

# HALLIBURTON

## ARRAY COMPENSATED TRUE RESISTIVITY LOG

COMPANY	<b>SANDRIDGE ENERGY</b>		
WELL	<b>MILLY 3020 1-19</b>		
FIELD/BLOCK	<b>EXCEL SOUTHWEST</b>		
COUNTY	<b>KIOWA</b>		
STATE	<b>KANSAS</b>		
COMPANY	<b>SANDRIDGE ENERGY</b>	API No.	15-097-21765-00-00
WELL	<b>MILLY 3020 1-19</b>	Location	(SHL) 740 FSL & 1980' FWL SE-NW-SE-SW
FIELD/BLOCK	<b>EXCEL SOUTHWEST</b>		
COUNTY	<b>KIOWA</b>	Other Services:	DSN/SDL CSNG MICROLOG WSTT ACRT MRIL
STATE	<b>KANSAS</b>		
Sect.	19	Twp.	30S
Rge.			20W
Elev.			2209.0 ft

Permanent Datum	GL	Elev.: K.B.	2226.5 ft
Log measured from	KB	D.F.	2226.5 ft
Drilling measured from	KB	G.L.	2209.0 ft

Date	15-Aug-13	Run No.	ONE
Depth - Driller	6322.00 ft	Depth - Logger	6324.0 ft
Bottom - Logged Interval	6314	Top - Logged Interval	738
Casing - Driller	8.625 in	Casing - Logger	738.0 ft
Bit Size	7.875 in	Type Fluid in Hole	WATER BASED MUD
Density	9.2 ppg	Viscosity	53.00 s/qt
PH	10.50 pH	Fluid Loss	6.0 cphm
Source of Sample	MUD PIT	Rm @ Meas. Temperature	0.200 ohmm @ 85.00 degF
Rmf @ Meas. Temperature	0.17 ohmm @ 85.00 degF	Rmc @ Meas. Temperature	0.230 ohmm @ 85.00 degF
Source Rmf	CALCULATED	Rmc	CALCULATED
Rm @ BHT	0.13 ohmm @ 137.0 degF	Time Since Circulation	6.5 hr
Time on Bottom	16-Aug-13 01:11	Max. Rec. Temperature	137.0 degF @ 6322.0 ft
Equipment	11230668	Location	LIBERAL
Recorded By	S. INGERSOLL	Witnessed By	B. TOMLINSON

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Service Ticket No.: 900661383      API Serial No.: 15-097-21765-00-00      PGM Version: WL INSITE R3.8.4 (Build 5)

CHANGE IN MUD TYPE OR ADDITIONAL SAMPLE				RESISTIVITY SCALE CHANGES			
Date	Sample No.			Type Log	Depth	Scale Up Hole	Scale Down Hole
Depth-Driller							
Type Fluid in Hole							
Density	Viscosity						
Ph	Fluid Loss						
Source of Sample				RESISTIVITY EQUIPMENT DATA			
Rm @ Meas. Temp	@		@	Run No.	Tool Type & No.	Pad Type	Tool Pos.
Rmf @ Meas. Temp.	@		@	ONE	ACRT	N/A	1.5" S.O.
Rmc @ Meas. Temp.	@		@		10929776		
Source Rmf	Rmc						
Rm @ BHT	@		@				
Rmf @ BHT	@		@				
Rmc @ BHT	@		@				

EQUIPMENT DATA							
GAMMA		ACOUSTIC		DENSITY		NEUTRON	
Run No.	ONE	Run No.	ONE	Run No.	ONE	Run No.	ONE
Serial No.	10748374	Serial No.	10753396	Serial No.	10714945	Serial No.	11019641
Model No.	GTET	Model No.	WSTT	Model No.	SDLT	Model No.	DSNT
Diameter	3.625"	No. of Cent.	3	Diameter	5.3"	Diameter	3.625"
Detector Model No.	T-102	Spacing	.5'	Log Type	GAM-GAM	Log Type	NEU-NEU
Type	SCINT			Source Type	CS-137	Source Type	AM-241BE
Length	8"	LSA [Y/N]	YES	Serial No.	5073GW	Serial No.	DSN-436
Distance to Source	N/A	FWDA [Y/N]	YES	Strength	1.5 CI	Strength	15 CI

LOGGING DATA

GENERAL			GAMMA		ACOUSTIC		DENSITY		NEUTRON					
Run No.	Depth		Speed	Scale		Scale		Matrix	Scale		Matrix			
	From	To	ft/min	L	R	L	R		L	R				
ONE	6324	738	REC	0	150	30	-10	47.6 us/ft	30	-10	2.71 gm/cc	30	-10	LIME

DIRECTIONAL INFORMATION

Maximum Deviation @ KOP @

Remarks: ANNULAR HOLE VOLUME CALCULATED FOR 5.5 INCH CASING.

CHLORIDES REPORTED AT 22000 mg/L.

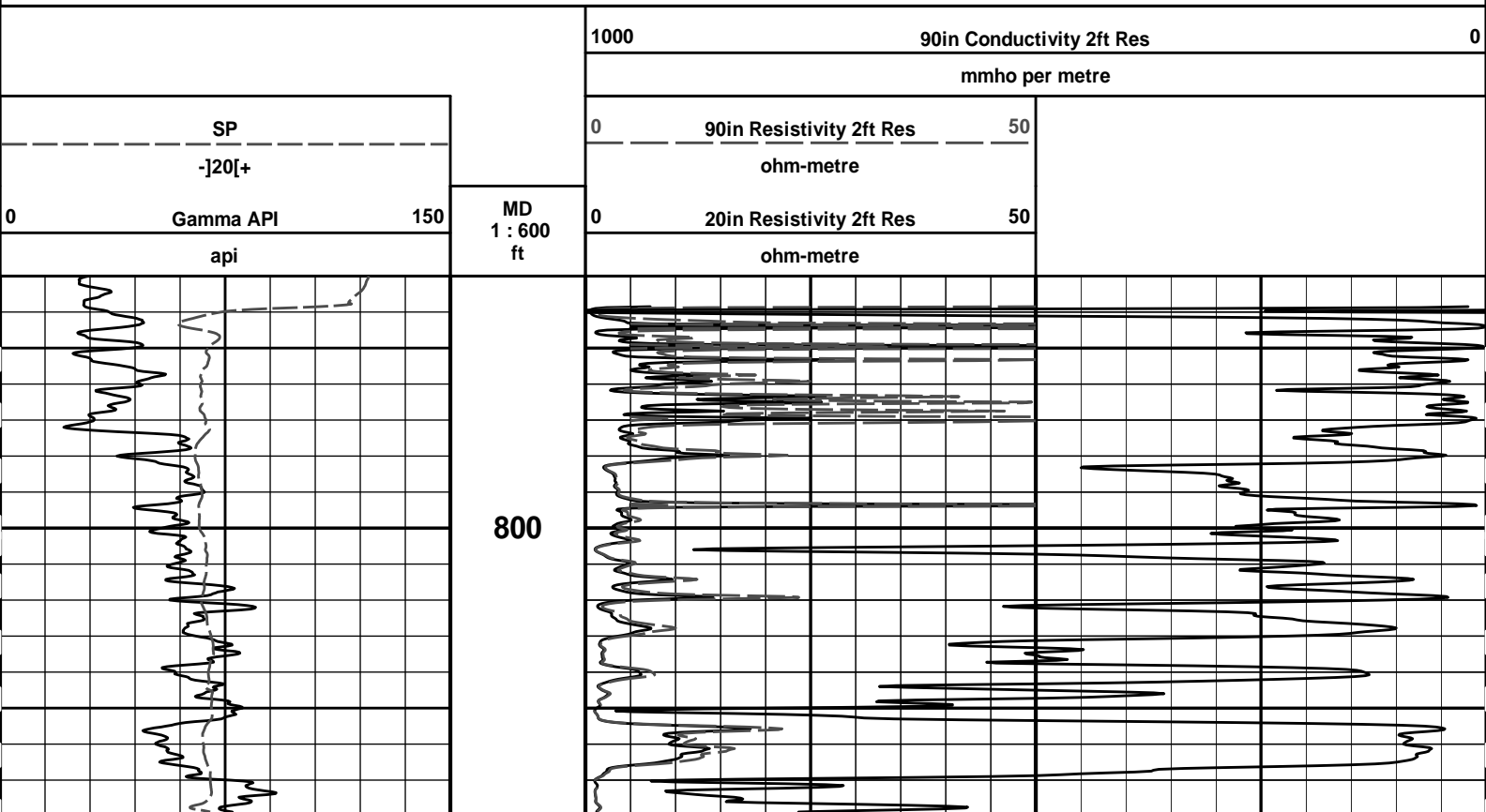
HALLIBURTON DOES NOT GUARANTEE THE ACCURACY OF ANY INTERPRETATION OF THE LOG DATA, CONVERSION OF LOG DATA TO PHYSICAL ROCK PARAMETERS OR RECOMMENDATIONS WHICH MAY BE GIVEN BY HALLIBURTON PERSONNEL OR WHICH APPEAR ON THE LOG OR IN ANY OTHER FORM. ANY USER OF SUCH DATA, INTERPRETATIONS, CONVERSIONS, OR RECOMMENDATIONS AGREES THAT HALLIBURTON IS NOT RESPONSIBLE EXCEPT WHERE DUE TO GROSS NEGLIGENCE OR WILLFUL MISCONDUCT, FOR ANY LOSS, DAMAGES, OR EXPENSES RESULTING FROM THE USE THEREOF.

