Schlumberger

Company: **Lamont Doherty Earth Observatory**

Well: **Expedition 351, Site U1438E**
Field: **IBM Arc Origins**
Rig: **JOIDES Resolution** Ocean: **Pacific**

Rig: JOIDES Resolution
Field: IBM Arc Origins
Location: Latitude: N 27.383588*
Well: Expedition 351, Site U1438E
Company: Lamont Doherty Earth Observatory

Hostile Natural Gamma Sonde (HNGS)
Caliper
Spectroscopy

LOCATION

Latitude: N 27.383588*
Longitude: E 134.318163*

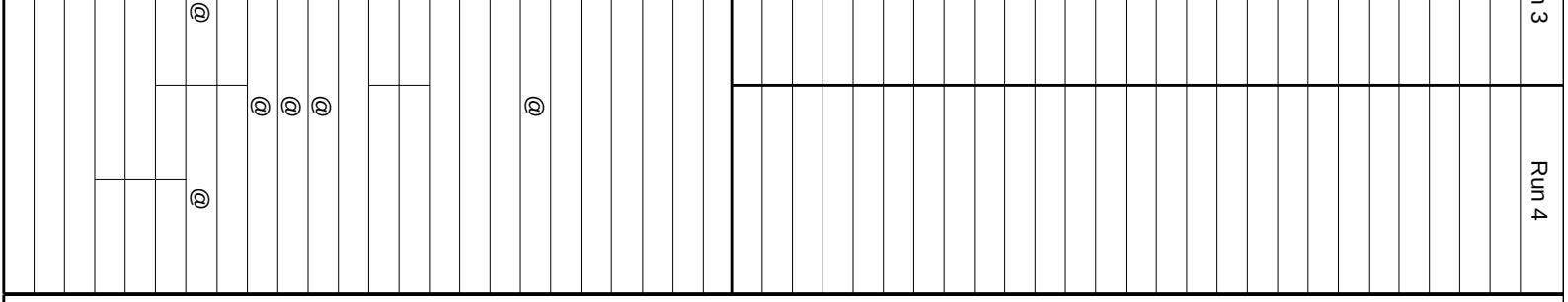
Elev.: K.B. −4711.00 m
G.L. 0.00 m
D.F. −4711.00 m

Permanent Datum: Sea Floor — Elev.: 0.00 m
Log Measured From: Sea Floor — 0.00 m above Perm. Datum
Drilling Measured From: Sea Floor

API Serial No.	N 27.383588	E 134.318163	

	Run 1	Run 2	Run
Logging Date	21−Jul−2014		
Run Number	1		
Depth Driller	1611 m		
Schlumberger Depth	1187 m		
Bottom Log Interval	1187 m		
Top Log Interval	0 m		
Casing Driller Size @ Depth	5.500 in @ 190 m	@	
Casing Schlumberger	187 m		
Bit Size	9.875 in		
Type Fluid In Hole	Seawater		
MUD Density / Viscosity	1.03 g/cm3		
MUD Fluid Loss / PH			
MUD Source Of Sample	N/A		
RM @ Measured Temperature	@	@	
RMF @ Measured Temperature	@	@	
RMC @ Measured Temperature	@	@	
Source RMF / RMC	N/A / N/A		
RM @ MRT / RMF @ MRT	@ 30 / @ 30	@ / @	
Maximum Recorded Temperatures	30 degC		
Circulation Stopped / Time	21−Jul−2014 / 14:00		
Logger On Bottom / Time	21−Jul−2014 / 22:28		
Unit Number / Location	627314 / Houston		
Recorded By	K. Swain		
Witnessed By	L. Drab		

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



DISCLAIMER

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OTHER SERVICES1	OTHER SERVICES2
OS1: HRLA	OS1:
OS2: GBM	OS2:
OS3: MSS	OS3:
OS4:	OS4:
OS5:	OS5:

REMARKS: RUN NUMBER 1	REMARKS: RUN NUMBER 2
Hole drilled with RCB coring bit and bottom hole assembly (BHA). 9 7/8 " BS	
Drill pipe set at 190mbsf and coring BHA to facilitate wireline logging.	
Lower part of toolstring (MSS and HRLA) centralized using modified MCD inline centralizers.	
Upper part of toolstring (HLDS, HNGS) eccentered using HLDS caliper, as per toolsketch.	
Fluid type was sea water, as used to drill, so no barite corrections were required.	
All logs presented in measured depth below sea floor (MDBSF).	
Maximum observed temperature on the HRLA temperature was 30degC.	
Original log data acquired with drill floor as the reference but later	
played back to sea floor depth as the primary depth reference.	

RUN 1			RUN 2		
SERVICE ORDER #:			SERVICE ORDER #:		
PROGRAM VERSION:		19C0−187	PROGRAM VERSION:		
FLUID LEVEL:			FLUID LEVEL:		
LOGGED INTERVAL	START	STOP	LOGGED INTERVAL	START	STOP

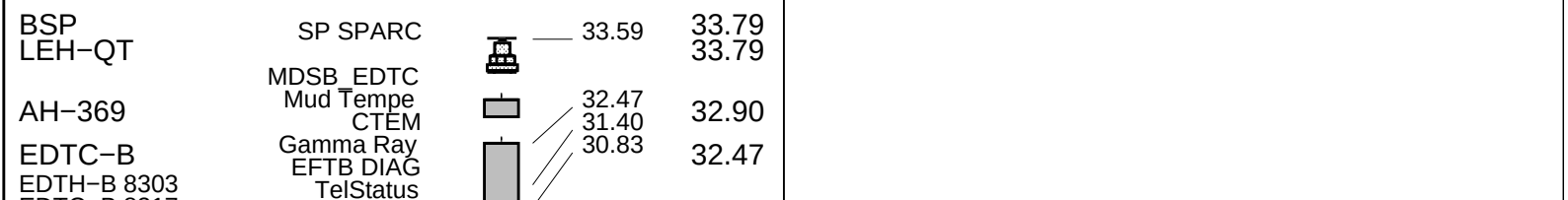
EQUIPMENT DESCRIPTION

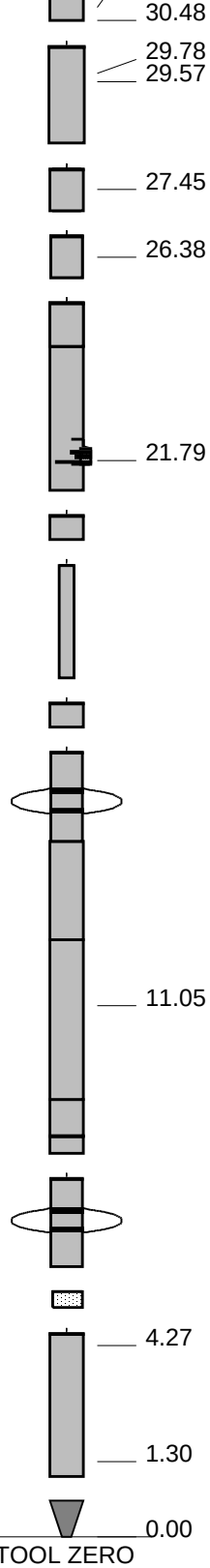
RUN 1	RUN 2

SURFACE EQUIPMENT

GSR−U 616008
WITM (EDTS)−A 1

DOWNHOLE EQUIPMENT





EDTC−B 8317

HNGS−BA 30.48
HNGS−BA 194
HNSH−BA 205

HNGC−B 27.98
HNGH−A 115

LDSC−B 26.92
LDSH−A 319

HLDS 25.85
GSR−Z 8113
HLDV−D 45
HLDS−D 45
HEH−H 47
HLDP−C 45

AH−184_NonMagKnuckleJoint 21.03

AH−NonMagSpacer 20.42
AH−NonMagSpacer 5714

AH−184_NonMagKnuckleJoint 17.53

AH−MCD2 16.92
AH−MCD2 82

HRLT−B 14.64
HRUH−B 978
HRUC−B 764
HRLS−B 768
HRLH−B 968
HRLC−B 974
AH−270 1708

AH−MCD1 7.26
AH−MCD1 1663

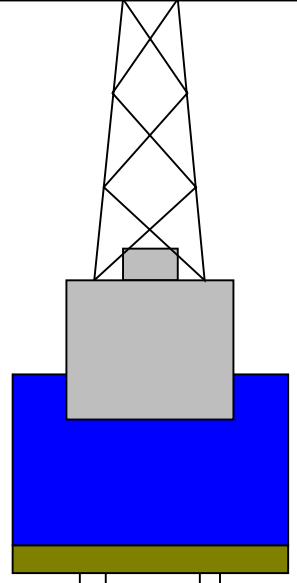
AH−230 4.98

MSS_LDEO−A 4.58
ELIC−A 1
MSS_LDEO−A 1

BNS−NG 0.91

MAXIMUM STRING DIAMETER 3.75 IN
MEASUREMENTS RELATIVE TO TOOL ZERO
ALL LENGTHS IN METERS

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



Kelly Bushing Elevation	−4711			
Derrick Floor Elevation	−4711			
Mean Sea Level	−4700			
				4.1
		Sea Floor	0	4.1
		Drill pipe + BHA	190.2	
		10 3/4" casing	605	10.75
		Open Hole		9.875
		Total Depth	1611	

Input DLIS Files

DEFAULT	MSS_LDEO_HRLA_LDL_027PUP	FN:33	PRODUCER	21−Jul−2014 15:48	5902.5 M	4700.9 M

Output DLIS Files

DEFAULT	MSS_LDEO_HRLA_LDL_040PUP	FN:47	PRODUCER	23−Jul−2014 00:16	1191.5 M	−10.1 M

OP System Version: 19C0−187

MSS_LDEO−A	19C0−187	HRLT−B	19C0−187
HLDS	19C0−187	LDSC−B	19C0−187
HNGC−B	19C0−187	HNGS−BA	19C0−187
EDTC−B	SKK−5169−EDTCB	BSP	19C0−187

PIP SUMMARY

Time Mark Every 60 S

HNGS Spectroscopy Gamma Ray (HSGR)

0 (GAPI) 100

Area1
From HCGR to HSGR

HNGS Borehole Potassium (HBHK)

−0.05 (−−−−) 0.05

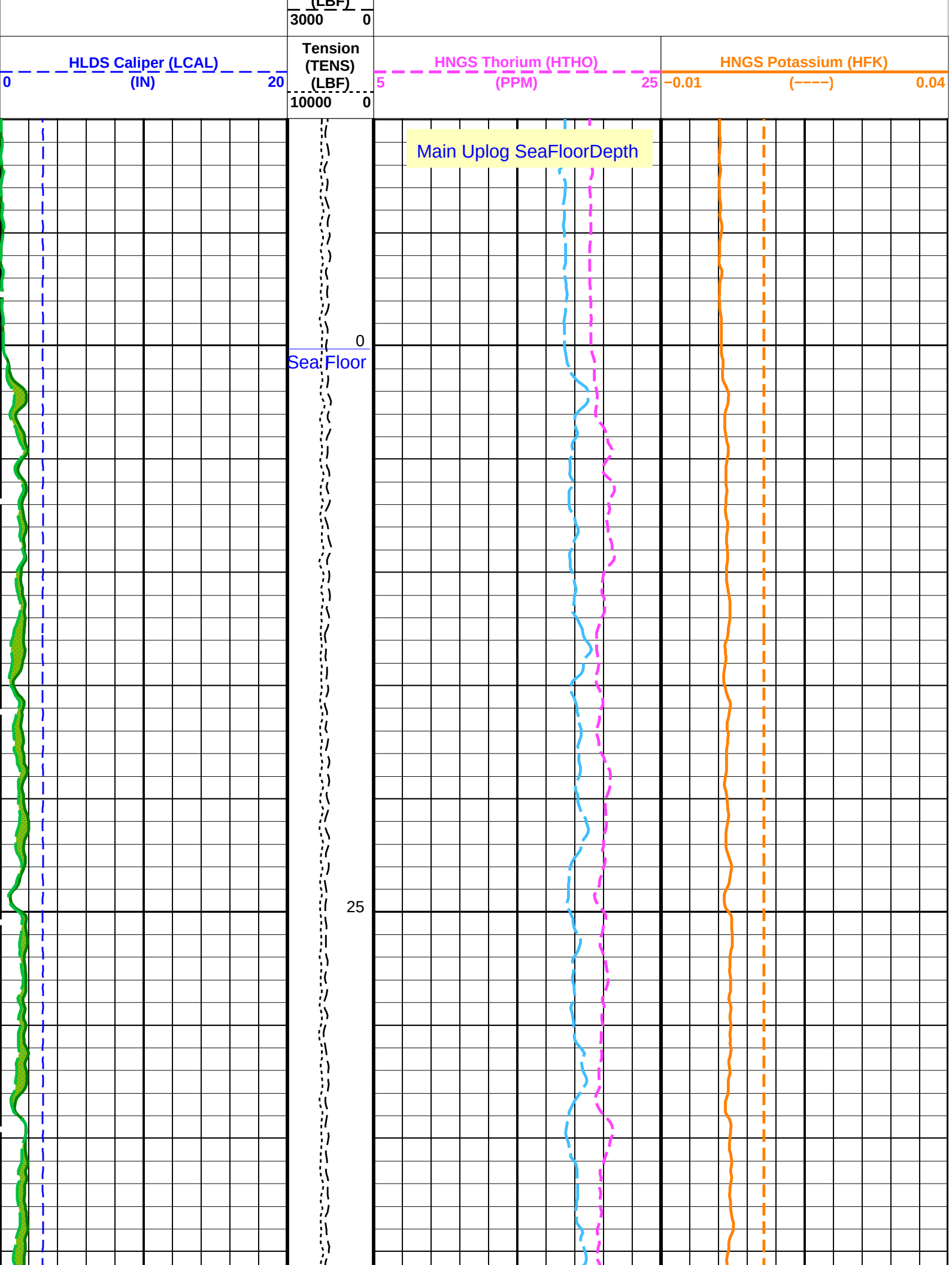
HNGS Computed Gamma Ray (HCGR)

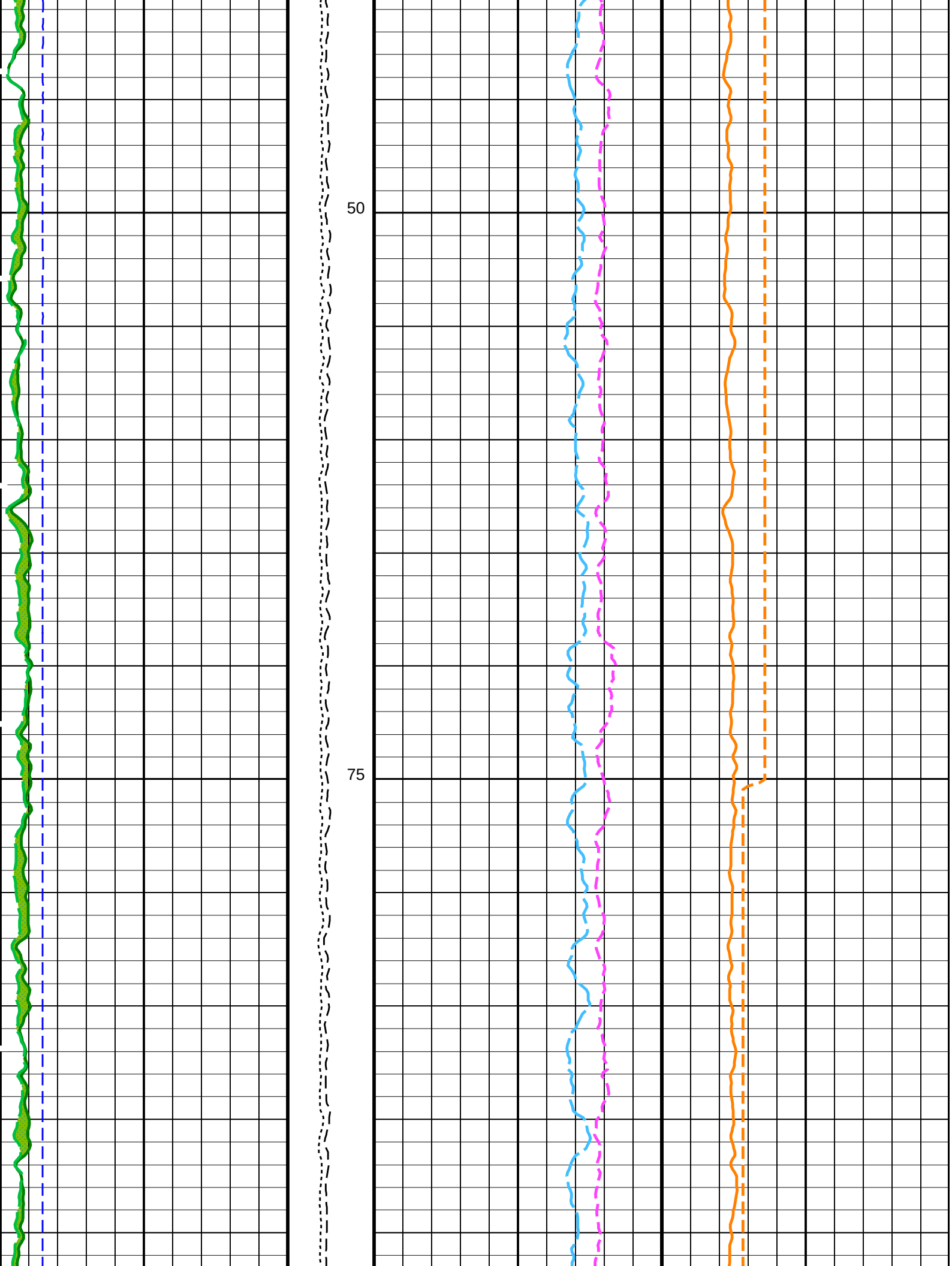
0 (GAPI) 100

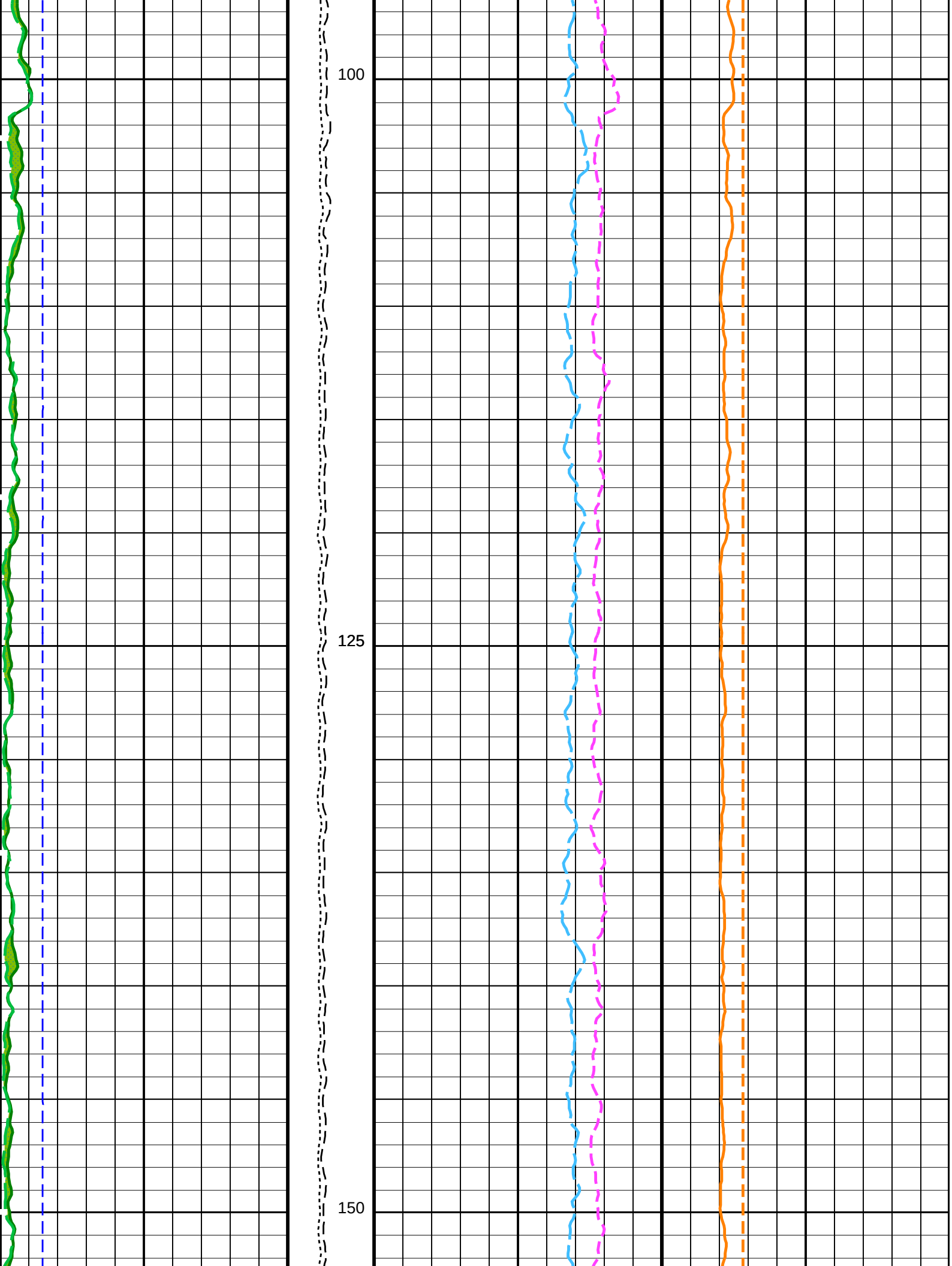
Calibrated Downhole Force (CDF) (LBF)

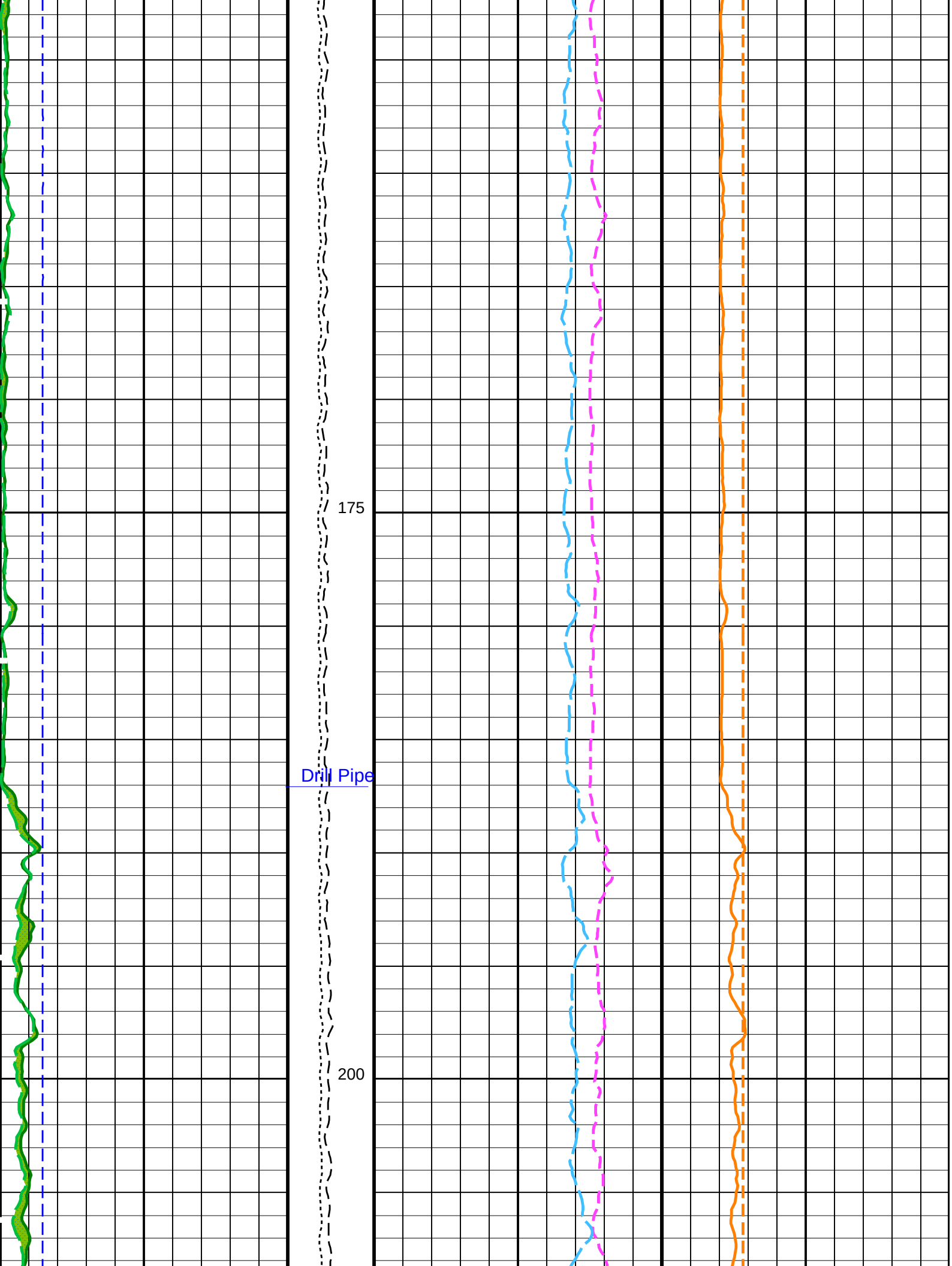
HNGS Uranium (HURA)

