

Company: Noble Energy Inc

Well: Colt A13-648

Field: Wattenberg

County: Weld State: Colorado

Compensated Neutron

Gamma Ray - CCL Log

County: Weld
Field: Wattenberg
Location: NWSW Sec. 17, T6N, R63W
Well: Colt A13-648
Company: Noble Energy Inc

Location:		NWSW Sec. 17, T6N, R63W SHL: 2496' FSL & 424' FWL Lat/Long: 40.486110/-104.468810	Elev.: K.B. 4694.00 ft G.L. 4664.00 ft D.F. 4693.00 ft
Permanent Datum:	Ground Level	Elev.: 4664.00 f	
Log Measured From:	Kelly Bushing	30.00 ft	above Perm.Datum
Drilling Measured From:	Kelly Bushing		
API Serial No.	Section: 17	Township: 6N	Range: 63W
05-123-40907-0000			

Logging Date	18-Apr-2015	18-Apr-2015	
Run Number	Run 1	Run 2	
Depth Driller	7019.00 ft	7019.00 ft	
Schlumberger Depth	7019.00 ft	7019.00 ft	
Bottom Log Interval	6850.00 ft	6850.00 ft	
Top Log Interval	30.00 ft	30.00 ft	
Casing Fluid Type	Water	Water	
Salinity			
Density	8.7 lbm/gal	8.7 lbm/gal	
Fluid Level	8.00 ft	8.00 ft	
BIT/CASING/TUBING STRING			
Bit Size	8.75 in	8.75 in	
From	934.00 ft	934.00 ft	
To	7019.00 ft	7019.00 ft	
Casing/Tubing Size	7 in	7 in	
Weight	26 lbm/ft	26 lbm/ft	
Grade	P110	P110	
From	30.00 ft	30.00 ft	
To	7019.00 ft	7019.00 ft	
Max Recorded Temperatures			
Logger on Bottom	Time	18-Apr-2015 09:08:00	20-Apr-2015 13:08:00
Unit Number	Location:	3022 Fort Morgan, CO	3022 Fort Morgan, CO
Recorded By		Keri Ondrus	Keri Ondrus
Witnessed By			

Disclaimer

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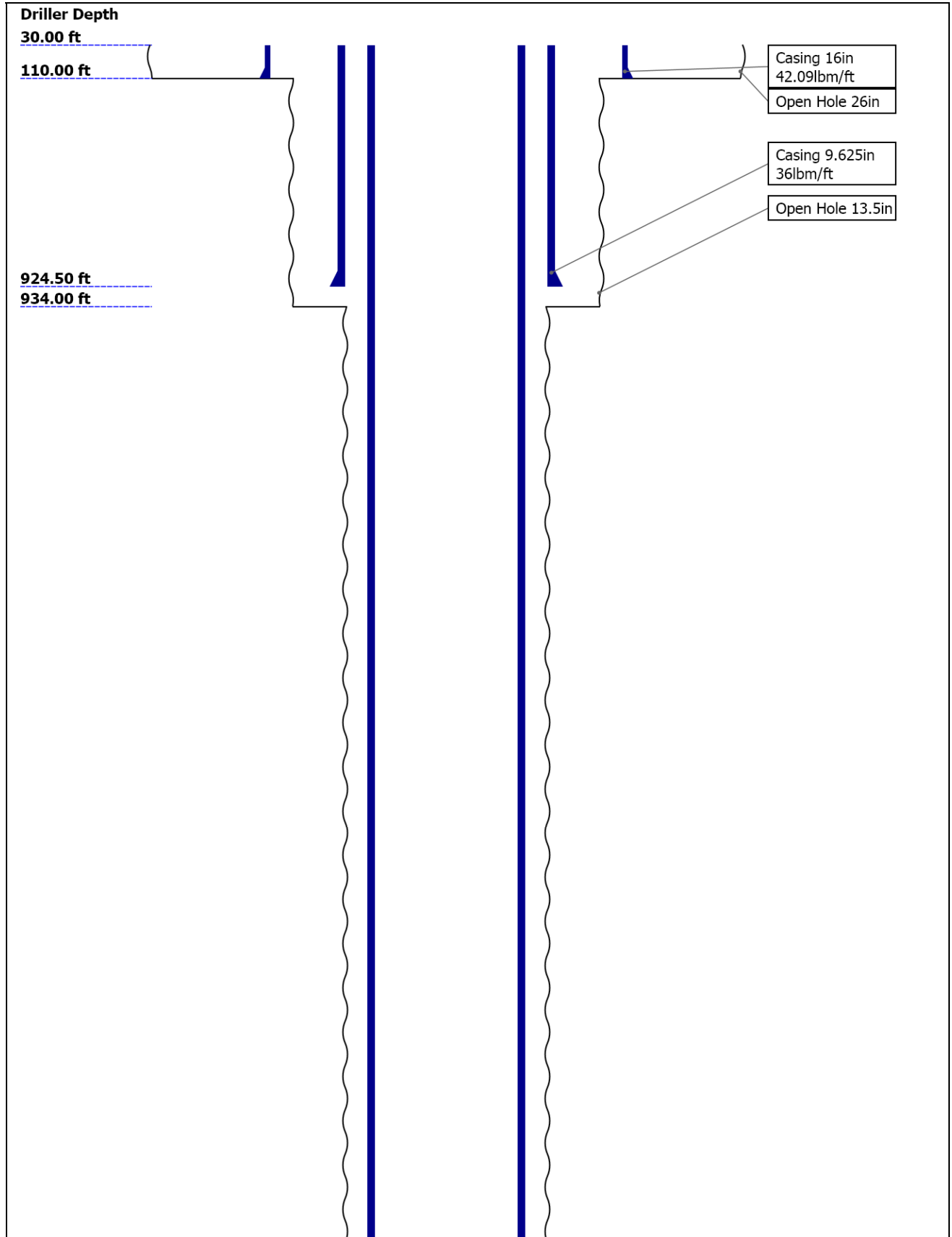
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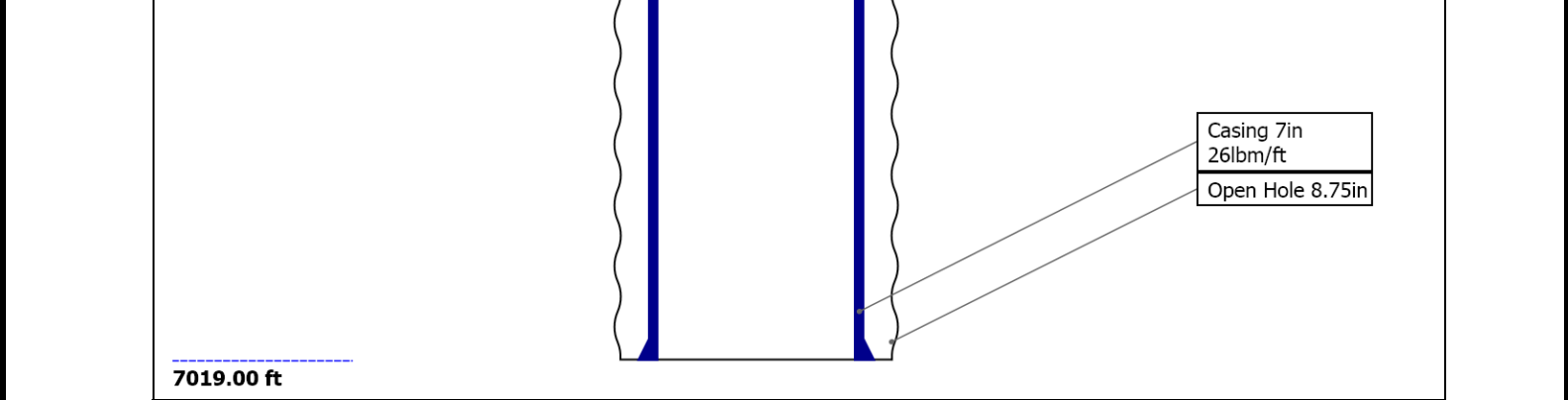
11.2 Noble Nuclear RA

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Well Sketch





Borehole Size/Casing/Tubing Record

Bit						
Bit Size (in)	26	13.5	8.75			
Top Driller (ft)	30	110	934			
Top Logger (ft)	30	110	934			
Bottom Driller (ft)	110	934	7019			
Bottom Logger (ft)	110	934	7019			
Casing						
Size (in)	16	9.625	7			
Weight (lbm/ft)	42.09	36	26			
Inner Diameter (in)	15.511	8.921	6.276			
Grade	N/A	J55	P110			
Top Driller (ft)	30	30	30			
Top Logger (ft)	30	30	30			
Bottom Driller (ft)	110	924.5	7019			
Bottom Logger (ft)	110	924.5	7019			

Operational Run Summary

Parameter (unit)	Run 1	Run 2				
Date Log Started	18-Apr-2015	18-Apr-2015				
Time Log Started	08:30:52	11:12:35				
Date Log Finished	18-Apr-2015	18-Apr-2015				
Time Log Finished	11:01:13	17:10:05				
Top Log Interval (ft)	30.00	30.00				
Bottom Log Interval (ft)	6850.00	6850.00				
Total Depth (ft)	6850.00	6850.00				
Max Hole Deviation (deg)	0.00	0.00				
Azimuth of Max Deviation (deg)	0.00	0.00				
Bit Size (in)	8.750	8.750				
Logging Unit Number	3022	3022				
Logging Unit Location	Fort Morgan, CO	Fort Morgan, CO				
Recorded By	Keri Ondrus	Keri Ondrus				

Borehole Fluids

Remarks and Equipment Summary

Toolstring run as per toolsketch.

No surface induced pressure for compensated neutron logs.

Run 1: Remarks

This is the second run in the well.

0 PSI repeat pass and 2500 PSI main pass.

Run 1: Toolstring

Run 2: Toolstring

Equip name	Length	MP name	Offset
LEH-QT	32.48		
LEH-QT			

AH-63	29.57	
AH-79	29.25	

Material	Value
PSTP-A:2702	28.42
PSC-A	
PSTC-A	
PBMS-A:2702	
Sapphire 10kP	
SI	
GR	24.71
PSTC	24.42
PSTC Tool	0.00
String Bot	
tom	
Temperatu	21.63
re	
Sapphire P	21.51
ressure	
CCL	20.9
PBMS	20.15

SCMT-CB:82 20.15
84

SECH-CA:823
5

SCMC-CA:823
7

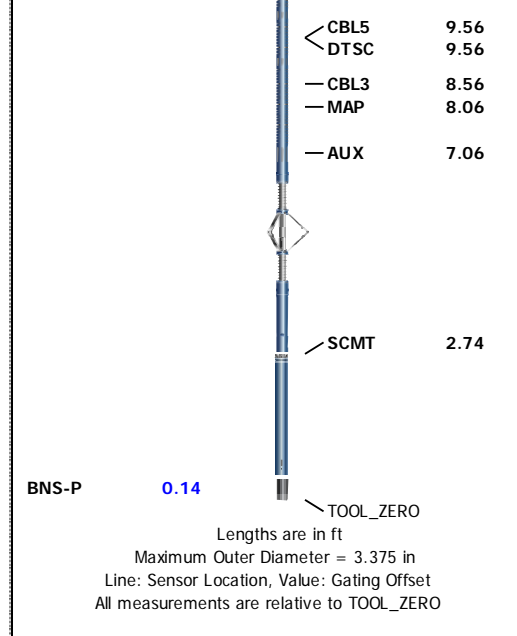
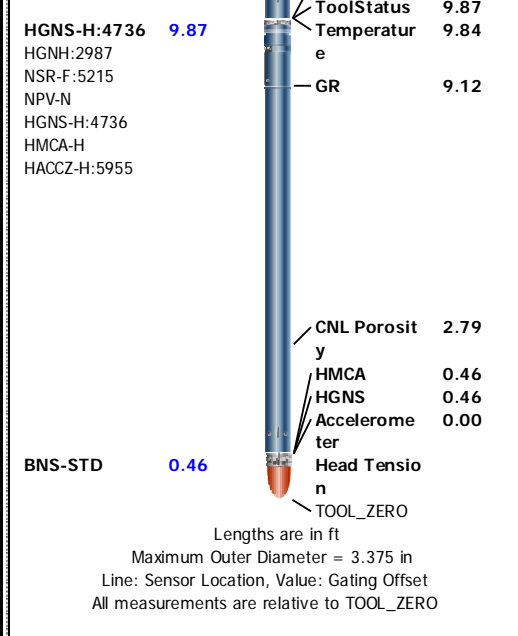
CMIR-AG
SCMS-CB-8284
SCMY CA:8238

Equip name	Length	MP name	Offset
LEH-QT	15.78		
LEH-QT			

Method	Value	Method	Value
DTC-H	12.87	CTEM	11.97
ECH-KC		HV	0.00
DTC-H			

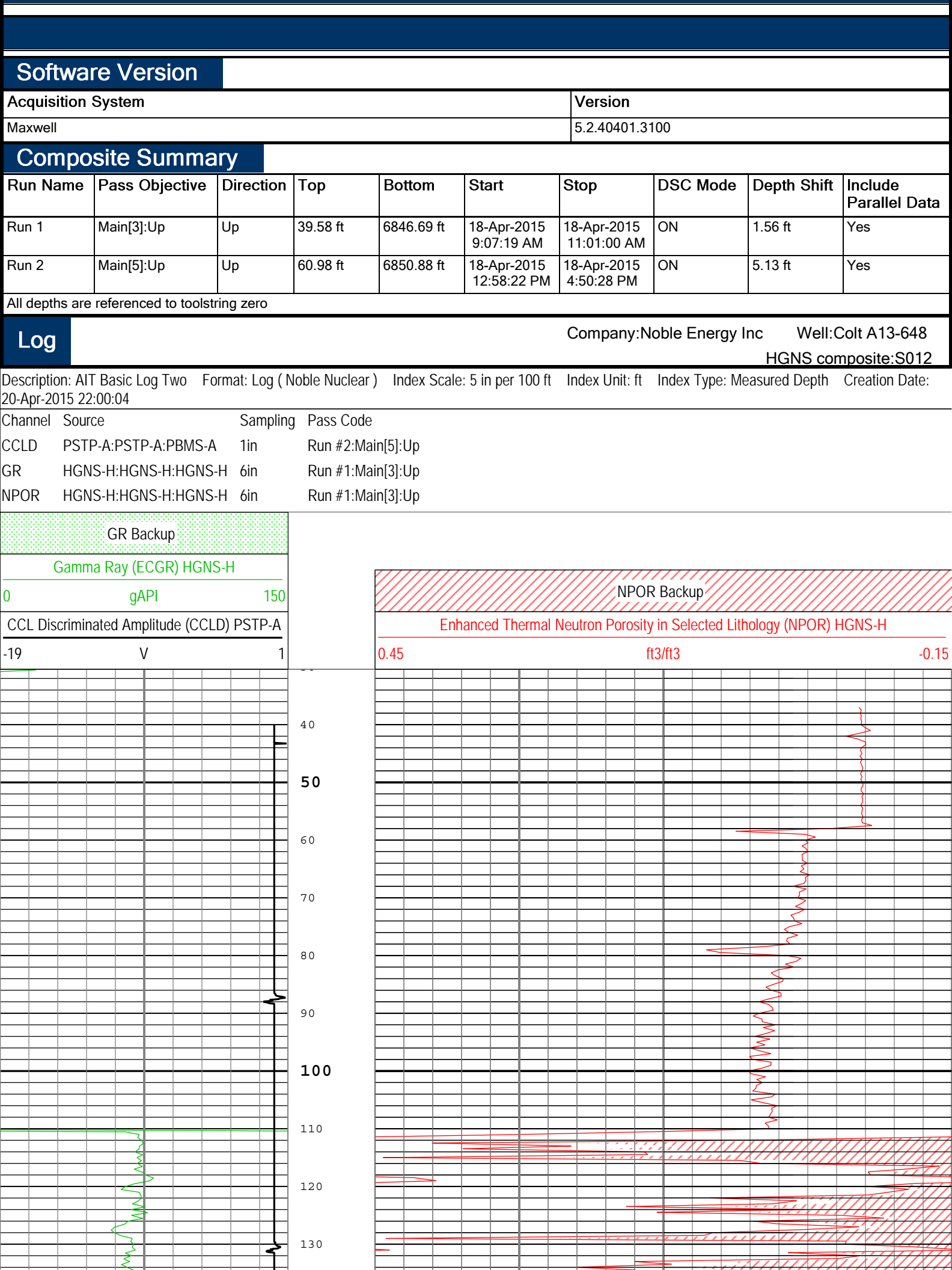
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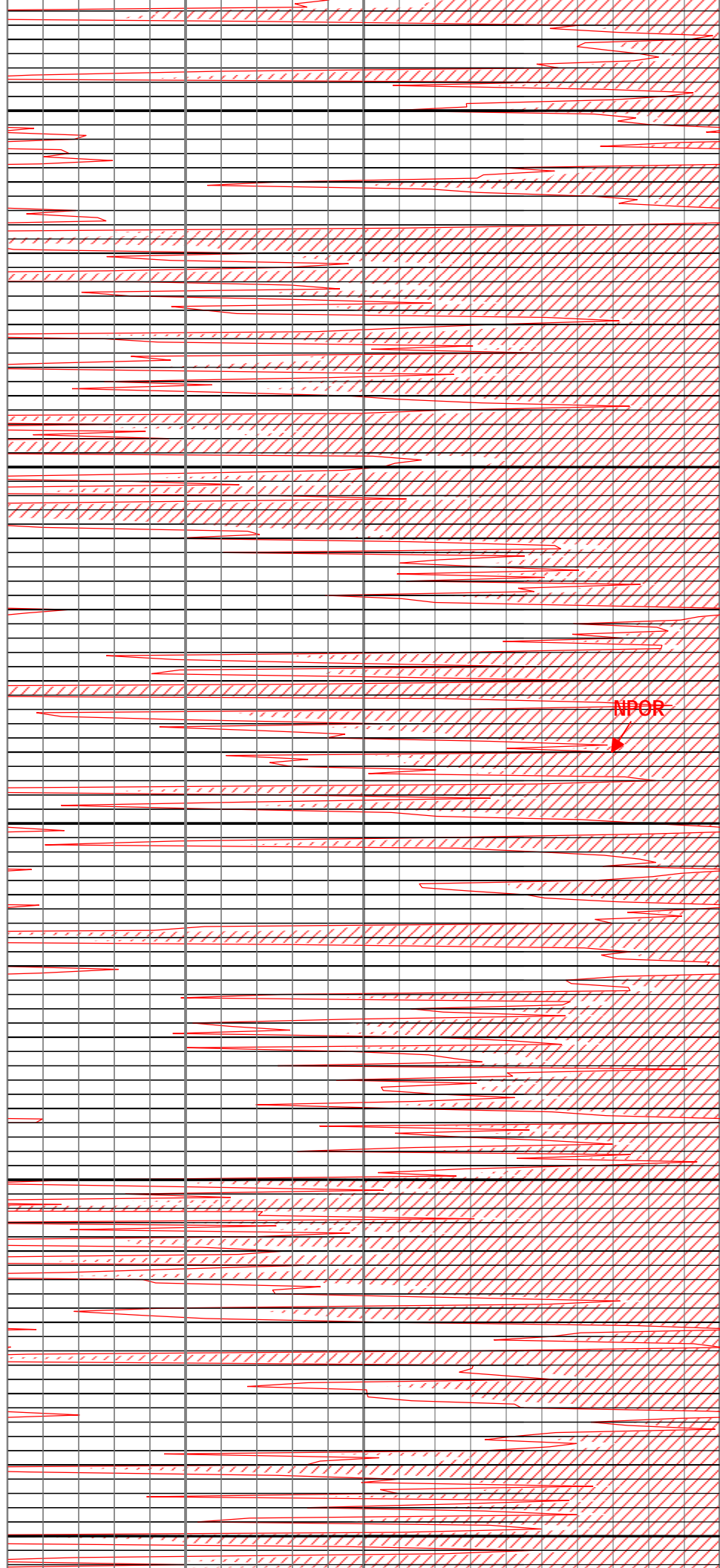
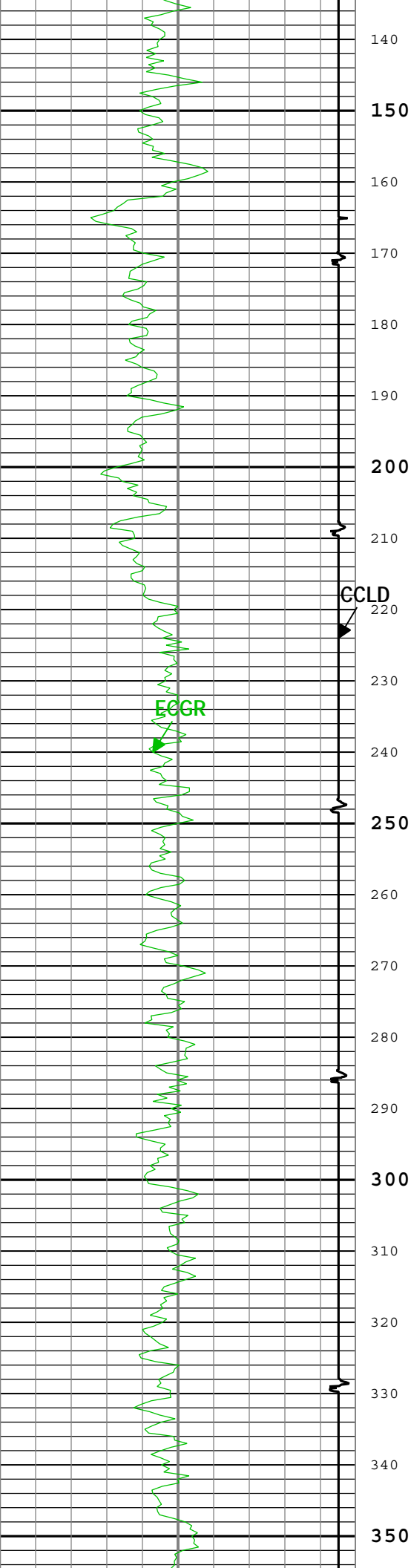
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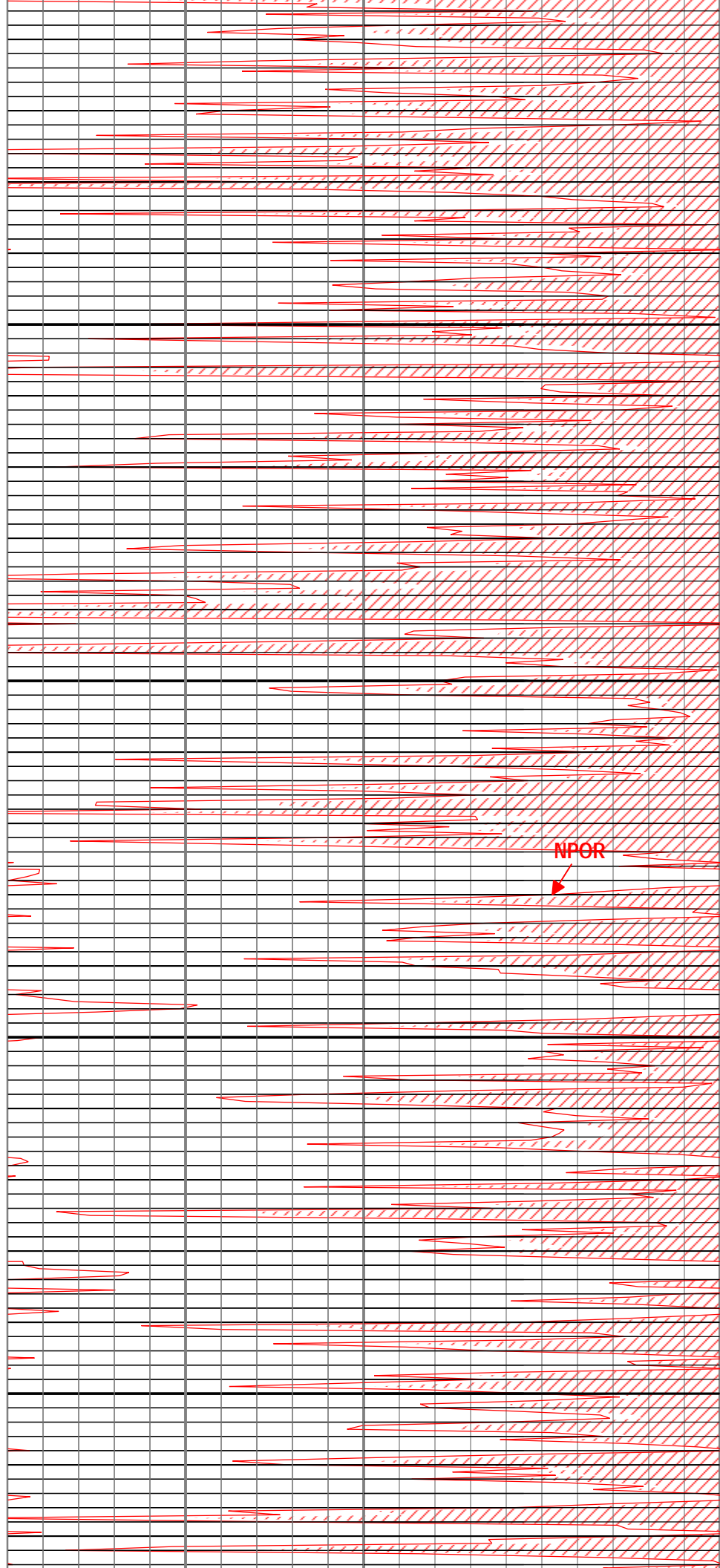
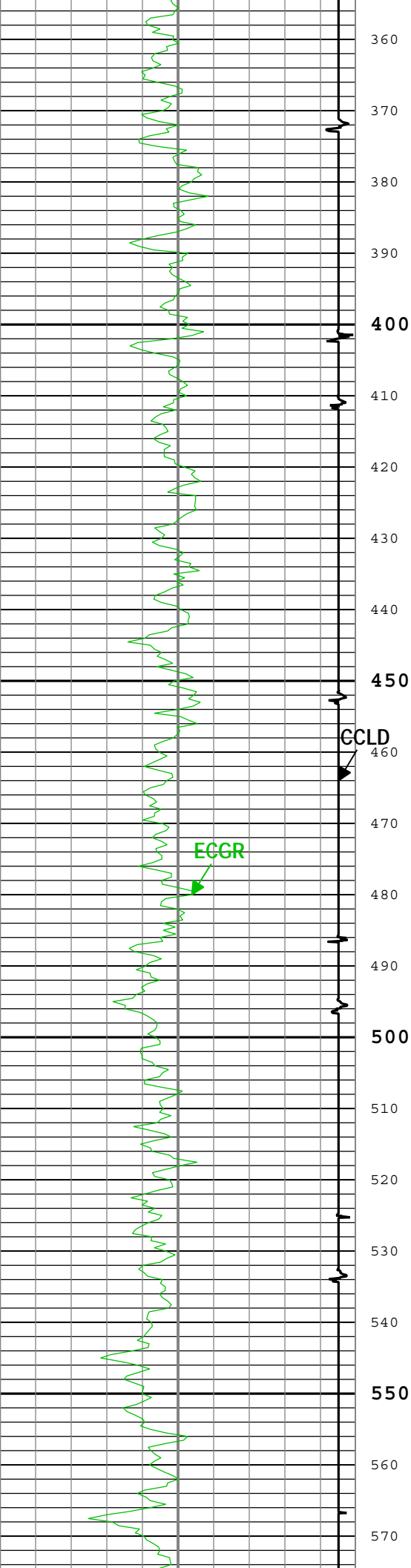