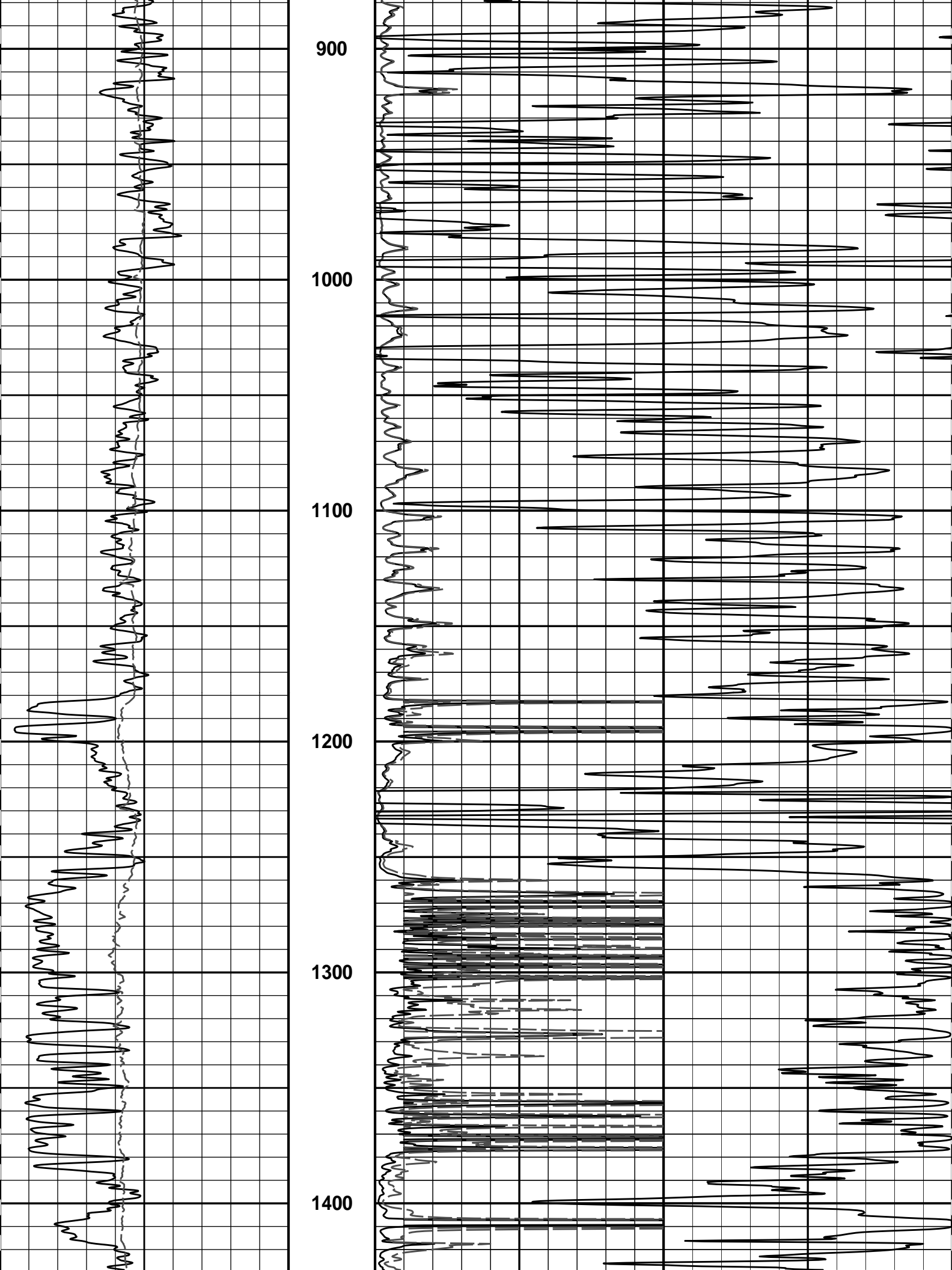
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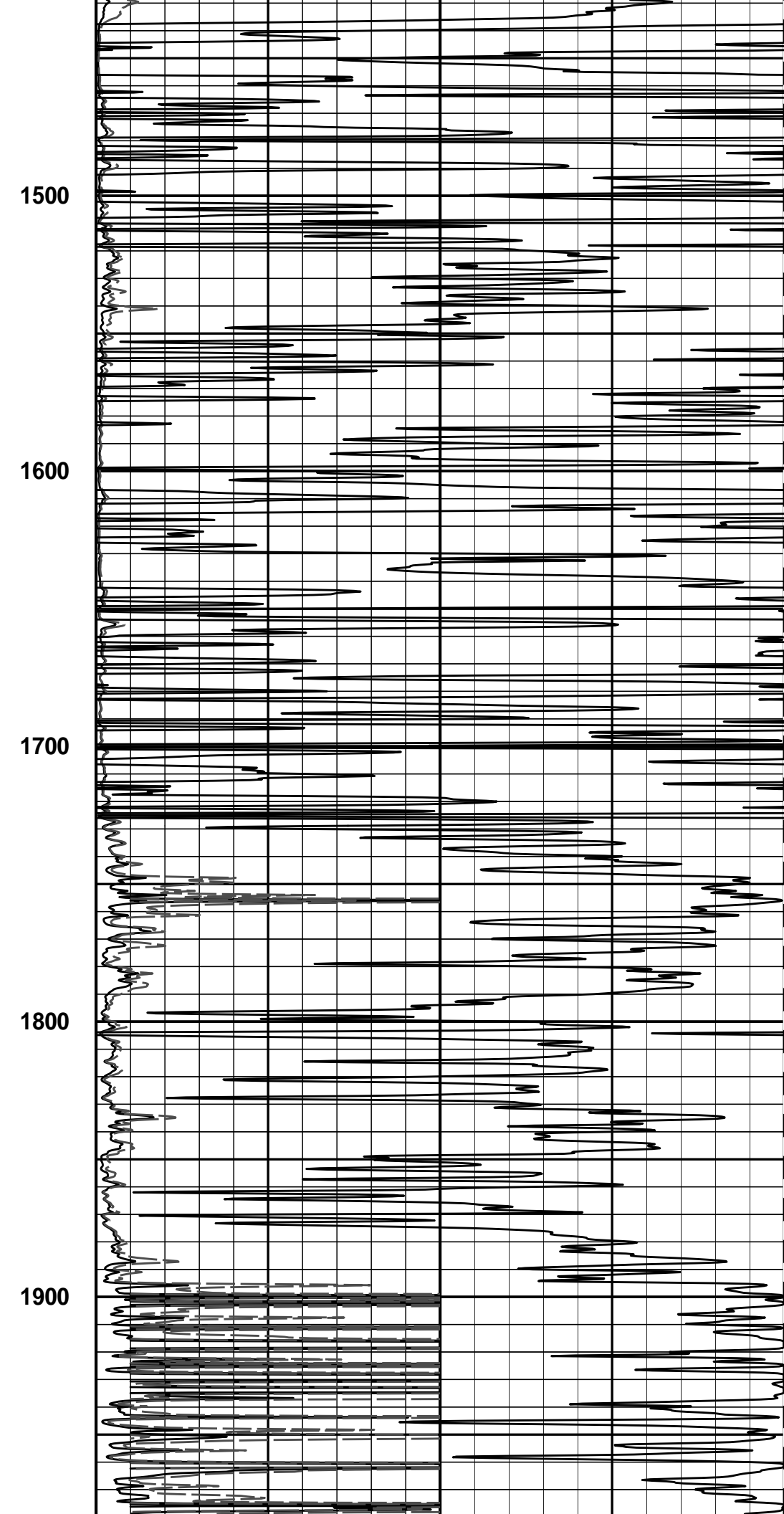
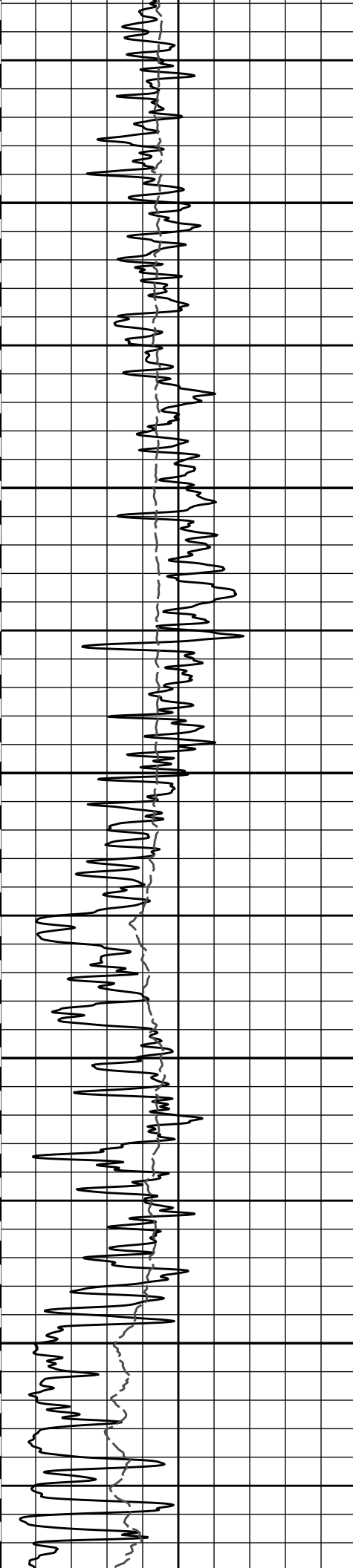
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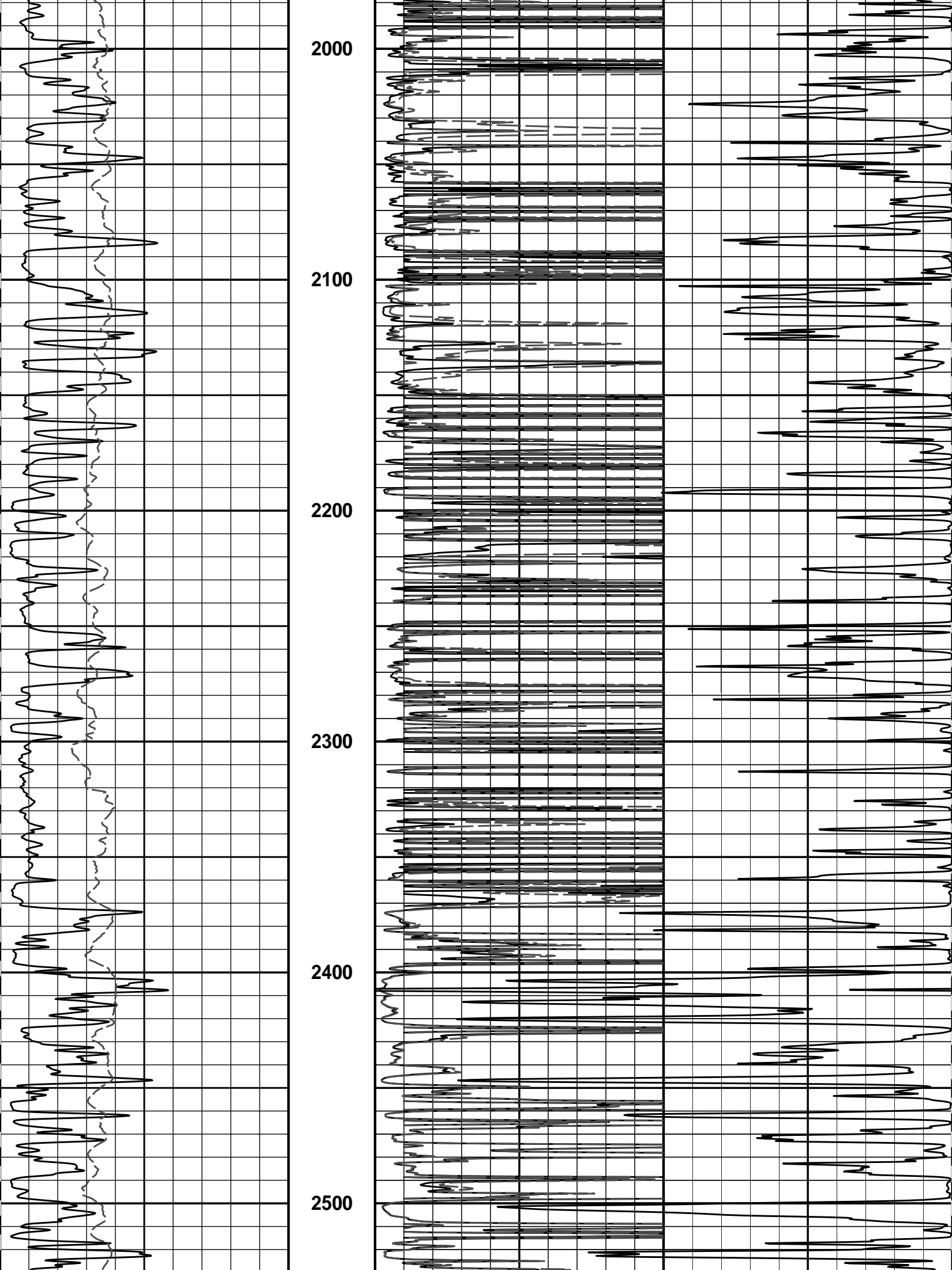
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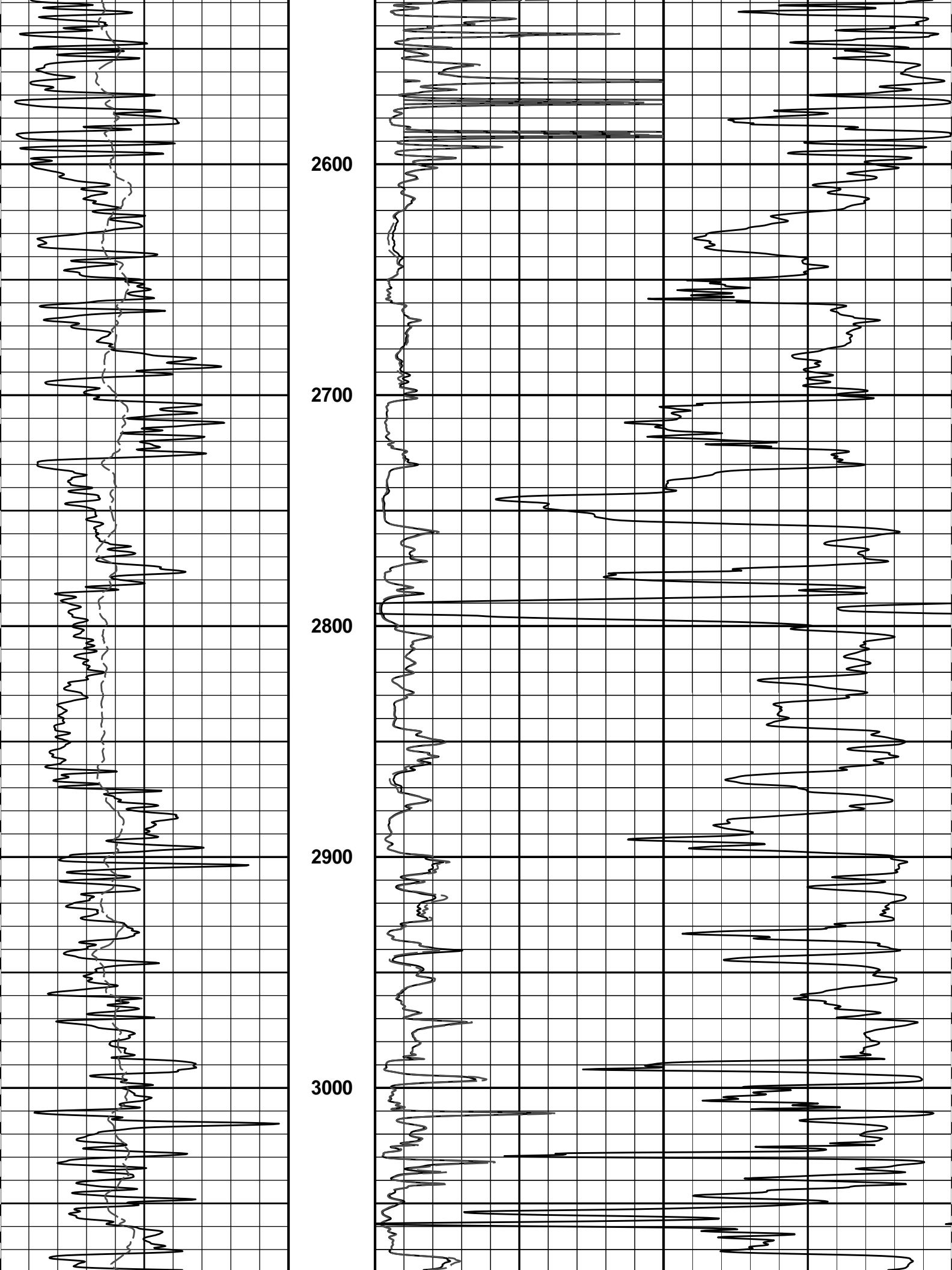
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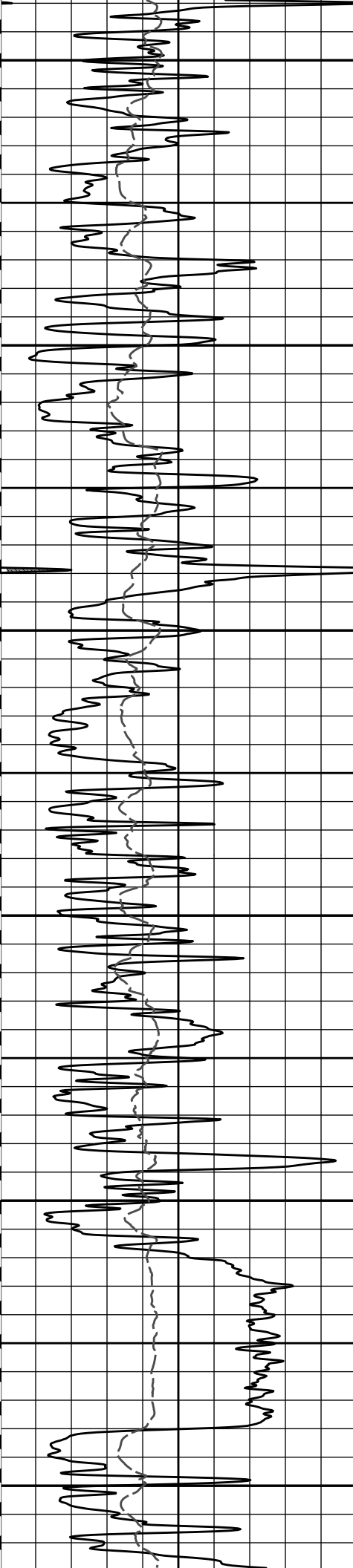