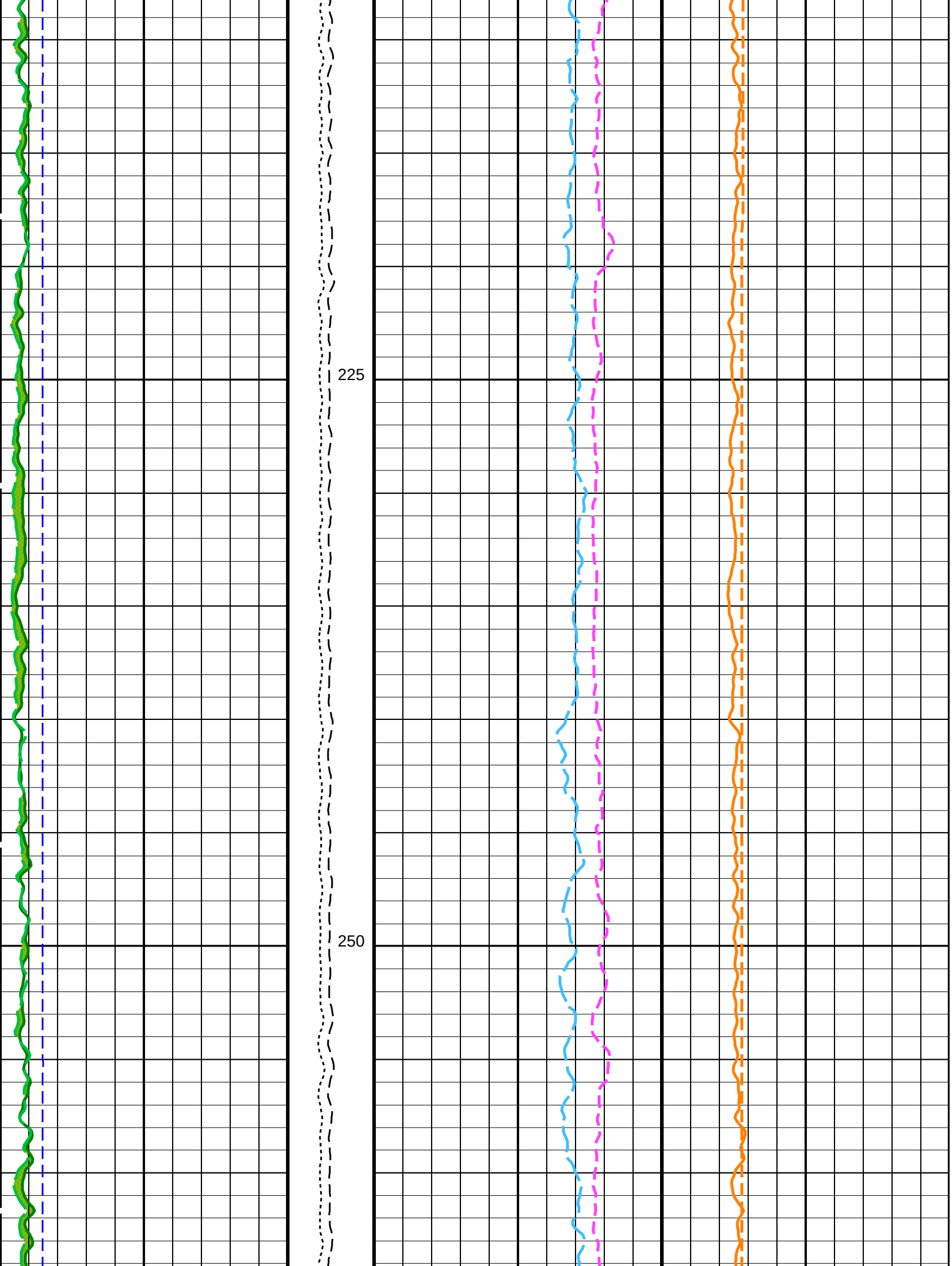
−5 (PPM) 10

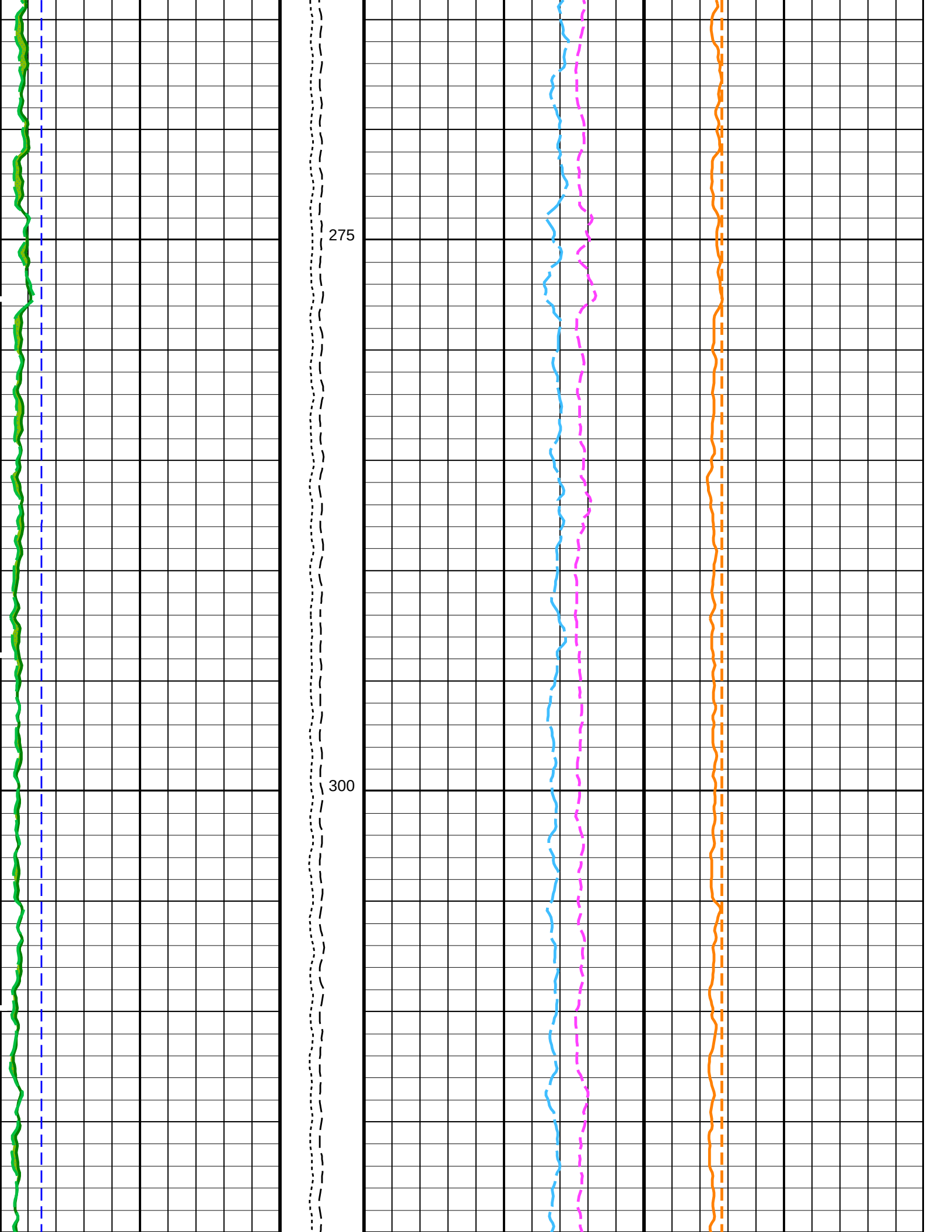

(LBF)
3000
0
HLDS Caliper (LCAL)
0
(IN)
20
Tension
(TENS)
(LBF)
10000
0
HNGS Thorium (HTHO)
5
(PPM)
25
HNGS Potassium (HFK)
−0.01
(−−−−)
0.04
Main Uplog SeaFloorDepth
0
Sea Floor
25

