8

HGNS Accelerometer EEPROM - Accelerometer EEPROM Read

Master (EEPROM): 00:00:00 15-Aug-2005

Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit
Accelerometer Manufacturer		Master			QAT_160	
Accelerometer Reference Temperature	degF	Master		30.2	77.0	122.0
Accelerometer Coefficients - 0		Master	-----	-----	336.900	-----
Accelerometer Coefficients - 1		Master	-----	-----	37.580	-----
Accelerometer Coefficients - 2		Master	-----	-----	-0.019	-----
Accelerometer Coefficients - 3		Master	-----	-----	0.000	-----
Accelerometer Coefficients - 4		Master	-----	-----	2.730	-----
Accelerometer Coefficients - 5		Master	-----	-----	0.000	-----
Accelerometer Coefficients - 6		Master	-----	-----	0.000	-----
Accelerometer Coefficients - 7		Master	-----	-----	0.000	-----
Accelerometer Coefficients - 8		Master	-----	-----	299.000	-----
Accelerometer Coefficients - 9		Master	-----	-----	1.007	-----

HGNS Neutron Calibration - HGNS Neutron Accumulations

Master (EEPROM): 13:10:00 23-Oct-2015 Before (Measured): 20:50:55 01-Nov-2015 Expired by 1 days

Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit
Near Zero Measurement	1/s	Master	0	5.0	28.0	40.0
		Before	0	5.0	27.0	40.0
		Before-Master	-----	-4.2	-1.0	4.2
Far Zero Measurement	1/s	Master	0	5.0	26.3	40.0
		Before	0	5.0	25.5	40.0
		Before-Master	-----	-3.9	-0.8	3.9

Near Plus Measurement	1/s	Master	6031.0	4700.0	4945.0	6900.0	
		Before	-----	-----	-----	-----	
		Before-Master	-----	-----	-----	-----	
Far Plus Measurement	1/s	Master	2793.0	1900.0	2073.0	2900.0	
		Before	-----	-----	-----	-----	
		Before-Master	-----	-----	-----	-----	
Near Corrected Plus Measurement	1/s	Master		4700.0	4971.0	6900.0	
		Before	-----	-----	-----	-----	
		Before-Master	-----	-----	-----	-----	
Far Corrected Plus Measurement	1/s	Master		1900.0	2080.0	2900.0	
		Before	-----	-----	-----	-----	
		Before-Master	-----	-----	-----	-----	

HGNS Gamma-Ray Calibration - Gamma-Ray Accumulations

Before (Measured): 20:51:18 01-Nov-2015 Expired by 1 days

Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit	
RGR Zero Measurement	gAPI	Before	30.0	0	73.8	120.0	
RGR Plus Measurement	gAPI	Before	185.4	157.1	168.6	206.3	
GR Calibration Gain		Before	0.89	0.80	0.98	1.05	

County:	Weld
State:	Colorado

Platform Express

Neutron Porosity