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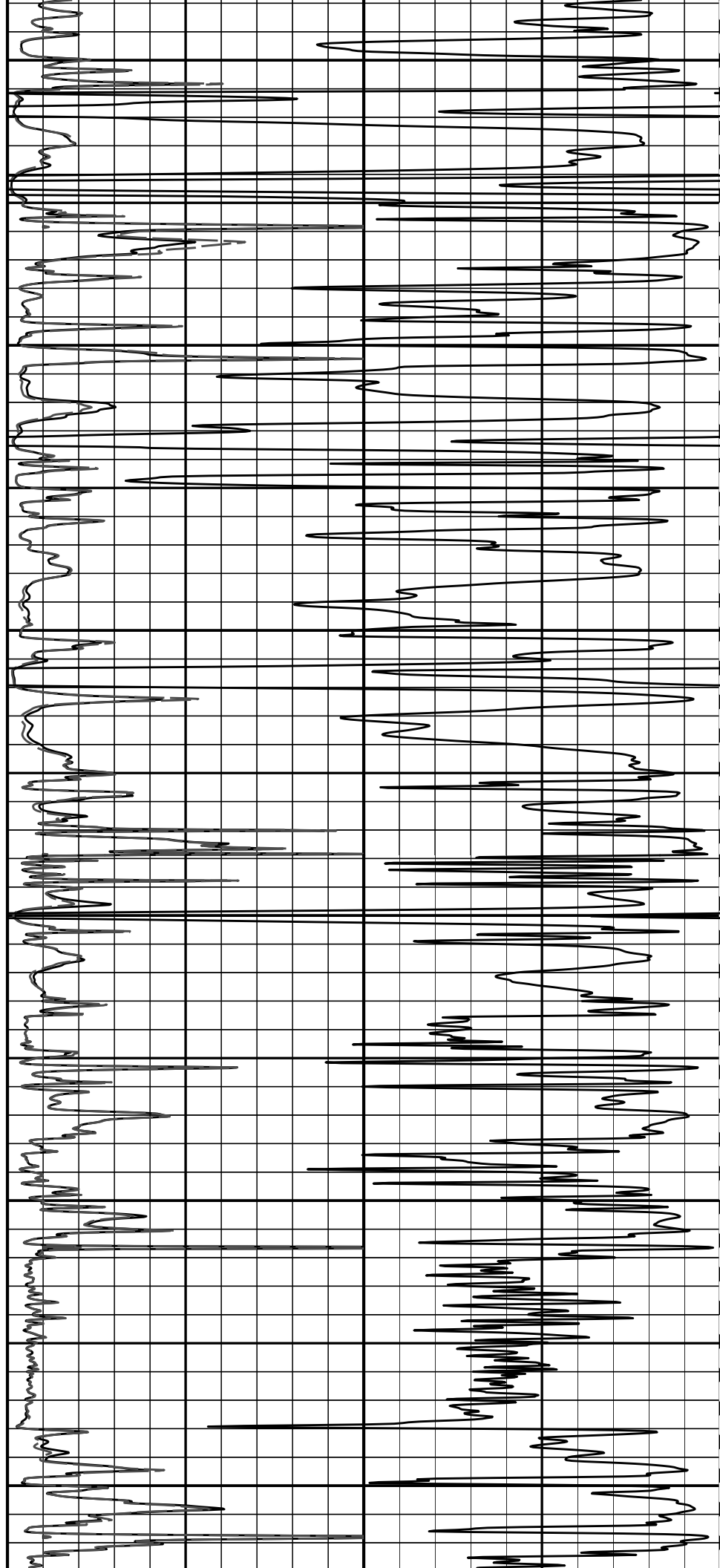
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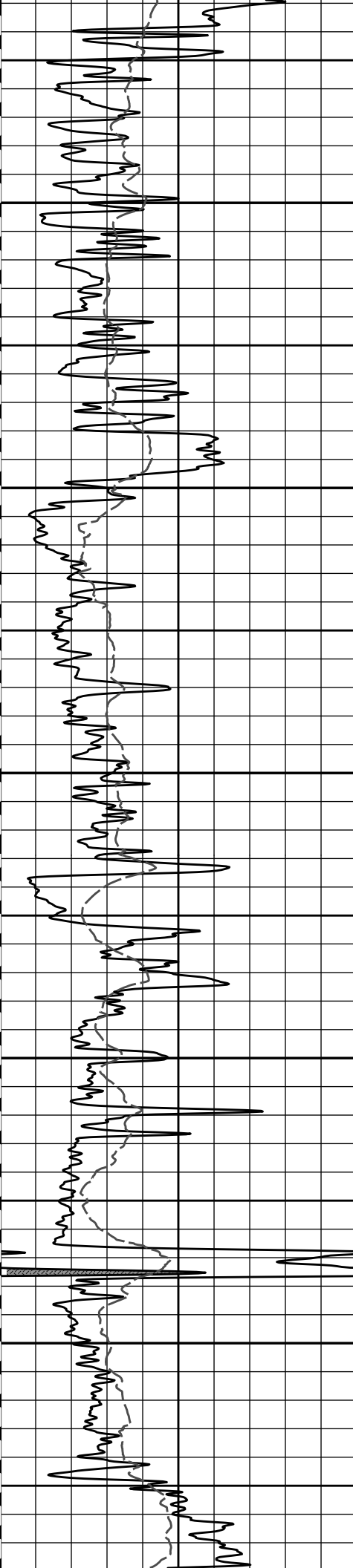
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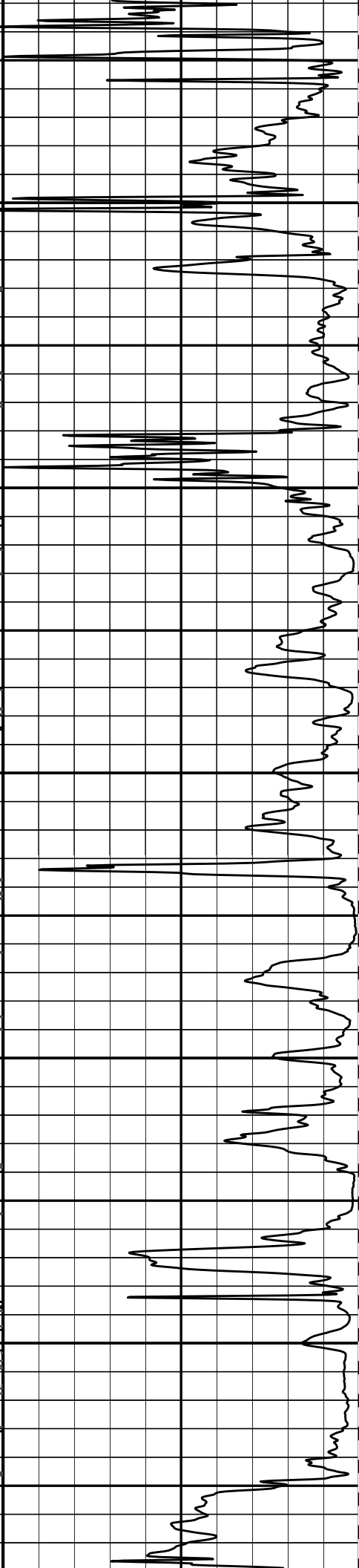
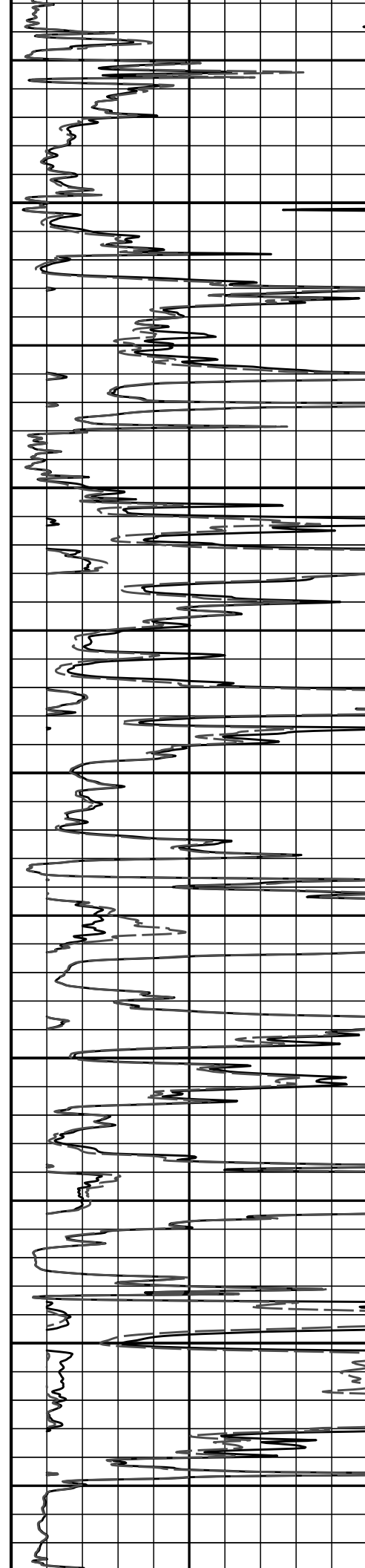
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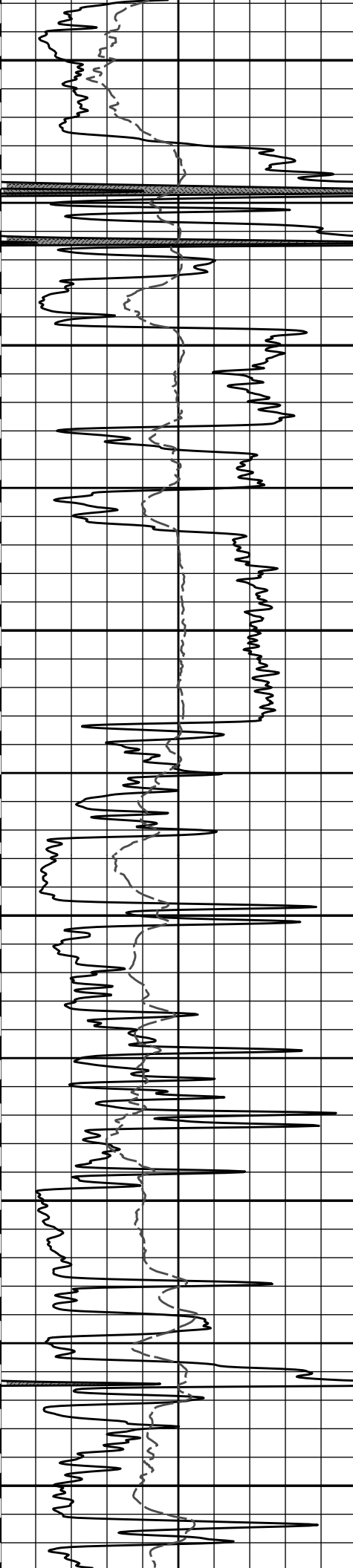
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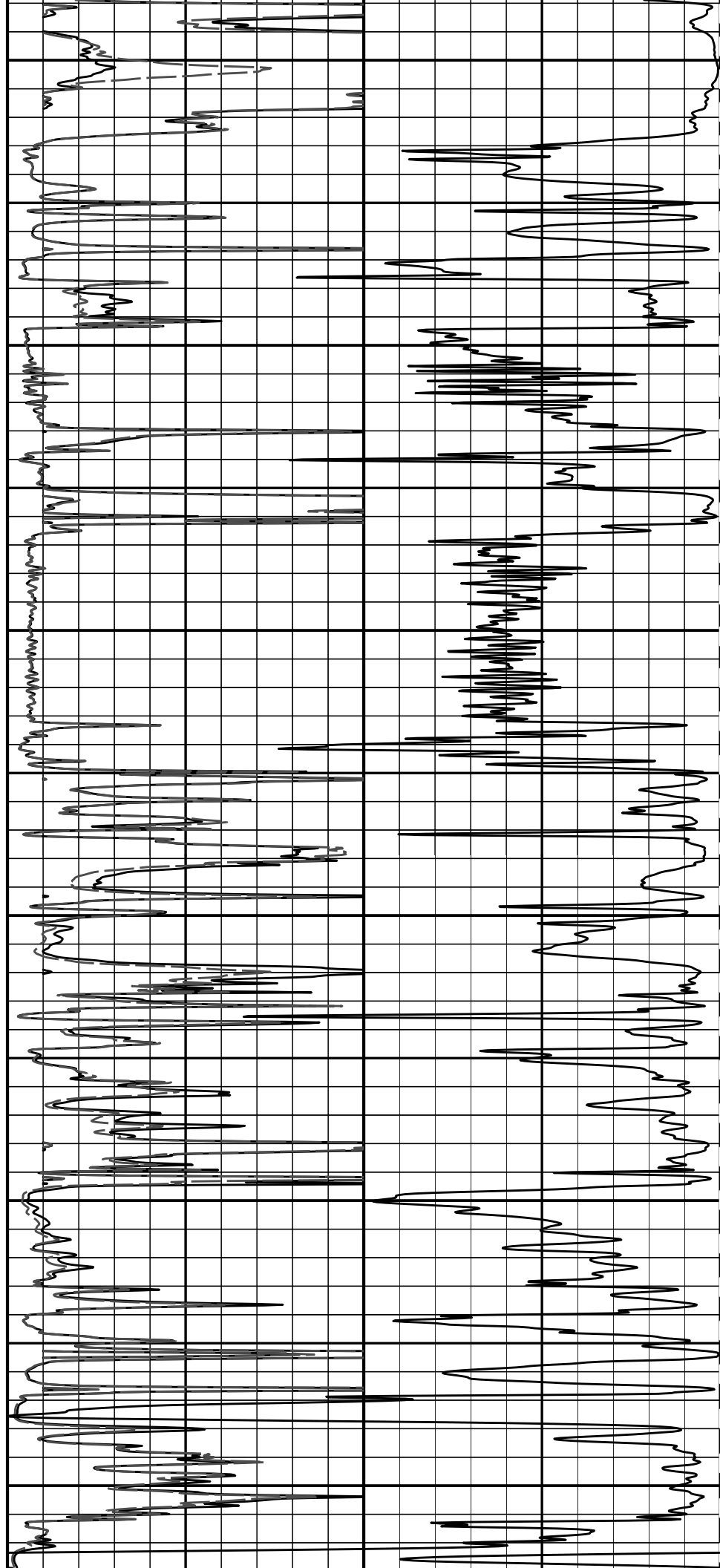
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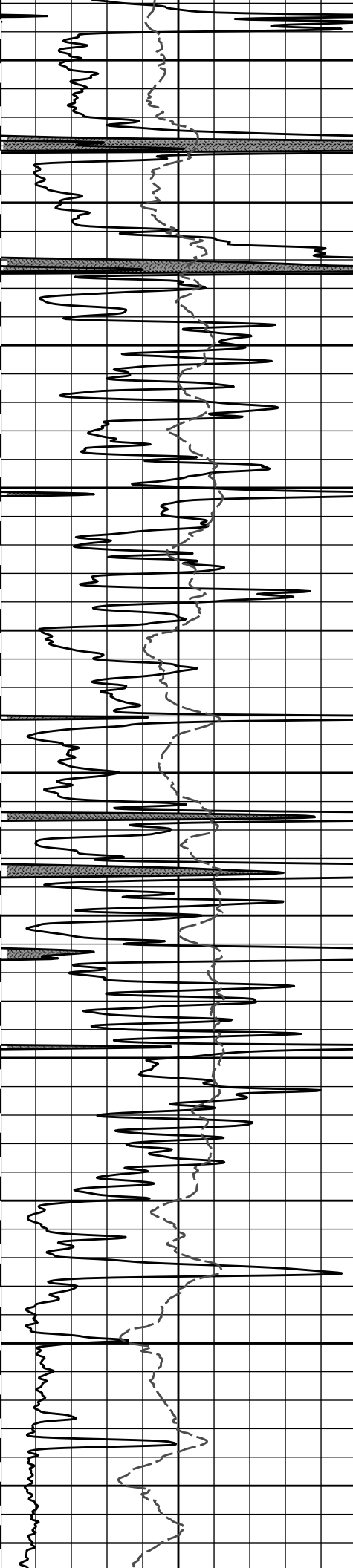
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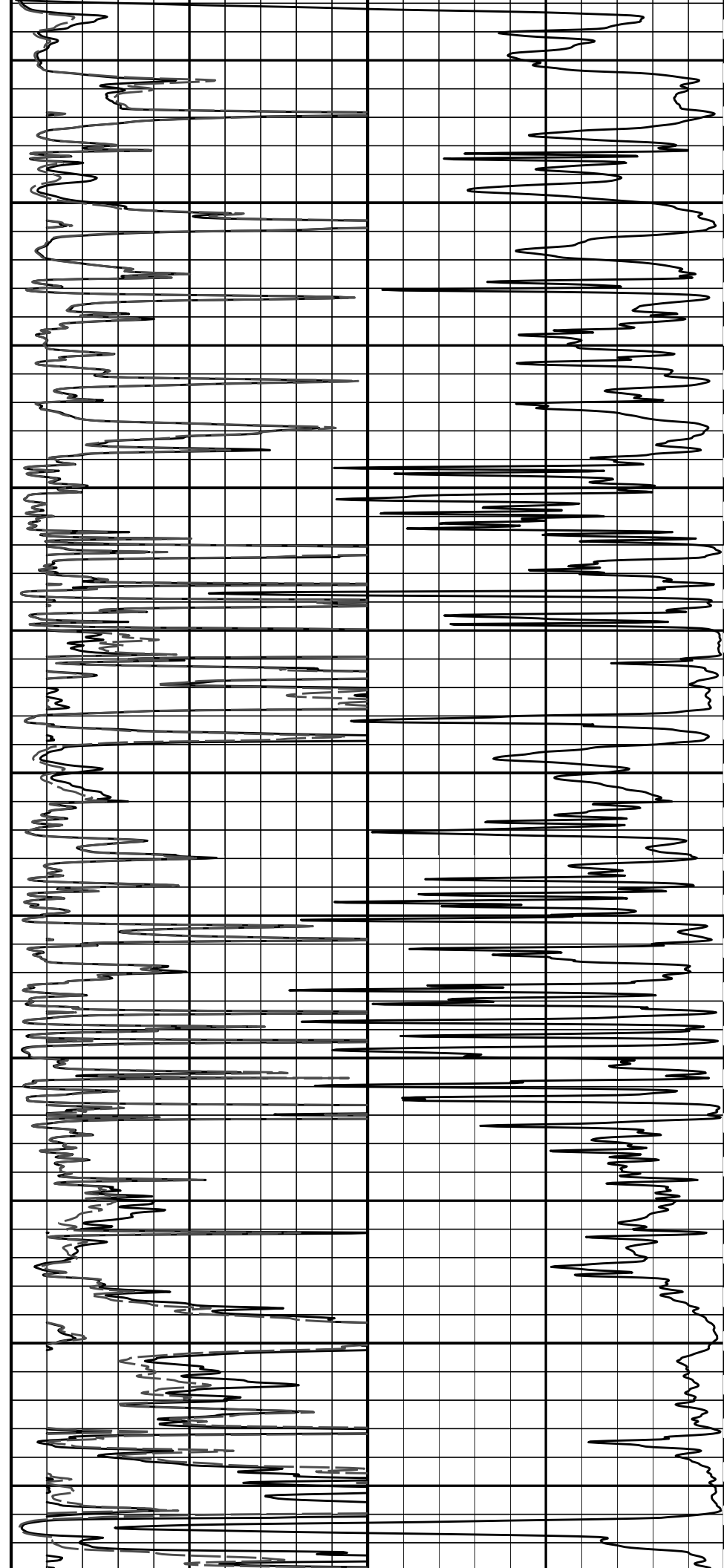
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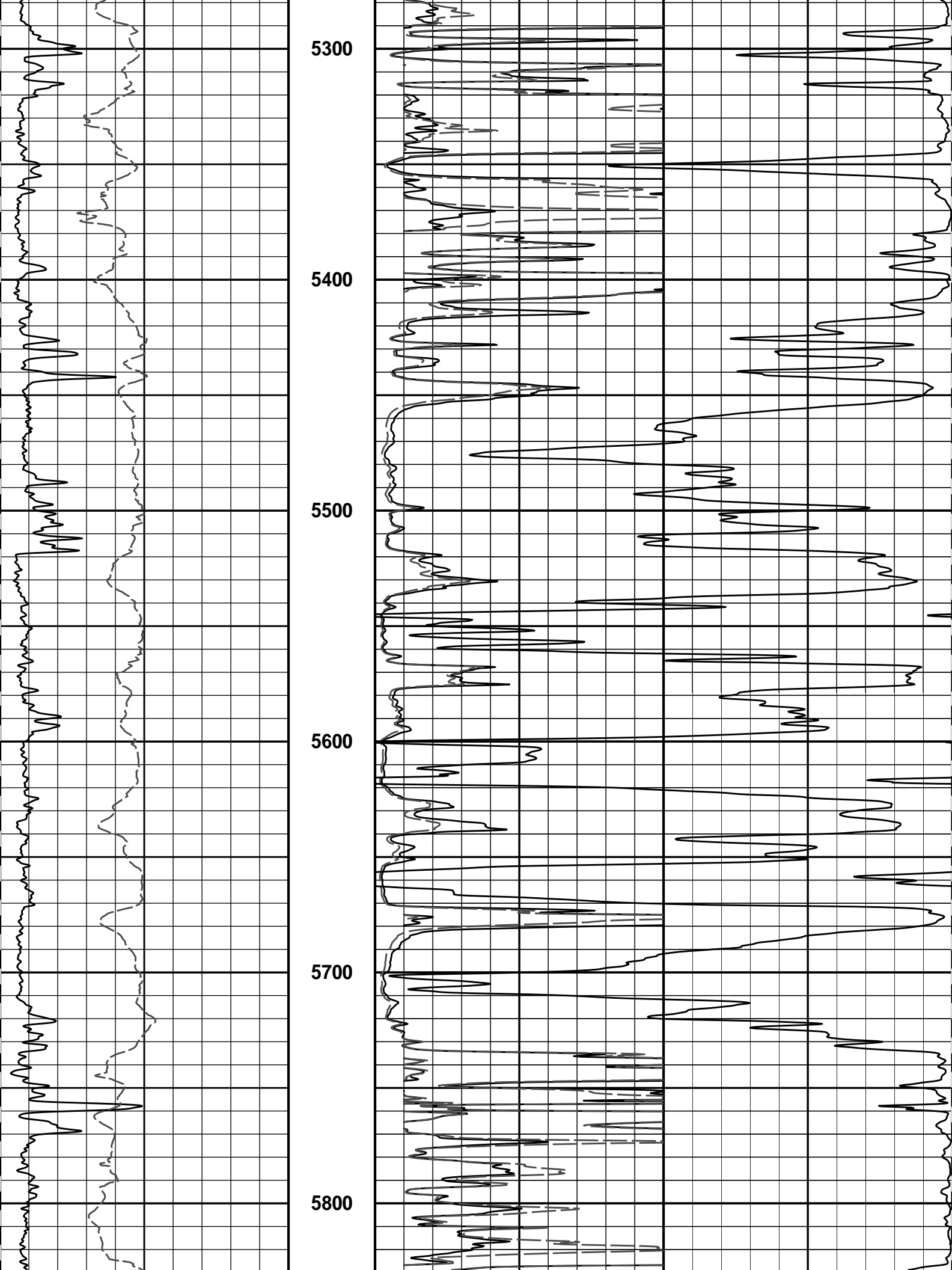
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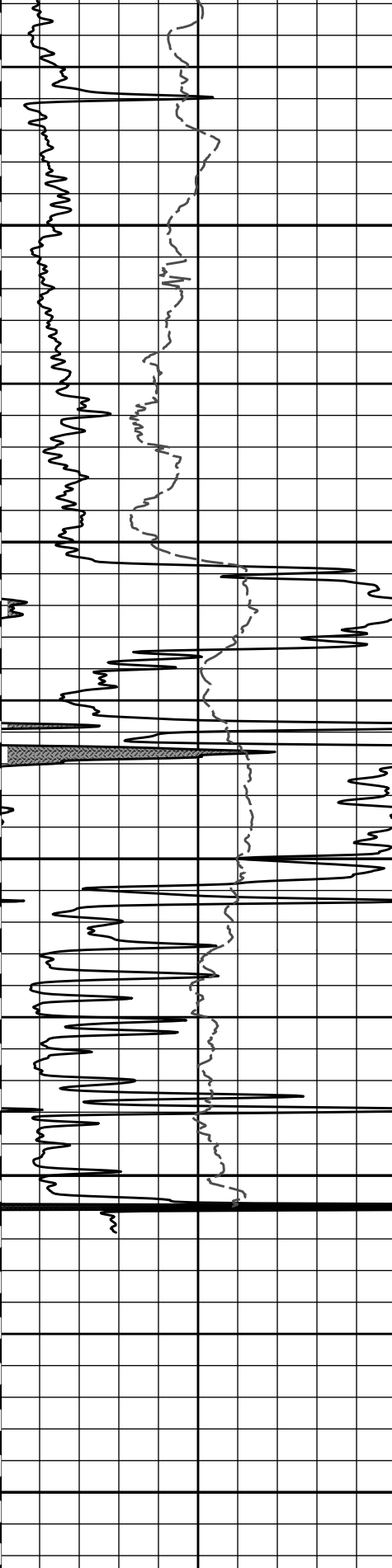
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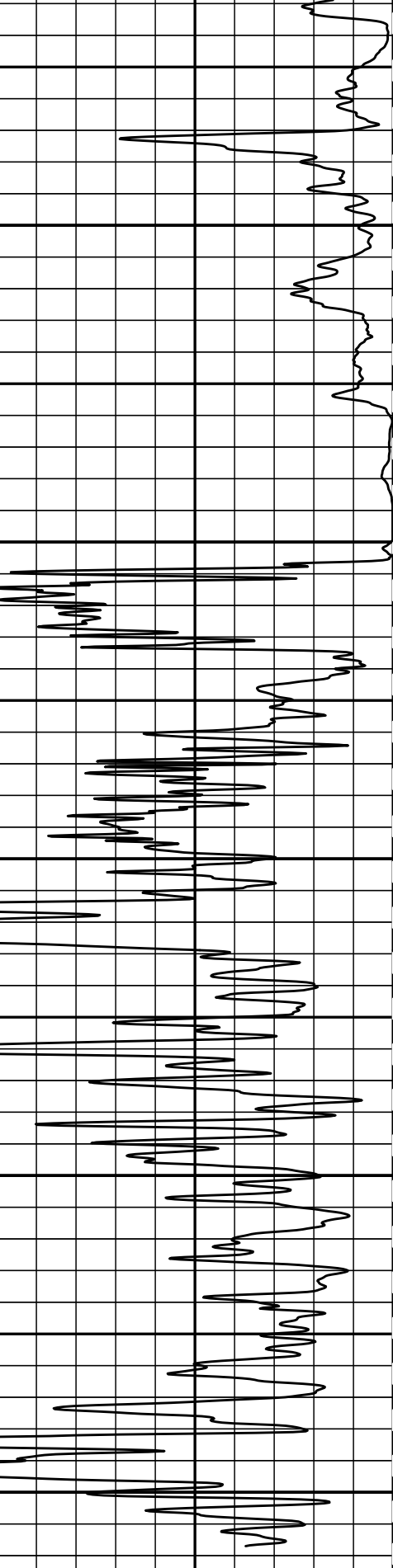
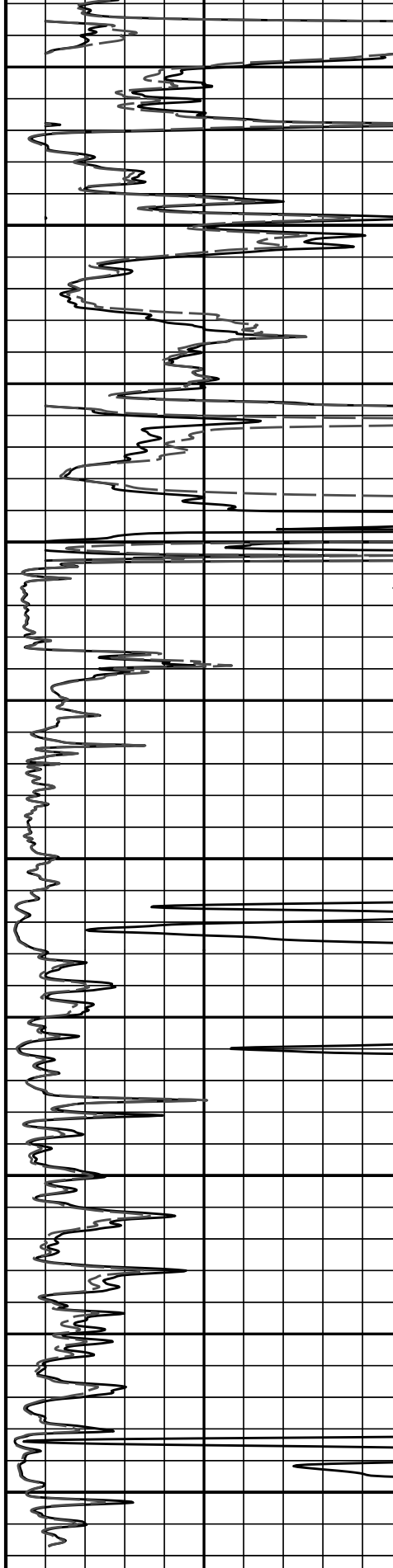
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6000

