



Weatherford

**BOREHOLE COMPENSATED
SONIC LOG**

COMPANY

MURFIN DRILLING COMPANY, INC.

WELL

DAUNTLESS #15-1

FIELD

WILDCAT

PROVINCE/COUNTY LINCOLN

COUNTRY/STATE

U.S.A. / COLORADO

LOCATION

990' FSL & 1650' FEL

SEC 1

TWP 9S

RGE 56W

Other Services

Latitude

39.290150

MPD / MDN

MAI / MFE

Longitude

-103.608500

MML

API Number

05-073-06732

Permanent Datum GL, Elevation 5541 feet

Log Measured From KB, 13.00 feet above Permanent Datum

Drilling Measured From KB

Date

16-DEC-2017

Run Number

ONE

Service Order

17937-200624549

Depth Driller

8820.00

feet

Depth Logger

8819.00

feet

First Reading

8806.00

feet

Last Reading

478.00

feet

Casing Driller

420.00

feet

Casing Logger

478.00

feet

Bit Size

7.875

inches

Hole Fluid Type

WBM

Density / Viscosity

9.35 lb/USg

46.00 sec/qt

PH / Fluid Loss

9.00

5.20 ml/30Min

Sample Source

FLOWLINE

Rm @ Measured Temp

0.93 @ 99.0

ohm-m

Rmf @ Measured Temp

0.74 @ 99.0

ohm-m

Rmc @ Measured Temp

1.12 @ 99.0

ohm-m

Source Rmf / Rmc

CALC

CALC

Rm @ BHT

0.51 @186.0

ohm-m

Time Since Circulation

8 HOURS

Max Recorded Temp

186.00

deg F

Equipment / Base

13057

OKC

Recorded By

M. MCGLOTHLIN

H. LEJEUNE

Witnessed By

WES HANSEN

SCOTT ROBINSON

BOREHOLE RECORD

Last Edited: 16-DEC-2017 16:40

Bit Size
inches

7.875

Depth From
feet

420.00

Depth To
feet

8820.00

CASING RECORD

Type

Size
inches

8.625

Depth From
feet

0.00

Shoe Depth
feet

420.00

Weight
pounds/ft

24.00

REMARKS

WLS SOFTWARE VERSION: 17.05.5956

TOOLSTRING: SHA, MCG, MMR, MDN (DUAL BOWSPRING ECCENTRALIZER), MPD (8" PROFILE PLATE), SKJ, MFE (ONE 0.5" STANDOFF), MSS (0.5" STANDOFF), MAI (TWO 0.5" STANDOFFS)

LOG INTERVALS REQUESTED:

MICROLOG / DENSITY / NEUTRON: TD - 4000 FT

GAMMA RAY / INDUCTION / CALIPER / SONIC: TD - CASING

LIMESTONE MATRIX USED FOR POROSITY CALCULATION, 2.71 G/CC.

TOTAL HOLE VOLUME FROM TD TO SURFACE CASING: 4220 CU FT.

ANNULAR HOLE VOLUME FROM TD TO SURFACE CASING WITH 5.5" FUTURE CASING: 2840 CU FT.

MUD PROPERTIES:

CHLORIDES: 720 mg/L

LCM: 9 lb/bbl

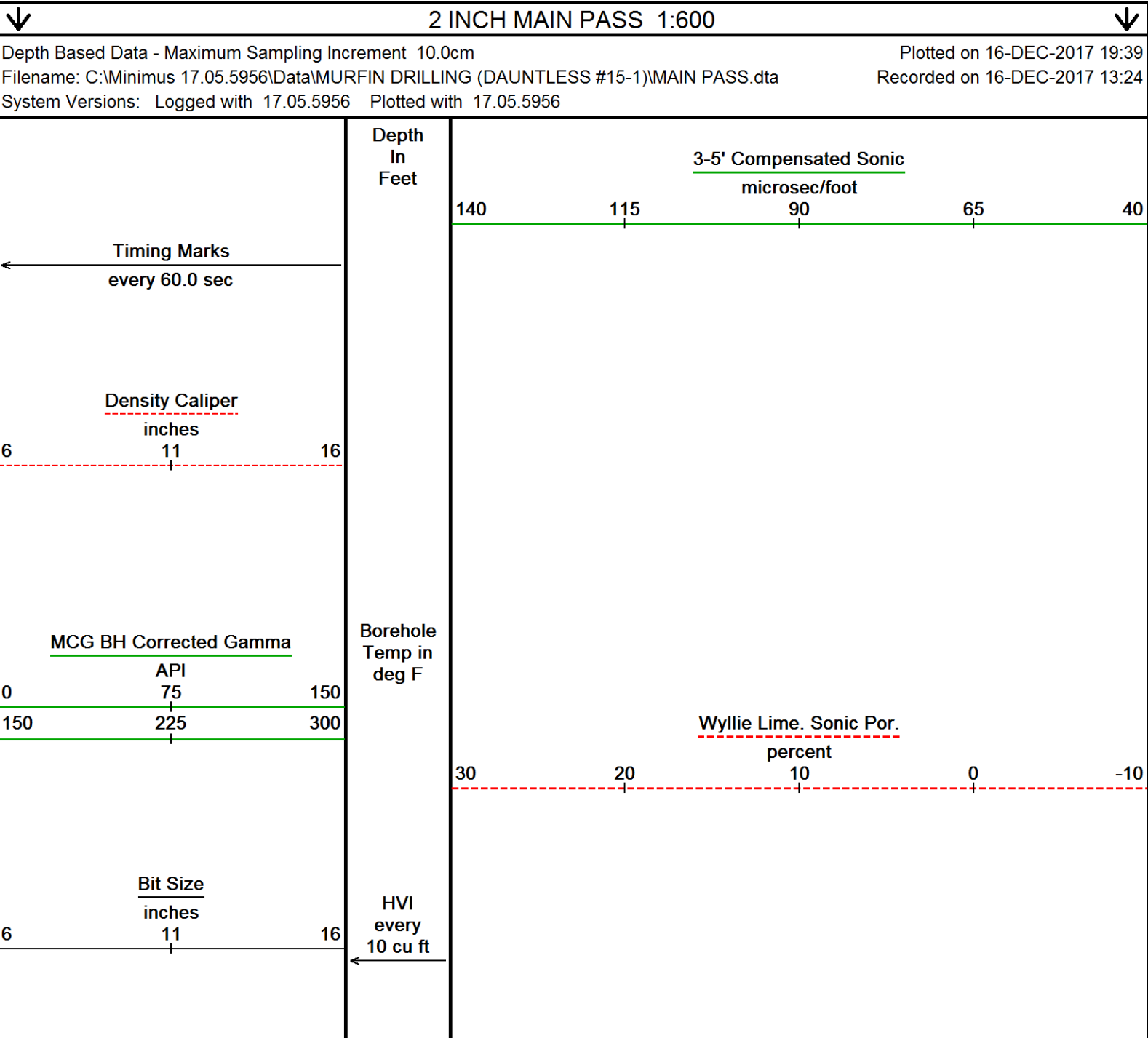
CREW: M. MCGLOTHLIN, H. LEJEUNE, D. GILLISPIE.

LOG RESPONSES EFFECTED BY HOLE RUGOSITY AND WASHOUTS

RESISTIVITY ANOMALY OBSERVED FROM 630 FEET TO CASING SHOE AT 478 FEET.

ANOMALY REPEATED DURING CASING CHECK AND SUBSEQUENT PASSES.

In interpreting, communicating or providing information and/or making recommendations, either written or oral, as to logs or test or other data, type or amount of material, or Work or other service to be furnished, or manner of performance, or in predicting results to be obtained, the Contractor will give the Company the benefit of the Contractor's best judgment based on its experience and will perform all such Work in a good and workmanlike manner. Any interpretation of test or other data, and any recommendation or reservoir description based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions, which inferences and assumptions are not infallible, and with respect to which professional engineers and analysts may differ. ACCORDINGLY ANY INTERPRETATION OR RECOMMENDATION RESULTING FROM THE SERVICES WILL BE AT THE SOLE RISK OF THE COMPANY, AND THE CONTRACTOR CANNOT AND DOES NOT WARRANT THE ACCURACY, CORRECTNESS OR COMPLETENESS OF ANY SUCH INTERPRETATION OR RECOMMENDATION, WHICH INTERPRETATIONS AND RECOMMENDATIONS SHOULD NOT, THEREFORE, UNDER ANY CIRCUMSTANCES BE RELIED UPON AS THE SOLE OR MAIN BASIS FOR ANY DRILLING, COMPLETION, WELL TREATMENT, PRODUCTION OR FINANCIAL DECISION, OR ANY PROCEDURE INVOLVING ANY RISK TO THE SAFETY OF ANY DRILLING ACTIVITY, DRILLING RIG OR ITS CREW OR ANY OTHER INDIVIDUAL. THE COMPANY HAS FULL RESPONSIBILITY FOR ALL DECISIONS CONCERNING THE SERVICES.



Annular
Integral
every
10 cu ft

Transit Time
every msec

DST Uphole Tension
pounds
5000 0

Replay
Scale
1:600

460
Casing
Shoe

500

4200

98°

600

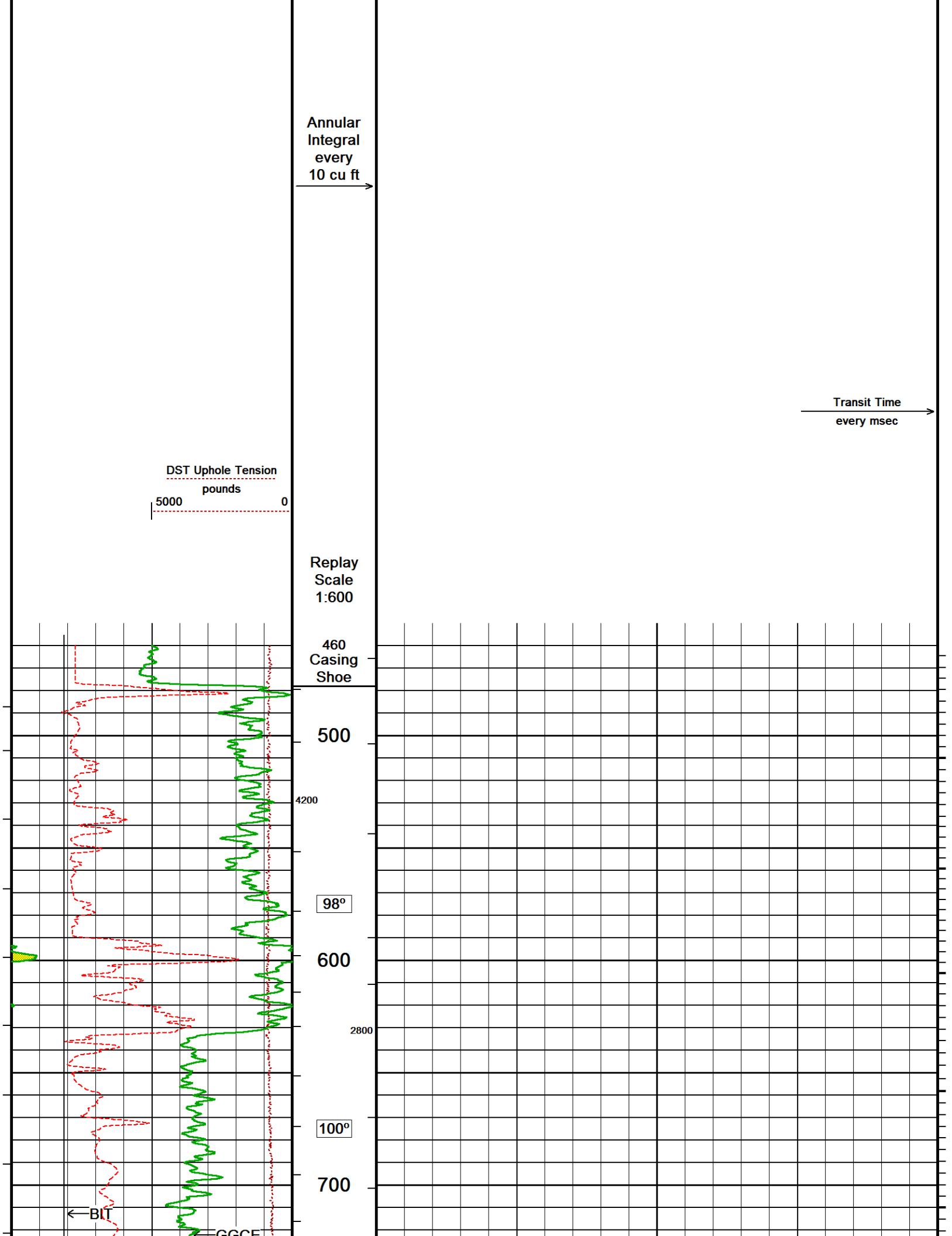
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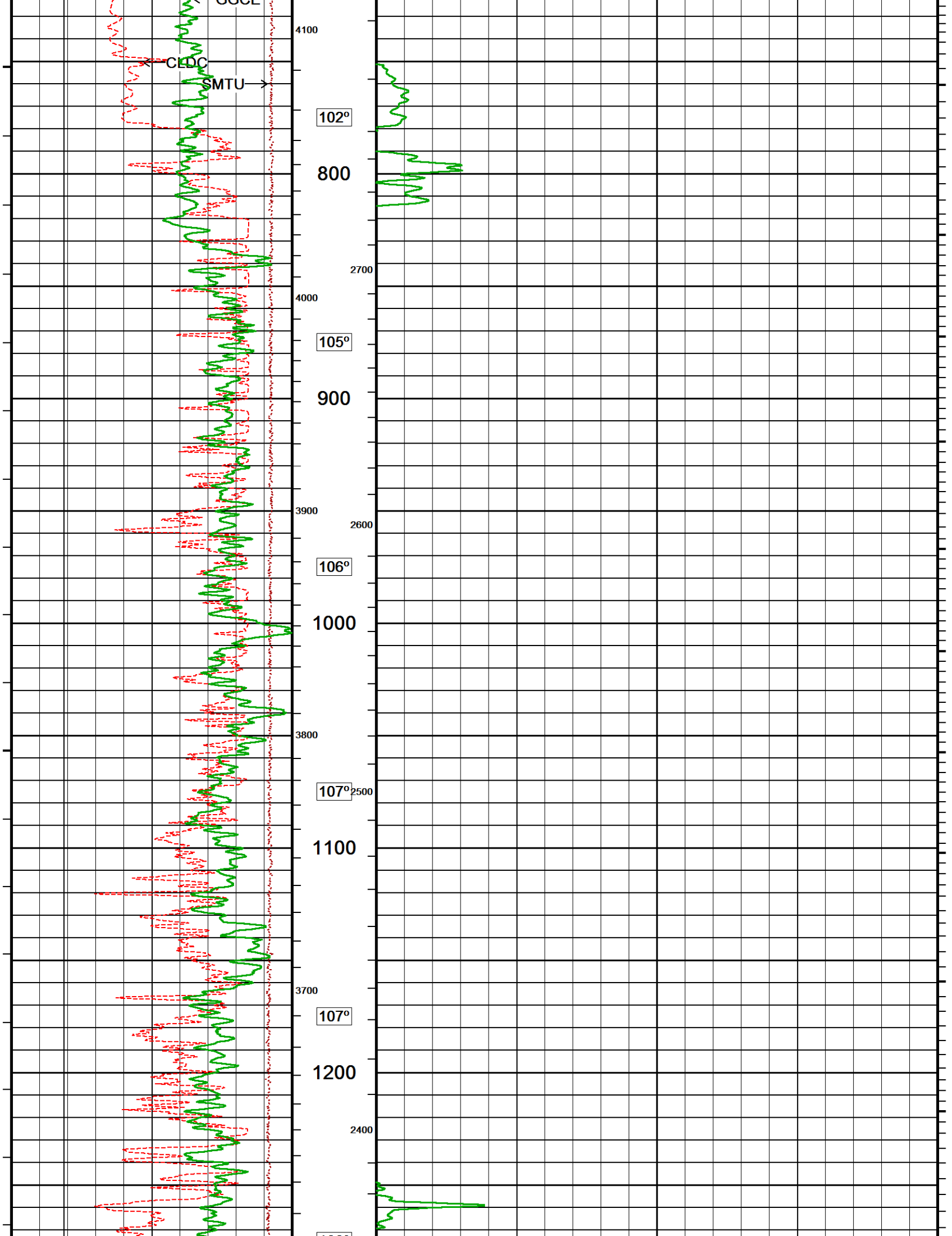
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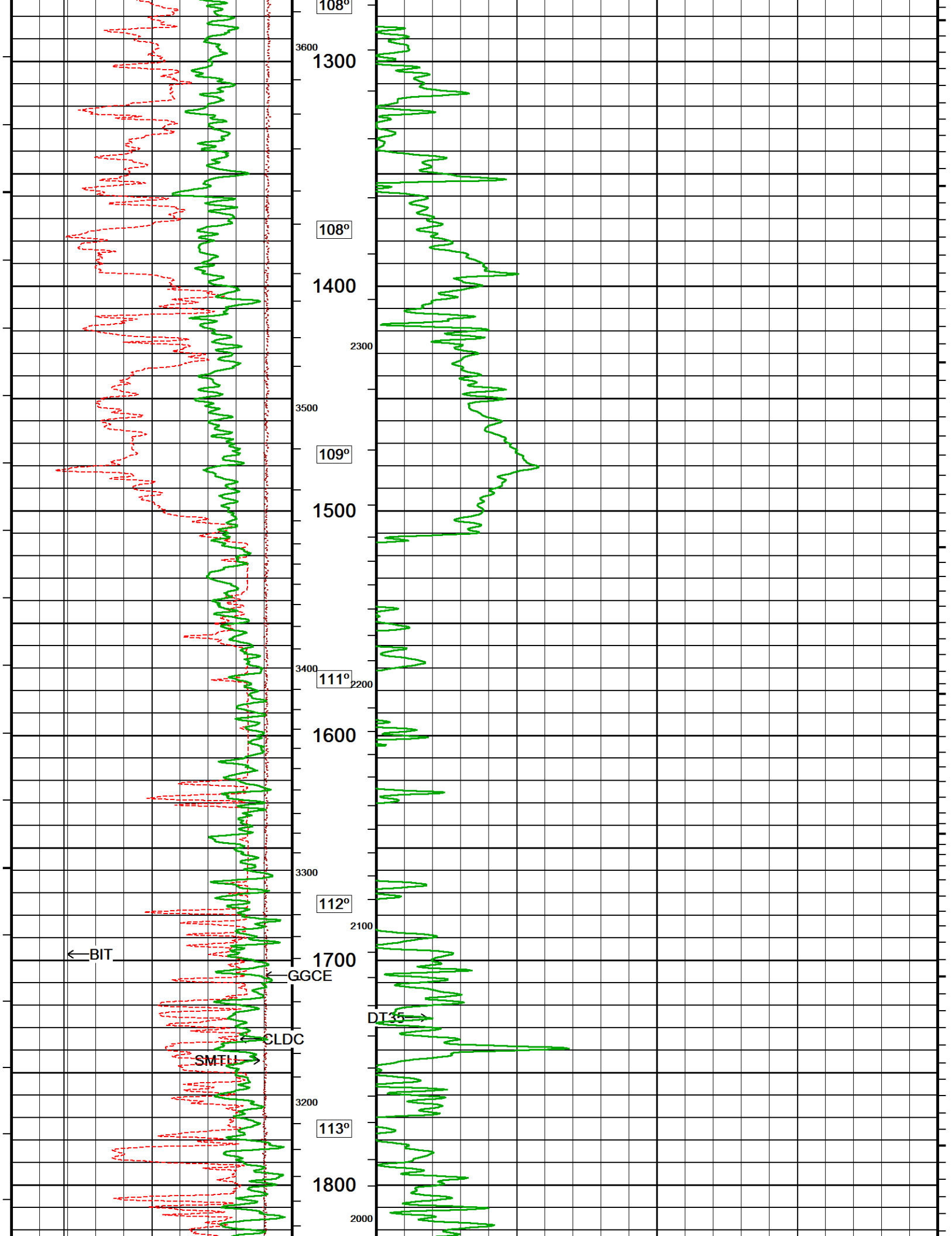
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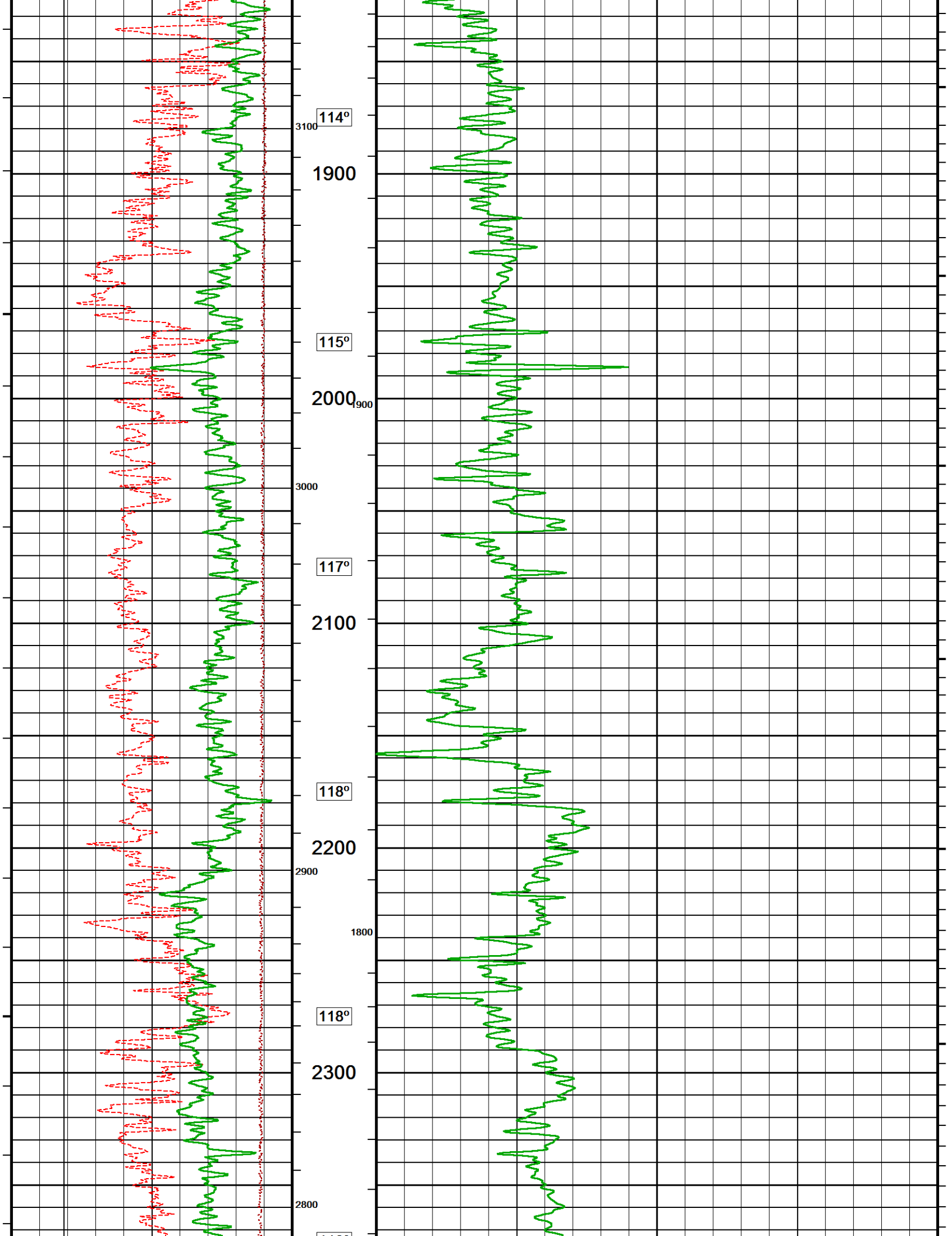
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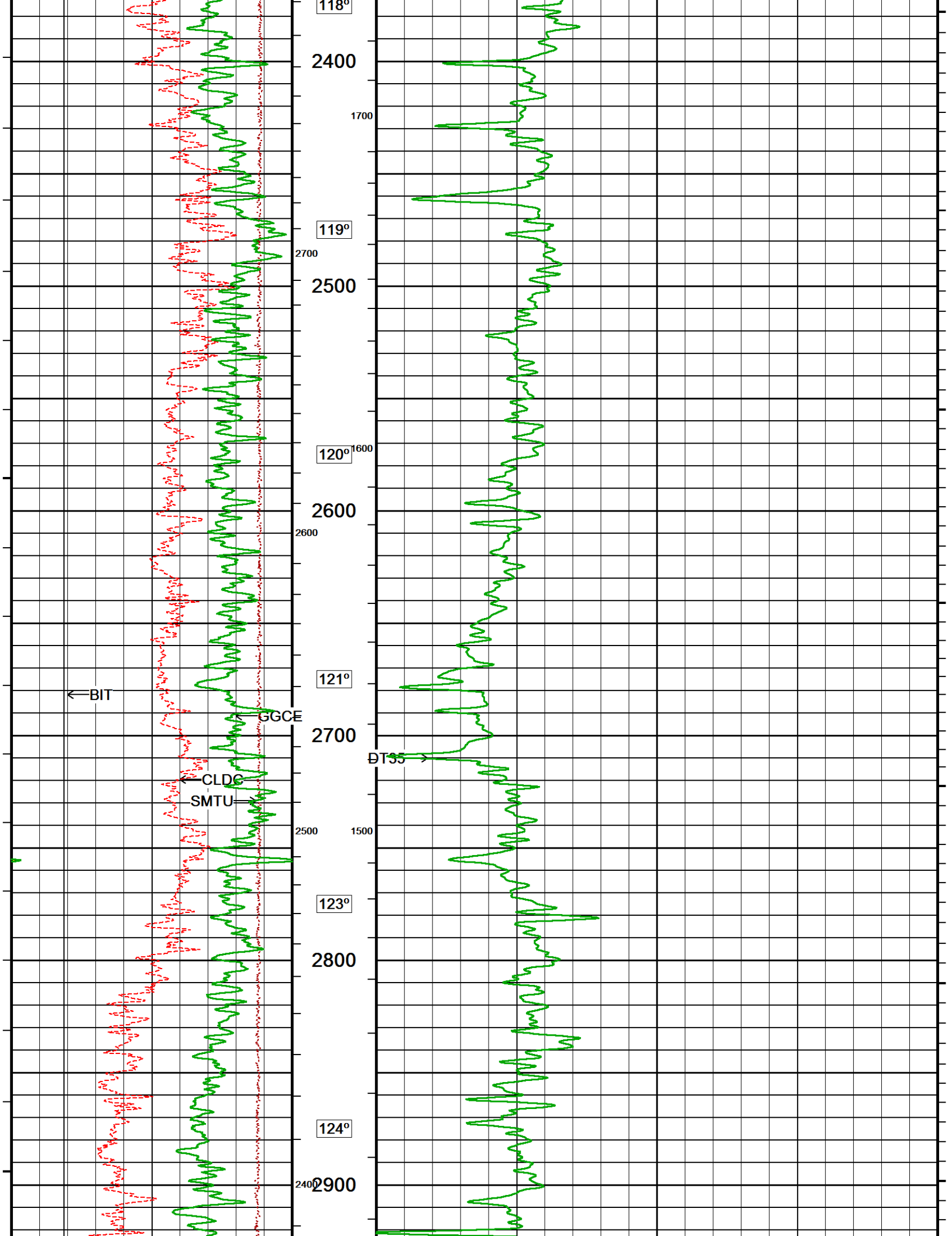
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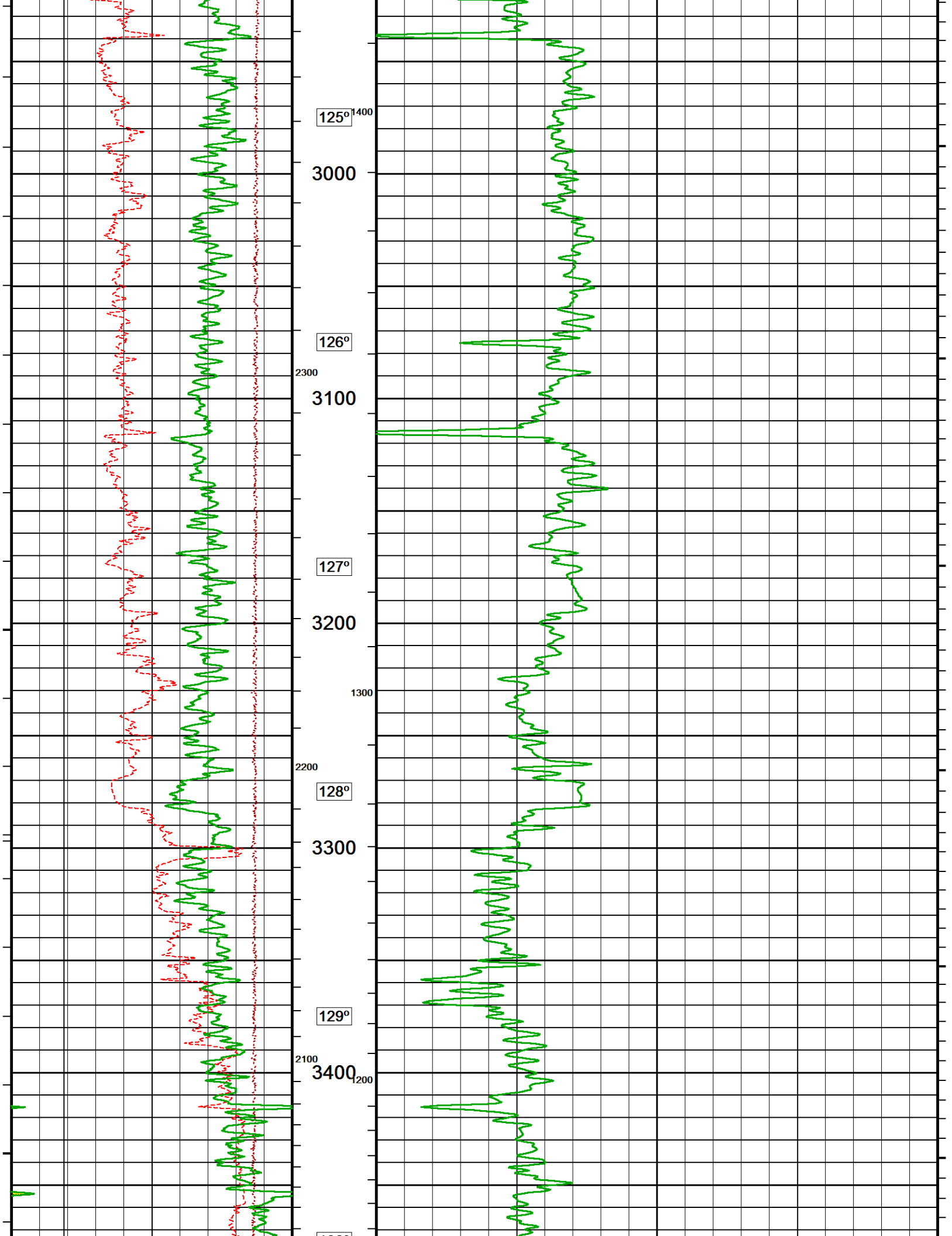