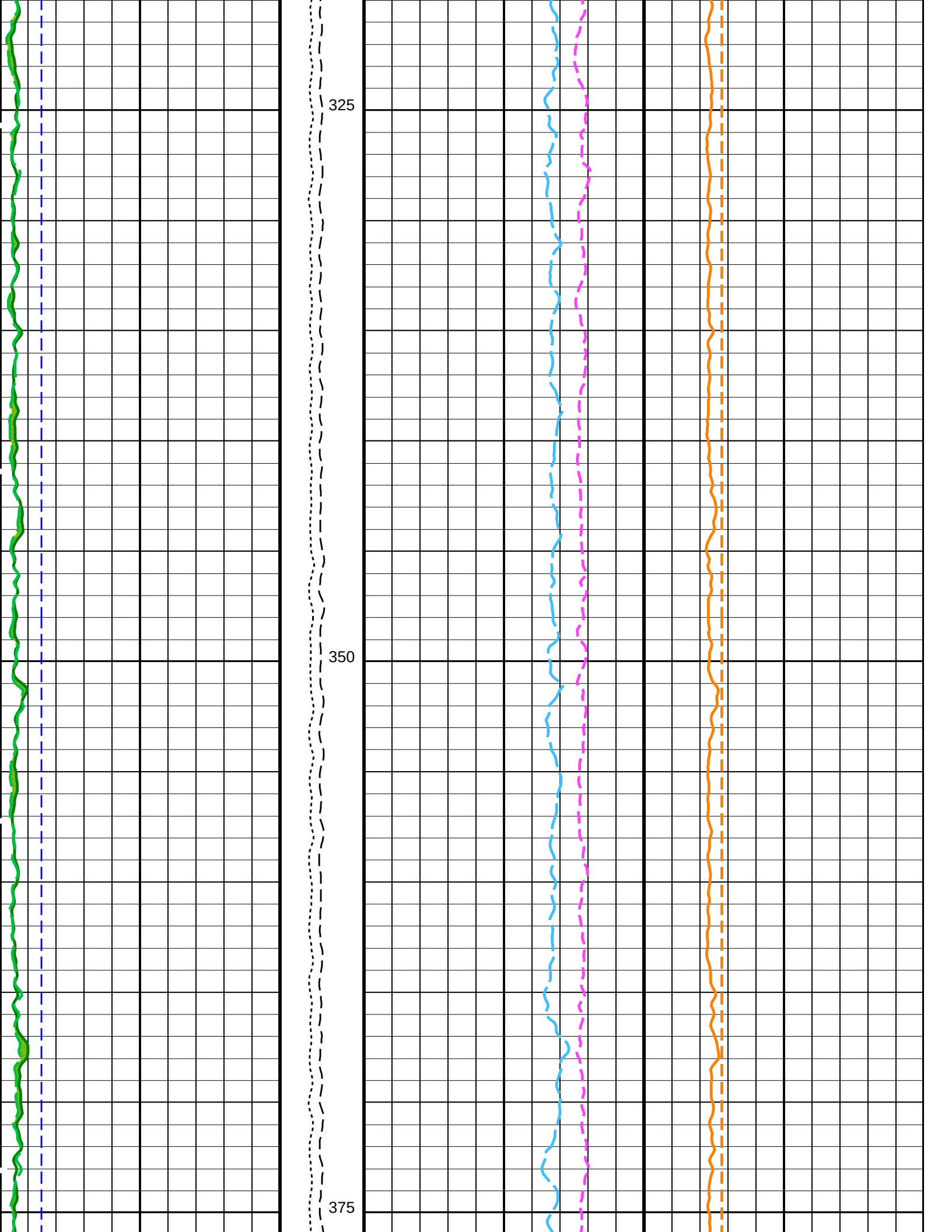

50
75

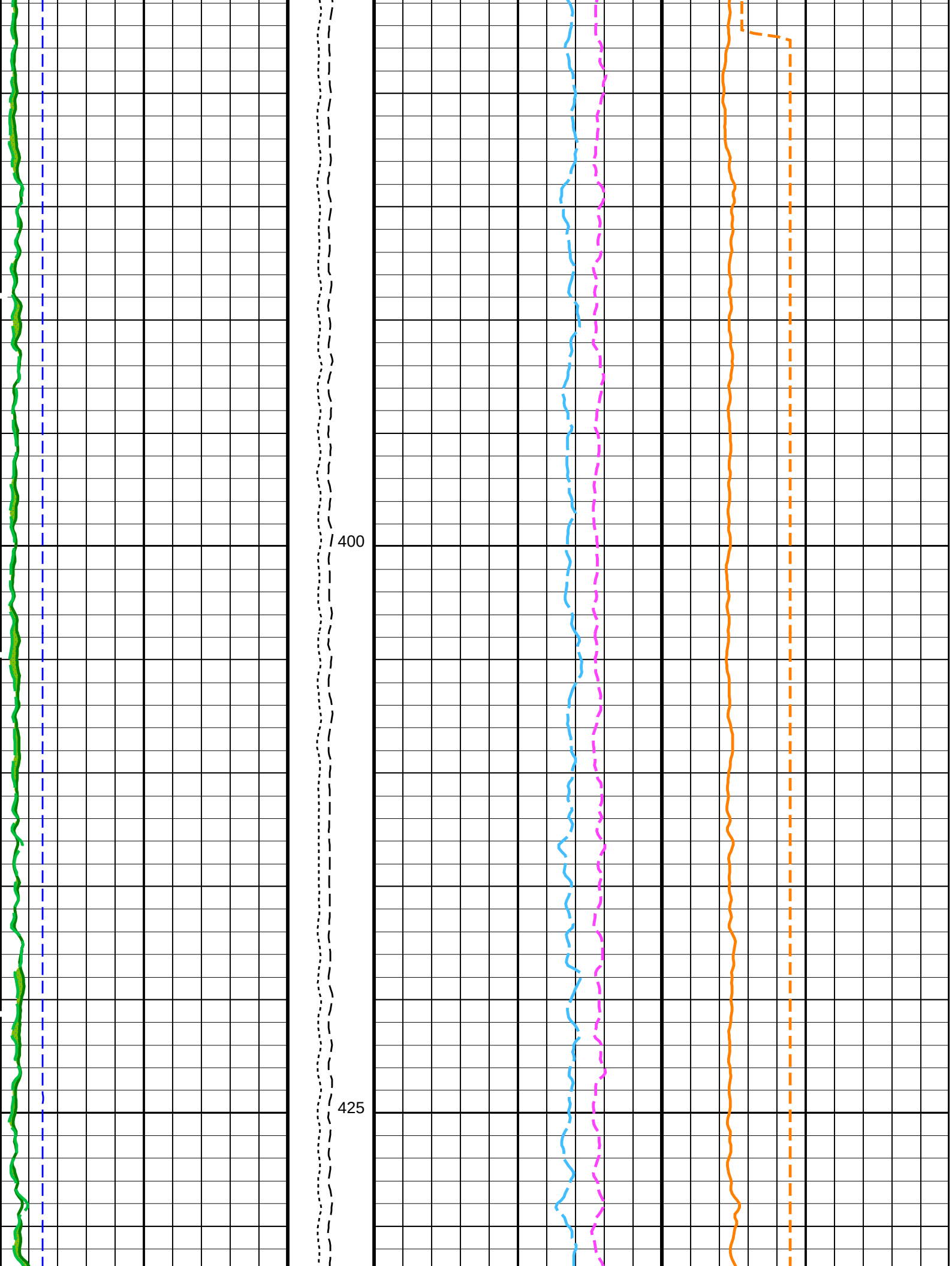

100
125
150

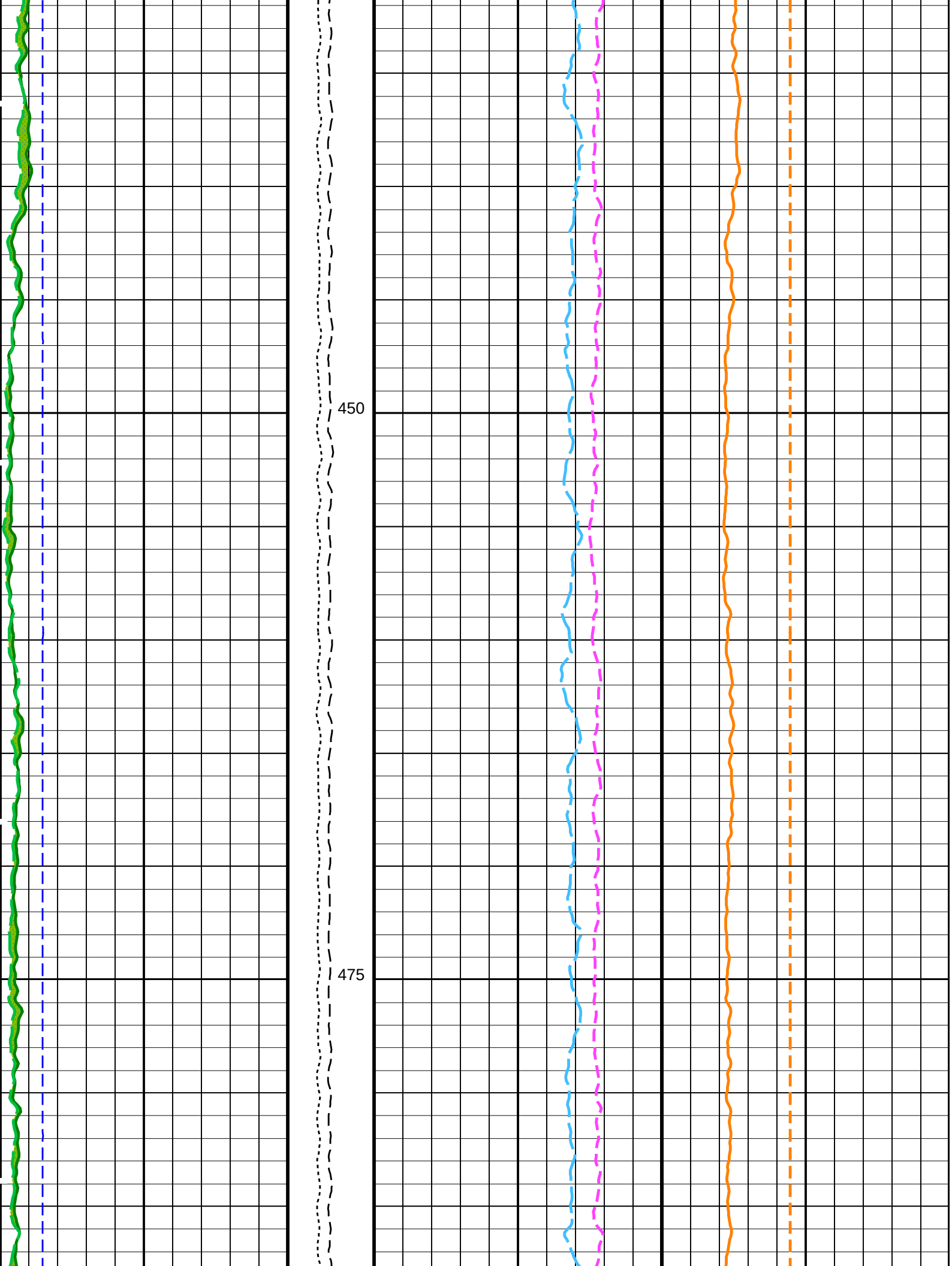

175
Drill Pipe
200

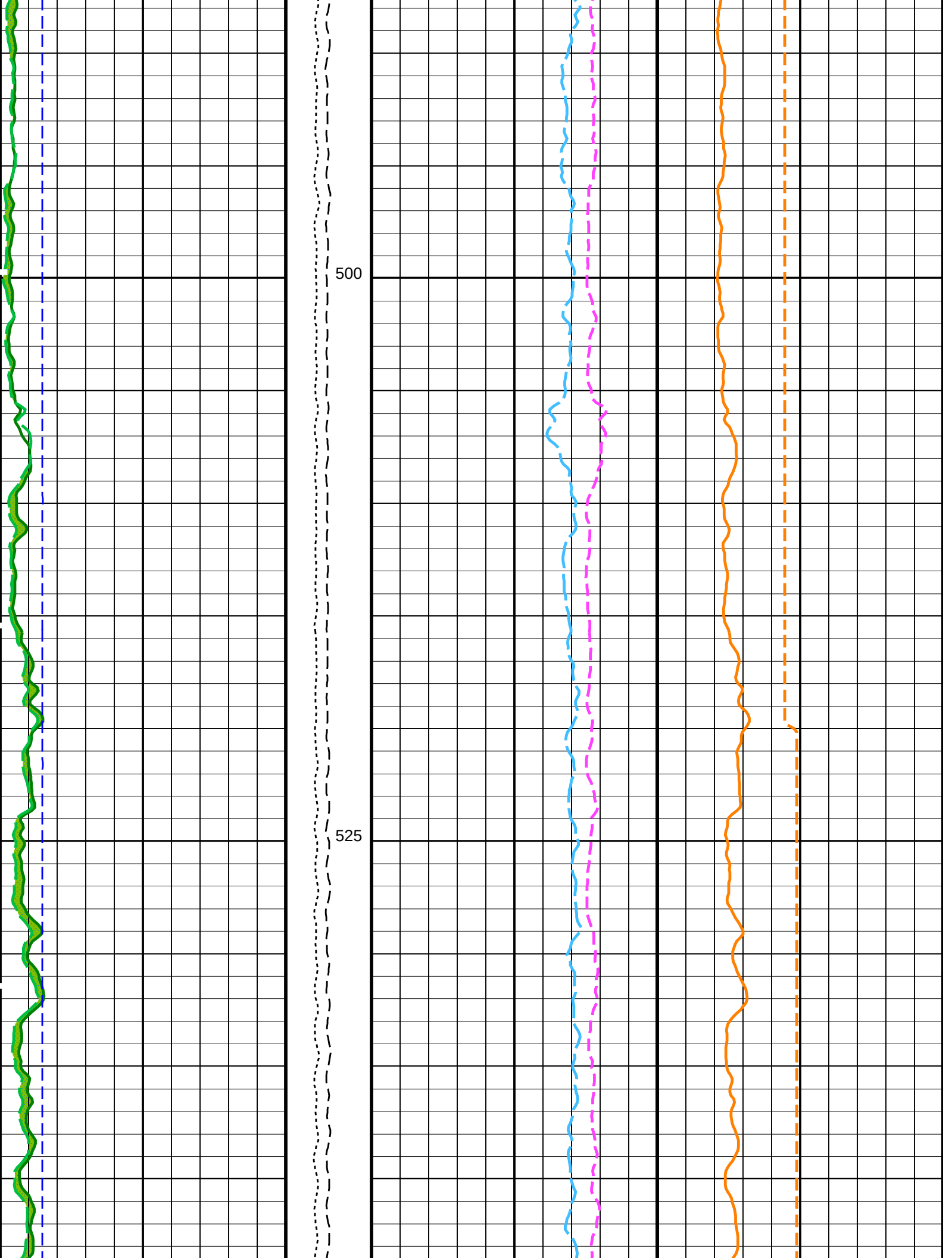

225
250

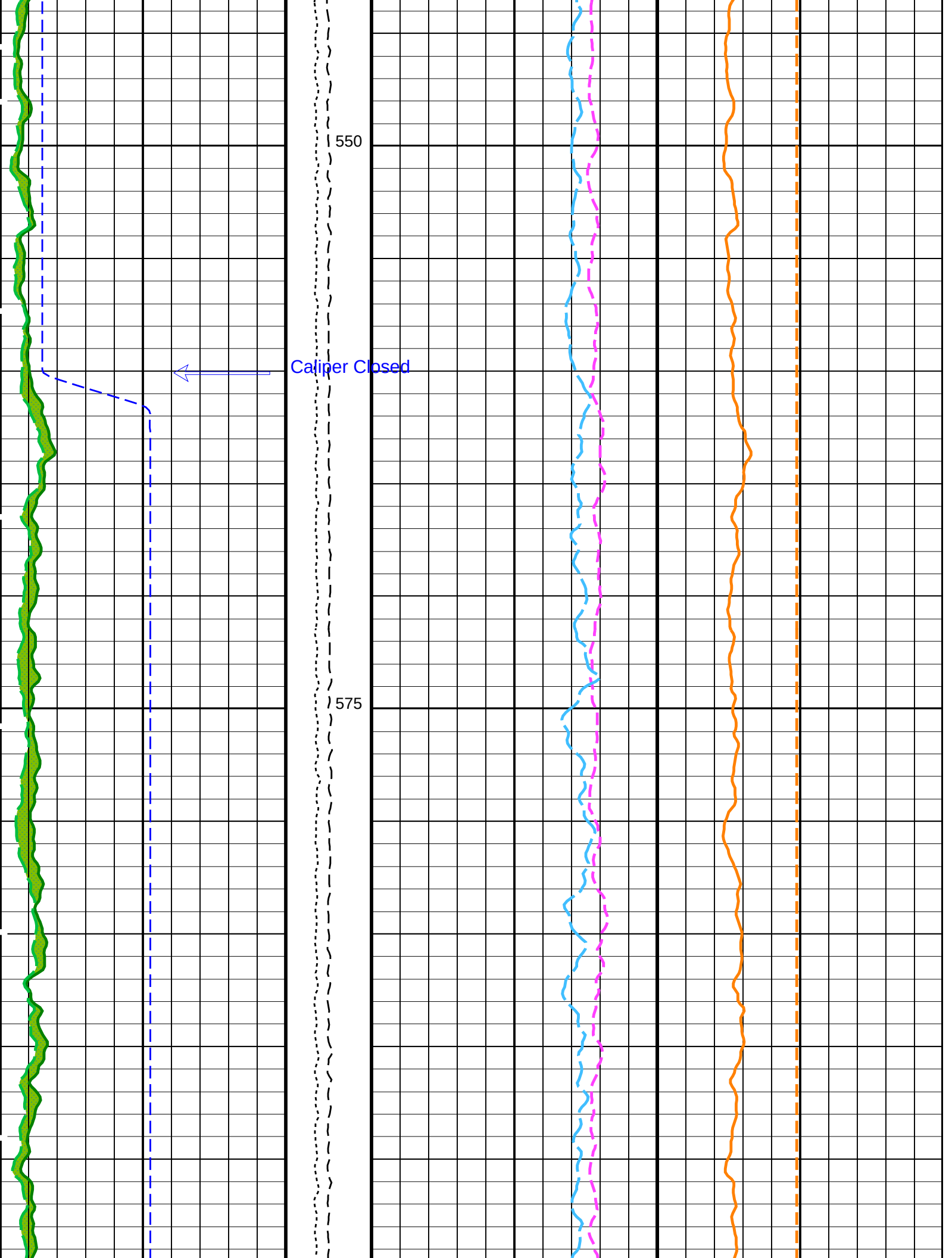

275
300

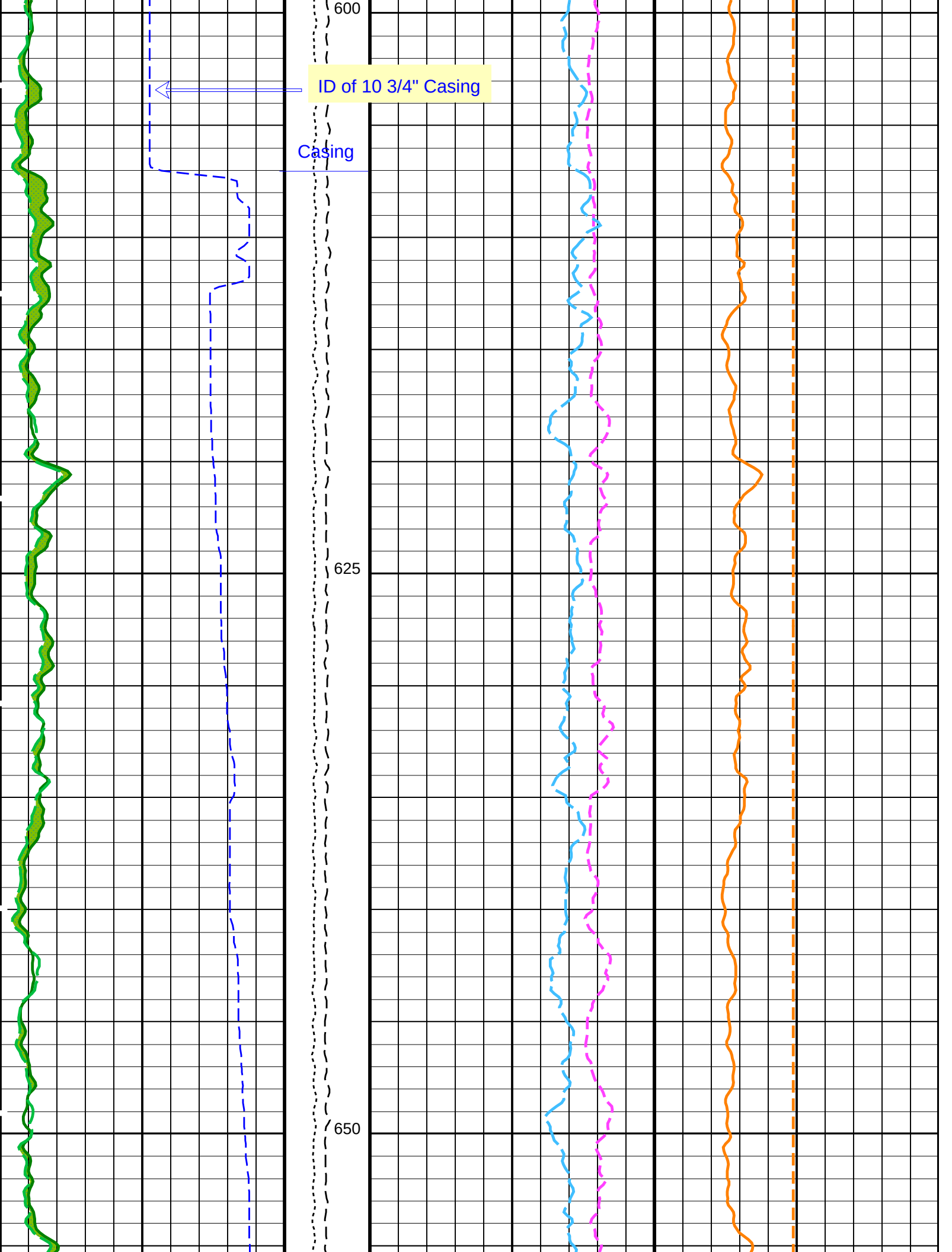

325
350
375

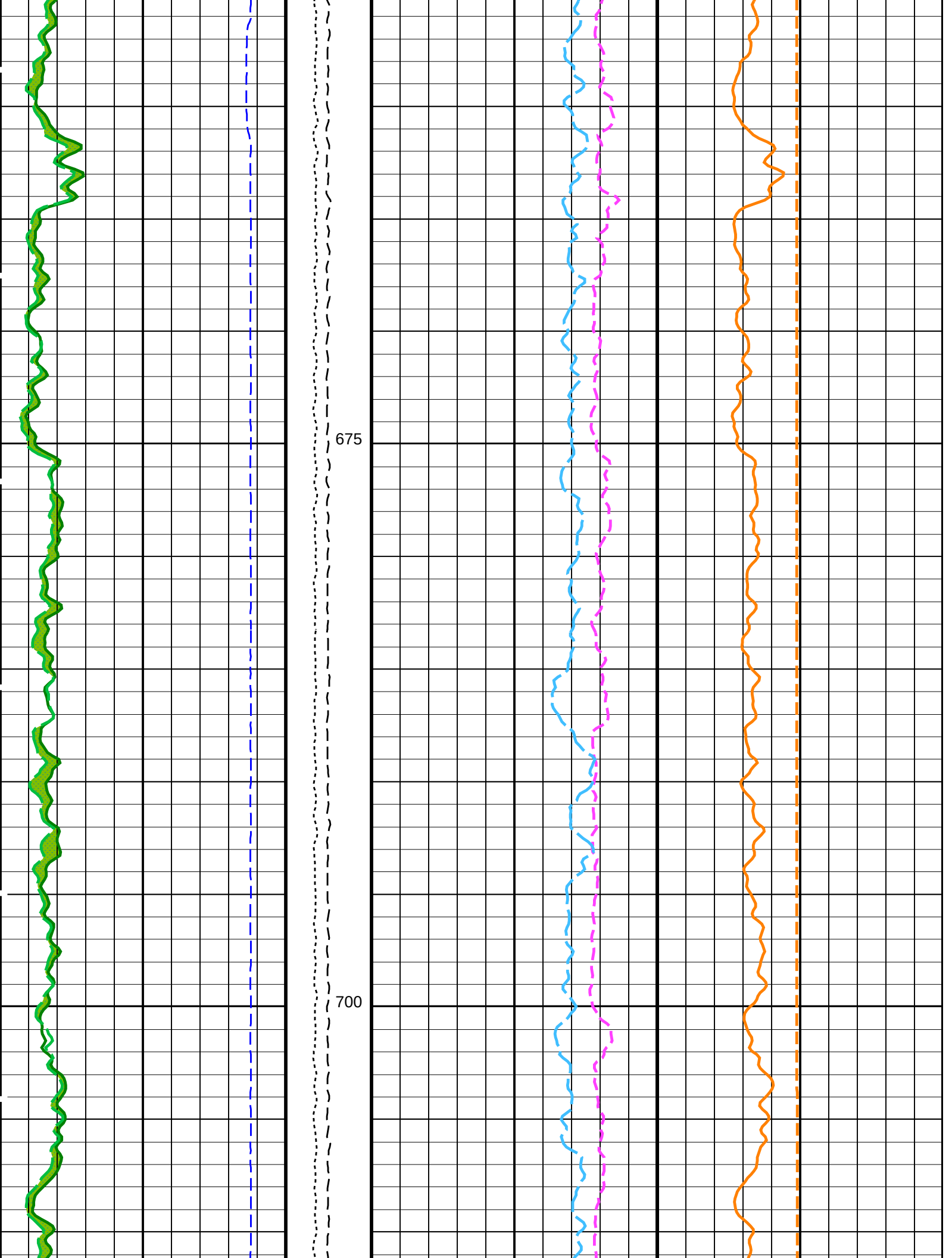

400
425

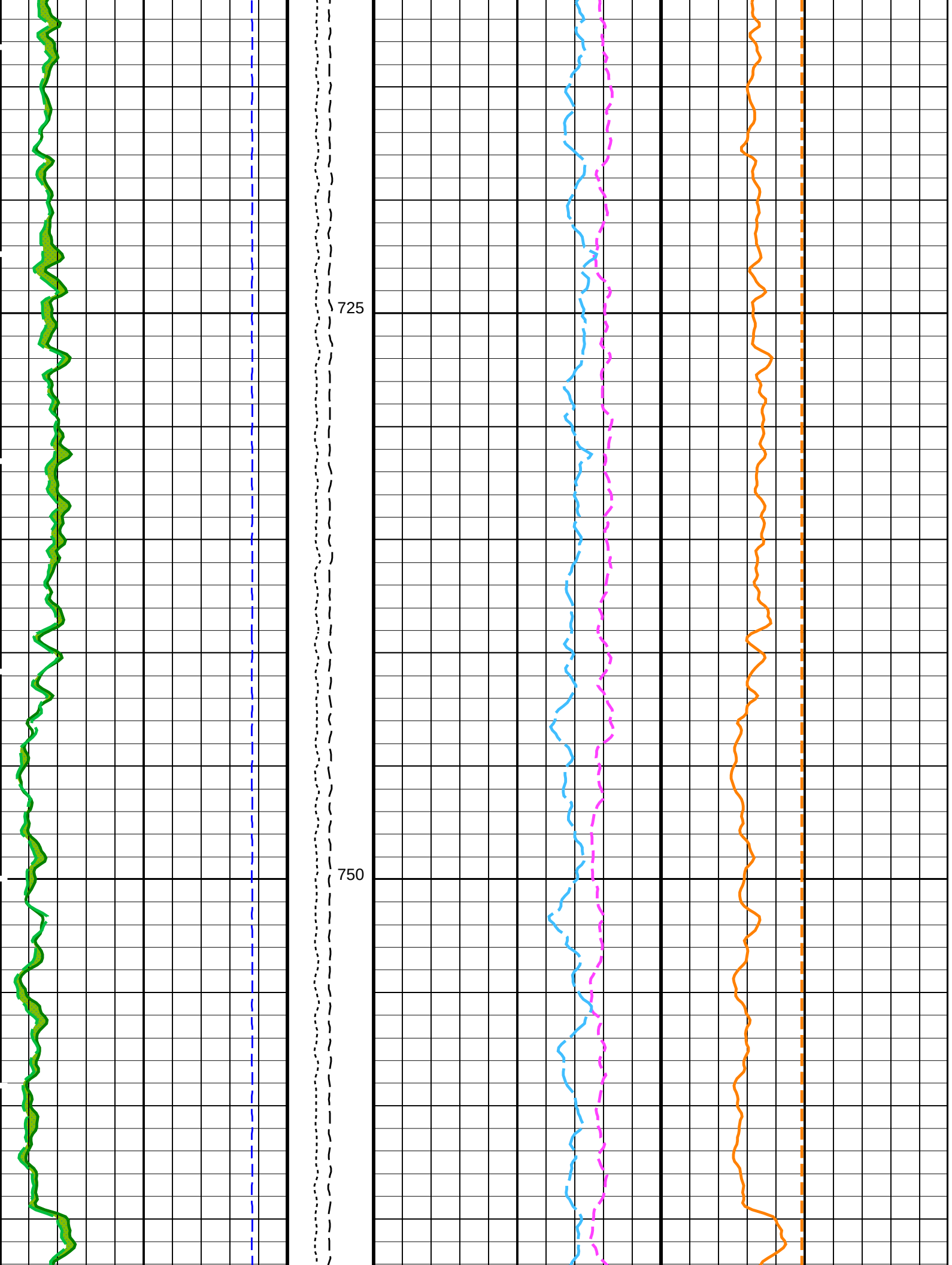

450
475

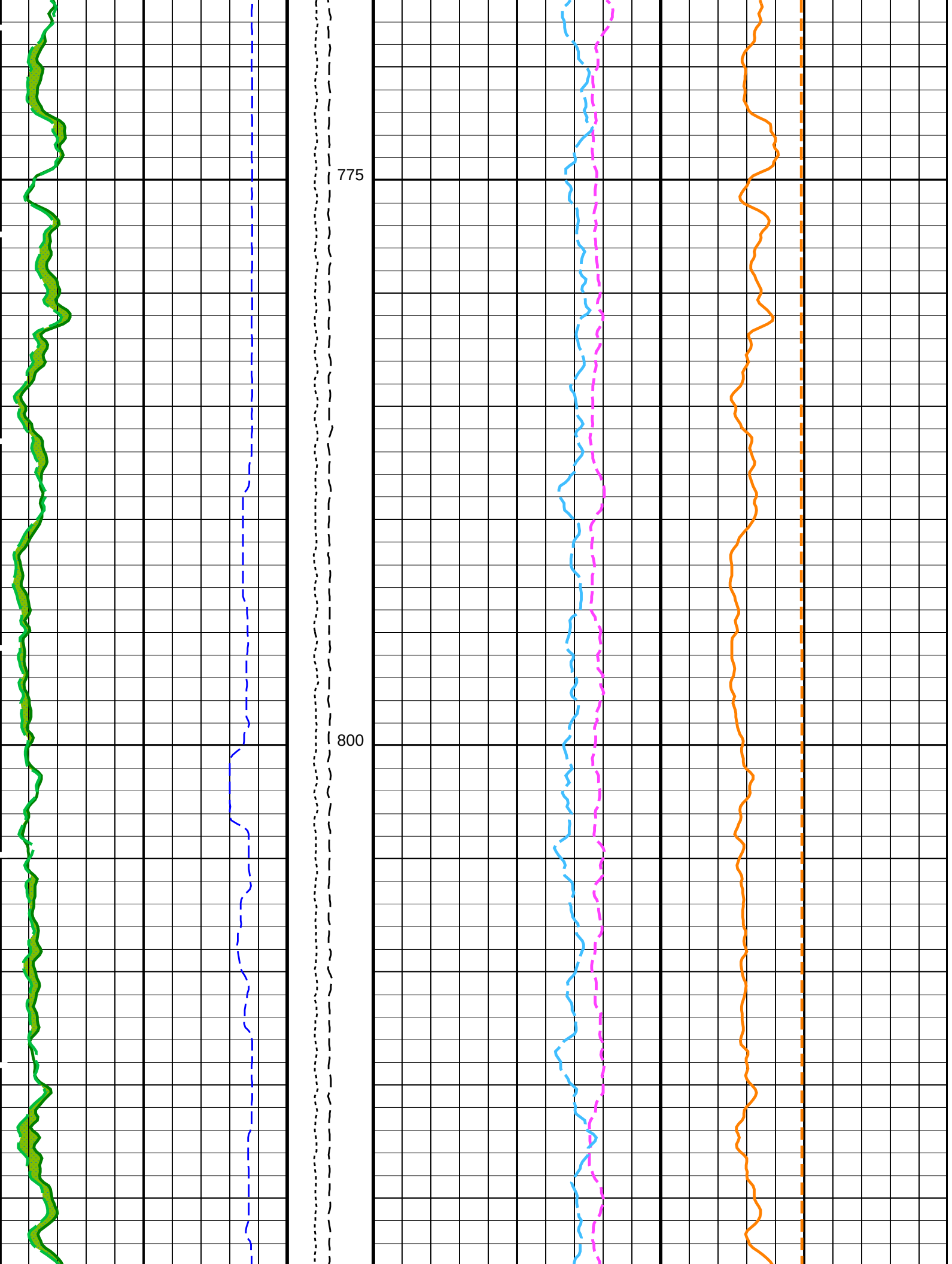

500
525

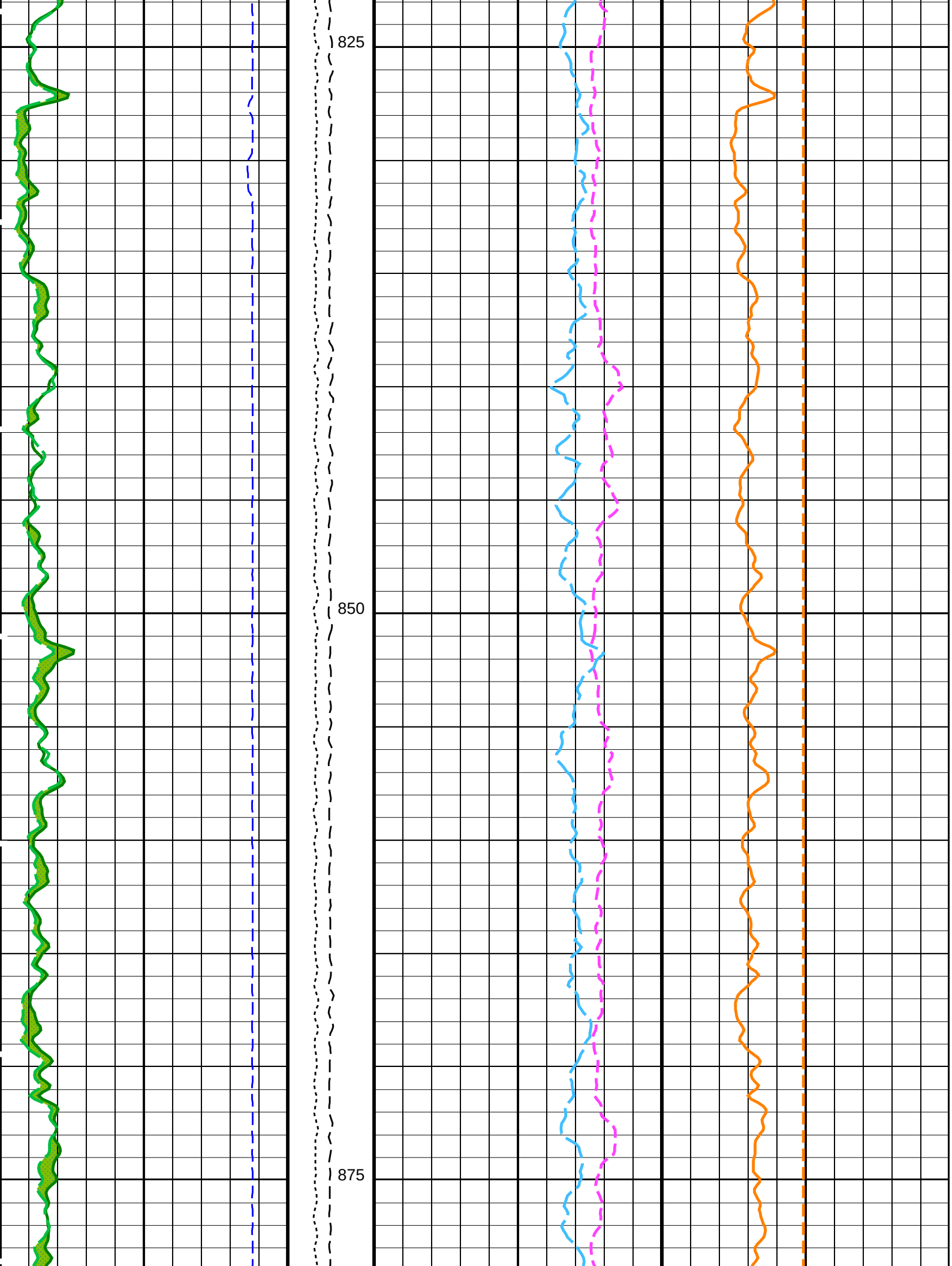

550
Caliper Closed
575

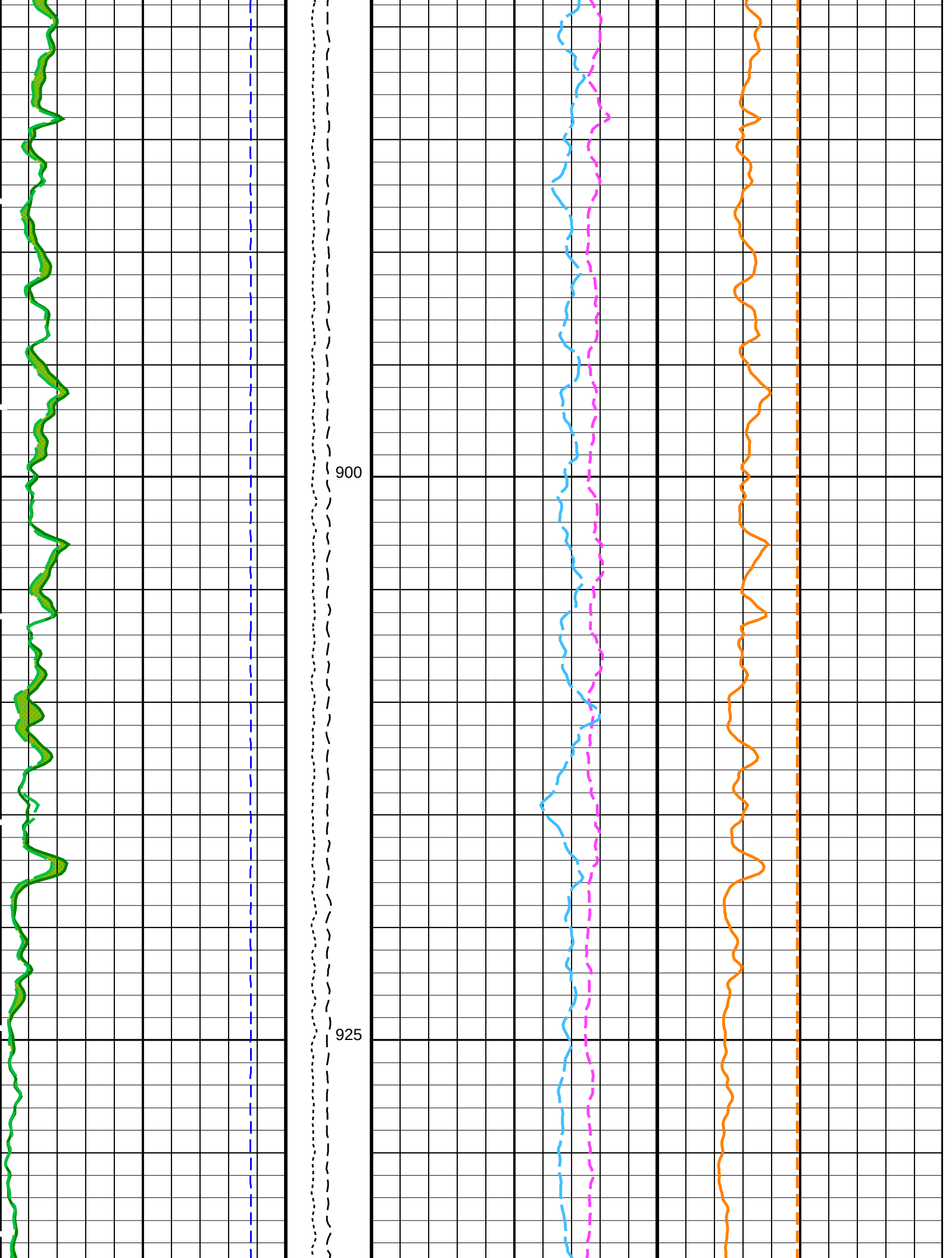

600
ID of 10 3/4" Casing
Casing
625
650

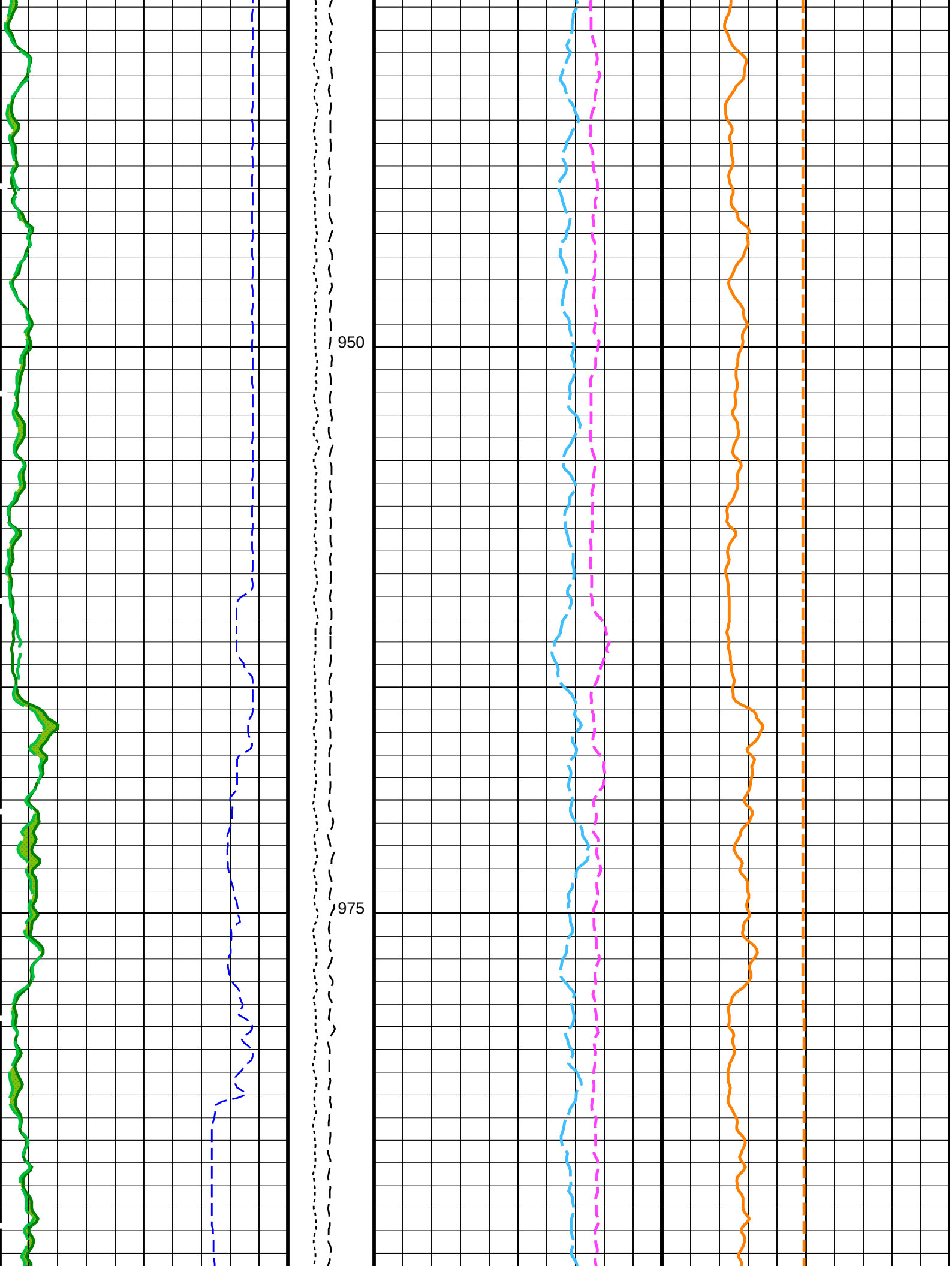

675
700

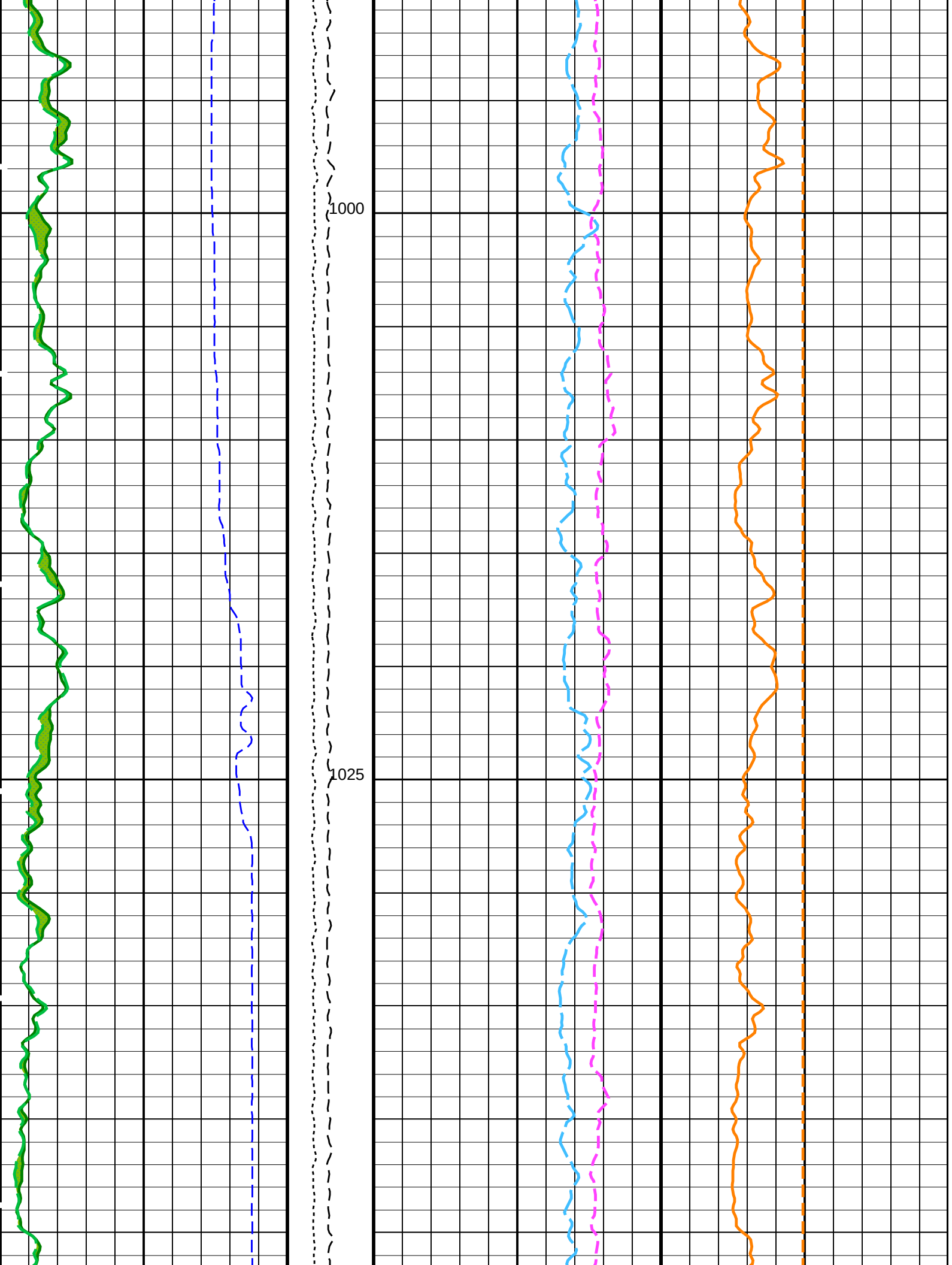

725
750

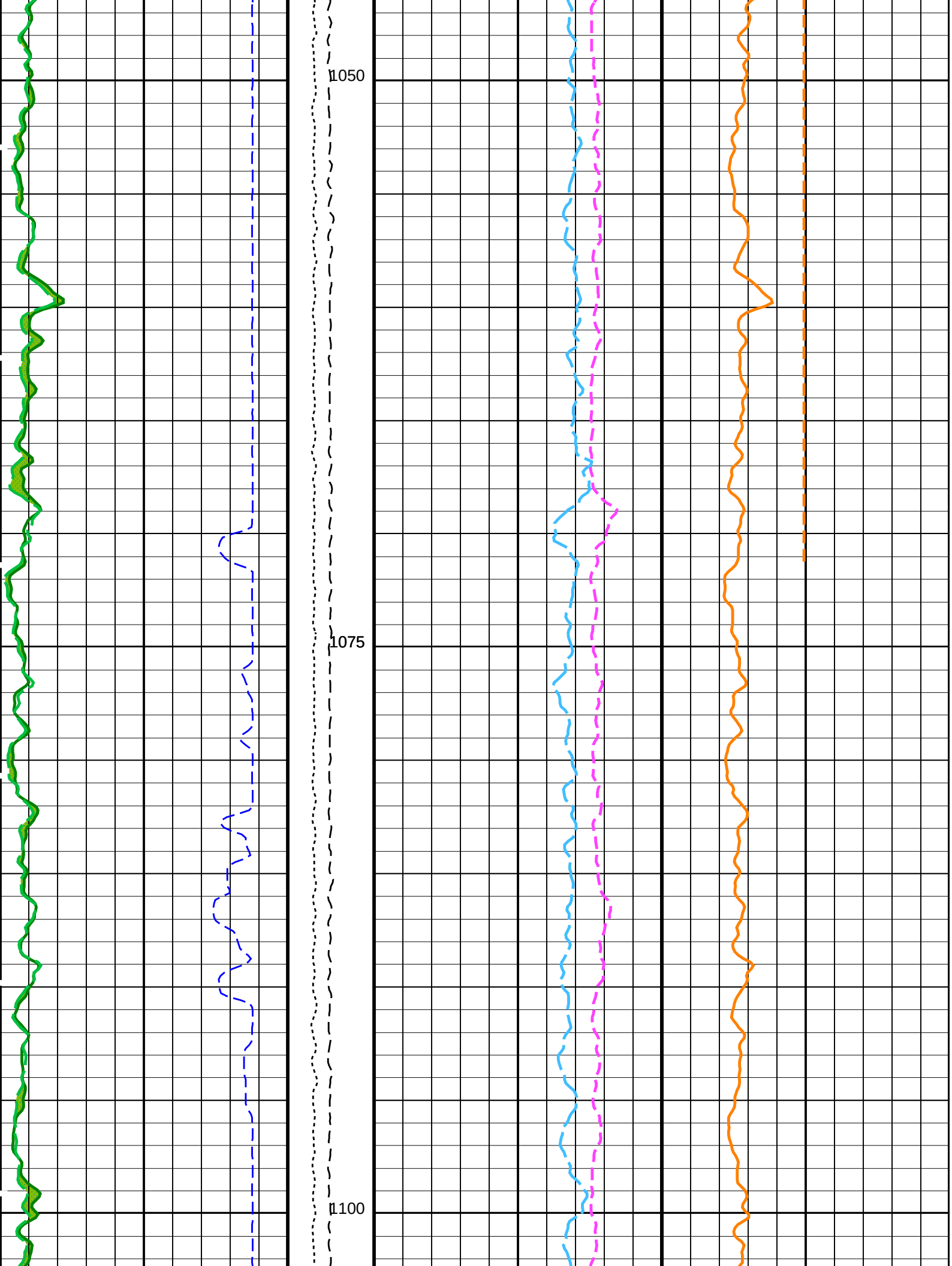

775
800

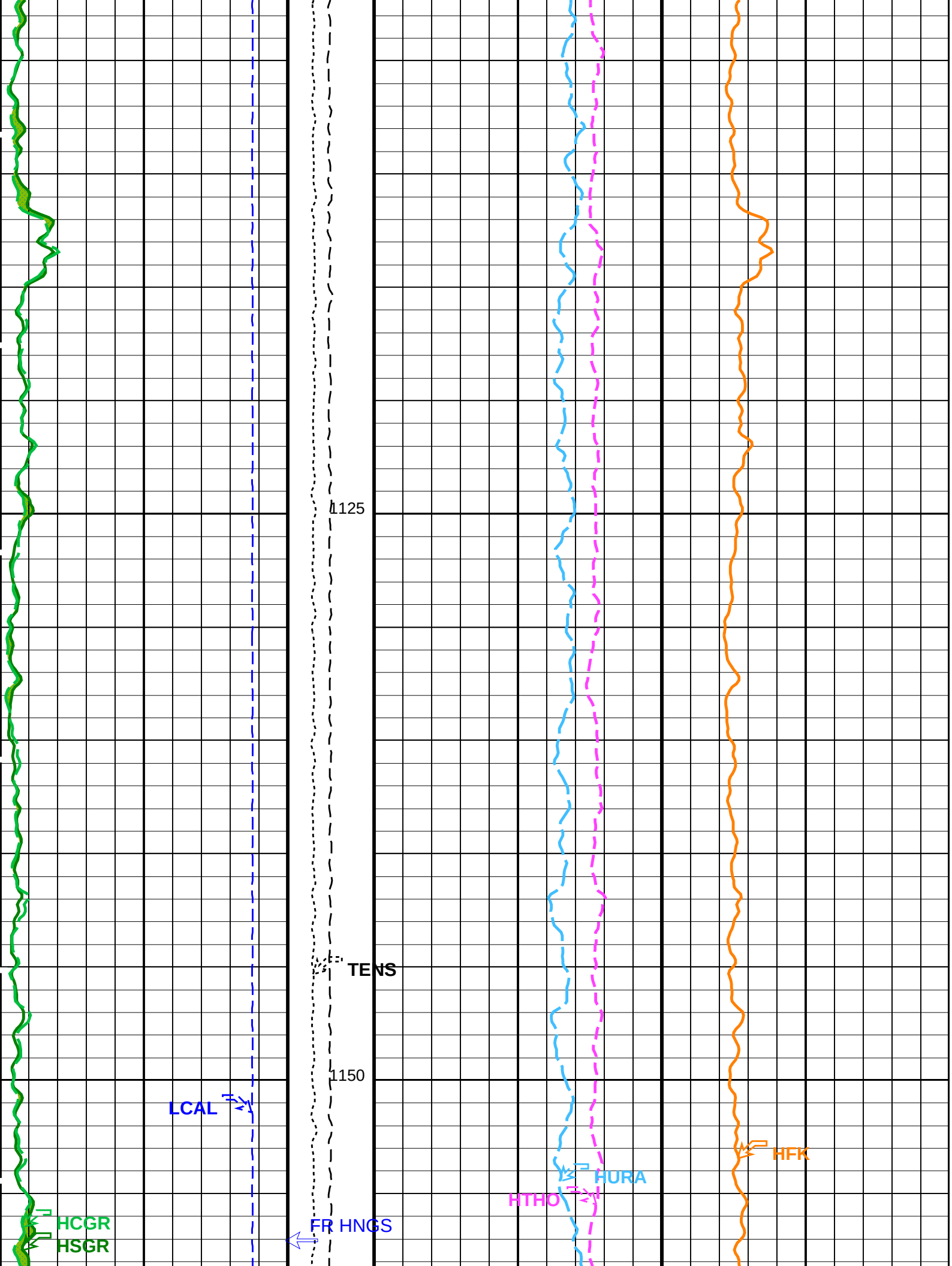

825
850
875

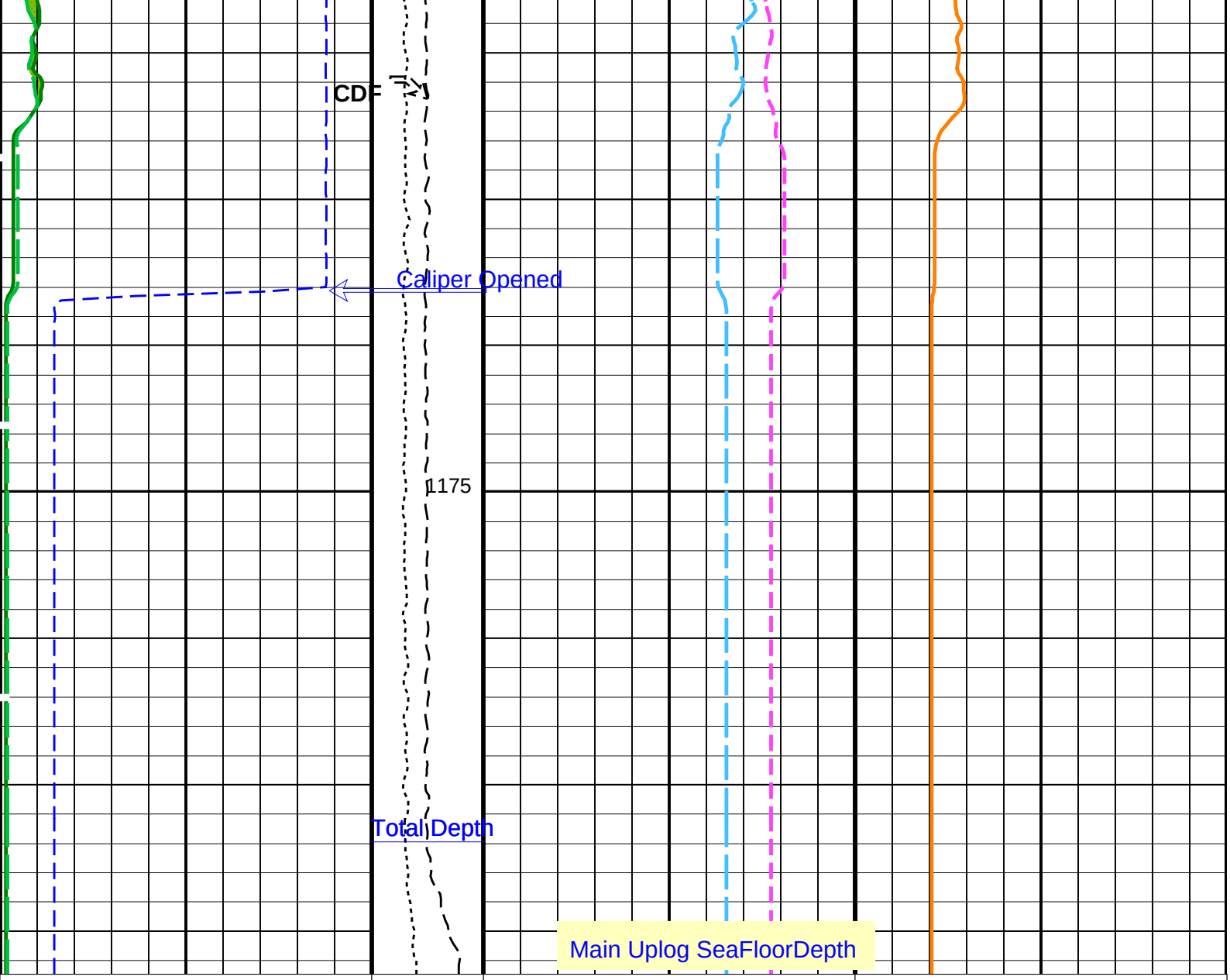

900
925


950
975


1000
1025


1050
1075
1100


1125
TENS
1150
LCAL
HCGR
HSGR
FR HNGS
HTHO
HURA
HFK



HLDS Caliper (LCAL) 0 (IN) 20	Tension (TENS) (LBF) 10000 0	HNGS Thorium (HTHO) 5 (PPM) 25	HNGS Potassium (HFK) −0.01 (−−−−) 0.04
HNGS Computed Gamma Ray (HCGR) 0 (GAPI) 100	Calibrated Downhole Force (CDF) (LBF) 3000 0	HNGS Uranium (HURA) −5 (PPM) 10	
Area1 From HCGR to HSGR			HNGS Borehole Potassium (HBHK) −0.05 (−−−−) 0.05
HNGS Spectroscopy Gamma Ray (HSGR) 0 (GAPI) 100			

PIP SUMMARY

Time Mark Every 60 S

Parameters

DLIS Name	Description	Value
	HRLT−B: High Resolution Laterolog Array − B	
BHS	Borehole Status	OPEN
GCSE	Generalized Caliper Selection	LCAL
	HNGS−BA: Hostile Natural Gamma Ray Sonde	

	HNGS−BA: Hostile Natural Gamma Ray Sonde		
BAR1	HNGS Detector 1 Barite Constant	1	
BAR2	HNGS Detector 2 Barite Constant	1	
BHK	HNGS Borehole Potassium Correction Concentration	0	
BHS	Borehole Status	OPEN	
CSD1	Inner Casing Outer Diameter	0	IN
CSD2	Outer Casing Outer Diameter	0	IN
CSW1	Inner Casing Weight	0	LB/F
CSW2	Outer Casing Weight	0	LB/F