6100

6200

6300



0	Gamma API	150
	api	
	SP	
	-120[+	

MD
1 : 600
ft

0	20in Resistivity 2ft Res	50
	ohm-metre	
0	90in Resistivity 2ft Res	50
	ohm-metre	

1000

90in Conductivity 2ft Res

0

mmho per metre

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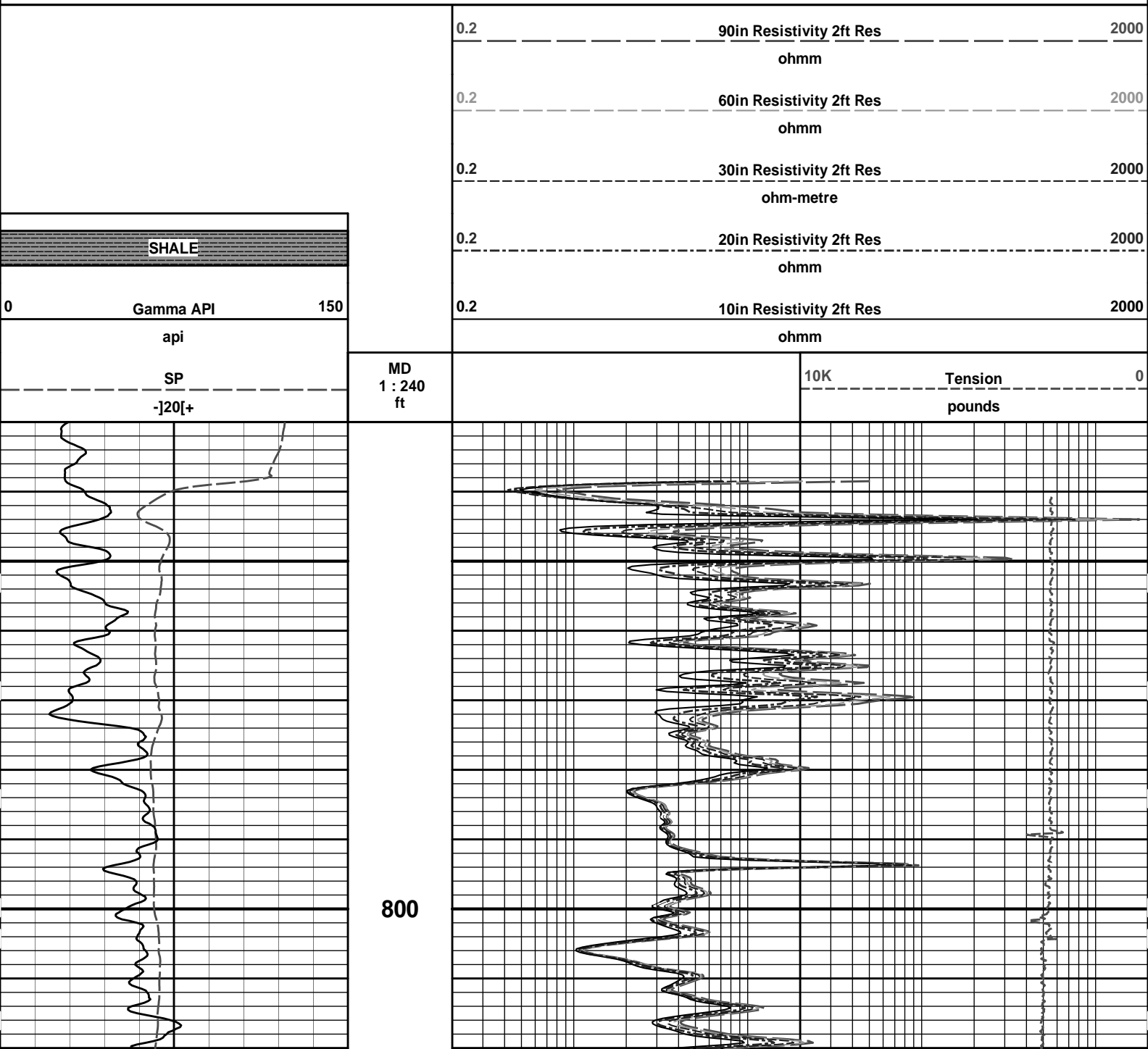
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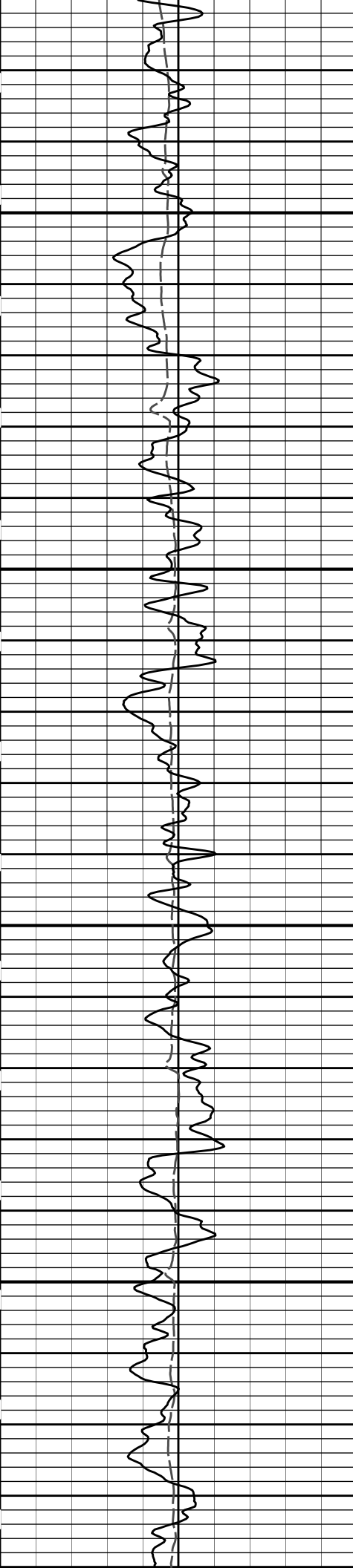
### 2 INCH MAIN LOG

HALLIBURTON

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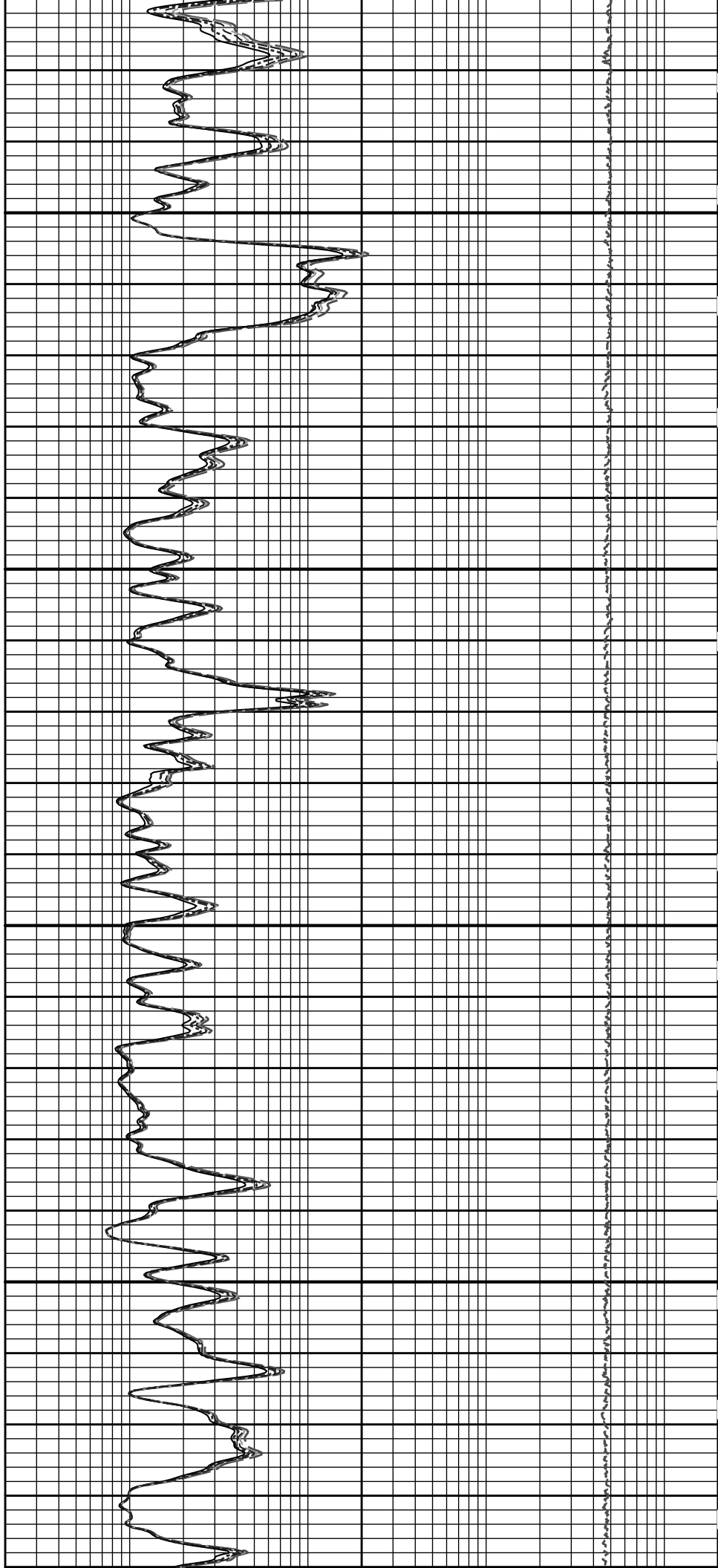
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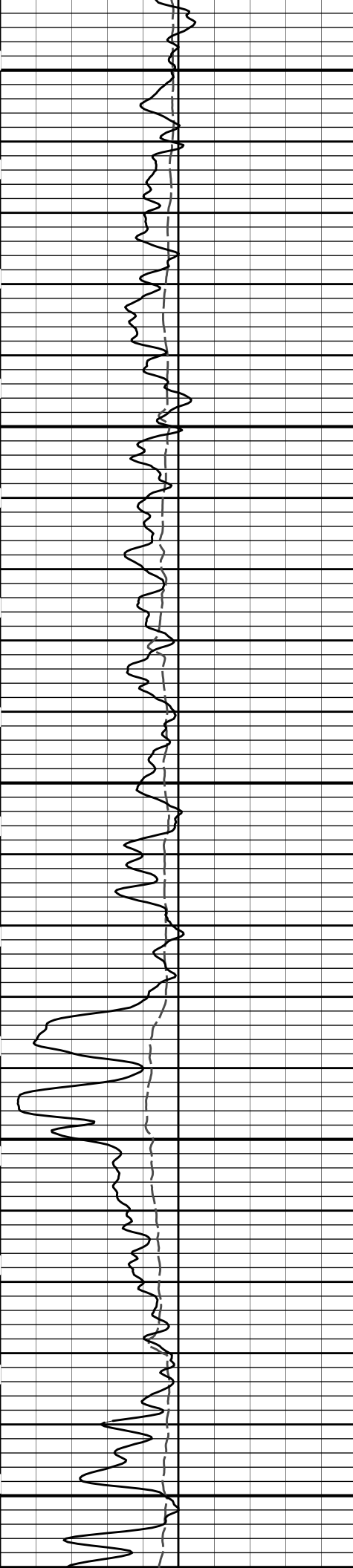