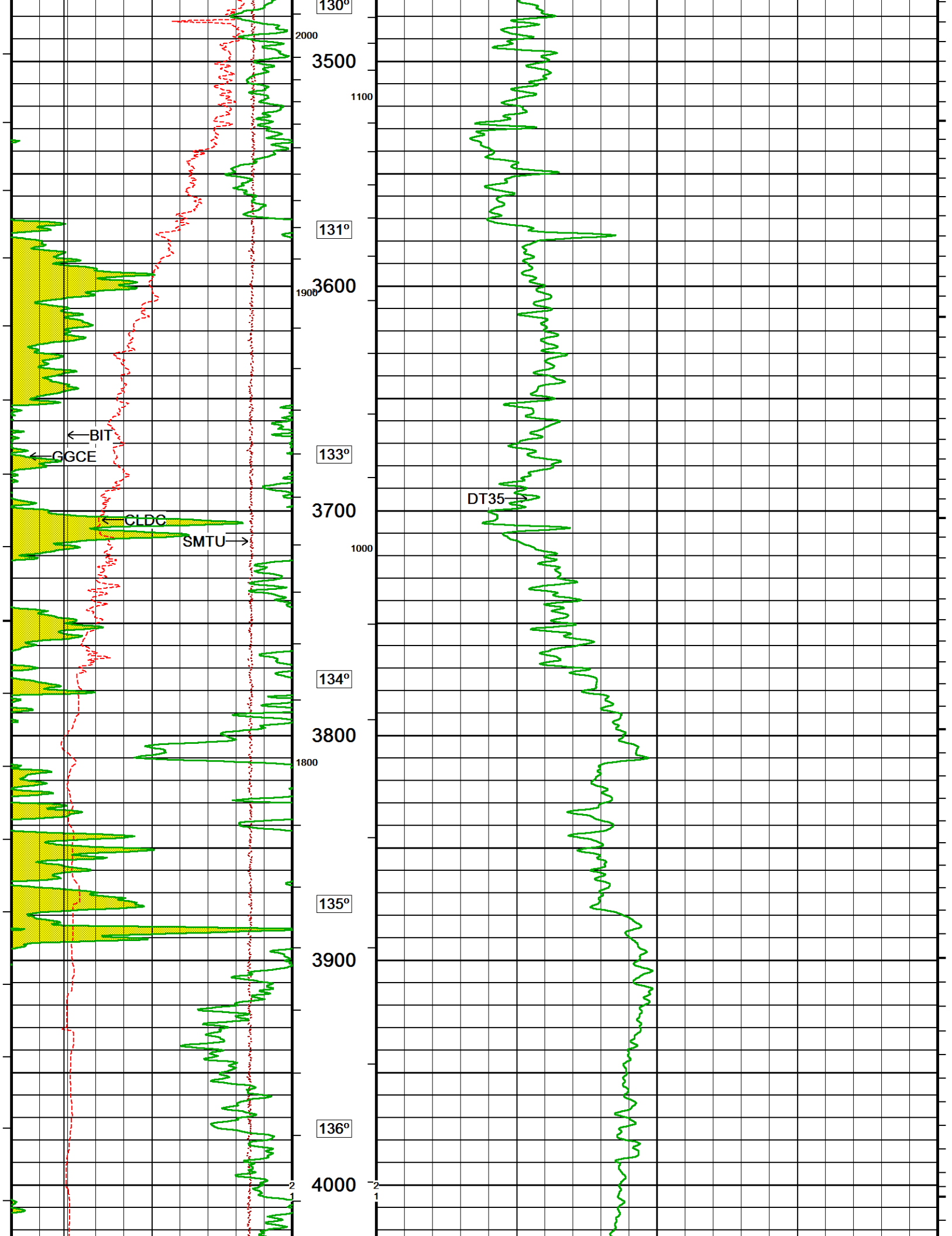


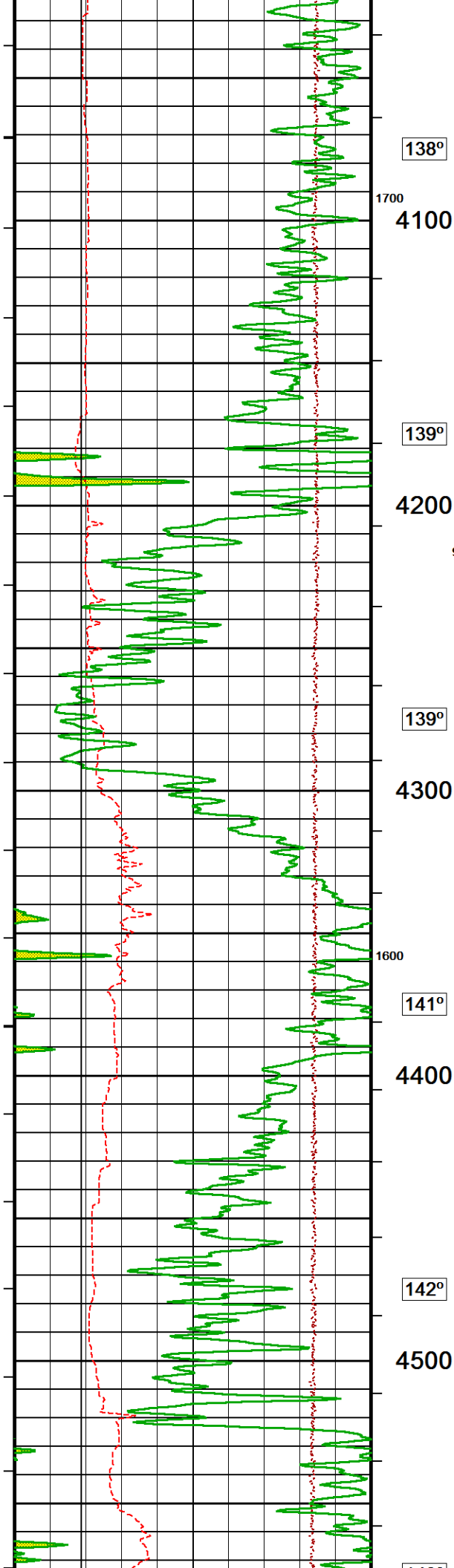




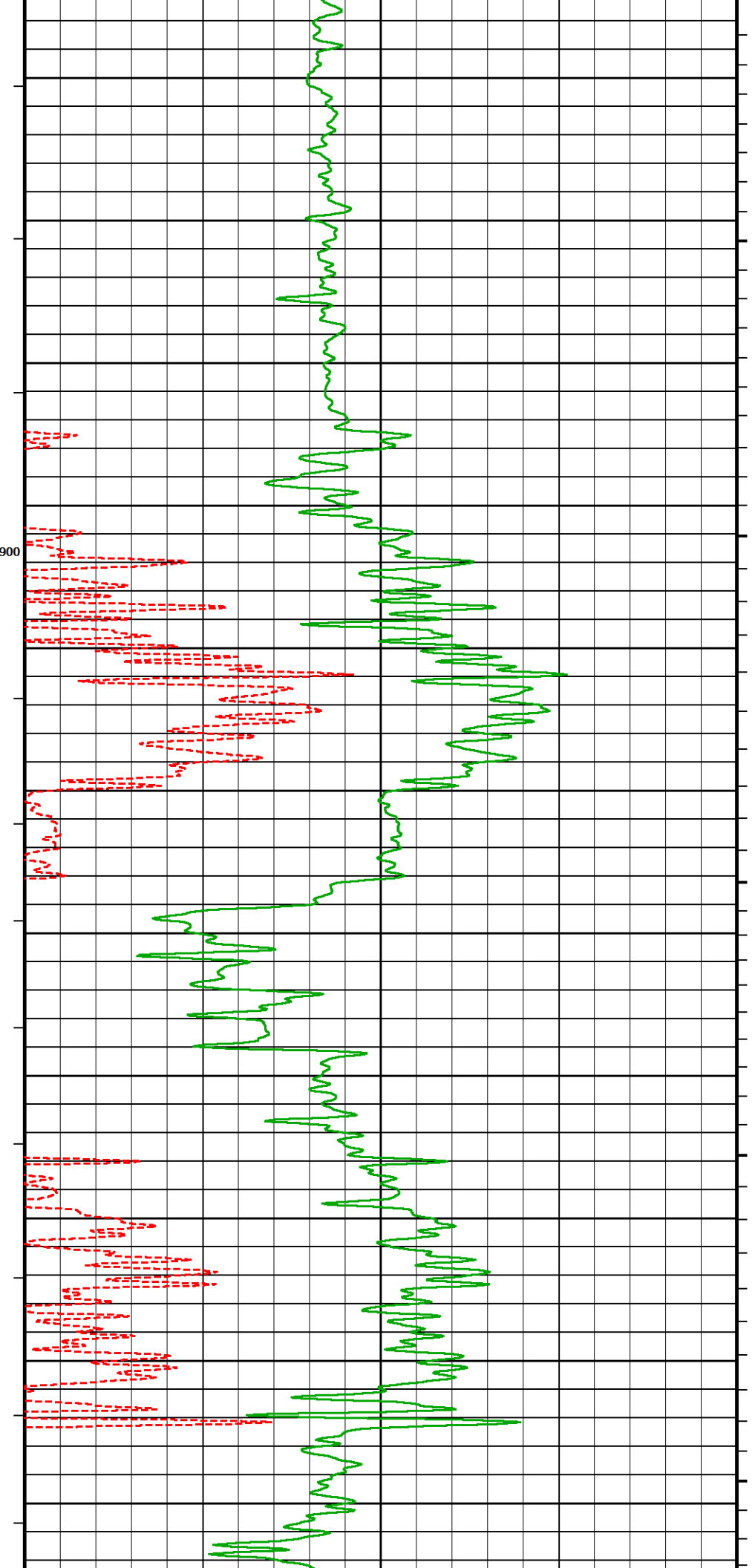


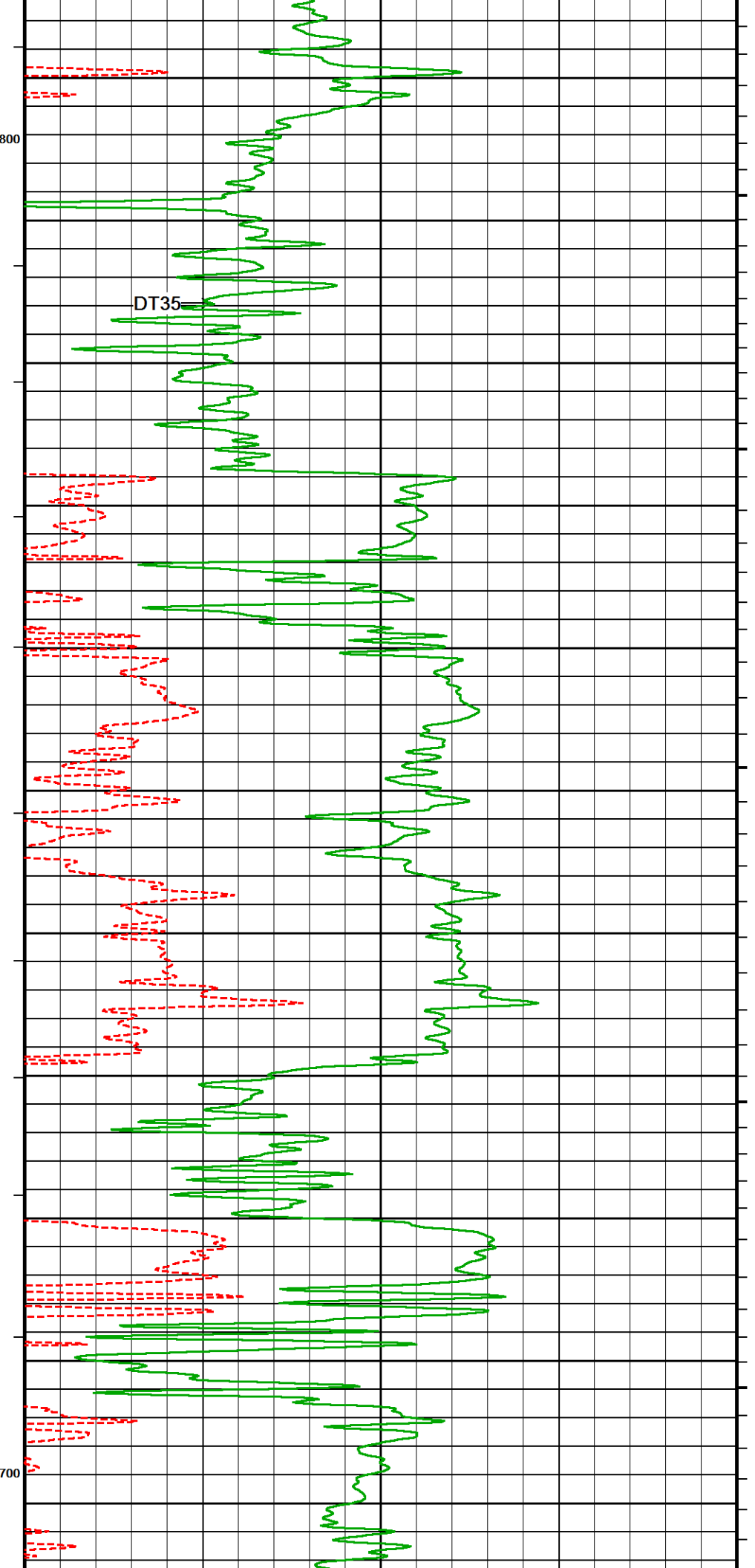
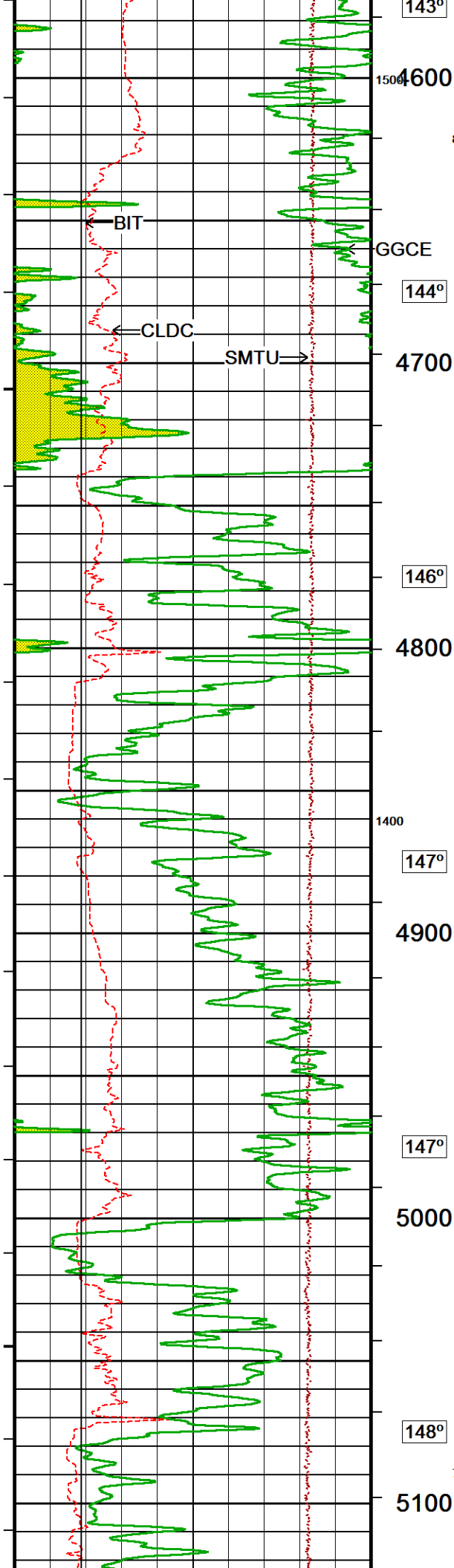


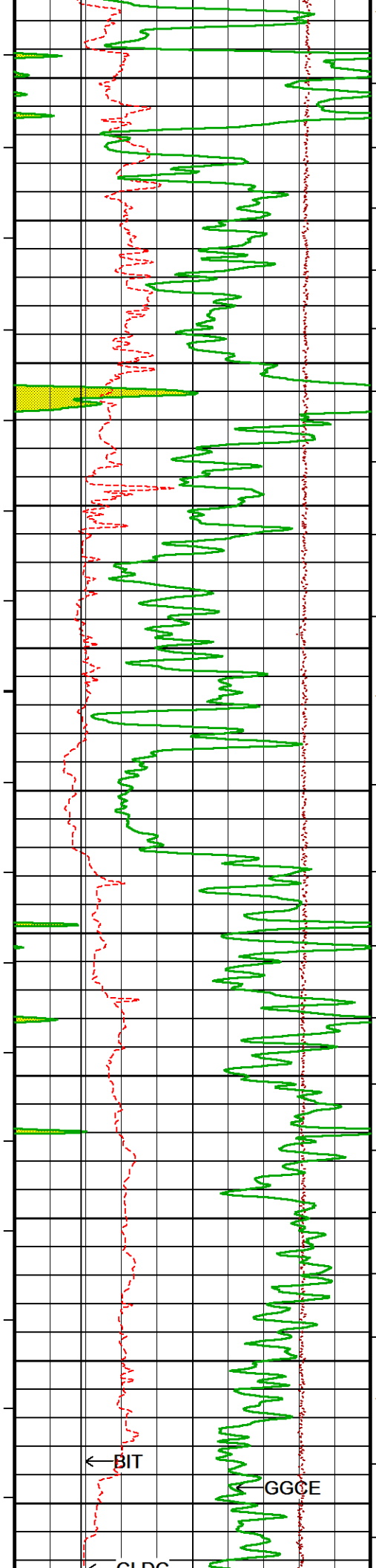




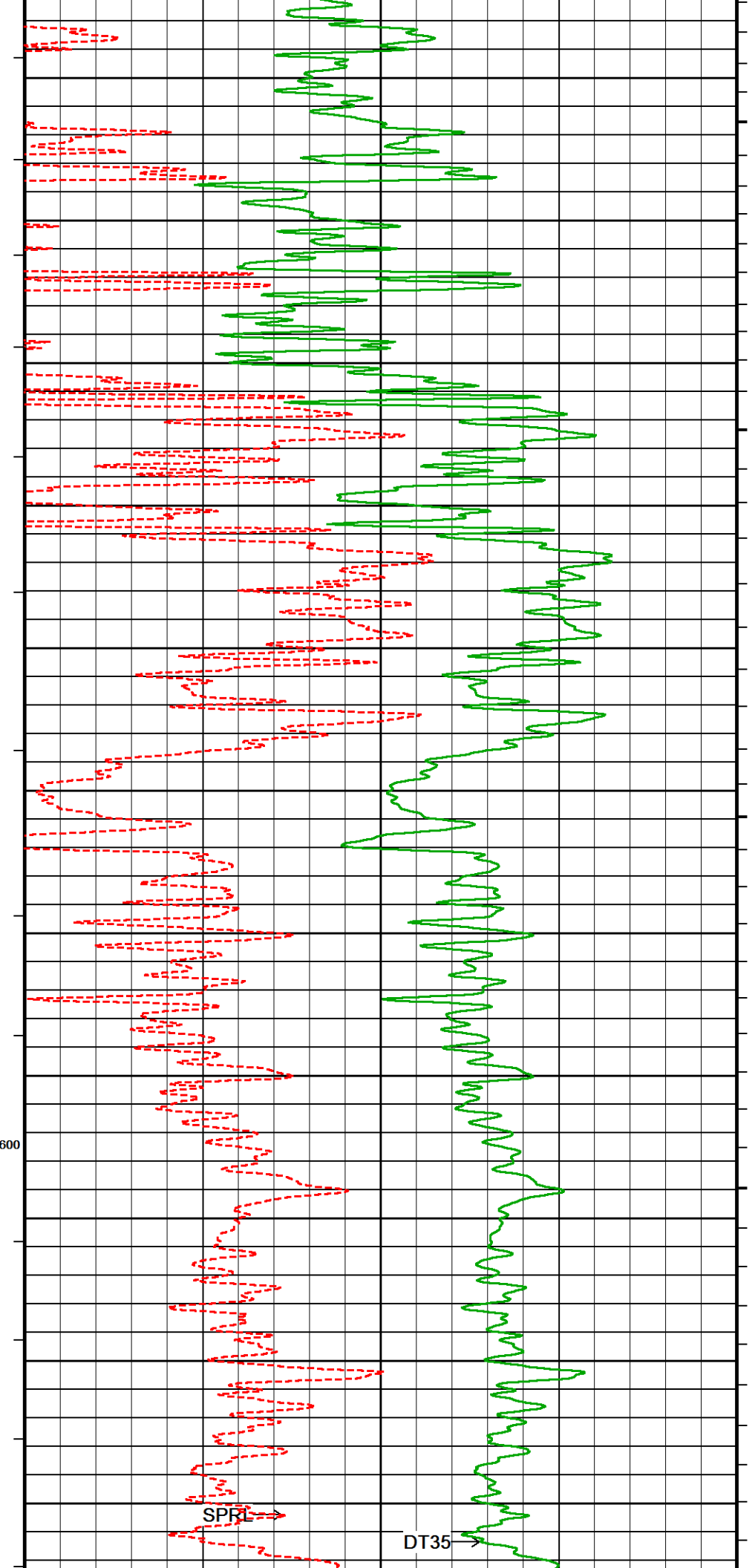
138°
1700
4100
139°
4200
900
139°
4300
1600
141°
4400
142°
4500







1300
149°
5200
149°
5300
1200
151°
5400
152°
5500
600
153°
5600
1100



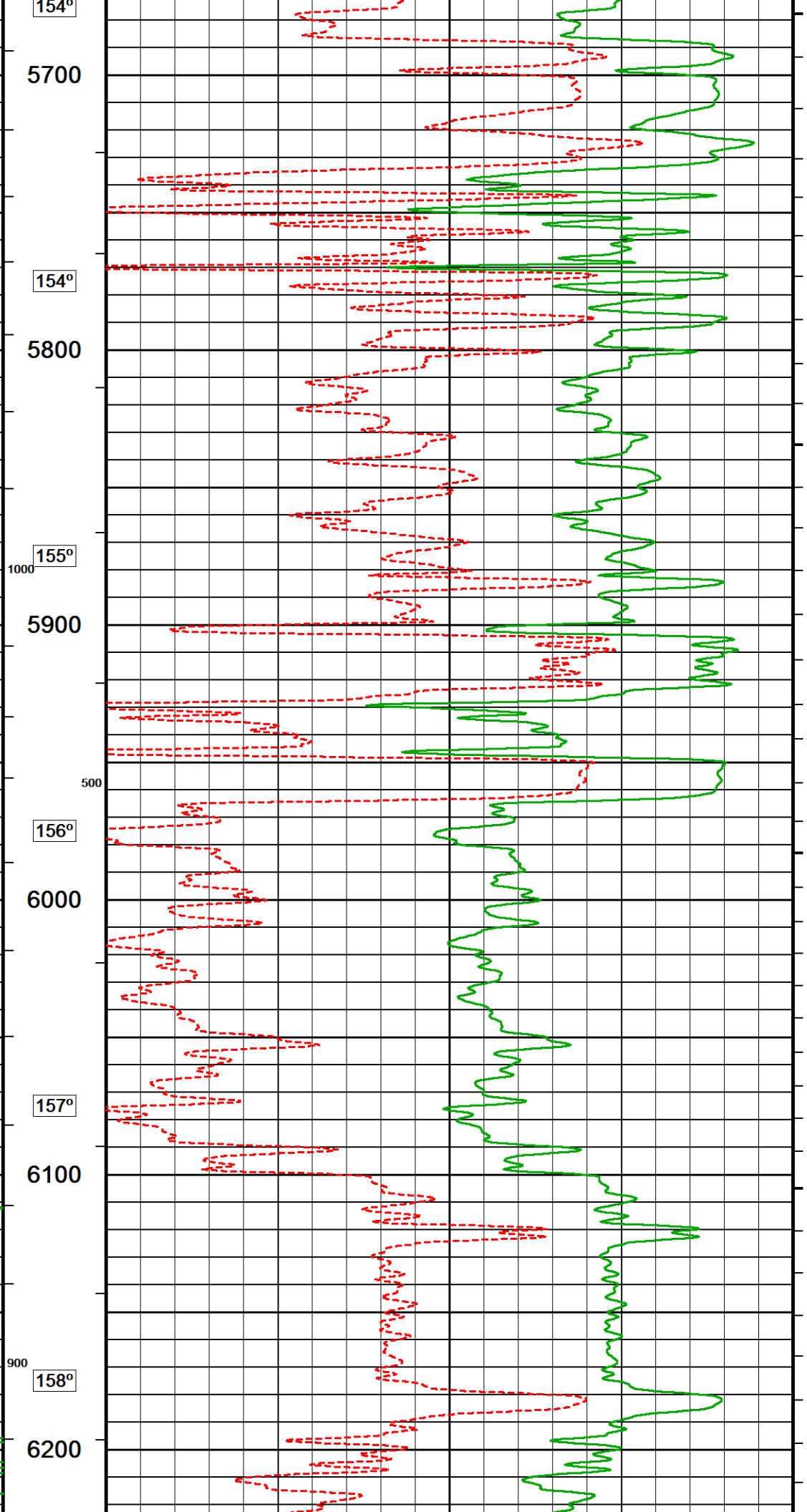
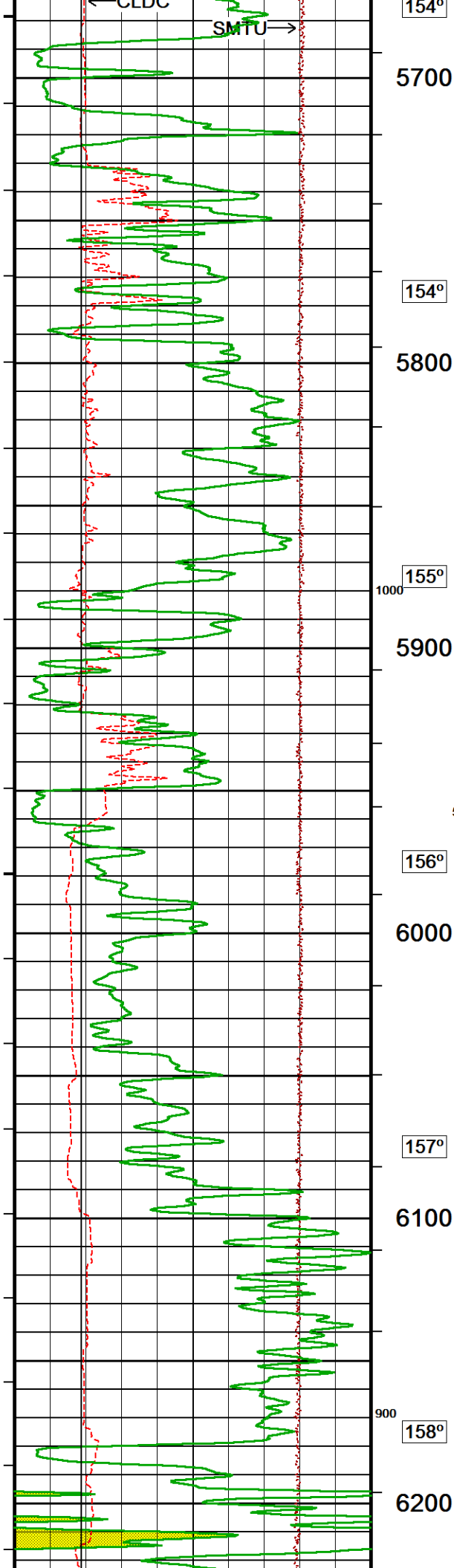
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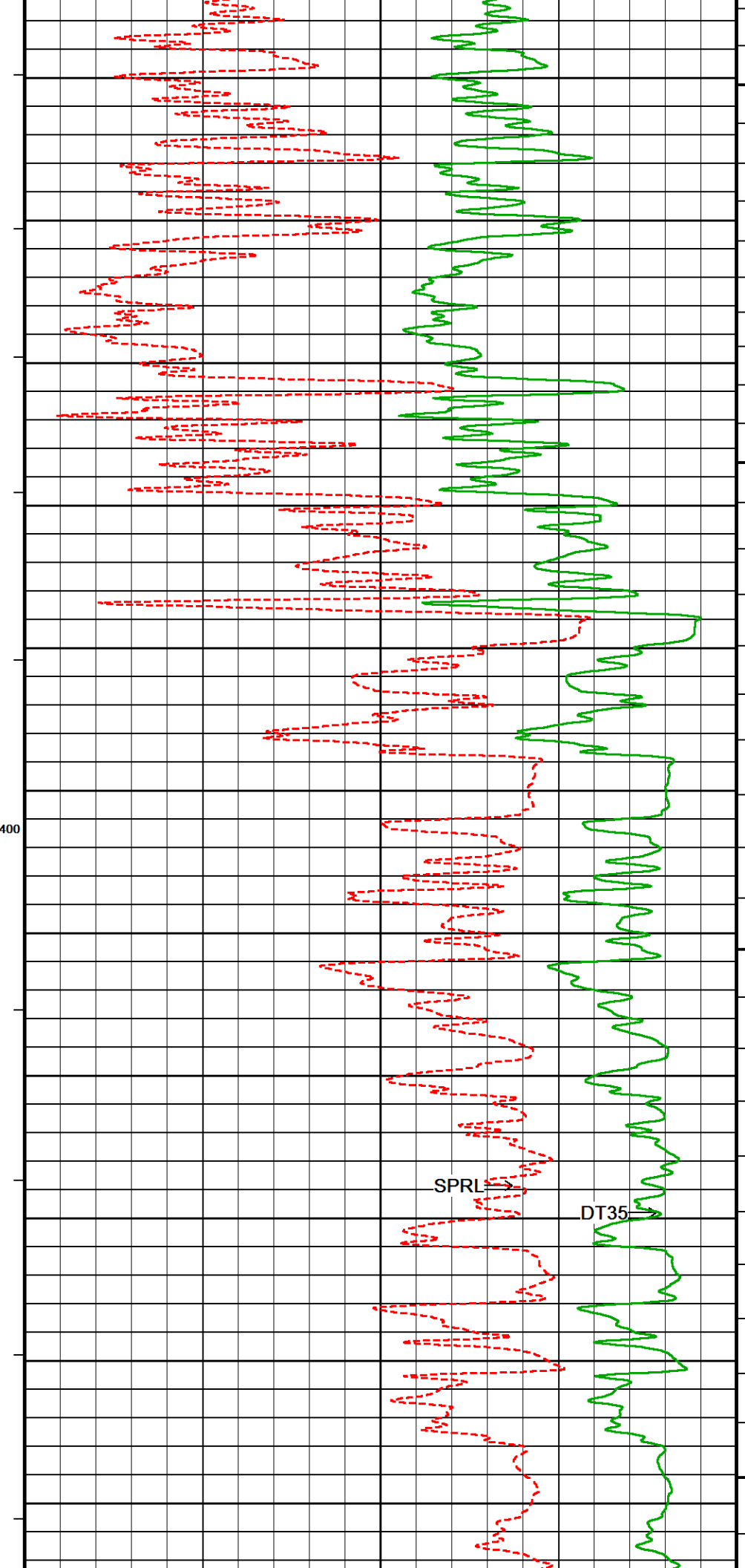
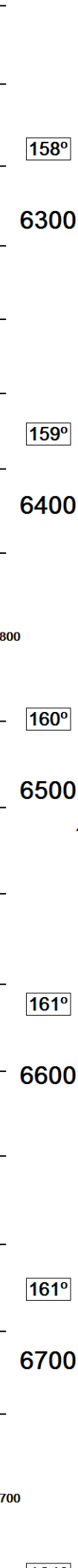
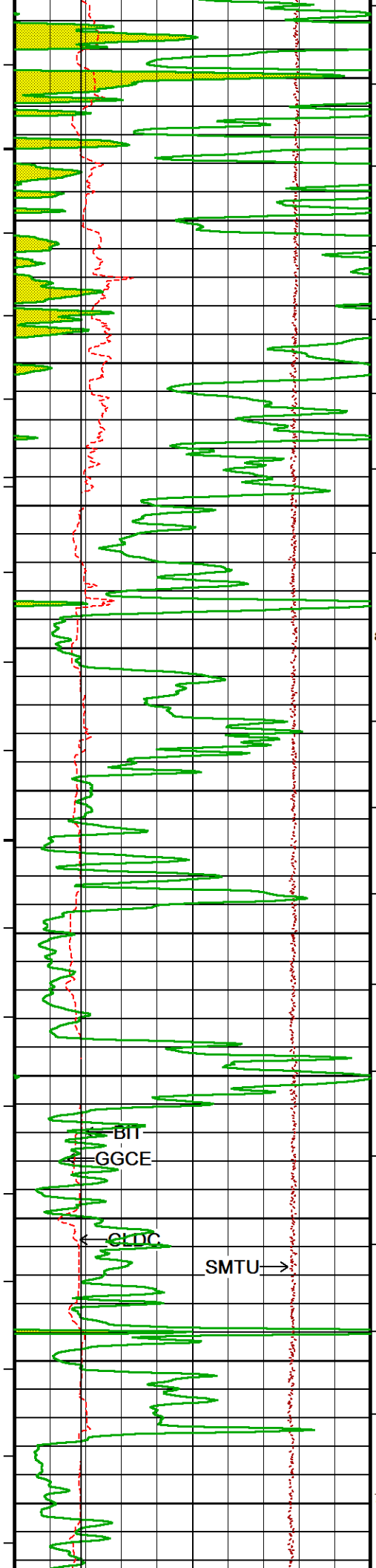
GGCE

← CLDC

SPRL →

DT35 →





158°

6300

159°

6400

800

160°

6500

400

161°

6600

BIT

GGCE

CLDC

SMTU

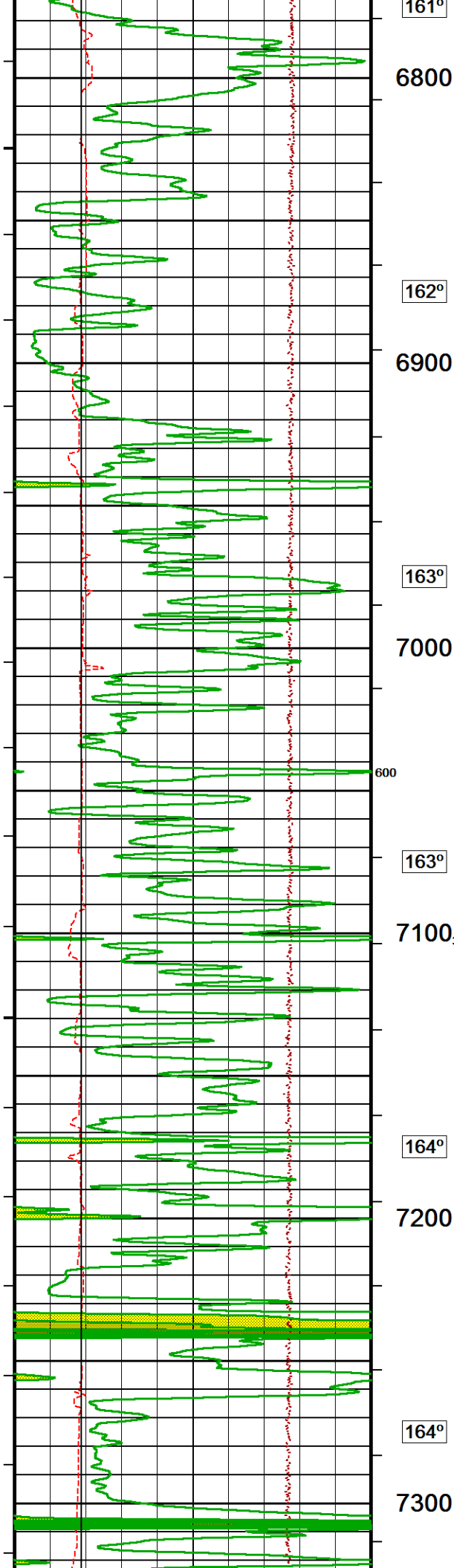
161°

6700

700

SPRL

DT35



161°

6800

162°

6900

163°

7000

600

163°

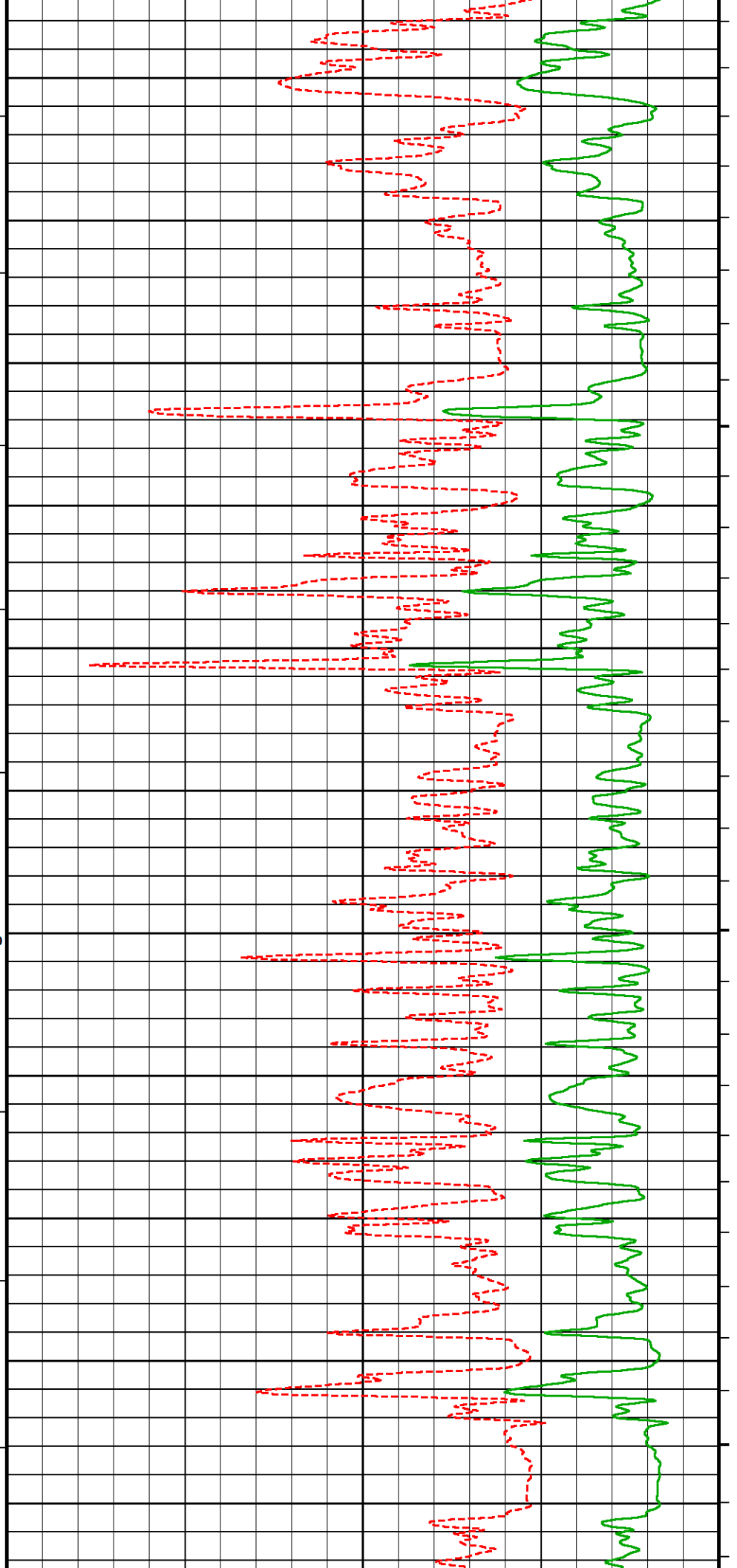
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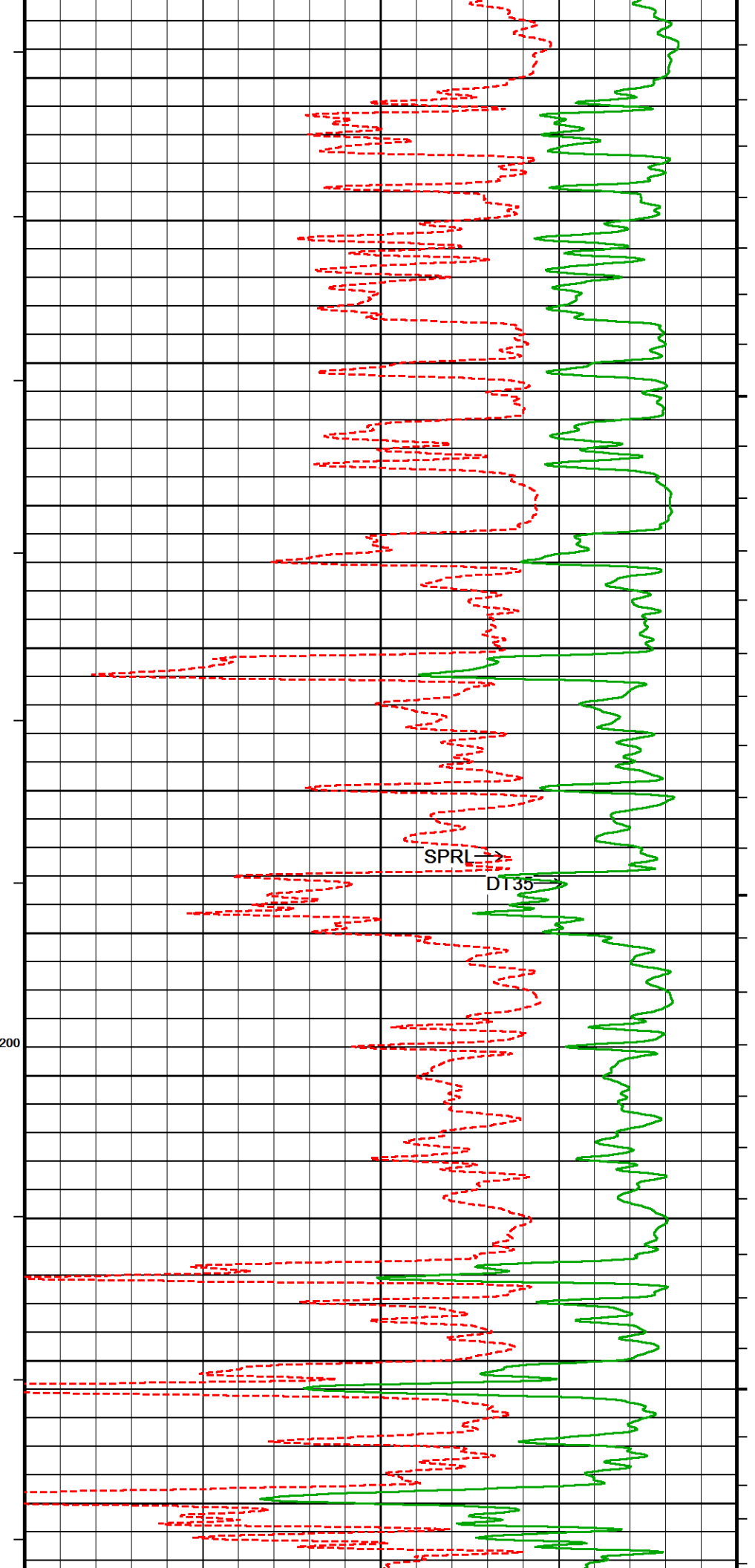
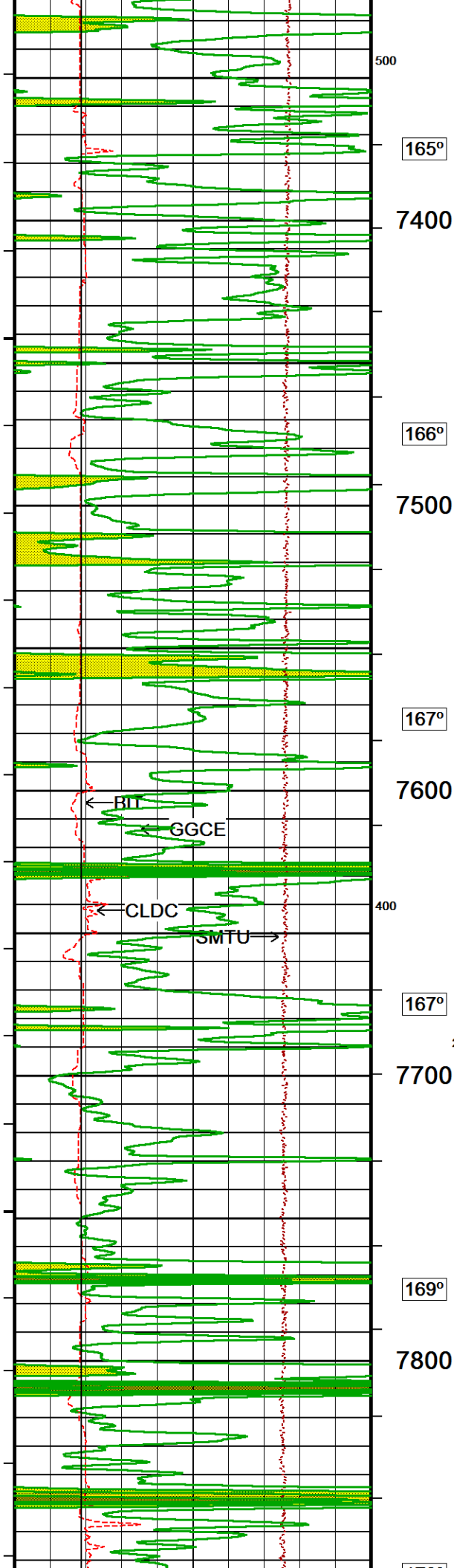
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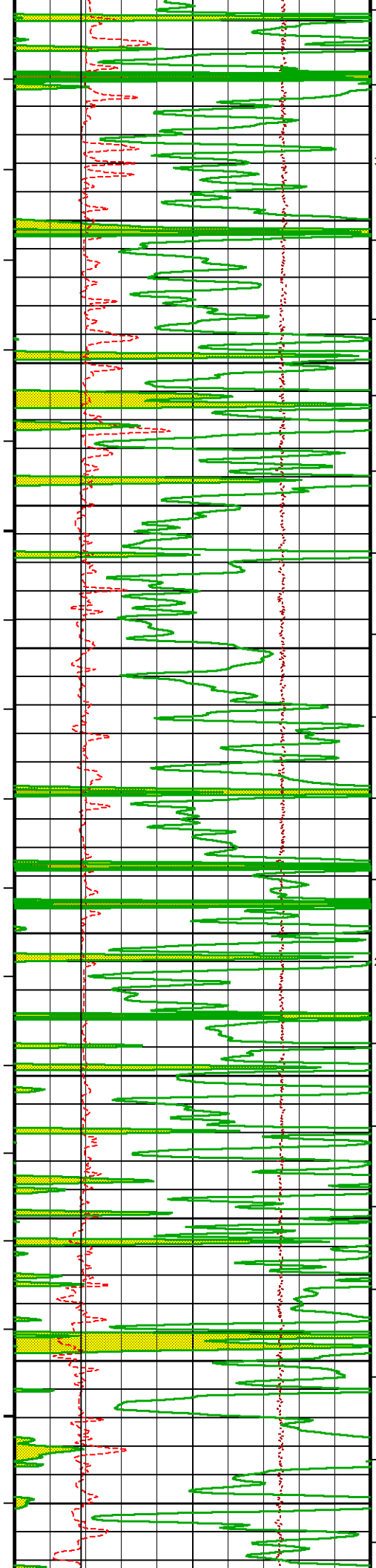
7200