DBCC	HNGS Barite Constant Correction Flag	NONE	
GCSE	Generalized Caliper Selection	LCAL	
H1P	HNGS Detector 1 Allow/Disallow In Processing	ALLOW	
H2P	HNGS Detector 2 Allow/Disallow In Processing	ALLOW	
HABK	HNGS Borehole Potassium Running Average	−0.00711471	
HALF	HNGS Alpha Filter Length	60	IN
HCRB	HNGS Apply Borehole Potassium Correction	NONE	
HMWM	Mud Weighting Material	NATU	
HNPE	HNGS Processing Enable	YES	
S1BI	HNGS Detector 1 Calibration Bismuth Count Rate	1.3	CPS
S2BI	HNGS Detector 2 Calibration Bismuth Count Rate	1.3	CPS
SGRC	HNGS Standard Gamma−Ray Correction Flag	YES	
TPOS	Tool Position	CENT	
VBA1	HNGS Detector 1 Variable Barite Factor Running Average	1.06202	
VBA2	HNGS Detector 2 Variable Barite Factor Running Average	1.06032	
	EDTC−B: Enhanced DTS Cartridge		
BHS	Borehole Status	OPEN	
GCSE	Generalized Caliper Selection	LCAL	
	System and Miscellaneous		
BS	Bit Size	9.875	IN
DFD	Drilling Fluid Density	1.03	G/C3
DO	Depth Offset for Playback	−4711.0	M
PP	Playback Processing	NORMAL	

Format: HNGSYields Vertical Scale: 1:200 Graphics File Created: 23−Jul−2014 00:16

OP System Version: 19C0−187

MSS_LDEO−A	19C0−187	HRLT−B	19C0−187
HLDS	19C0−187	LDSC−B	19C0−187
HNGC−B	19C0−187	HNGS−BA	19C0−187
EDTC−B	SKK−5169−EDTCB	BSP	19C0−187

Input DLIS Files

DEFAULT	MSS_LDEO_HRLA_LDL_027PUP	FN:33	PRODUCER	21−Jul−2014 15:48	5902.5 M	4700.9 M

Output DLIS Files

DEFAULT	MSS_LDEO_HRLA_LDL_040PUP	FN:47	PRODUCER	23−Jul−2014 00:16		

Input DLIS Files

DEFAULT	Flip_MSS_LDEO_HRLA_036PUP		PRODUCER	23−Jul−2014 00:04	1149.7 M	−49.5 M

Output DLIS Files

DEFAULT	MSS_LDEO_HRLA_LDL_038PUP	FN:45	PRODUCER	23−Jul−2014 00:09	1149.7 M	−49.5 M

OP System Version: 19C0−187

MSS_LDEO−A	19C0−187	HRLT−B	19C0−187
HLDS	19C0−187	LDSC−B	19C0−187
HNGC−B	19C0−187	HNGS−BA	19C0−187
EDTC−B	SKK−5169−EDTCB	BSP	19C0−187

PIP SUMMARY

Time Mark Every 60 S

HNGS Spectroscopy Gamma Ray (HSGR)

0 (GAPI) 100

Flipped Downlog, Sea Floor Depth

HNGS Borehole Potassium (HBHK)