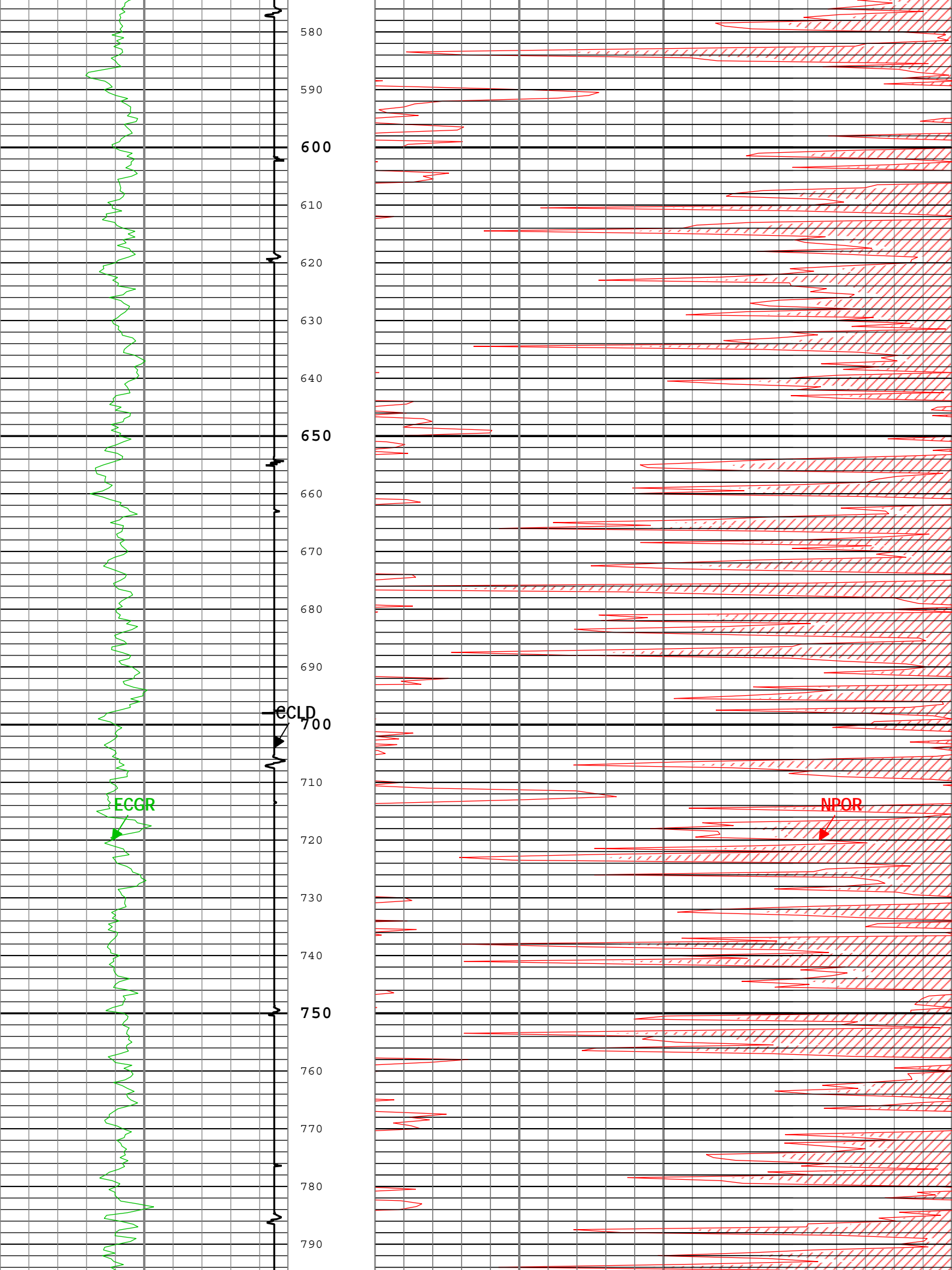
Depth Summary			
		Run 1	Run 2
Depth Measuring Device			
Type	IDW-B	IDW-B	
Serial Number	7234	7234	
Calibration Date	13-Feb-2015	13-Feb-2015	
Calibrator Serial Number			
Calibration Cable Type	7-39PLXS	7-39PLXS	
Wheel Correction 1	-4	-4	
Wheel Correction 2	-2	-2	
Tension Device			
Type	CMTD-B/A	CMTD-B/A	
Serial Number	1109	1109	
Calibration Date	19-Mar-2015	19-Mar-2015	
Calibrator Serial Number	78135A	78135A	
Number of Calibration Points	10	10	
Calibration Root Mean Square Error	11	11	
Calibration Peak Error	19	19	
Logging Cable			
Type	7-39P-LXS	7-39P-LXS	
Serial Number	U711136	U711136	
Length	17200.00 ft	17200.00 ft	
Conveyance Type	Wireline	Wireline	
Rig Type	Crane	Crane	
Run 1:Depth Control Parameters		Depth Control Remarks	
Log Sequence	First Log In the Well	All Schlumberger depth control procedures followed.	
Rig Up Length At Surface		IDW used as primary depth control device.	
Rig Up Length At Bottom		Z-chart used as secondary depth control device.	
Rig Up Length Correction			
Stretch Correction			
Tool Zero Check At Surface			
Run 2:Depth Control Parameters		Depth Control Remarks	
Log Sequence	Subsequent Log In the Well	All Schlumberger depth control procedures followed.	
Reference Log Name		IDW used as primary depth control device.	
Reference Log Run Number		Z-chart used as secondary depth control device.	
Reference Log Date			

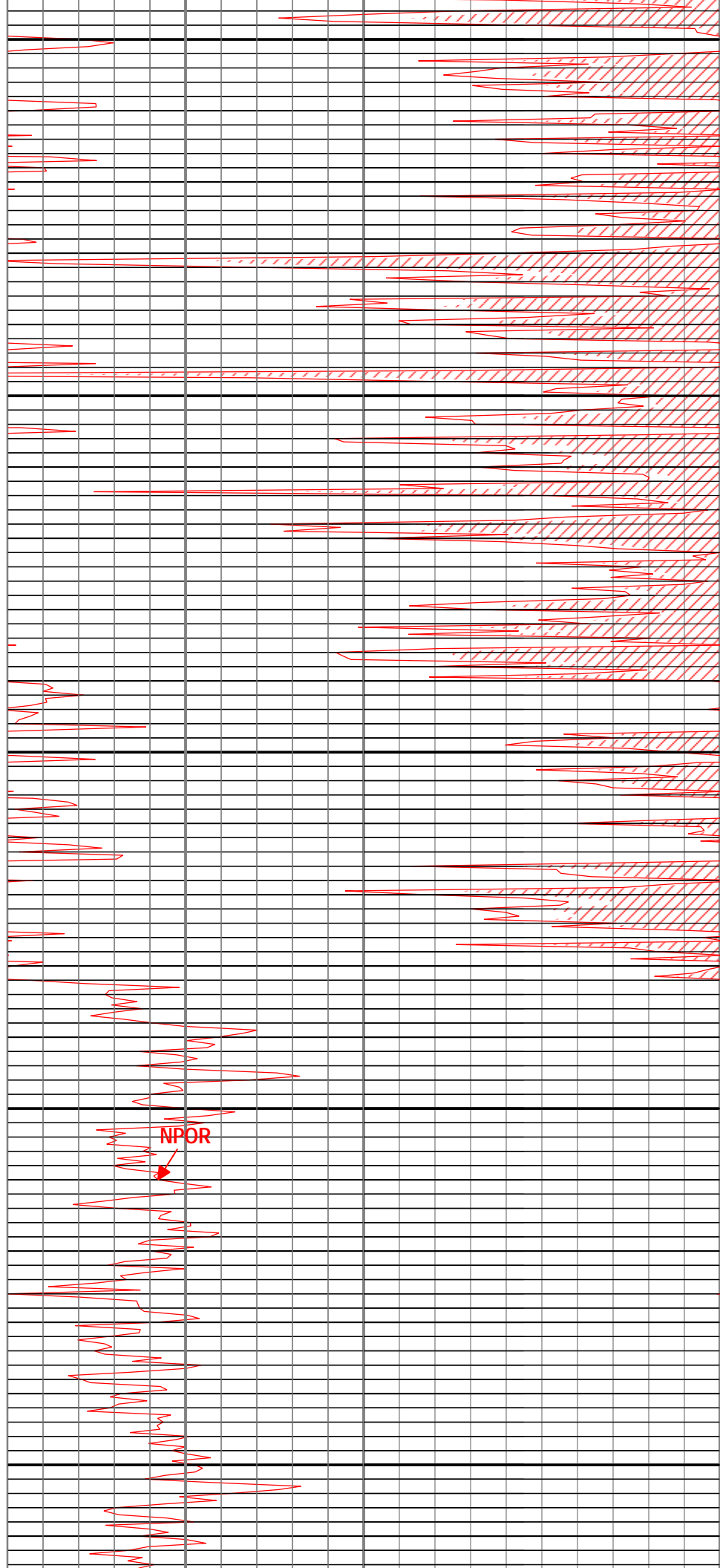
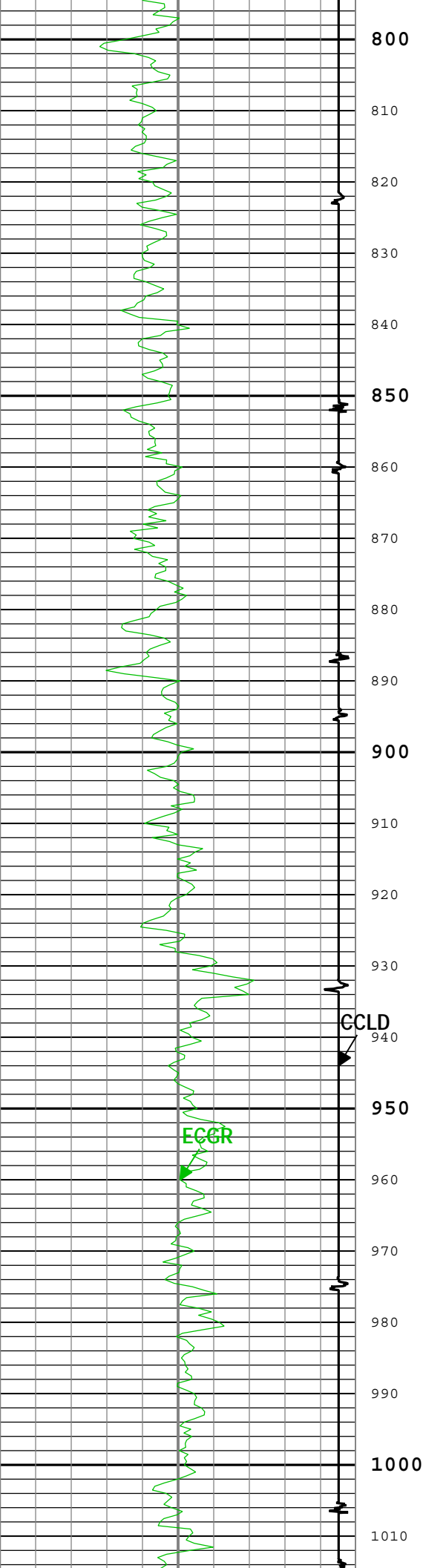
HGNS composite

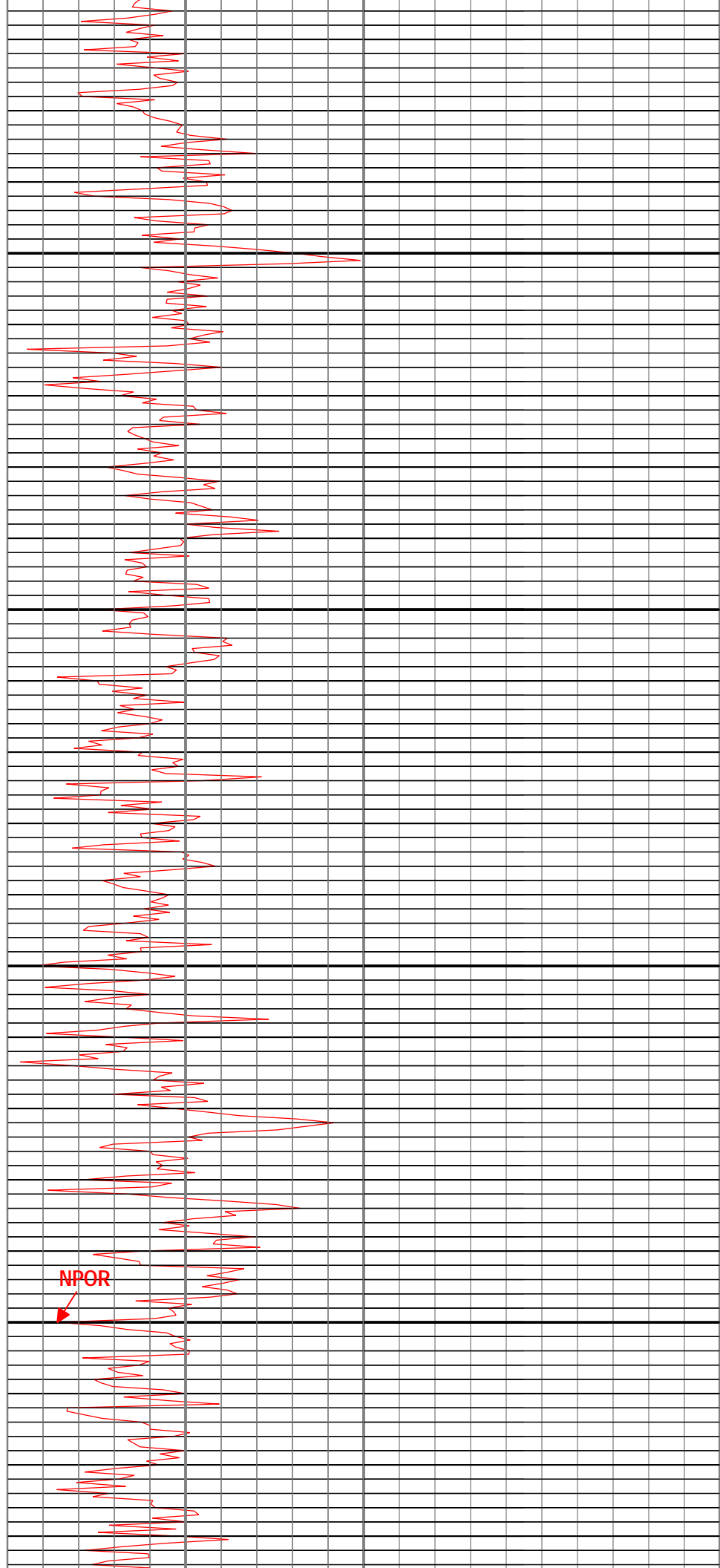
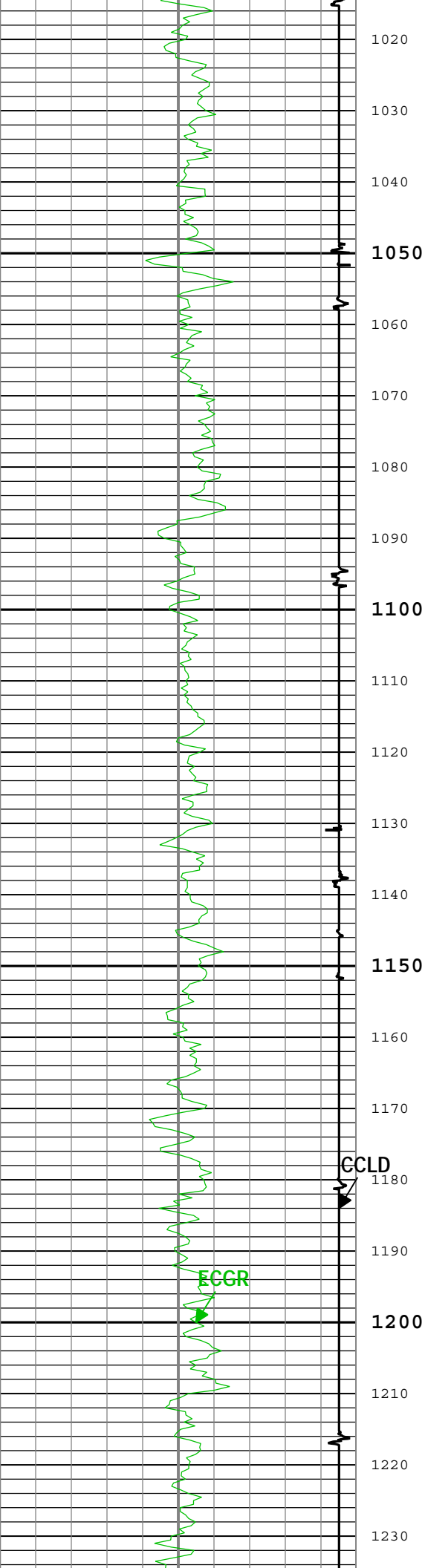


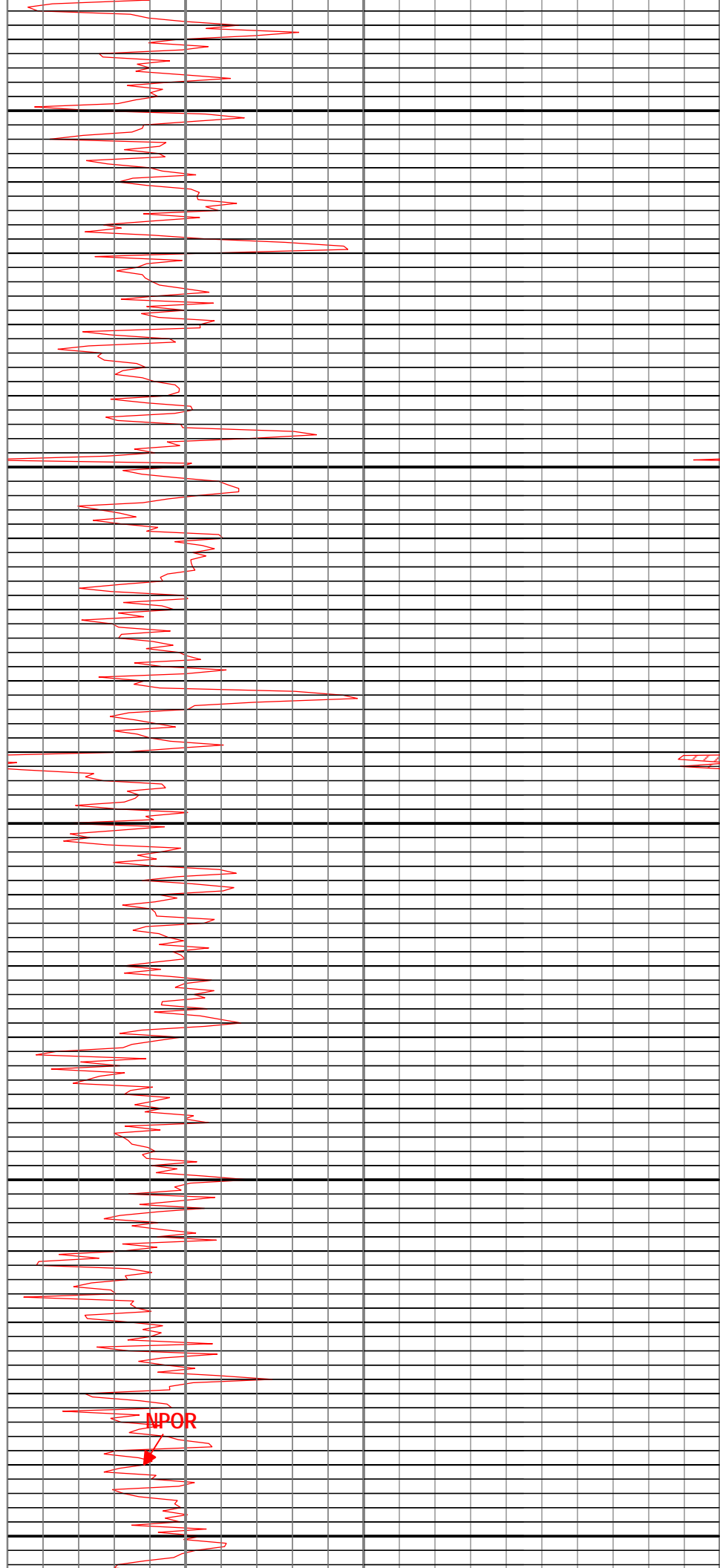
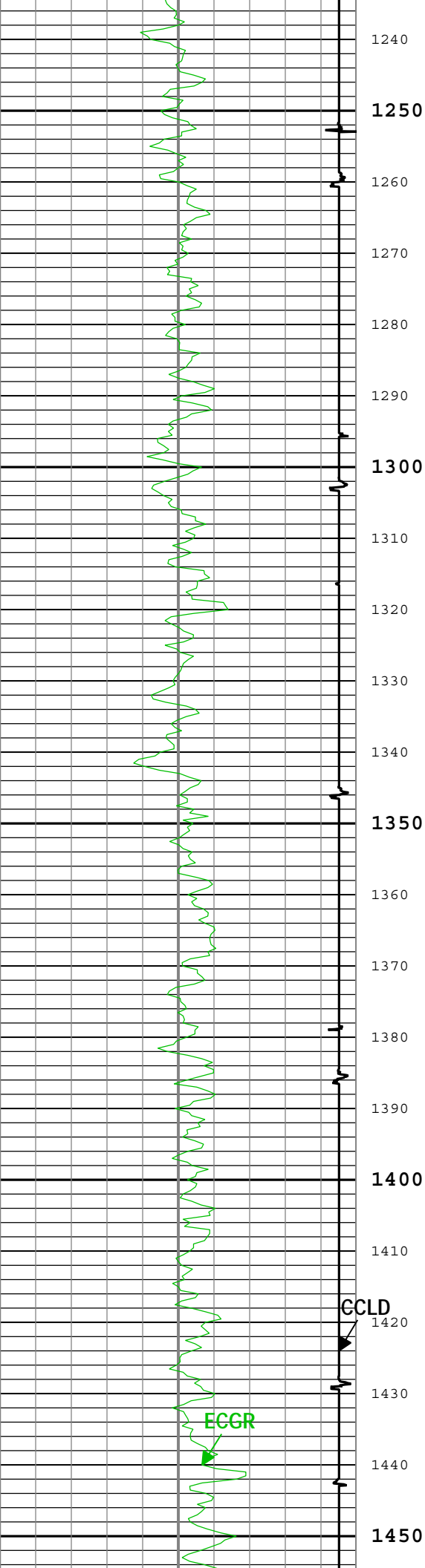


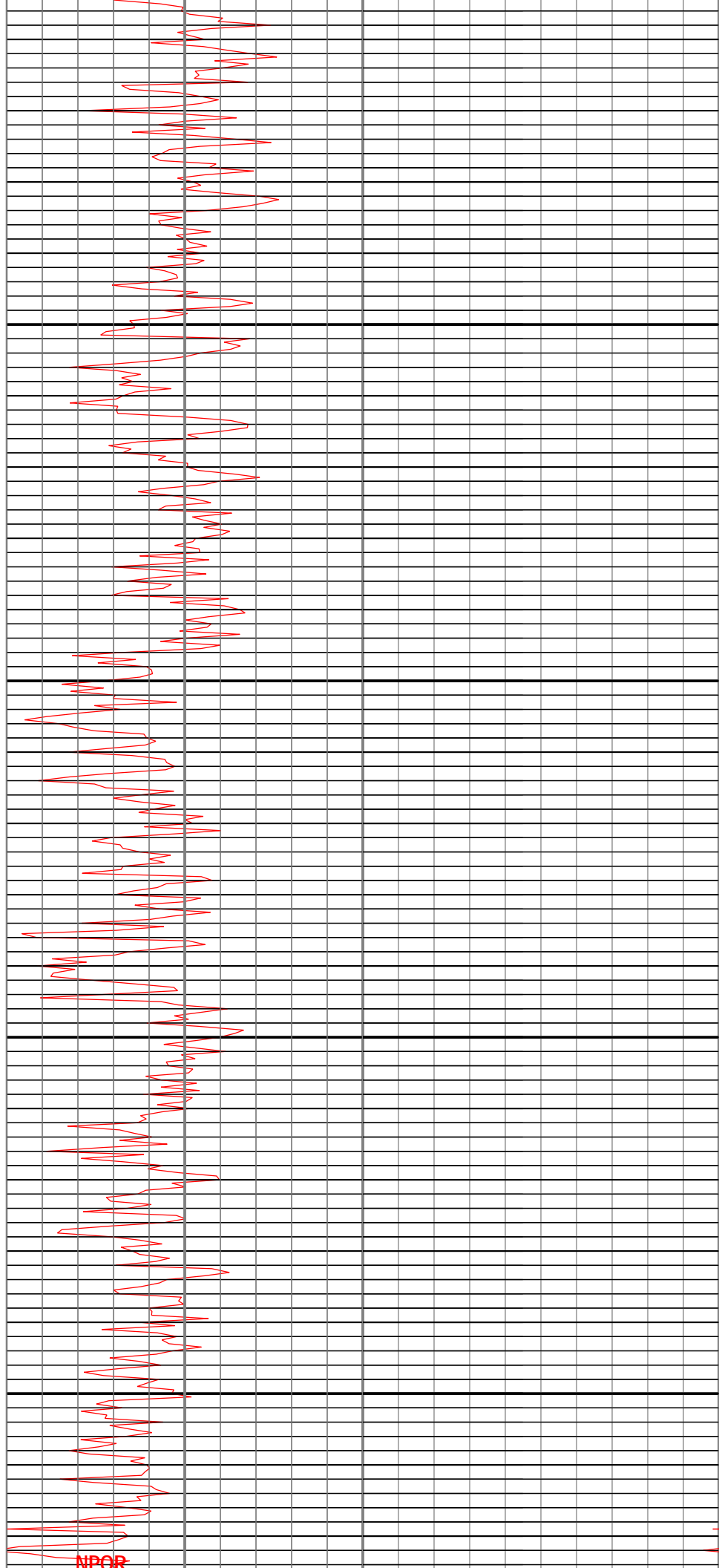
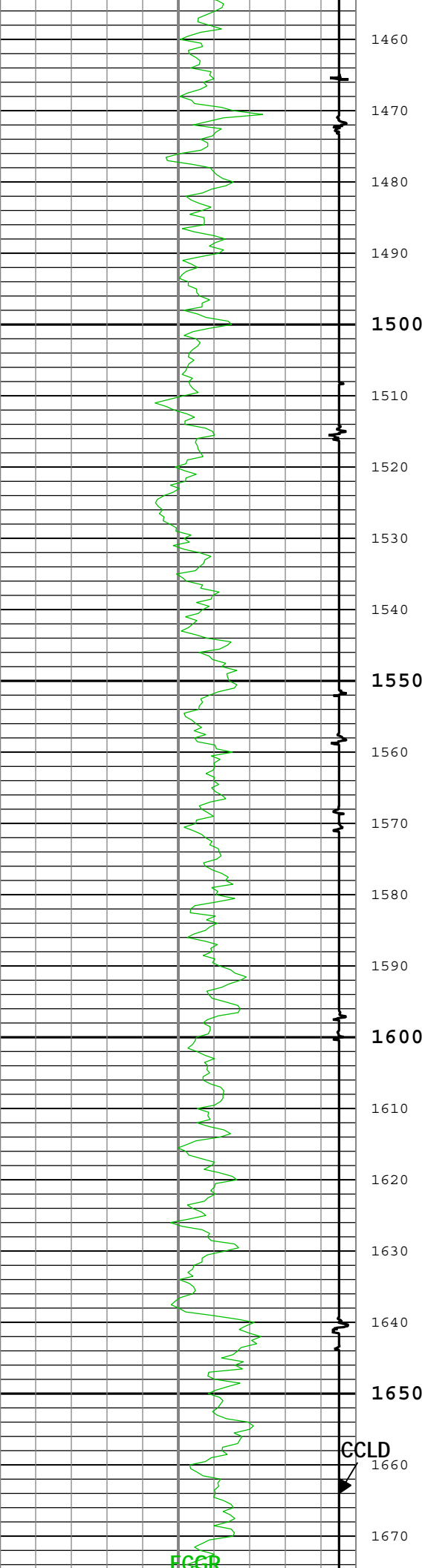