164°

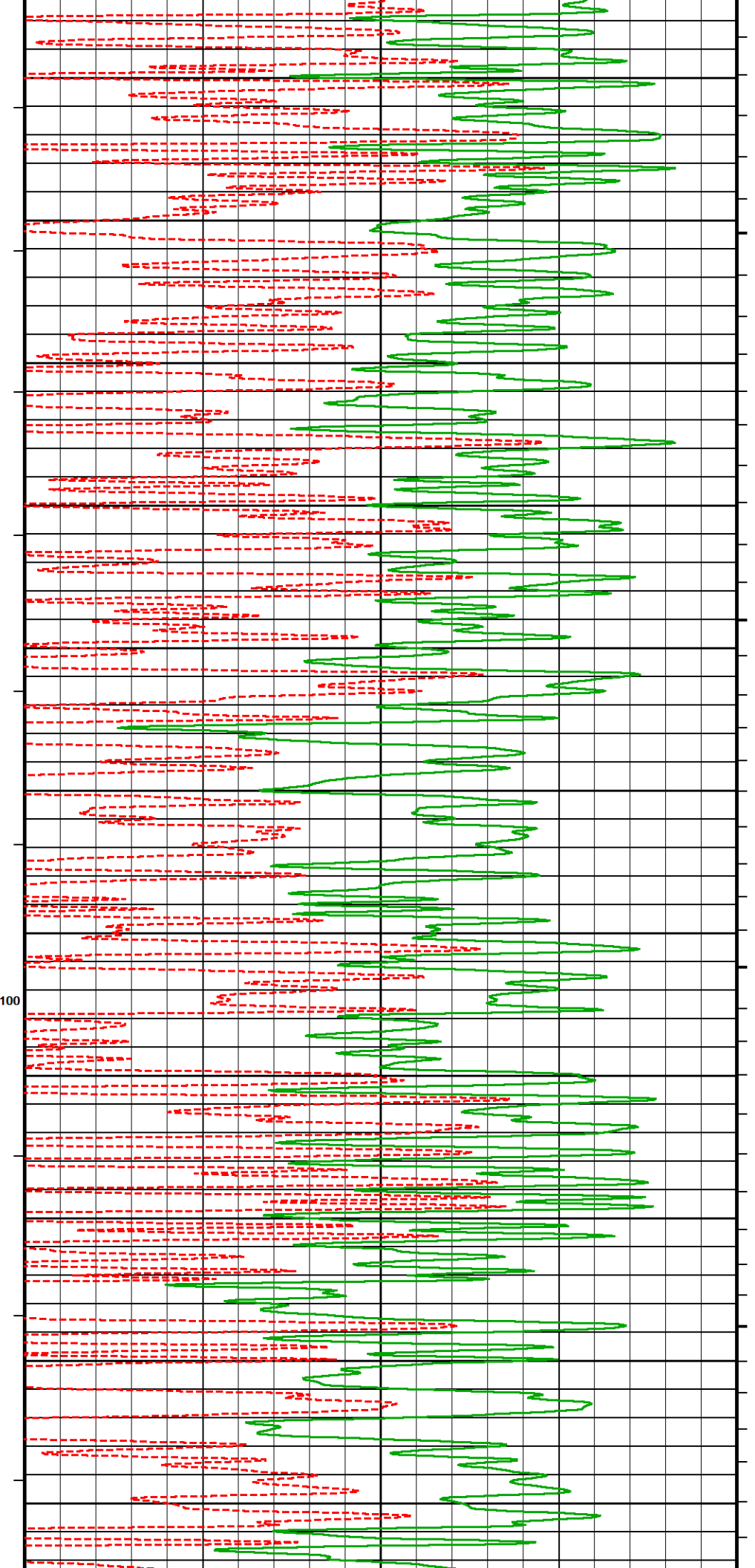
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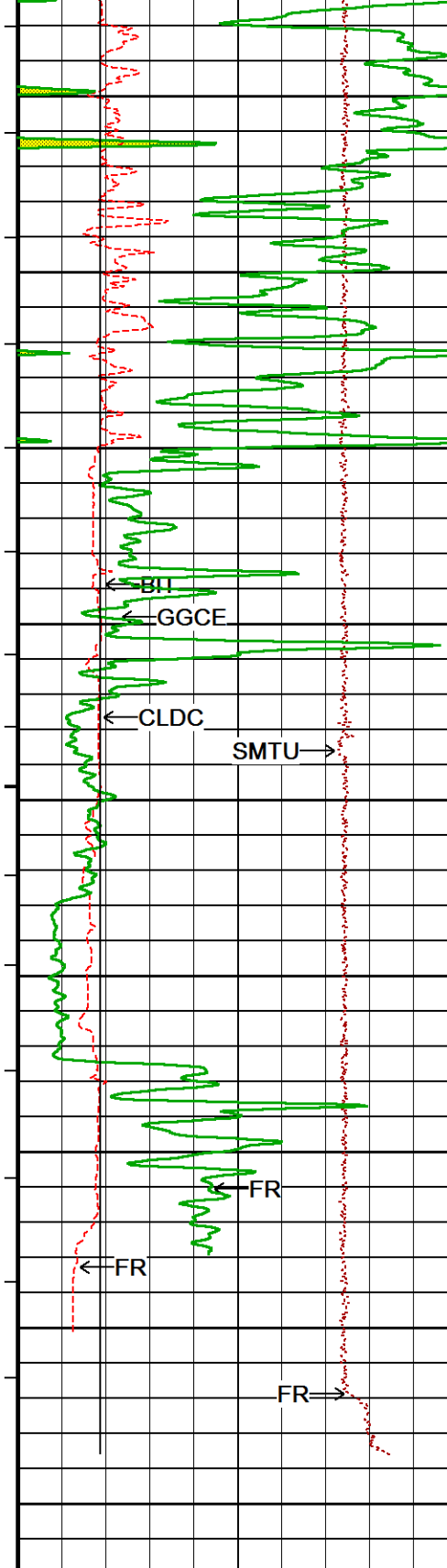




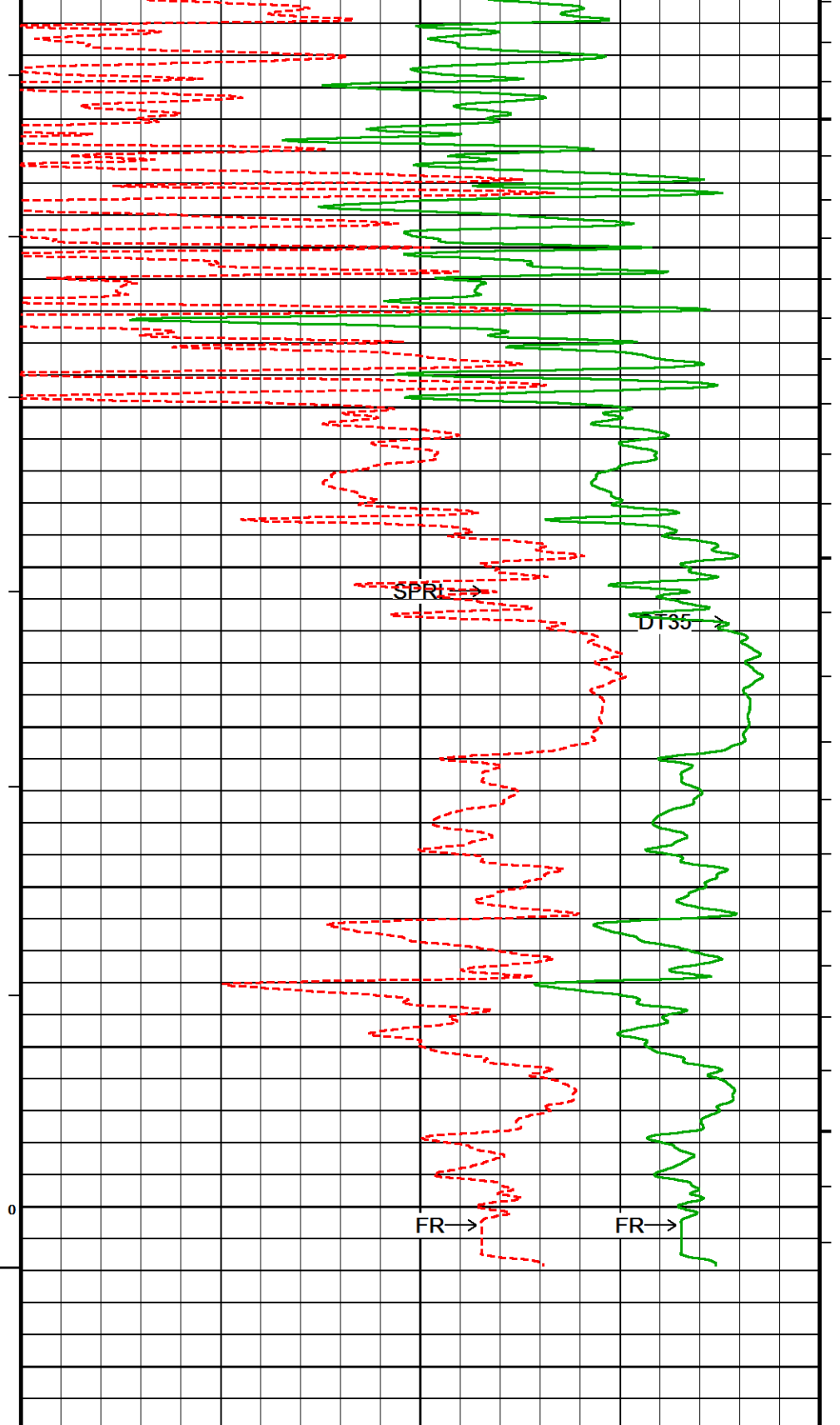


170°
7900
300
171°
8000
171°
8100
173°
8200
200
100
175°
8300
178°
8400





180°
100
8500
183°
8600
185°
8700
185°
8800
0
TD



Depth
In
Feet

3-5' Compensated Sonic
microsec/foot

140 115 90 65 40

Timing Marks
every 60.0 sec

Density Caliper

inches

6 11 16

MCG BH Corrected Gamma

API

0 75 150

150 225 300

Borehole
Temp in
deg F

Wyllie Lime. Sonic Por.

percent

30 20 10 0 -10

Bit Size

inches

6 11 16

HVI
every
10 cu ft

Annular
Integral
every
10 cu ft

Transit Time
every msec

DST Uphole Tension

pounds

5000 0

Replay
Scale
1:600

Depth Based Data - Maximum Sampling Increment 10.0cm

Plotted on 16-DEC-2017 19:39

Filename: C:\Minimus 17.05.5956\Data\MURFIN DRILLING (DAUNTLESS #15-1)\MAIN PASS.dta

Recorded on 16-DEC-2017 13:24

System Versions: Logged with 17.05.5956 Plotted with 17.05.5956



2 INCH MAIN PASS 1:600



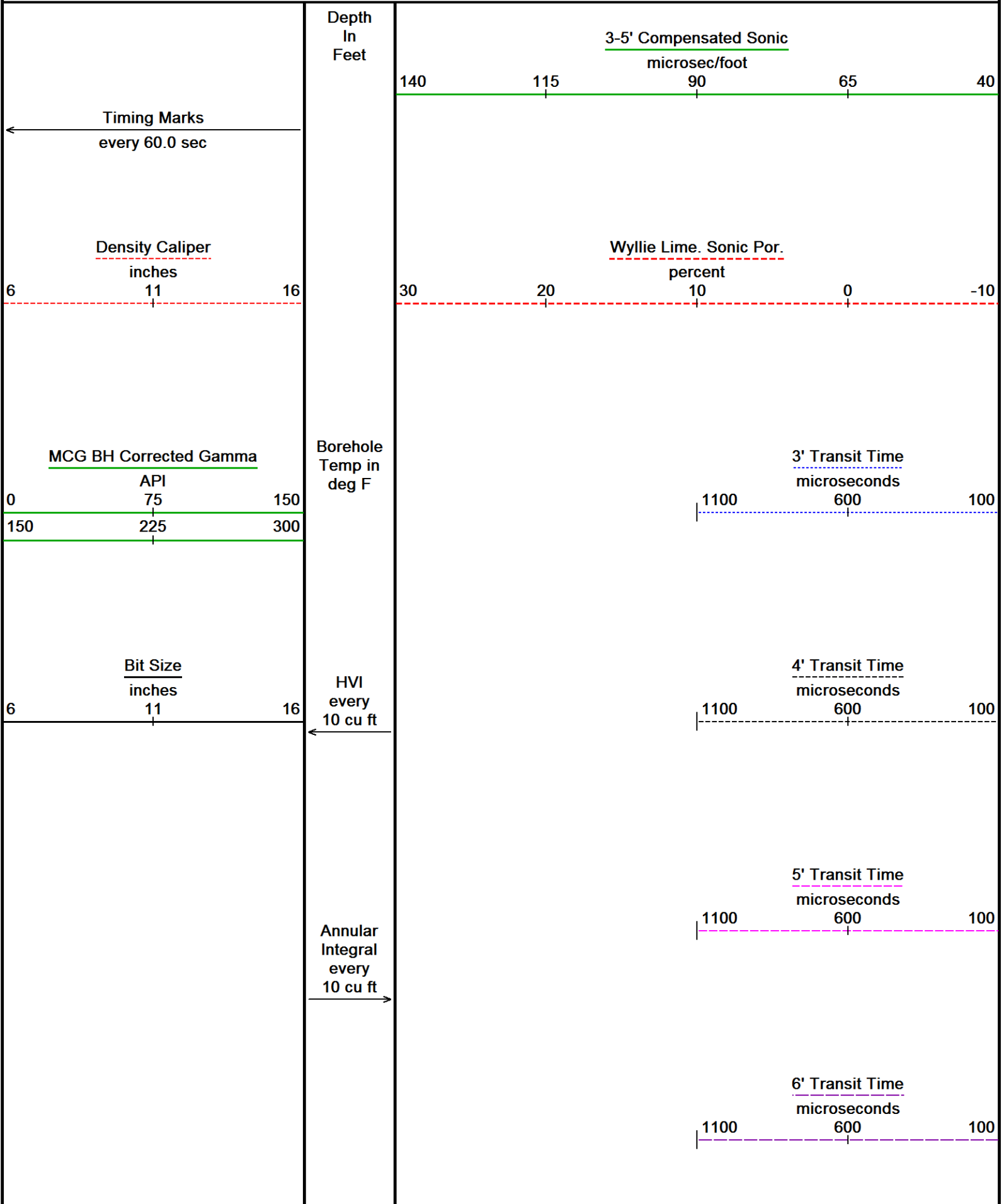
Depth Based Data - Maximum Sampling Increment 10.0cm

Plotted on 16-DEC-2017 19:39

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Recorded on 16-DEC-2017 13:24

System Versions: Logged with 17.05.5956 Plotted with 17.05.5956



DST Uphole Tension
pounds
5000 0

Transit Time
every msec

Replay
Scale
1:240

458

2850

Casing
Shoe

4220

500

4210

2840

4200

←BIT

GGCF
98°

2830

550

4190

←CLDC

SMTU →

4180

98°

2820

600

4170

2810

4160

4150

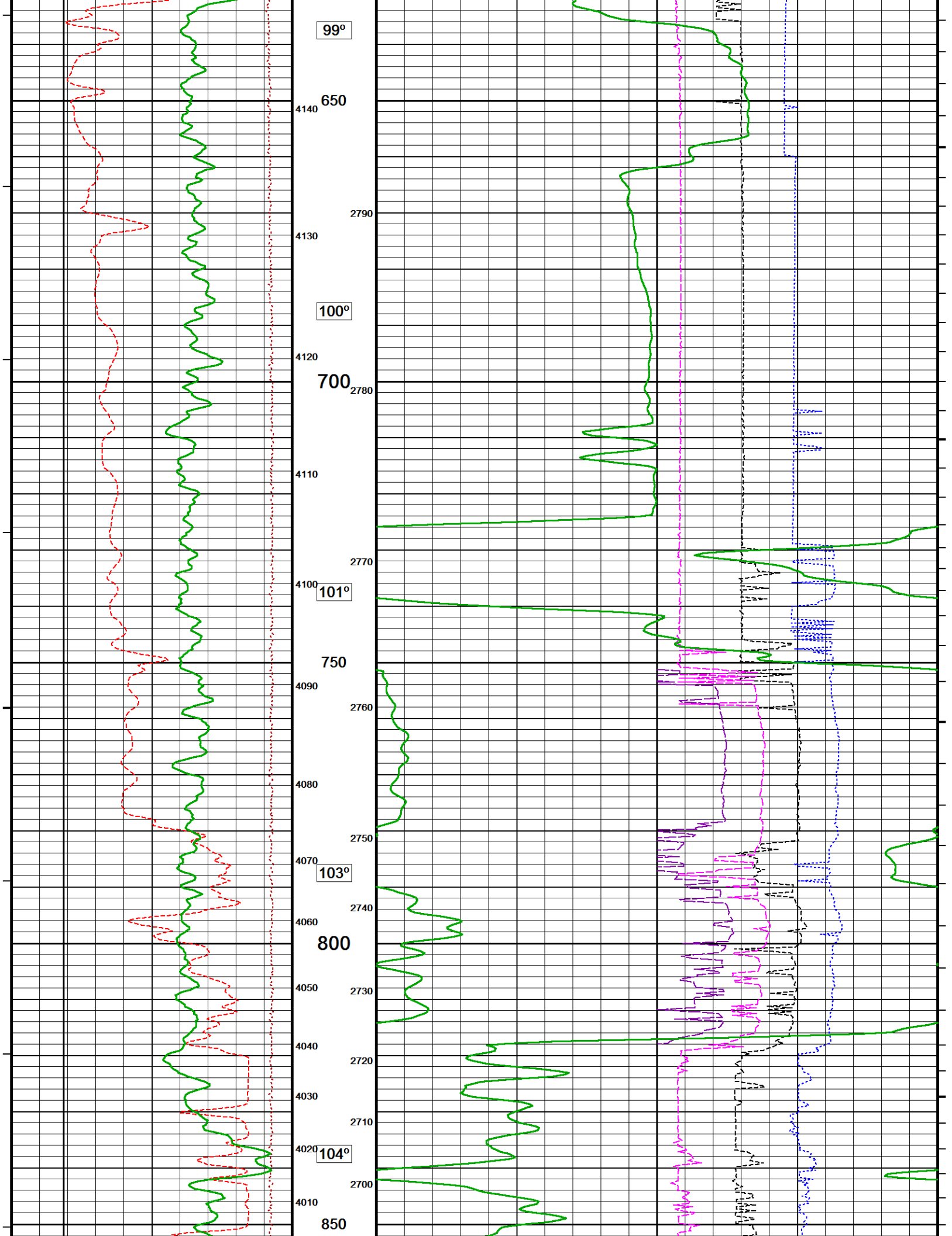
2800

DT35 →

TR22 →

TR11 →

TR21 →



← BIT

← GG65

← CLDC

SMTU →

DT35 →

TR22 →

TR11

TR21 →

105°

900

105°

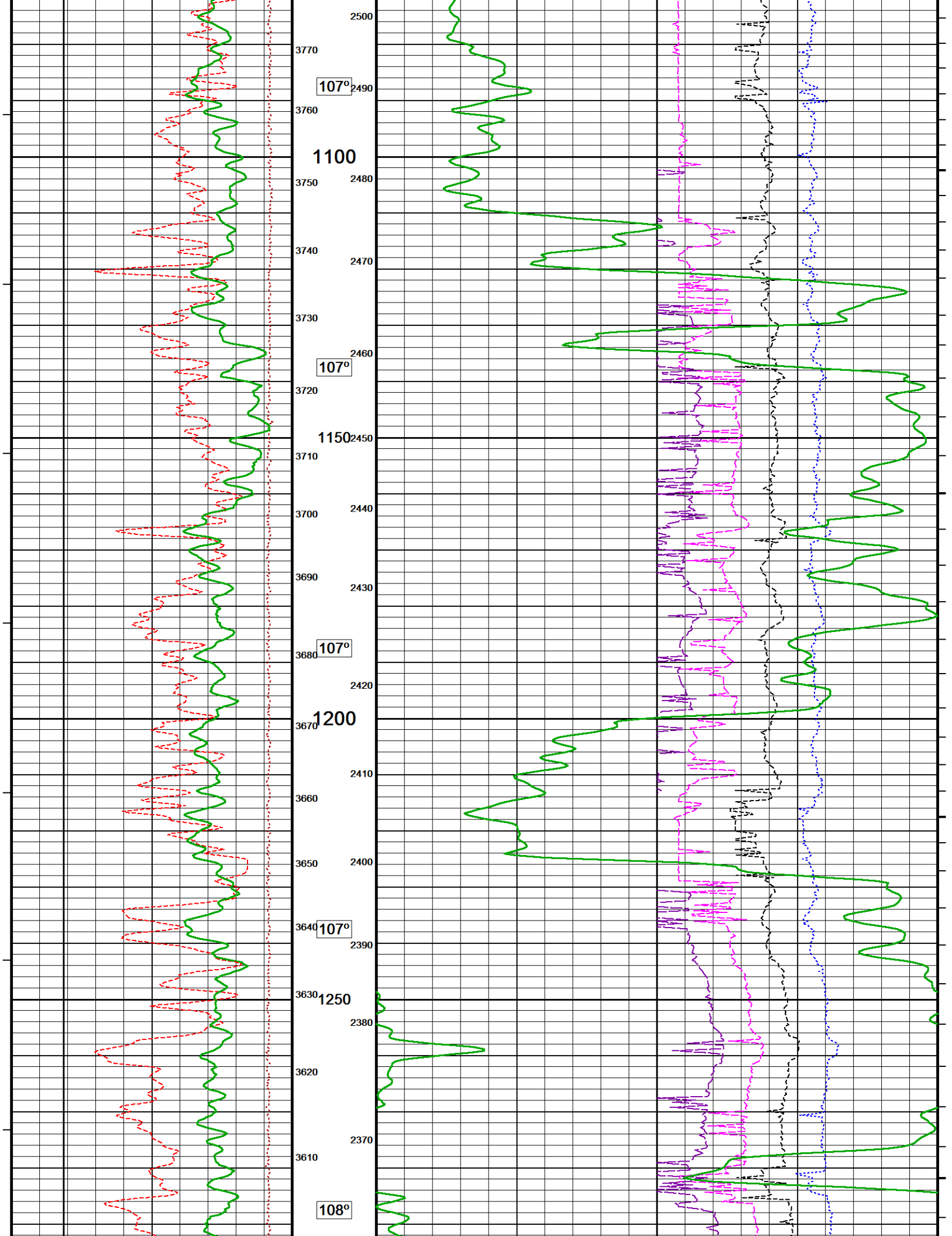
950

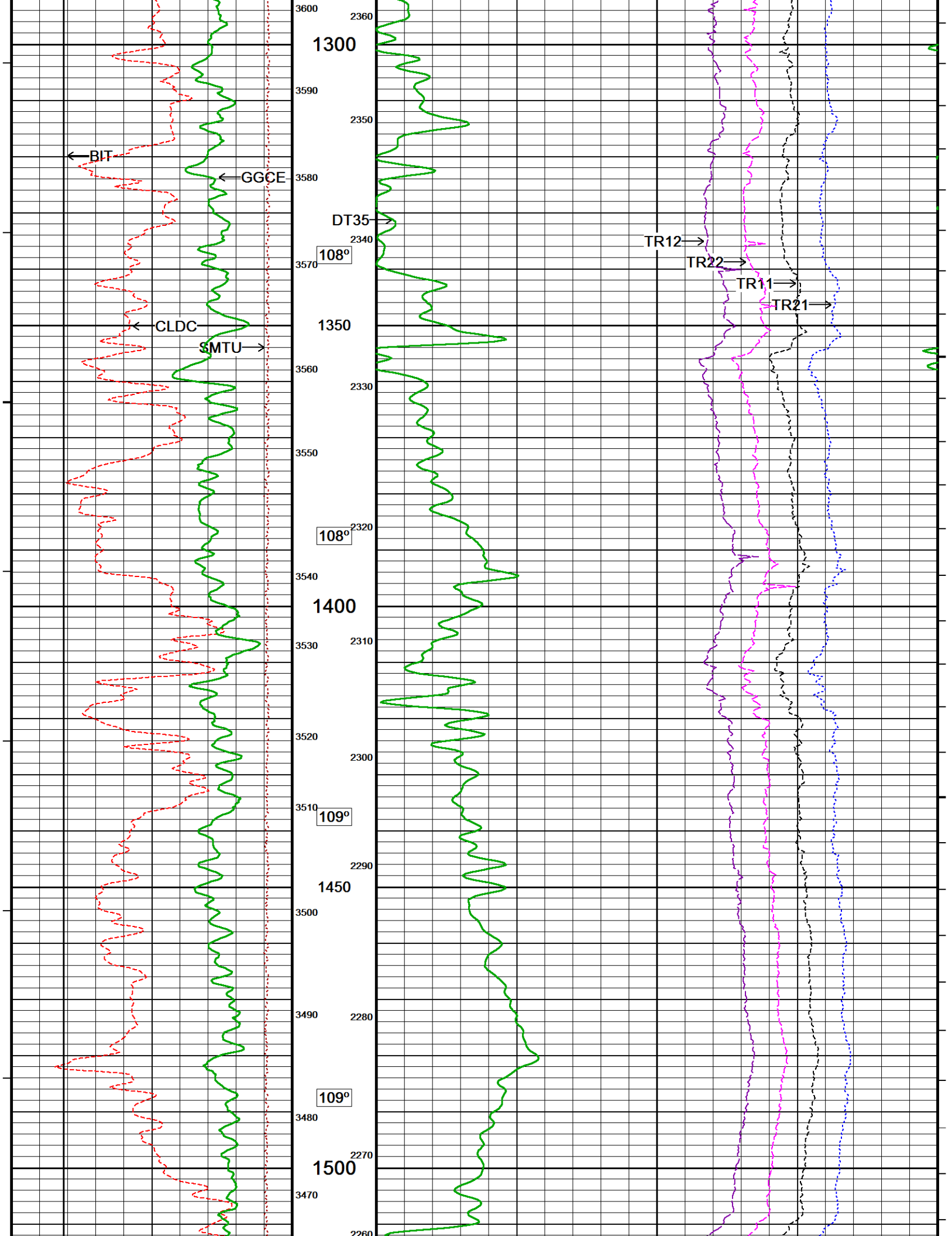
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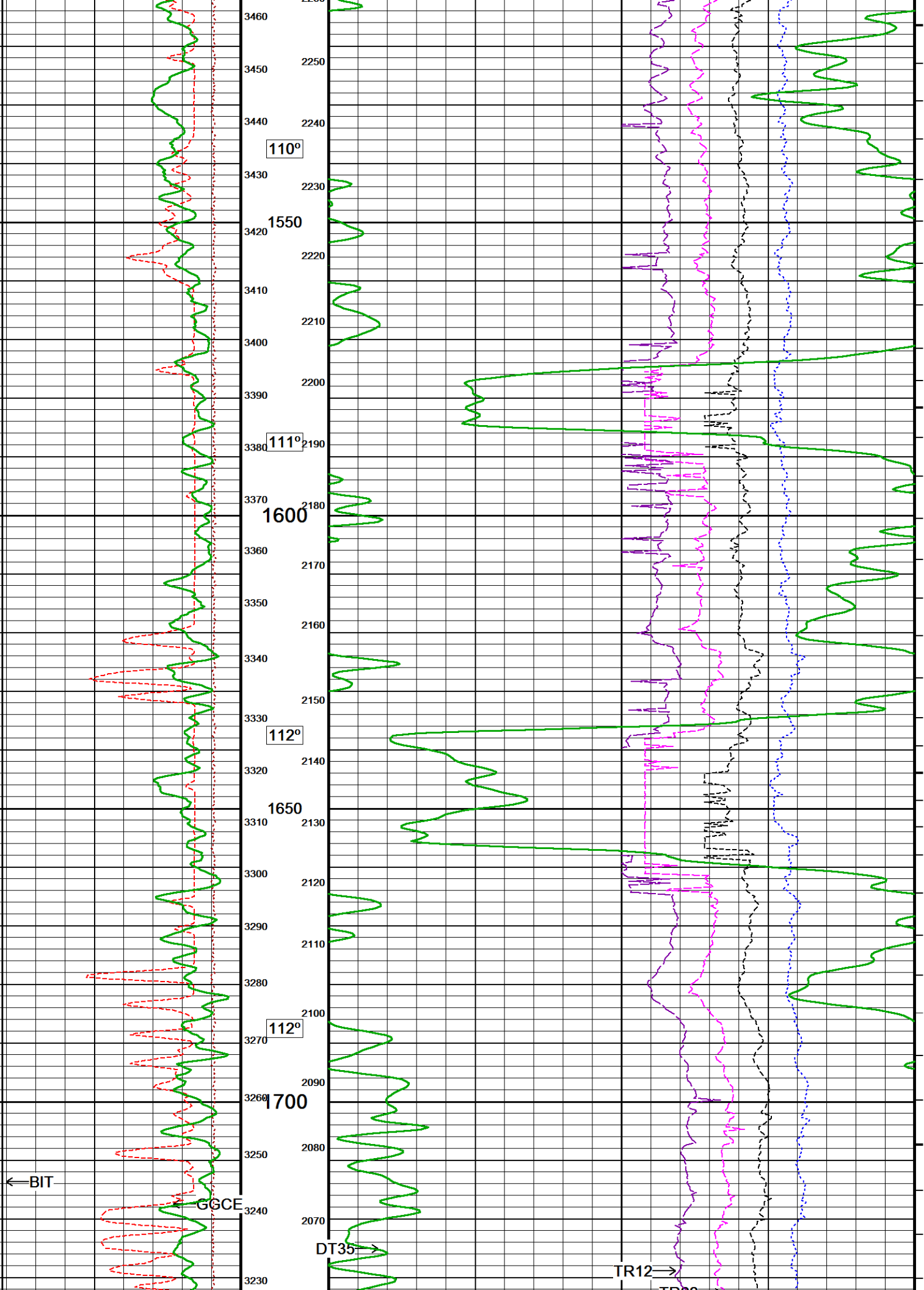
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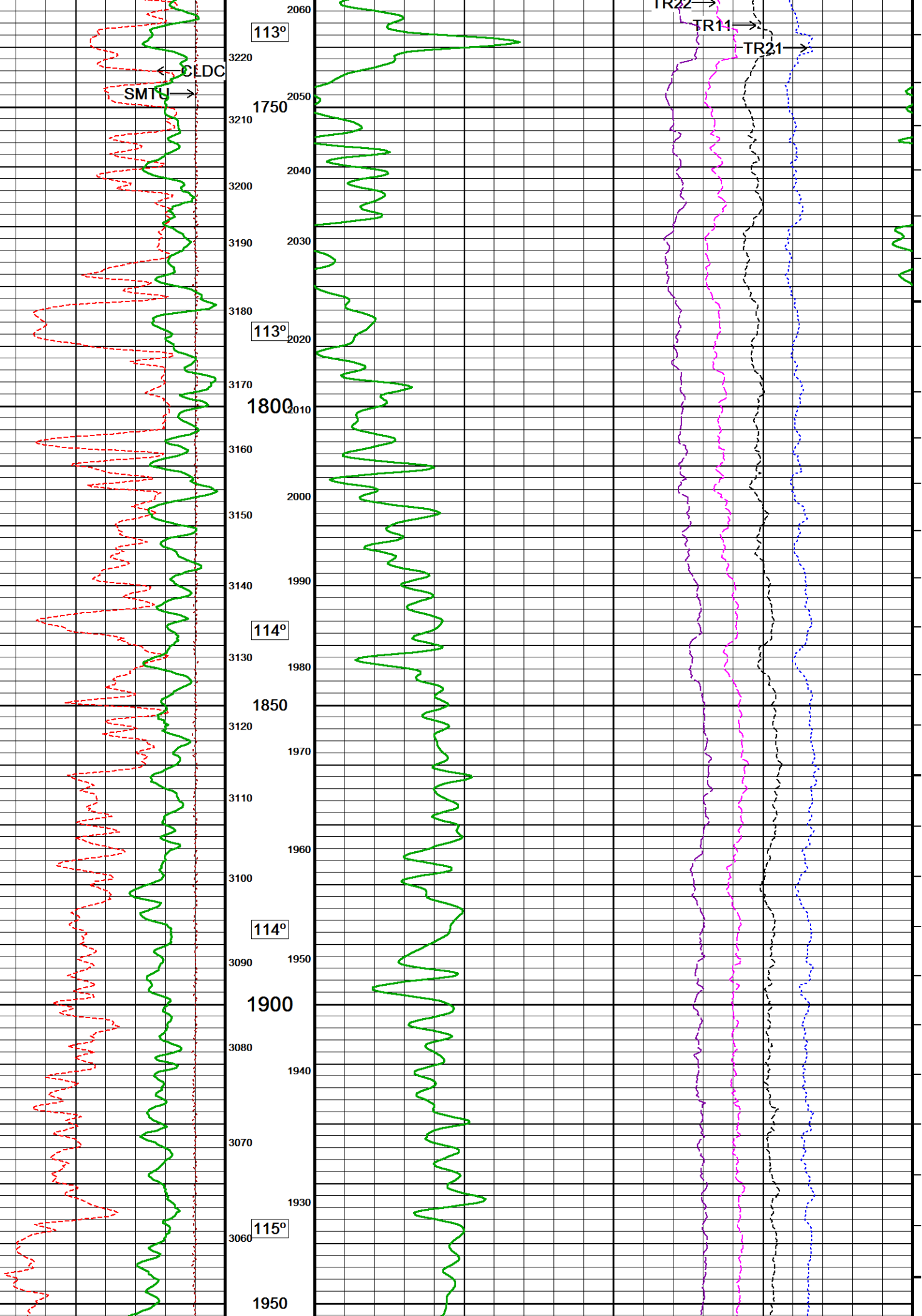
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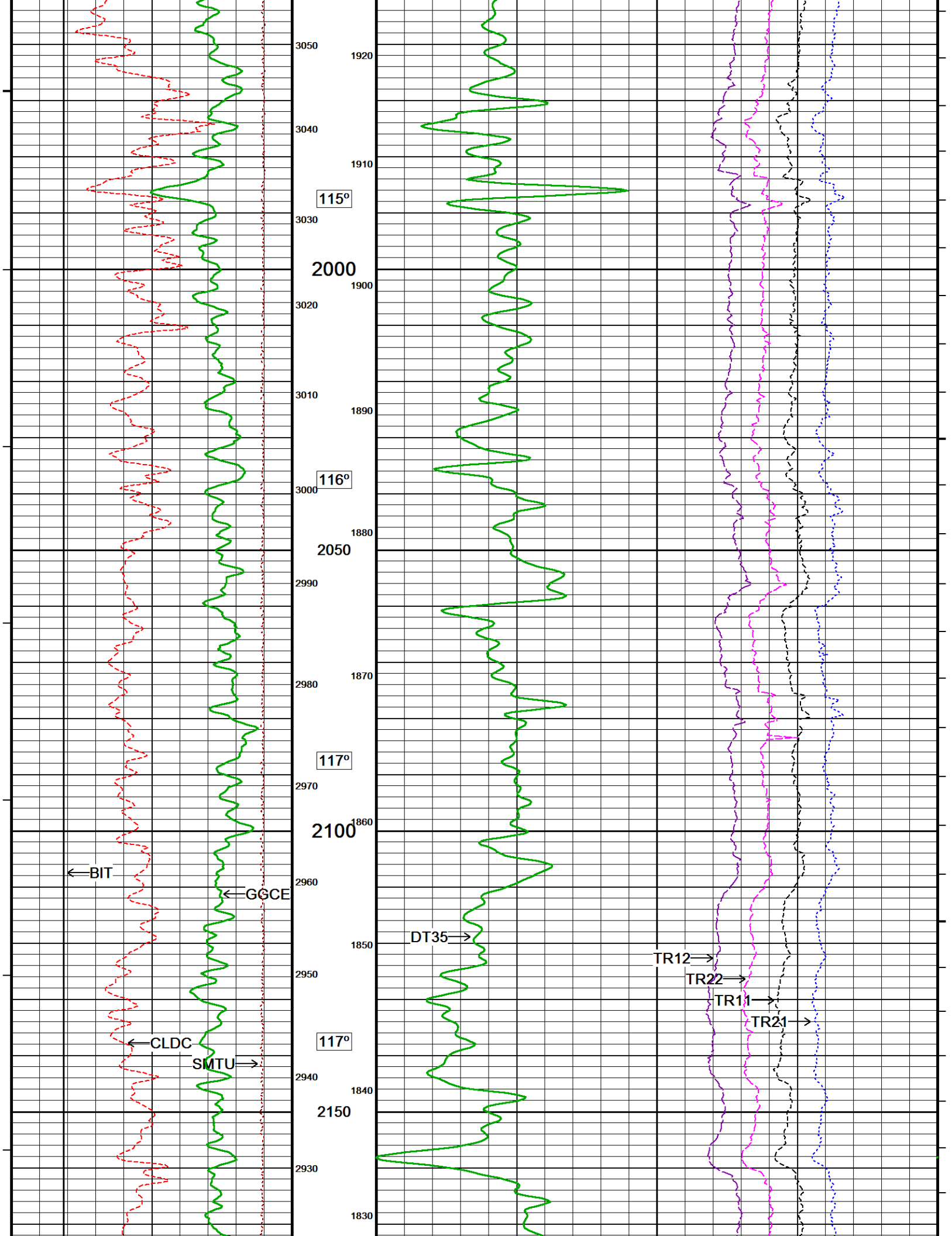
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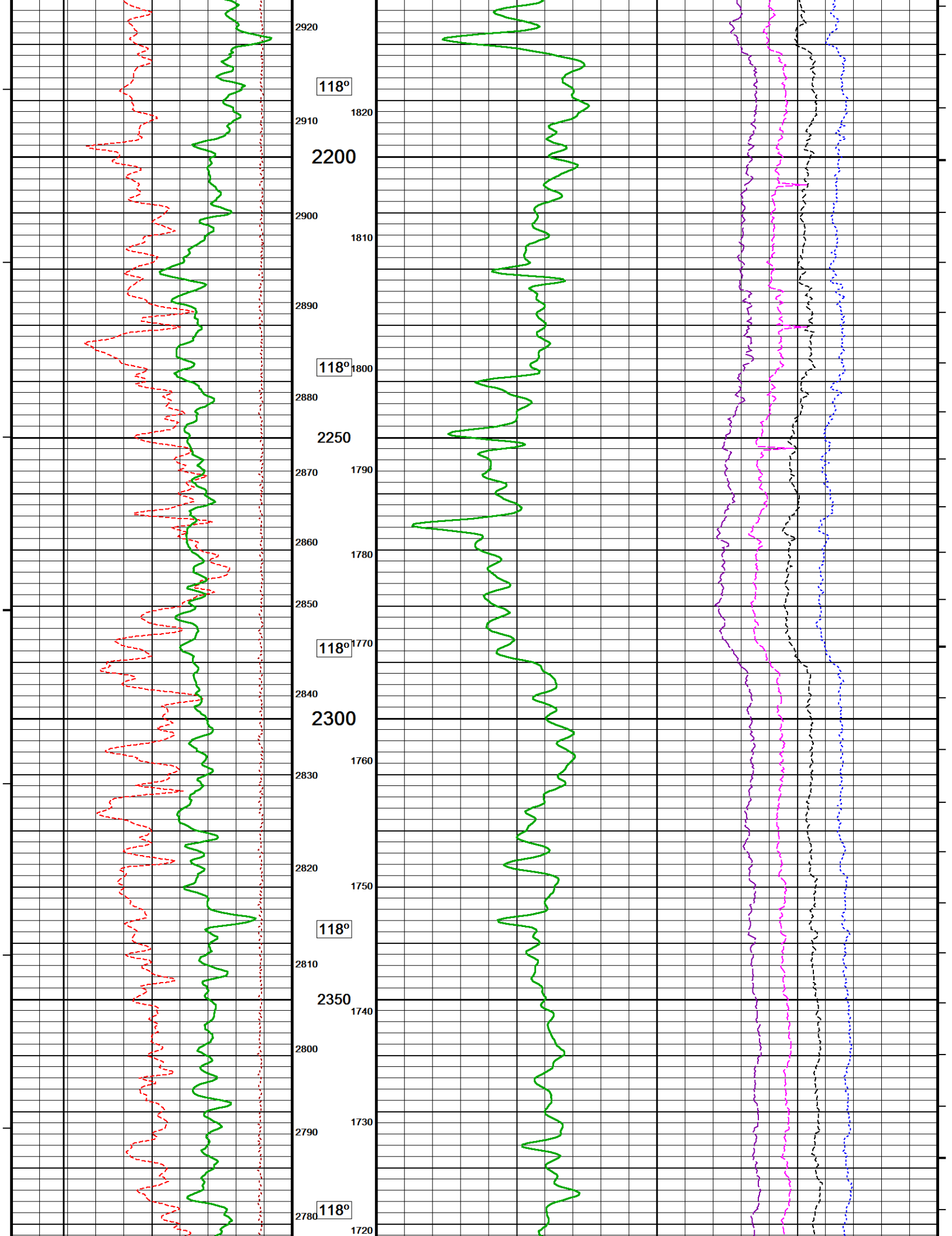