Area1

From HCGR to HSGR

−0.05 (−−−−) 0.05

HNGS Computed Gamma Ray (HCGR)
0 (GAPI) 100

Calibrated Downhole Force (CDF) (LBF)
3000 0

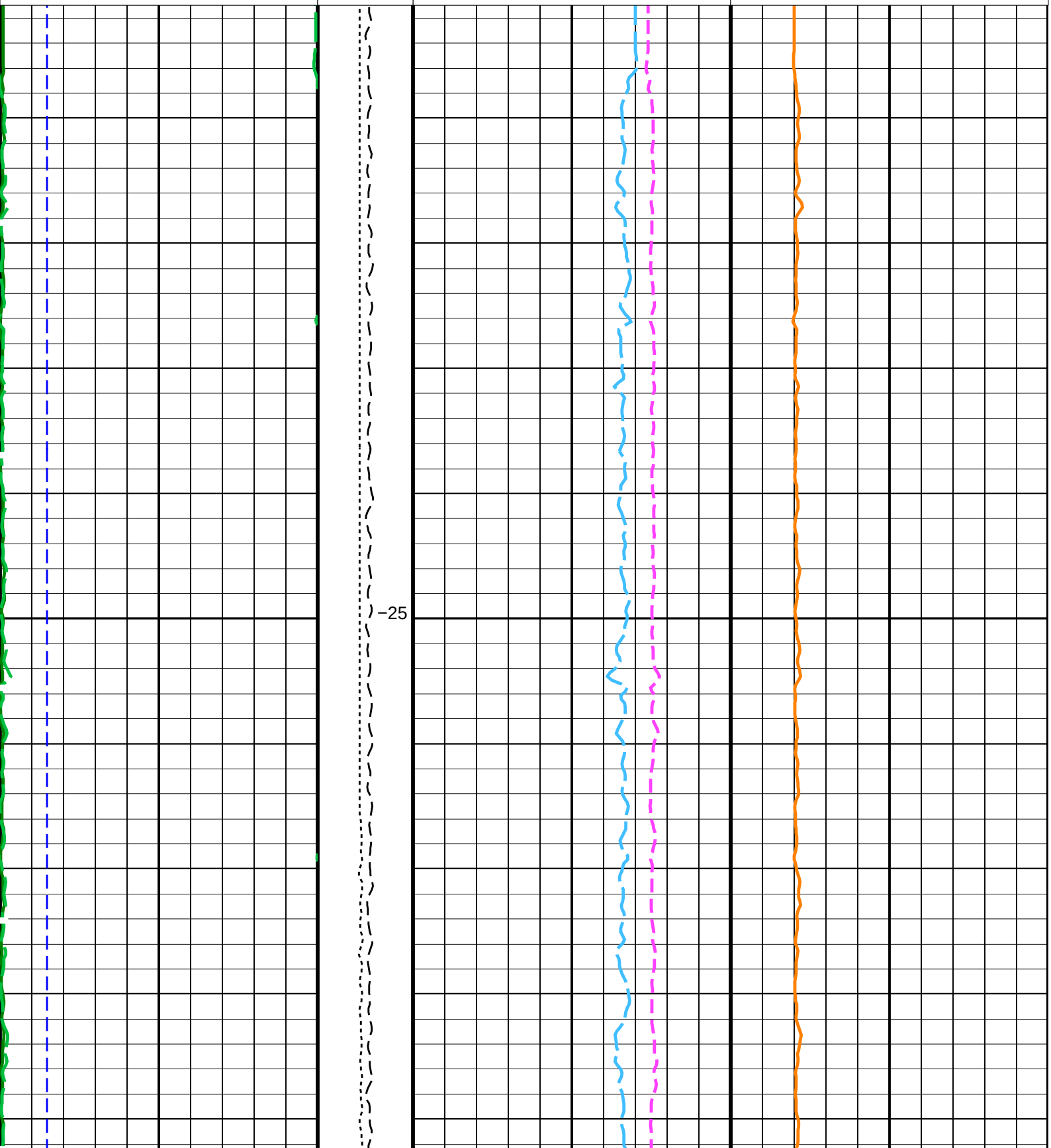
HNGS Uranium (HURA)
−5 (PPM) 10

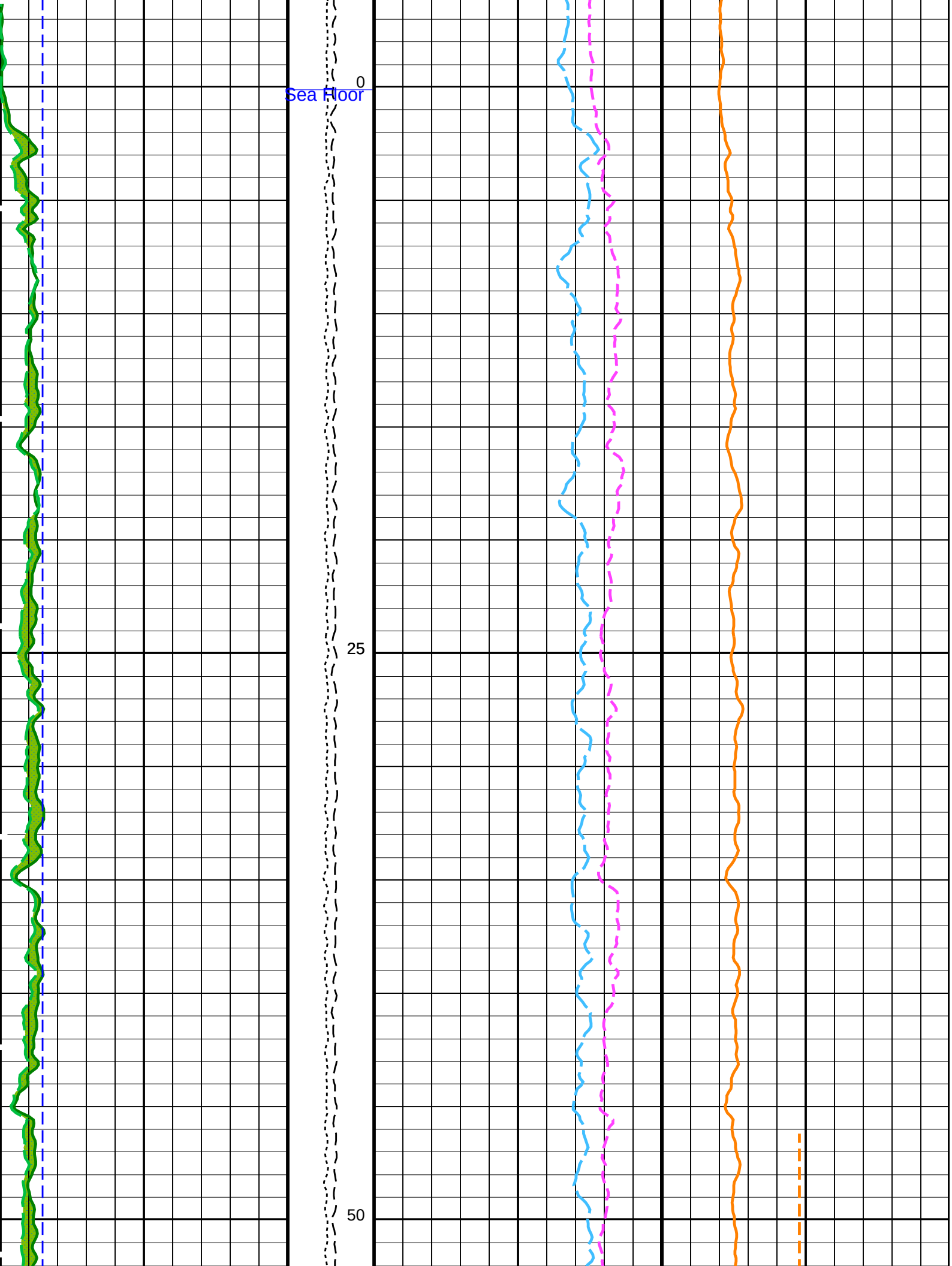
HLDS Caliper (LCAL)
0 (IN) 20

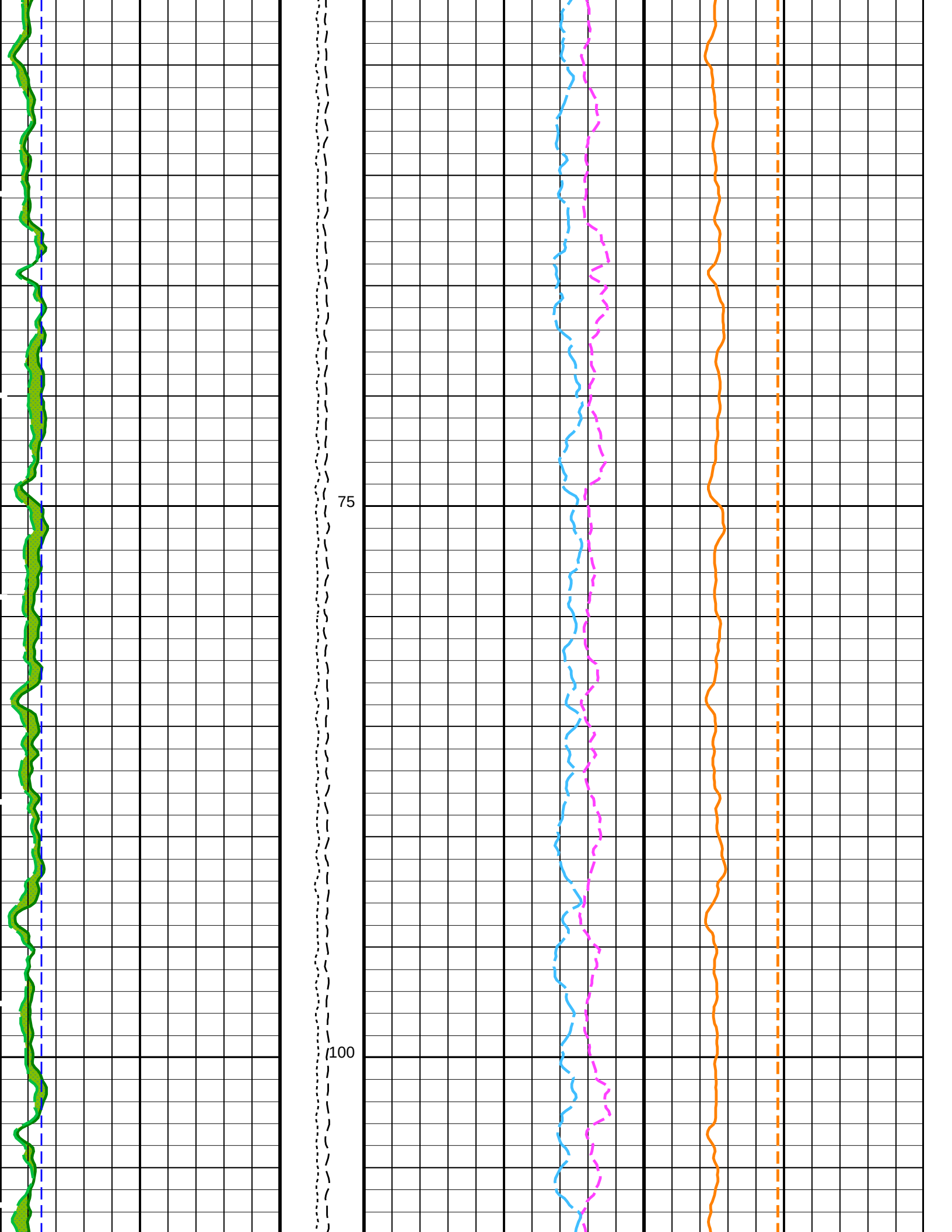
Tension (TENS) (LBF)
10000 0

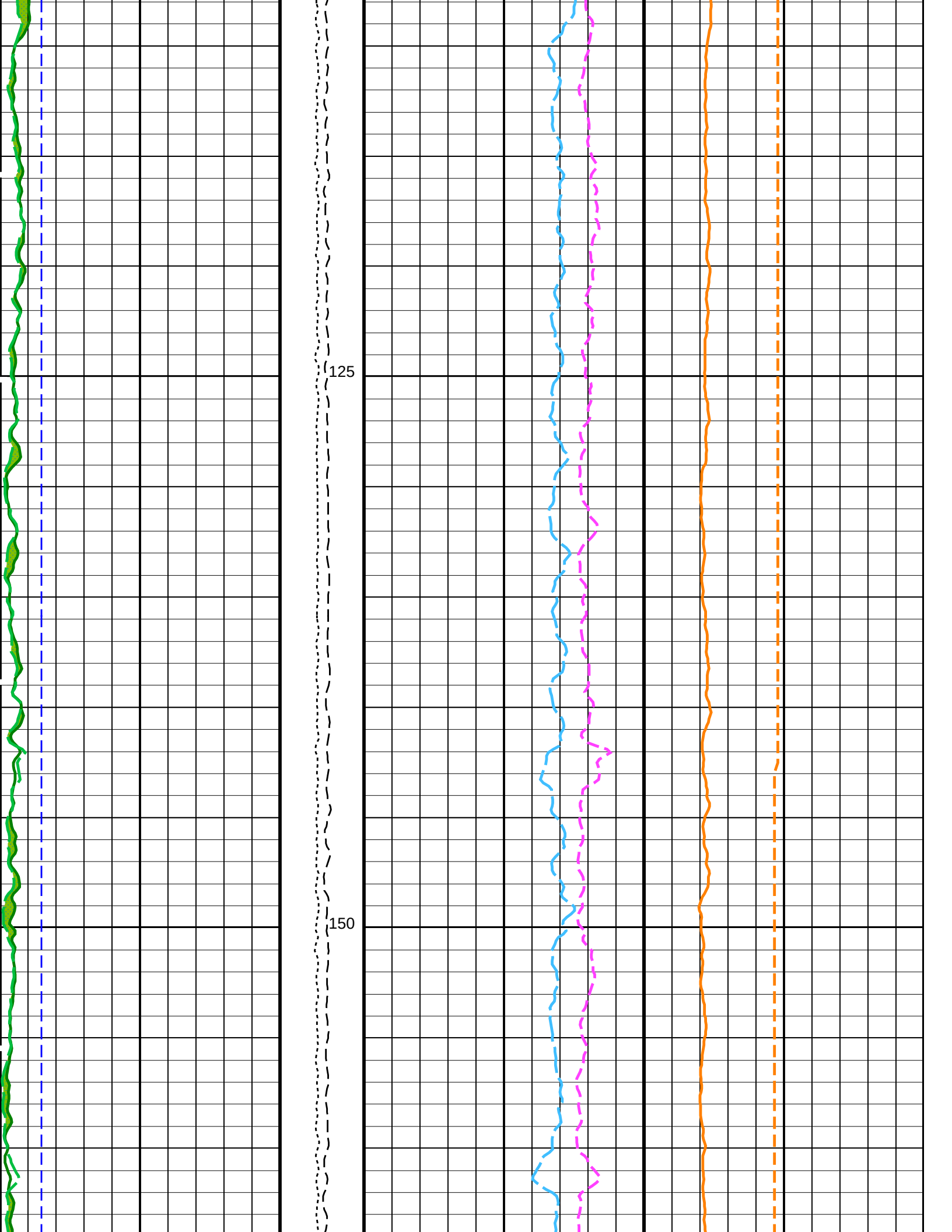
HNGS Thorium (HTHO)
5 (PPM) 25

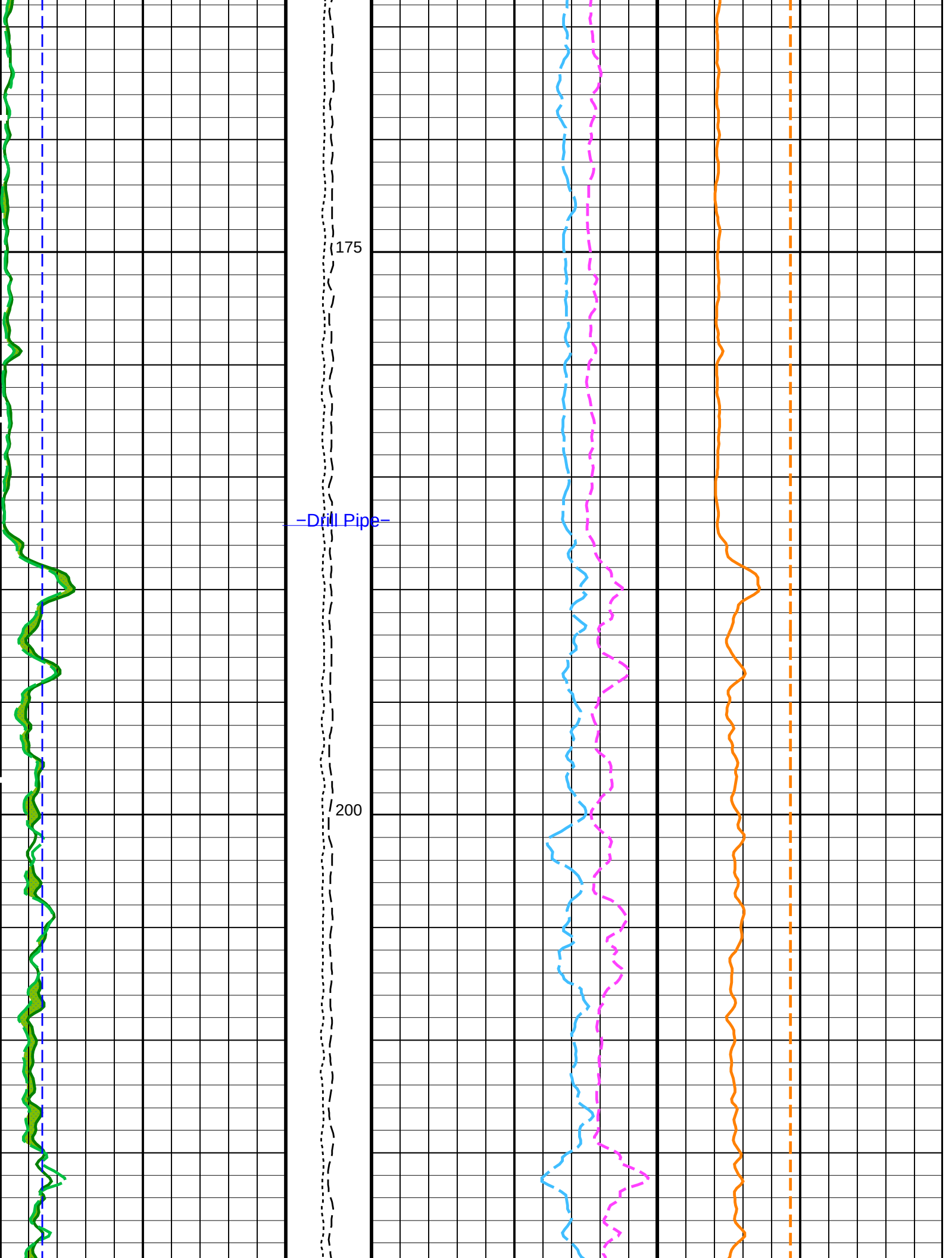
HNGS Potassium (HFK)
−0.01 (−−−−) 0.04

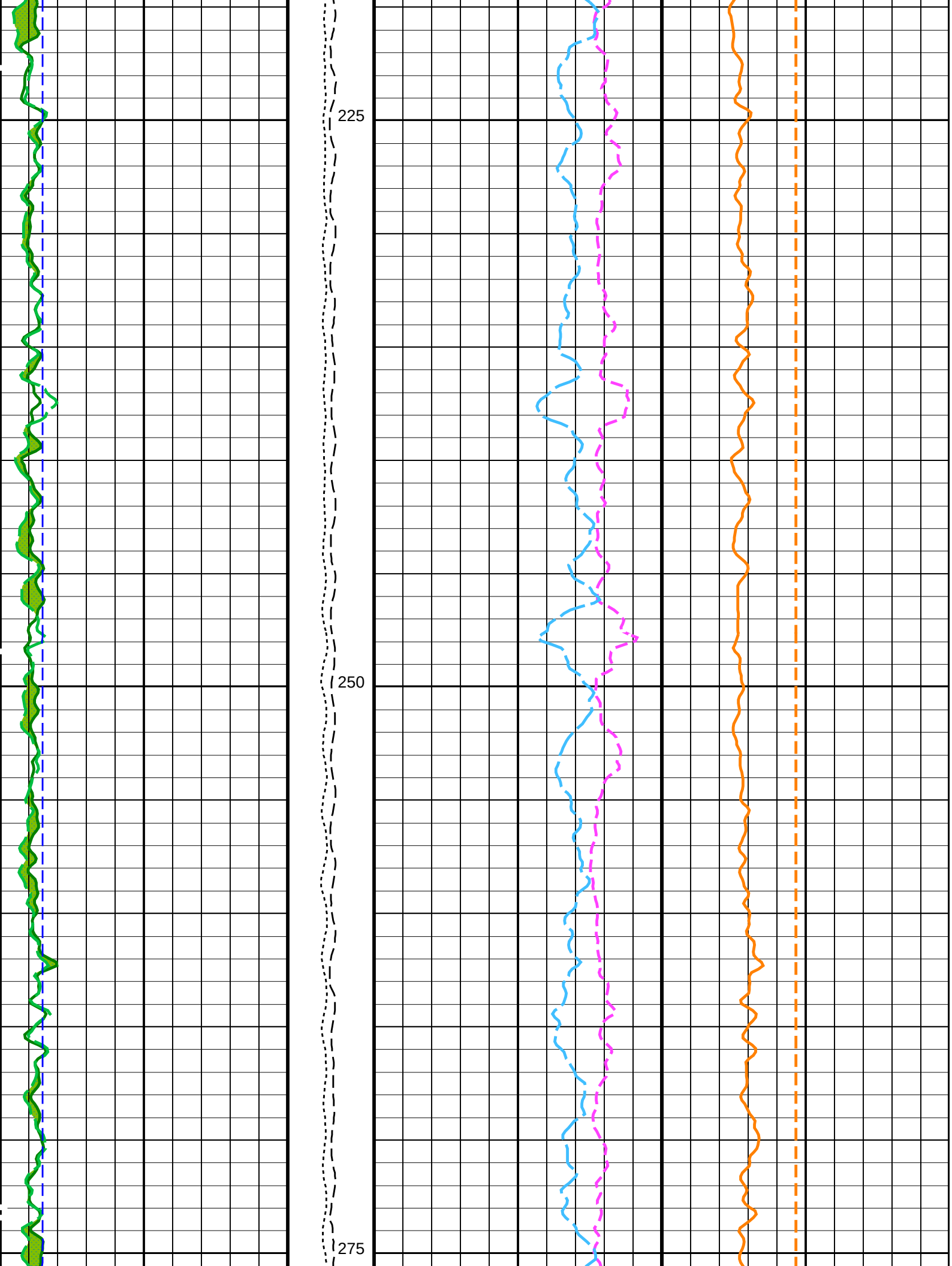


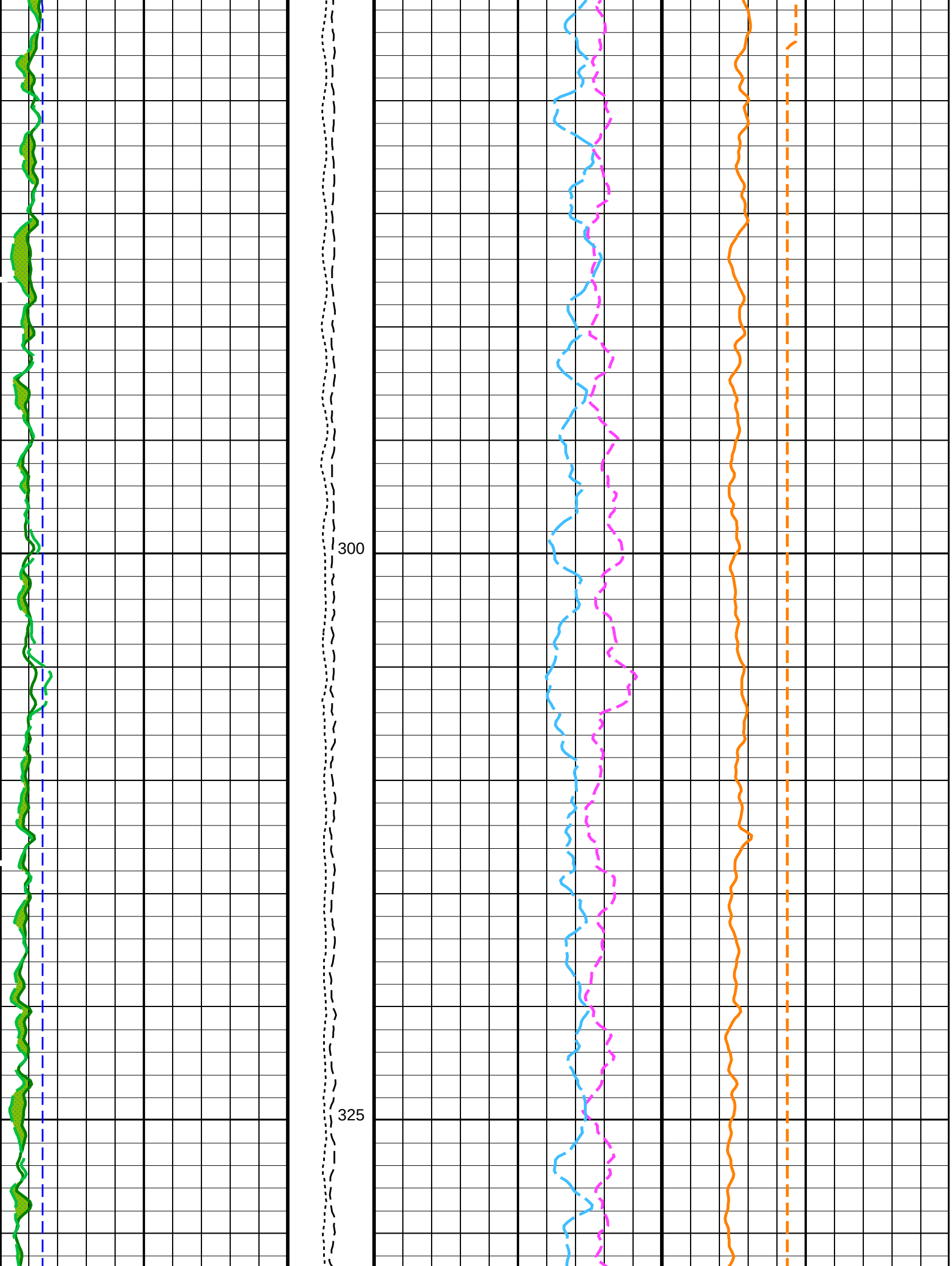

0
Sea Floor
25
50

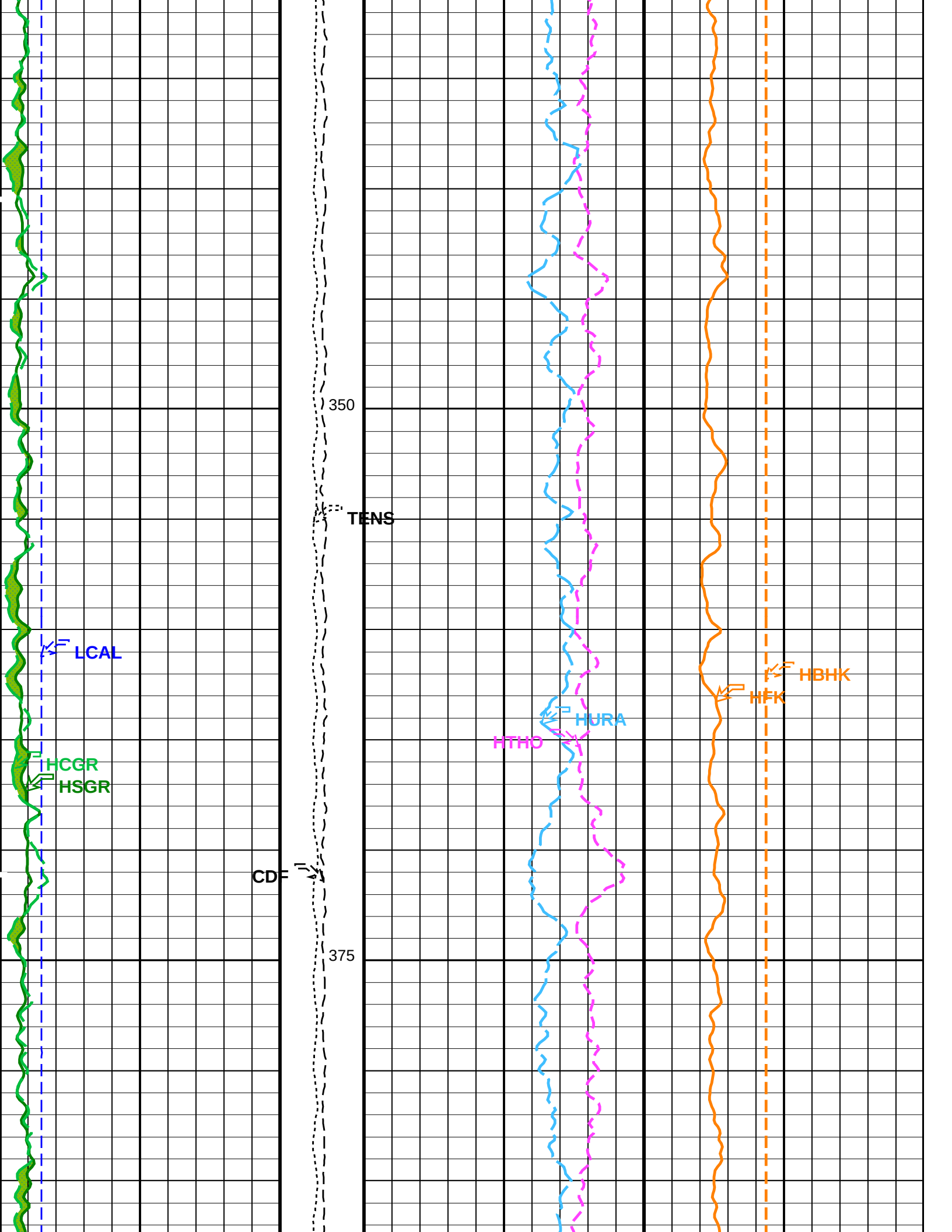

75
100

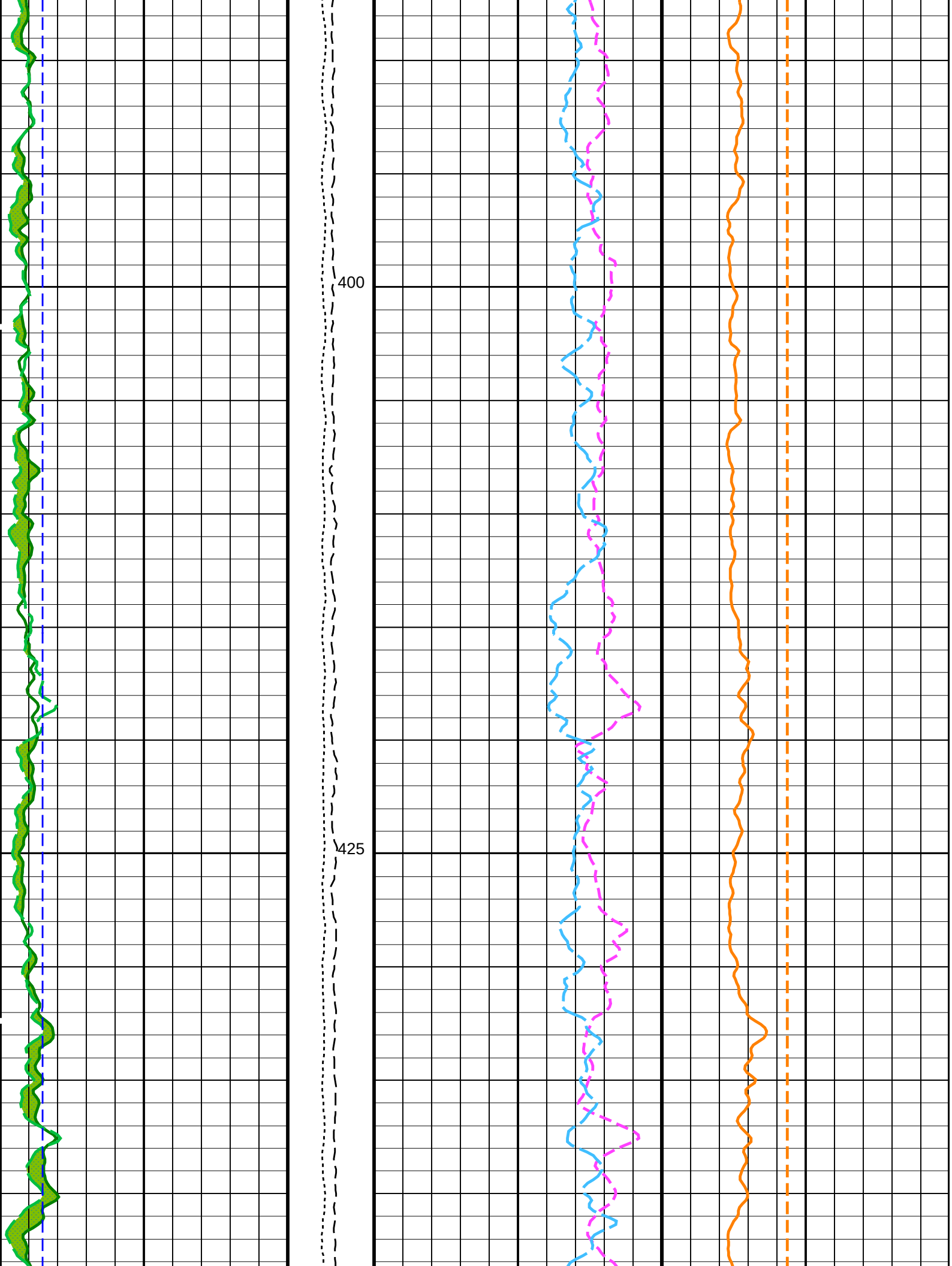

125
150

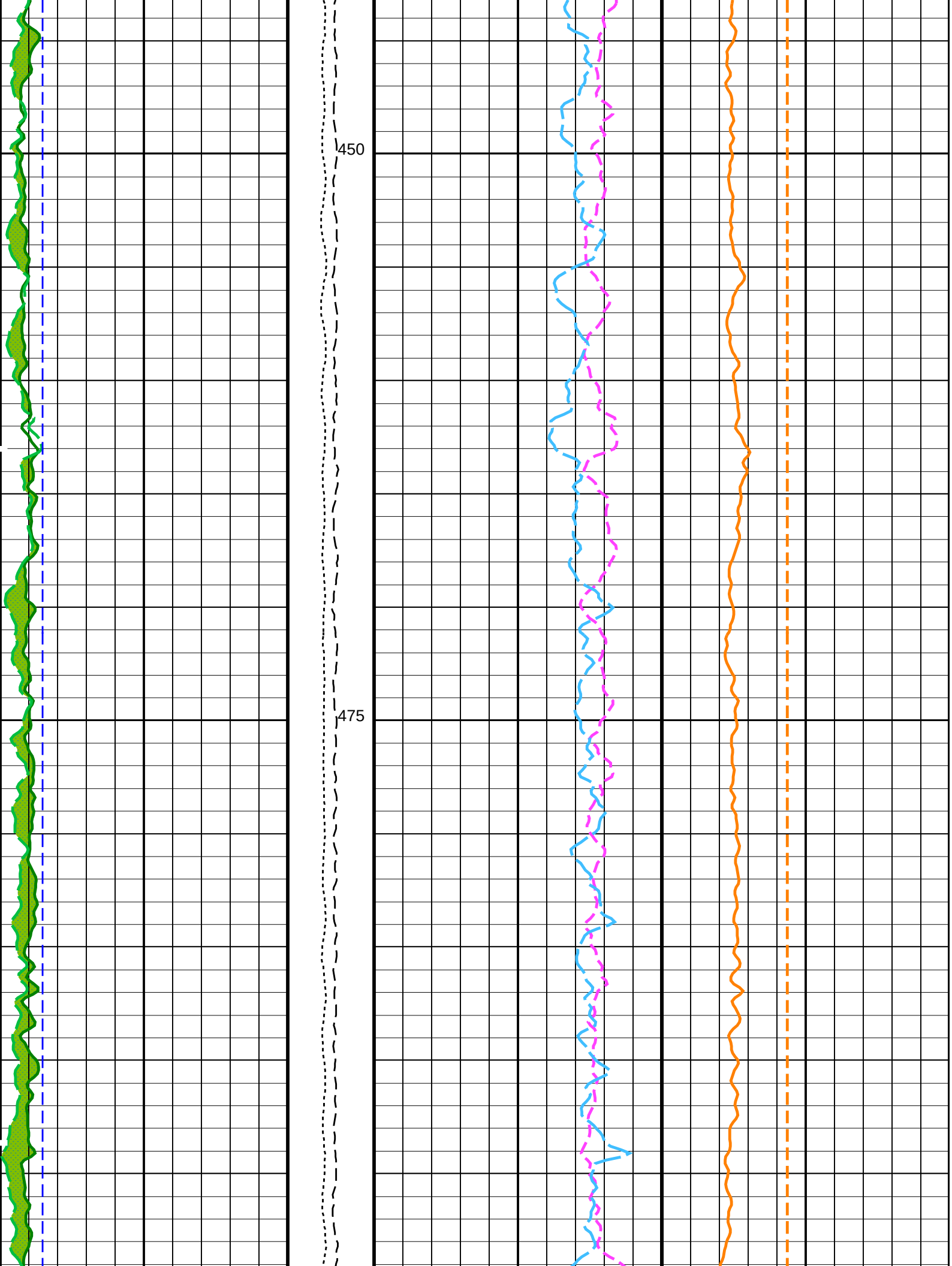

175
Drill Pipe
200

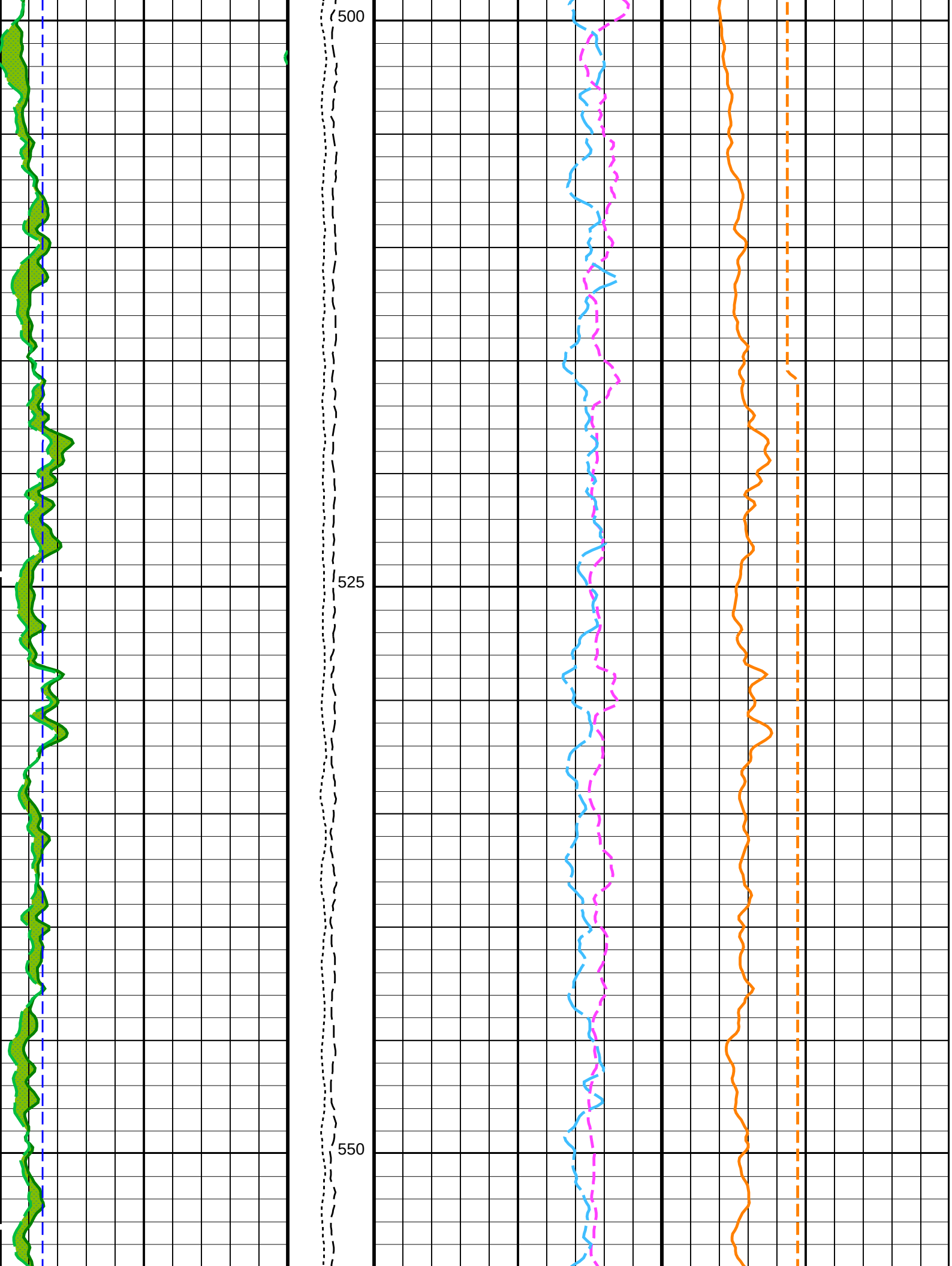

225
250
275

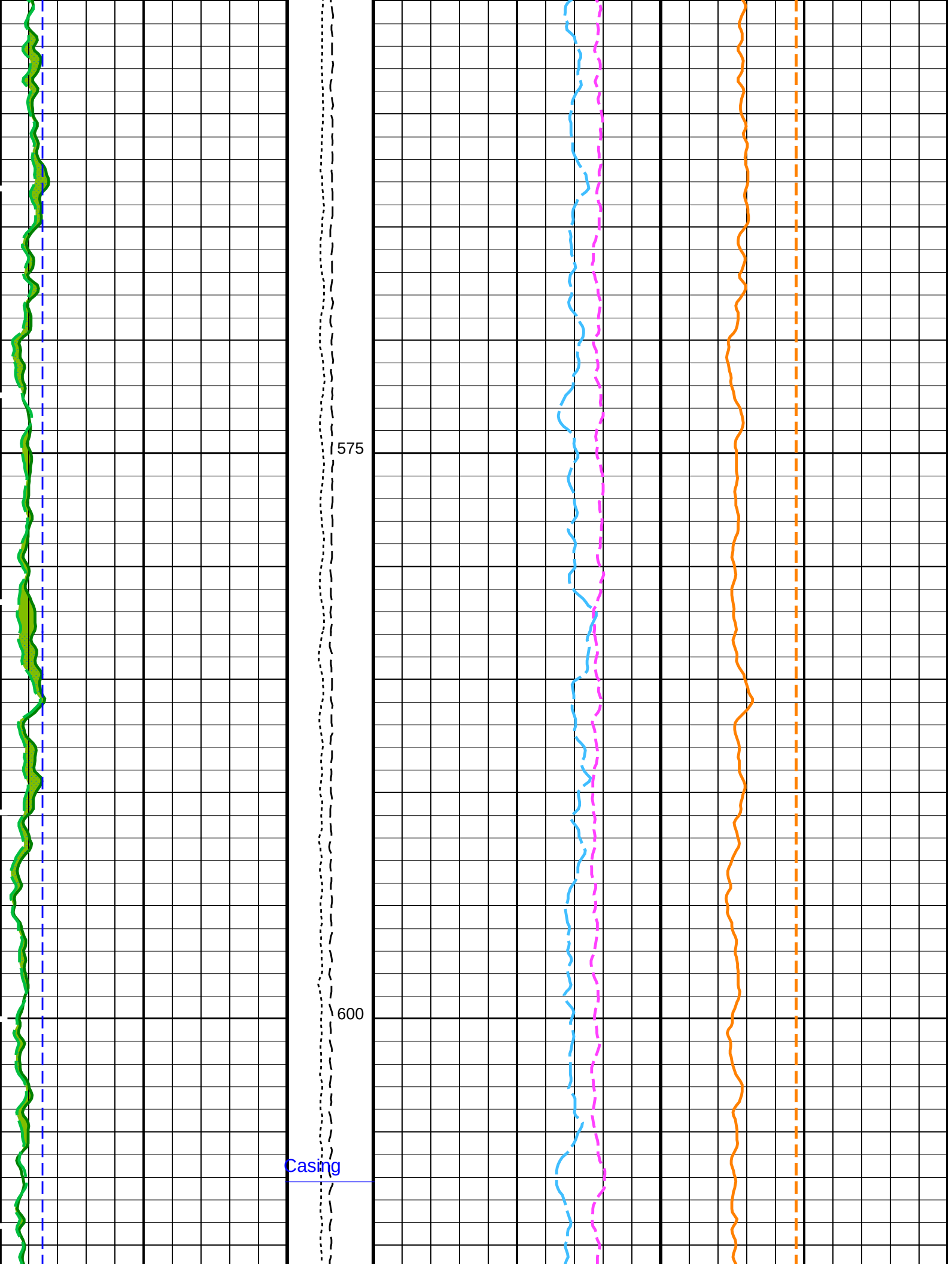

300
325

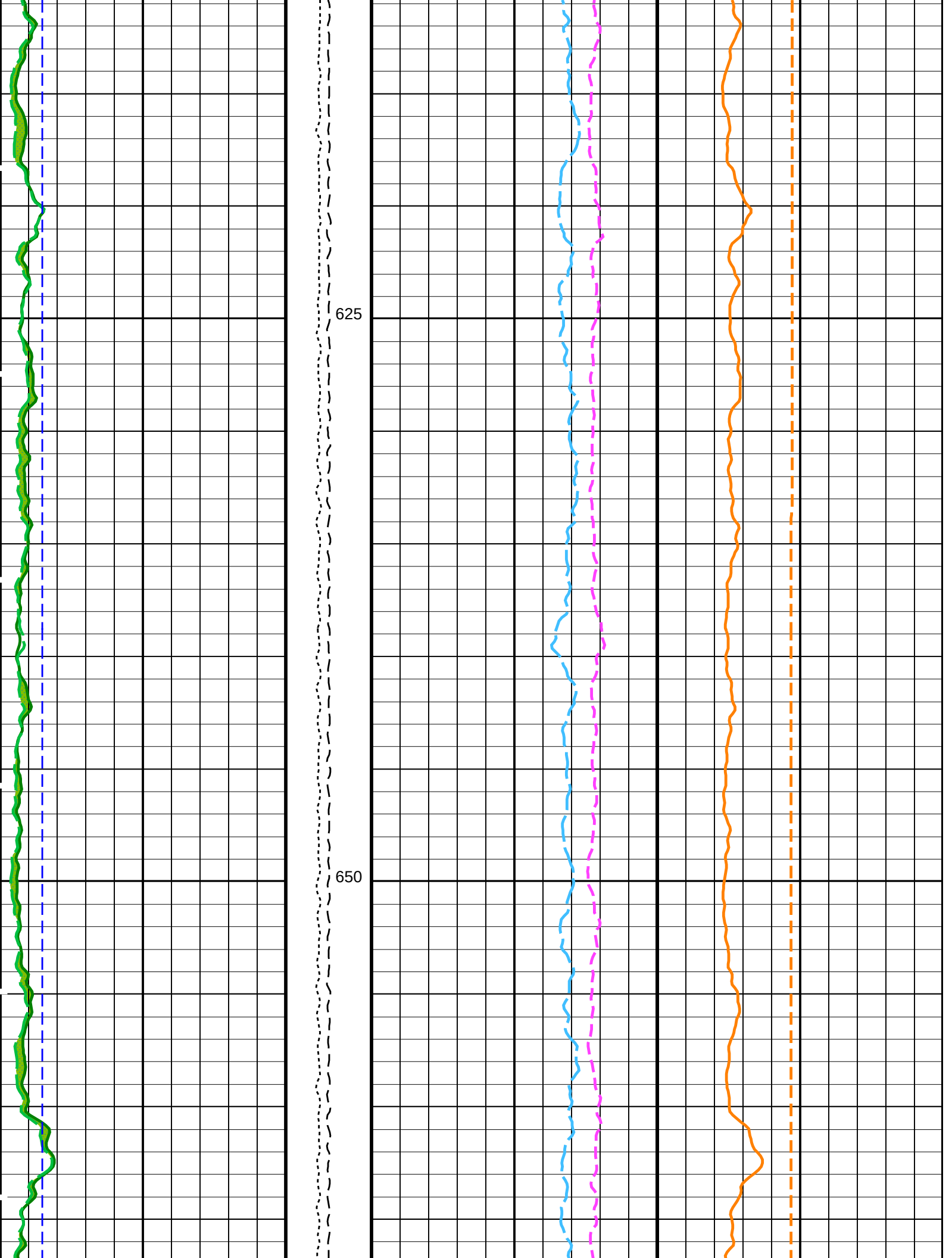

350
TENS
LCAL
HCGR
HSGR
CDF
375
HTHO
HURA
HFK
HBHK

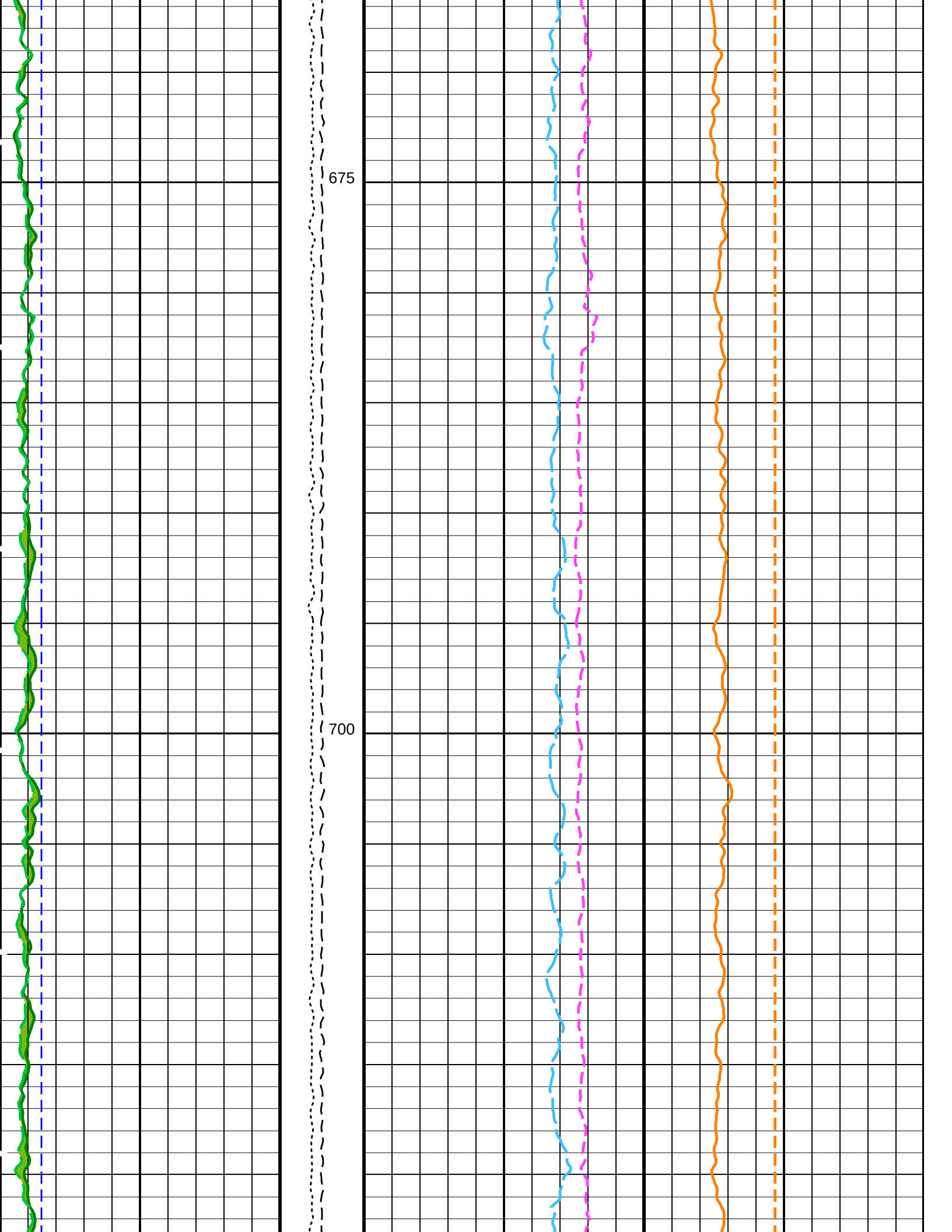

400
425

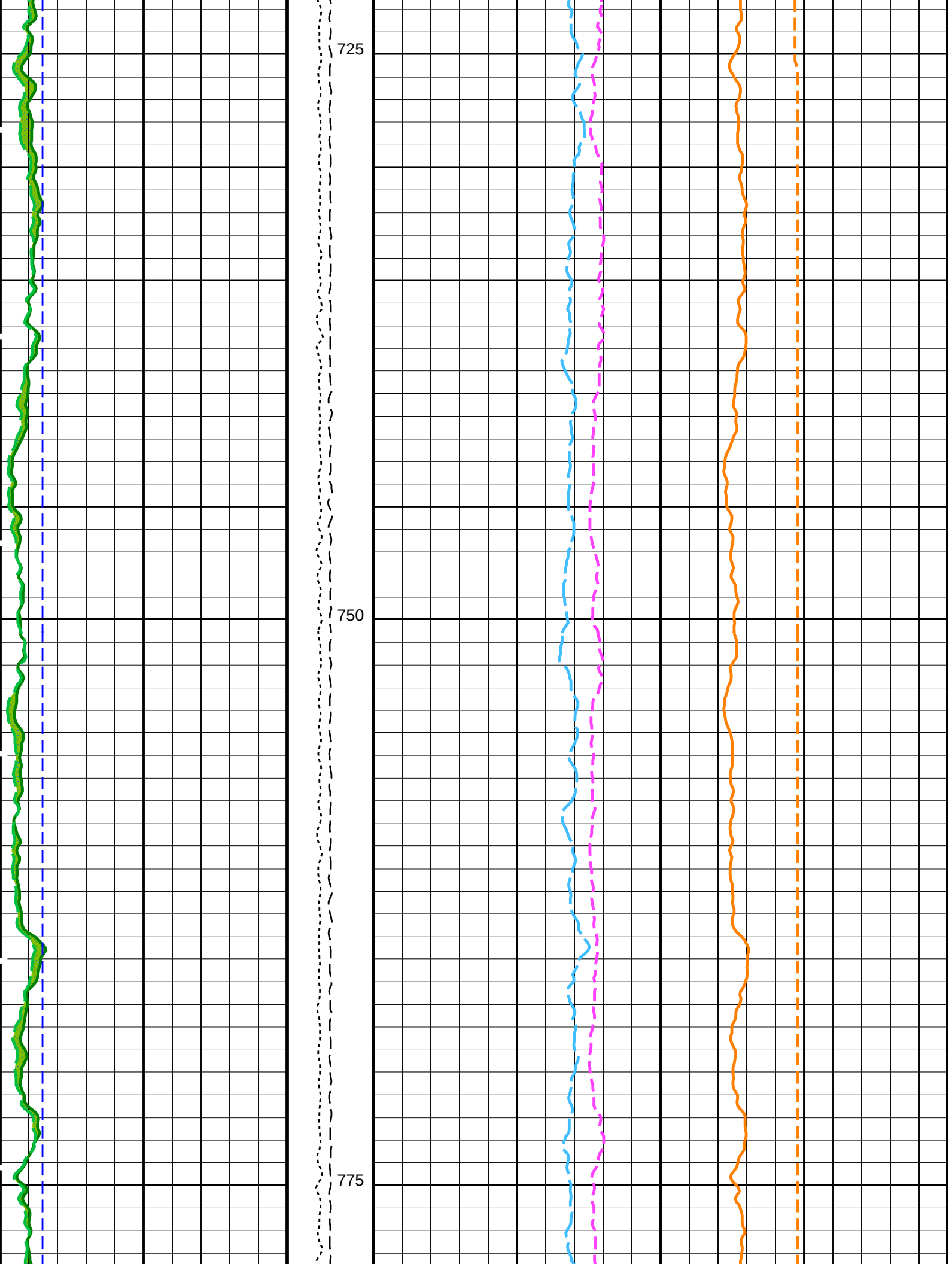

450
475

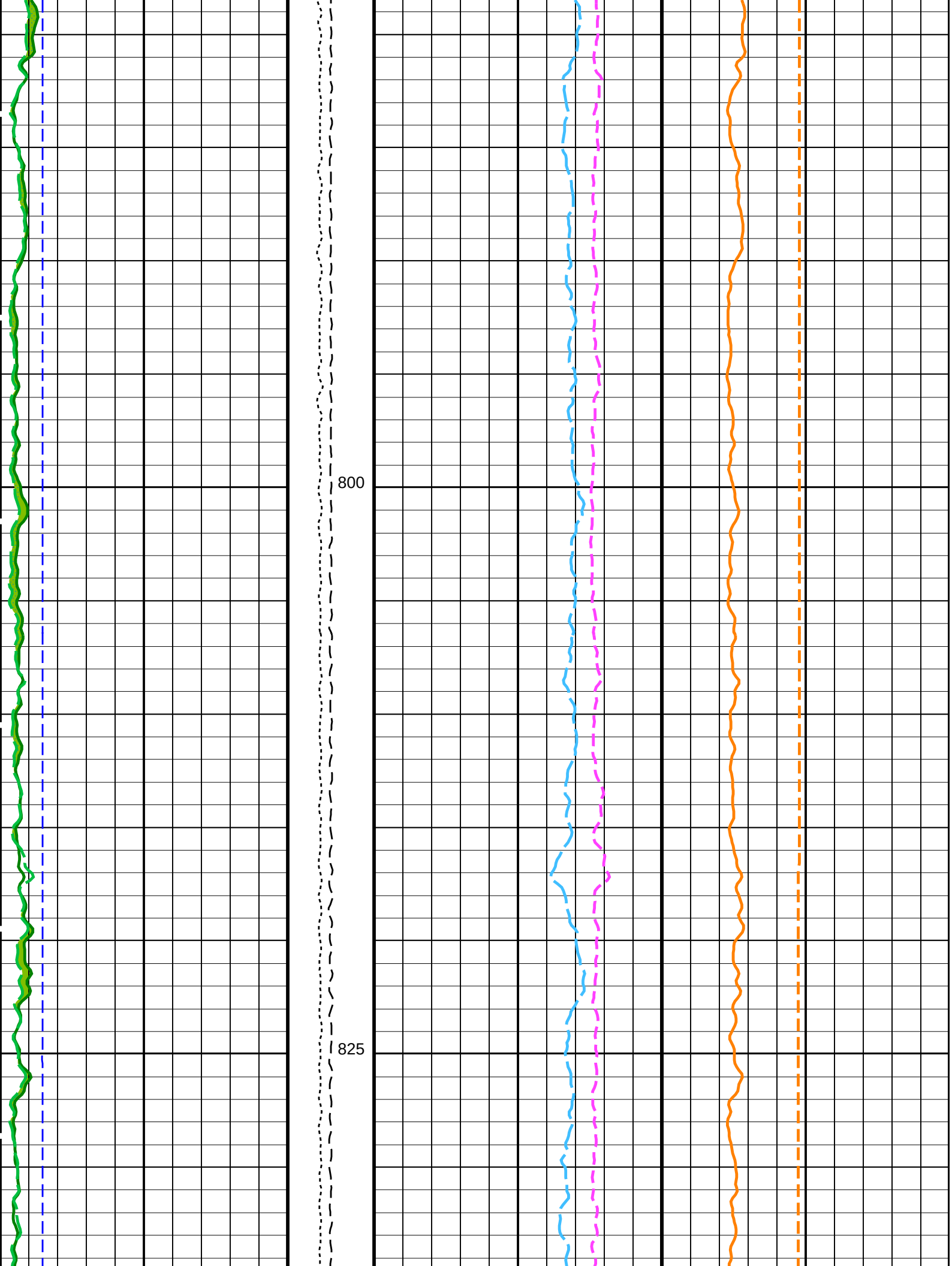

500
525
550

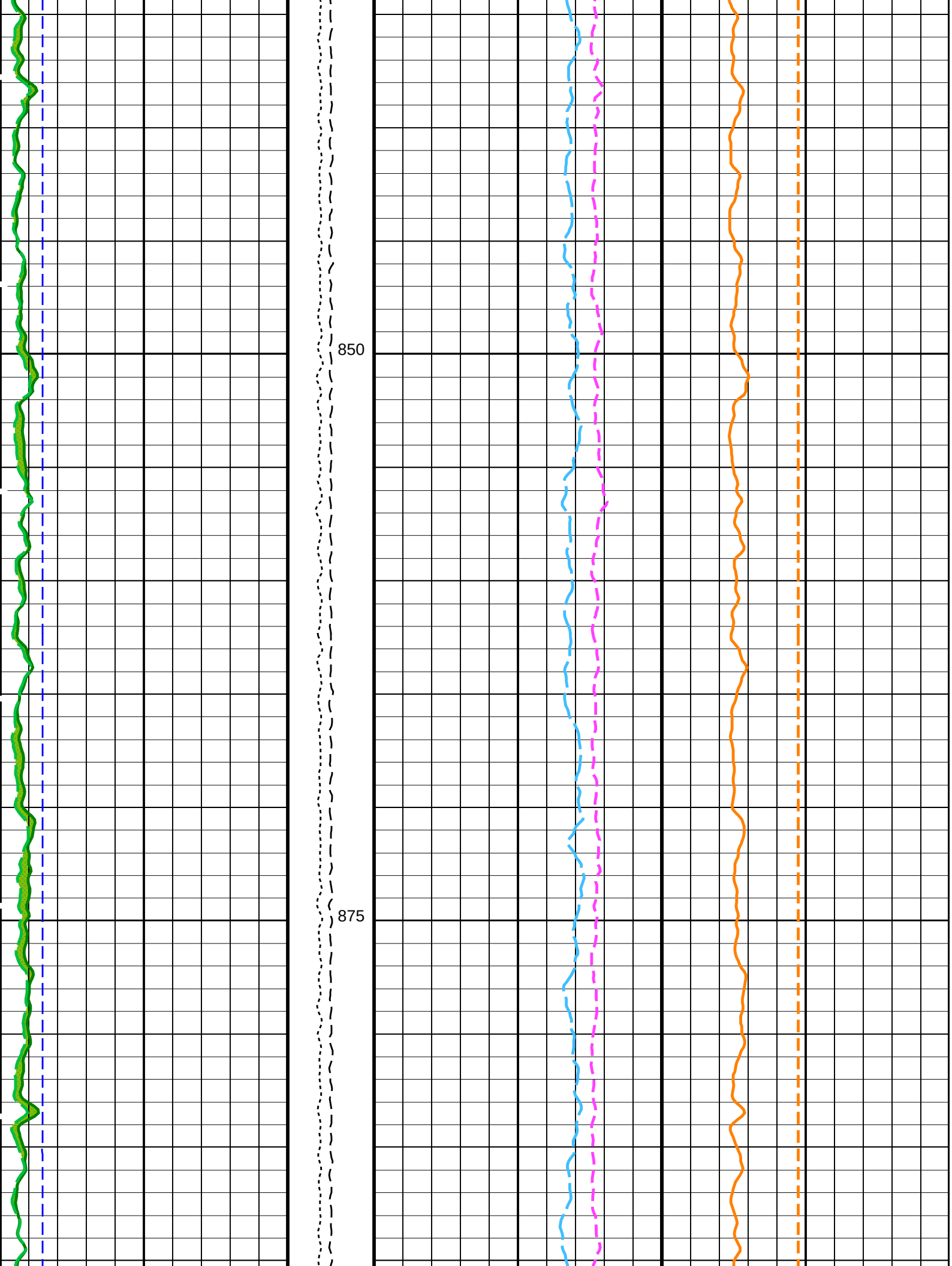

575
600
Casing

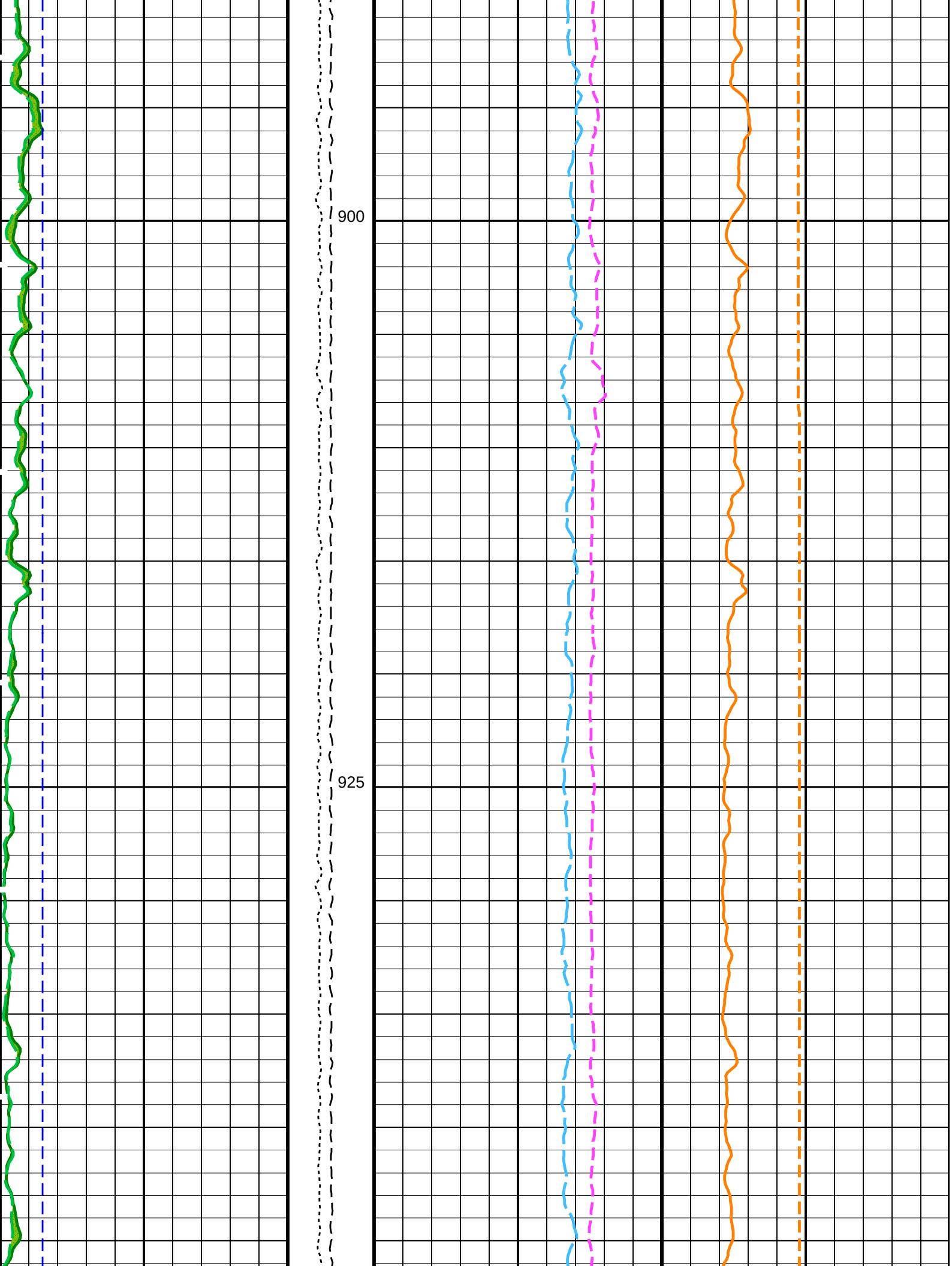

625
650