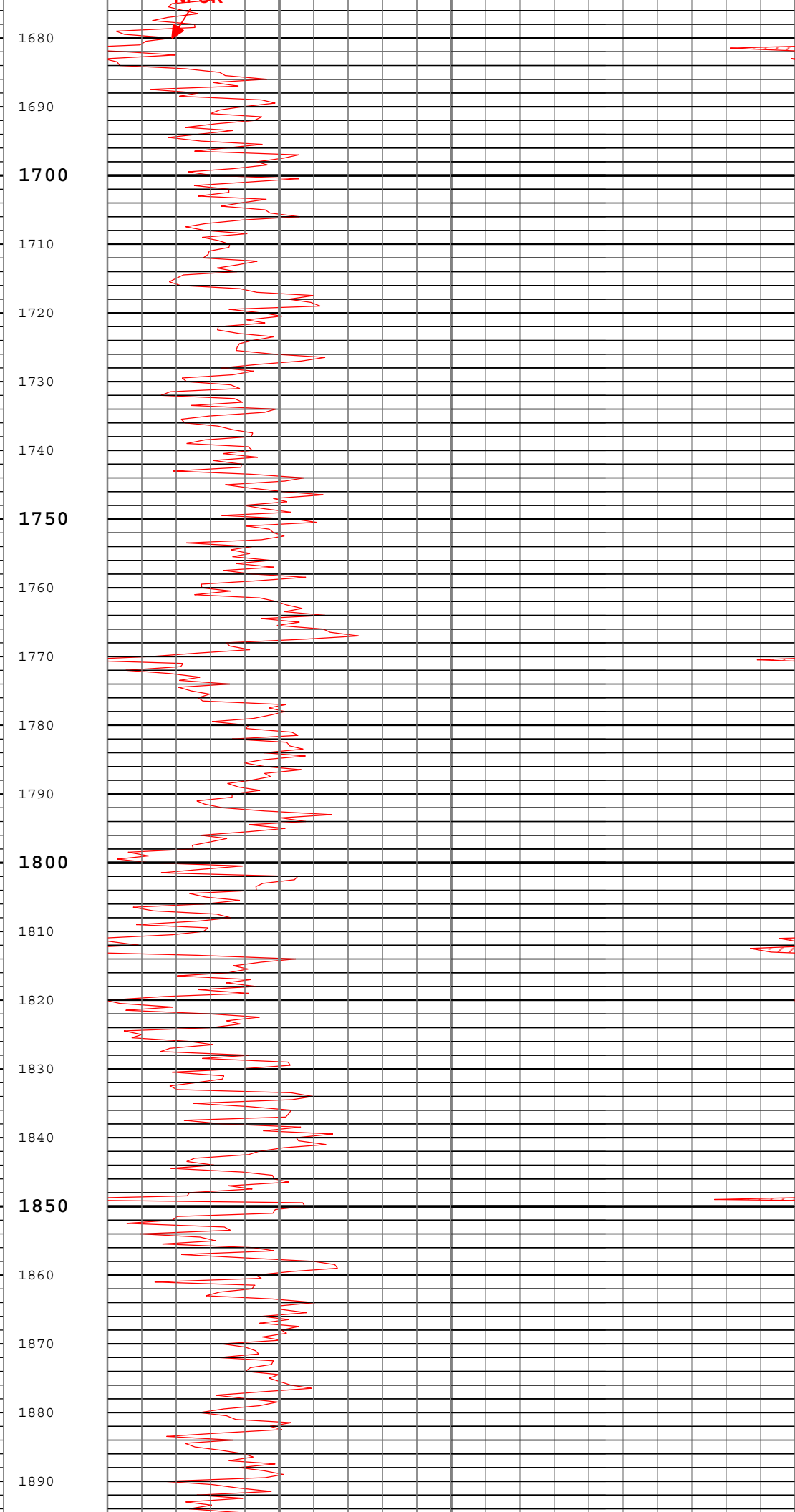
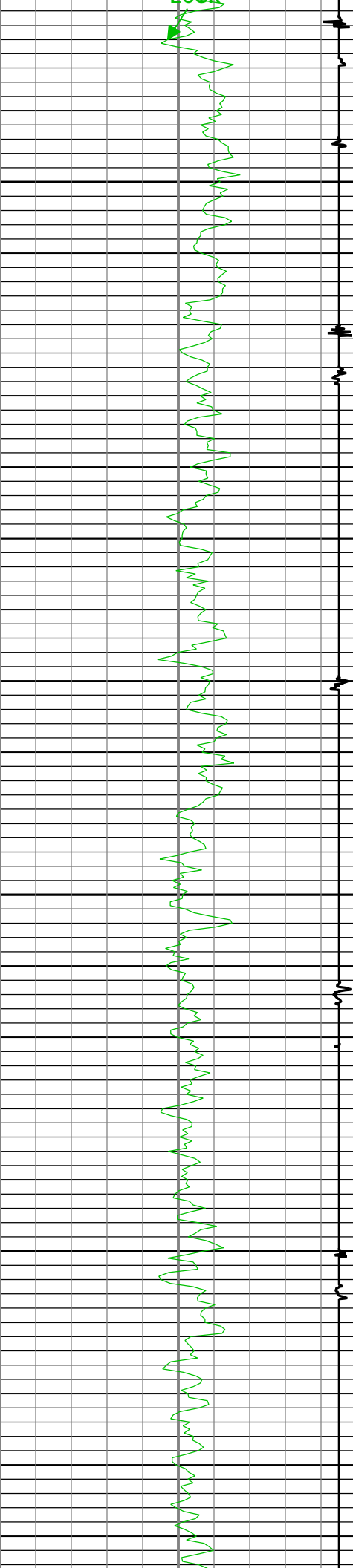


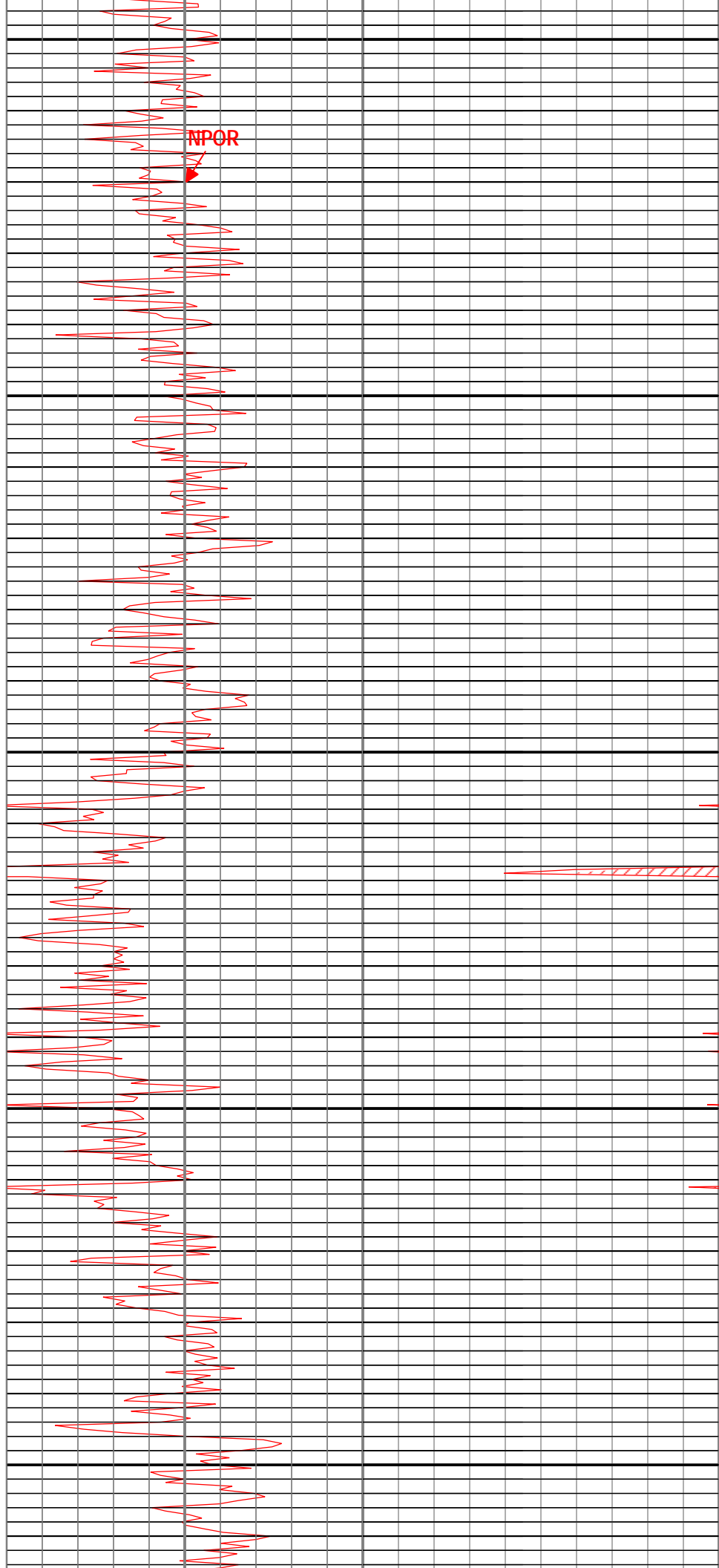
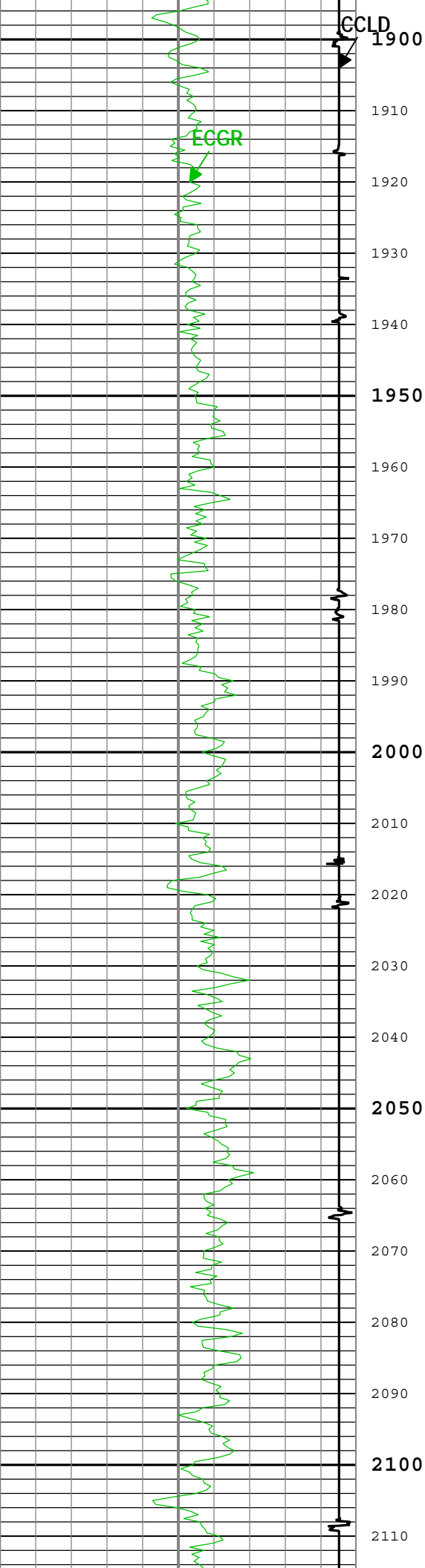


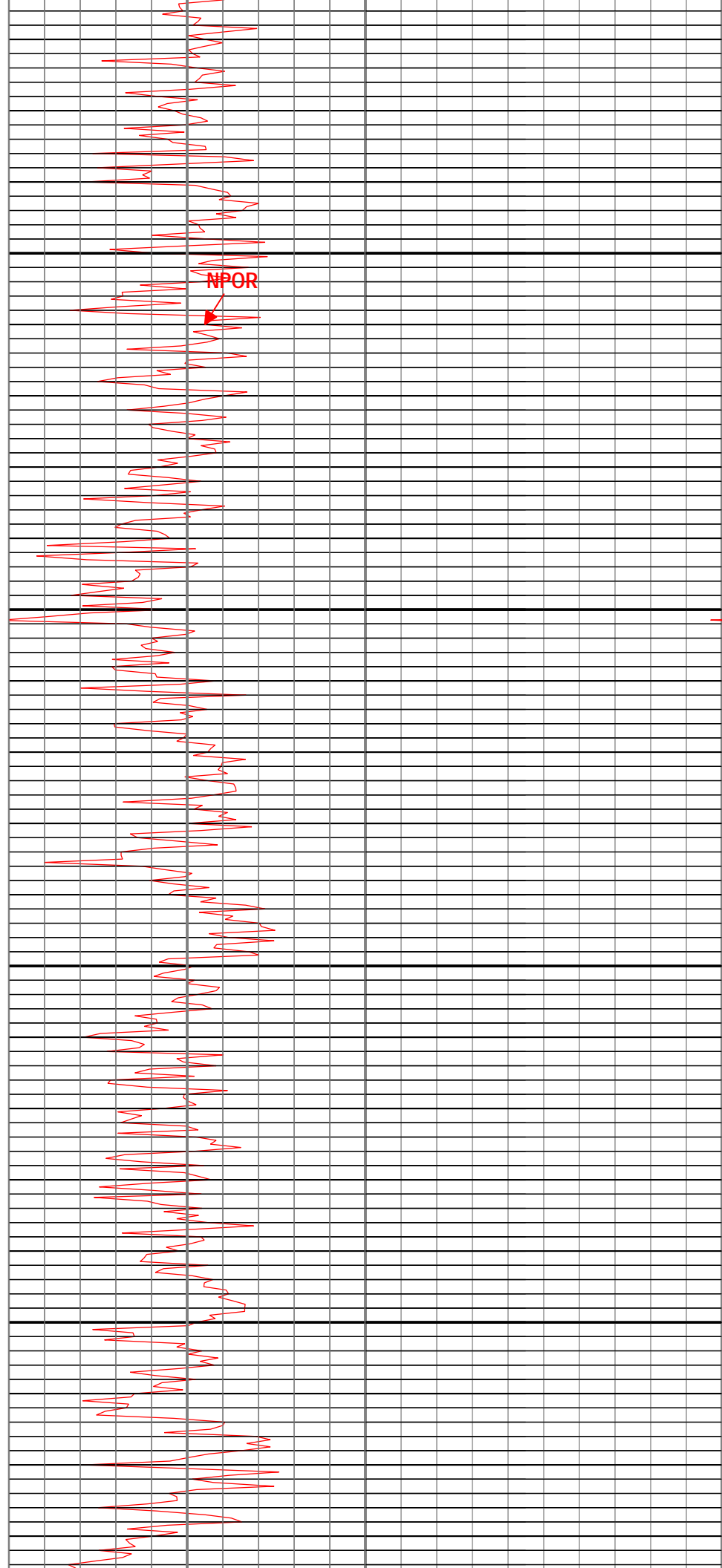
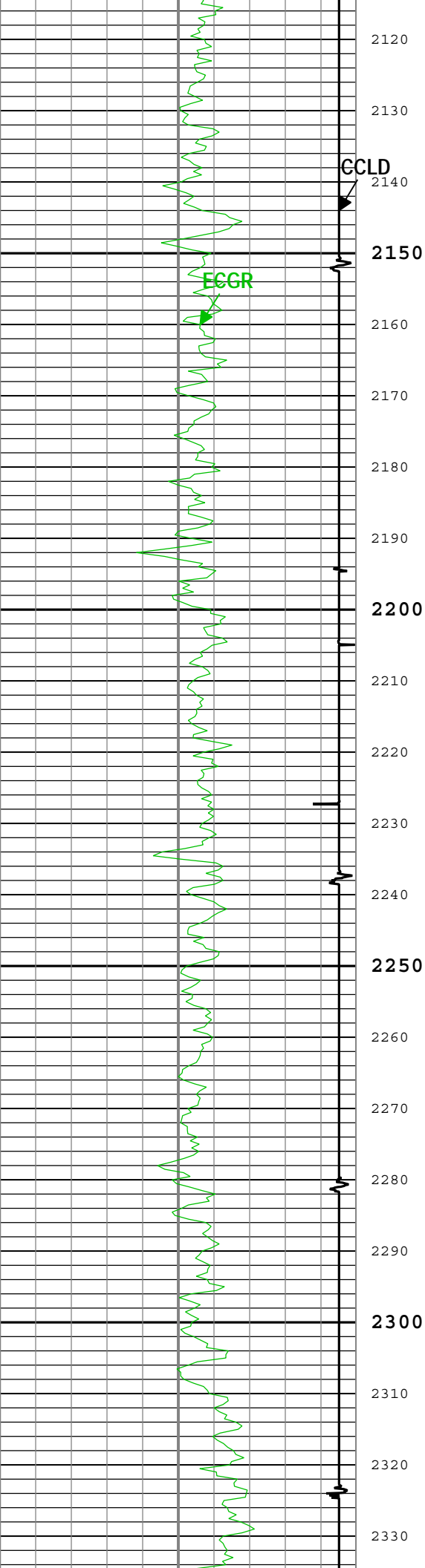


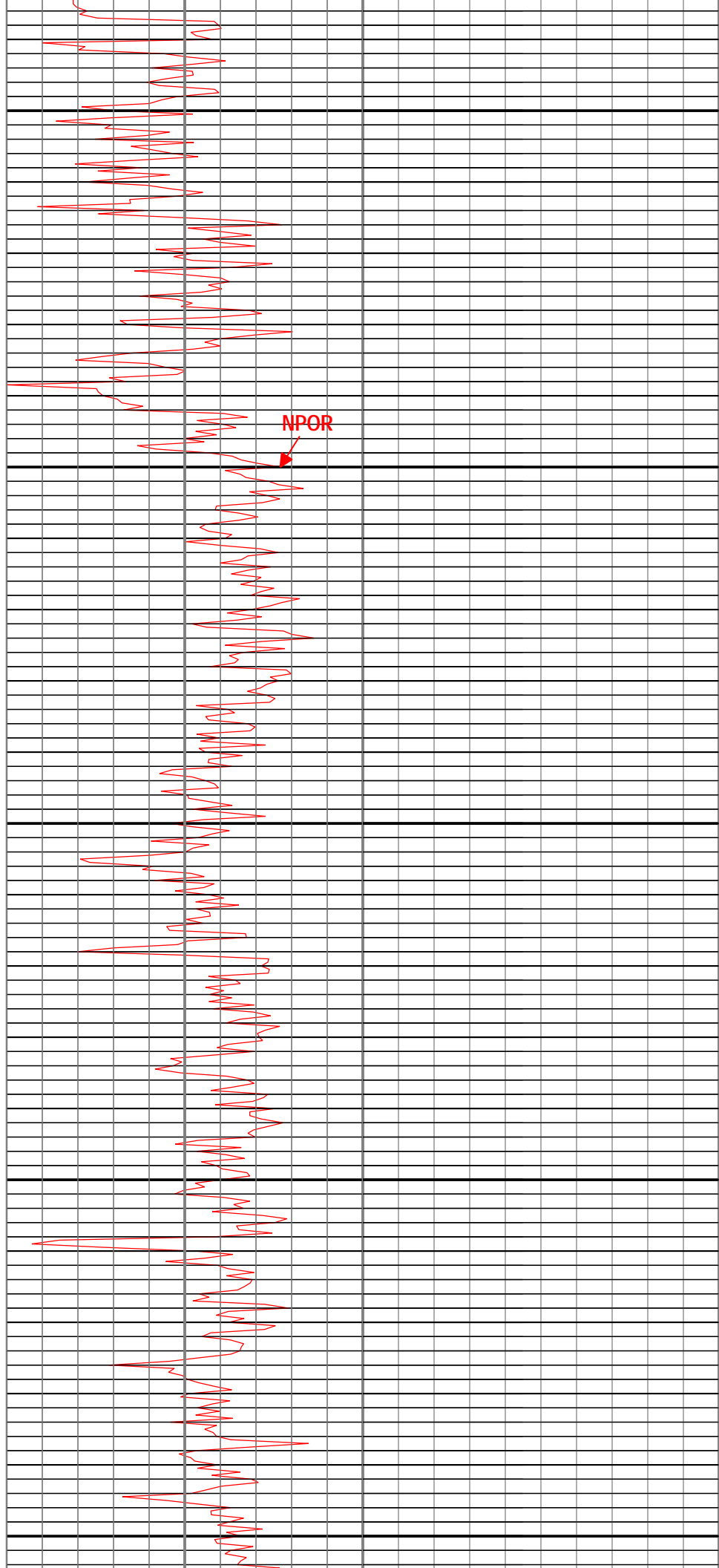
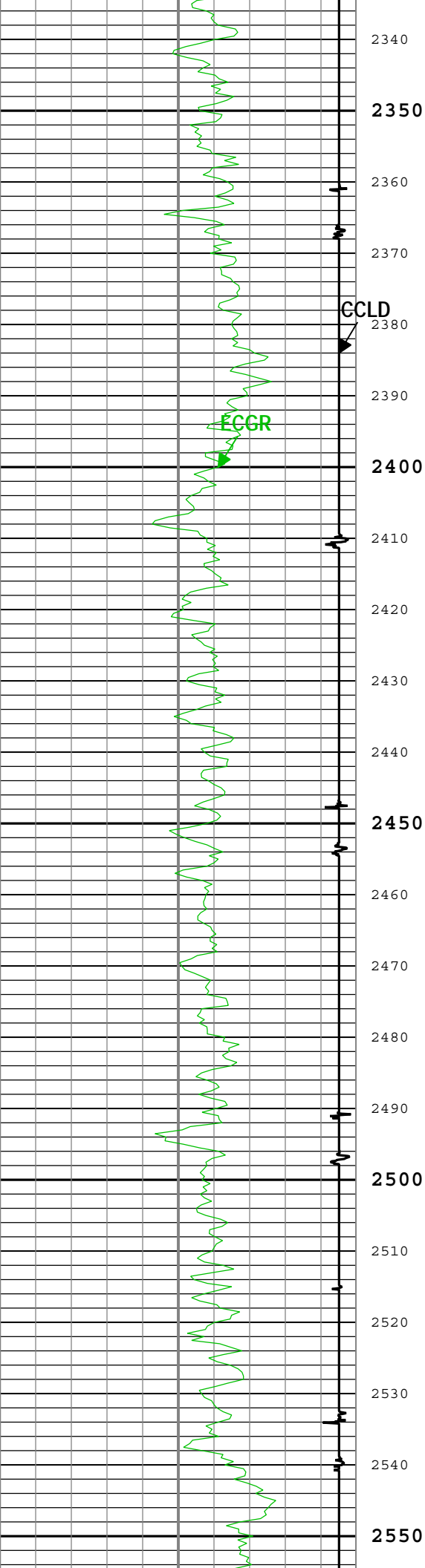


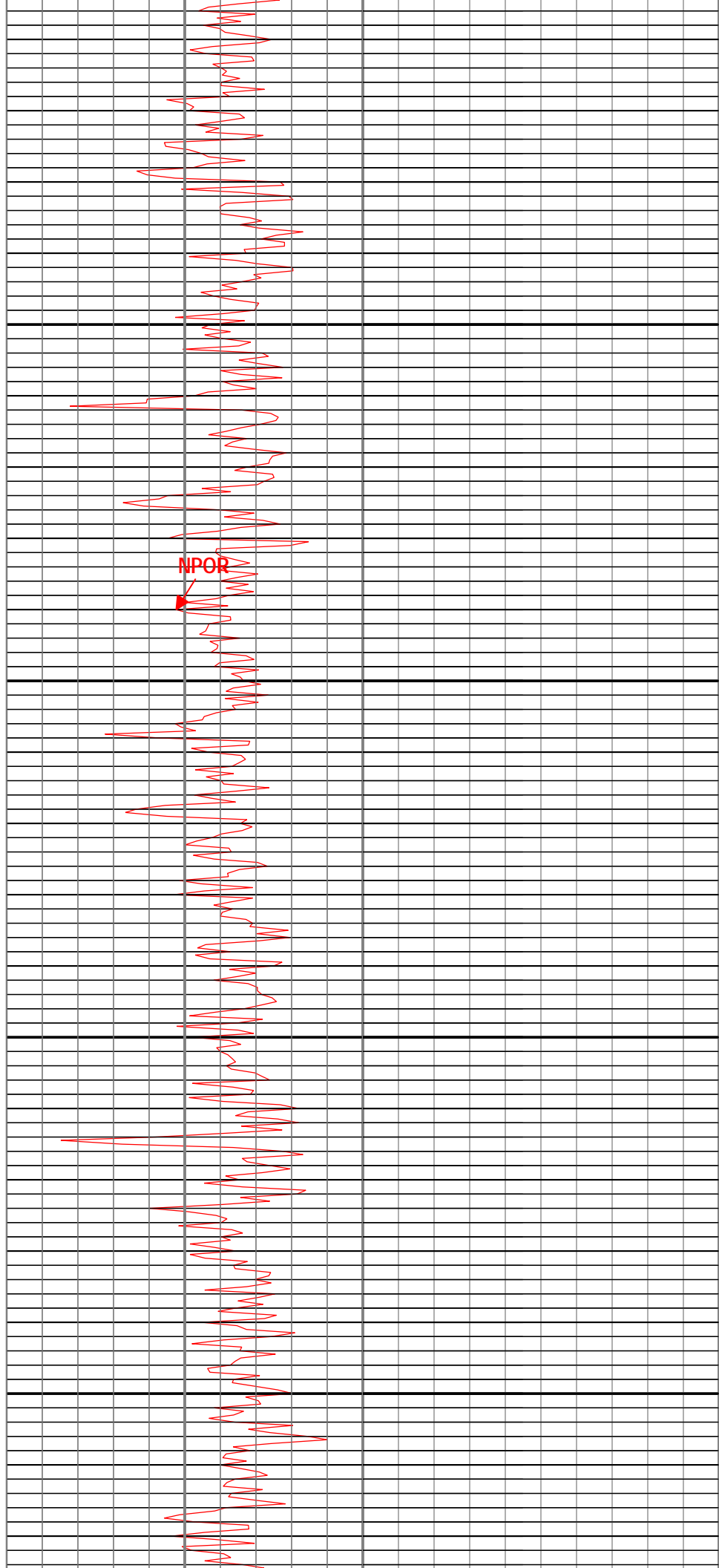
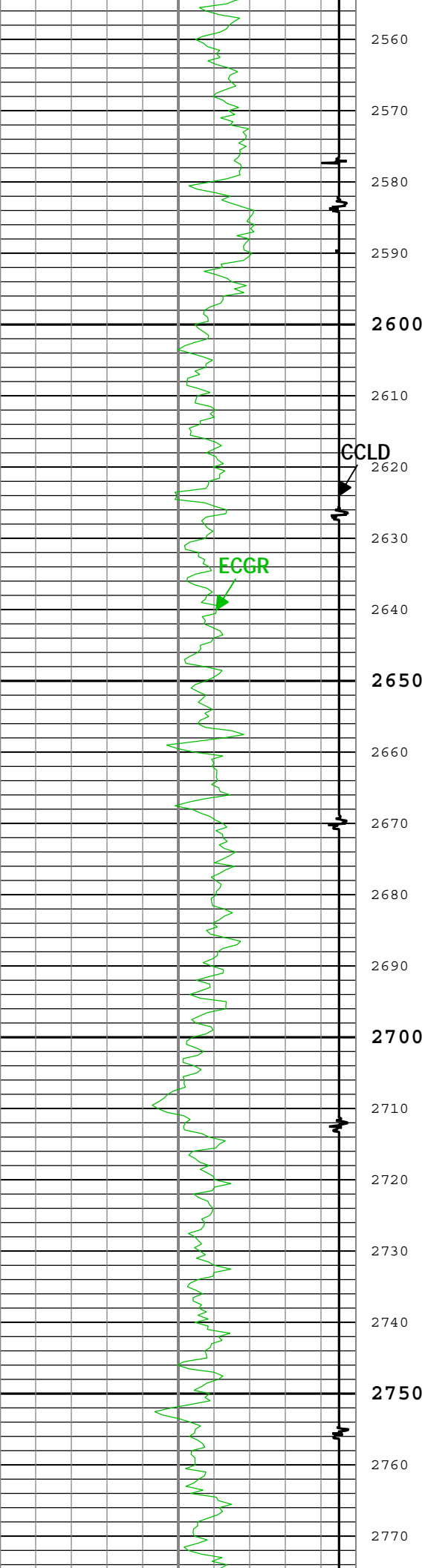