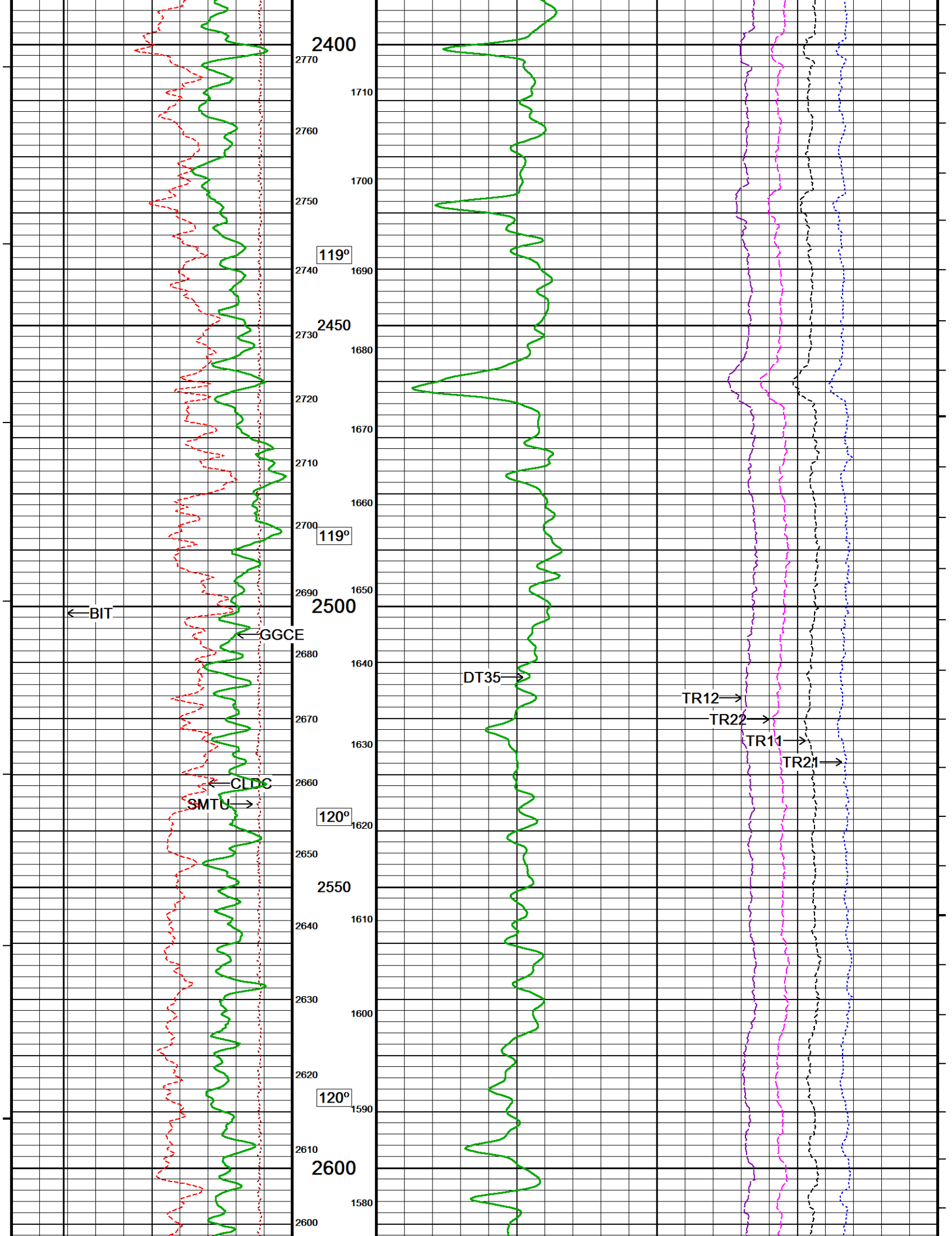


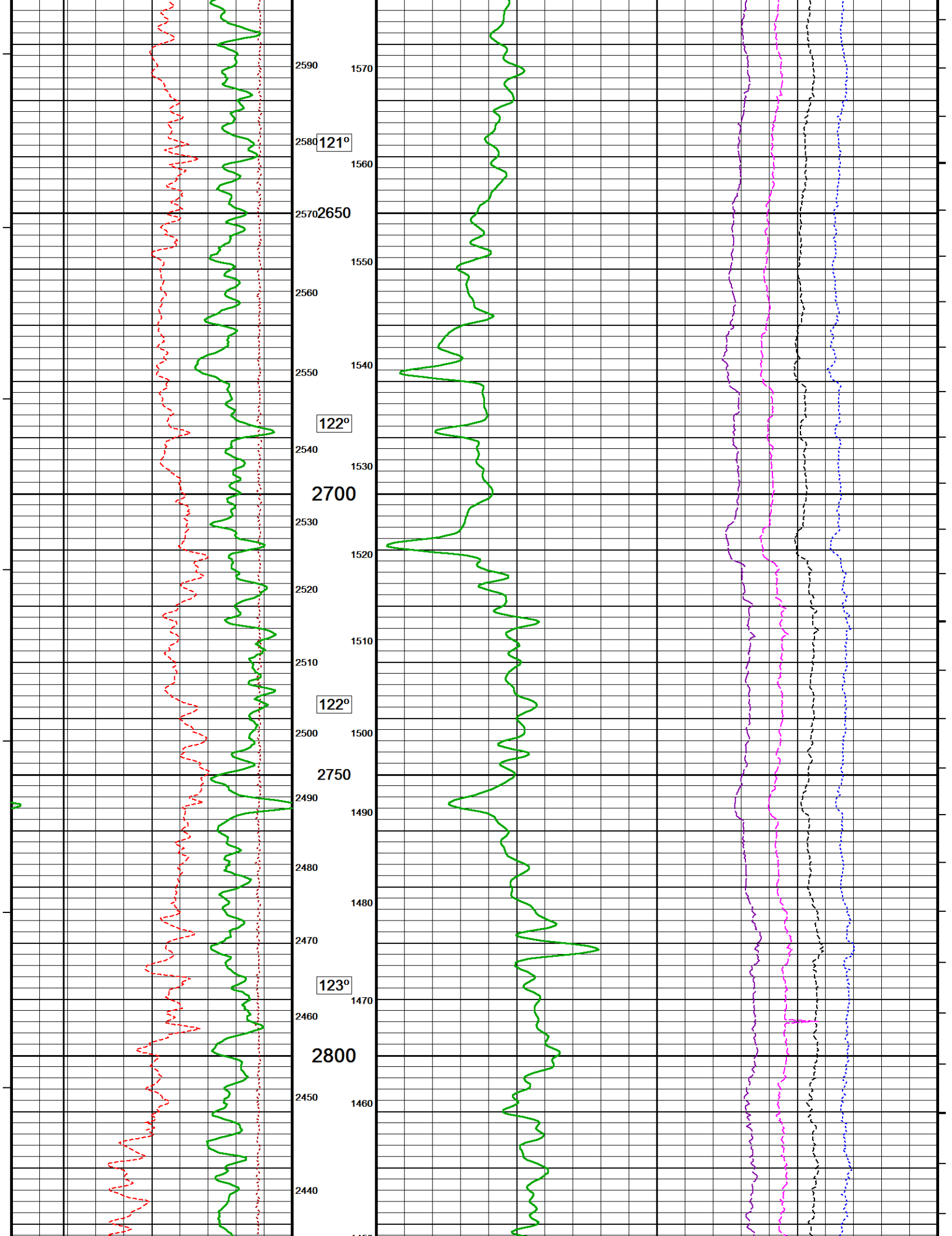


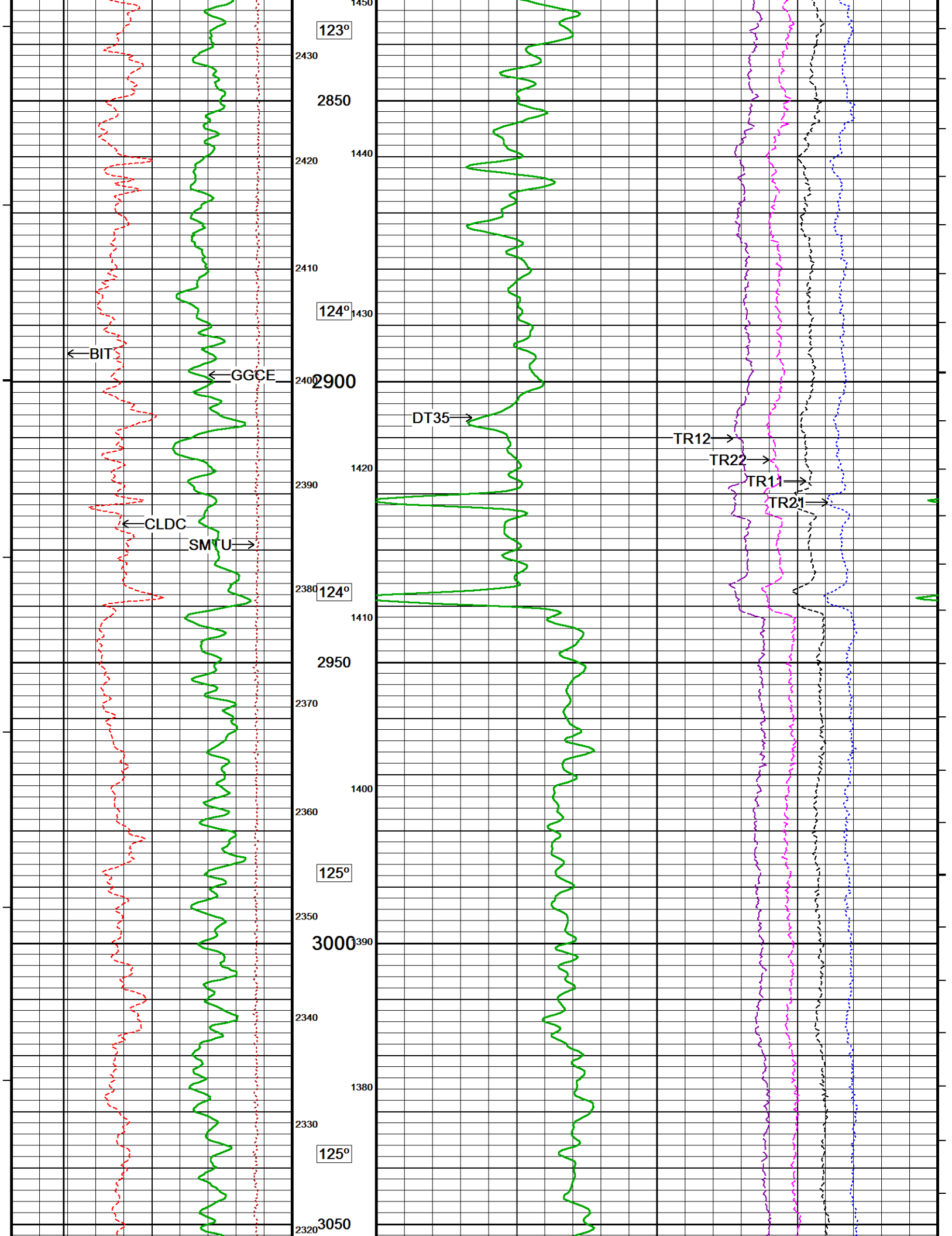


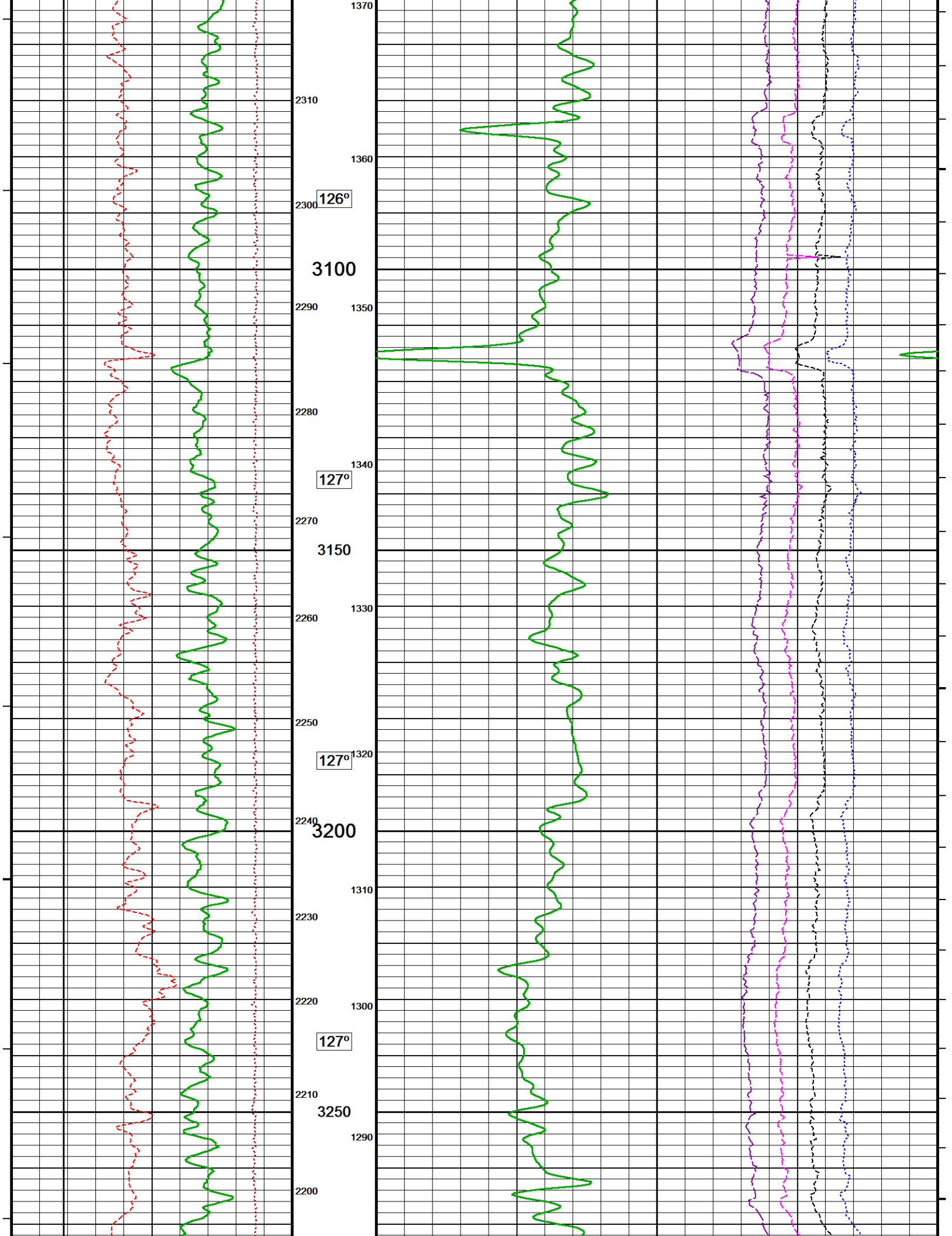


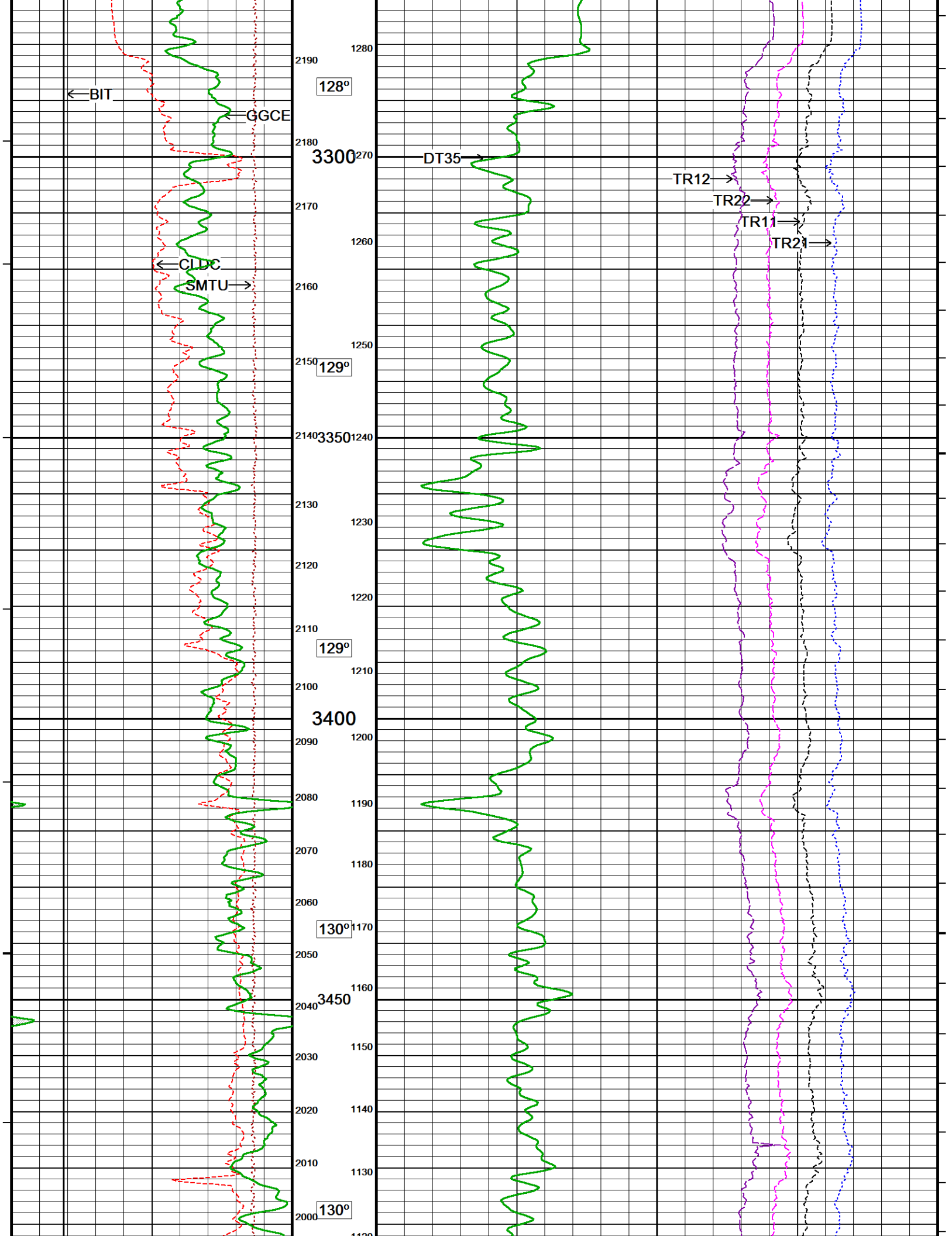


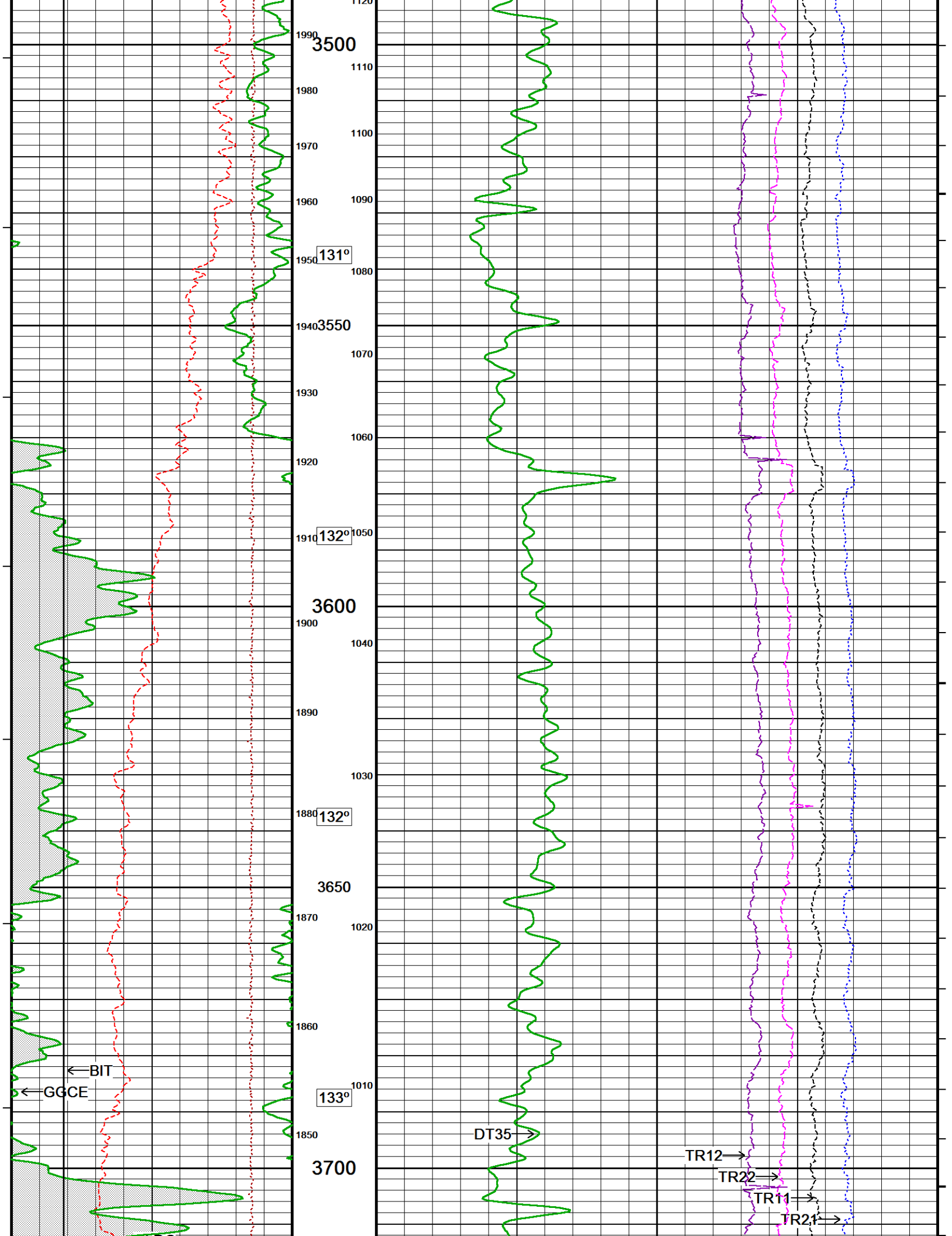


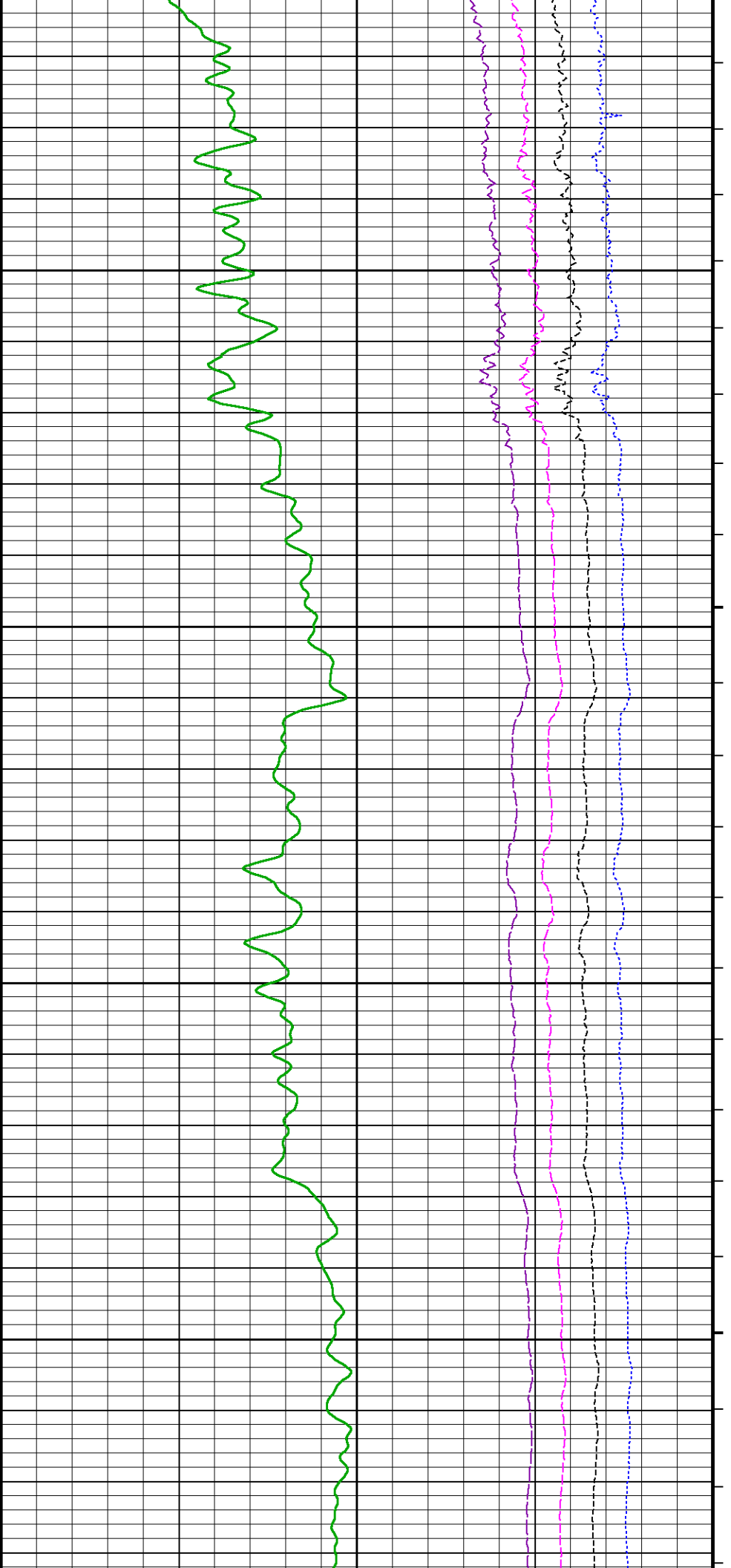
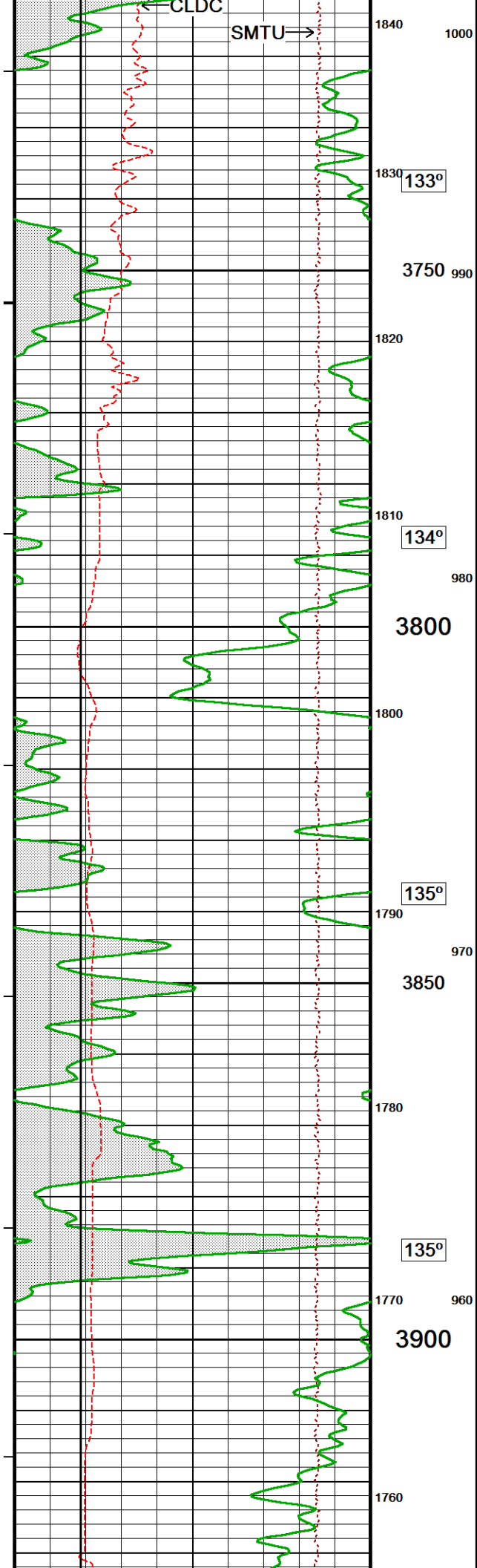