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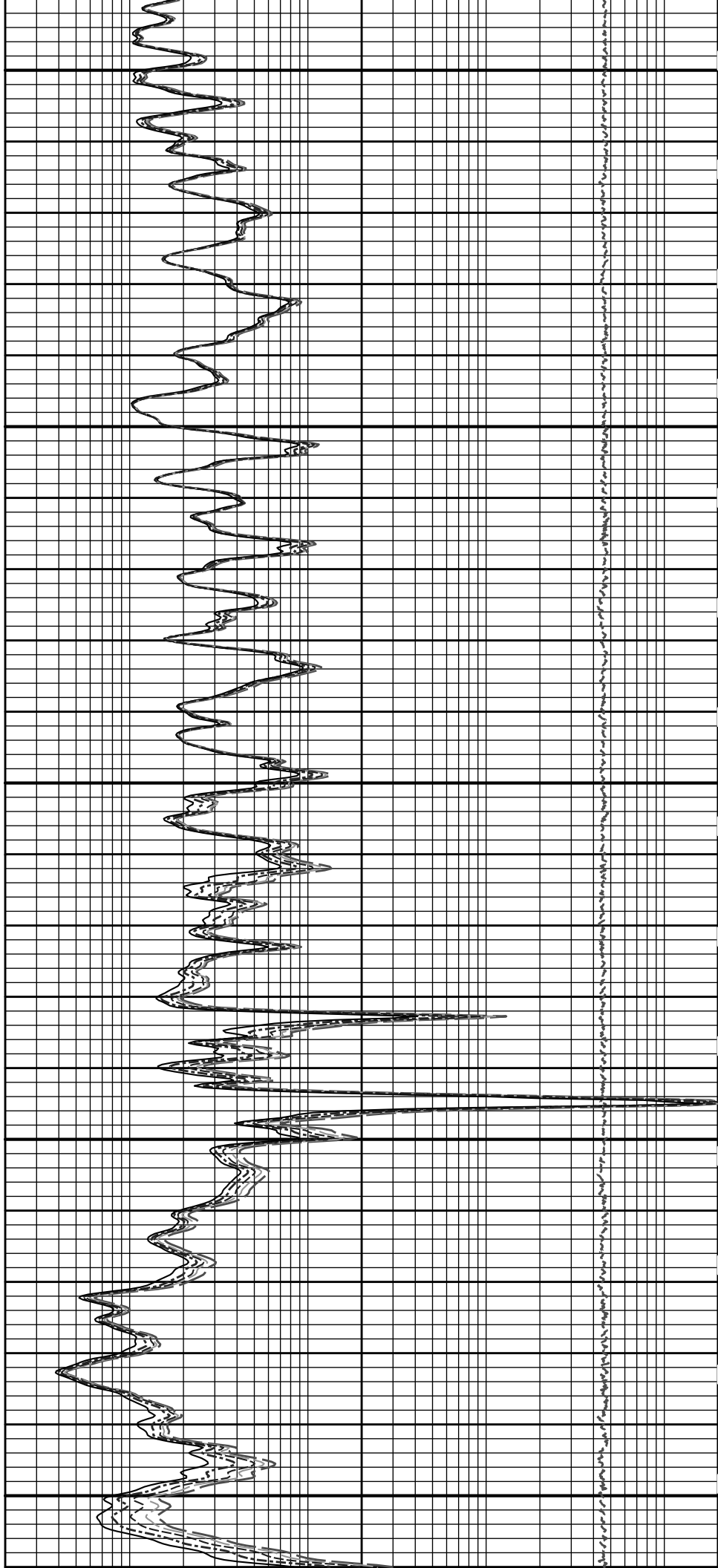
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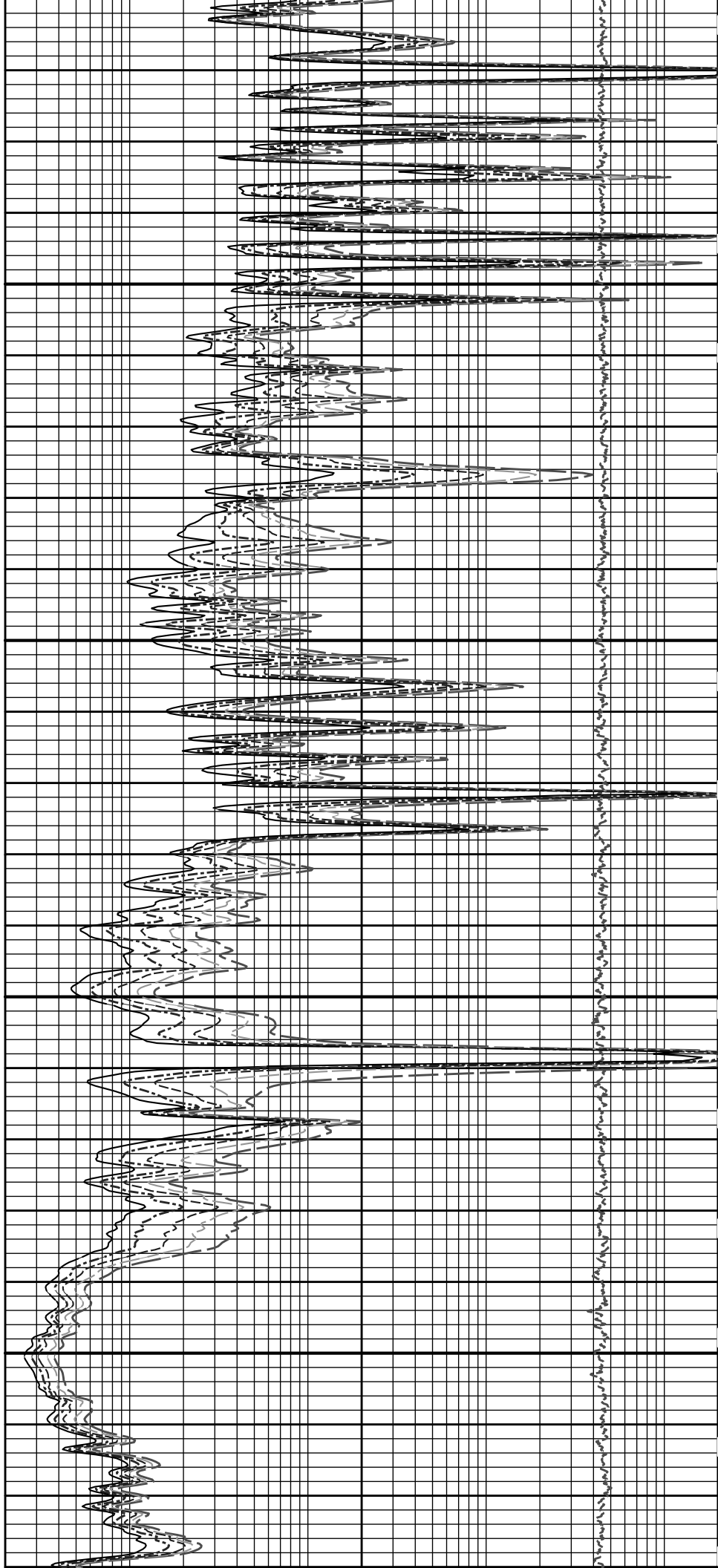
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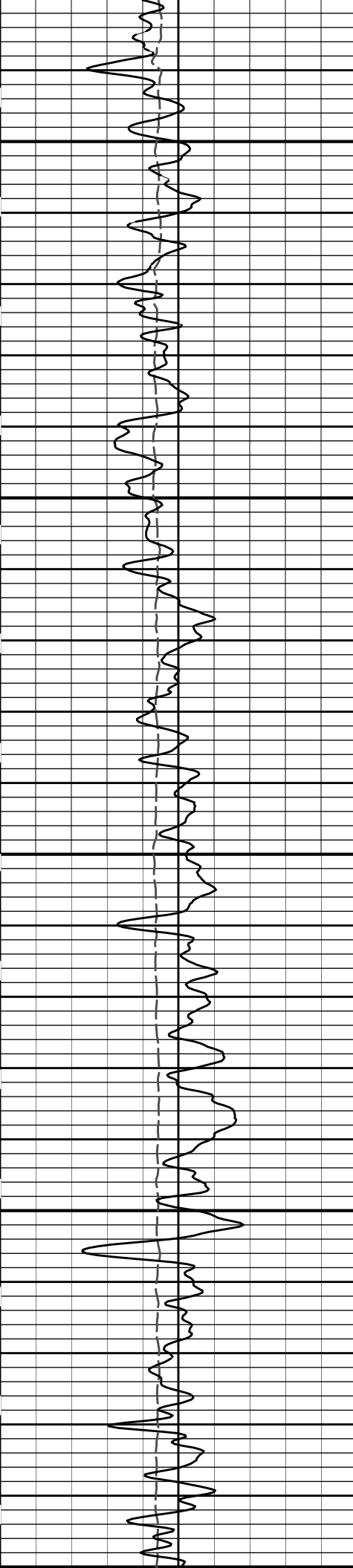




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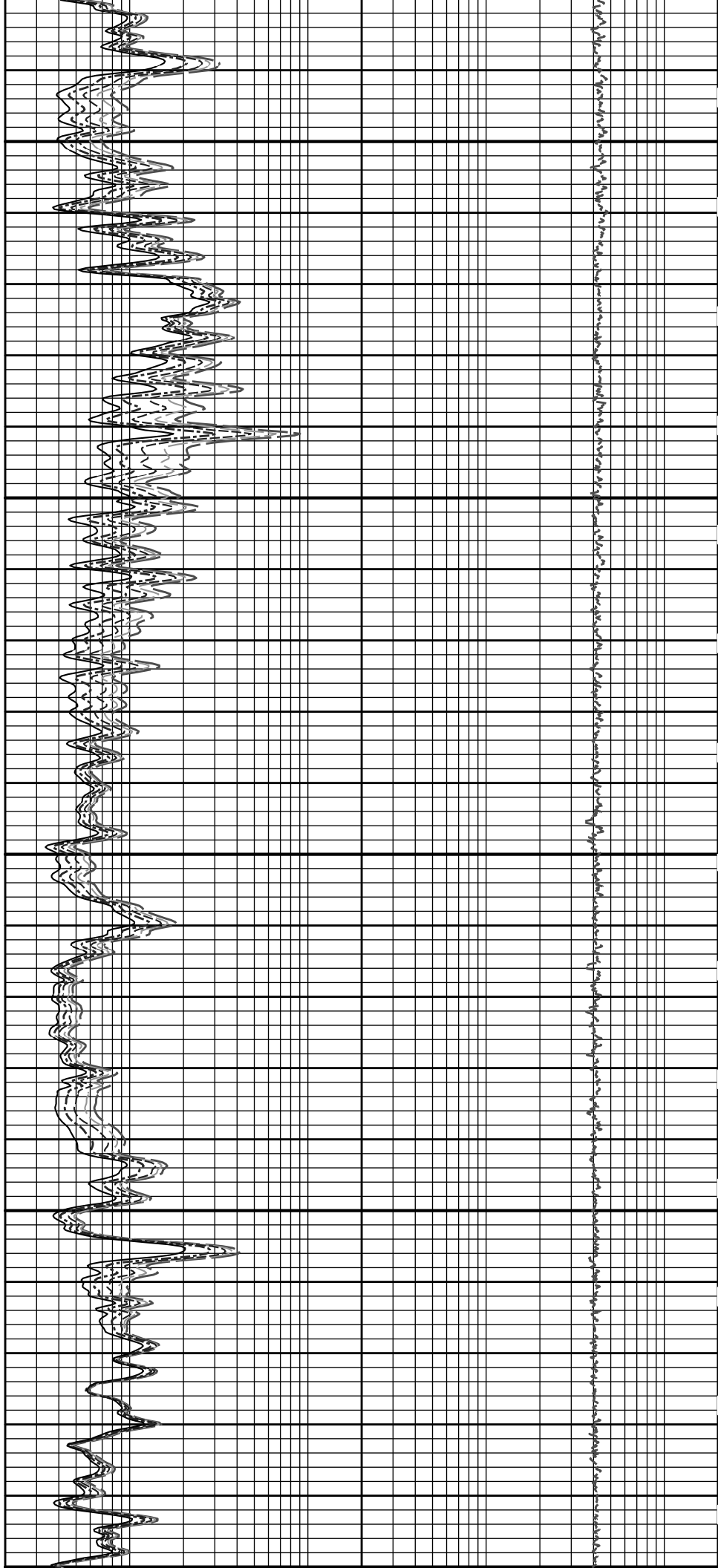


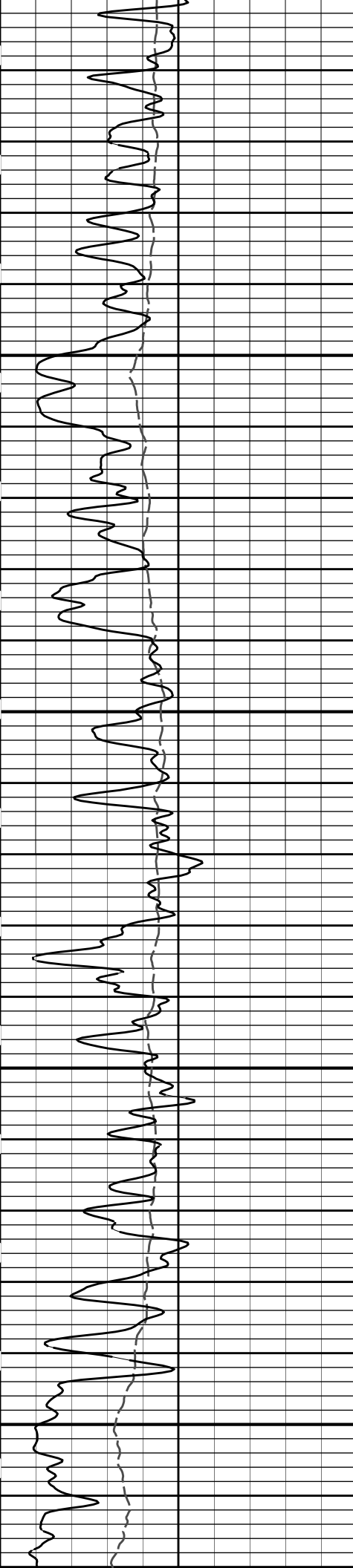


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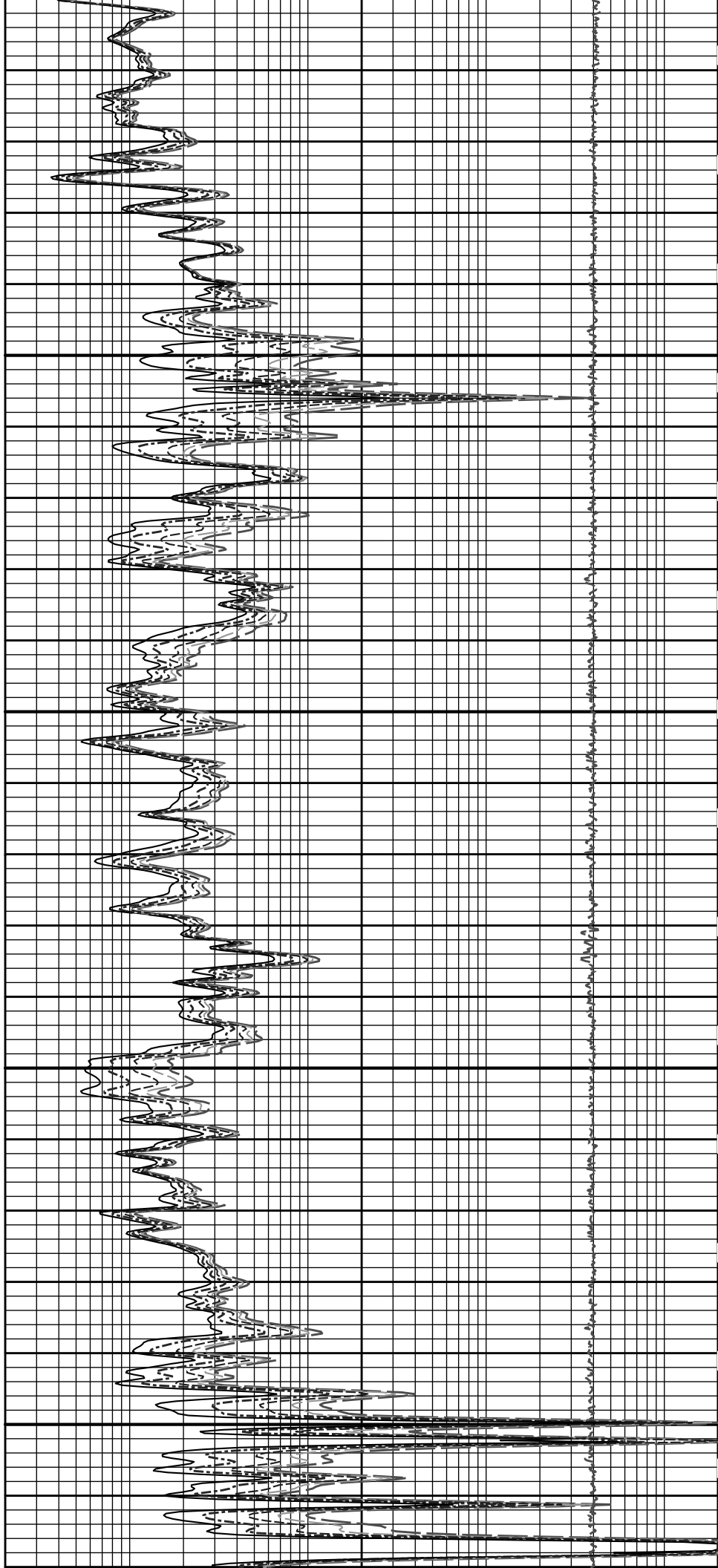