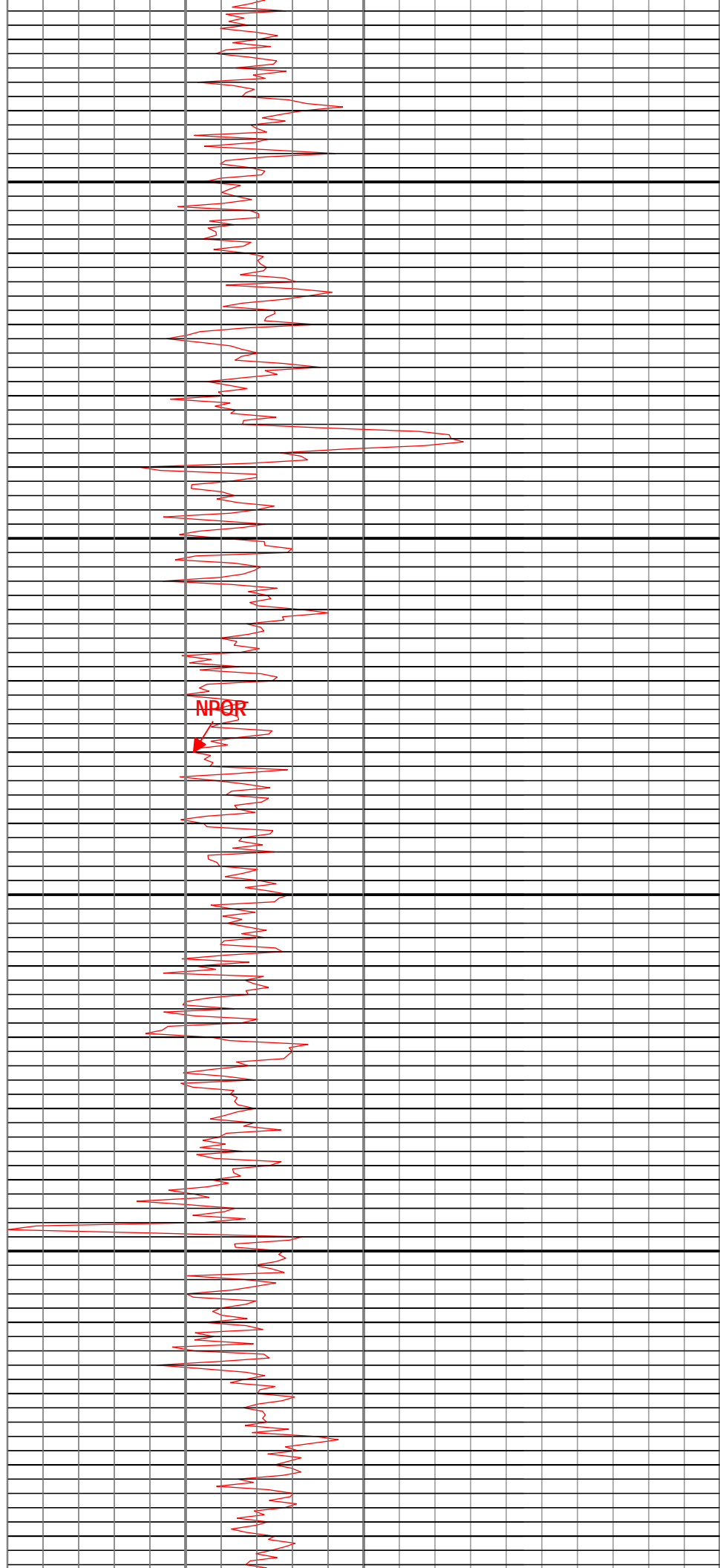
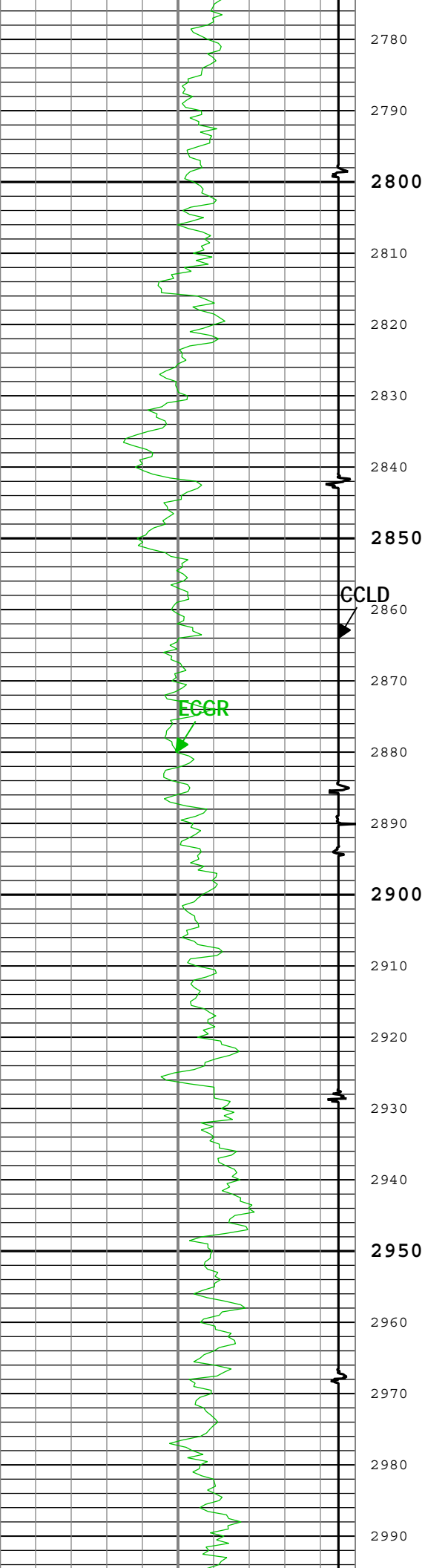


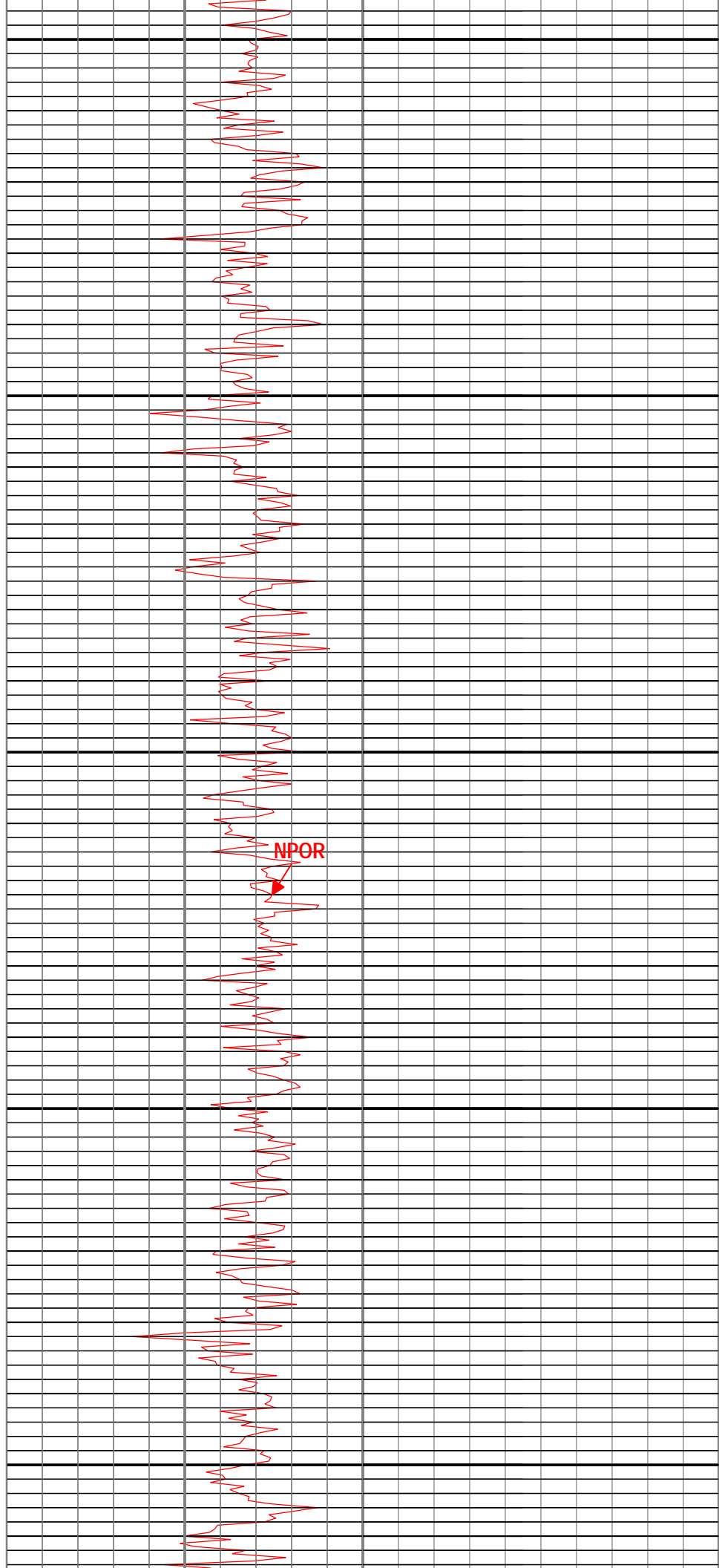
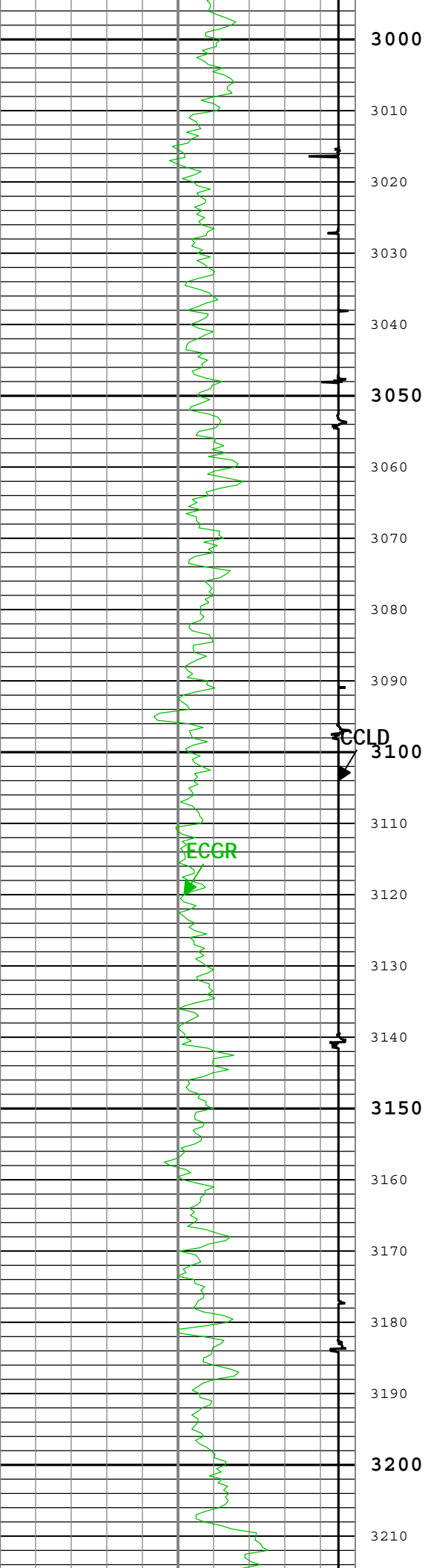


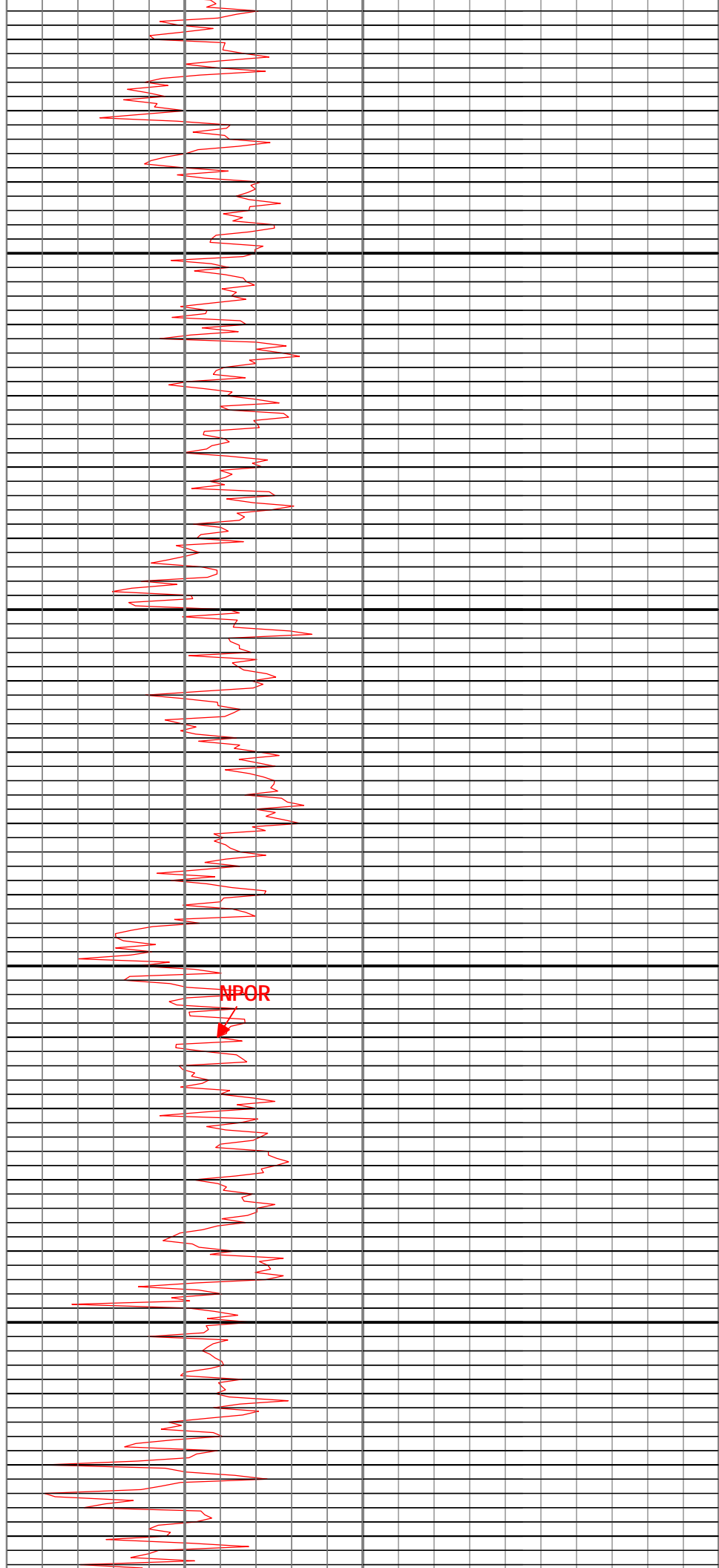
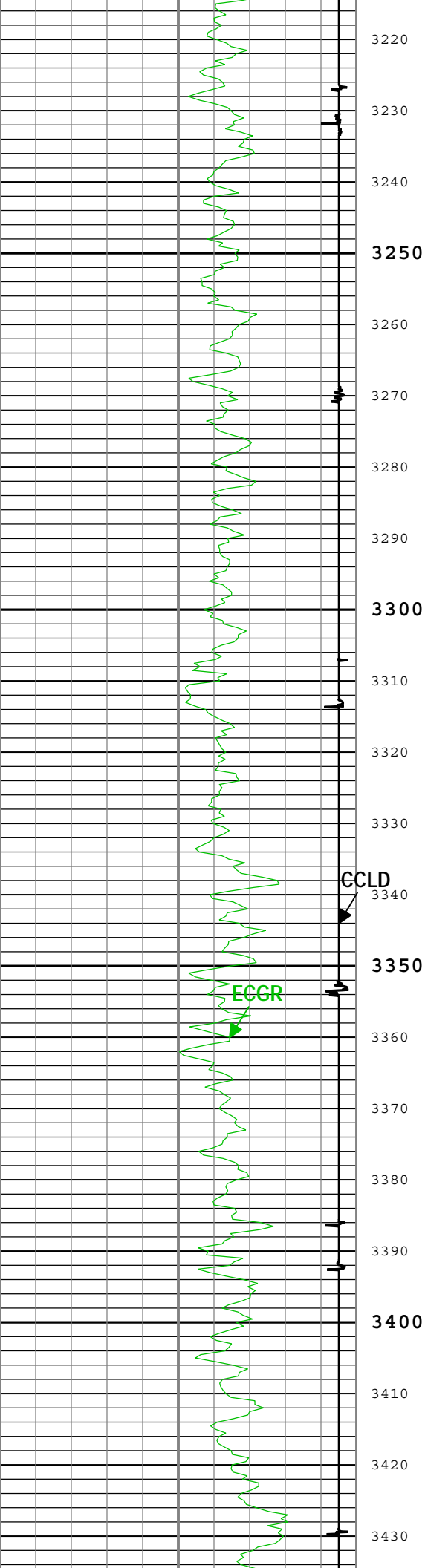


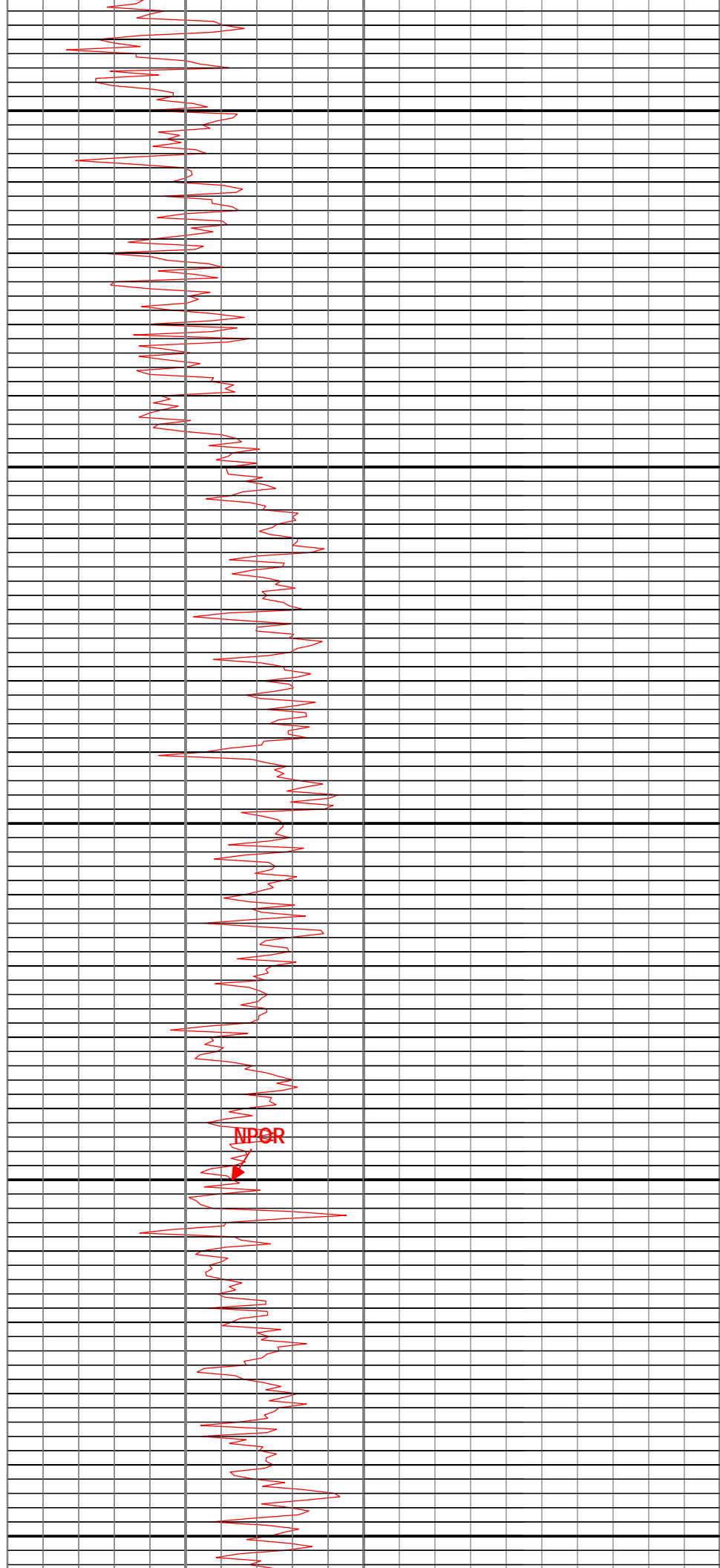
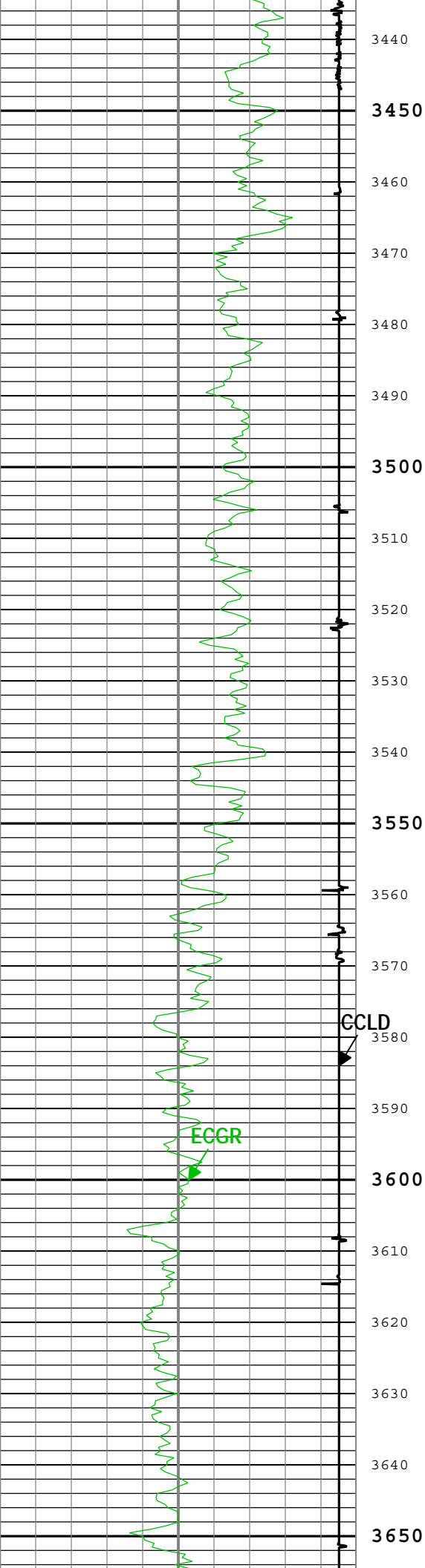