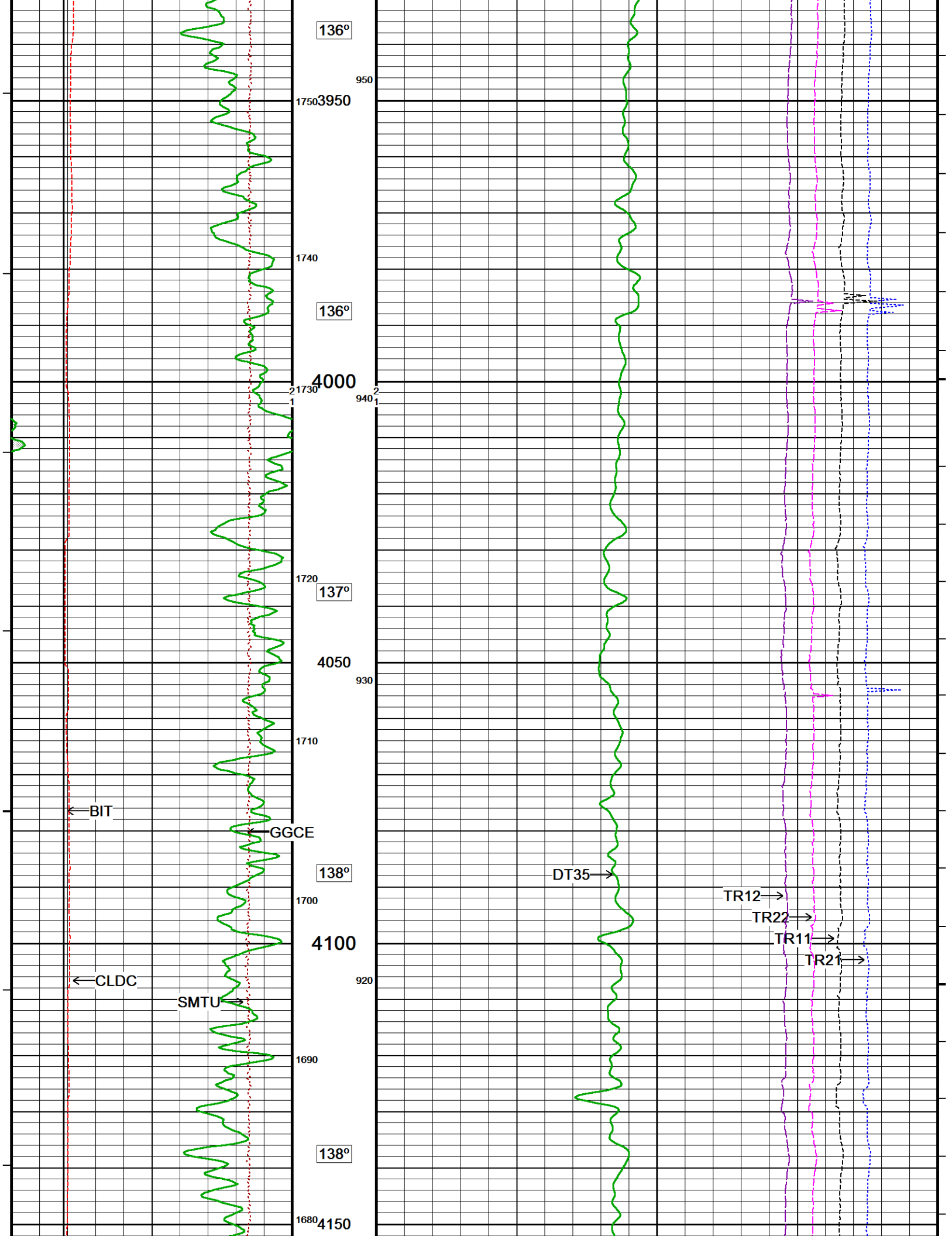


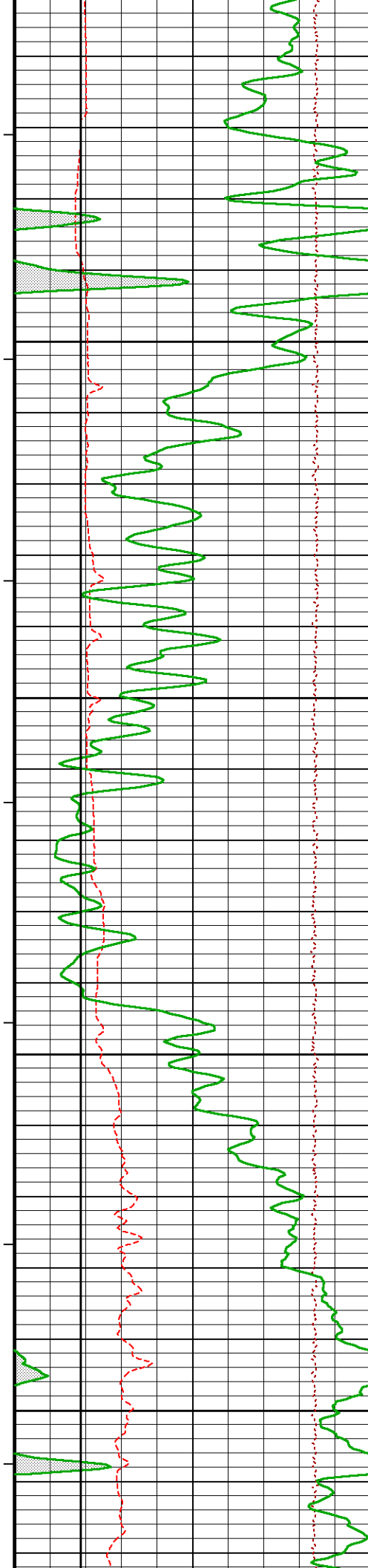




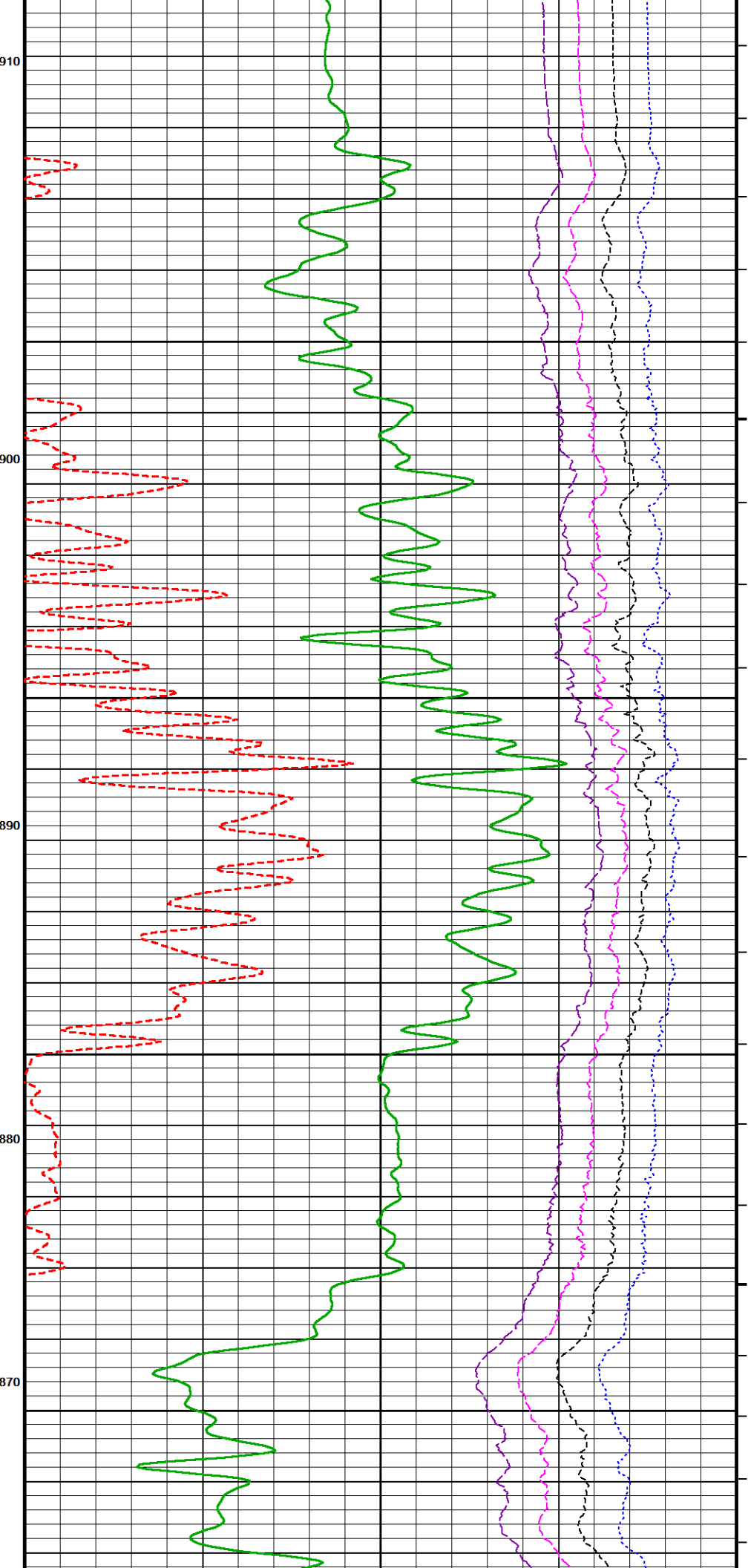


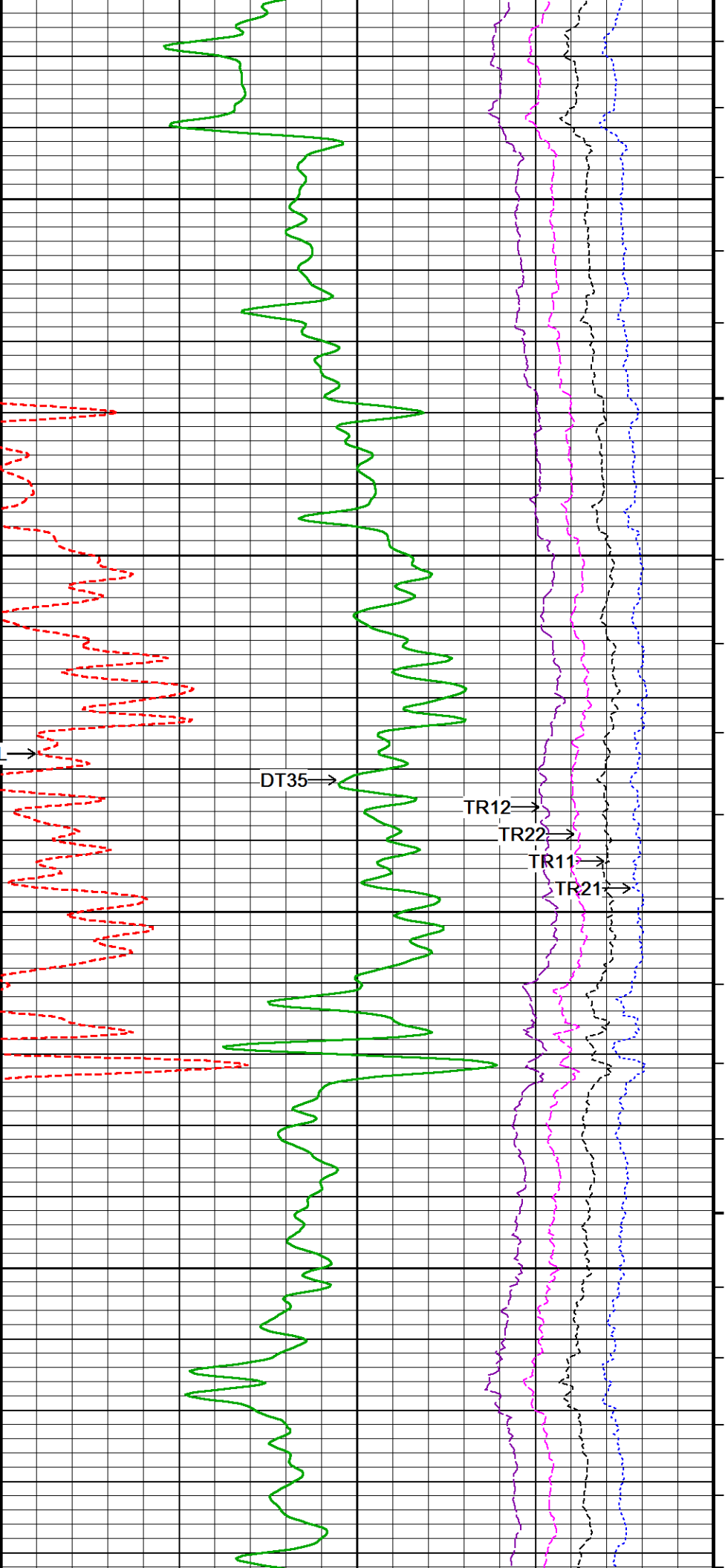
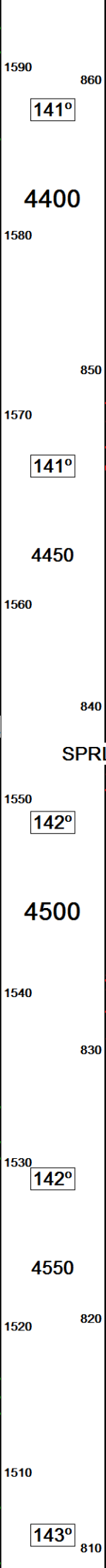
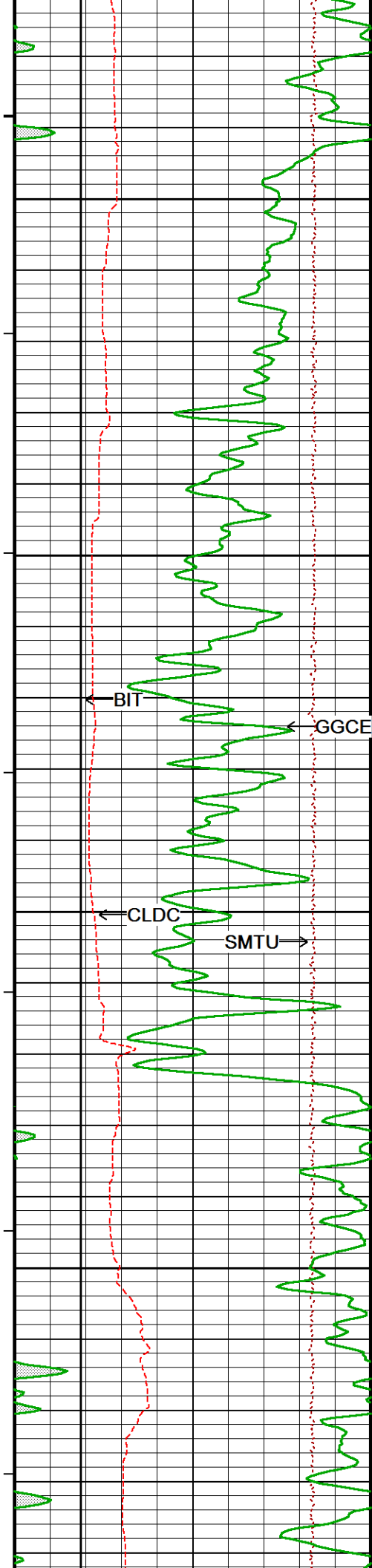


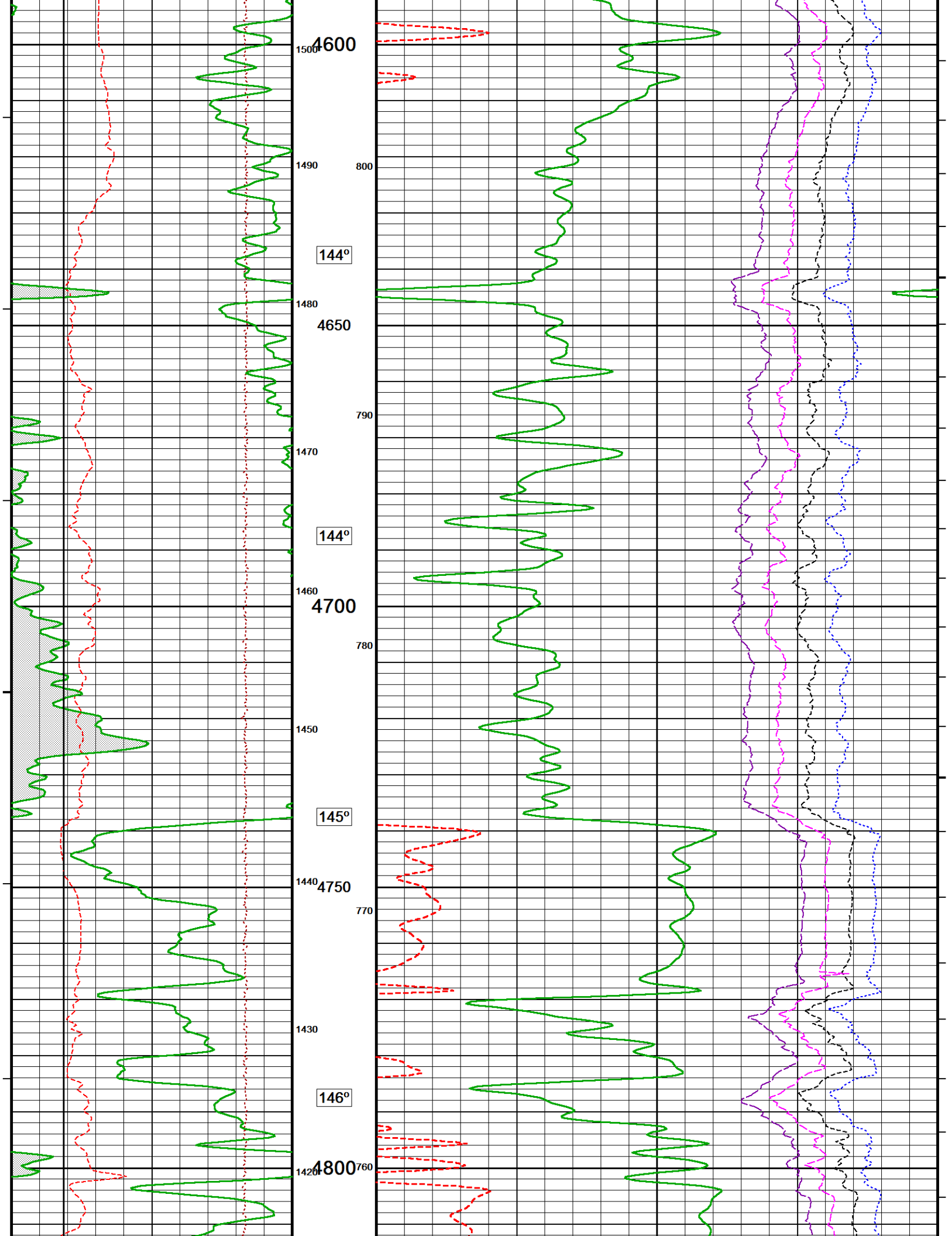


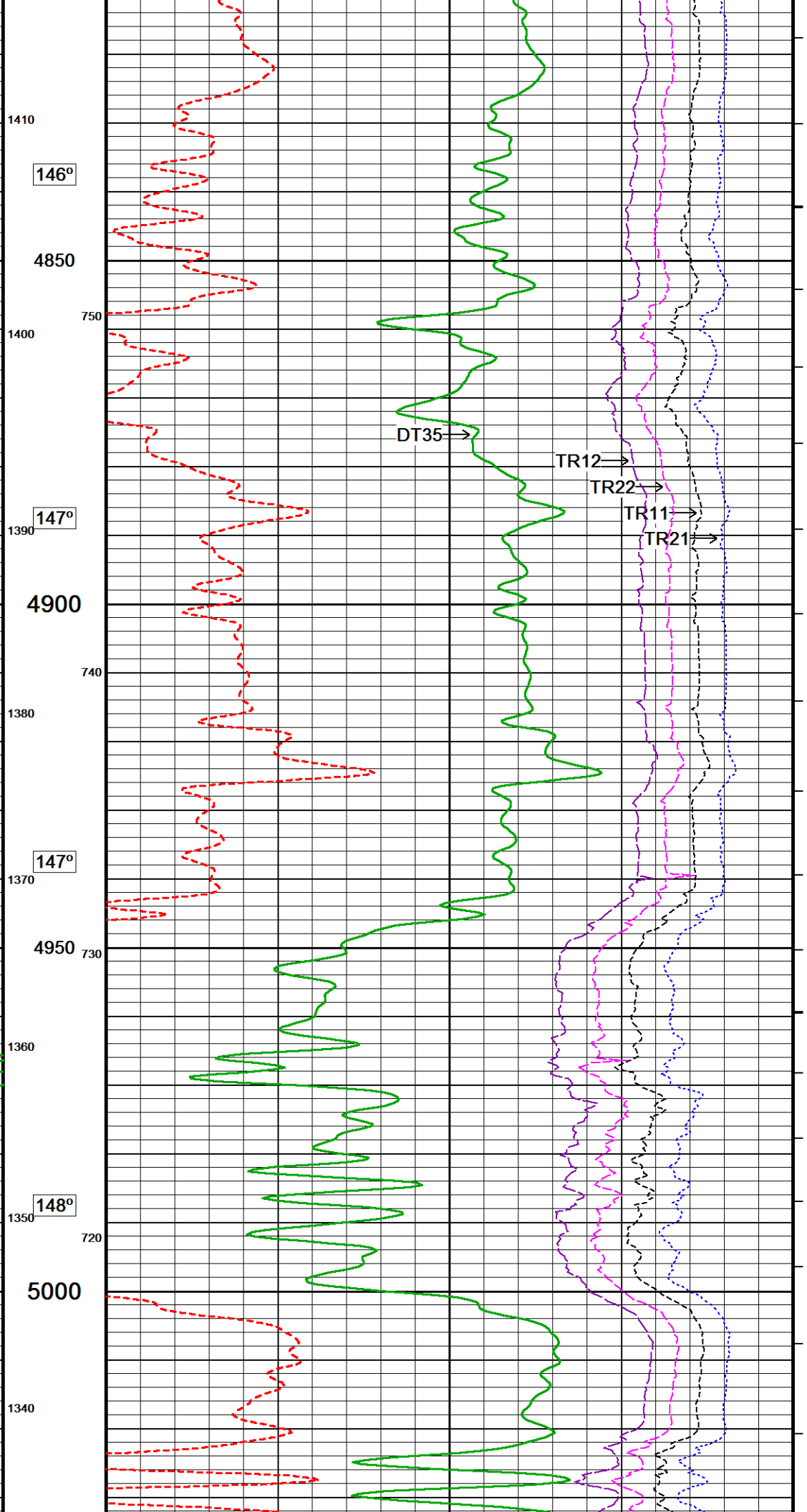
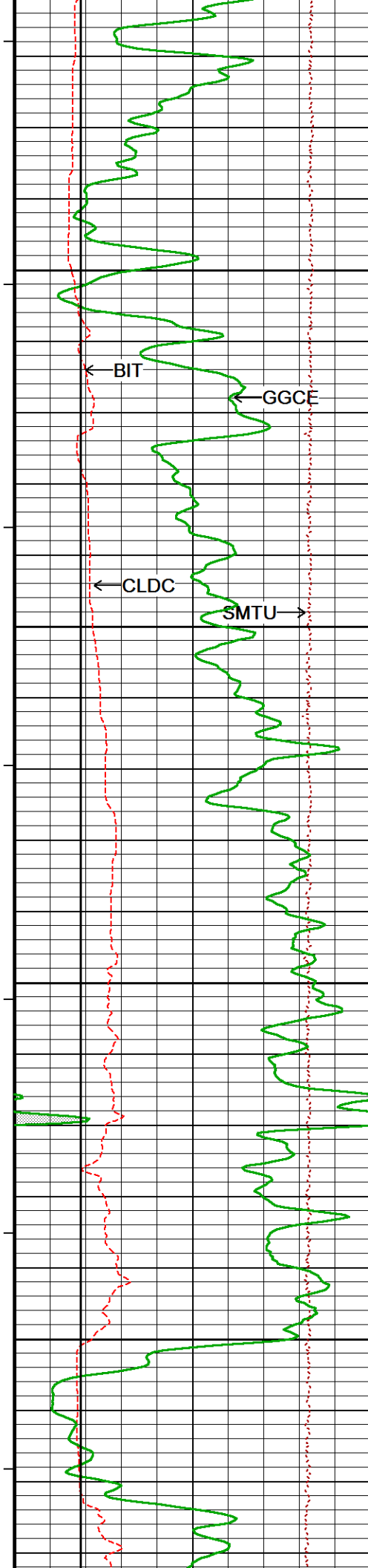


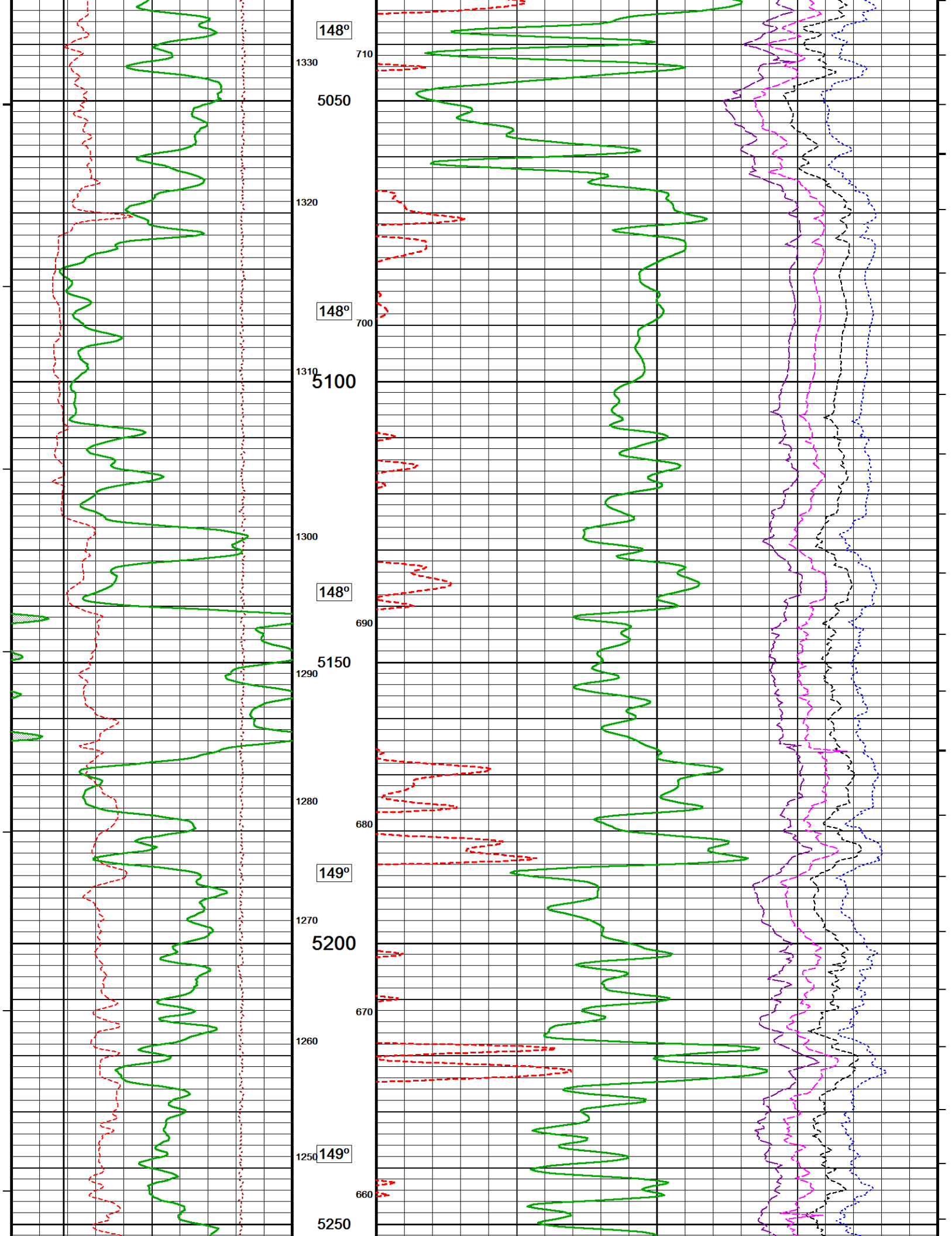
1670
139°
4200
1660
1650
139°
4250
1640
1630
140°
4300
1620
1610
140°
4350
1600

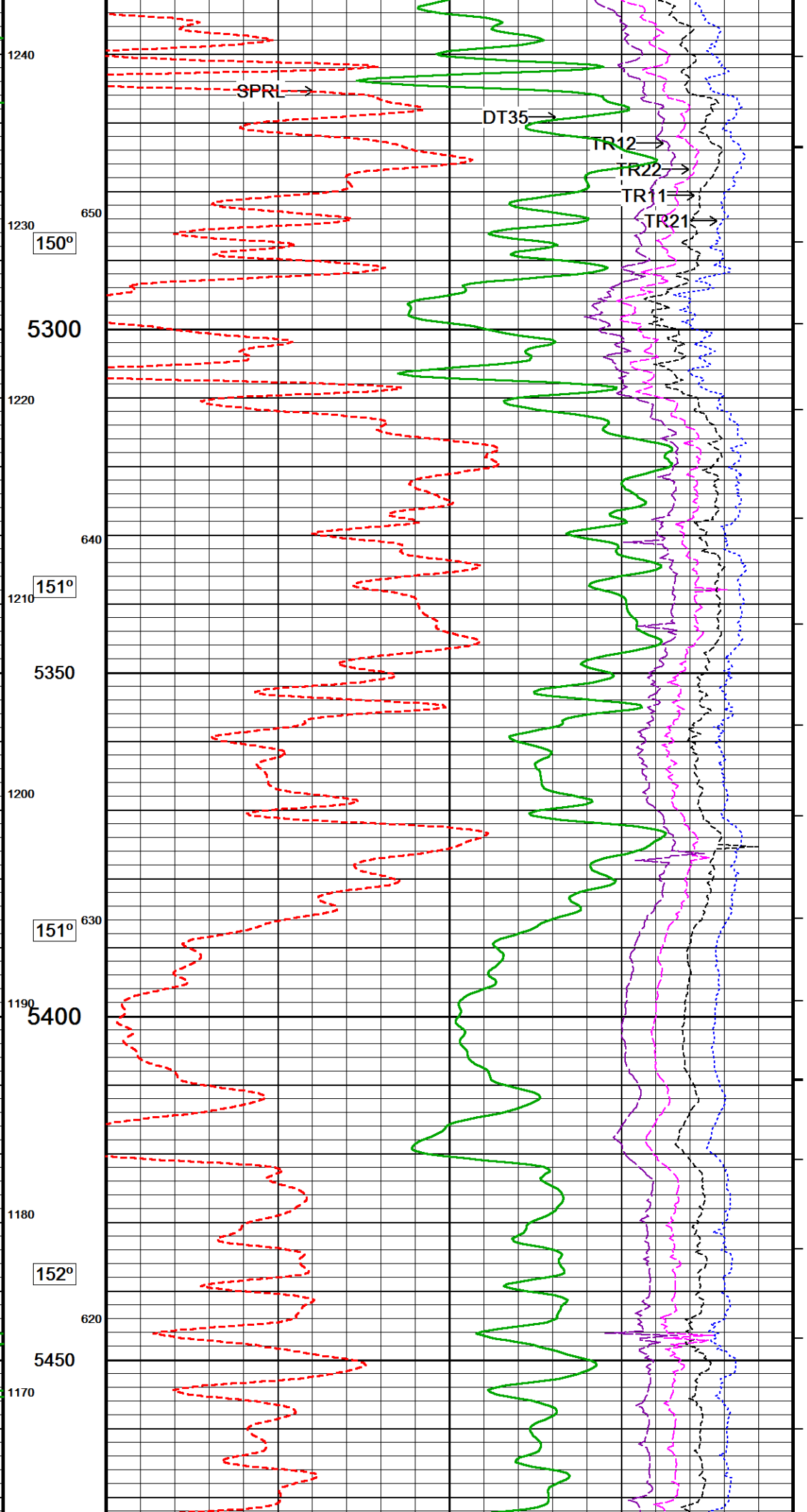
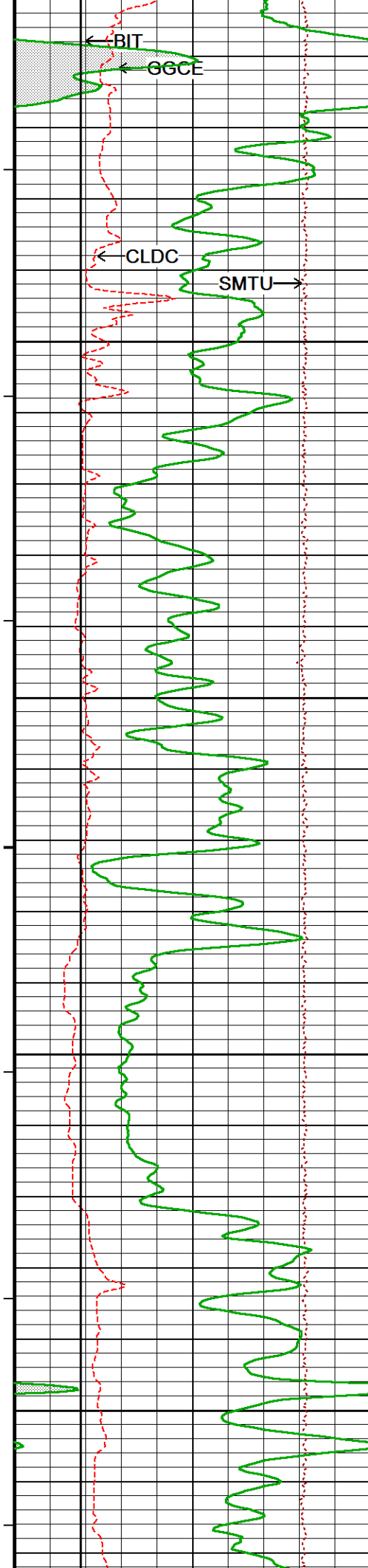


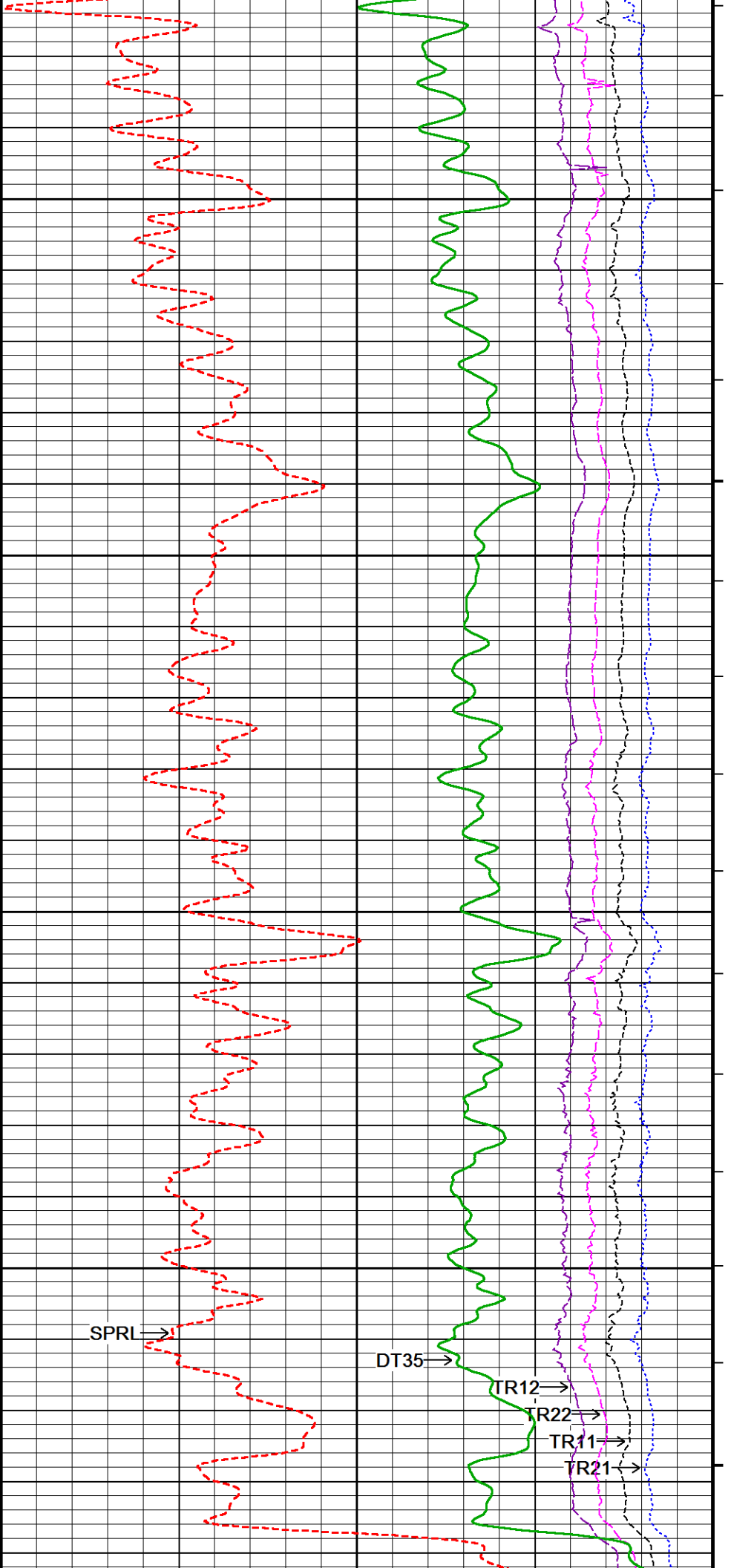
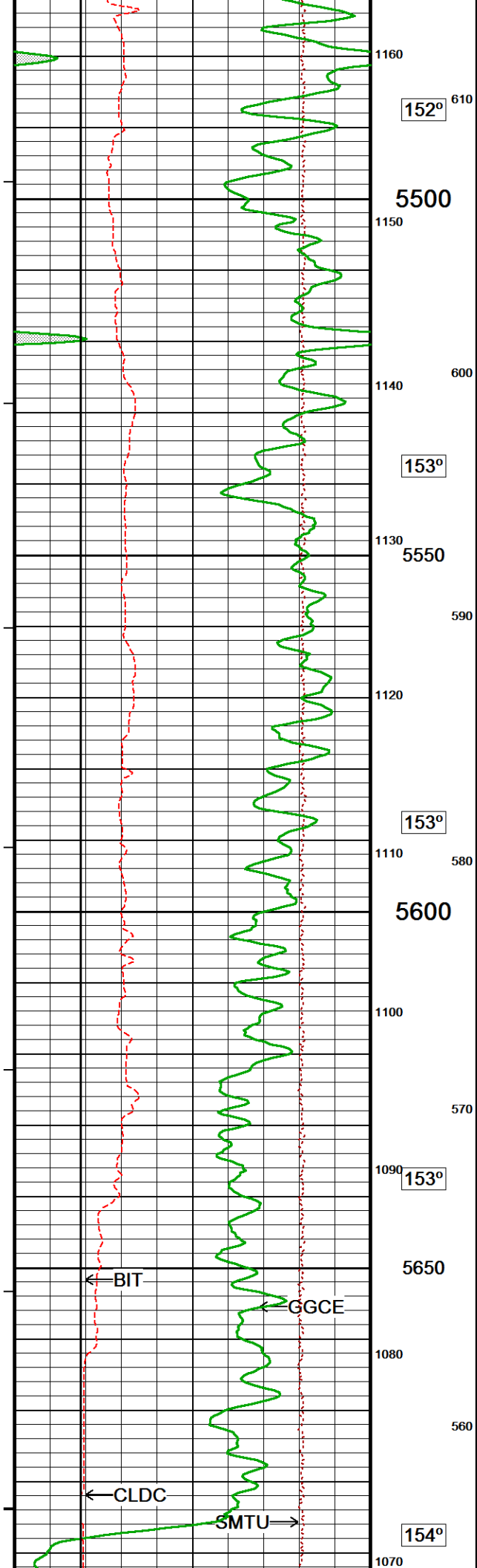


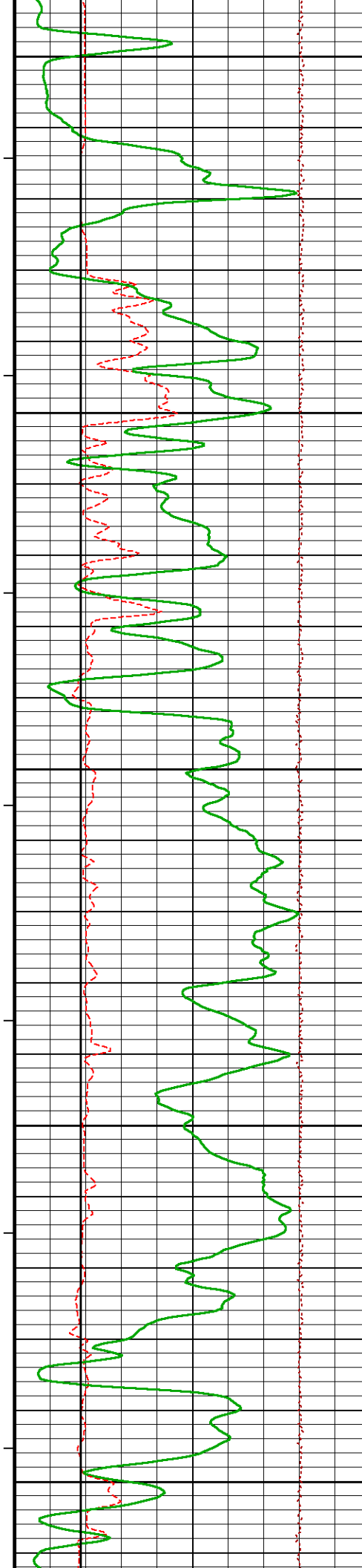




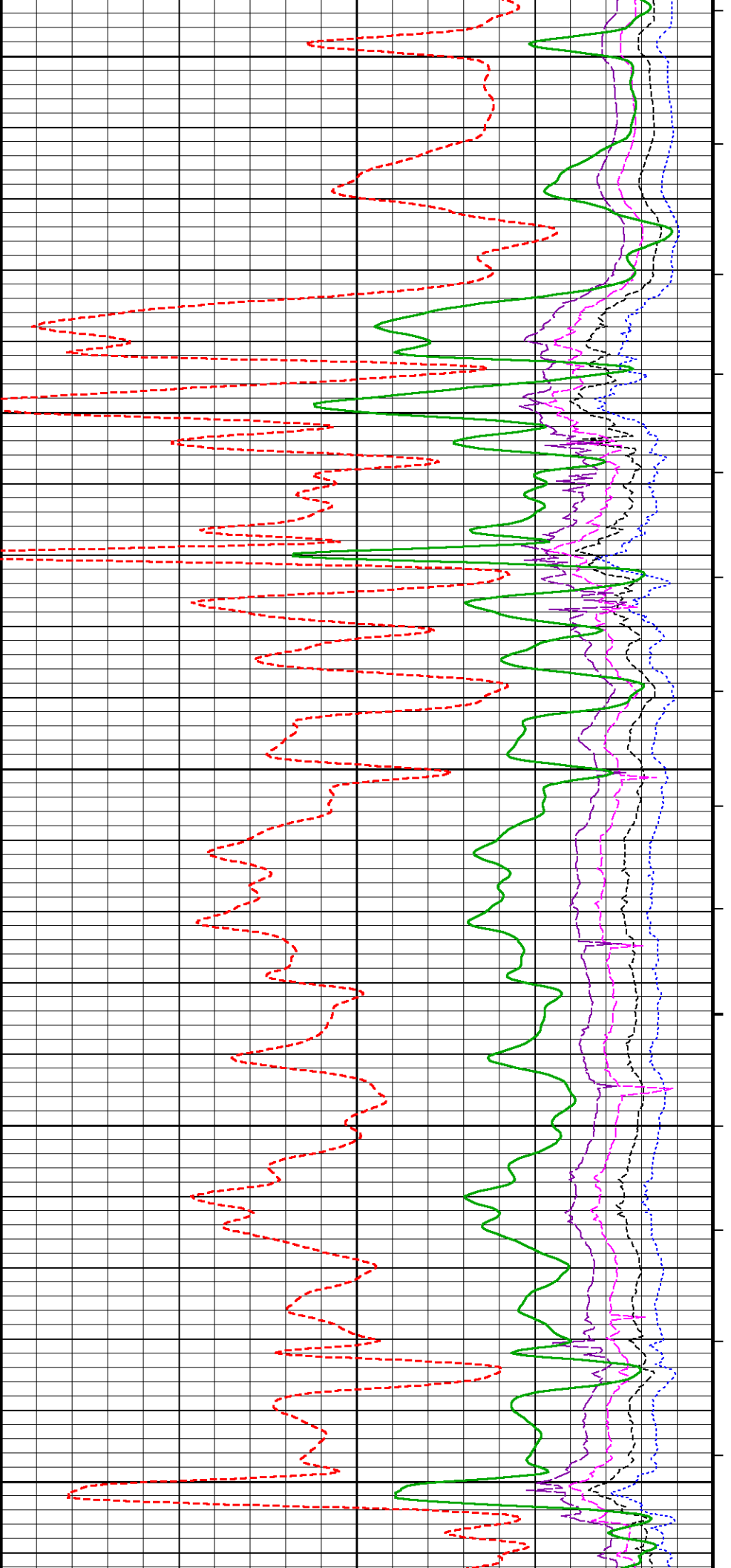


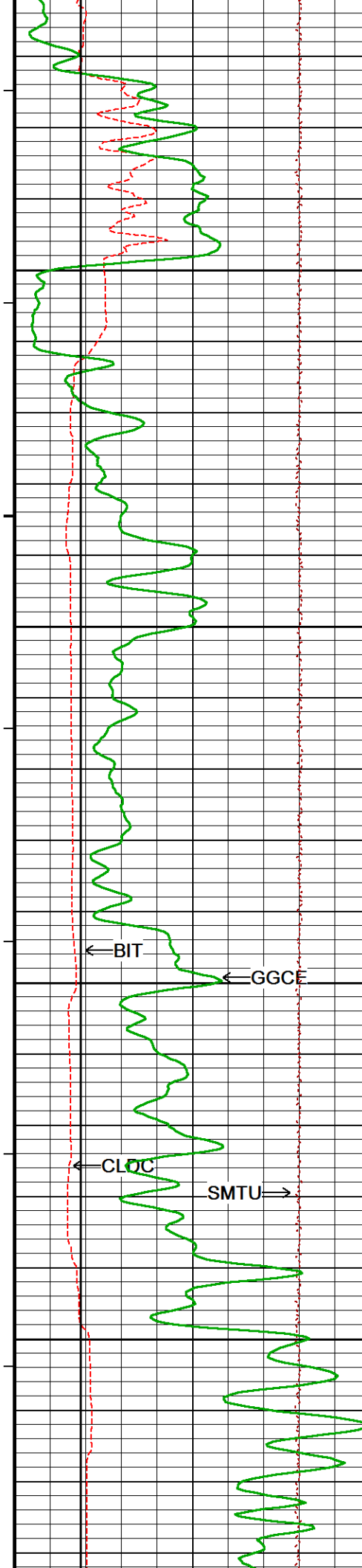






5700
1060
550
154°
1050
5750
1040
540
154°
1030
5800
530
1020
155°
1010
5850
520
1000
156°
5900
990