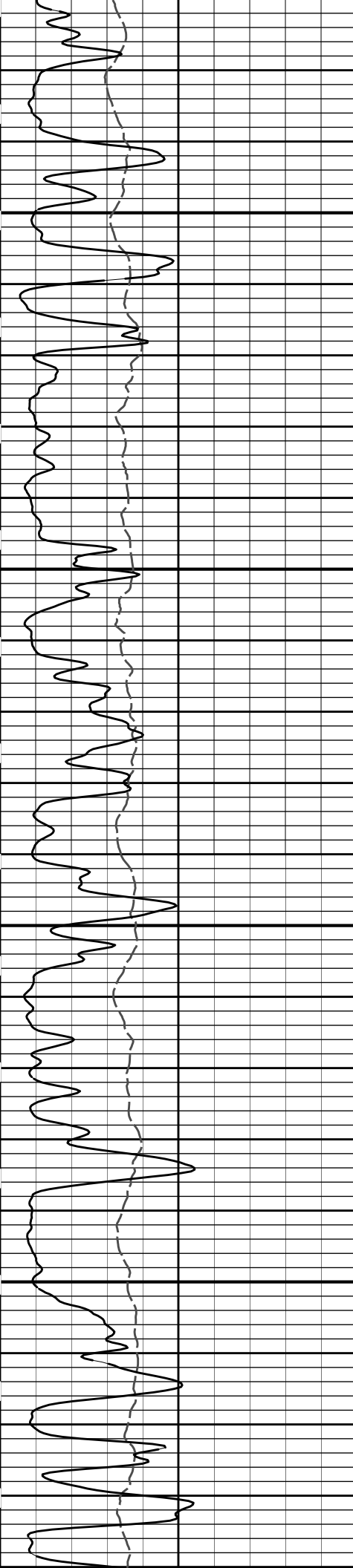


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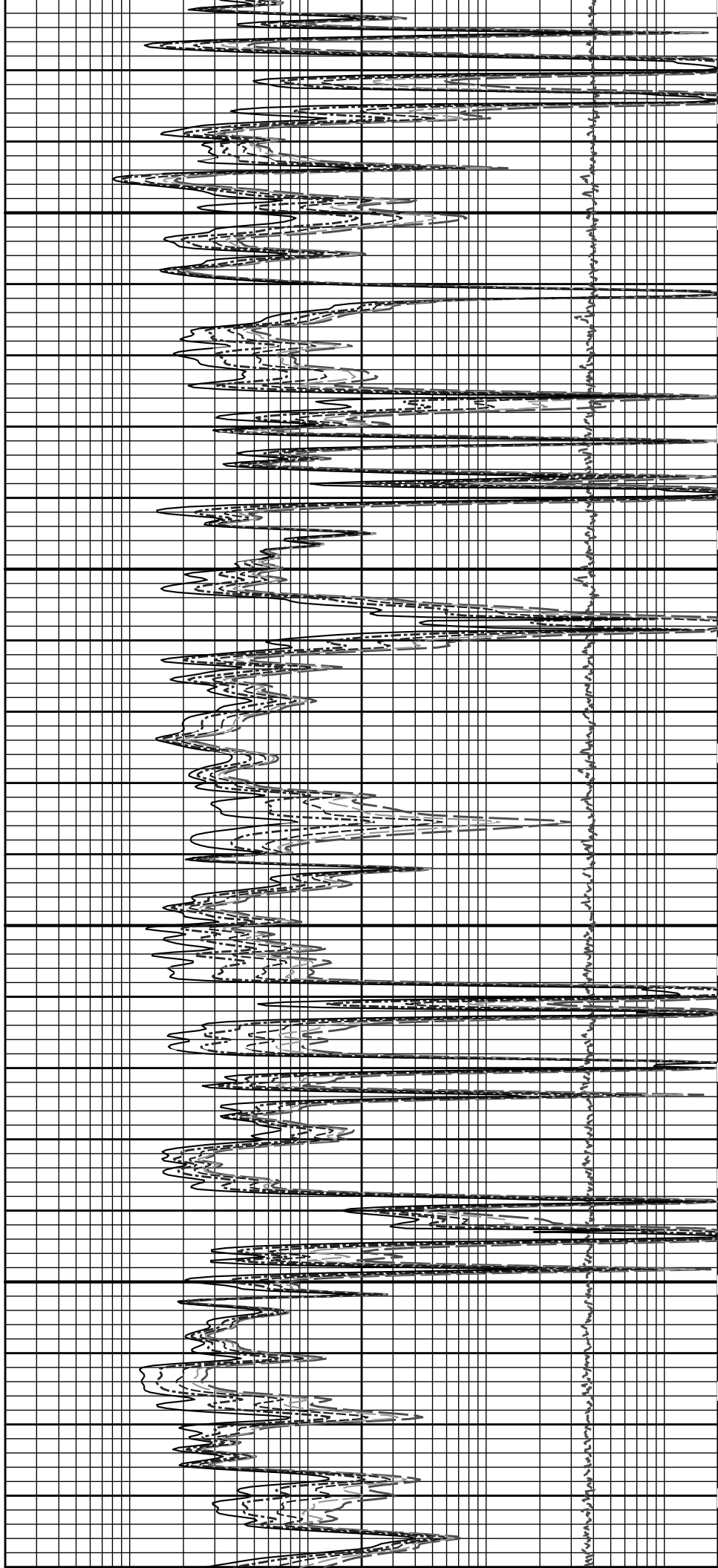
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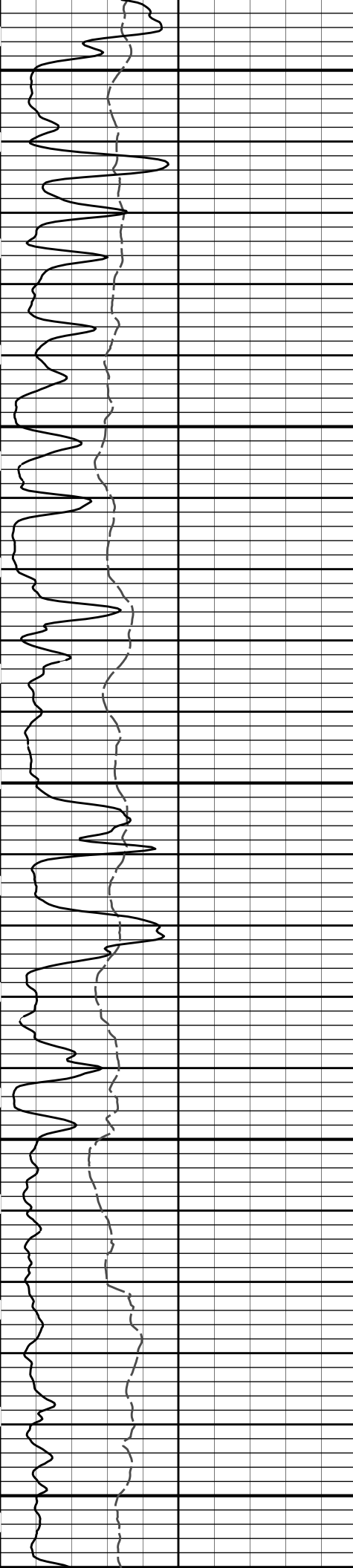




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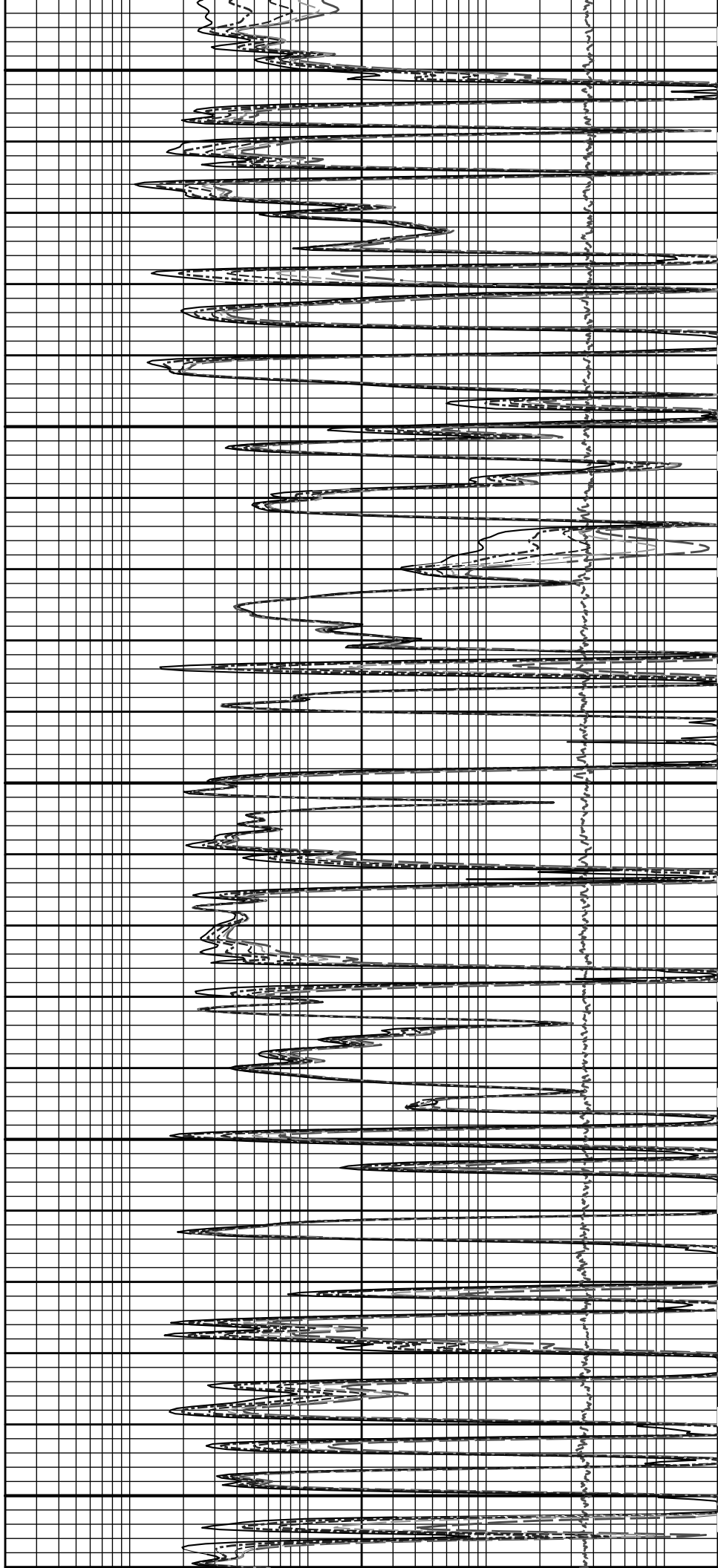
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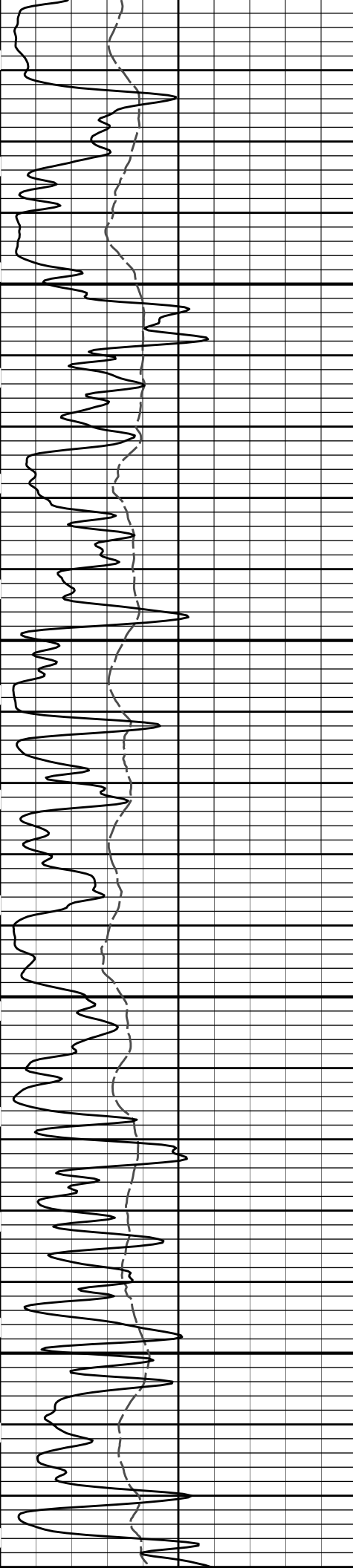




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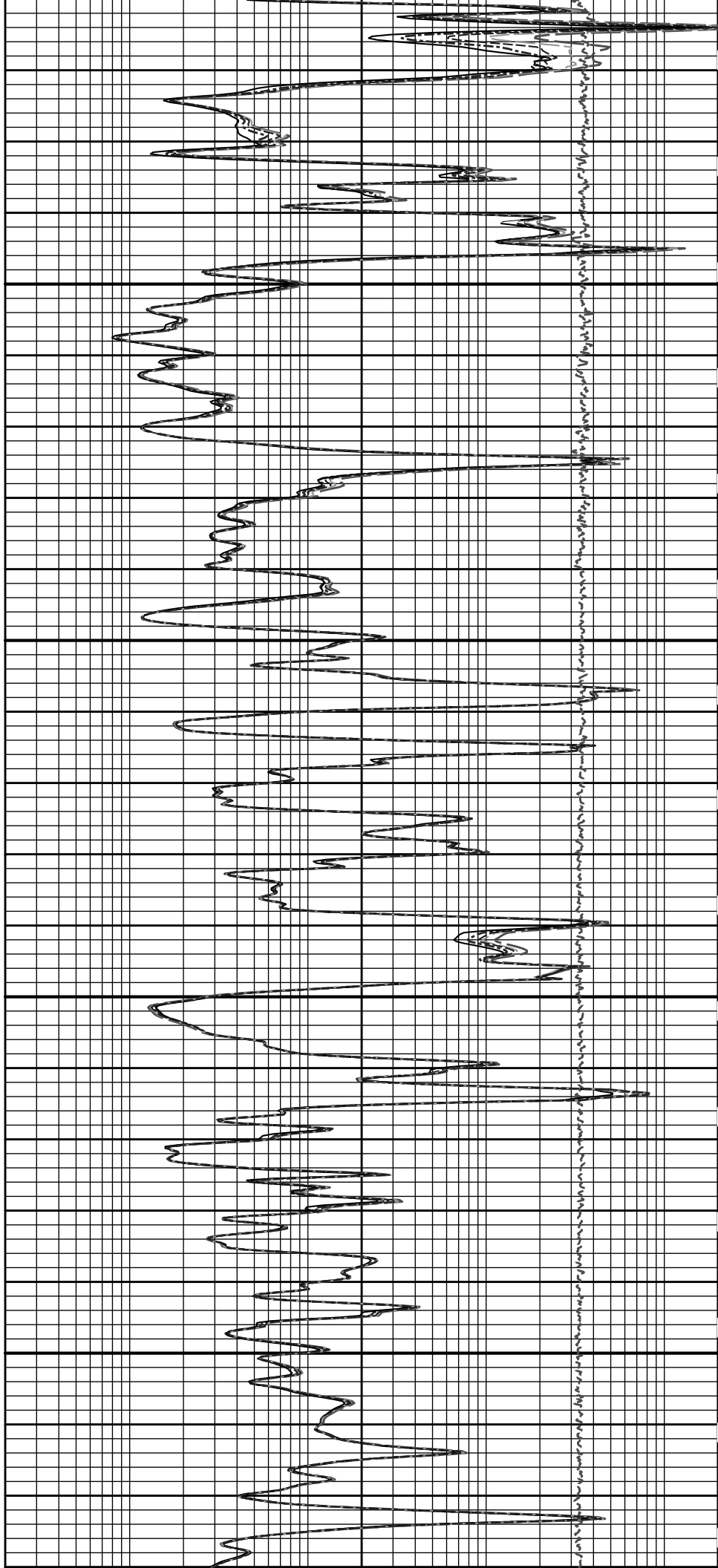
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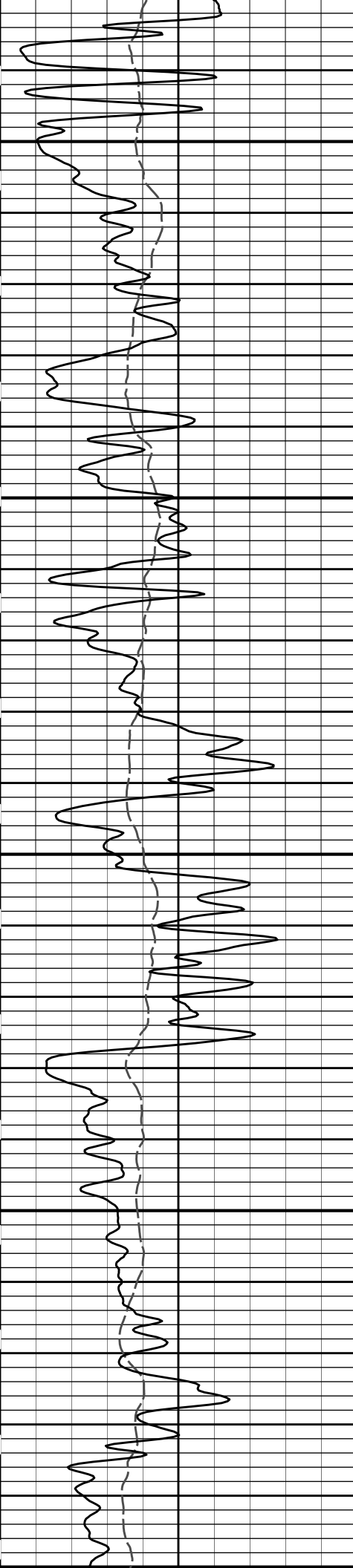