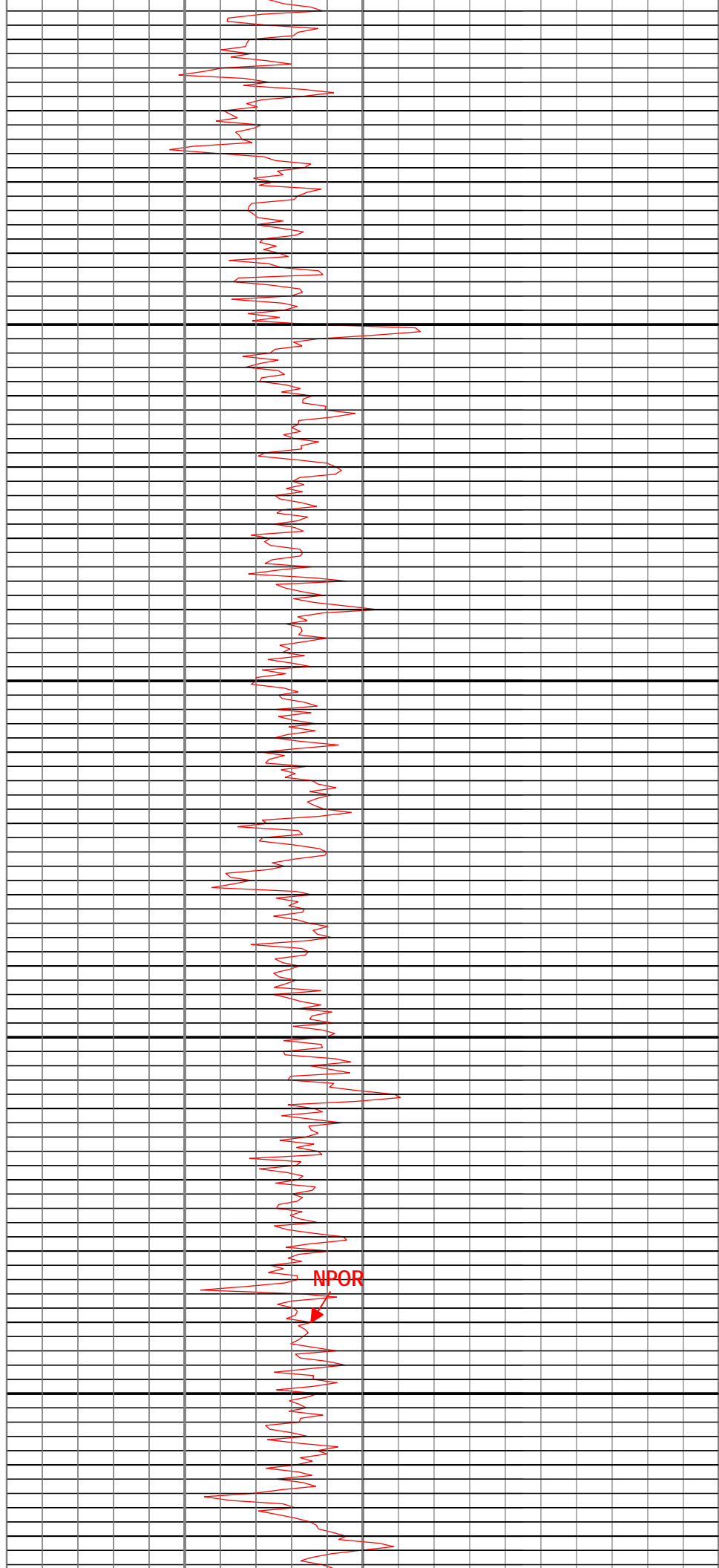
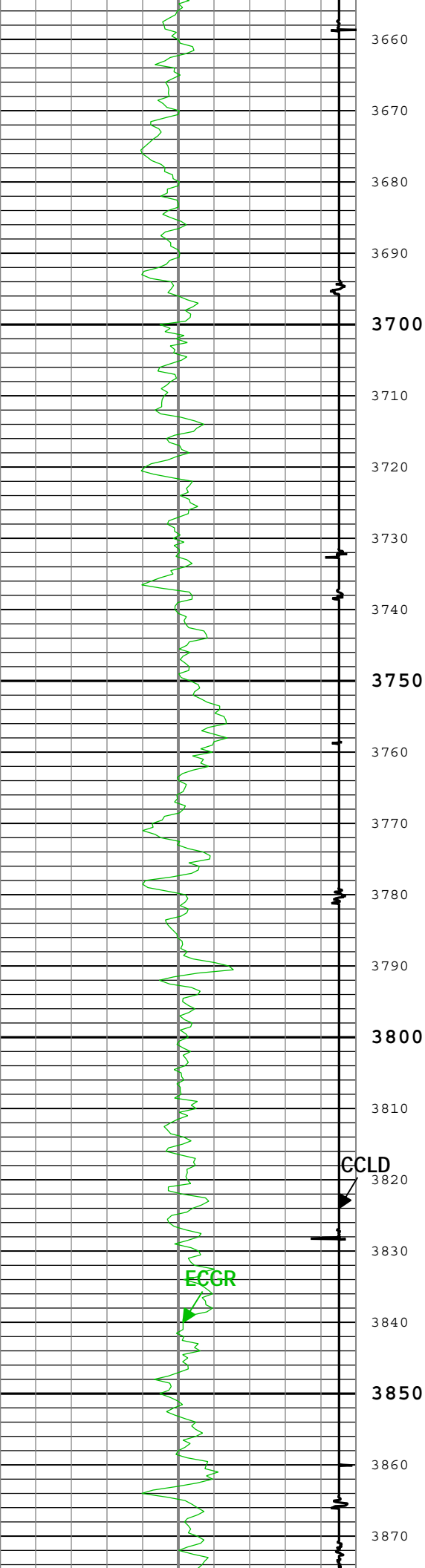


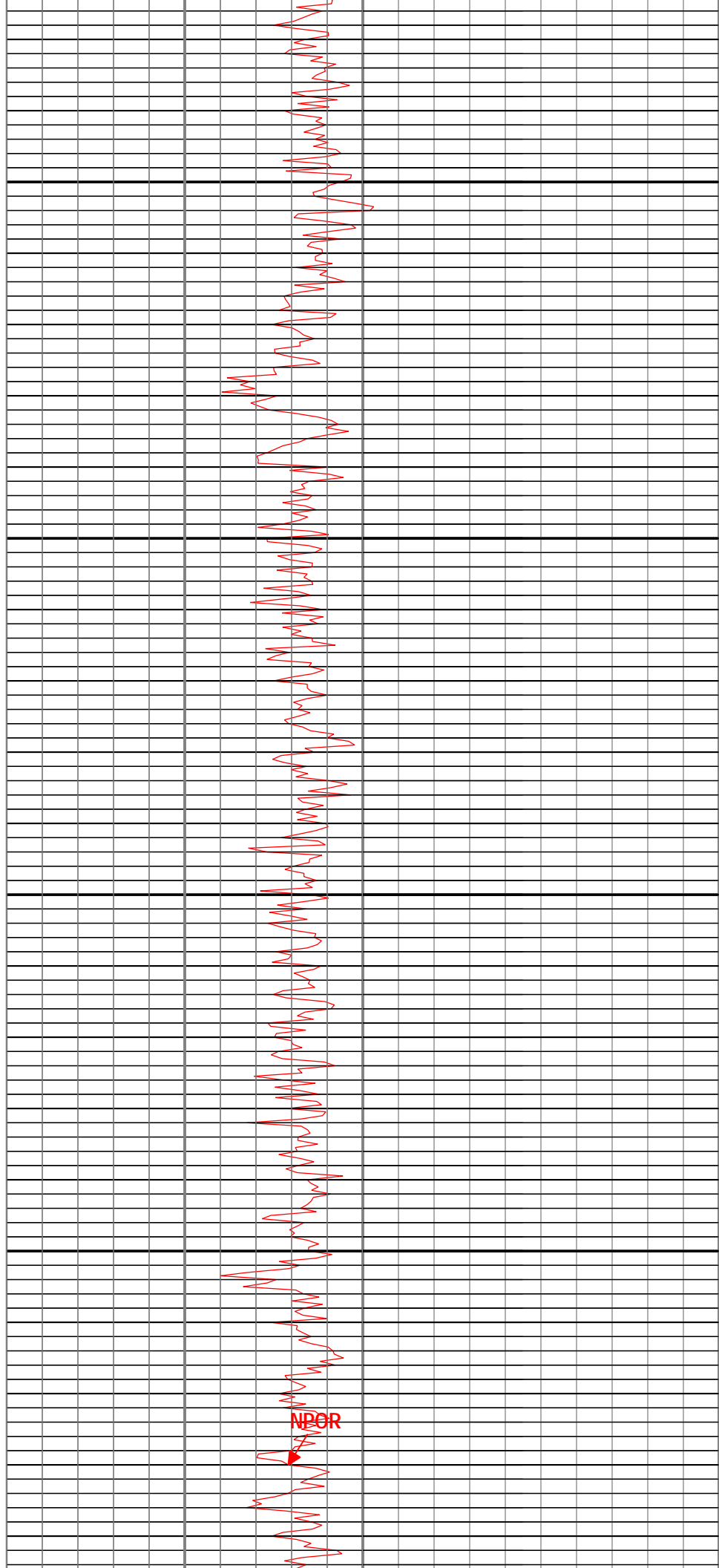
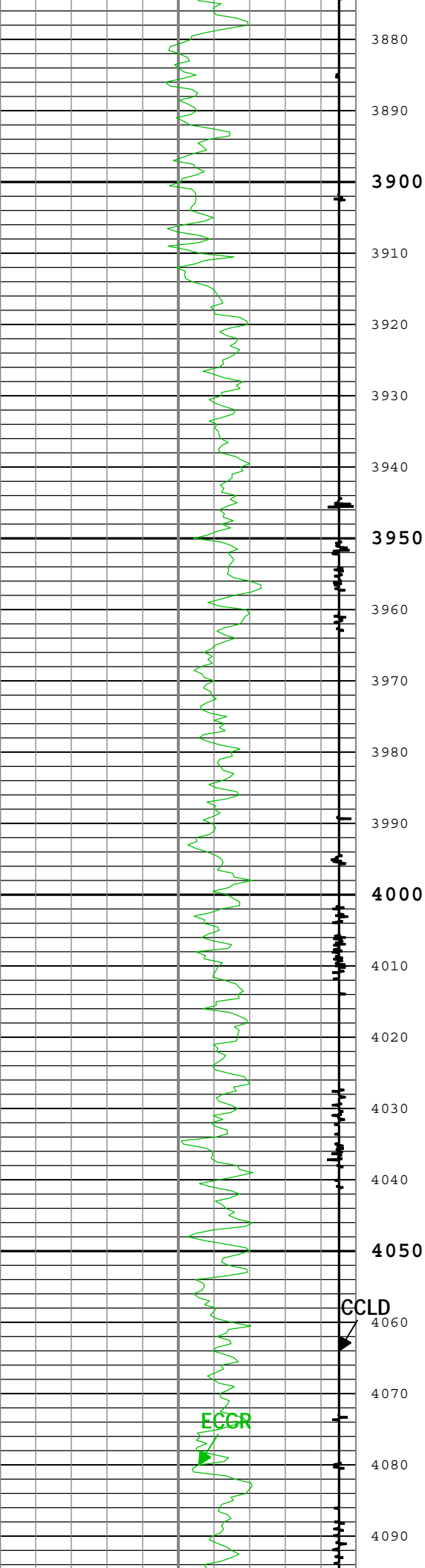


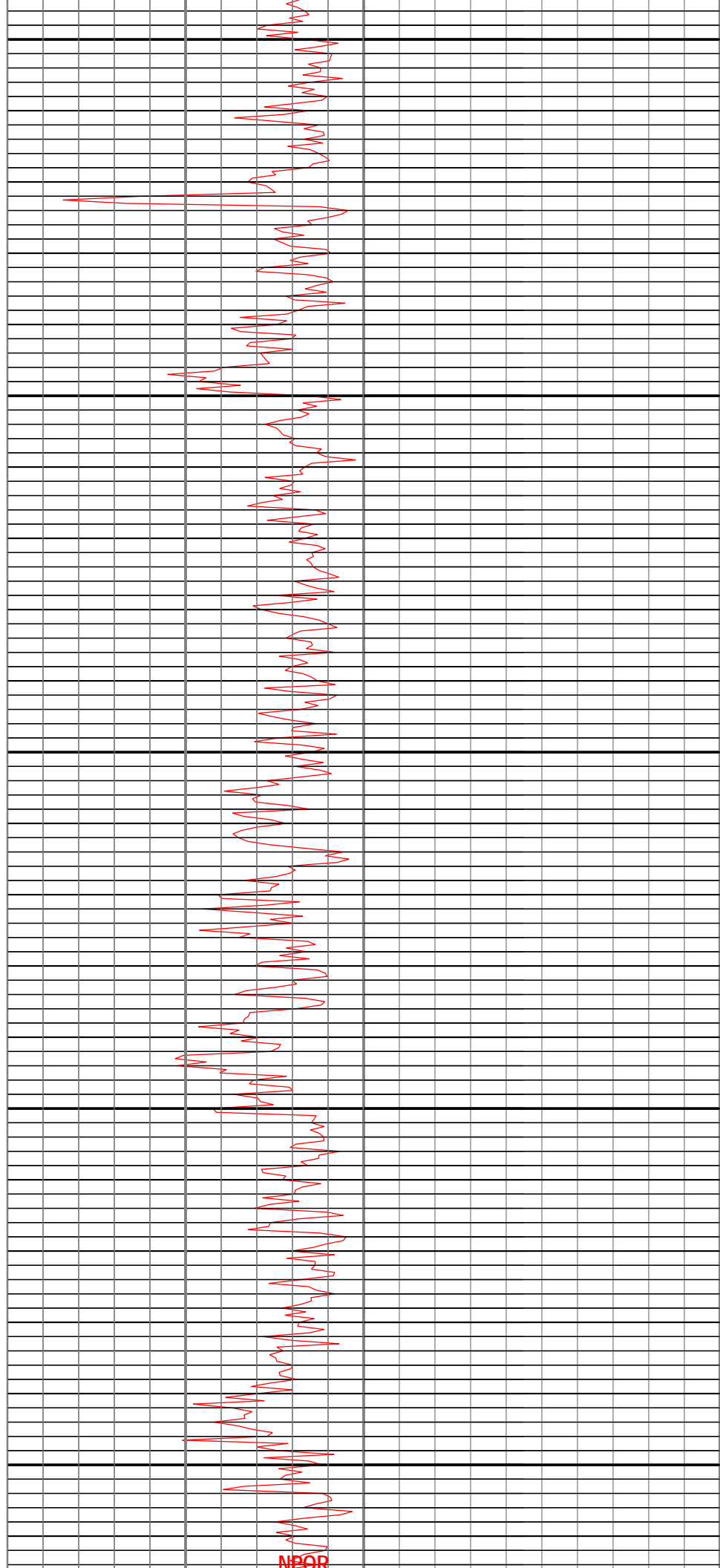
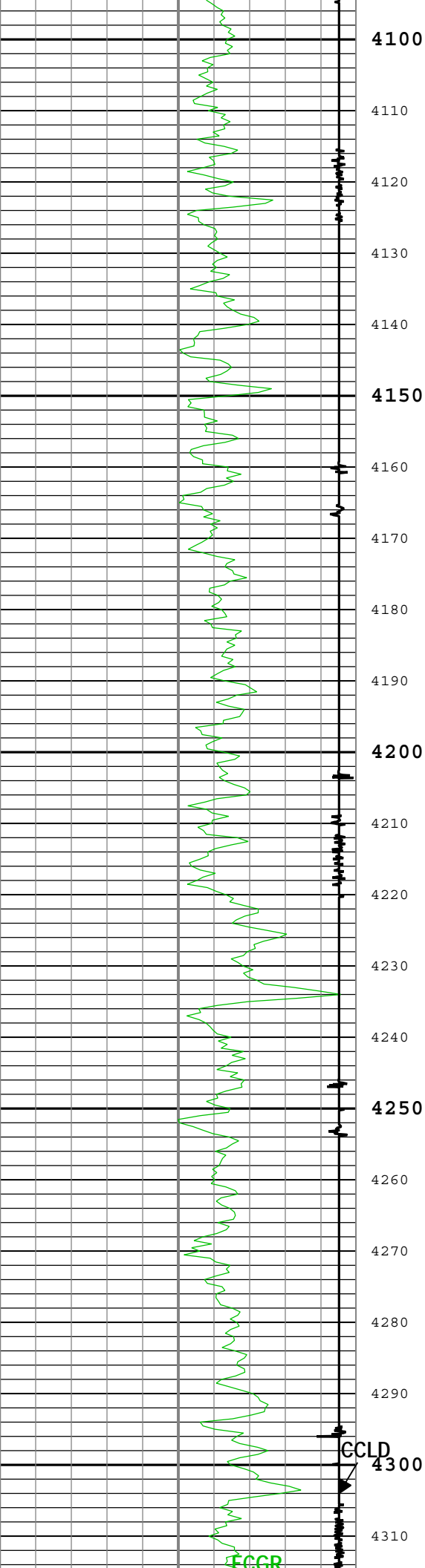


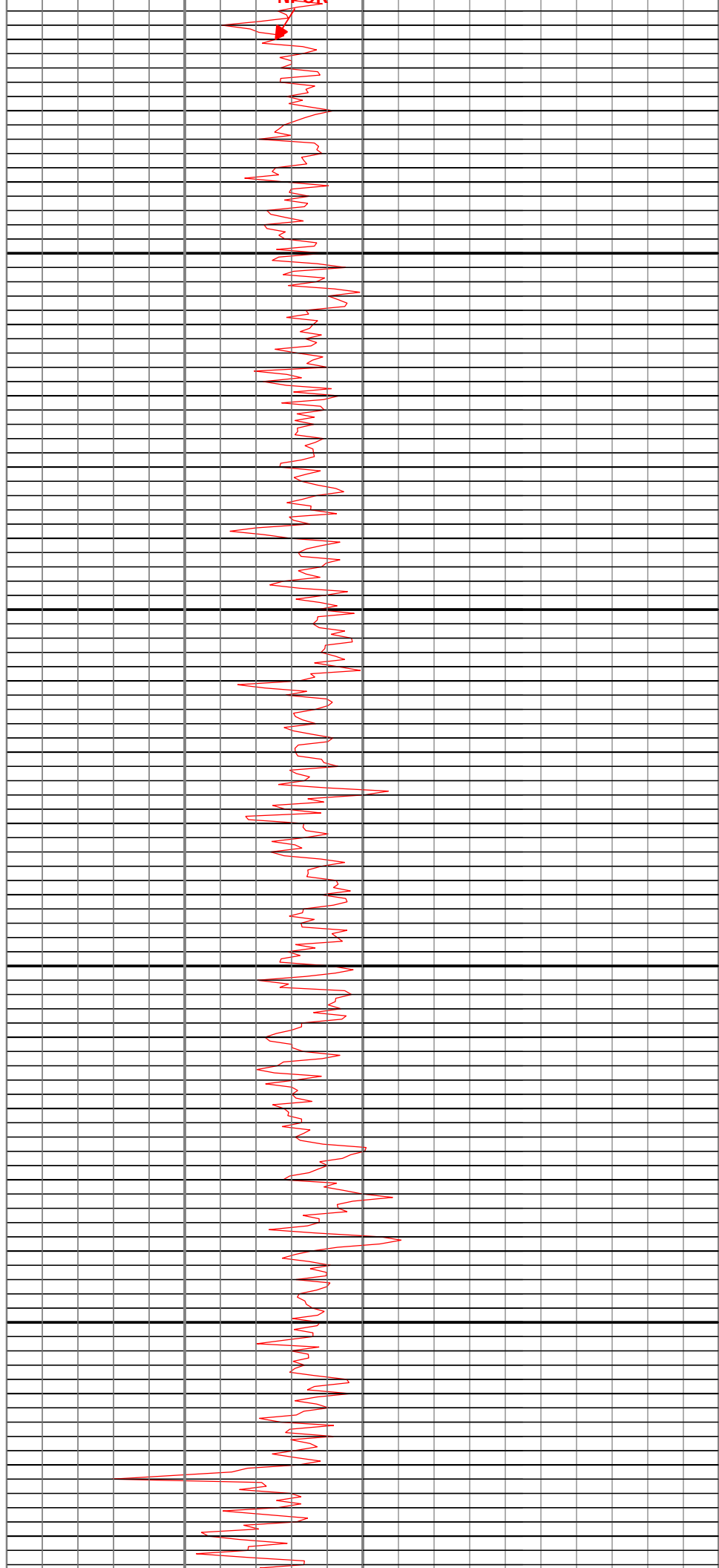
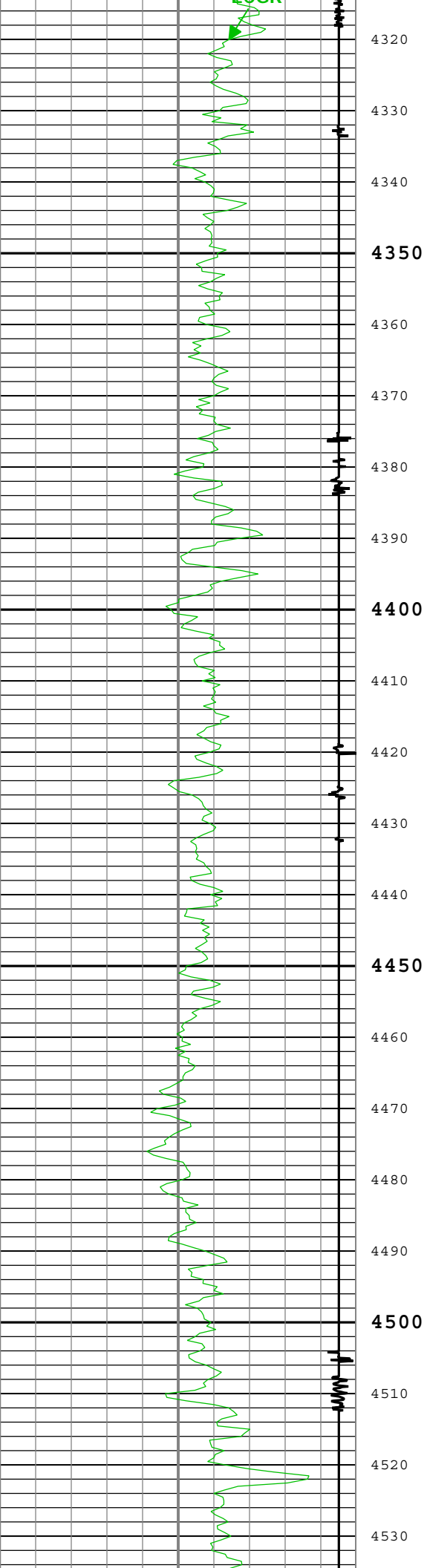


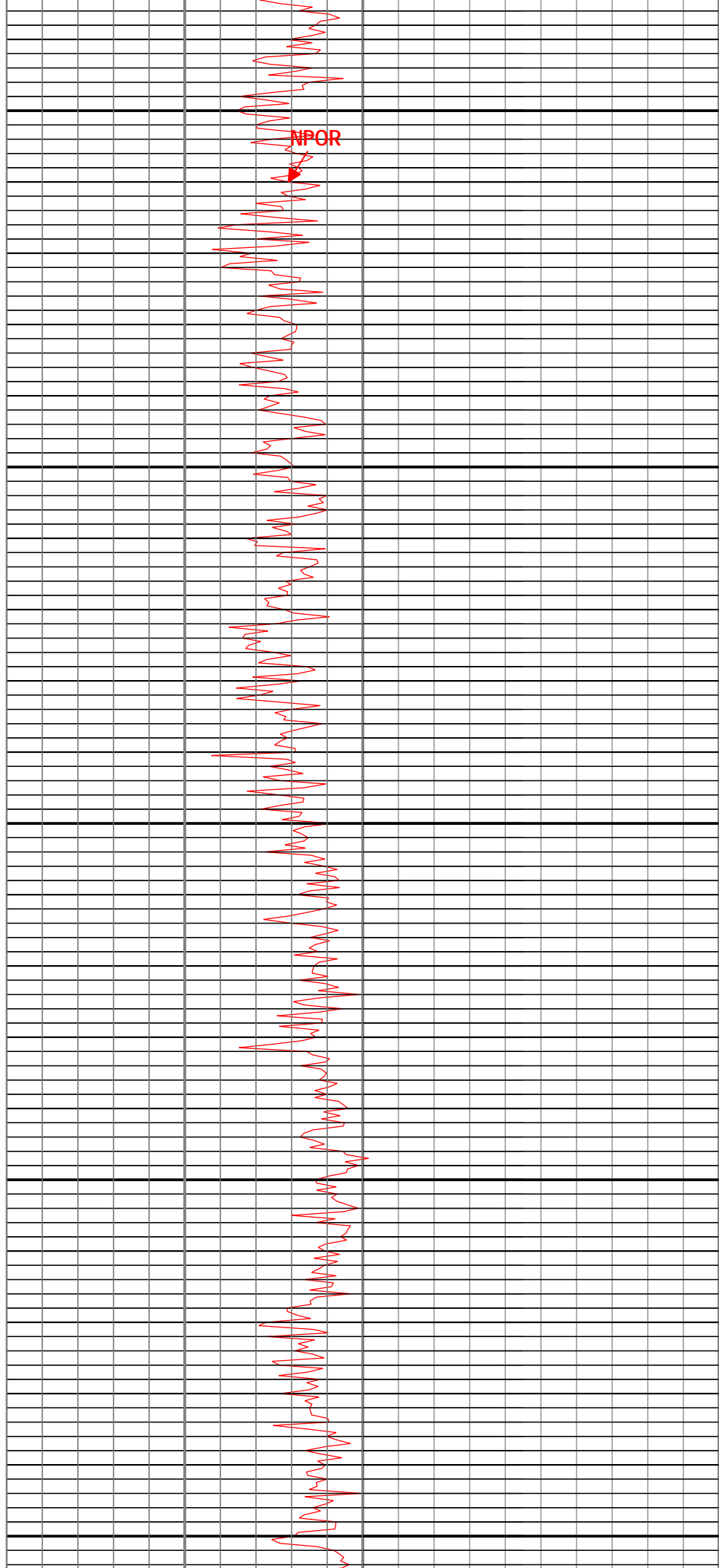
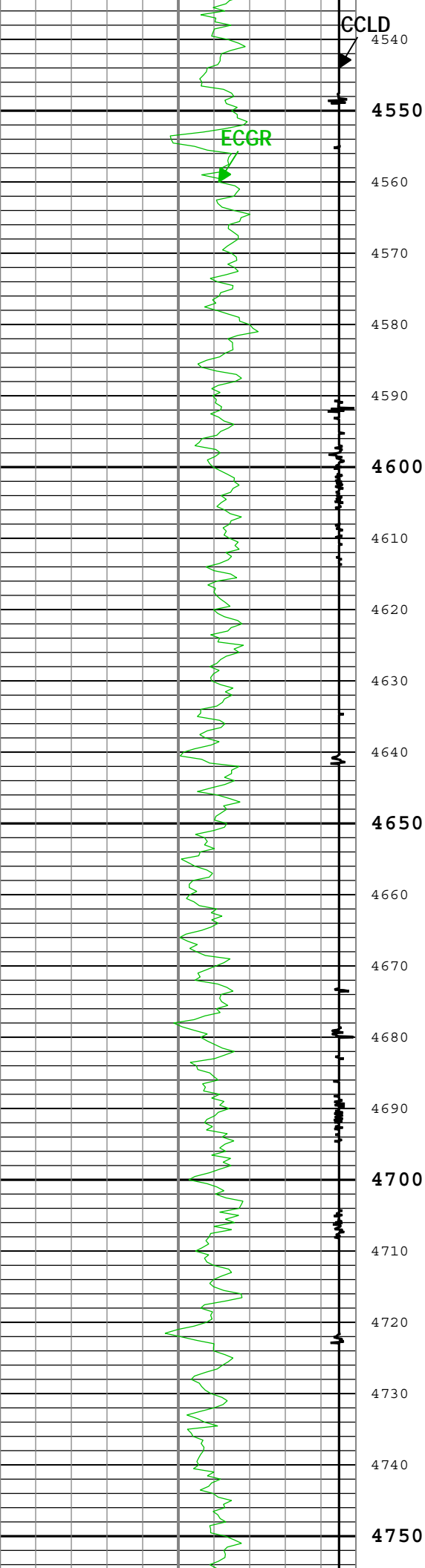