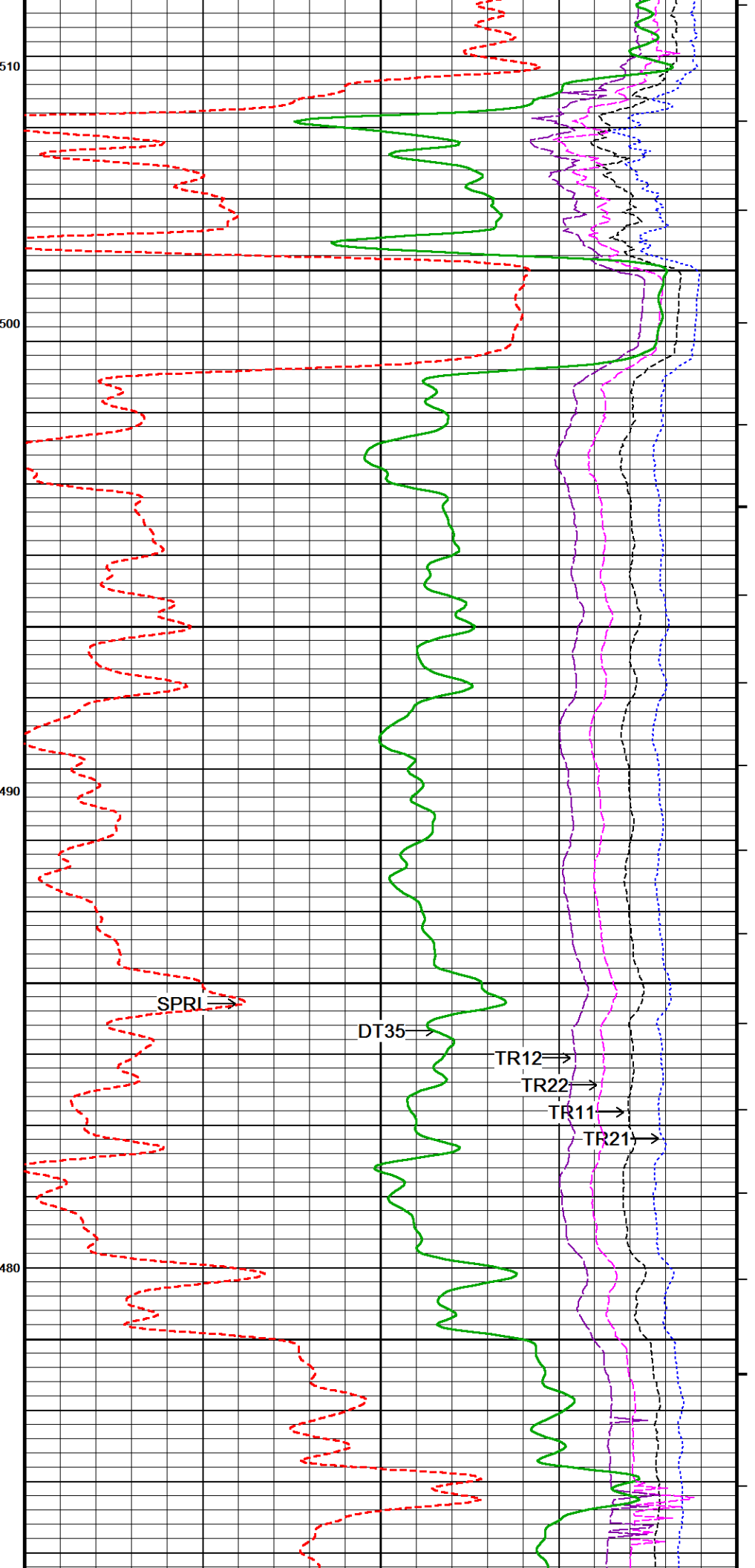


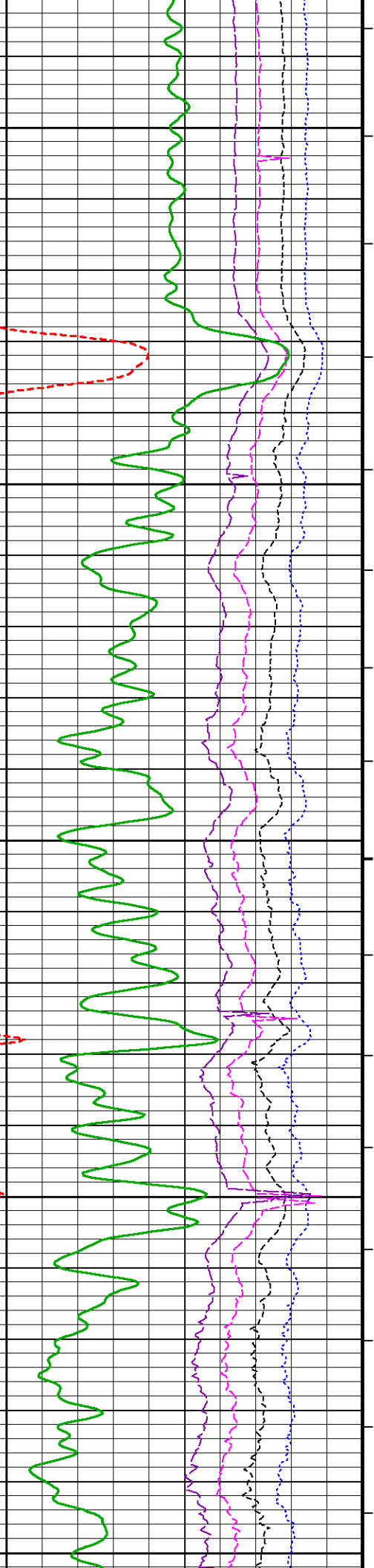
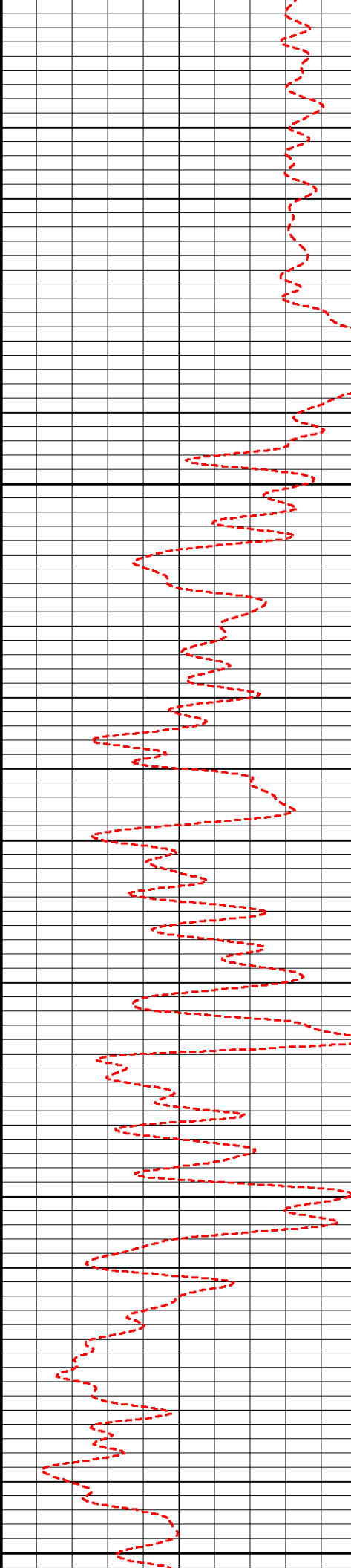
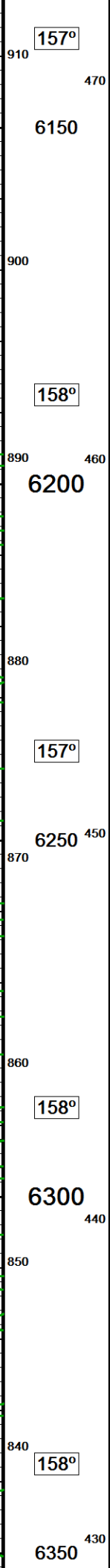
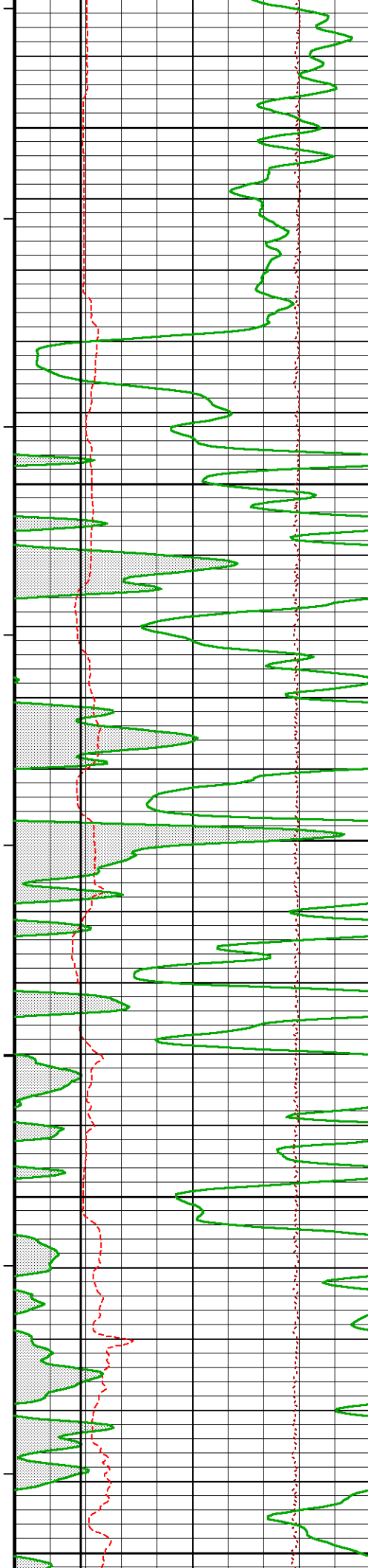


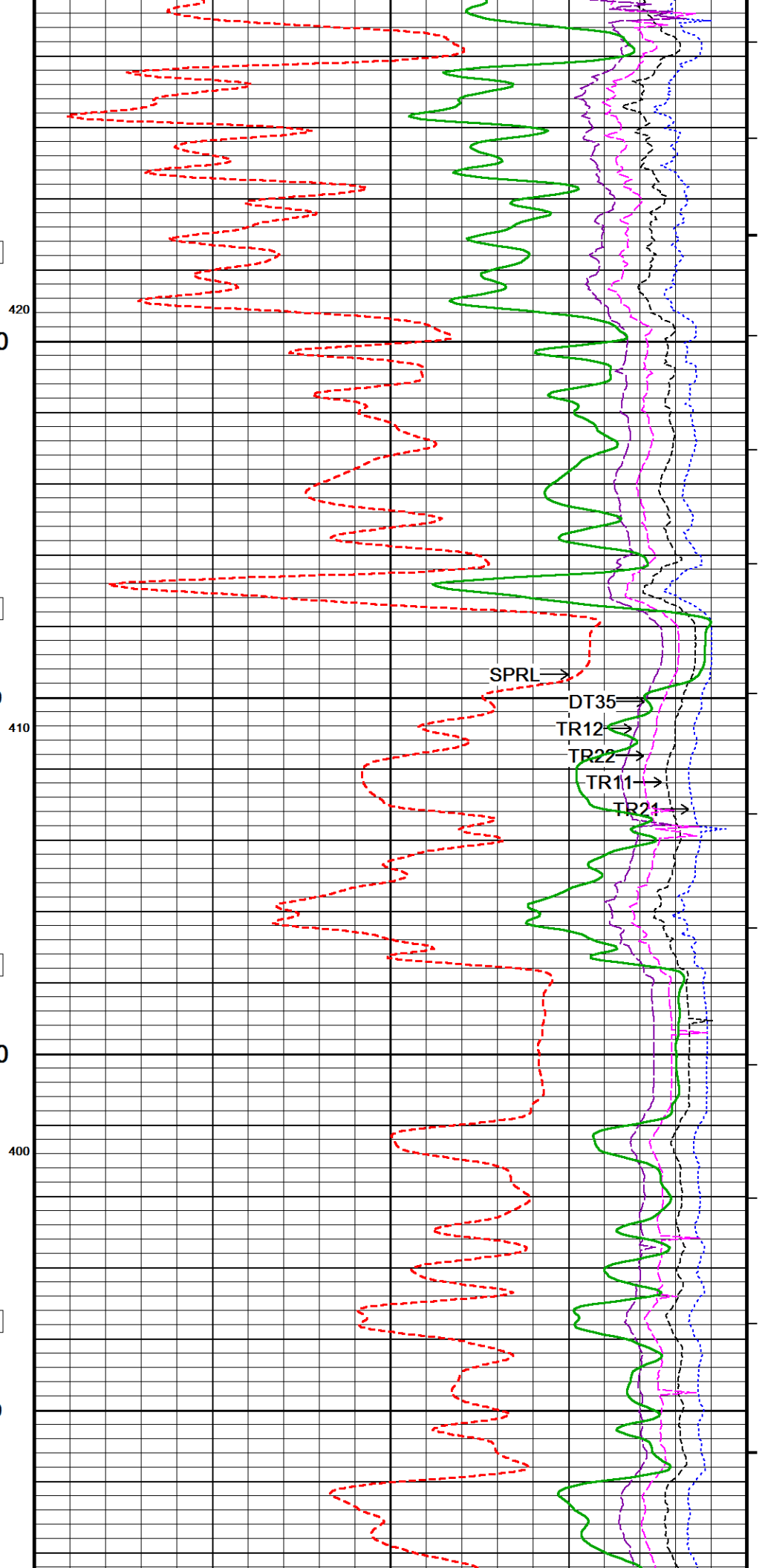
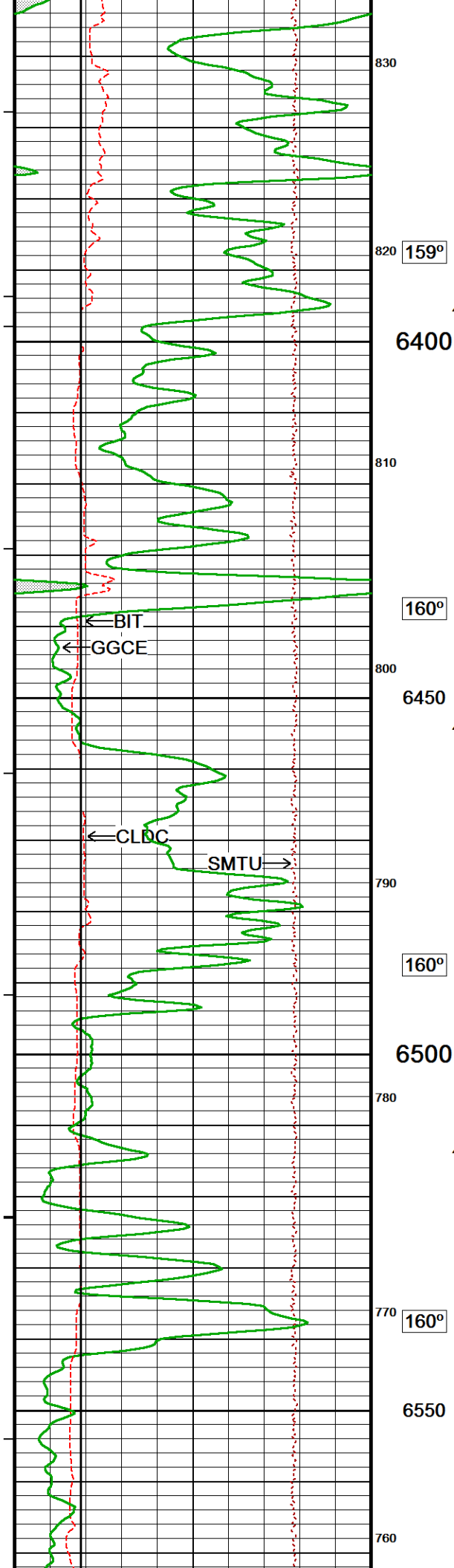
510
980
5950
970
960
6000
950
940
930
920

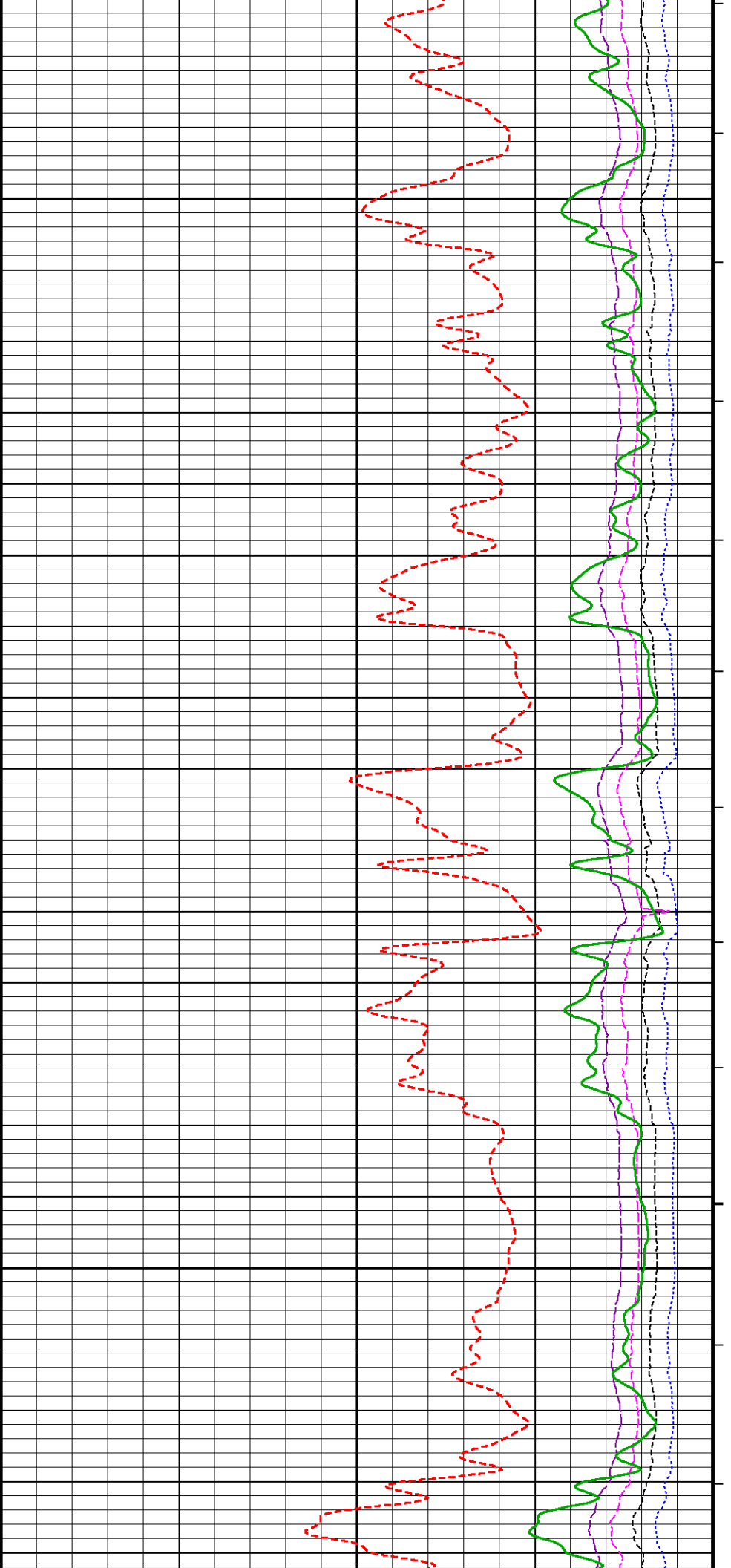
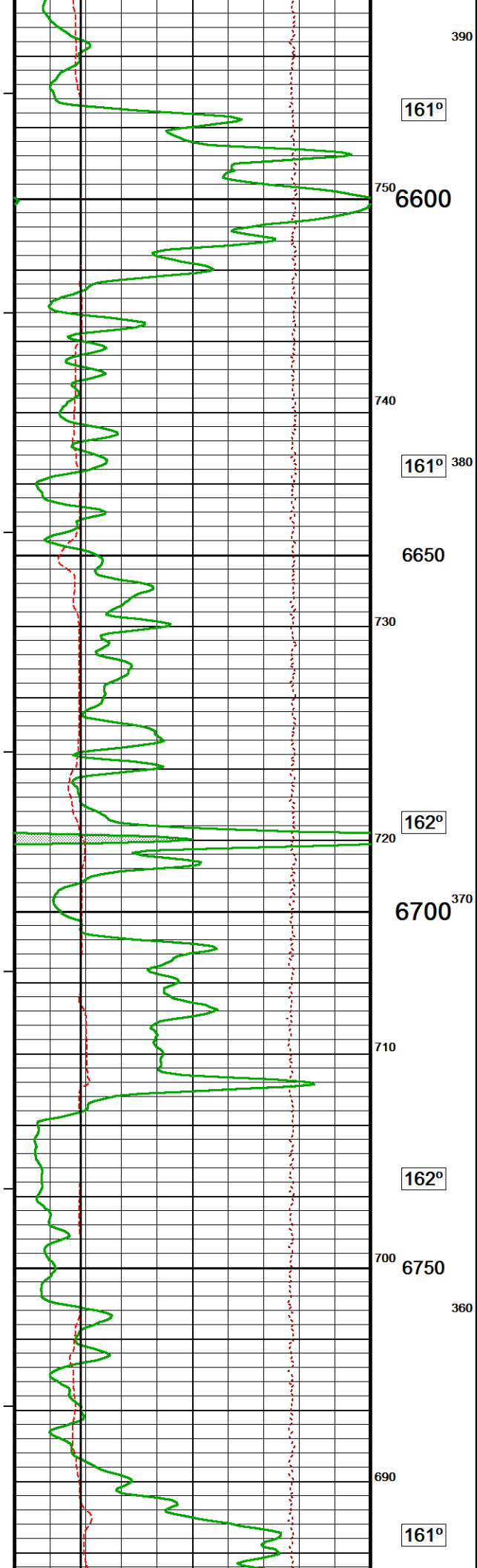
156°
156°
156°
157°

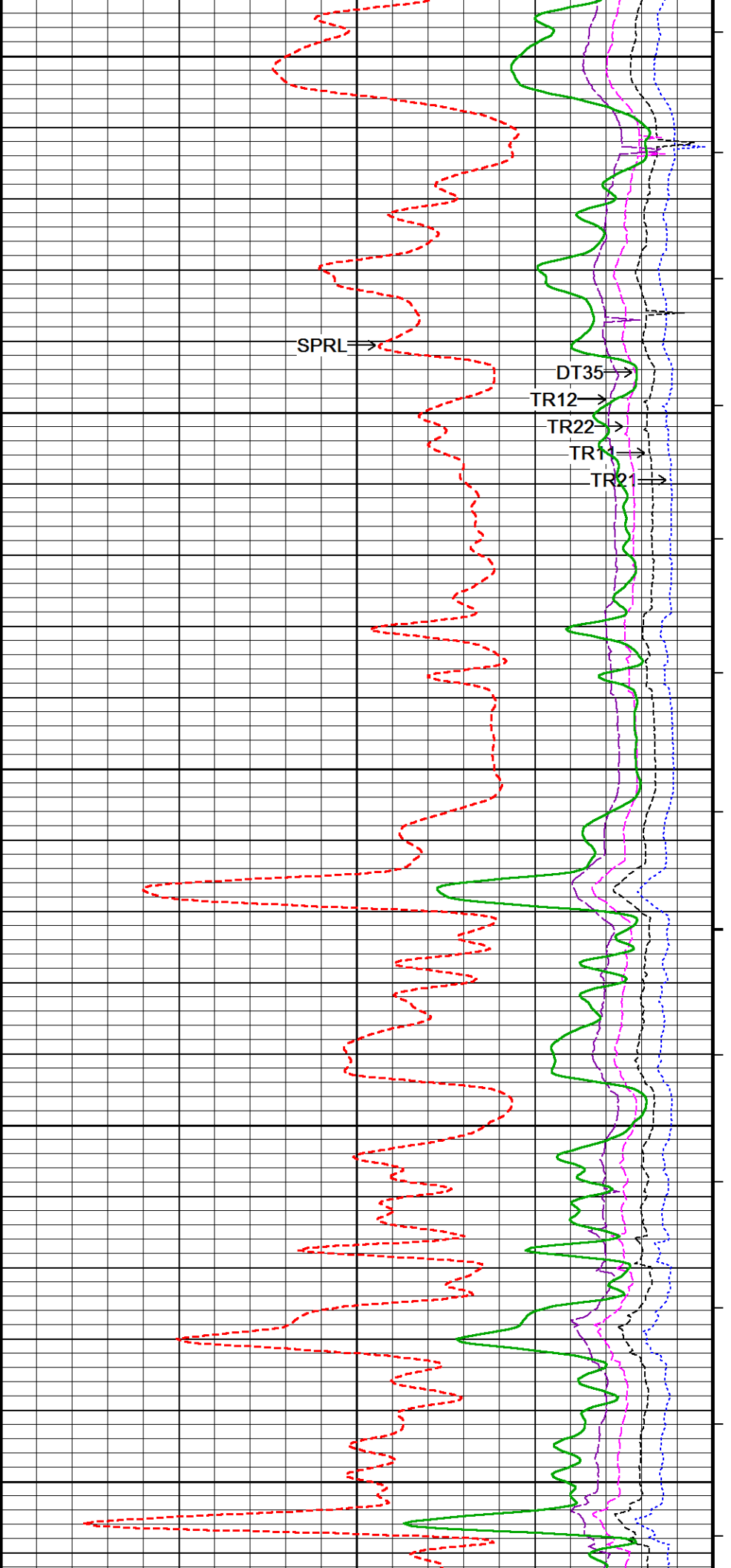
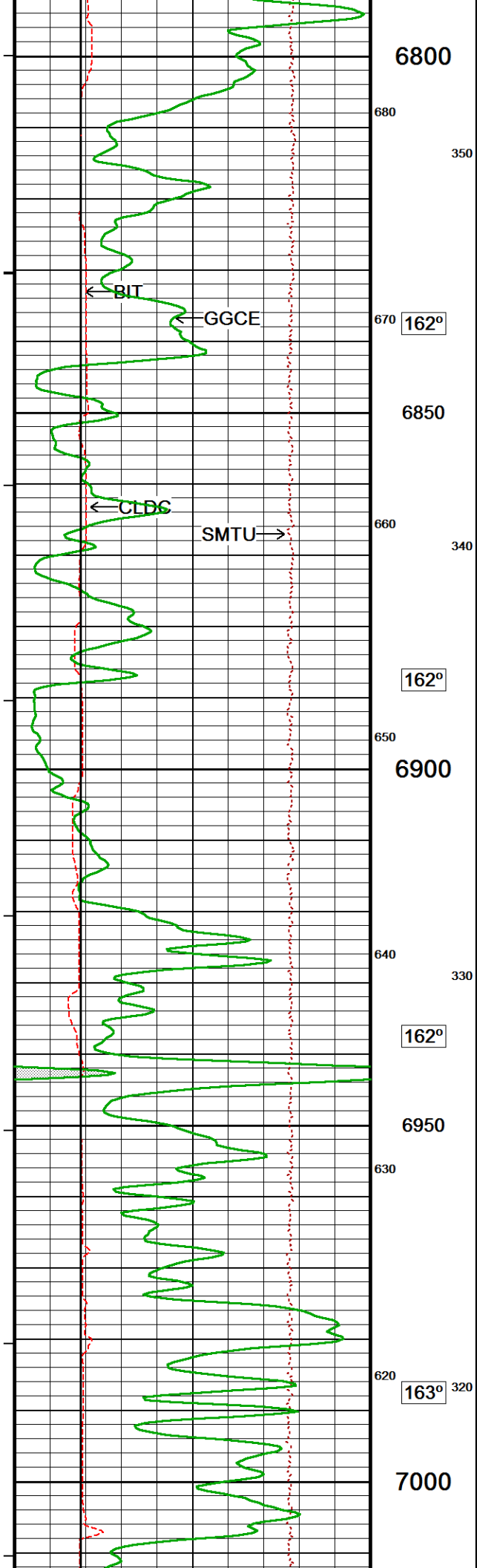
6050
6100

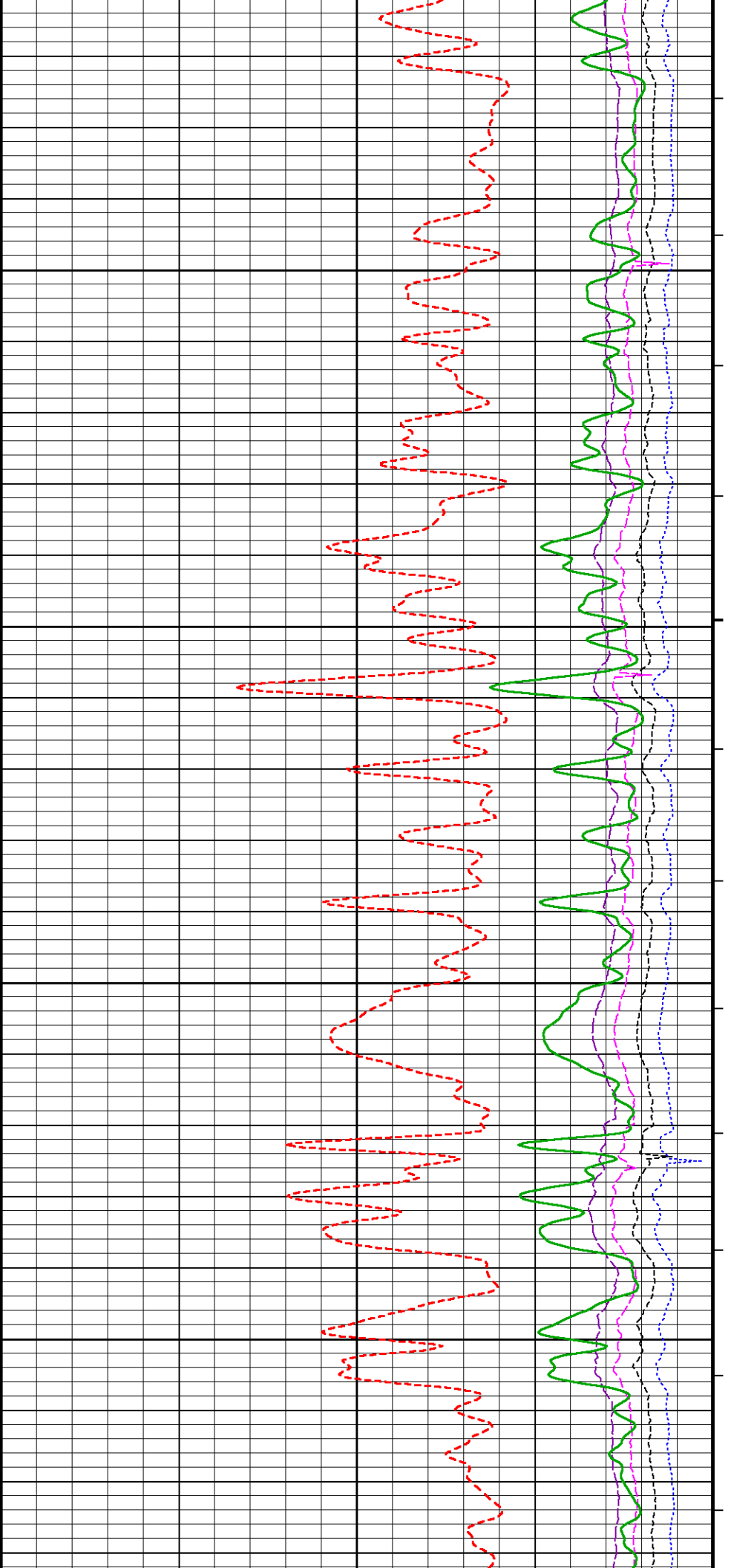
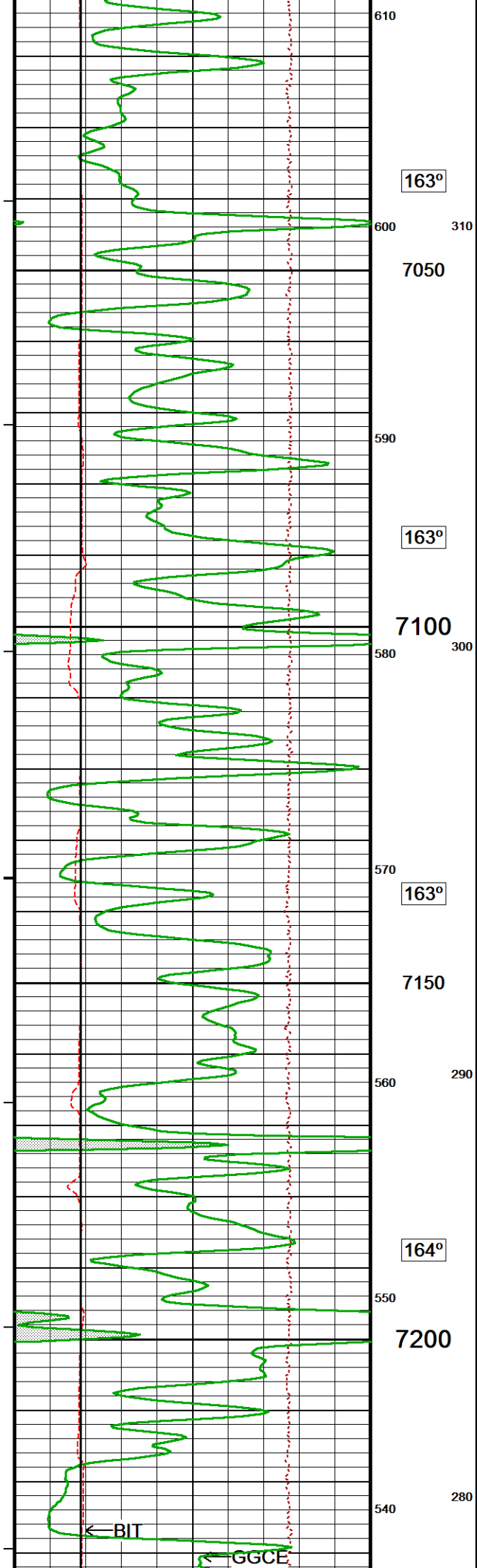


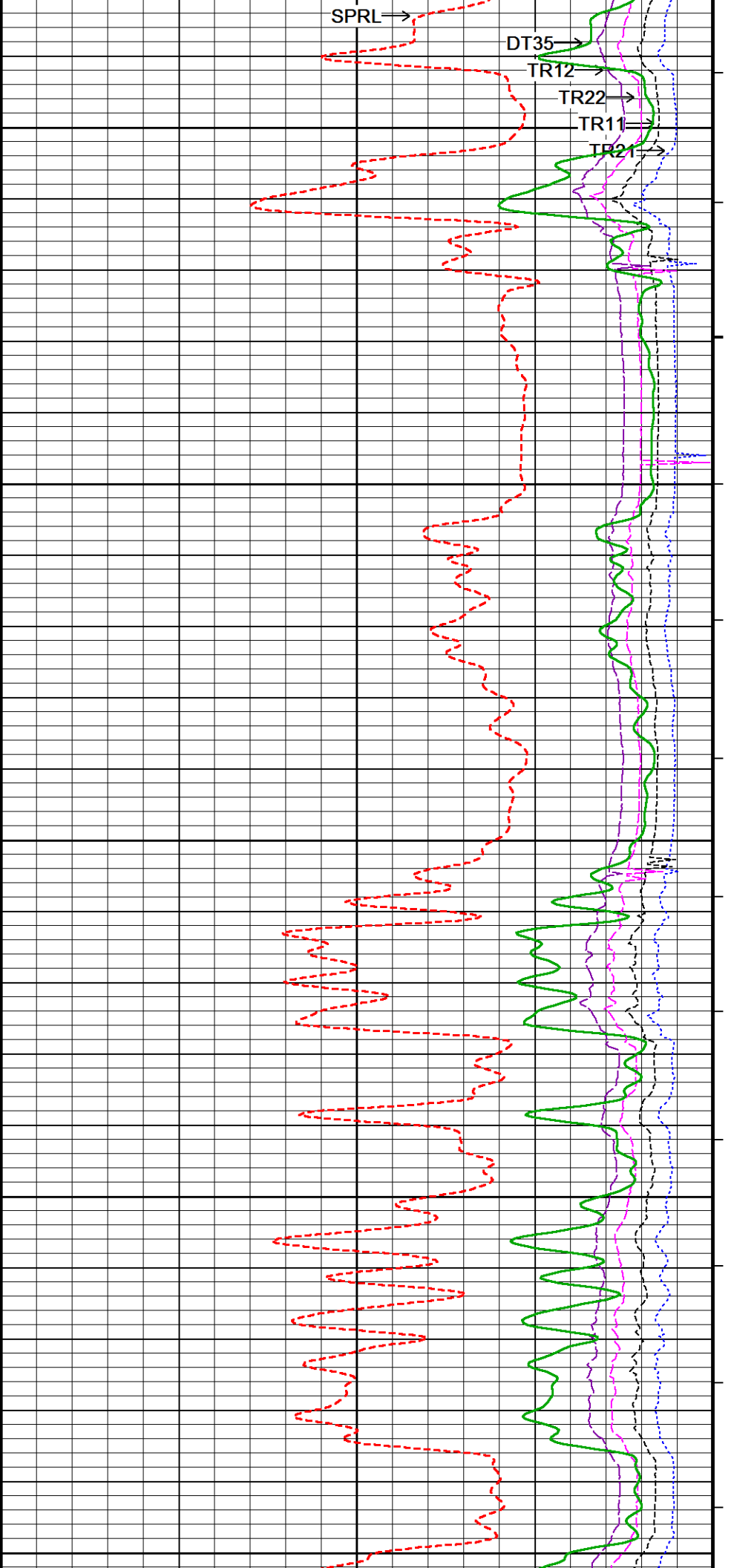
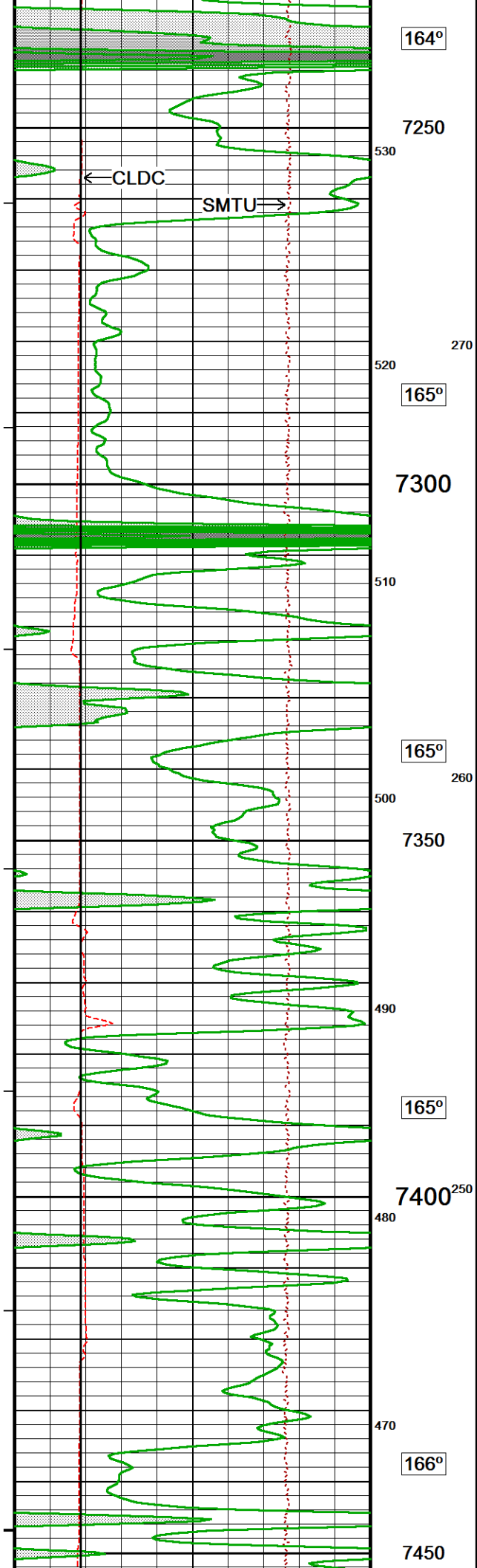