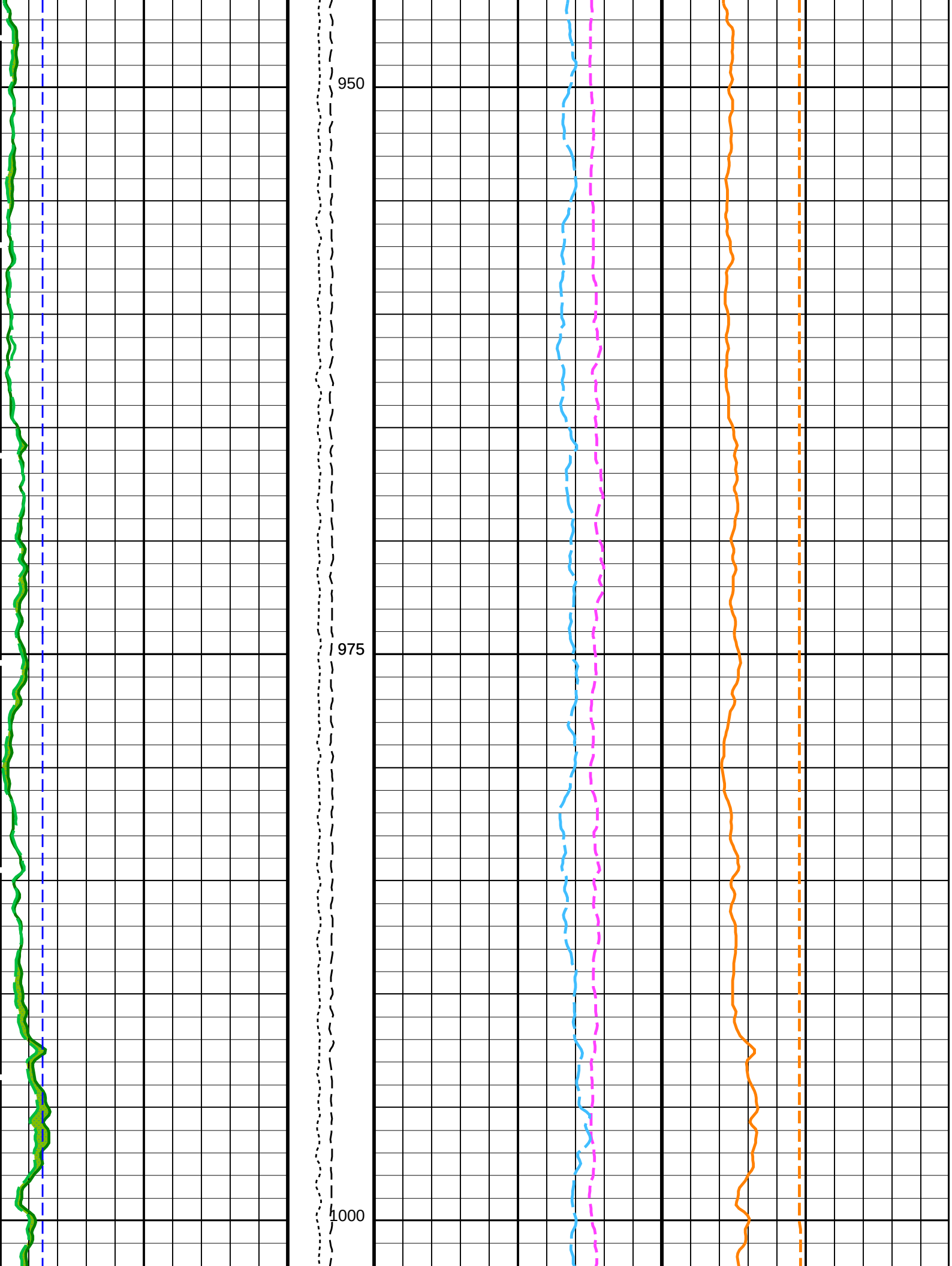

675
700

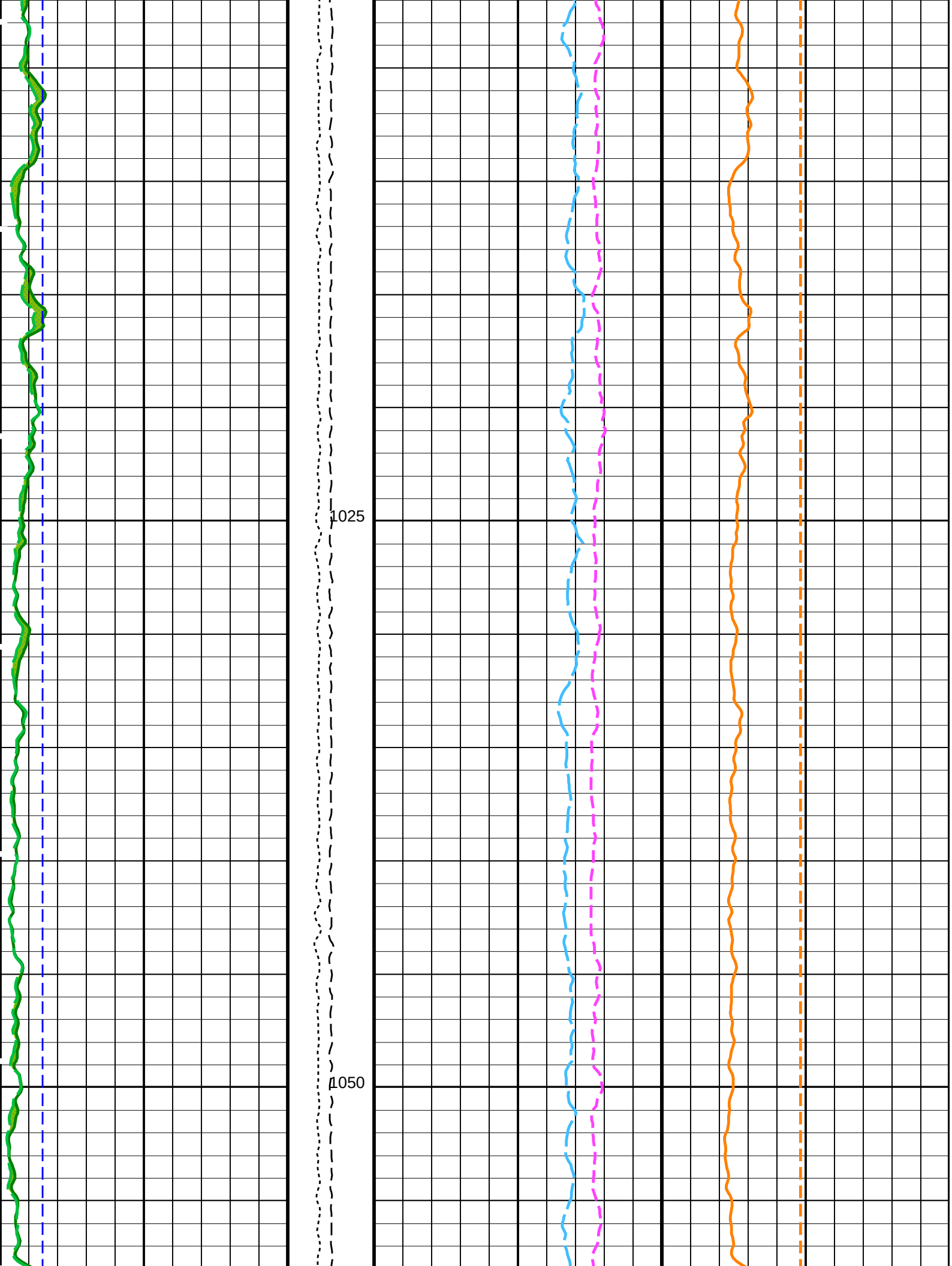

725
750
775

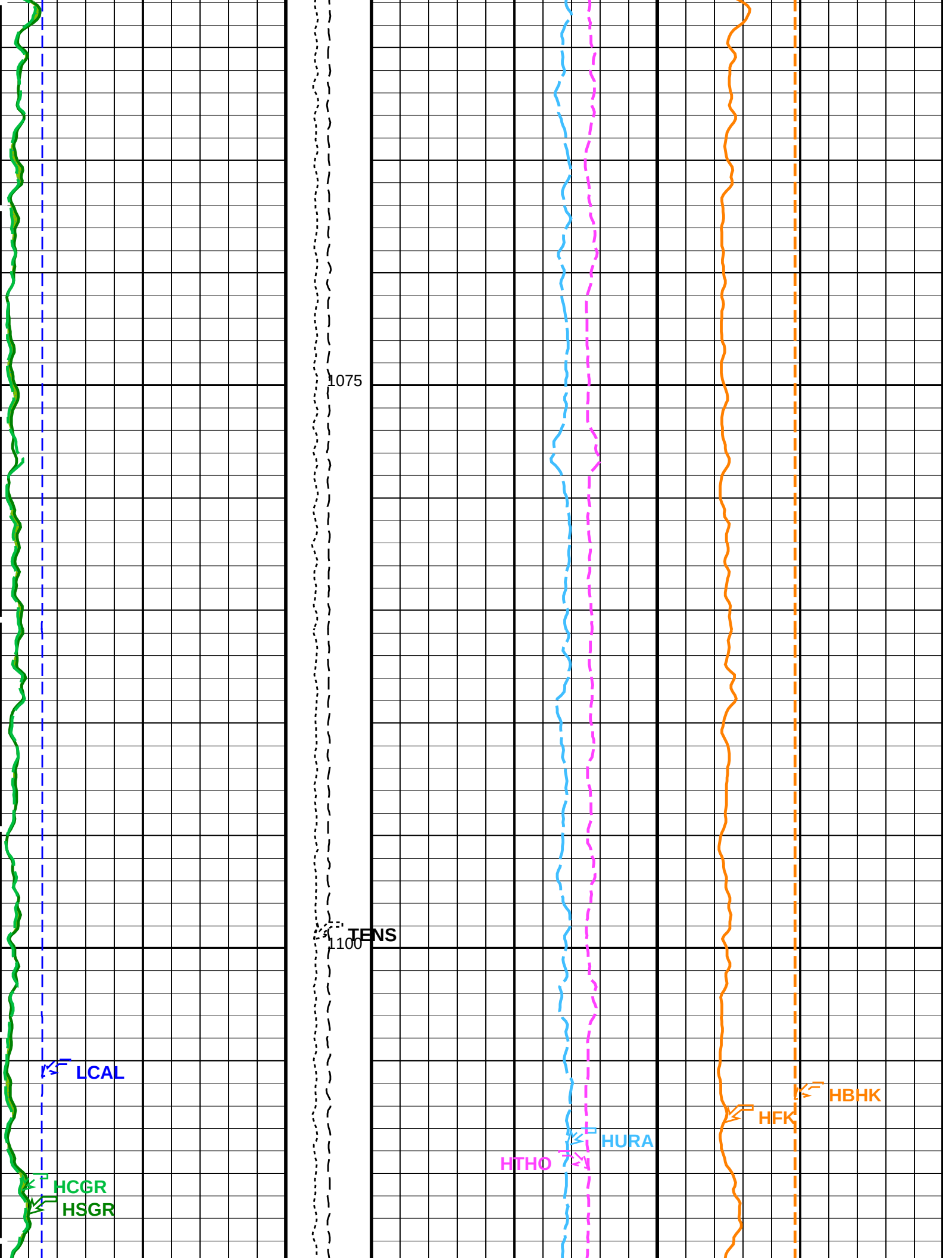

800
825

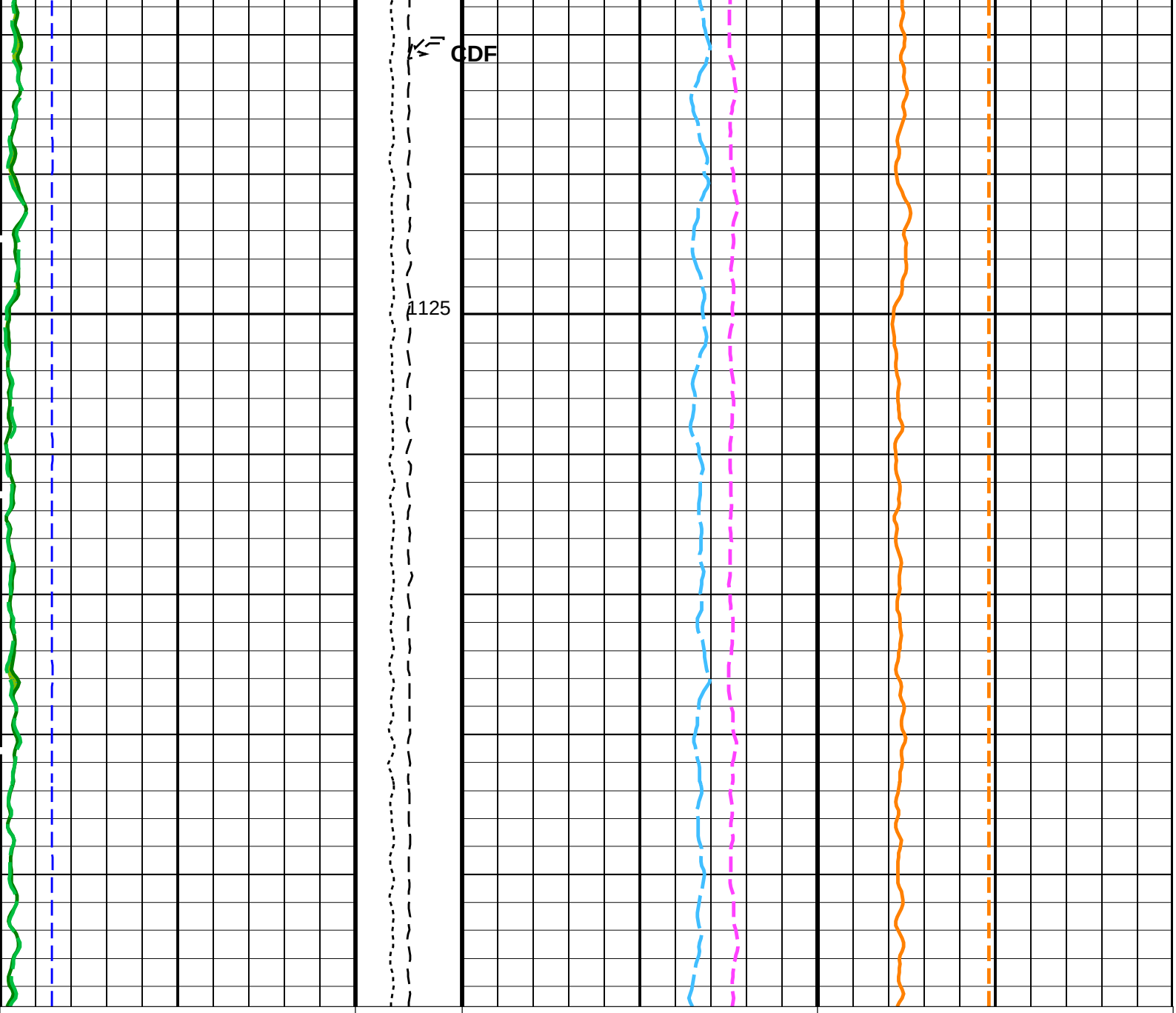

850
875


900
925


950
975
1000


1025
1050


1075
1100
TENS
LCAL
HCGR
HSGR
HTHO
HURA
HFK
HBHK



HLDS Caliper (LCAL)
0 (IN) 20

Tension (TENS) (LBF)
10000 0

HNGS Thorium (HTHO)
5 (PPM) 25

HNGS Potassium (HFK)
−0.01 (−−−−) 0.04

HNGS Computed Gamma Ray (HCGR)
0 (GAPI) 100

Calibrated Downhole Force (CDF) (LBF)
3000 0

HNGS Uranium (HURA)
−5 (PPM) 10

Area1
From HCGR to HSGR

HNGS Spectroscopy Gamma Ray (HSGR)
0 (GAPI) 100

Flipped Downlog, Sea Floor Depth

HNGS Borehole Potassium (HBHK)
−0.05 (−−−−) 0.05

PIP SUMMARY

Time Mark Every 60 S

Parameters

DLIS Name	Description	Value

HRLT−B: High Resolution Laterolog Array − B			
BHS	**Borehole Status**	**OPEN**	
GCSE	**Generalized Caliper Selection**	**BS**	
HNGS−BA: Hostile Natural Gamma Ray Sonde			
BAR1	**HNGS Detector 1 Barite Constant**	**1**	
BAR2	**HNGS Detector 2 Barite Constant**	**1**	
BHK	**HNGS Borehole Potassium Correction Concentration**	**0**	
BHS	**Borehole Status**	**OPEN**	
CSD1	**Inner Casing Outer Diameter**	**0**	**IN**
CSD2	**Outer Casing Outer Diameter**	**0**	**IN**