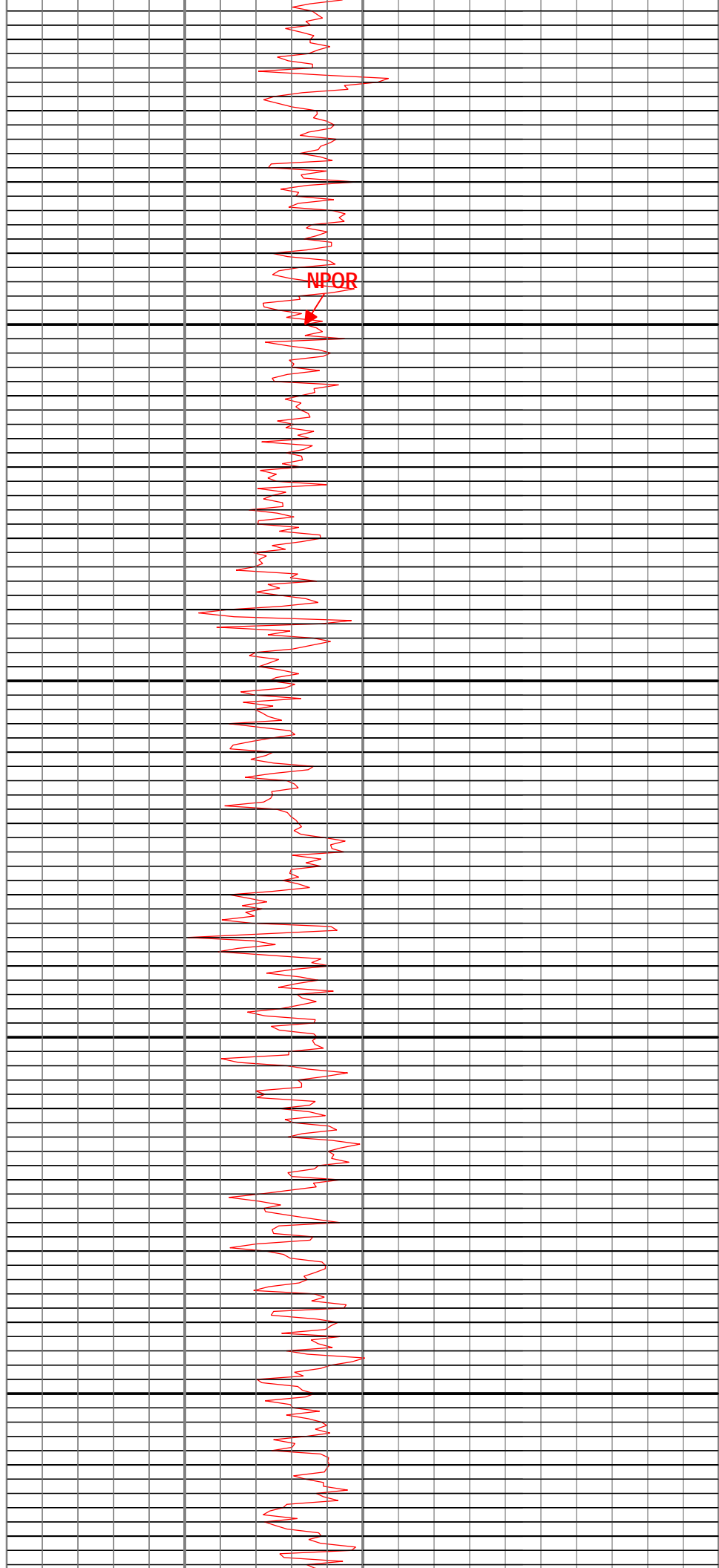
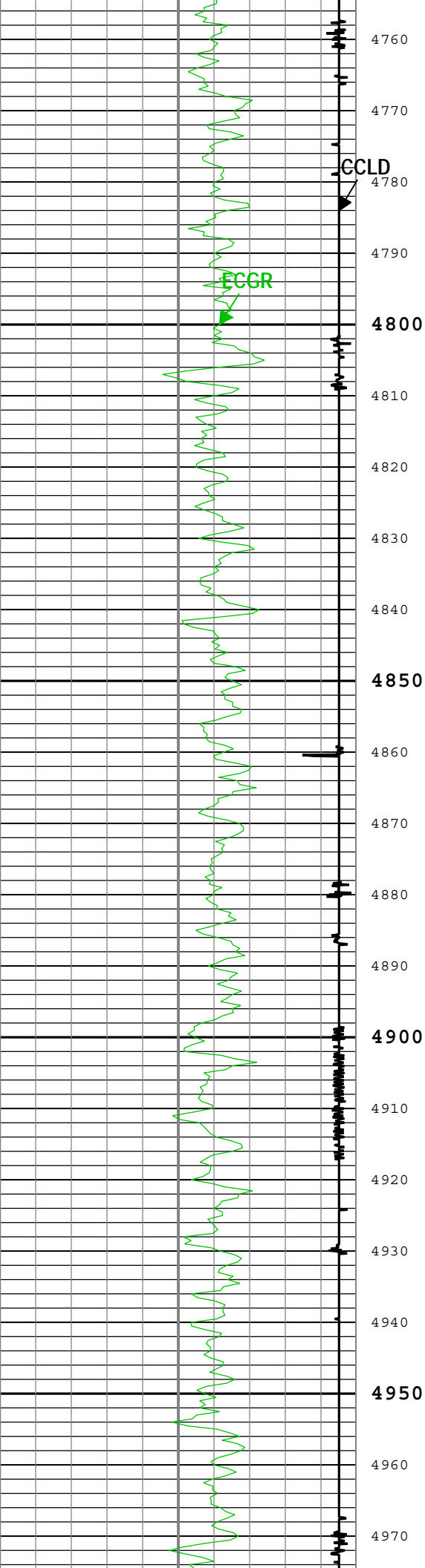


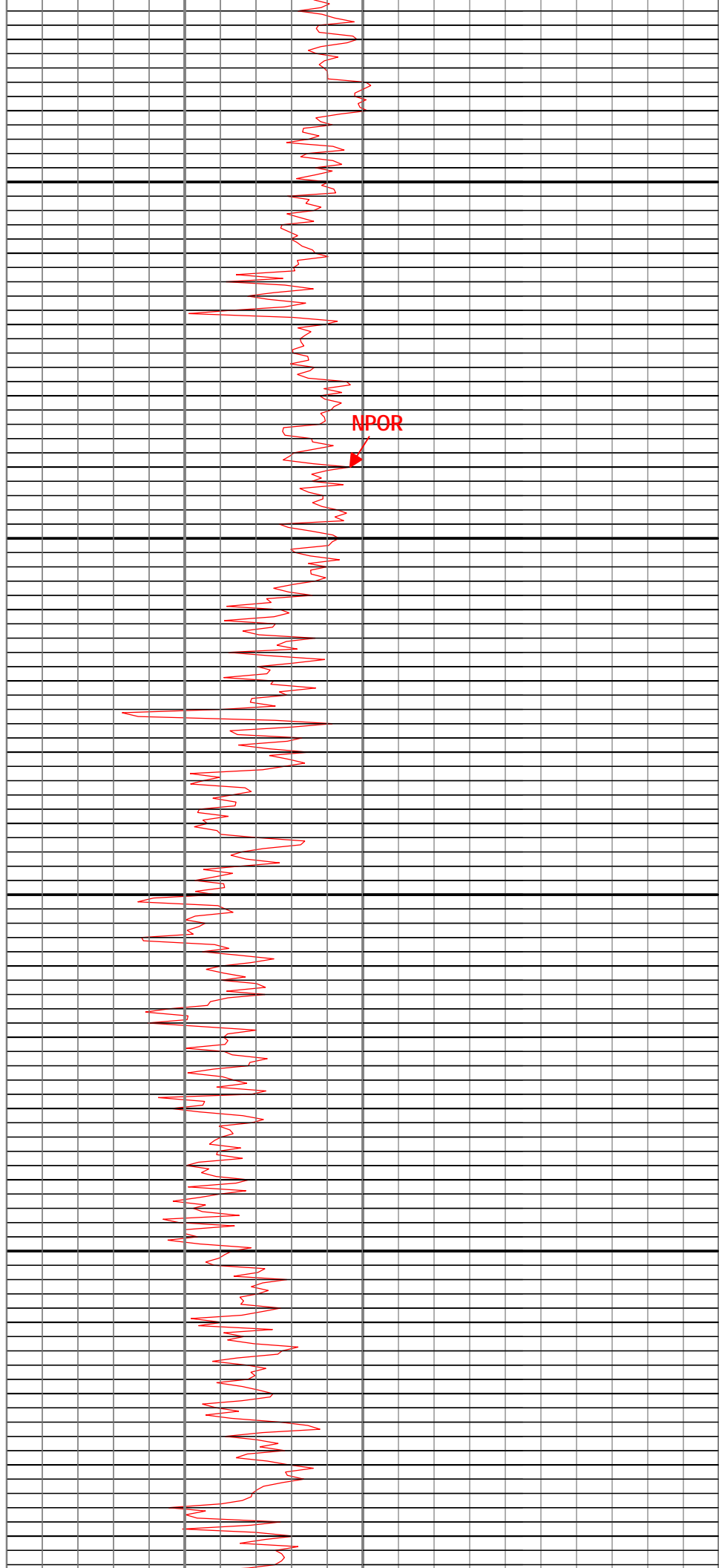
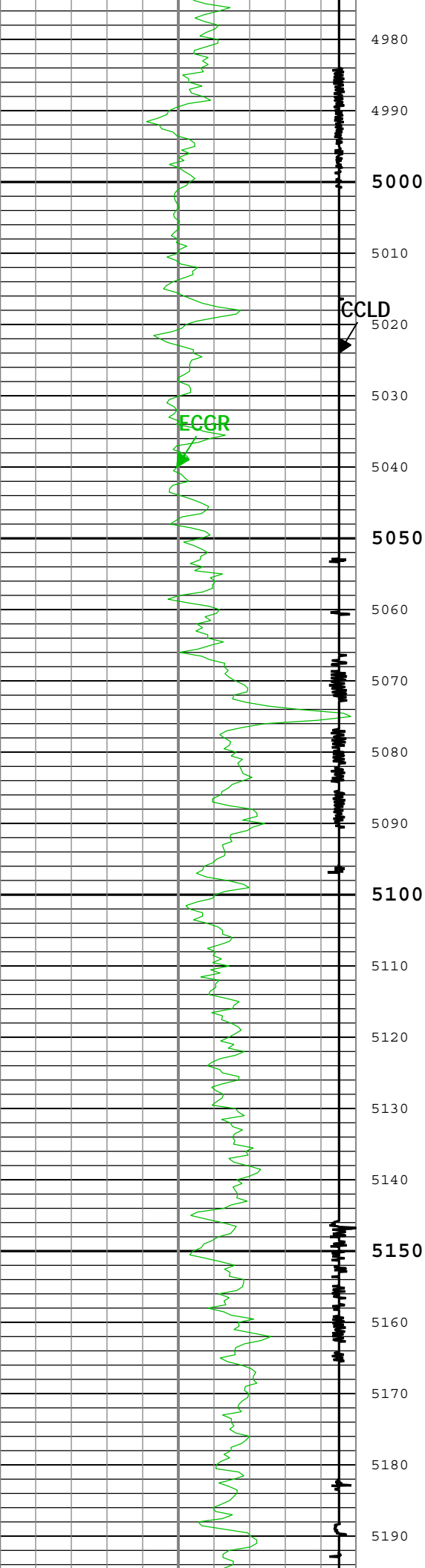


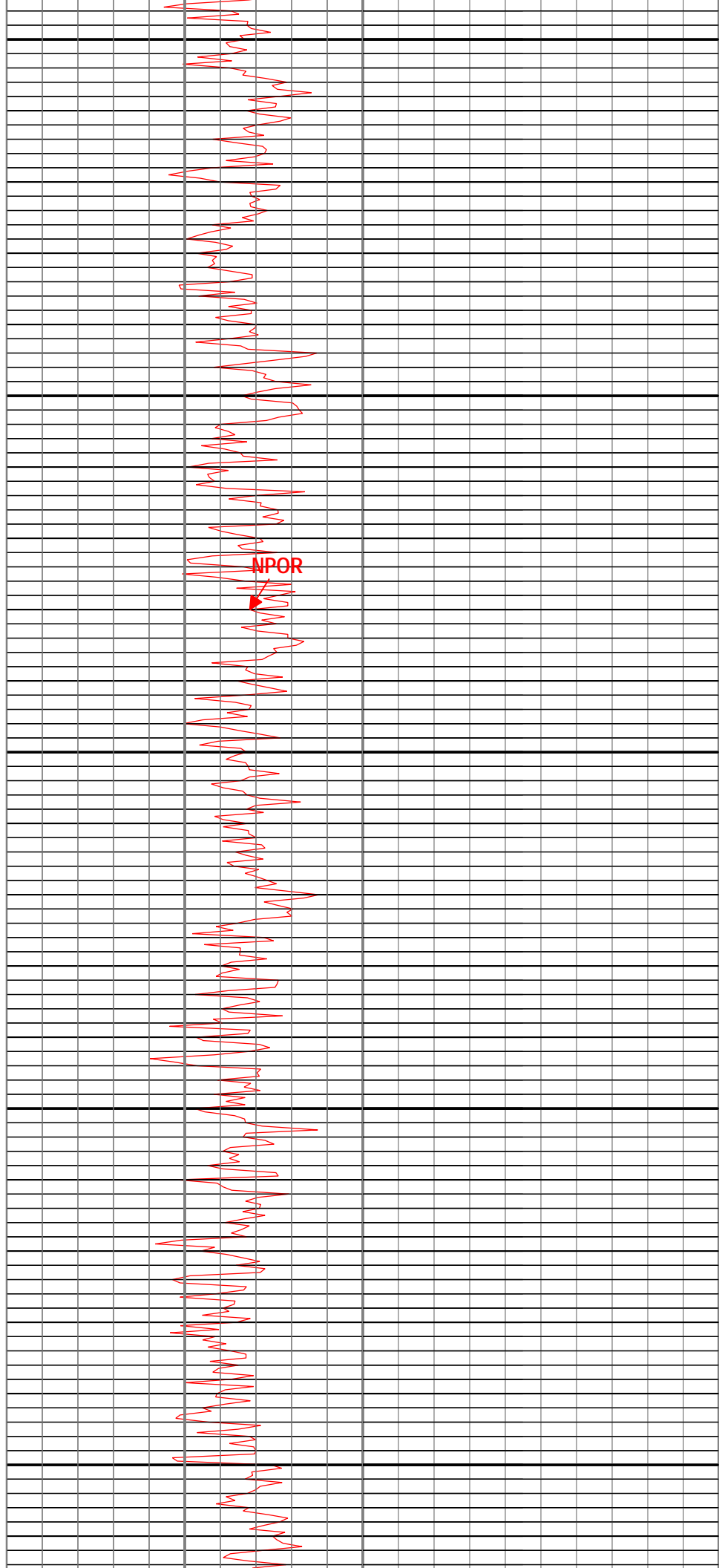
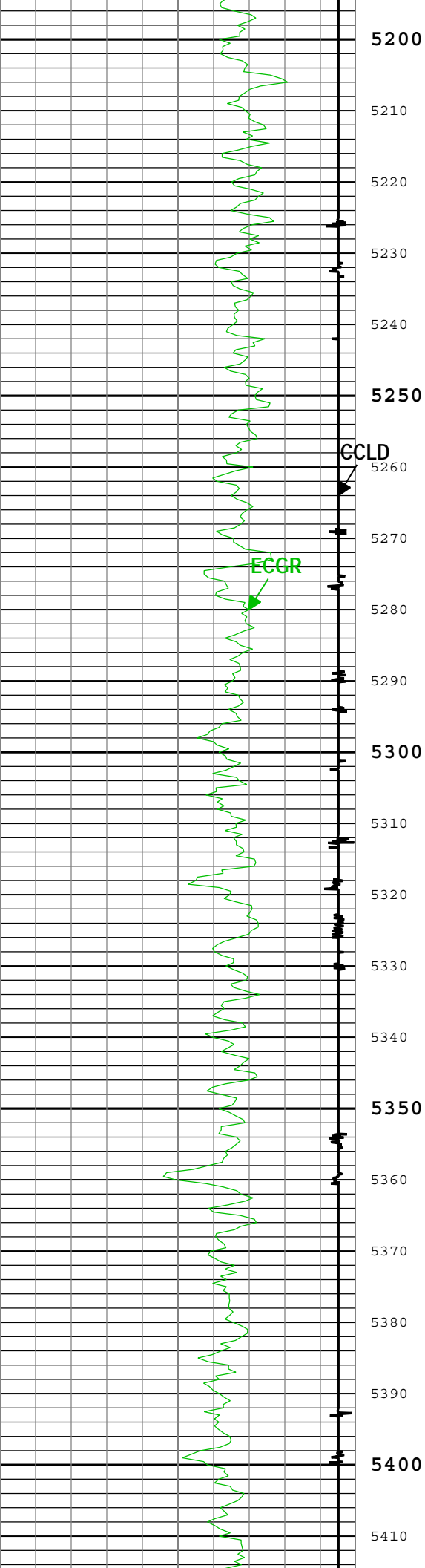


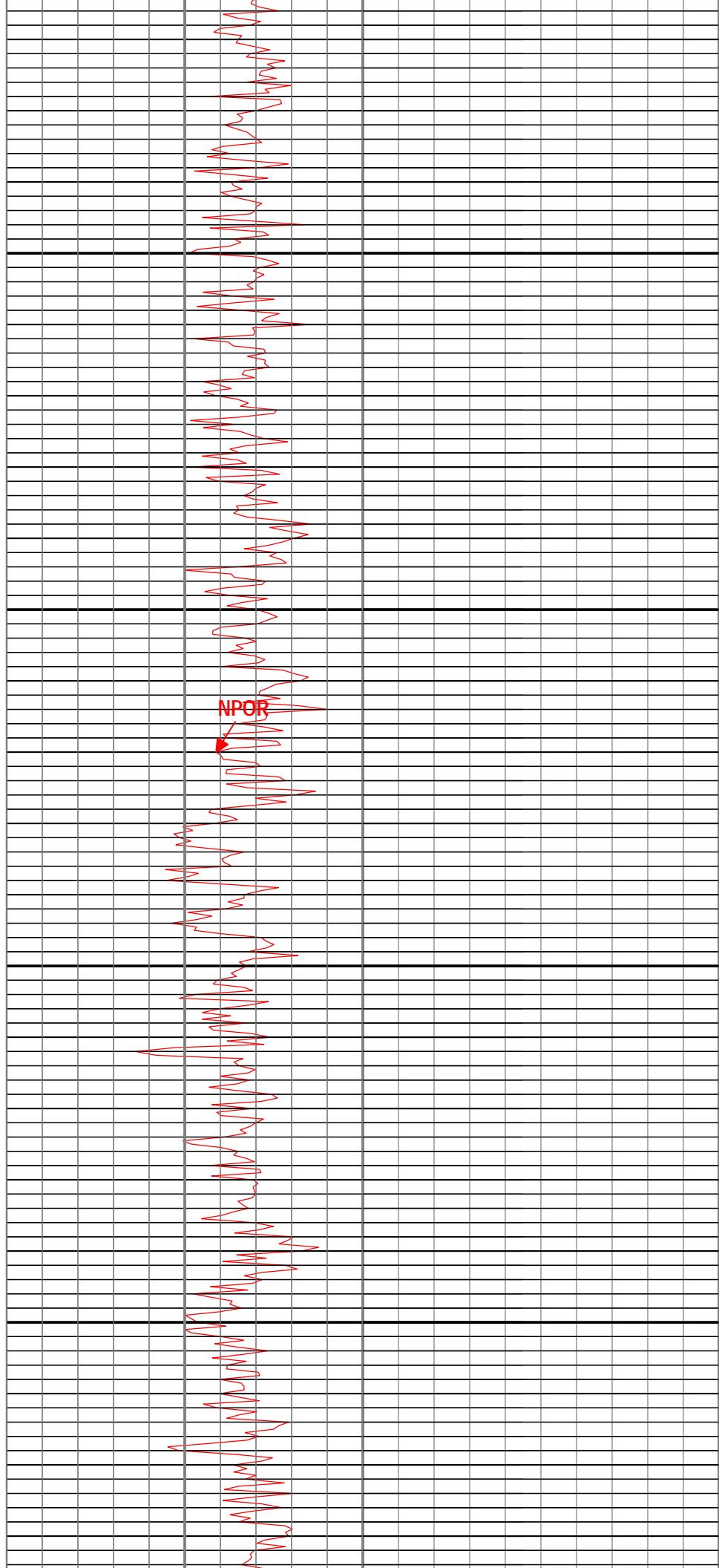
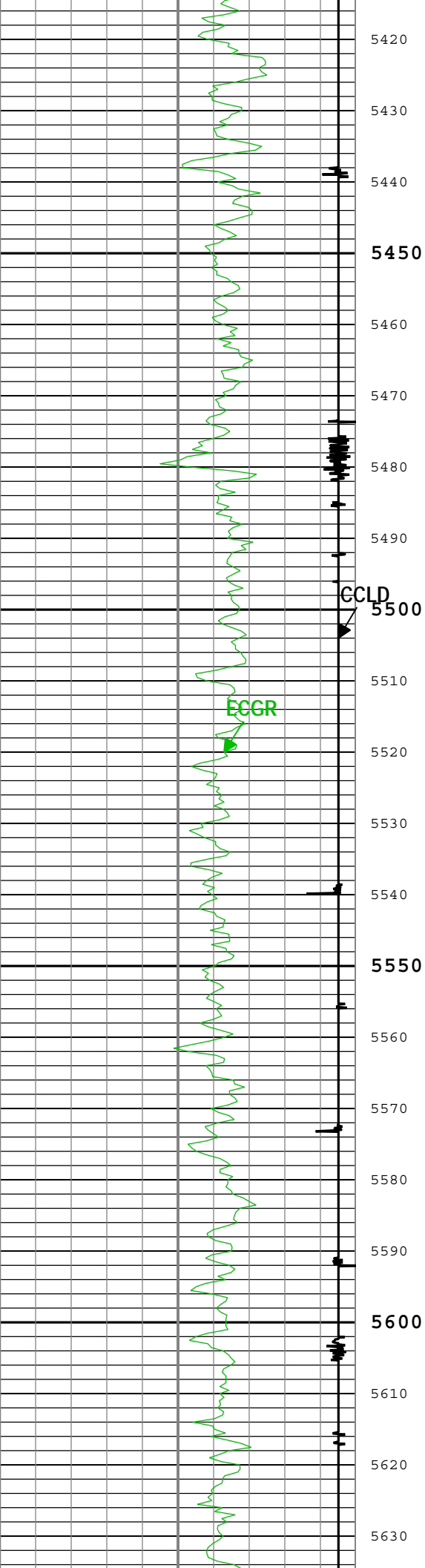


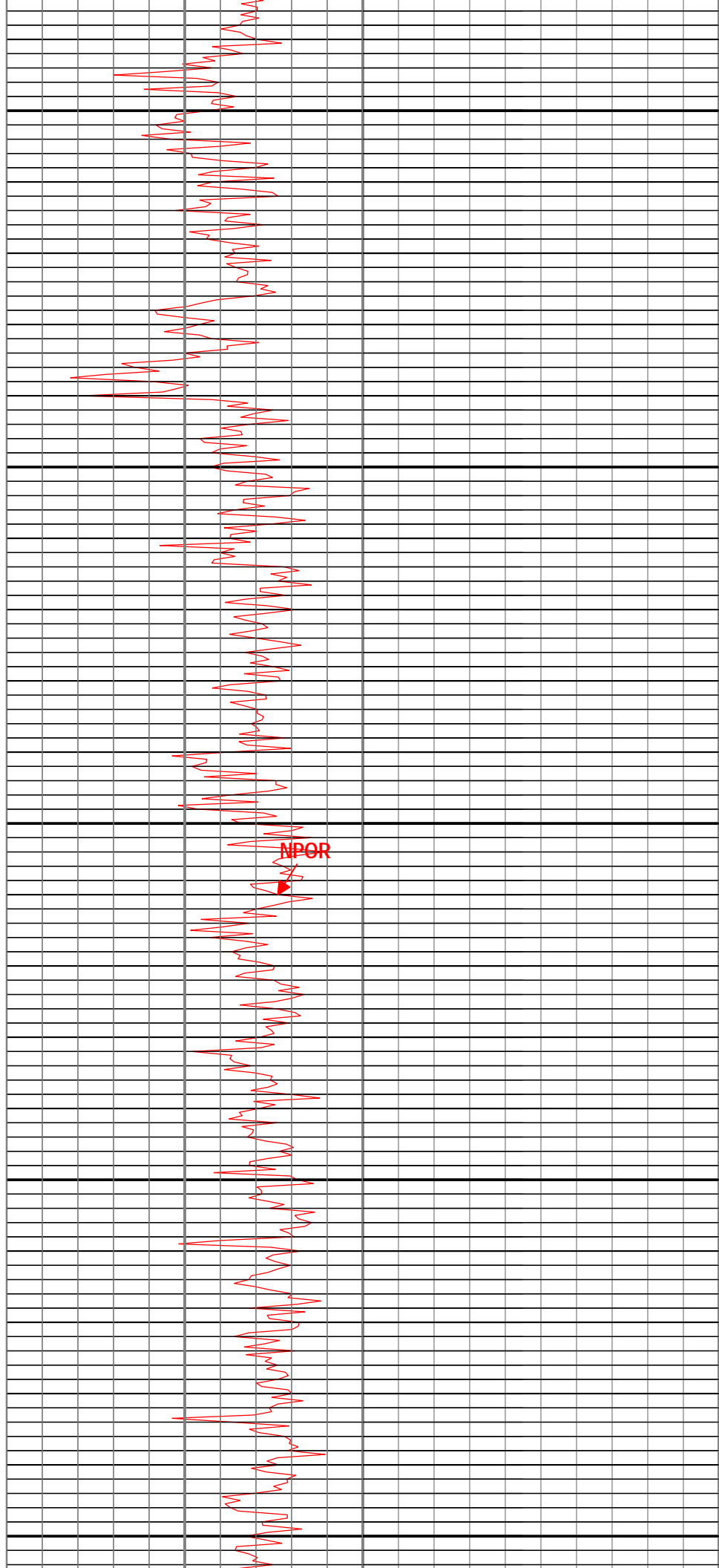
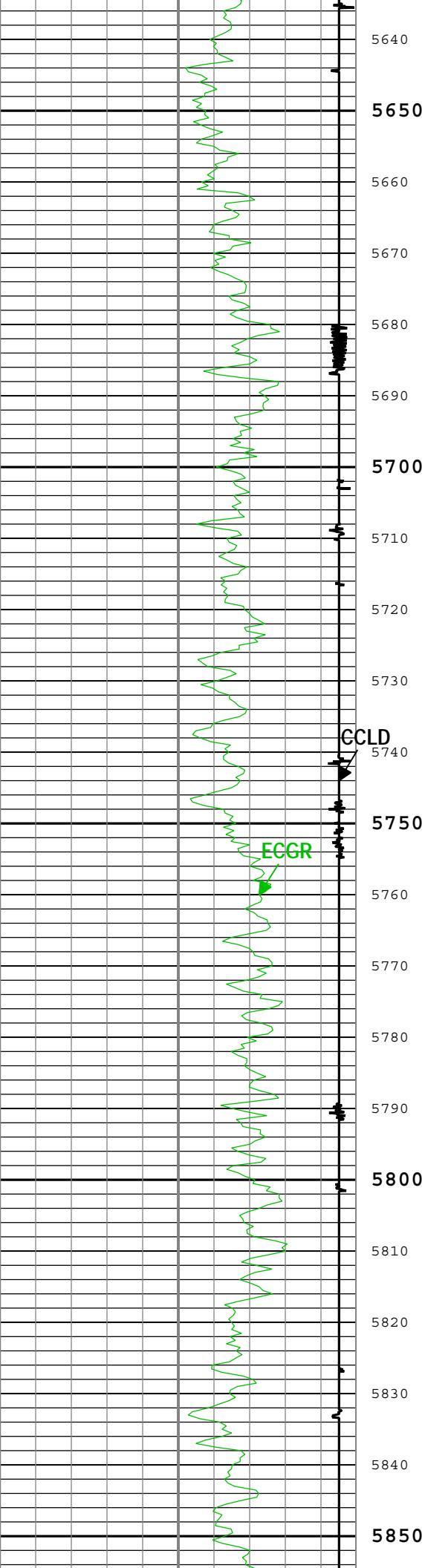