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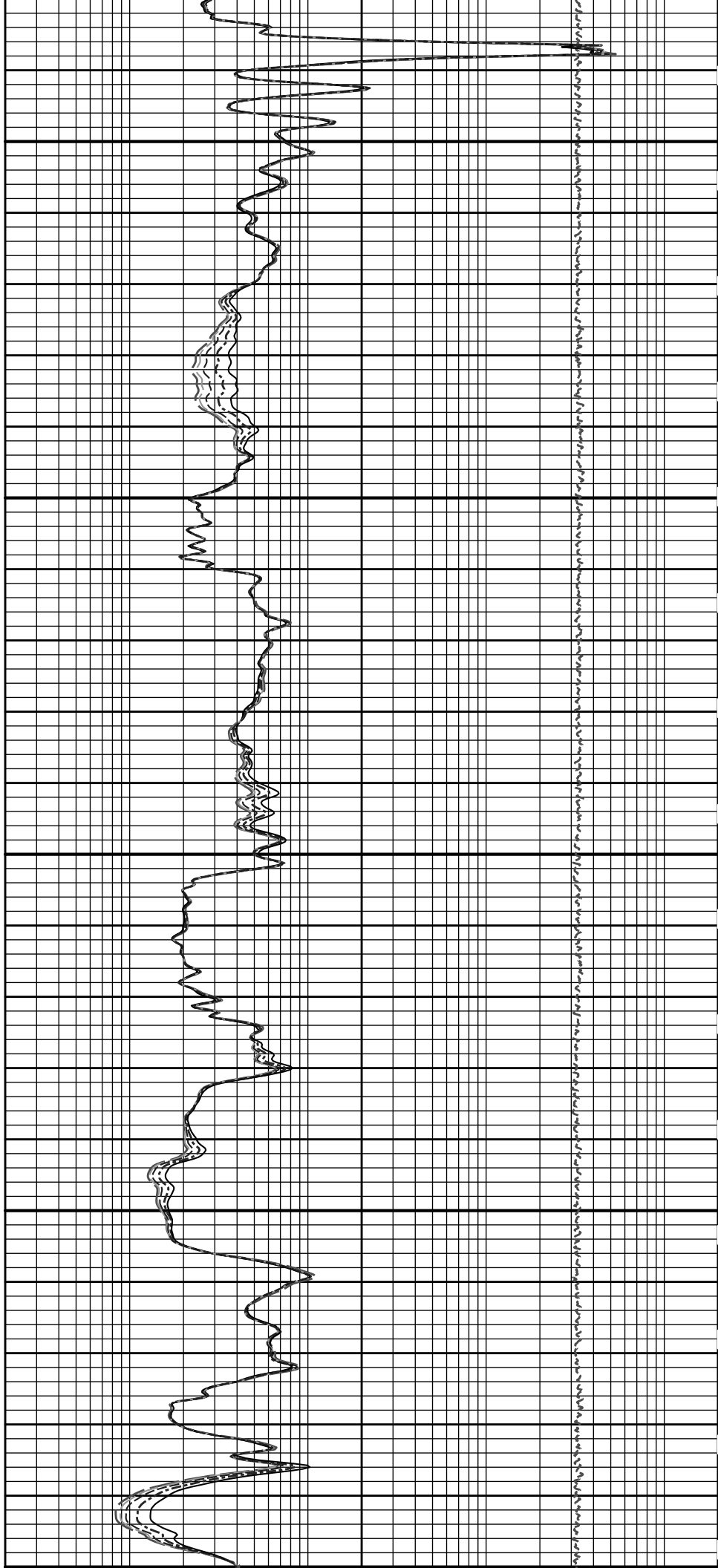


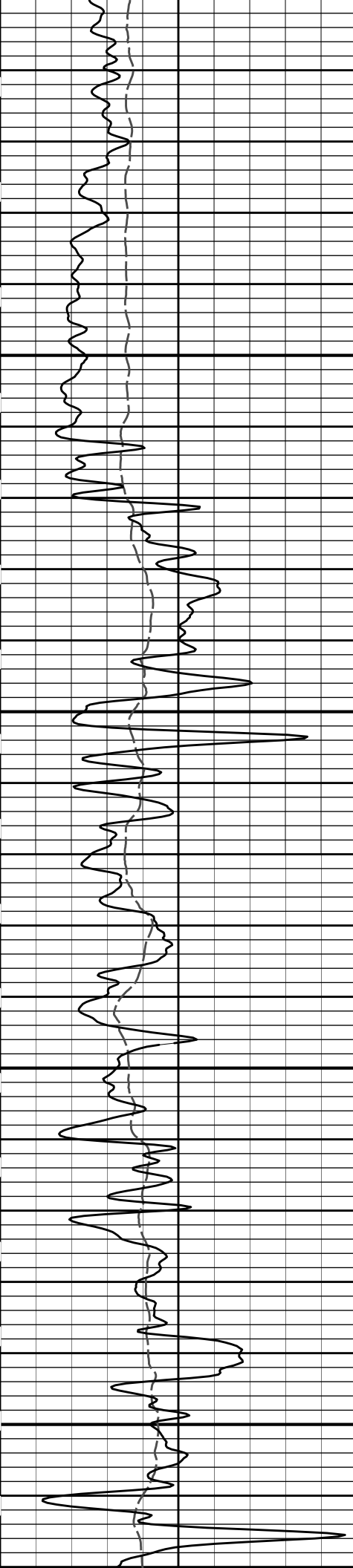


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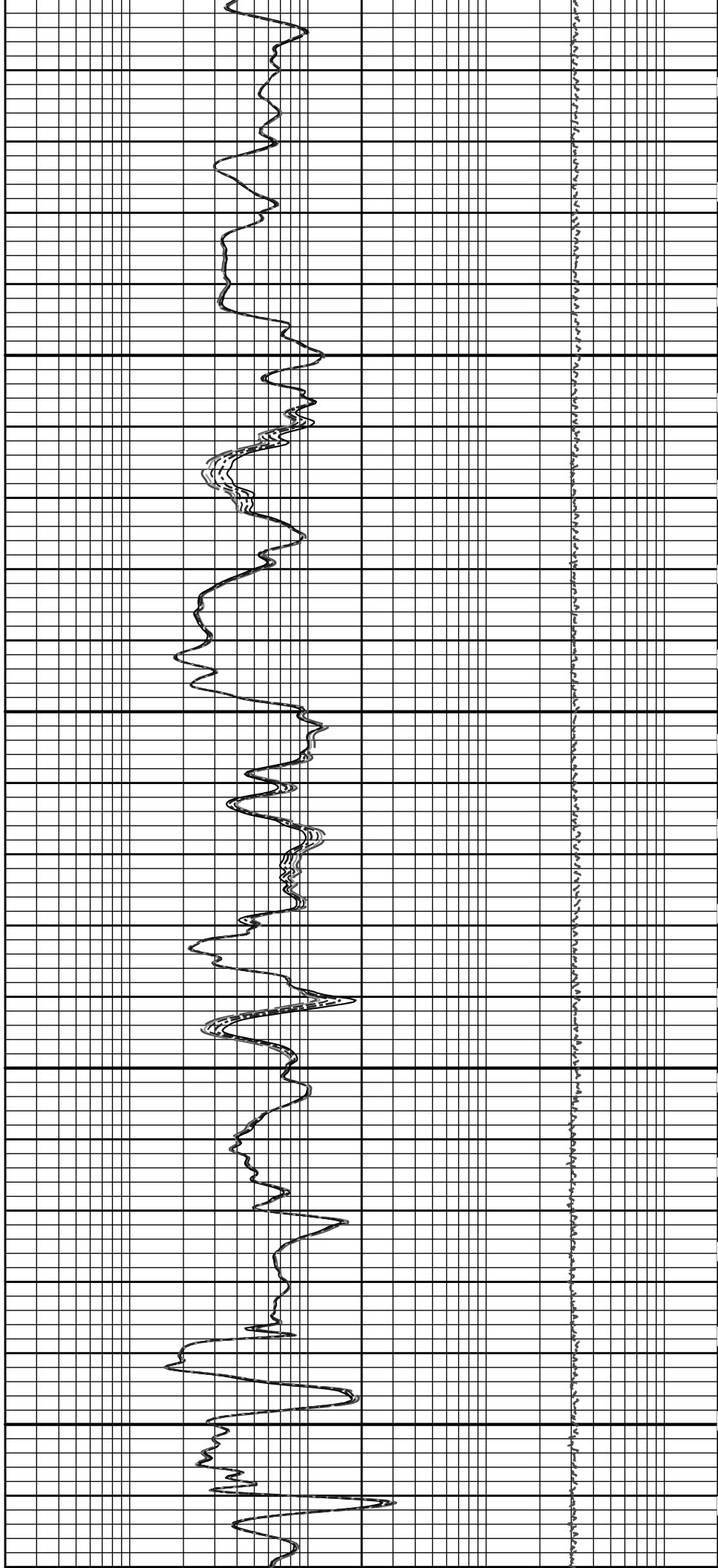
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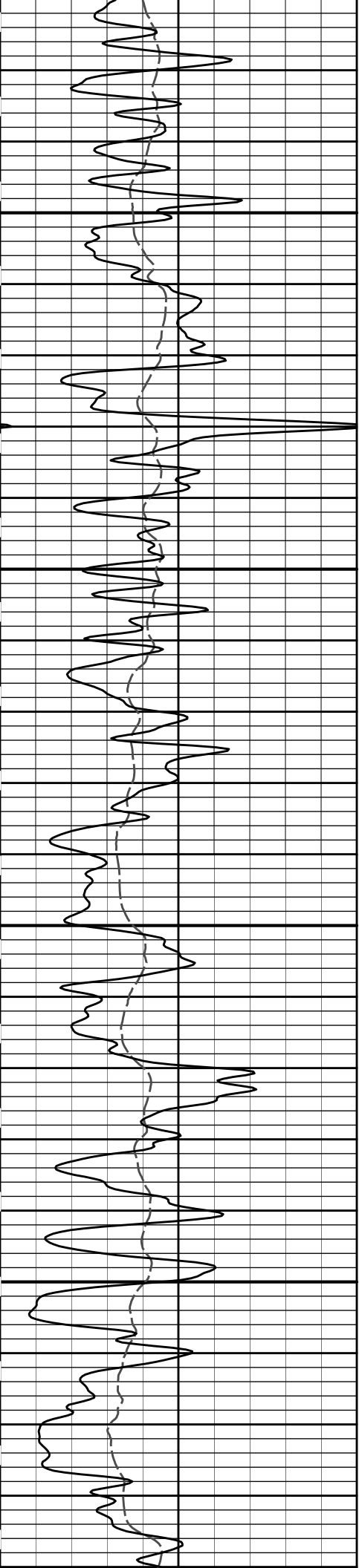


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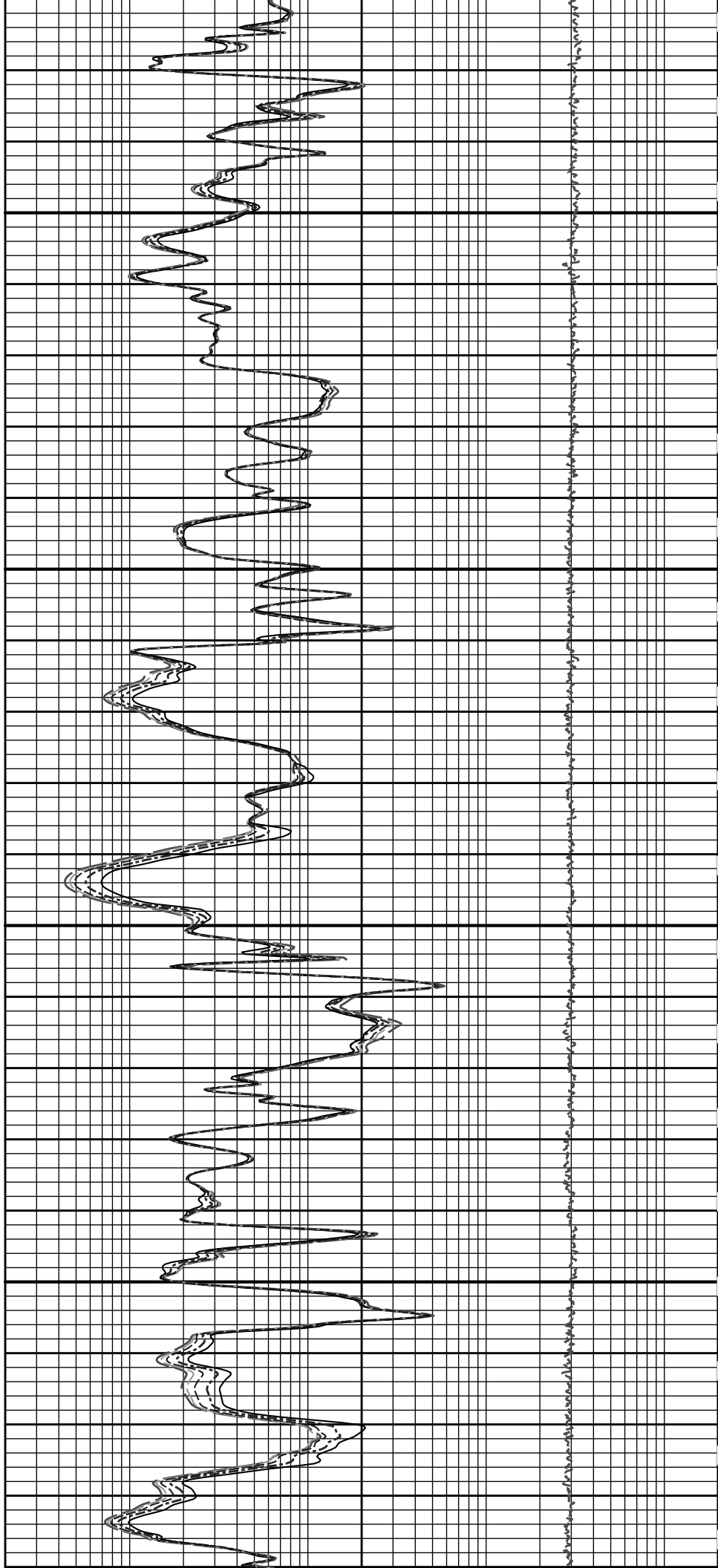
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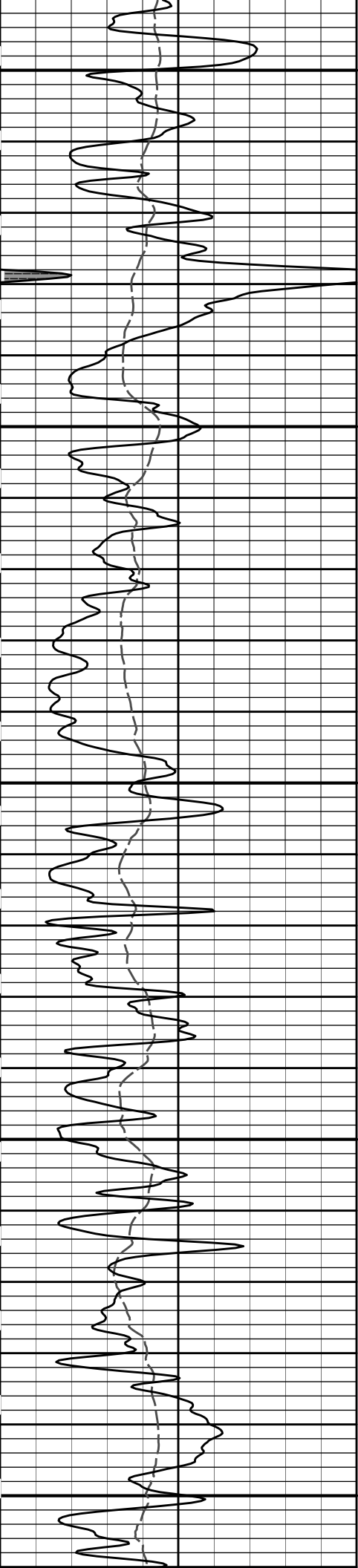
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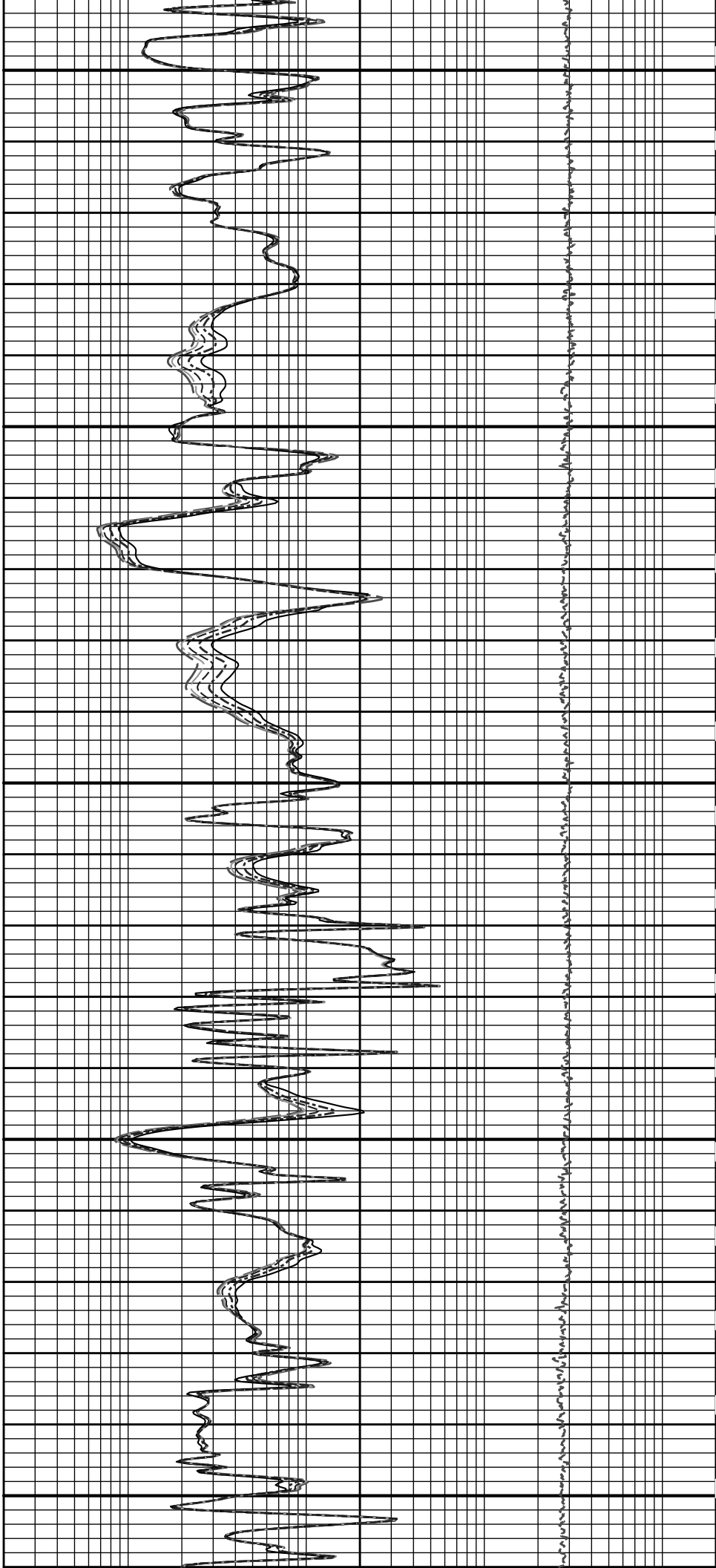
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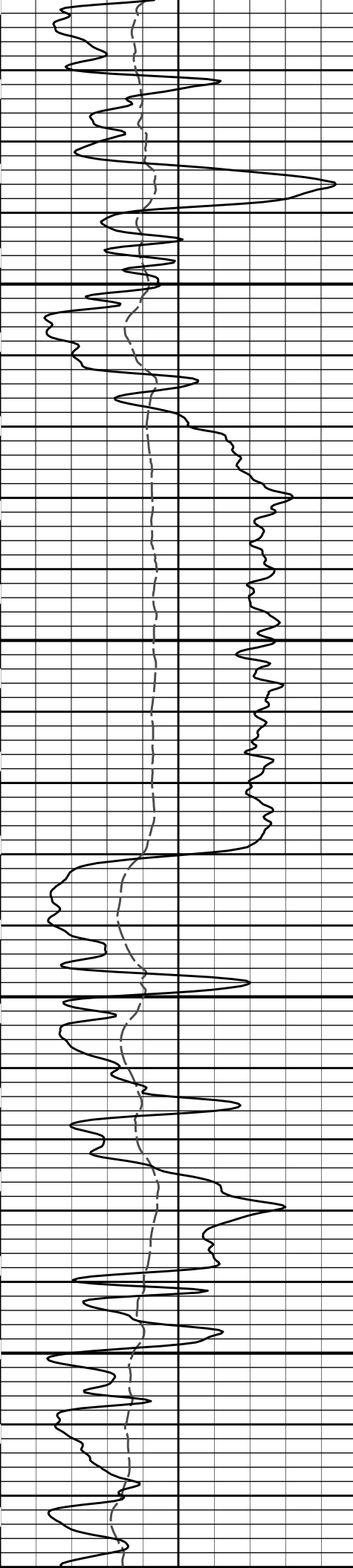