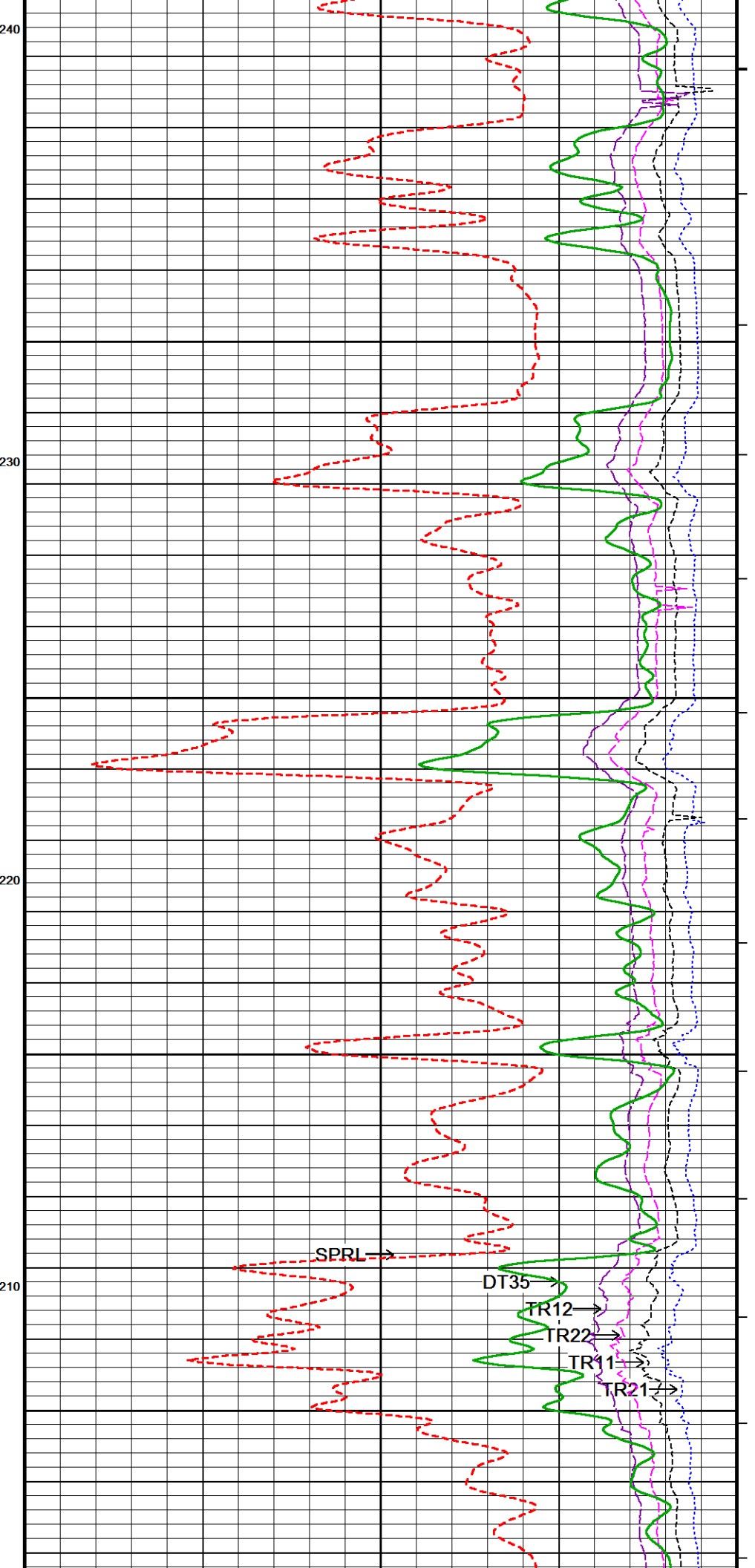
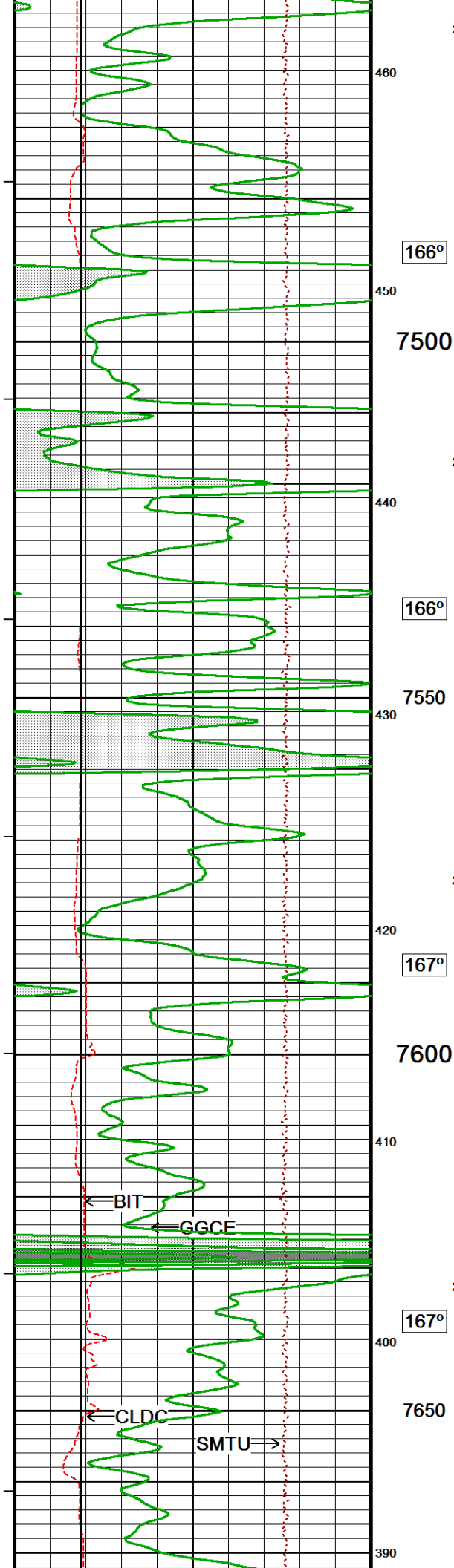


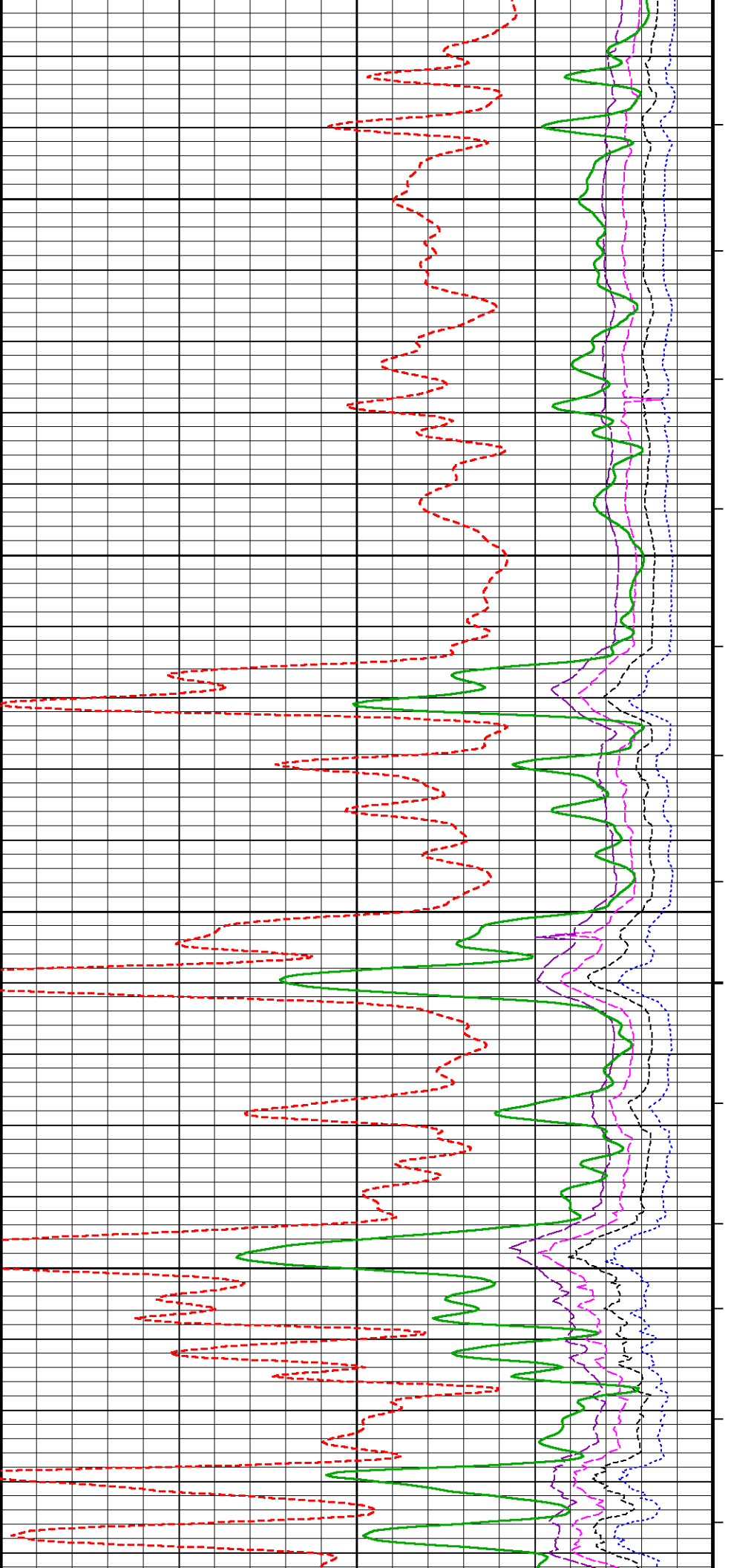
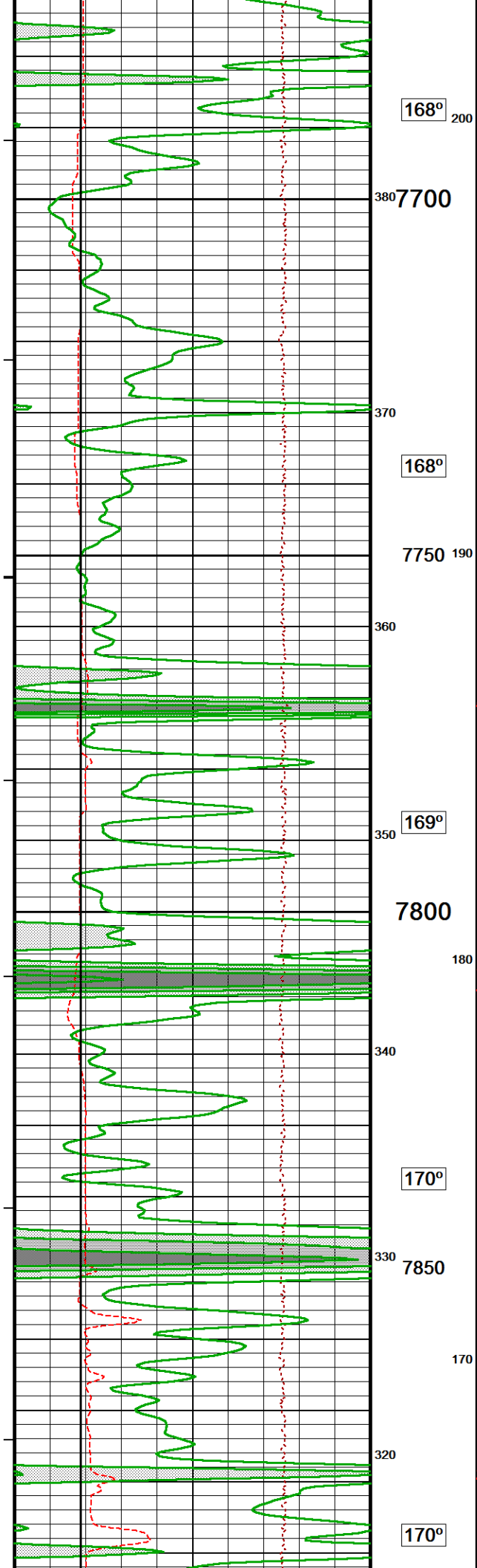


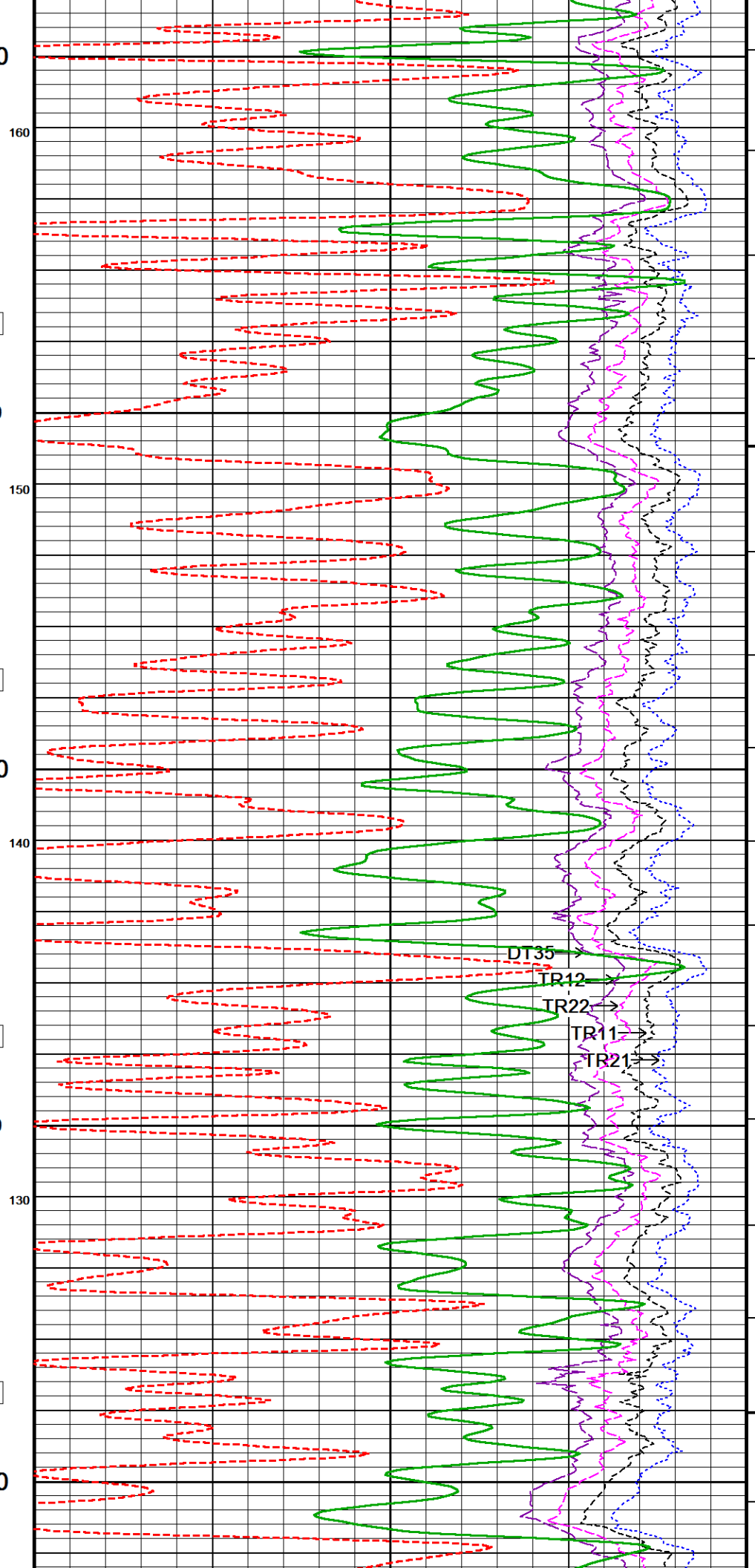
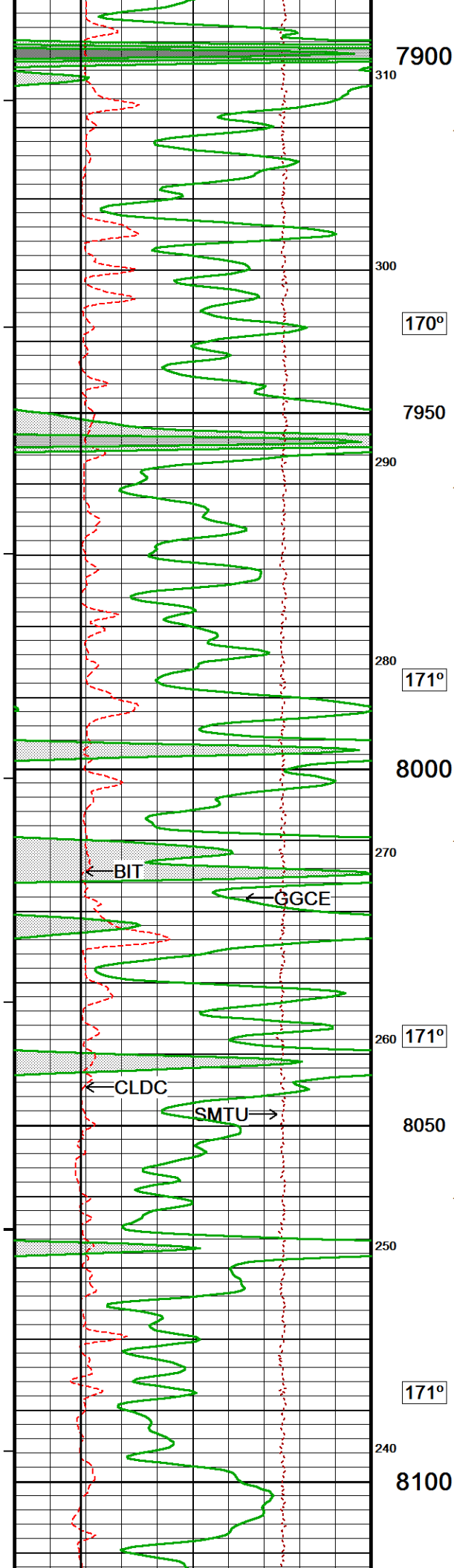


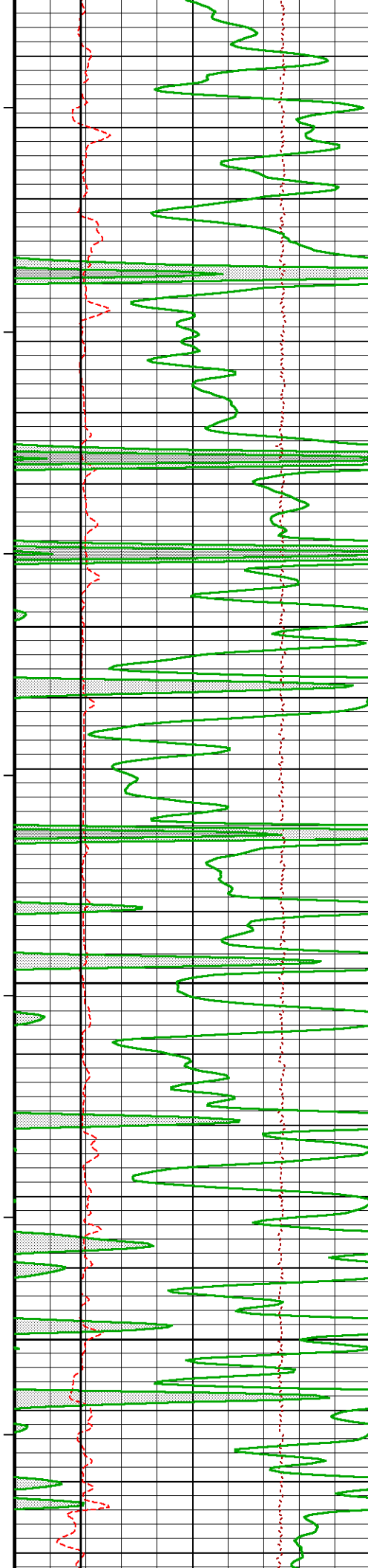




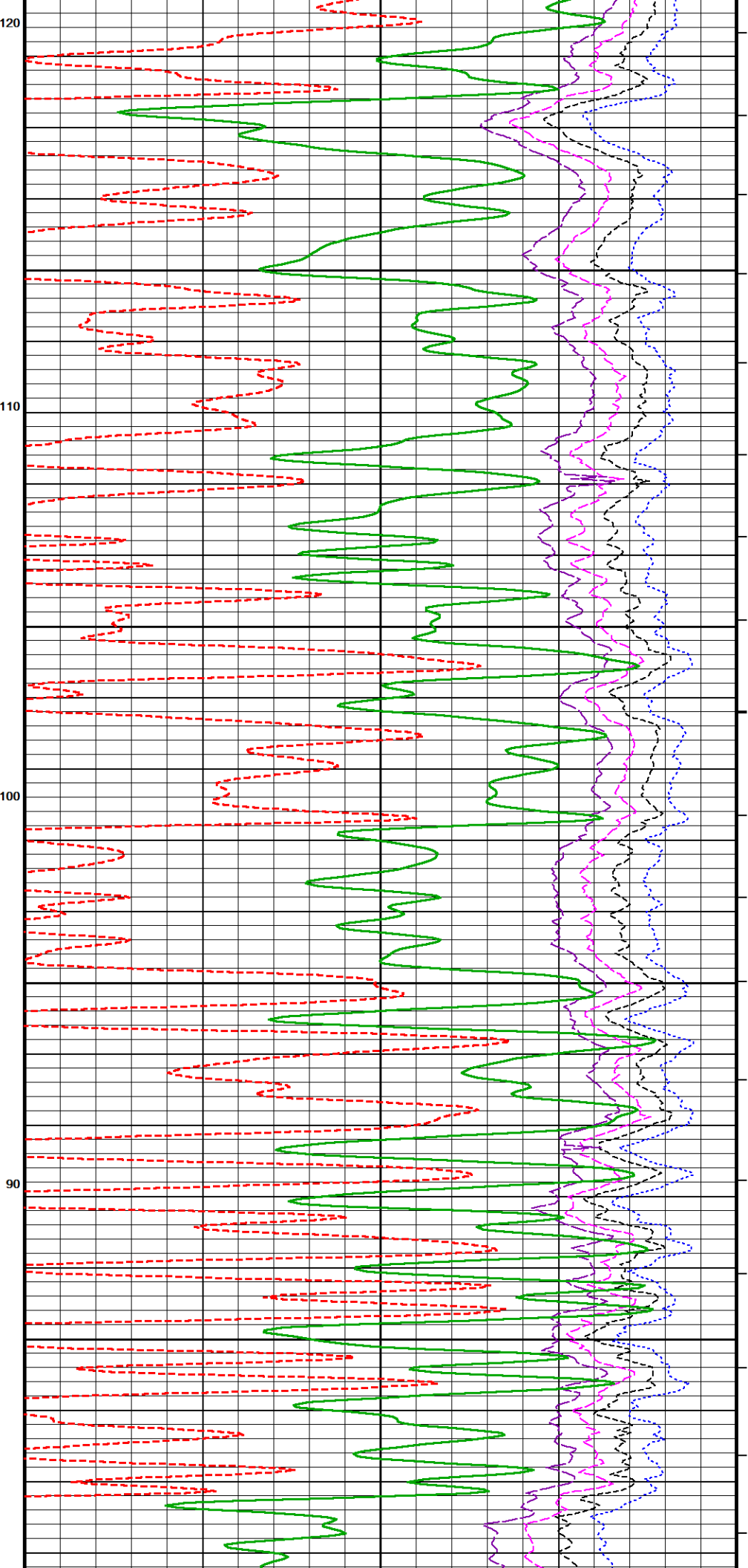


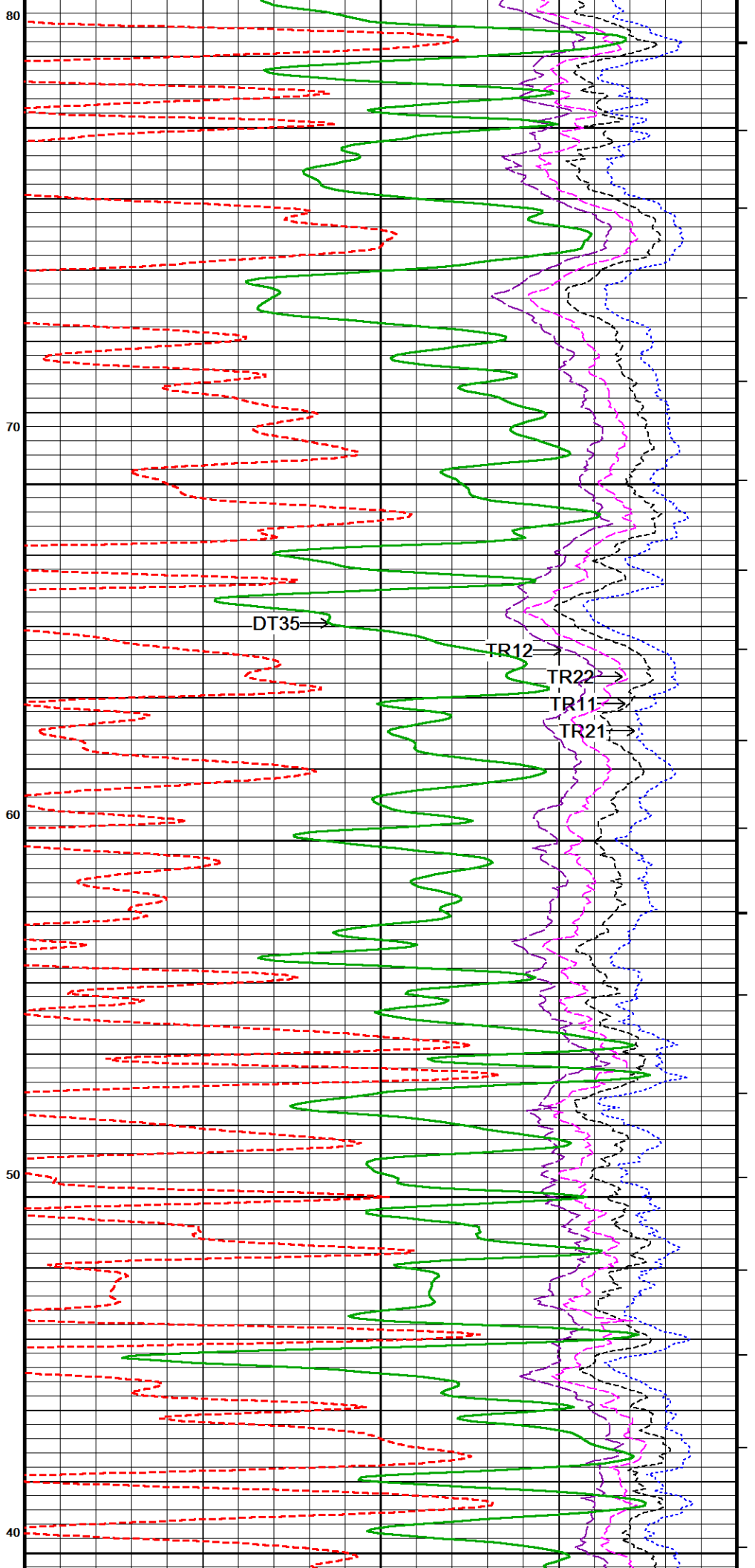
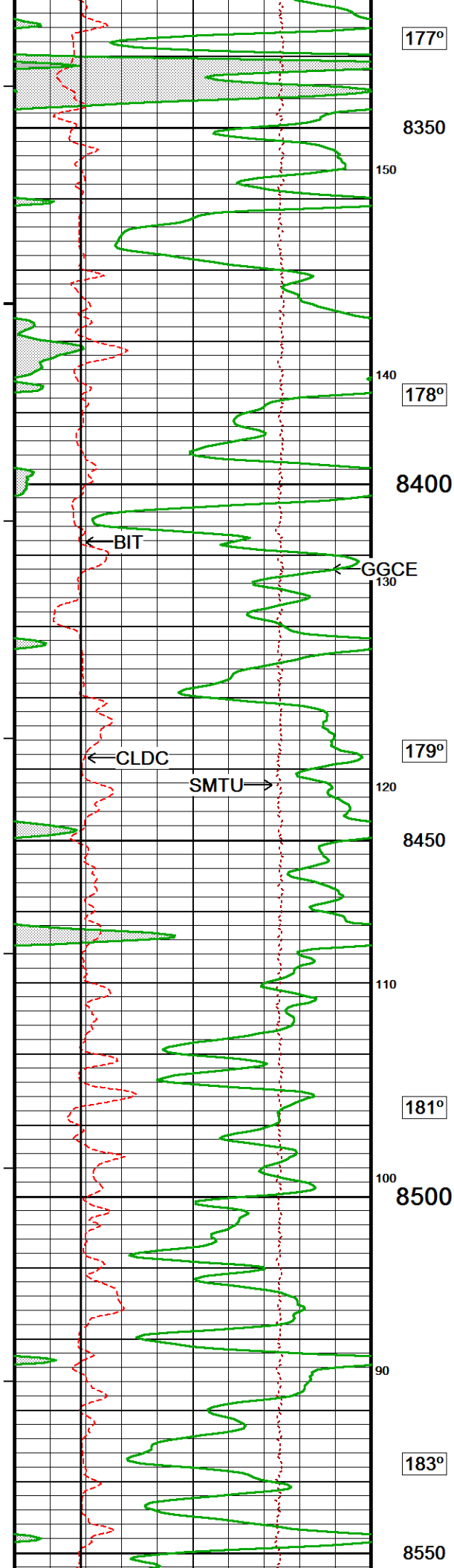


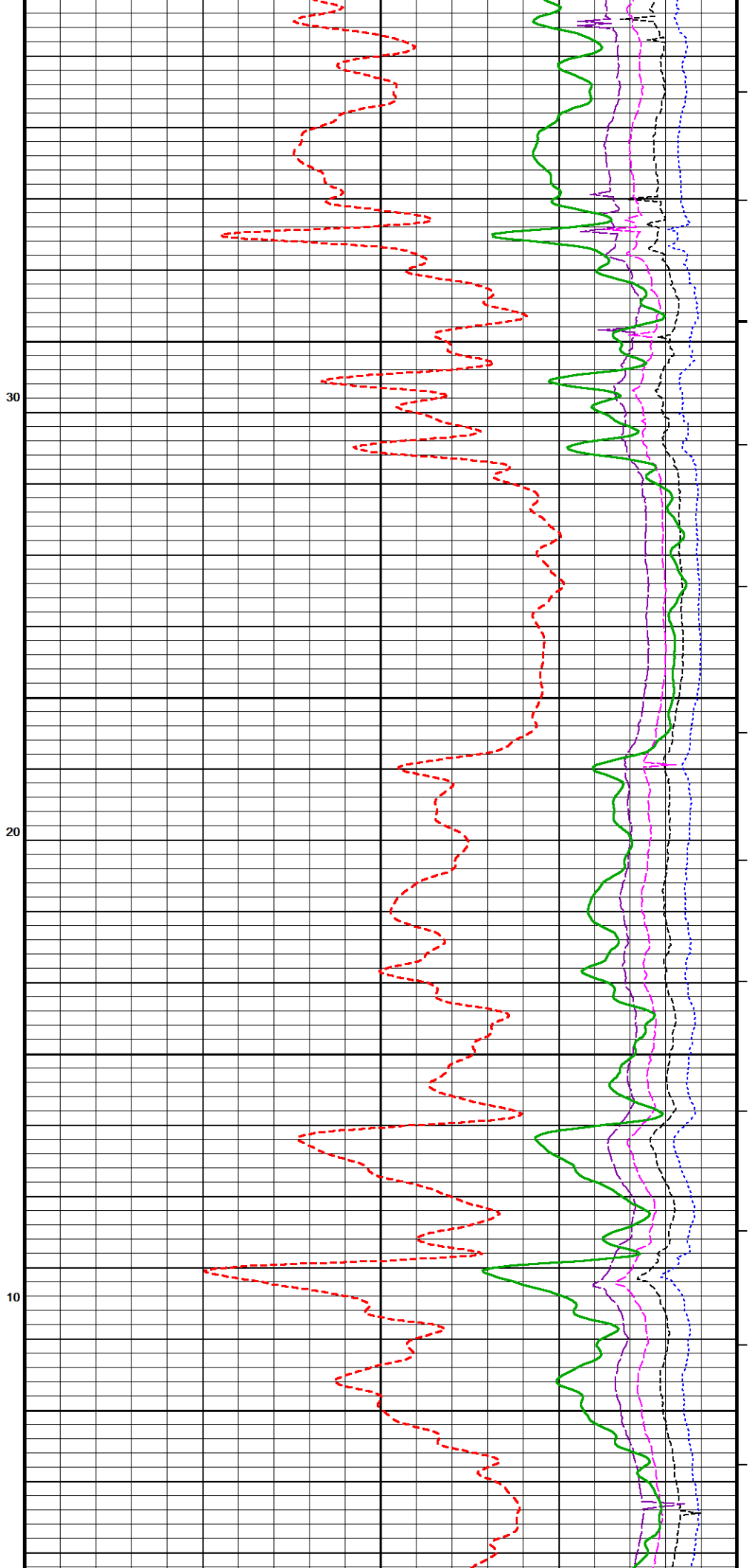
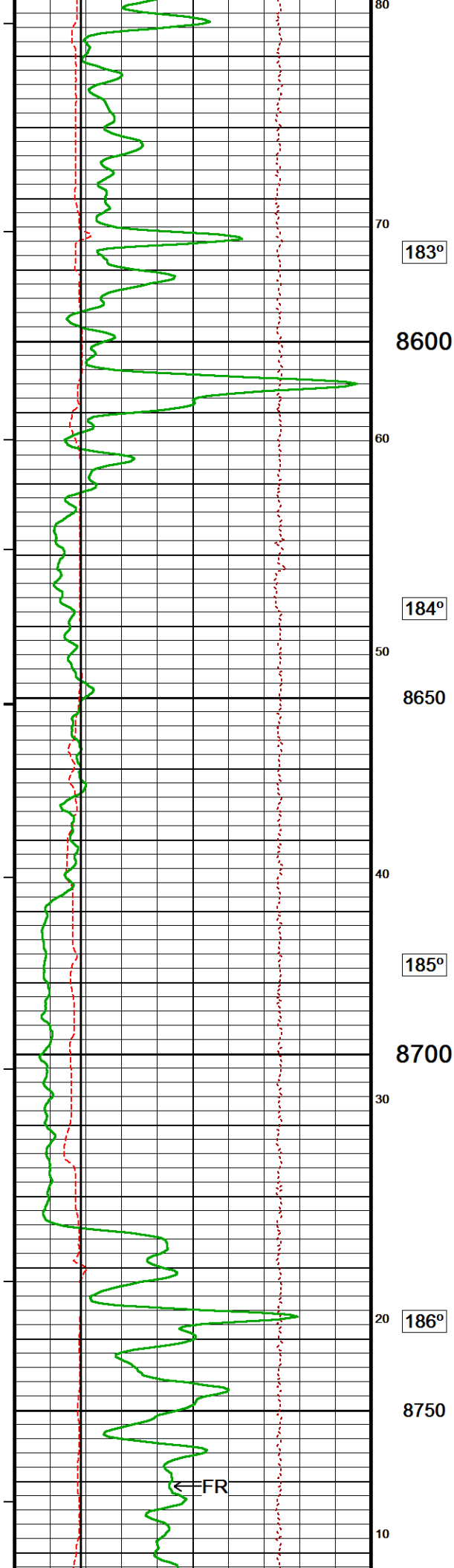