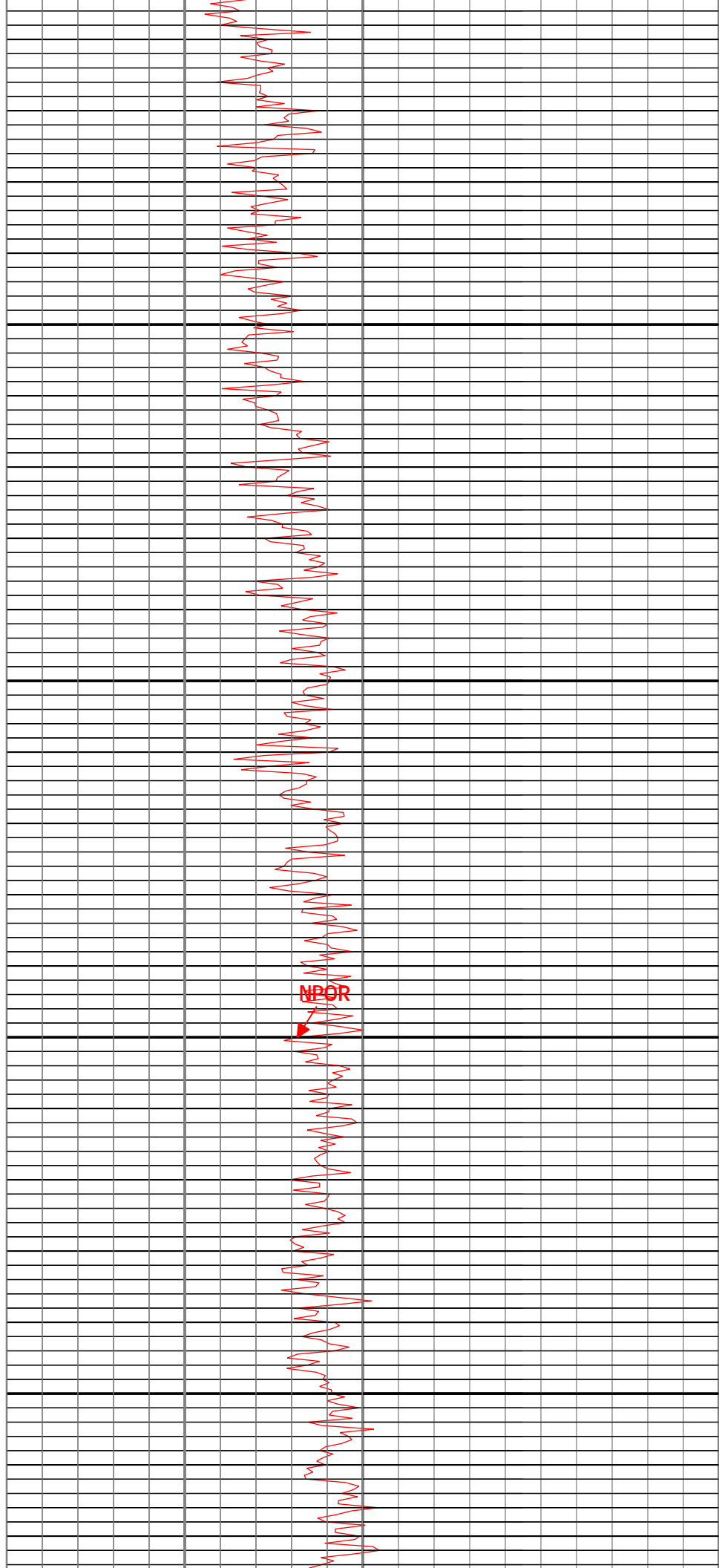
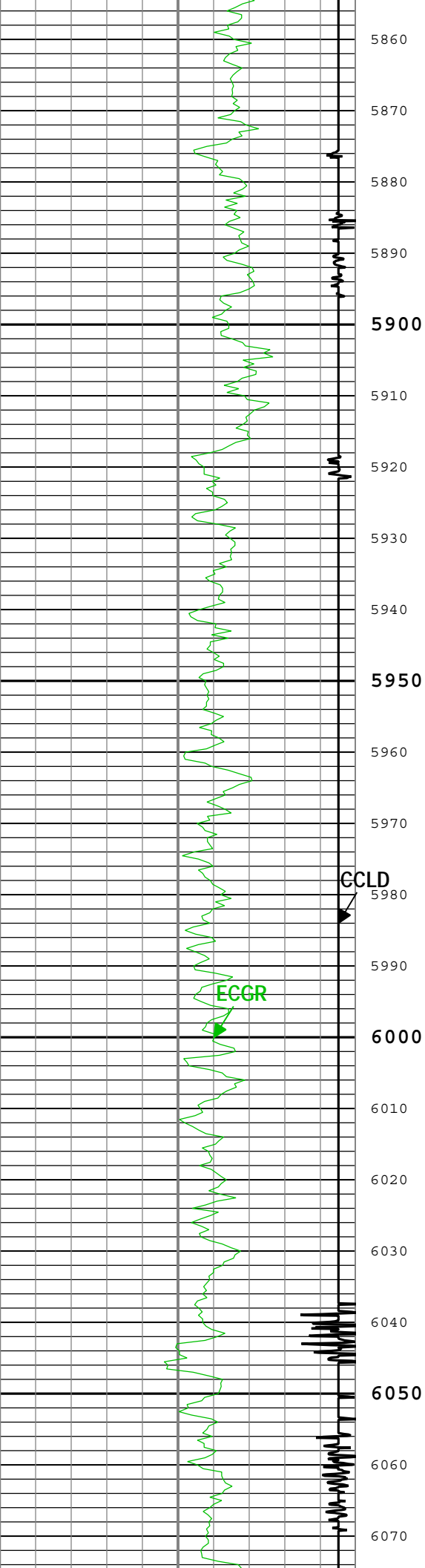


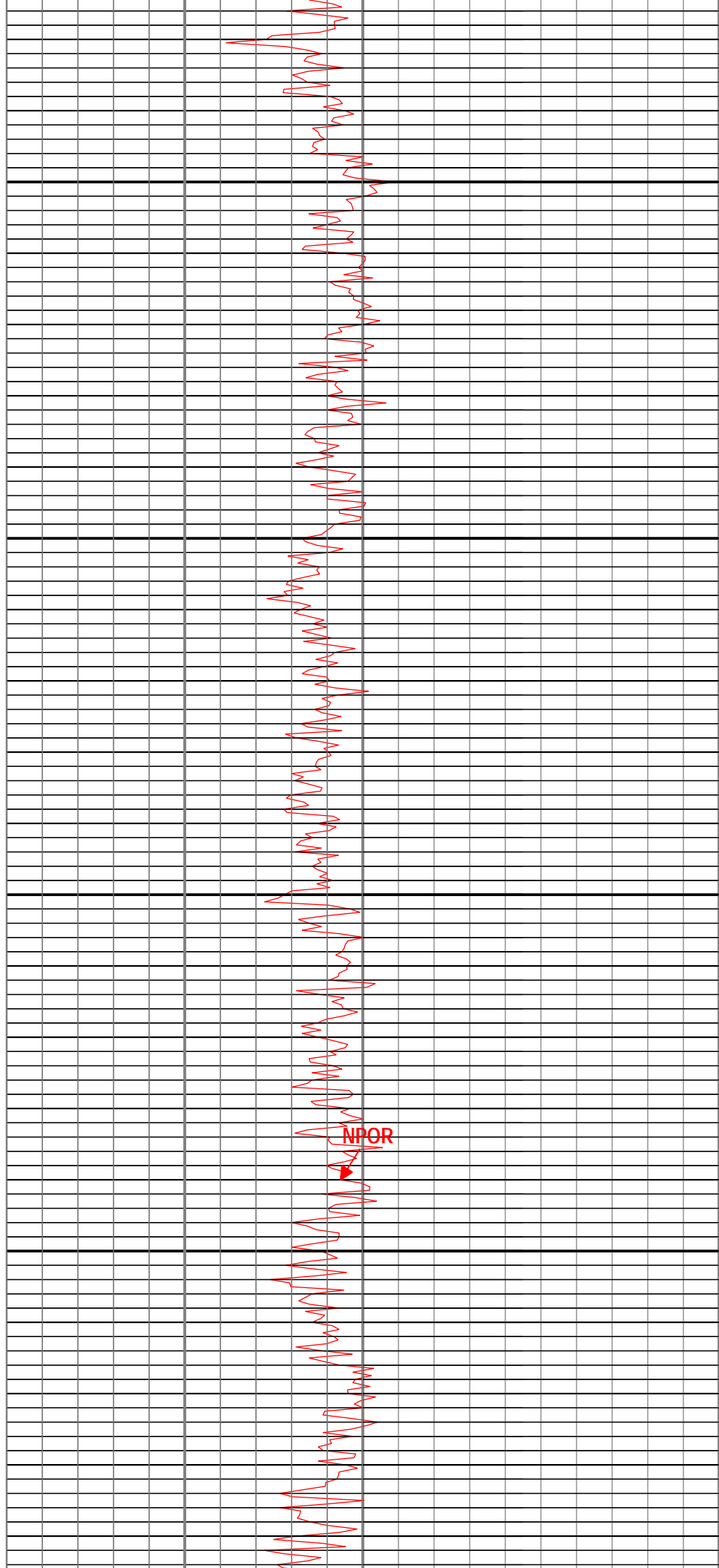
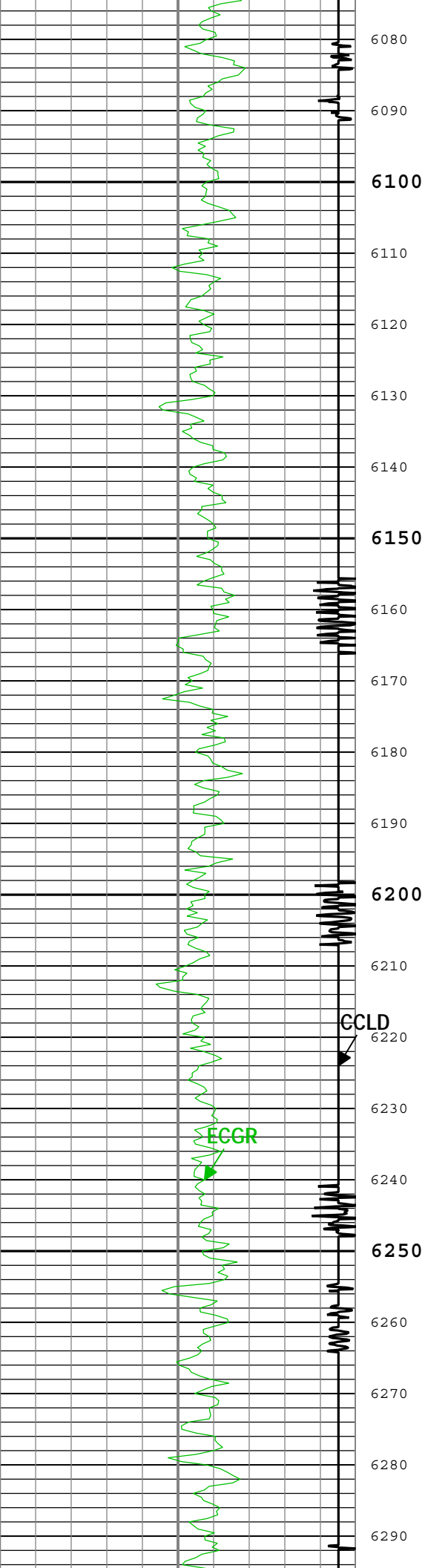


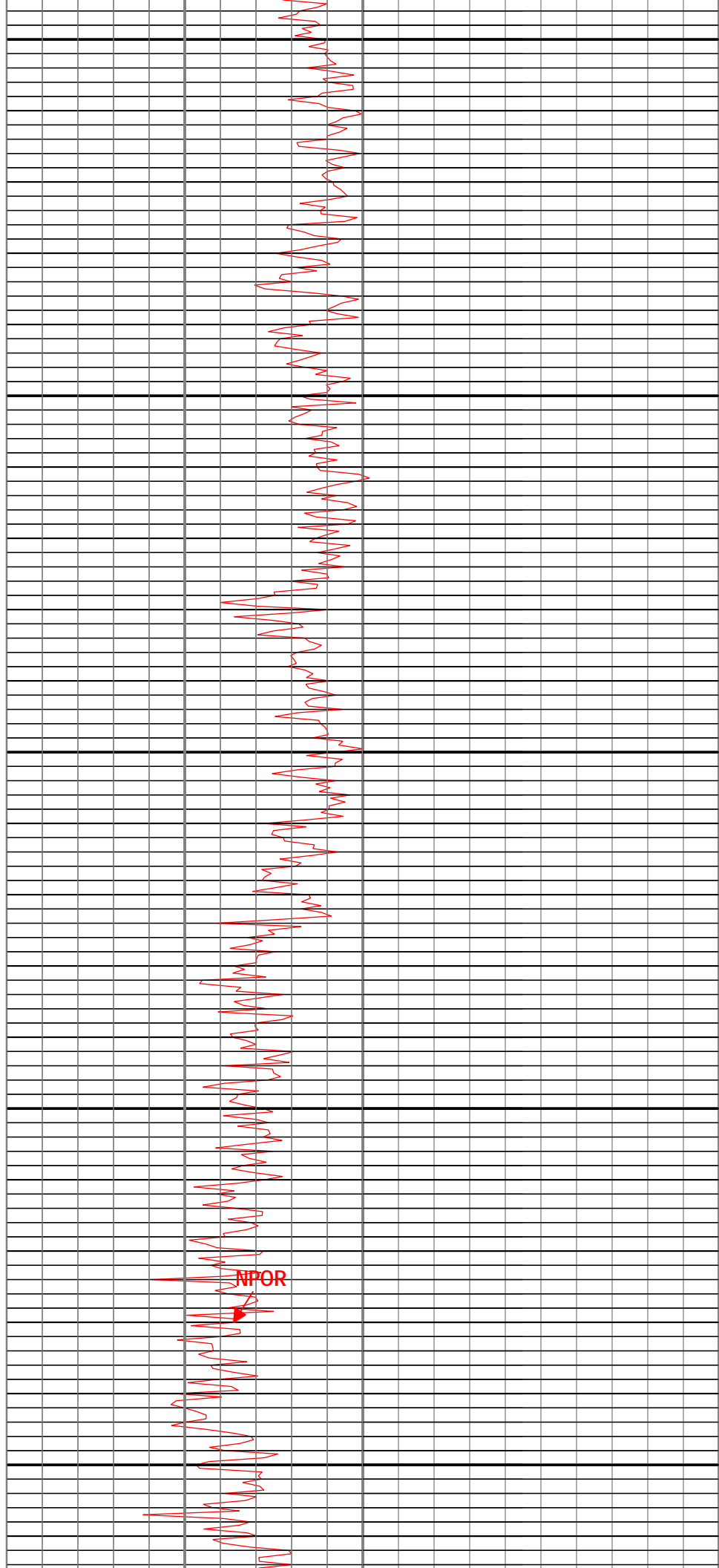
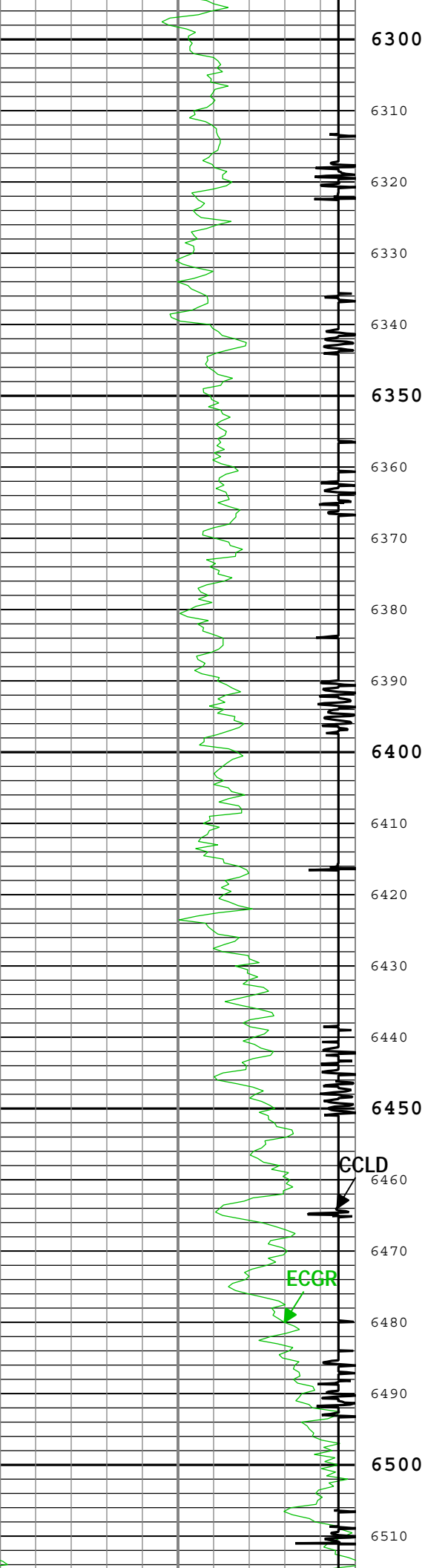


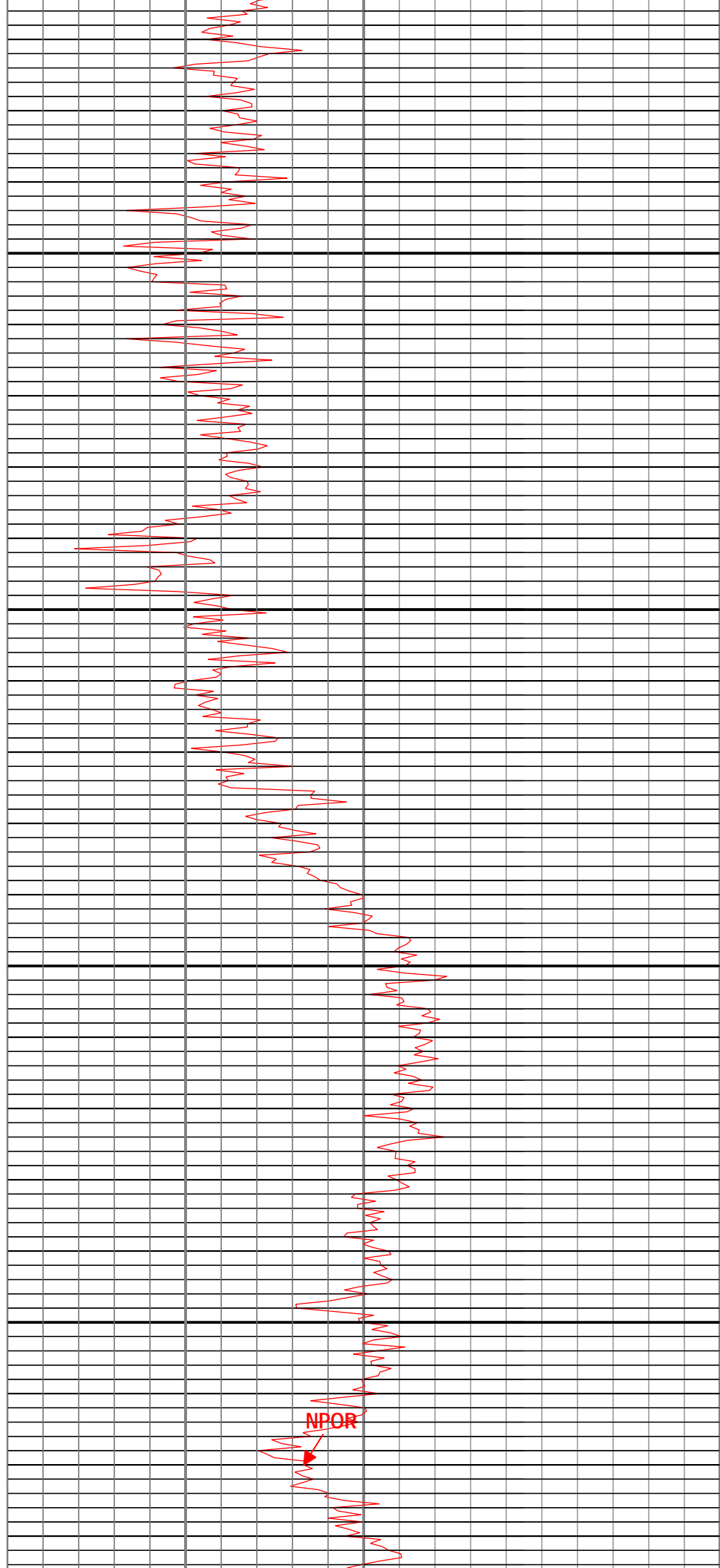
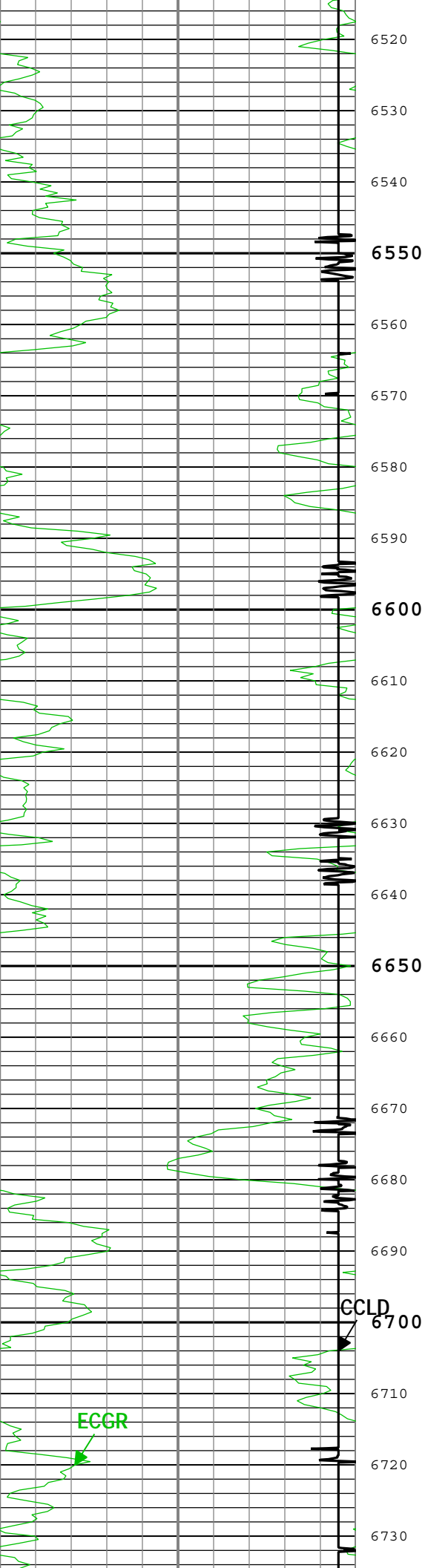


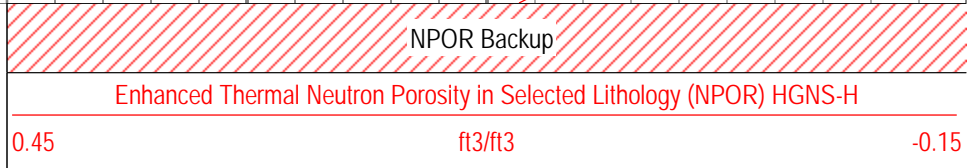
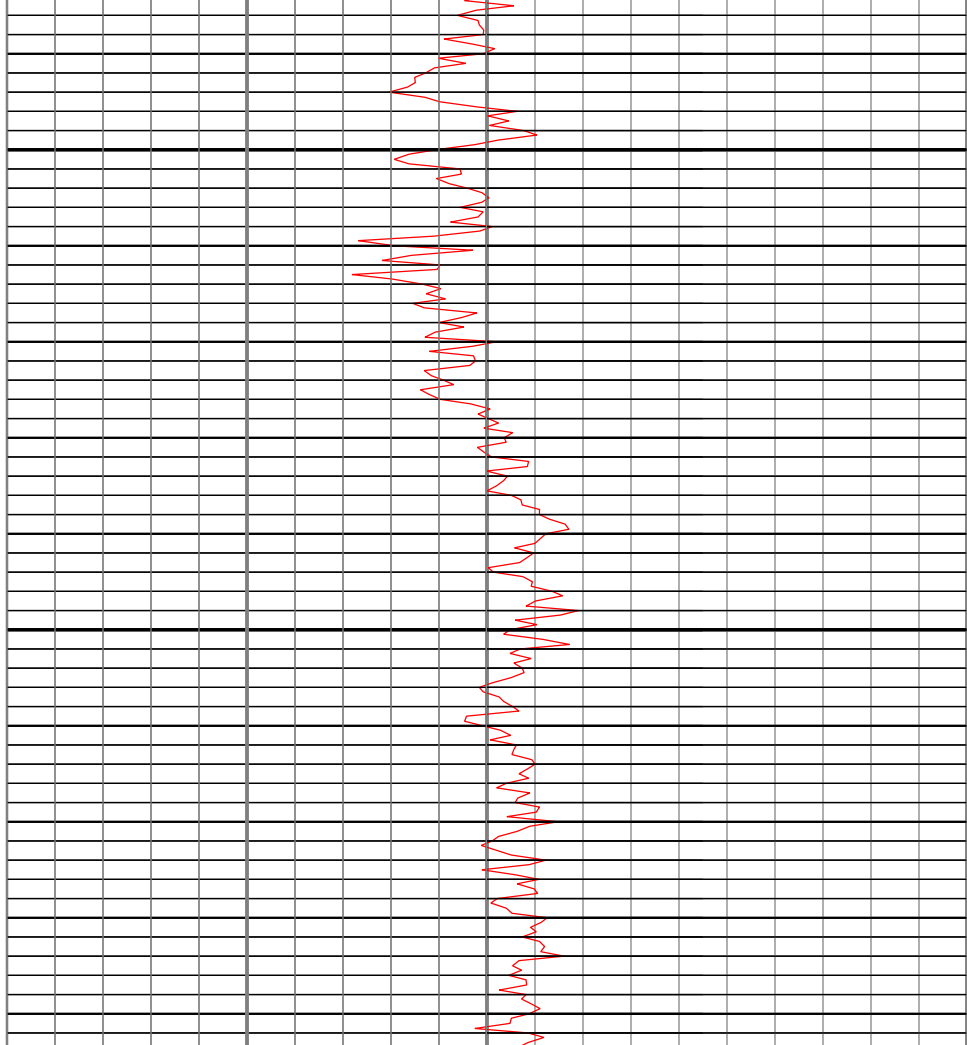
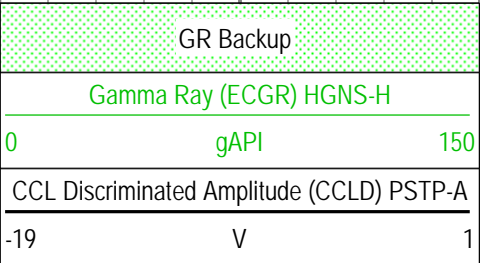
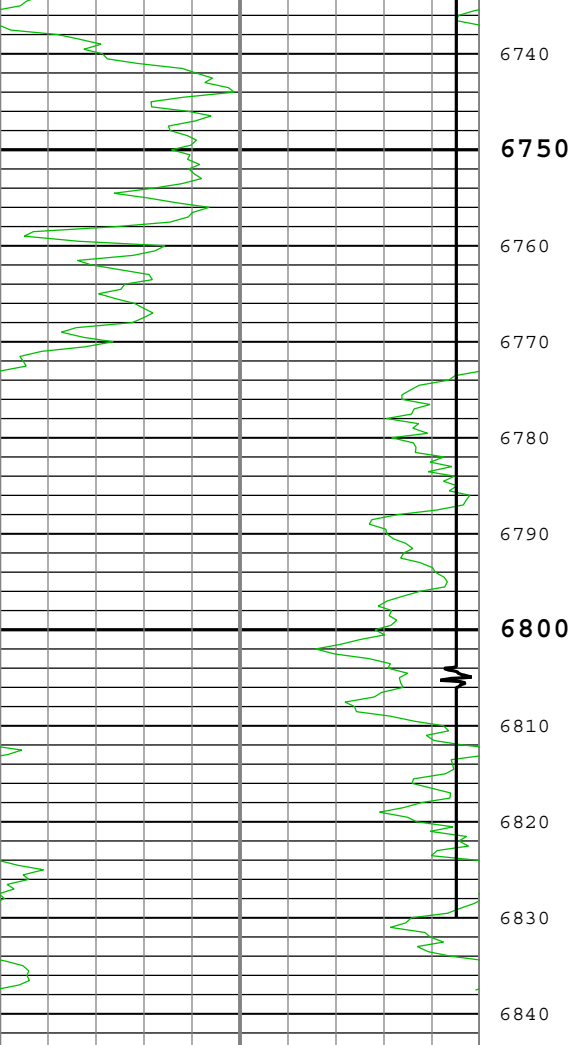












Description: AIT Basic Log Two Format: Log (Noble Nuclear) Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth Creation Date: 20-Apr-2015 22:00:04

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	216.02	degF
BS	Bit Size	WLSESSION	Depth Zoned	in
BSAL	Borehole Salinity	Borehole	0	ppm
CBLO	Casing Bottom (Logger)	WLSESSION	7019	ft
CDEN	Cement Density	HGNS-H	2	g/cm3
DC_MODE	Depth Correction Mode	DepthCorrection	Real-time	
DFD	Drilling Fluid Density	Borehole	8.7	lbm/gal
DFT	Drilling Fluid Type	Borehole	Water	
EDF	Elevation of Derrick Floor Above Permanent Datum	WLSESSION	29	ft
EPD	Elevation of Permanent Datum (PDAT) above Mean Sea Level	WLSESSION	4664	ft
FSAL	Formation Salinity	Borehole	0	ppm
GCSE_DOWNPASS	Generalized Caliper Selection for WL Log Down Passes	Borehole	PS	

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	
MATR	Rock Matrix for Neutron Porosity Corrections	Borehole	LIMESTONE	
MFST	Mud Filtrate Sample Temperature	Borehole	68	degF
MST	Mud Sample Temperature	Borehole	68	degF
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	
TD	Total Measured Depth	Borehole	6850	ft

Run 1Depth Zoned Parameters			
Parameter	Value	Start (ft)	Stop (ft)
BS	26	30.5	110
BS	13.5	110	934
BS	8.75	934	6843.5
All depth are actual.			