CSW1	**Inner Casing Weight**	**0**	**LB/F**
CSW2	**Outer Casing Weight**	**0**	**LB/F**
DBCC	**HNGS Barite Constant Correction Flag**	**NONE**	
GCSE	**Generalized Caliper Selection**	**BS**	
H1P	**HNGS Detector 1 Allow/Disallow In Processing**	**ALLOW**	
H2P	**HNGS Detector 2 Allow/Disallow In Processing**	**ALLOW**	
HABK	**HNGS Borehole Potassium Running Average**	**−0.00711471**	
HALF	**HNGS Alpha Filter Length**	**60**	**IN**
HCRB	**HNGS Apply Borehole Potassium Correction**	**NONE**	
HMWM	**Mud Weighting Material**	**NATU**	
HNPE	**HNGS Processing Enable**	**YES**	
S1BI	**HNGS Detector 1 Calibration Bismuth Count Rate**	**1.3**	**CPS**
S2BI	**HNGS Detector 2 Calibration Bismuth Count Rate**	**1.3**	**CPS**
SGRC	**HNGS Standard Gamma−Ray Correction Flag**	**YES**	
TPOS	**Tool Position**	**CENT**	
VBA1	**HNGS Detector 1 Variable Barite Factor Running Average**	**1.06202**	
VBA2	**HNGS Detector 2 Variable Barite Factor Running Average**	**1.06032**	
EDTC−B: Enhanced DTS Cartridge			
BHS	**Borehole Status**	**OPEN**	
GCSE	**Generalized Caliper Selection**	**BS**	
System and Miscellaneous			
BS	**Bit Size**	**9.875**	**IN**
DFD	**Drilling Fluid Density**	**1.03**	**G/C3**
DO	**Depth Offset for Playback**	**0.0**	**M**
PP	**Playback Processing**	**NORMAL**	