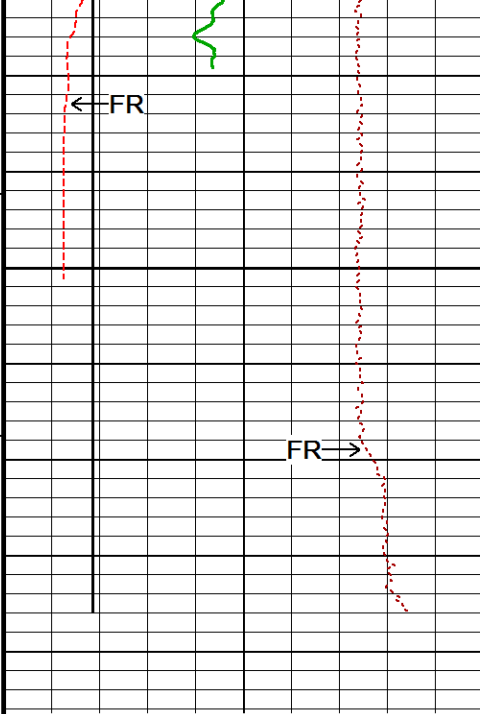


230
173°
8150
220
210
174°
8200
200
190
175°
8250
180
175°
8300
170
160



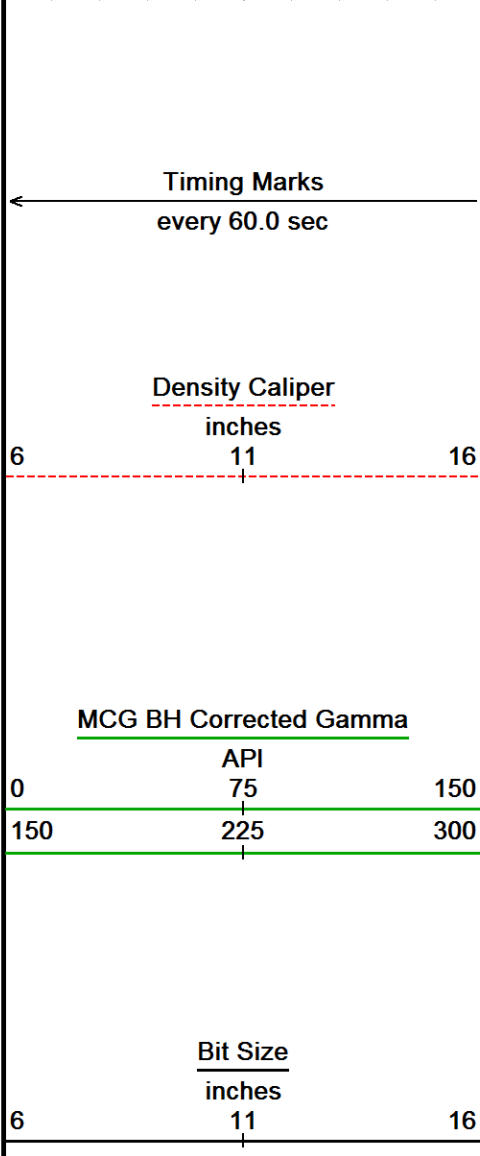
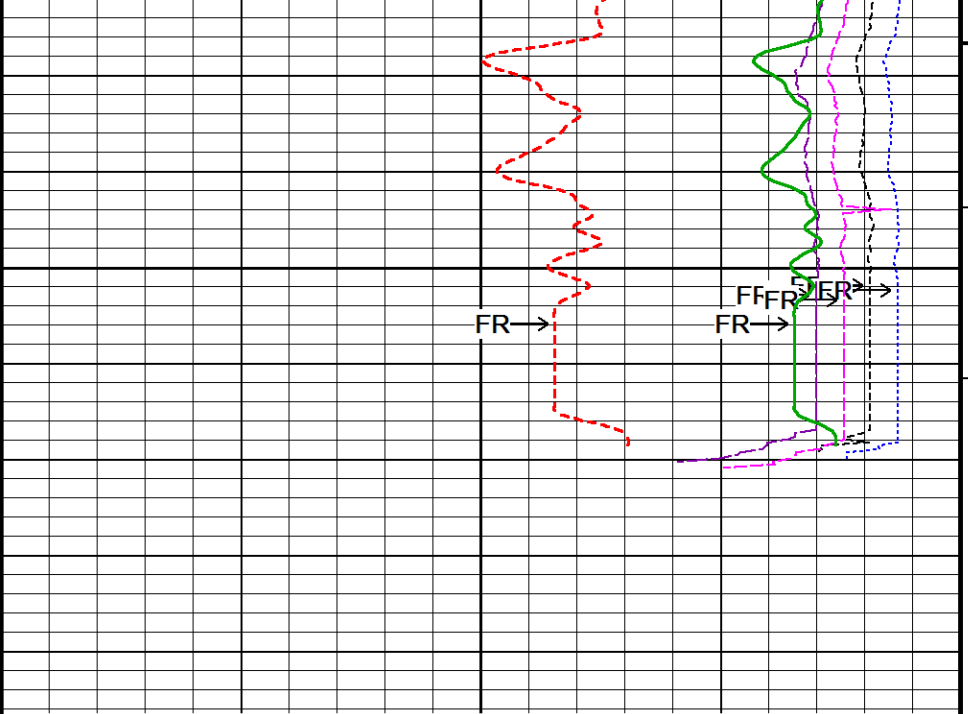






0 8800 0

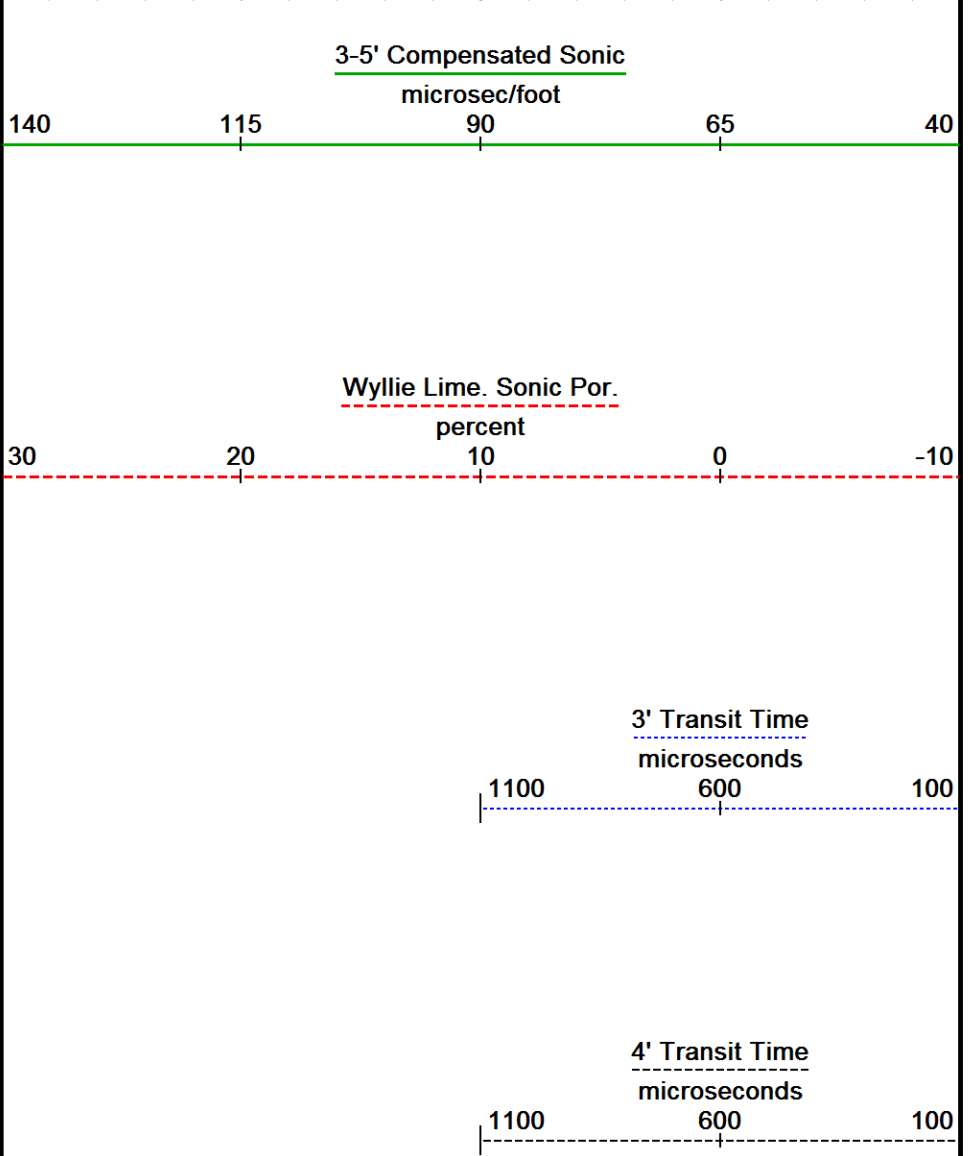
TD



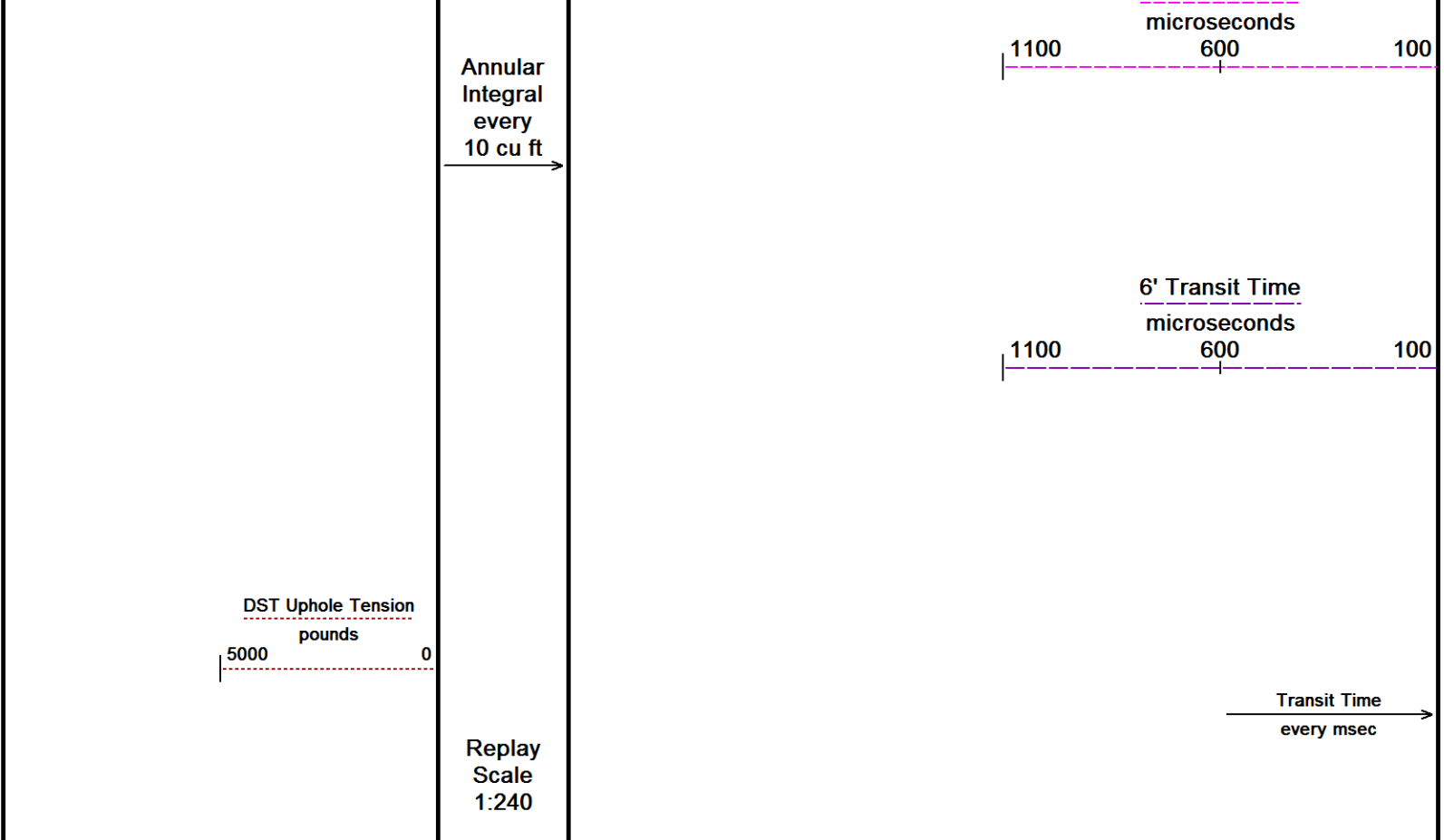
Depth In Feet

Borehole Temp in deg F

HVI every 10 cu ft



5' Transit Time

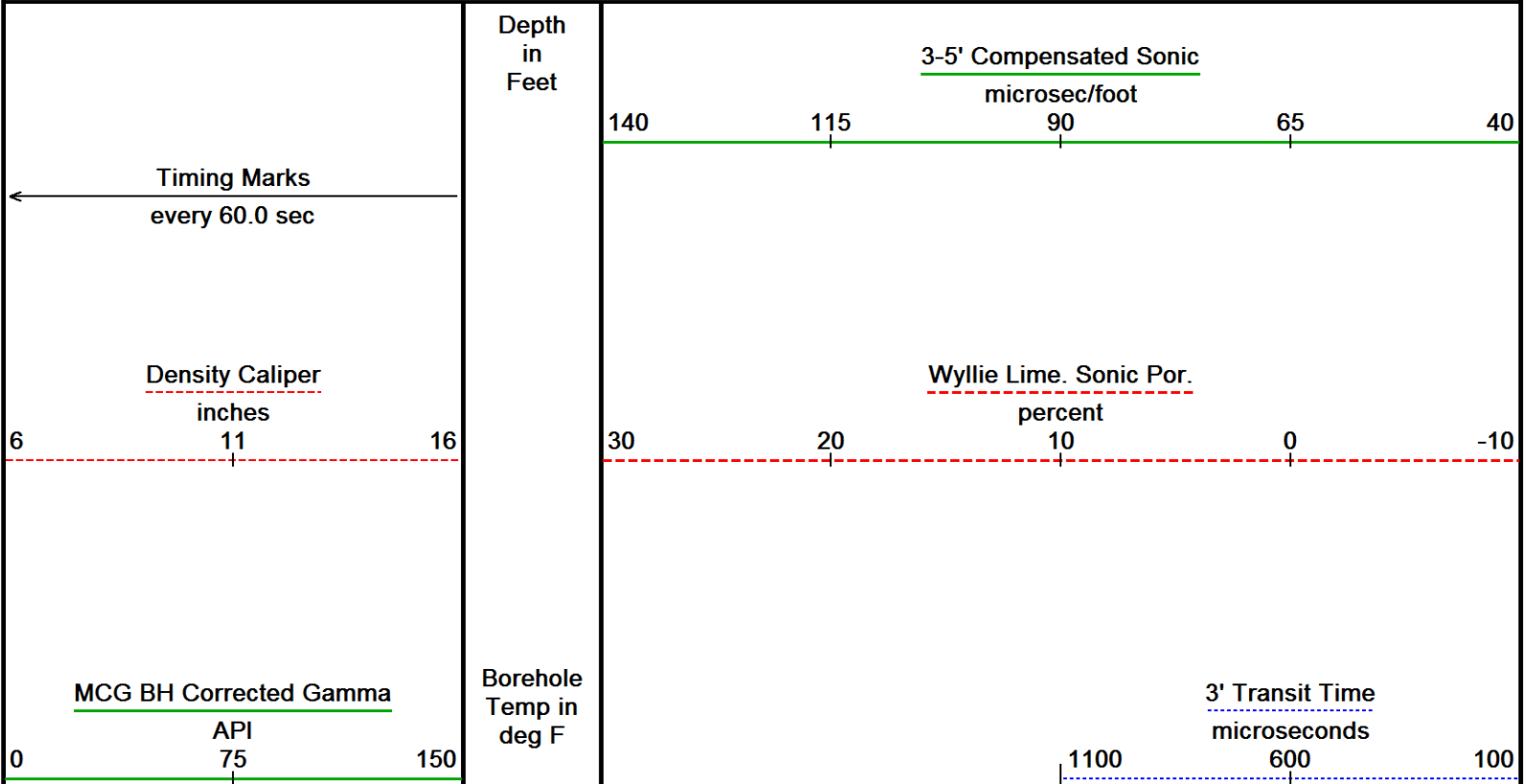


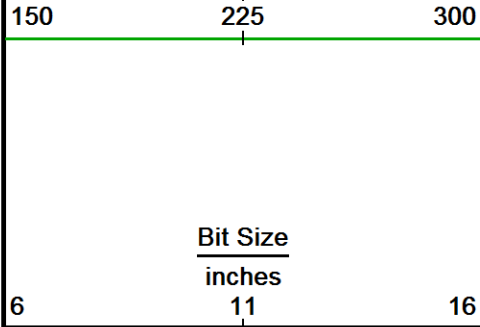
Depth Based Data - Maximum Sampling Increment 10.0cm	Plotted on 16-DEC-2017 19:39
Filename: C:\Minimus 17.05.5956\Data\MURFIN DRILLING (DAUNTLESS #15-1)\MAIN PASS.dta	Recorded on 16-DEC-2017 13:24
System Versions: Logged with 17.05.5956 Plotted with 17.05.5956	

↑	5 INCH MAIN PASS 1:240	↑
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↓	5 INCH REPEAT PASS 1:240	↓
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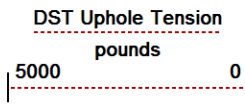
Depth Based Data - Maximum Sampling Increment 10.0cm	Plotted on 16-DEC-2017 19:39
Filename: C:\Minimus 17.05.5956\Data\MURFIN DRILLING (DAUNTLESS #15-1)\REPEAT PASS.dta	Recorded on 16-DEC-2017 12:47
System Versions: Logged with 17.05.5956 Plotted with 17.05.5956	





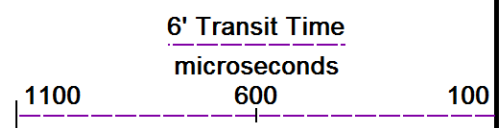
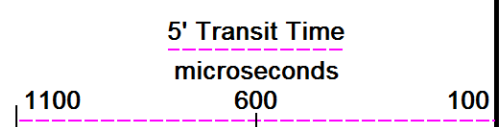
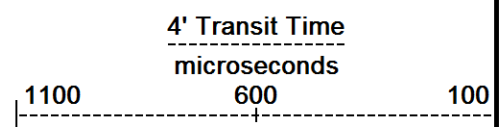
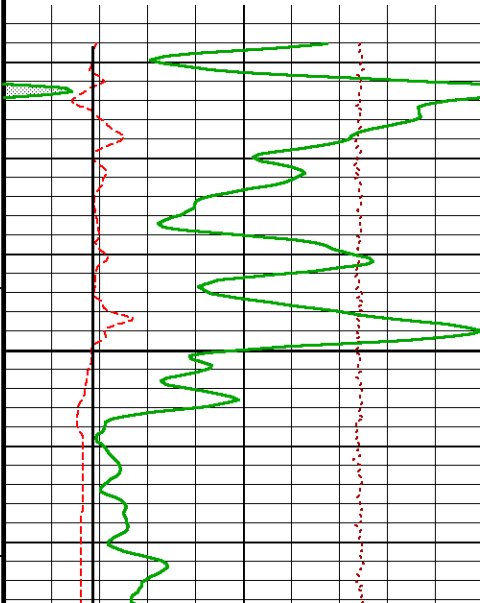
HVI
every
10 cu ft

Annular
Integral
every
10 cu ft

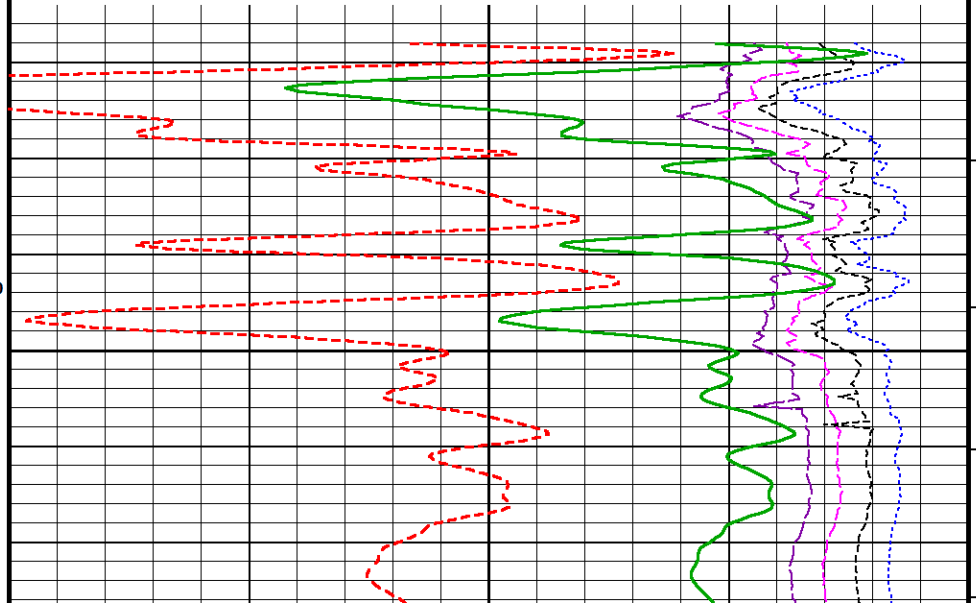


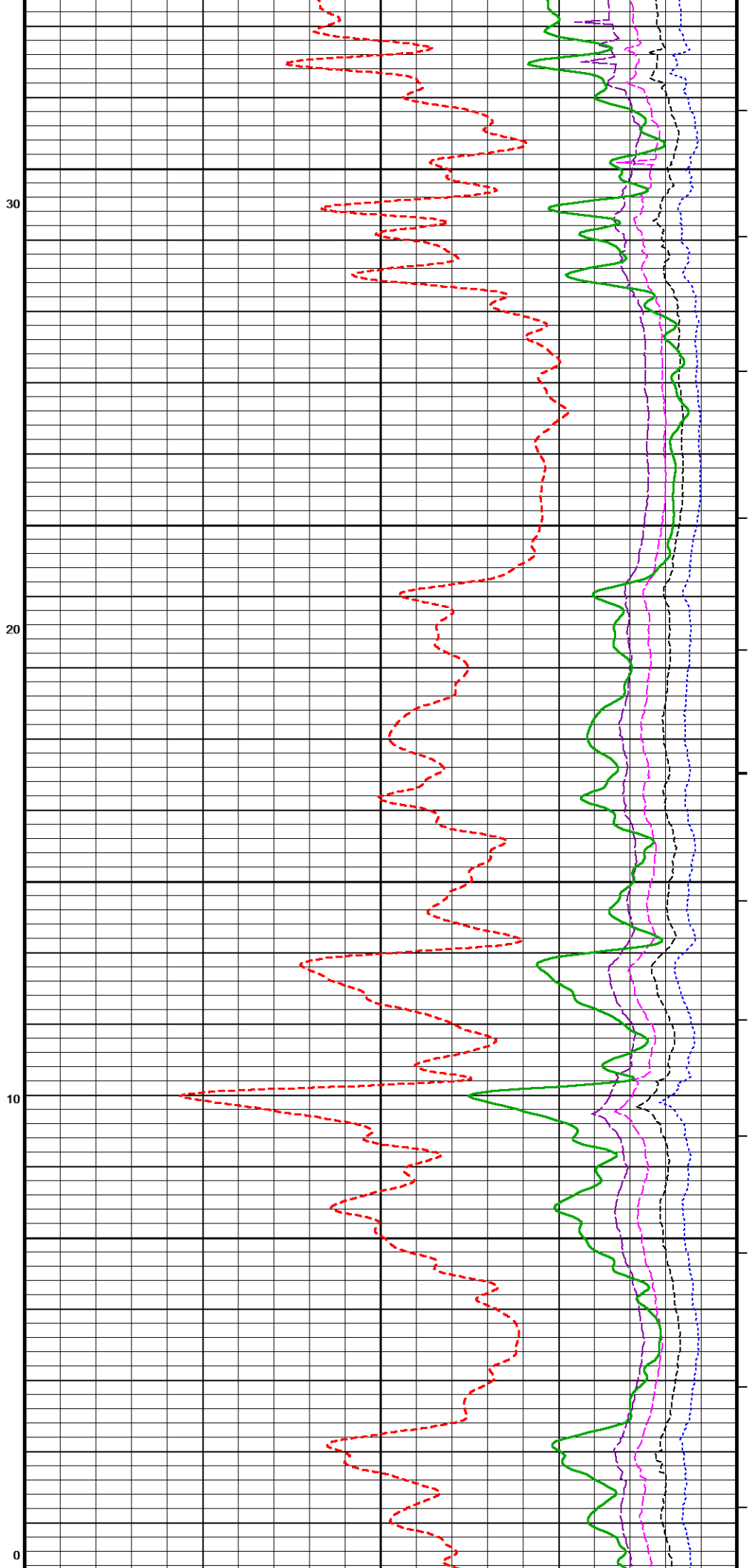
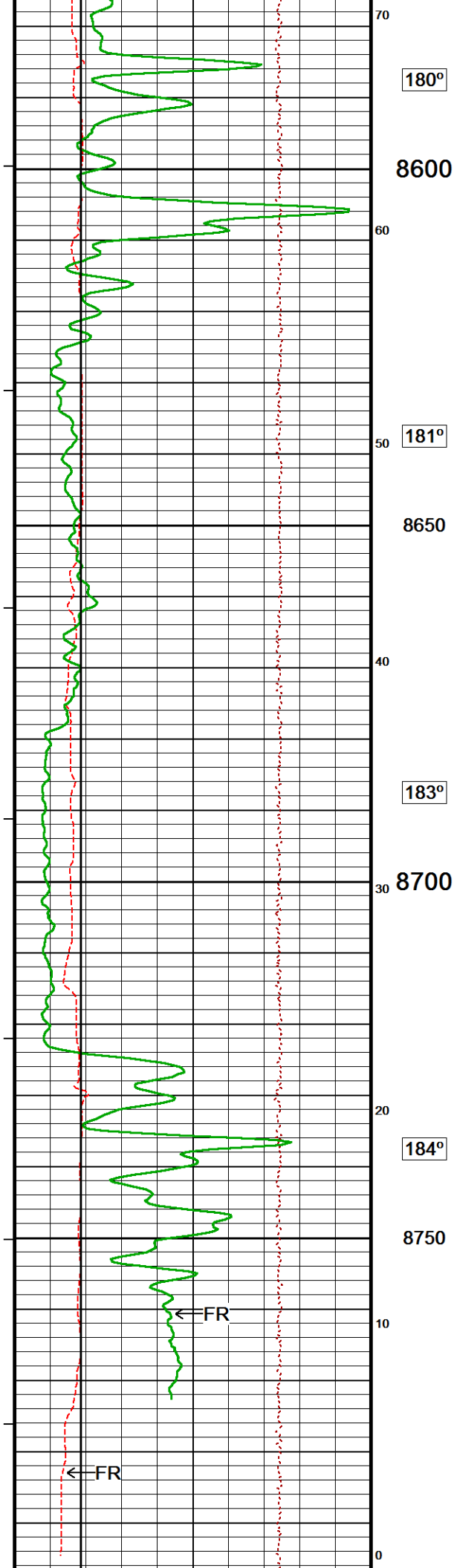
Replay
Scale
1:240

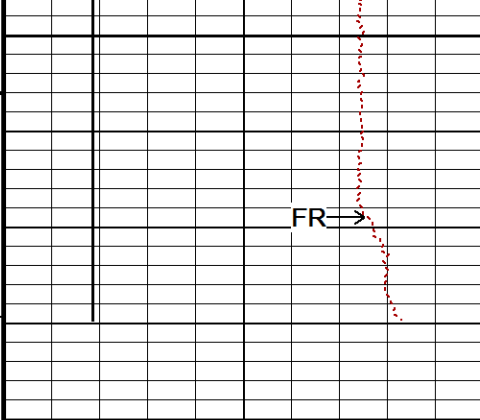
8516
90
40
80
8550



Transit Time
every msec

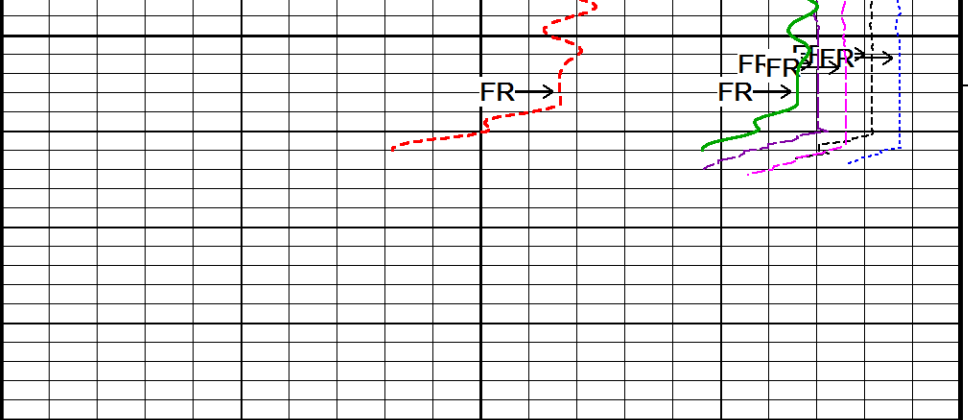






8800

TD



Depth
in
Feet

3-5' Compensated Sonic
microsec/foot

140 115 90 65 40

← Timing Marks
every 60.0 sec

Density Caliper
inches

6 11 16

Wyllie Lime. Sonic Por.
percent

30 20 10 0 -10

MCG BH Corrected Gamma

API

0 75 150

150 225 300

Borehole
Temp in
deg F

3' Transit Time
microseconds

1100 600 100

Bit Size
inches

6 11 16

HVI
every
10 cu ft

4' Transit Time
microseconds

1100 600 100

← Annular
Integral
every
10 cu ft →

5' Transit Time
microseconds

1100 600 100

DST Uphole Tension
pounds
5000 0

6' Transit Time
microseconds
1100 600 100

Transit Time
every msec

Replay
Scale
1:240

Depth Based Data - Maximum Sampling Increment 10.0cm Plotted on 16-DEC-2017 19:39
Filename: C:\Minimus 17.05.5956\Data\MURFIN DRILLING (DAUNTLESS #15-1)\REPEAT PASS.dta Recorded on 16-DEC-2017 12:47
System Versions: Logged with 17.05.5956 Plotted with 17.05.5956



5 INCH REPEAT PASS 1:240



BEFORE SURVEY CALIBRATION

C:\Minimus 17.05.5956\Data\MURFIN DRILLING (DAUNTLESS #15-1)\MAIN PASS.dta

General Constants All 000

Last Edited on 16-DEC-2017,11:58

General Parameters

Mud Resistivity	0.930	ohm-metres
Mud Resistivity Temperature	99.000	degrees F
Water Level	0.000	feet
Borehole Fluid Processing	Wet Hole	

Hole/Annular Volume and Differential Caliper Parameters

HVOL Method	Single Caliper	
HVOL Caliper 1	Density Caliper	
HVOL Caliper 2	N/A	
Annular Volume Diameter	5.500	inches
Caliper for Differential Caliper	Density Caliper	

Rwa Parameters

Porosity used	Crossplot Porosity
Resistivity used	Array Ind. One Res Rt
RWA Constant A	0.620
RWA Constant M	2.150
SW/APOR Tool Source	0.000

High Resolution Temperature Calibration MCG-D.K 475

Field Calibration on 15-DEC-2017,10:22

	Measured	Calibrated(Deg F)
Lower	50.00	50.00
Upper	200.00	200.00

High Resolution Temperature Constants MCG-D.K 475

Last Edited on 11-MAY-2016 11:23

Pre-filter Length 11

Gamma Calibration MCG-D.K 475

Field Calibration on 14-DEC-2017 14:26

	Measured	Calibrated (API)
Background	46	31
Calibrator (Gross)	1905	1292
Calibrator (Net)	1859	1261

Gamma Calibration Tolerances MCG-D.K 475

Ratio	1.474	<div><div>1.40</div><div>1.475</div><div>1.55</div></div>	Counts/API						
Gamma Constants MCG-D.K 475				Last Edited on 16-DEC-2017,09:19					
Gamma Calibrator Number	GRC.C 46								
GRC-M Calibrator Jig in Use?	NO								
Inactive Background Jig in Use?	NO								
Mud Density	1.12	gm/cc							
Caliper Source for Processing	Density Caliper								
Tool Position	Eccentred								
Potassium Equivalence	Chloride								
K Mud Concentration	0.00	%							
Sonic Constants MSS-C.A 147				Last Edited on 16-DEC-2017,09:19					
Maximum Boundary Contrast	70.00	micro-sec/ft							
Fluid Transit Time	189.00	micro-sec/ft							
Limestone Transit Time	47.50	micro-sec/ft							
Sandstone Transit Time	55.50	micro-sec/ft							
Dolomite Transit Time	43.50	micro-sec/ft							
Sonic used for Porosities	3-5' Compensated Sonic								
Correction for Sonde Skew	Applied								
Cycle Stretch Algorithm	Applied								
MN3FT	N/A	micro-sec							
MX3FT	N/A	micro-sec							
Hunt-Raymer Constant	83.13	micro-sec/ft							
Sonde Mode	Compensated								
Hole Type	Open Hole								
Sonde Parameters									
	Measured	Calibrated							
Offset	0.0000	0.0000							
Free Pipe	N/A	N/A							
Peak Amplitude Source	N/A								
Waveform	Start Time (micro-sec)	Width (micro-sec)	Pre Gain	Start Gain	Discriminator (mV)				
3'	N/A	N/A	N/A	N/A	N/A				
4'	N/A	N/A	N/A	N/A	N/A				
5'	N/A	N/A	N/A	N/A	N/A				
6'	N/A	N/A	N/A	N/A	N/A				
Processed Fixed Gate Parameters									
Waveform Used For Processing	N/A								
Start Time (micro-sec)	End Time (micro-sec)	Discriminator (mV)		N/A					
N/A	N/A	N/A							
N/A	N/A	N/A							
N/A	N/A	N/A							
N/A	N/A	N/A							
N/A	N/A	N/A							
Full Waveform Parameters									
Use 3' Waveform to derive TR	N/A								
Use 4' Waveform to derive TR	N/A								
Use 5' Waveform to derive TR	N/A								
Use 6' Waveform to derive TR	N/A								
3' Waveform Discriminator Level	N/A			mV					
4' Waveform Discriminator Level	N/A			mV					
5' Waveform Discriminator Level	N/A			mV					
6' Waveform Discriminator Level	N/A			mV					
Waveform Discriminator Filter	N/A								
Semblance Window Width	N/A			micro-sec					
Semblance Processing Enabled	N/A								
Tracking Boxes Enabled In Processing	N/A								

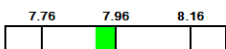
Reading No	Measured	Calibrator Size (in)
1	17603	4.00
2	26000	5.96
3	34637	7.96
4	43056	9.86
5	52138	11.88
6	N/A	N/A

Field Calibration

Measured Caliper (in)
7.91

Actual Caliper (in)
7.96

Caliper Calibration Tolerances MPD-B 120

Short Arm Field Cal. 7.91  in

DOWNHOLE EQUIPMENT

C:\Minimus 17.05.5956\Data\MURFIN DRILLING (DAUNTLESS #15-1)\MAIN PASS.dta

11B Tension Cablehead

MCB-A.A 2 LG: 2.40 ft WT: 19.8 lb OD: 2.244 in

Compact Swivel Head Adaptor

SHA-J.A 438 LG: 2.30 ft WT: 22.0 lb OD: 2.244 in

Compact Comms Gamma

MCG-D.K 475 LG: 8.70 ft WT: 63.9 lb OD: 2.244 in

Compact Micro-Resistivity

MMR-A 11 LG: 8.59 ft WT: 81.6 lb OD: 4.882 in

Compact Neutron

MDN-B.J 388 LG: 5.04 ft WT: 50.7 lb OD: 2.244 in

Compact Density/Caliper

MPD-B 120 LG: 9.59 ft WT: 90.4 lb OD: 2.449 in

Compact Knuckle Joint

SKJ-E.A 166 LG: 2.17 ft WT: 24.3 lb OD: 2.244 in

Compact Focussed Electric

MFE-B.A 261 LG: 6.05 ft WT: 48.5 lb OD: 2.244 in

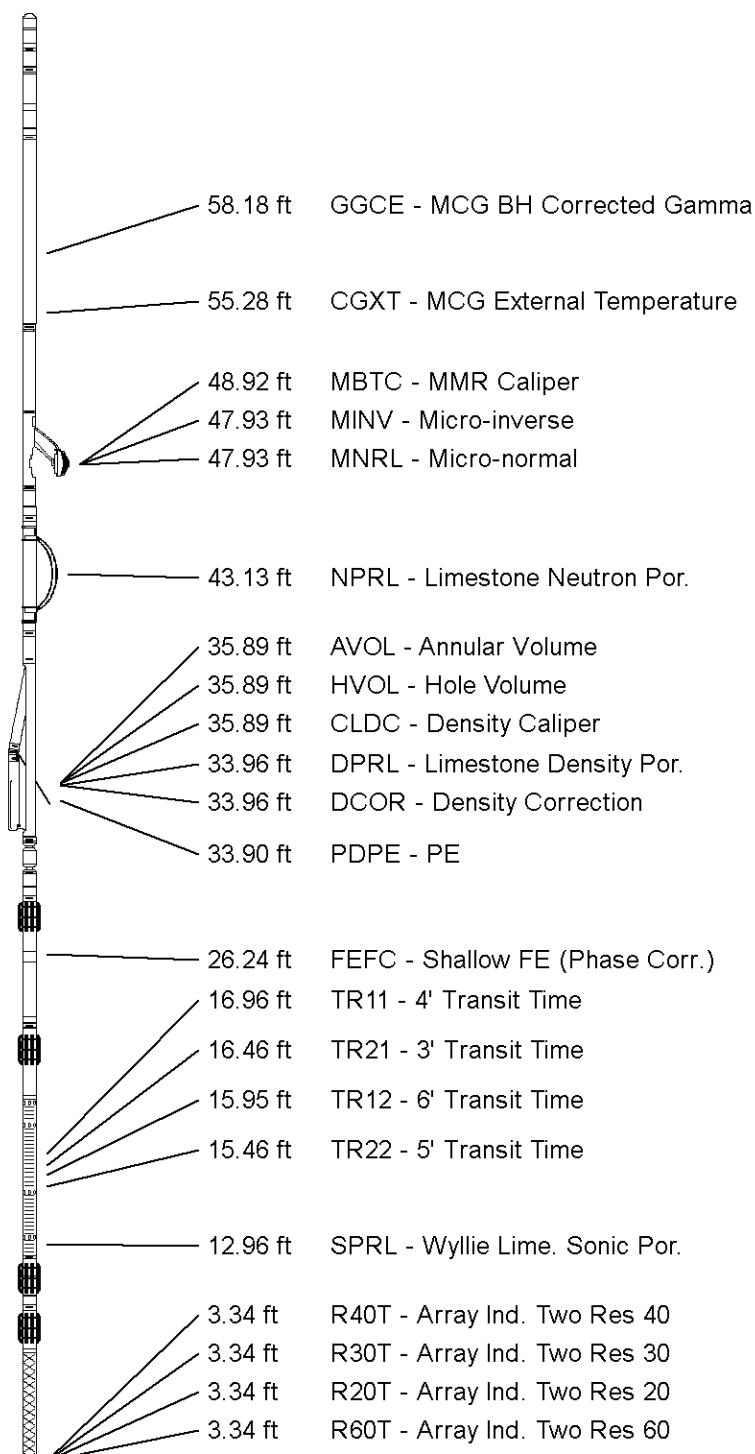
Compact Sonic

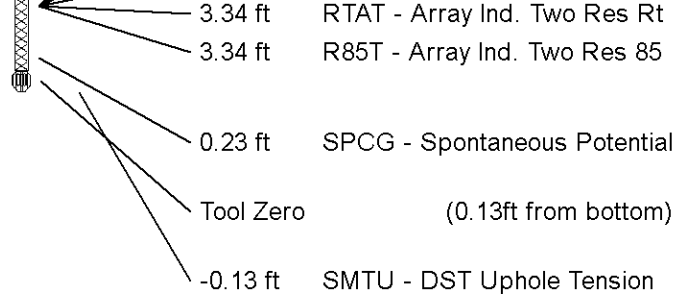
MSS-C.A 147 LG: 12.52 ft WT: 72.8 lb OD: 2.240 in

Compact Induction

MAI-B.J 426 LG: 10.81 ft WT: 48.5 lb OD: 2.244 in

Total Length: 68.16 ft Weight: 522.5 lb





All measurements relative to tool zero.

COMPANY	MURFIN DRILLING COMPANY, INC.
WELL	DAUNTLESS #15-1
FIELD	WILDCAT
PROVINCE/COUNTY	LINCOLN
COUNTRY/STATE	U.S.A. / COLORADO

Elevation Kelly Bushing	5554	feet	First Reading	8806.00	feet
Elevation Drill Floor	5552	feet	Depth Driller	8820.00	feet
Elevation Ground Level	5541	feet	Depth Logger	8819.00	feet



BOREHOLE COMPENSATED
SONIC LOG

Weatherford®