Tool Control Parameters				
Run 1: Parameters				
Parameter	Description	Tool	Value	Unit
MAX_LOG_SPEED	Toolstring Maximum Logging Speed	WLSESSION	3600	ft/h

HGNS composite				

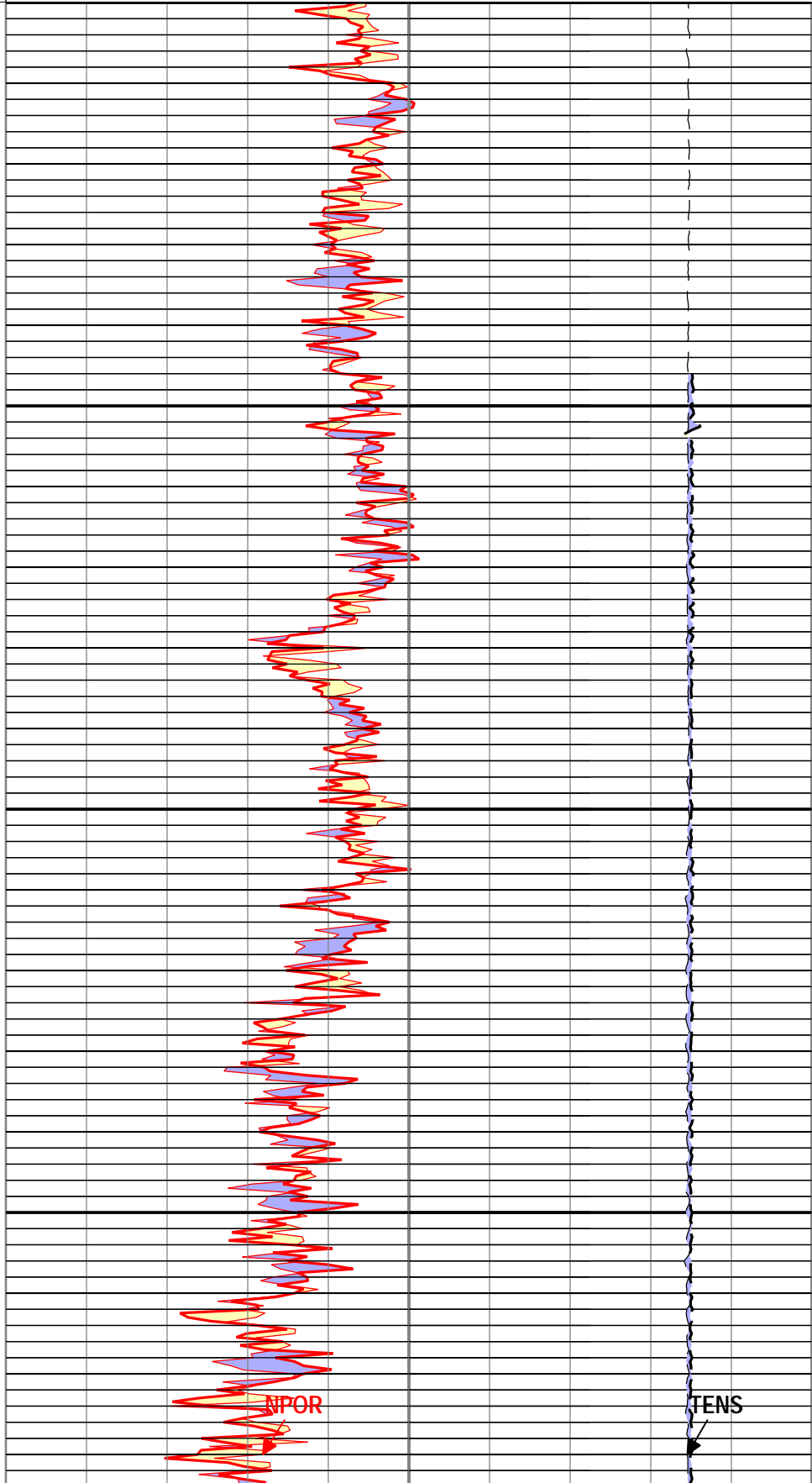
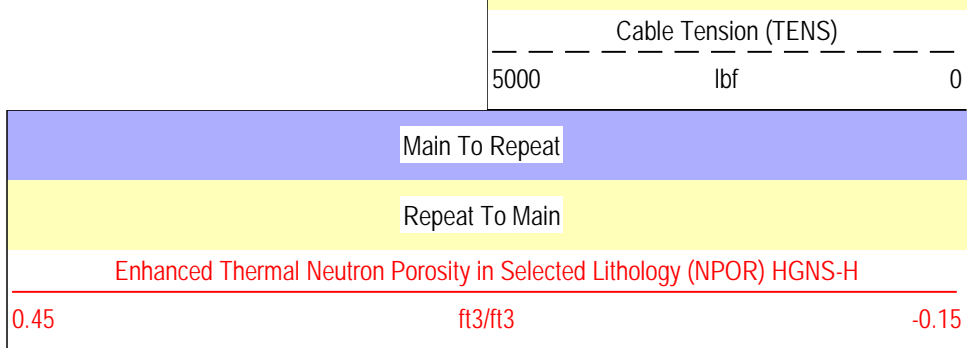
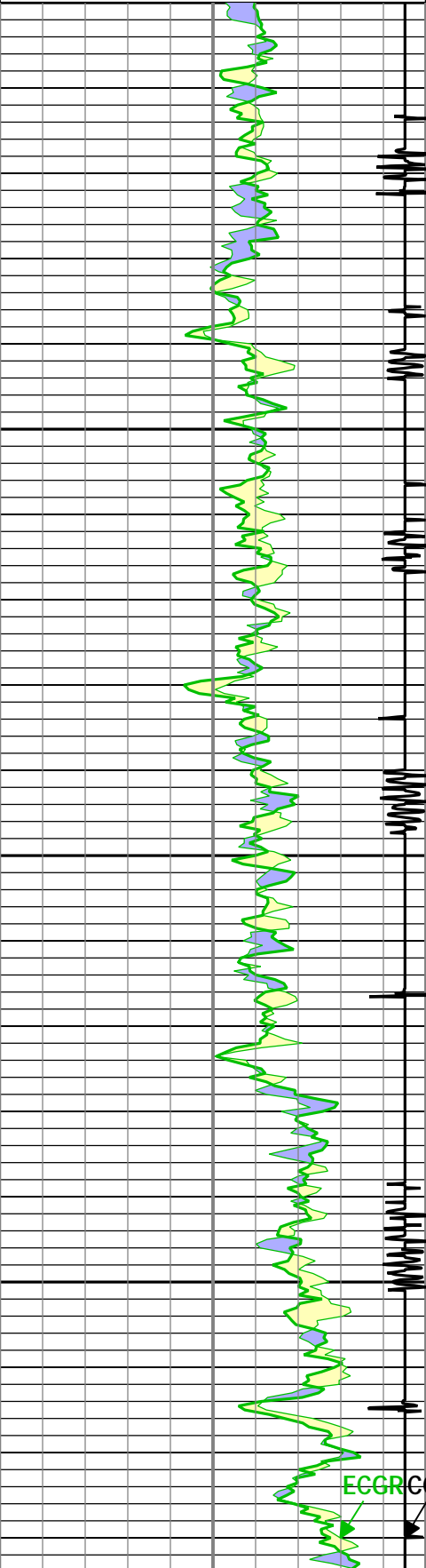
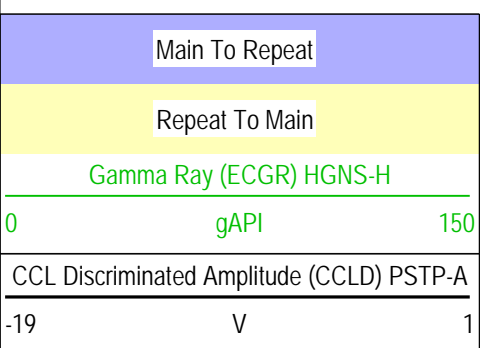
Software Version				
Acquisition System		Version		
Maxwell		5.2.40401.3100		

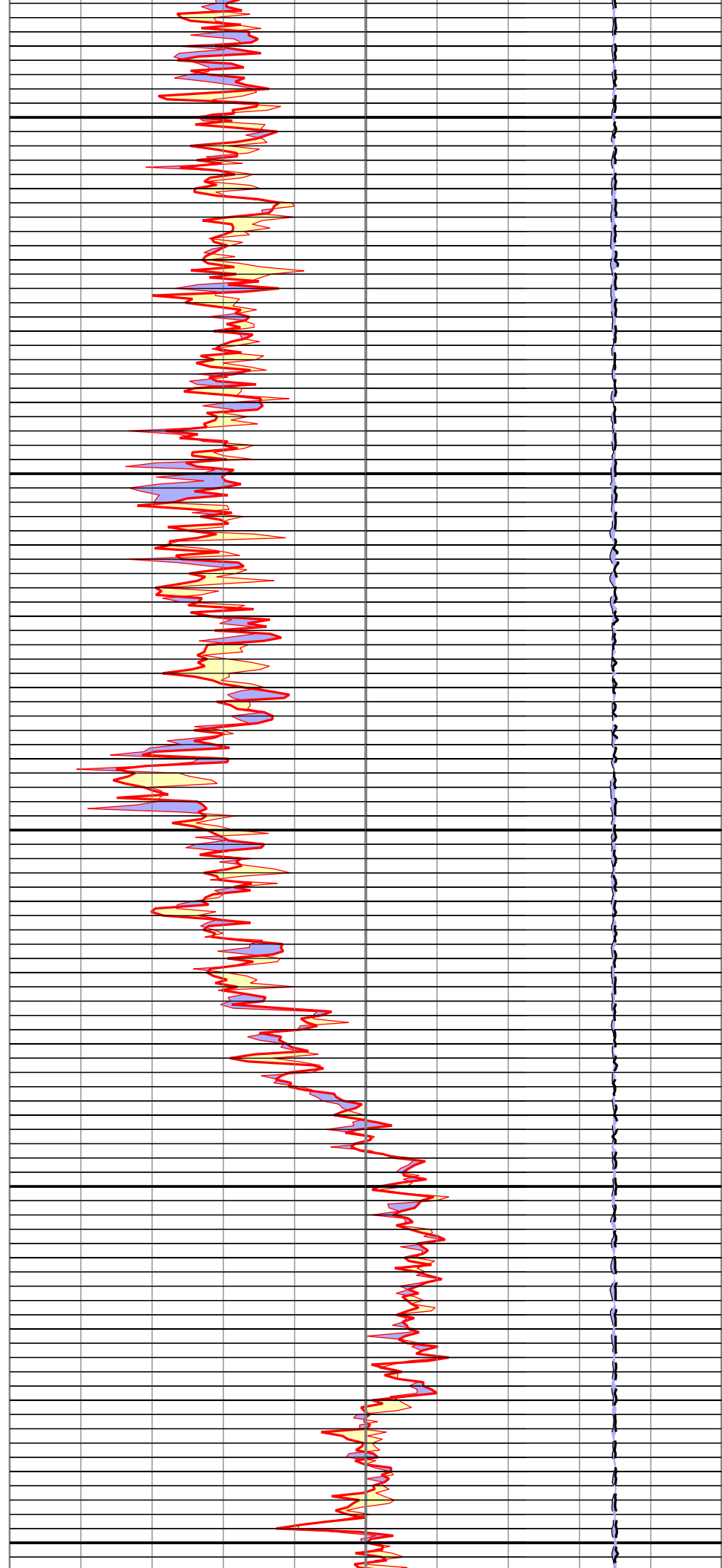
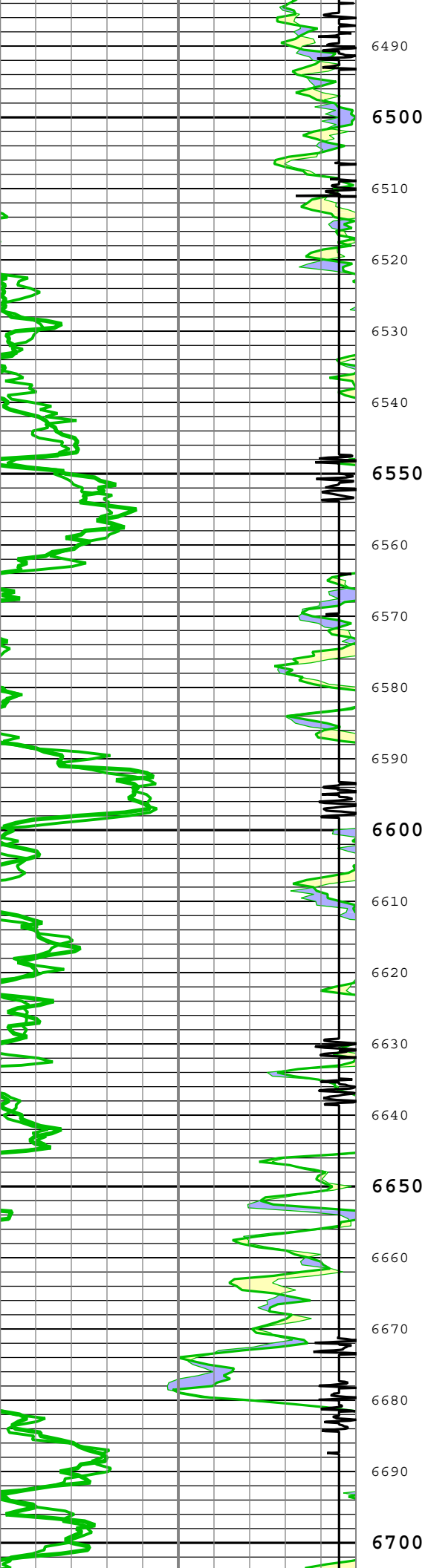
Composite Summary									
Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	DSC Mode	Depth Shift	Include Parallel Data
Run 1	Repeat[2]:Up	Up	6290.87 ft	6846.77 ft	18-Apr-2015 8:53:04 AM	18-Apr-2015 9:03:07 AM	ON	1.28 ft	Yes
Run 1	Main[3]:Up	Up	39.58 ft	6846.69 ft	18-Apr-2015 9:07:19 AM	18-Apr-2015 11:01:00 AM	ON	1.56 ft	Yes
Run 2	Repeat[4]:Up	Up	6345.78 ft	6849.09 ft	18-Apr-2015 12:36:16 PM	18-Apr-2015 12:53:08 PM	ON	3.40 ft	Yes
Run 2	Main[5]:Up	Up	60.98 ft	6850.88 ft	18-Apr-2015 12:58:22 PM	18-Apr-2015 4:50:28 PM	ON	5.13 ft	Yes

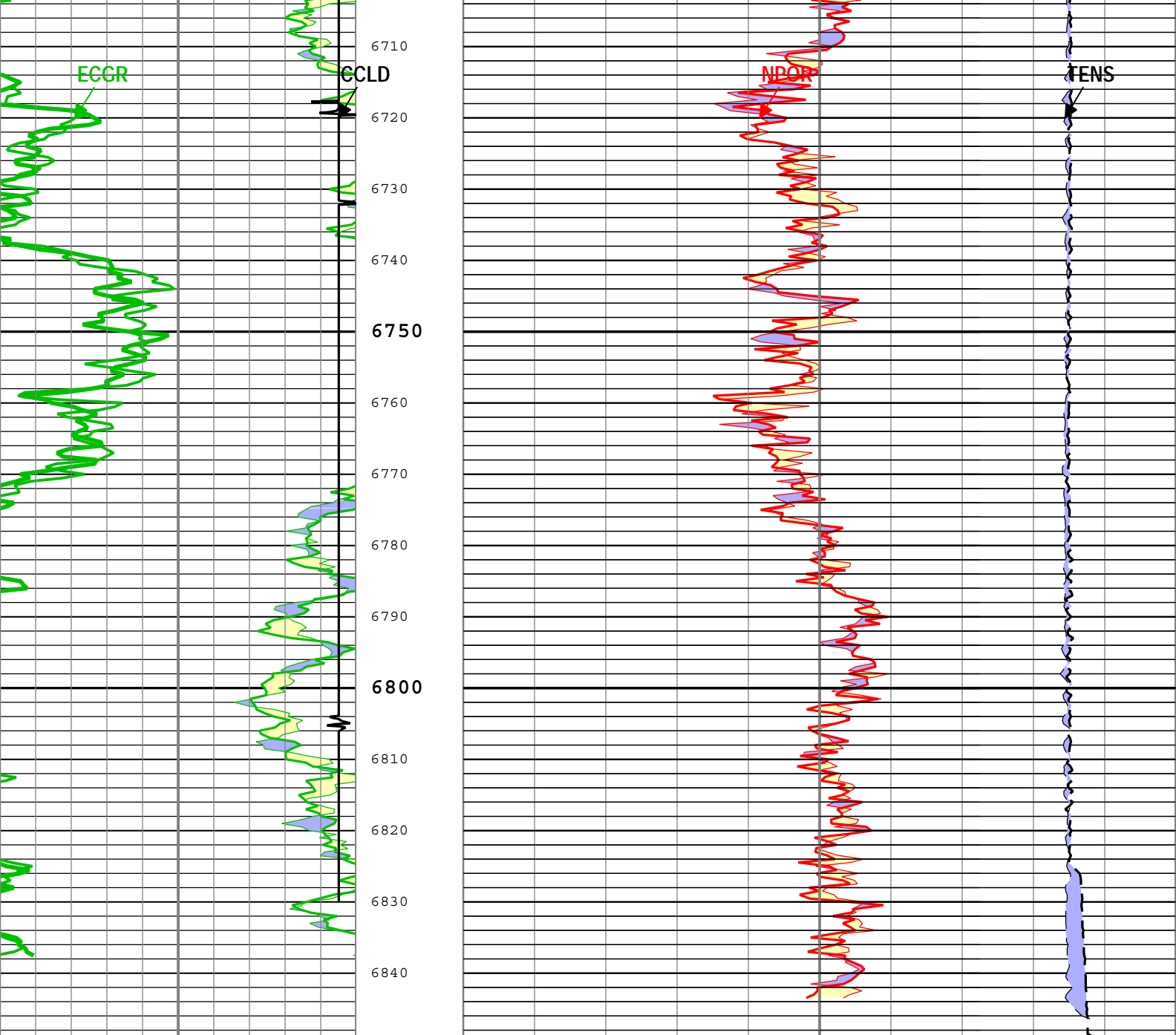
All depths are referenced to toolstring zero									
Log		<div>Company:Noble Energy Inc Well:Colt A13-648</div> <div>HGNS composite:S012</div>							

Description: AIT Basic Log Two Format: Noble Nuclear RA Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth Creation Date: 20-Apr-2015 22:00:06

	Main To Repeat
	Repeat To Main







Main To Repeat		
Repeat To Main		
Gamma Ray (ECGR) HGNS-H		
0	gAPI	150
CCL Discriminated Amplitude (CCLD) PSTP-A		
-19	V	1

Main To Repeat		
Repeat To Main		
Enhanced Thermal Neutron Porosity in Selected Lithology (NPOR) HGNS-H		
0.45	ft3/ft3	-0.15

Main To Repeat	
Repeat To Main	
Cable Tension (TENS)	
5000	lbf
0	

Description: AIT Basic Log Two Format: Noble Nuclear RA Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth Creation Date: 20-Apr-2015 22:00:06

Channel Processing Parameters				
Run 1: Parameters				
Parameter	Description	Tool	Value	Unit

SSBAR	Barite Mud Presence Flag	Borehole	No	
BHS	Borehole Status (Open or Cased Hole)	Borehole	Cased	
BHT	Bottom Hole Temperature	Borehole	216.02	degF
BS	Bit Size	WLSESSION	8.75	in
BSAL	Borehole Salinity	Borehole	0	ppm
CBLO	Casing Bottom (Logger)	WLSESSION	7019	ft
CDEN	Cement Density	HGNS-H	2	g/cm3
DC_MODE	Depth Correction Mode	DepthCorrection	Real-time	
DFD	Drilling Fluid Density	Borehole	8.7	lbm/gal
DFT	Drilling Fluid Type	Borehole	Water	
EDF	Elevation of Derrick Floor Above Permanent Datum	WLSESSION	29	ft
EPD	Elevation of Permanent Datum (PDAT) above Mean Sea Level	WLSESSION	4664	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	
MATR	Rock Matrix for Neutron Porosity Corrections	Borehole	LIMESTONE	
MFST	Mud Filtrate Sample Temperature	Borehole	68	degF
MST	Mud Sample Temperature	Borehole	68	degF
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	
TD	Total Measured Depth	Borehole	6850	ft

Tool Control Parameters

Run 1: Parameters

Parameter	Description	Tool	Value	Unit
MAX_LOG_SPEED	Toolstring Maximum Logging Speed	WLSESSION	3600	ft/h

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	4736	
Auxiliary Equipment :				
	HGNS Accelerometer, 150 degC	HACCZ-H	5955	
	AmBe Neutron Logging Source	NSR-F	5215	
Calibration Parameter :				
	Water Temperature			
	Housing Size			
	JIG-BKG (Jig minus background reference)	165		

HGNS Accelerometer Calibration - Accelerometer Accumulations

Before (Measured):		08:32:03 18-Apr-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-Jan-2007

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	----	----	1155.700	----	
Accelerometer Coefficients - 1		Master	----	----	26.890	----	
Accelerometer Coefficients - 2		Master	----	----	-0.008	----	
Accelerometer Coefficients - 3		Master	----	----	0.000	----	
Accelerometer Coefficients - 4		Master	----	----	2.748	----	
Accelerometer Coefficients - 5		Master	----	----	0.000	----	
Accelerometer Coefficients - 6		Master	----	----	0.000	----	
Accelerometer Coefficients - 7		Master	----	----	0.000	----	
Accelerometer Coefficients - 8		Master	----	----	298.600	----	
Accelerometer Coefficients - 9		Master	----	----	0.983	----	

HGNS Neutron Calibration - HGNS Neutron Accumulations

Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit	
Near Zero Measurement	1/s	Master	0	5.0	24.2	40.0	
		Before	0	5.0	25.5	40.0	
		Before-Master	----	-3.6	1.3	3.6	
Far Zero Measurement	1/s	Master	0	5.0	28.1	40.0	
		Before	0	5.0	30.5	40.0	
		Before-Master	----	-4.2	2.4	4.2	
Near Plus Measurement	1/s	Master	6031.0	4700.0	5190.0	6900.0	
		Before	----	----	----	----	
		Before-Master	----	----	----	----	
Far Plus Measurement	1/s	Master	2793.0	1900.0	2159.0	2900.0	
		Before	----	----	----	----	
		Before-Master	----	----	----	----	
Near Corrected Plus Measurement	1/s	Master		4700.0	5328.0	6900.0	
		Before	----	----	----	----	
		Before-Master	----	----	----	----	
Far Corrected Plus Measurement	1/s	Master		1900.0	2235.0	2900.0	
		Before	----	----	----	----	
		Before-Master	----	----	----	----	

HGNS Gamma-Ray Calibration - Gamma-Ray Accumulations

Before (Measured): 18:05:58 17-Apr-2015

Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit	
RGR Zero Measurement	gAPI	Before	30.0	0	75.9	120.0	
RGR Plus Measurement	gAPI	Before	185.4	157.1	173.4	206.3	
GR Calibration Gain		Before	0.89	0.80	0.95	1.05	

Company: Noble Energy Inc

Schlumberger

Well: Colt A13-648

Field: Wattenberg

County:	Weld
State:	Colorado
Compensated Neutron Gamma Ray - CCL Log	