Format: HNGSYields **Vertical Scale: 1:200** **Graphics File Created: 23−Jul−2014 00:09**

OP System Version: 19C0−187

MSS_LDEO−A	**19C0−187**	**HRLT−B**	**19C0−187**
HLDS	**19C0−187**	**LDSC−B**	**19C0−187**
HNGC−B	**19C0−187**	**HNGS−BA**	**19C0−187**
EDTC−B	**SKK−5169−EDTCB**	**BSP**	**19C0−187**

Input DLIS Files

DEFAULT	**Flip_MSS_LDEO_HRLA_036PUP**	**PRODUCER**	**23−Jul−2014 00:04**	**1149.7 M**	**−49.5 M**

Output DLIS Files

DEFAULT	**MSS_LDEO_HRLA_LDL_038PUP**	**FN:45**	**PRODUCER**	**23−Jul−2014 00:09**

Calibration and Check Summary

Measurement	Nominal	Master	Before	After	Change	Limit	Units
High Resolution Laterolog Array − B Wellsite Calibration − HRLT M01							
Before: 21−Jul−2014 8:50 After: 21−Jul−2014 15:38							
HRLT M0−M1 Voltage Plus − 0	0	N/A	−319.0	−319.0	0.008270	9.681	UV
HRLT M0−M1 Voltage Plus − 1	0	N/A	−328.9	−332.6	−3.709	9.681	UV
HRLT M0−M1 Voltage Plus − 2	0	N/A	−331.0	−334.3	−3.314	9.681	UV
HRLT M0−M1 Voltage Plus − 3	0	N/A	−335.6	−337.9	−2.299	9.681	UV
HRLT M0−M1 Voltage Plus − 4	0	N/A	−325.2	−326.2	−0.9919	9.681	UV
HRLT M0−M1 Voltage Plus − 5	0	N/A	−321.7	−322.3	−0.6901	9.681	UV
HRLT M0−M1 Voltage Plus − 6	0	N/A	320.9	324.6	3.659	9.681	UV
HRLT M0−M1 Voltage Plus − 7	0	N/A	−322.7	−322.7	0	9.681	UV
High Resolution Laterolog Array − B Wellsite Calibration − HRLT M12							
Before: 21−Jul−2014 8:50 After: 21−Jul−2014 15:38							
HRLT M1−M2 Voltage Plus − 0	0	N/A	1755	1753	−2.365	53.42	UV
HRLT M1−M2 Voltage Plus − 1	0	N/A	1814	1830	15.92	53.42	UV
HRLT M1−M2 Voltage Plus − 2	0	N/A	1819	1833	13.87	53.42	UV
HRLT M1−M2 Voltage Plus − 3	0	N/A	1843	1851	8.708	53.42	UV

HRLT M1−M2 Voltage Plus −	4	0	N/A	1785	1787	2.206	53.42	UV
HRLT M1−M2 Voltage Plus −	5	0	N/A	1766	1767	0.5416	53.42	UV
HRLT M1−M2 Voltage Plus −	6	0	N/A	−1778	−1794	−15.82	53.42	UV
HRLT M1−M2 Voltage Plus −	7	0	N/A	1781	1781	0	53.42	UV

High Resolution Laterolog Array − B Wellsite Calibration − HRLT M23
Before: 21−Jul−2014 8:50 After: 21−Jul−2014 15:38

HRLT M2−M3 Voltage Plus −	0	0	N/A	1741	1738	−2.458	53.42	UV
HRLT M2−M3 Voltage Plus −	1	0	N/A	1811	1827	15.69	53.42	UV
HRLT M2−M3 Voltage Plus −	2	0	N/A	1818	1832	13.78	53.42	UV
HRLT M2−M3 Voltage Plus −	3	0	N/A	1845	1854	8.537	53.42	UV
HRLT M2−M3 Voltage Plus −	4	0	N/A	1781	1783	2.287	53.42	UV
HRLT M2−M3 Voltage Plus −	5	0	N/A	1763	1764	0.5970	53.42	UV
HRLT M2−M3 Voltage Plus −	6	0	N/A	−1766	−1781	−14.98	53.42	UV
HRLT M2−M3 Voltage Plus −	7	0	N/A	1781	1781	0	53.42	UV

High Resolution Laterolog Array − B Wellsite Calibration − HRLT V34
Before: 21−Jul−2014 8:50 After: 21−Jul−2014 15:38

HRLT A3−A4 Voltage Plus −	0	0	N/A	68420	68390	−29.48	2100	UV
HRLT A3−A4 Voltage Plus −	1	0	N/A	71000	71650	651.0	2100	UV
HRLT A3−A4 Voltage Plus −	2	0	N/A	71540	72120	585.8	2100	UV
HRLT A3−A4 Voltage Plus −	3	0	N/A	72880	73260	387.9	2100	UV
HRLT A3−A4 Voltage Plus −	4	0	N/A	70320	70440	126.3	2100	UV
HRLT A3−A4 Voltage Plus −	5	0	N/A	69620	69700	79.61	2100	UV
HRLT A3−A4 Voltage Plus −	6	0	N/A	−68220	−68850	−623.2	2100	UV
HRLT A3−A4 Voltage Plus −	7	0	N/A	70000	70000	0	2100	UV

High Resolution Laterolog Array − B Wellsite Calibration − HRLT V45
Before: 21−Jul−2014 8:50 After: 21−Jul−2014 15:38

HRLT A4−A5 Voltage Plus −	0	0	N/A	68690	68660	−28.23	2100	UV
HRLT A4−A5 Voltage Plus −	1	0	N/A	71380	72020	645.5	2100	UV
HRLT A4−A5 Voltage Plus −	2	0	N/A	71900	72480	573.4	2100	UV
HRLT A4−A5 Voltage Plus −	3	0	N/A	73210	73610	400.8	2100	UV
HRLT A4−A5 Voltage Plus −	4	0	N/A	70600	70740	142.4	2100	UV
HRLT A4−A5 Voltage Plus −	5	0	N/A	69900	69970	68.60	2100	UV
HRLT A4−A5 Voltage Plus −	6	0	N/A	−68570	−69230	−654.4	2100	UV
HRLT A4−A5 Voltage Plus −	7	0	N/A	70000	70000	0	2100	UV

High Resolution Laterolog Array − B Wellsite Calibration − HRLT V56
Before: 21−Jul−2014 8:50 After: 21−Jul−2014 15:38

HRLT A5−A6 Voltage Plus −	0	0	N/A	68590	68550	−38.27	2100	UV
HRLT A5−A6 Voltage Plus −	1	0	N/A	71100	71740	642.8	2100	UV
HRLT A5−A6 Voltage Plus −	2	0	N/A	71660	72250	585.8	2100	UV
HRLT A5−A6 Voltage Plus −	3	0	N/A	73030	73410	379.5	2100	UV
HRLT A5−A6 Voltage Plus −	4	0	N/A	70470	70600	129.0	2100	UV
HRLT A5−A6 Voltage Plus −	5	0	N/A	69780	69850	71.20	2100	UV
HRLT A5−A6 Voltage Plus −	6	0	N/A	−68310	−68940	−629.3	2100	UV
HRLT A5−A6 Voltage Plus −	7	0	N/A	70000	70000	0	2100	UV

High Resolution Laterolog Array − B Wellsite Calibration − HRLT VTP
Before: 21−Jul−2014 8:50 After: 21−Jul−2014 15:38

HRLT Torpedo−M0 Voltage −	0	0	N/A	−68280	−68240	33.55	2100	UV
HRLT Torpedo−M0 Voltage −	1	0	N/A	−71430	−72100	−672.0	2100	UV
HRLT Torpedo−M0 Voltage −	2	0	N/A	−71940	−72550	−610.8	2100	UV
HRLT Torpedo−M0 Voltage −	3	0	N/A	−73300	−73710	−407.2	2100	UV
HRLT Torpedo−M0 Voltage −	4	0	N/A	−70670	−70810	−143.0	2100	UV
HRLT Torpedo−M0 Voltage −	5	0	N/A	−69940	−70010	−75.42	2100	UV
HRLT Torpedo−M0 Voltage −	6	0	N/A	68570	69220	648.9	2100	UV
HRLT Torpedo−M0 Voltage −	7	0	N/A	−70000	−70000	0	2100	UV

High Resolution Laterolog Array − B Wellsite Calibration − HRLT VBD
Before: 21−Jul−2014 8:50 After: 21−Jul−2014 15:38

HRLT Bridle#9−M0 Voltage −	0	0	N/A	−68270	−68240	36.54	2100	UV
HRLT Bridle#9−M0 Voltage −	1	0	N/A	−71410	−72070	−663.3	2100	UV
HRLT Bridle#9−M0 Voltage −	2	0	N/A	−71930	−72530	−601.4	2100	UV
HRLT Bridle#9−M0 Voltage −	3	0	N/A	−73290	−73680	−389.1	2100	UV
HRLT Bridle#9−M0 Voltage −	4	0	N/A	−70660	−70800	−137.2	2100	UV
HRLT Bridle#9−M0 Voltage −	5	0	N/A	−69930	−70010	−80.99	2100	UV
HRLT Bridle#9−M0 Voltage −	6	0	N/A	68550	69200	649.8	2100	UV
HRLT Bridle#9−M0 Voltage −	7	0	N/A	−70000	−70000	0	2100	UV

High Resolution Laterolog Array − B Wellsite Calibration − HRLT ISO
Before: 21−Jul−2014 8:50 After: 21−Jul−2014 15:38

HRLT Source Current Plus −	0	0	N/A	284.7	284.5	−0.2152	8.520	UA
HRLT Source Current Plus −	1	0	N/A	281.1	281.1	0	8.520	UA
HRLT Source Current Plus −	2	0	N/A	281.1	281.1	0	8.520	UA
HRLT Source Current Plus −	3	0	N/A	281.1	281.1	0	8.520	UA
HRLT Source Current Plus −	4	0	N/A	281.1	281.1	0	8.520	UA
HRLT Source Current Plus −	5	0	N/A	281.1	281.1	0	8.520	UA
HRLT Source Current Plus −	6	0	N/A	281.1	281.1	0	8.520	UA
HRLT Source Current Plus −	7	0	N/A	281.1	281.1	0	8.520	UA

High Resolution Laterolog Array − B Wellsite Calibration − HRLT MV
Before: 21−Jul−2014 8:50 After: 21−Jul−2014 15:38

HRLT Vertical Voltage Pl − 0	0	N/A	−321.4	−321.5	−0.1011	9.681	UV
HRLT Vertical Voltage Pl − 1	0	N/A	−324.1	−327.5	−3.353	9.681	UV
HRLT Vertical Voltage Pl − 2	0	N/A	−325.2	−328.2	−2.906	9.681	UV
HRLT Vertical Voltage Pl − 3	0	N/A	−327.7	−329.8	−2.080	9.681	UV
HRLT Vertical Voltage Pl − 4	0	N/A	−314.6	−315.5	−0.9247	9.681	UV
HRLT Vertical Voltage Pl − 5	0	N/A	−326.1	−326.7	−0.5971	9.681	UV
HRLT Vertical Voltage Pl − 6	0	N/A	329.1	332.6	3.496	9.681	UV
HRLT Vertical Voltage Pl − 7	0	N/A	−322.7	−322.7	0	9.681	UV

Hostile Litho−Density Sonde Wellsite Calibration − Background Measurement
Master: 16−Jul−2014 4:36 Before: 17−Jul−2014 5:36 After: 17−Jul−2014 5:45

SS Cs Resolution Bkg	9.000	8.061	8.076	7.968	−0.1079	1.800	%
LS Cs Resolution Bkg	9.000	8.137	8.180	8.175	−0.005135	1.800	%
LSW1 Background	100.0	69.74	68.24	70.48	2.248	0.03000	CPS
LSW2 Background	100.0	63.61	64.16	63.74	−0.4206	0.03000	CPS
LSW3 Background	200.0	141.8	137.9	141.1	3.244	0.03000	CPS
LSW4 Background	250.0	172.4	171.0	170.7	−0.2442	0.03000	CPS
LSW5 Background	600.0	395.0	391.5	393.4	1.954	0.03000	CPS
SSW1 Background	100.0	78.54	77.29	78.86	1.570	0.03000	CPS
SSW2 Background	200.0	139.1	138.0	138.2	0.2109	0.03000	CPS
SSW3 Background	500.0	371.9	374.7	371.5	−3.237	0.03000	CPS
SSW4 Background	270.0	195.4	192.7	195.5	2.744	0.03000	CPS
SSW5 Background	200.0	142.5	140.4	142.0	1.542	0.03000	CPS

Hostile Litho−Density Sonde Wellsite Calibration − Aluminum Measurement
Master: 16−Jul−2014 5:05

LSW1 Aluminum	600.0	508.4	N/A	N/A	N/A	N/A	CPS
LSW2 Aluminum	900.0	733.7	N/A	N/A	N/A	N/A	CPS
LSW3 Aluminum	1100	883.4	N/A	N/A	N/A	N/A	CPS
LSW4 Aluminum	580.0	447.4	N/A	N/A	N/A	N/A	CPS
LSW5 Aluminum	570.0	407.5	N/A	N/A	N/A	N/A	CPS
SSW1 Aluminum	2800	2389	N/A	N/A	N/A	N/A	CPS
SSW2 Aluminum	8000	6455	N/A	N/A	N/A	N/A	CPS
SSW3 Aluminum	11600	8951	N/A	N/A	N/A	N/A	CPS
SSW4 Aluminum	5000	3637	N/A	N/A	N/A	N/A	CPS
SSW5 Aluminum	660.0	442.1	N/A	N/A	N/A	N/A	CPS

Hostile Litho−Density Sonde Wellsite Calibration − Lithology Measurement
Master: 16−Jul−2014 4:57

LSW1 Iron	400.0	349.8	N/A	N/A	N/A	N/A	CPS
LSW2 Iron	730.0	590.1	N/A	N/A	N/A	N/A	CPS
LSW3 Iron	1000	785.3	N/A	N/A	N/A	N/A	CPS
LSW4 Iron	520.0	408.9	N/A	N/A	N/A	N/A	CPS
LSW5 Iron	470.0	376.5	N/A	N/A	N/A	N/A	CPS
SSW1 Iron	2100	1743	N/A	N/A	N/A	N/A	CPS
SSW2 Iron	6800	5378	N/A	N/A	N/A	N/A	CPS
SSW3 Iron	10800	8163	N/A	N/A	N/A	N/A	CPS
SSW4 Iron	4600	3323	N/A	N/A	N/A	N/A	CPS
SSW5 Iron	580.0	390.1	N/A	N/A	N/A	N/A	CPS

Hostile Litho−Density Sonde Wellsite Calibration − Caliper Calibration
Before: 17−Jul−2014 5:38

HLDS Caliper Small Ring	12.00	N/A	15.84	N/A	N/A	N/A	IN
HLDS Caliper Large Ring	15.19	N/A	19.69	N/A	N/A	N/A	IN

Hostile Natural Gamma Ray Sonde Wellsite Calibration − Detector 1 Check
Master: 15−Jul−2014 0:16 Before: 15−Jul−2014 8:28 After: 15−Jul−2014 8:42

Na 511 Peak Loc	40.00	39.57	39.75	39.77	0.02731	1.000	
Na 511 Peak Res	15.50	15.78	15.47	15.60	0.1276	2.000	%
High Voltage	1150	1197	1198	1197	−0.5396	N/A	V
Na 1785 Peak Loc	142.6	142.4	143.3	142.8	−0.5427	7.000	
Na 1785 Peak Res	8.500	9.334	9.234	8.659	−0.5749	2.000	%
Temperature	15.50	37.42	37.47	37.56	0.09754	N/A	DEGC
Na Count Rate	45.00	10.91	10.93	10.90	−0.02571	8.000	CPS

Hostile Natural Gamma Ray Sonde Wellsite Calibration − Detector 2 Check
Master: 15−Jul−2014 0:16 Before: 15−Jul−2014 8:28 After: 15−Jul−2014 8:42

Na 511 Peak Loc	40.00	39.46	39.66	39.81	0.1556	1.000	
Na 511 Peak Res	15.50	16.20	15.73	15.53	−0.2004	2.000	%
High Voltage	1150	1129	1129	1130	1.742	N/A	V
Na 1785 Peak Loc	142.6	141.8	140.1	143.7	3.554	7.000	
Na 1785 Peak Res	8.500	10.06	10.03	8.567	−1.463	2.000	%
Temperature	15.50	38.37	38.33	38.34	0.006504	N/A	DEGC
Na Count Rate	45.00	11.54	11.55	11.30	−0.2470	8.000	CPS

Hostile Natural Gamma Ray Sonde Wellsite Calibration − Ratio Of Detector 1 To Detector 2
Master: 15−Jul−2014 0:16 Before: 15−Jul−2014 8:28 After: 15−Jul−2014 8:42

Coincidence Count Rate Ratio	1.000	0.9495	0.9508	0.9685	0.01775	0.05000	

Hostile Natural Gamma Ray Sonde Master Calibration − Detector 1 Calibration
Master: 14−Jul−2014 23:07

Na 511 Peak Set Point	40.00	41.00	−−	−−	−−	−−	
Th Peak Loc	209.6	210.1	−−	−−	−−	−−	
Th Peak Res	7.000	7.101	−−	−−	−−	−−	%
Background Count Rate	142.5	15.67	−−	−−	−−	−−	CPS
Gain Ratio	1.000	1.010	−−	−−	−−	−−	

Hostile Natural Gamma Ray Sonde Master Calibration − Detector 2 Calibration
Master: 14−Jul−2014 23:07

Na 511 Peak Set Point	40.00	41.00	−−	−−	−−	−−	
Th Peak Loc	209.6	207.2	−−	−−	−−	−−	
Th Peak Res	7.000	7.470	−−	−−	−−	−−	%
Background Count Rate	142.5	15.79	−−	−−	−−	−−	CPS
Gain Ratio	1.000	0.9988	−−	−−	−−	−−	

Enhanced DTS Cartridge Wellsite Calibration − EDTC Accelerometer Calibration
Before: 21−Jul−2014 8:50

EDTC Z−Axis Acceleration	9.810	N/A	9.759	N/A	N/A	N/A	M/S2

Enhanced DTS Cartridge Wellsite Calibration − Detector Calibration
Before: 15−Jul−2014 8:25 After: 15−Jul−2014 8:38

Gamma Ray (Jig − Bkg)	154.0	N/A	154.0	158.6	4.600	14.00	GAPI
Gamma Ray (Calibrated)	164.0	N/A	164.0	168.9	4.899	15.00	GAPI

High Resolution Laterolog Array − B / Equipment Identification

Primary Equipment:		
HRLT Sonde	HRLS − B	768
Auxiliary Equipment:		
HRLT lower Housing	HRLH − B	968
HRLT Lower Cartridge	HRLC − B	974
HRLT upper Housing	HRUH − B	978
HRLT Upper Cartridge	HRUC − B	764

Hostile Litho−Density Sonde / Equipment Identification

Primary Equipment:		
Hostile Litho Density Sonde	HLDS − D	45
Hostile Litho Density High Voltage	HLDV − D	45
Gamma Source Radioactive	GSR − Z	8113
Auxiliary Equipment:		
Hostile Litho Density Pad	HLDP − C	45
Hostile Litho Density High Voltage Housi	HEH − H	47

Litho−Density Spectroscopy Cartridge − B / Equipment Identification

Primary Equipment:		
LDSC Cartridge	LDSC − B	521
Auxiliary Equipment:		
LDSC Housing	LDSH − A	319

Hostile Natural Gamma Ray Cartridge − B / Equipment Identification

Primary Equipment:		
HNGC Cartridge	HNGC − B	300
Auxiliary Equipment:		
HNGC Housing	HNGH − A	115

Hostile Natural Gamma Ray Sonde / Equipment Identification

Primary Equipment:		
HNGS Sonde	HNGS − BA	194
Auxiliary Equipment:		
HNGS Sonde Housing	HNSH − BA	205
Gamma Source Radioactive	GSR − U	616008

Hostile Natural Gamma Ray Sonde Wellsite Calibration

Detector 1 Check

Phase	Na 511 Peak Loc	Value
Master		39.57
Before		39.75
After		39.77
	37.50 (Minimum) 40.00 (Nominal) 43.50 (Maximum)	

Phase	Na 511 Peak Res %	Value
Master		15.78
Before		15.47
After		15.60
	12.00 (Minimum) 15.50 (Nominal) 19.00 (Maximum)	

Phase	High Voltage V	Value
Master		1197
Before		1198
After		1197
	900.0 (Minimum) 1150 (Nominal) 1600 (Maximum)	

Phase	Na 1785 Peak Loc	Value
Master		142.4
Before		143.3
After		142.8
	135.0 (Minimum) 142.6 (Nominal) 150.3 (Maximum)	

Phase	Na 1785 Peak Res %	Value
Master		9.334
Before		9.234
After		8.659
	7.000 (Minimum) 8.500 (Nominal) 11.00 (Maximum)	

Phase	Temperature DEGC	Value
Master		37.42
Before		37.47
After		37.56
	−28.89 (Minimum) 15.50 (Nominal) 60.00 (Maximum)	

Phase	Na Count Rate CPS	Value
Master		10.91
Before		10.93
After		10.90
	10.00 (Minimum) 45.00 (Nominal) 100.0 (Maximum)	

Master: 15−Jul−2014 0:16 Before: 15−Jul−2014 8:28 After: 15−Jul−2014 8:42

Hostile Natural Gamma Ray Sonde Wellsite Calibration

Detector 2 Check

Phase	Na 511 Peak Loc	Value
Master		39.46
Before		39.66
After		39.81
	37.50 (Minimum) 40.00 (Nominal) 43.50 (Maximum)	

Phase	Na 511 Peak Res %	Value
Master		16.20
Before		15.73
After		15.53
	12.00 (Minimum) 15.50 (Nominal) 19.00 (Maximum)	

Phase	High Voltage V	Value
Master		1129
Before		1129
After		1130
	900.0 (Minimum) 1150 (Nominal) 1600 (Maximum)	

Phase	Na 1785 Peak Loc	Value
Master		141.8
Before		140.1
After		143.7
	135.0 (Minimum) 142.6 (Nominal) 150.3 (Maximum)	

Phase	Na 1785 Peak Res %	Value
Master		10.06
Before		10.03
After		8.567
	7.000 (Minimum) 8.500 (Nominal) 11.00 (Maximum)	

Phase	Temperature DEGC	Value
Master		38.37
Before		38.33
After		38.34
	−28.89 (Minimum) 15.50 (Nominal) 60.00 (Maximum)	

Phase	Na Count Rate CPS	Value
Master		11.54
Before		11.55
After		11.30
	10.00 (Minimum) 45.00 (Nominal) 100.0 (Maximum)	

Master: 15−Jul−2014 0:16 Before: 15−Jul−2014 8:28 After: 15−Jul−2014 8:42

Hostile Natural Gamma Ray Sonde Wellsite Calibration

Ratio Of Detector 1 To Detector 2

Phase	Coincidence Count Rate Ratio	Value
Master	EXCEEDS LIMIT	0.9495
Before		0.9508
After		0.9685
	0.9500 (Minimum) 1.000 (Nominal) 1.050 (Maximum)	

Master: 15−Jul−2014 0:16
Before: 15−Jul−2014 8:28
After: 15−Jul−2014 8:42

Hostile Natural Gamma Ray Sonde Master Calibration

Detector 1 Calibration

Phase	Na 511 Peak Set Point	Value	Phase	Th Peak Loc	Value	Phase	Th Peak Res %	Value
Master		41.00	Master		210.1	Master		7.101
	38.00 (Minimum) 40.00 (Nominal) 43.00 (Maximum)			201.0 (Minimum) 209.6 (Nominal) 218.3 (Maximum)			5.000 (Minimum) 7.000 (Nominal) 9.000 (Maximum)	

Phase	Background Count Rate CPS	Value	Phase	Gain Ratio	Value
Master		15.67	Master		1.010
	10.00 (Minimum) 142.5 (Nominal) 265.0 (Maximum)			0.9400 (Minimum) 1.000 (Nominal) 1.060 (Maximum)	

Master: 14−Jul−2014 23:07

Hostile Natural Gamma Ray Sonde Master Calibration

Detector 2 Calibration

Phase	Na 511 Peak Set Point	Value	Phase	Th Peak Loc	Value	Phase	Th Peak Res %	Value
Master		41.00	Master		207.2	Master		7.470
	38.00 (Minimum) 40.00 (Nominal) 43.00 (Maximum)			201.0 (Minimum) 209.6 (Nominal) 218.3 (Maximum)			5.000 (Minimum) 7.000 (Nominal) 9.000 (Maximum)	

Phase	Background Count Rate CPS	Value	Phase	Gain Ratio	Value
Master		15.79	Master		0.9988
	10.00 (Minimum) 142.5 (Nominal) 265.0 (Maximum)			0.9400 (Minimum) 1.000 (Nominal) 1.060 (Maximum)	

Master: 14−Jul−2014 23:07

Enhanced DTS Cartridge / Equipment Identification

Primary Equipment:

EDTC Gamma Ray Detector	EDTG − A/B	8305
Enhanced DTS Cartridge	EDTC − B	8317

Auxiliary Equipment:

EDTC Housing	EDTH − B	8303

Enhanced DTS Cartridge Wellsite Calibration

EDTC Accelerometer Calibration

Phase	EDTC Z−Axis Acceleration M/S2	Value
Before		9.759
	9.610 (Minimum) 9.810 (Nominal) 10.01 (Maximum)	

Before: 21−Jul−2014 8:50

Enhanced DTS Cartridge Wellsite Calibration

Detector Calibration

Phase	Gamma Ray Background GAPI	Value	Phase	Gamma Ray (Jig − Bkg) GAPI	Value	Phase	Gamma Ray (Calibrated) GAPI	Value
Before		6.019	Before		154.0	Before		164.0
After		5.723	After		158.6	After		168.9
	0 (Minimum) 30.00 (Nominal) 120.0 (Maximum)			140.0 (Minimum) 154.0 (Nominal) 168.0 (Maximum)			149.0 (Minimum) 164.0 (Nominal) 179.0 (Maximum)	

Before: 15−Jul−2014 8:25 After: 15−Jul−2014 8:38

Schlumberger

Well:	**Expedition 351, Site U1438E**
Field:	**IBM Arc Origins**
Rig:	**JOIDES Resolution**
Ocean:	**Pacific**

Hostile Natural Gamma Sonde (HNGS)
Caliper
Spectroscopy