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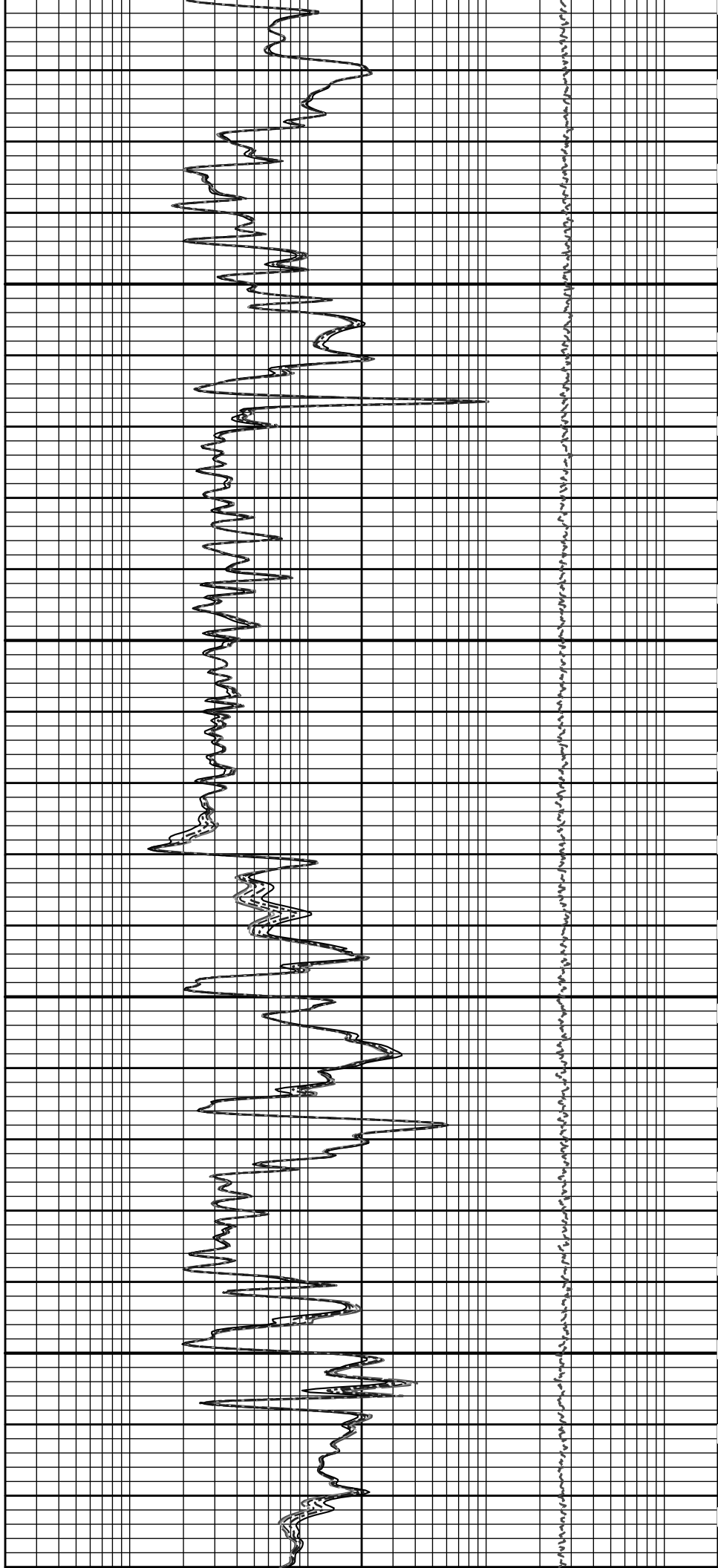
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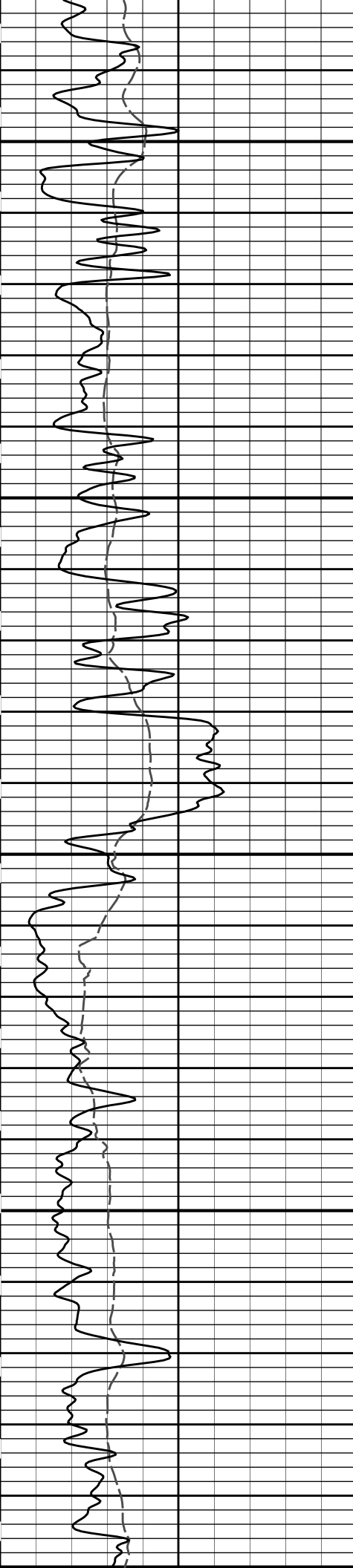




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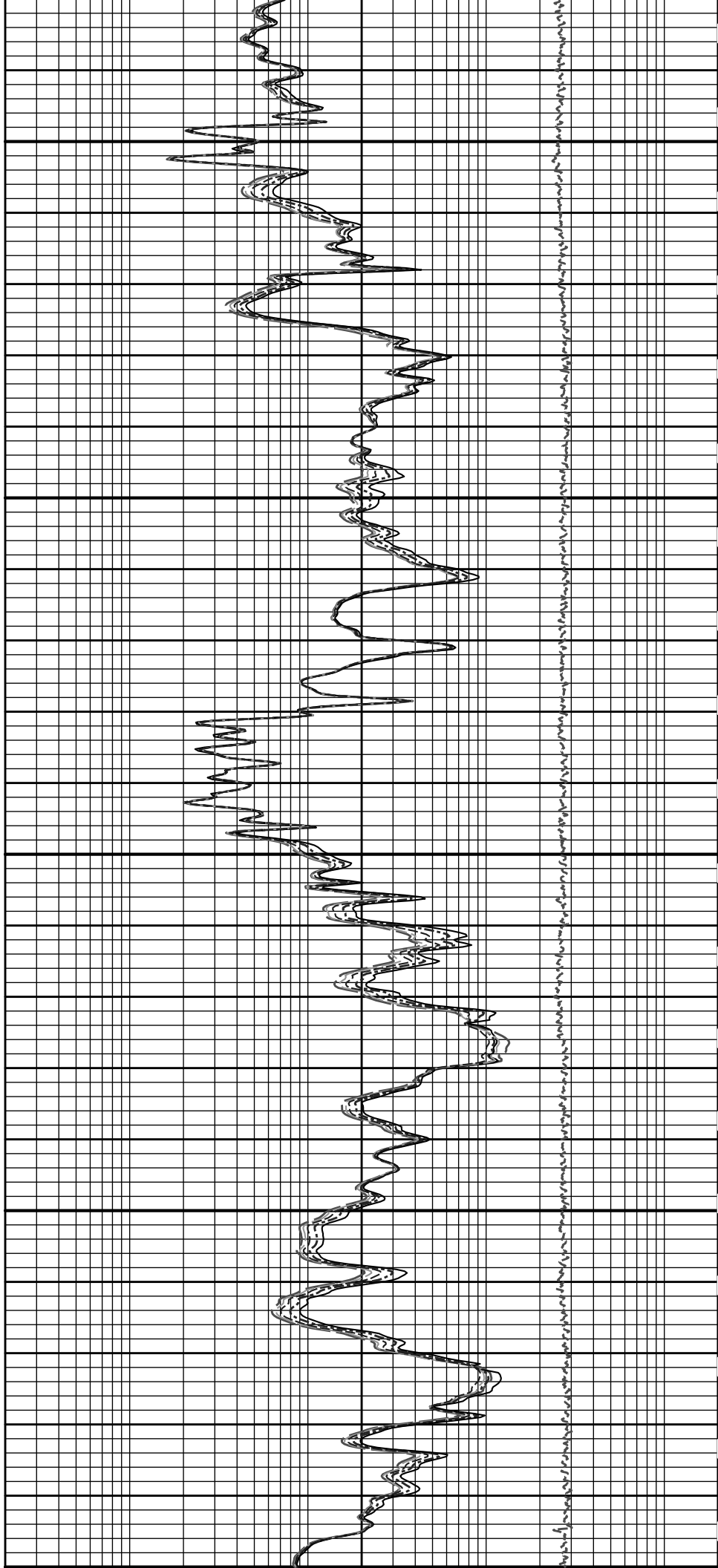


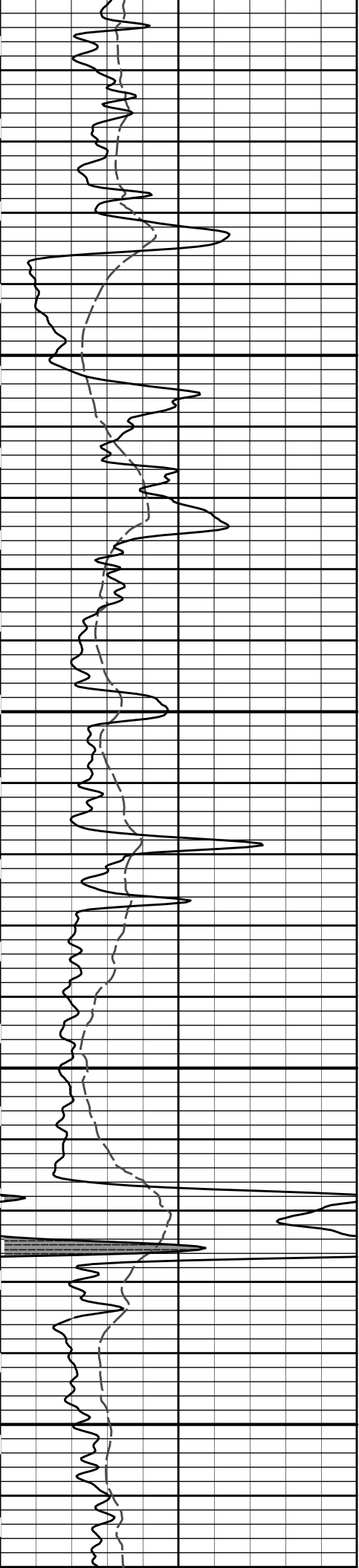


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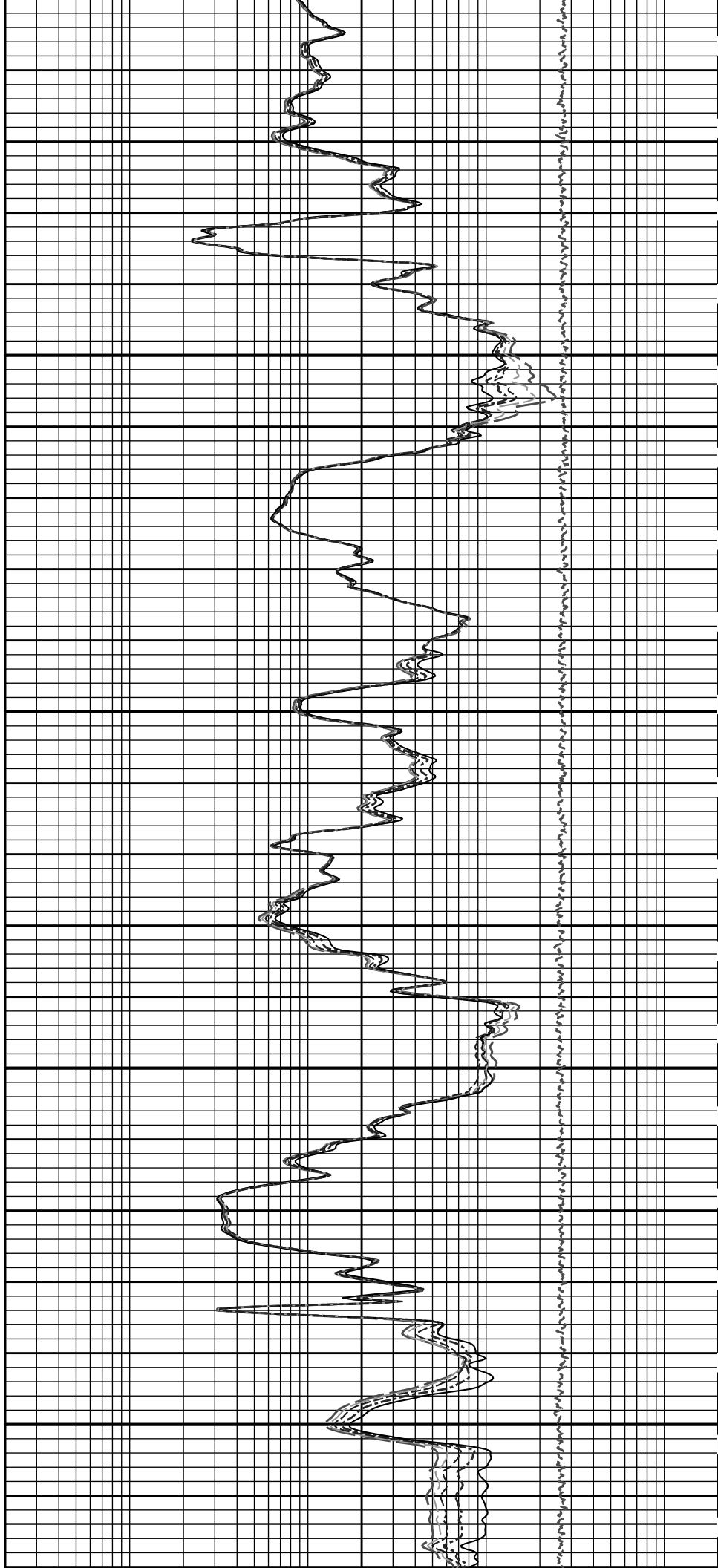


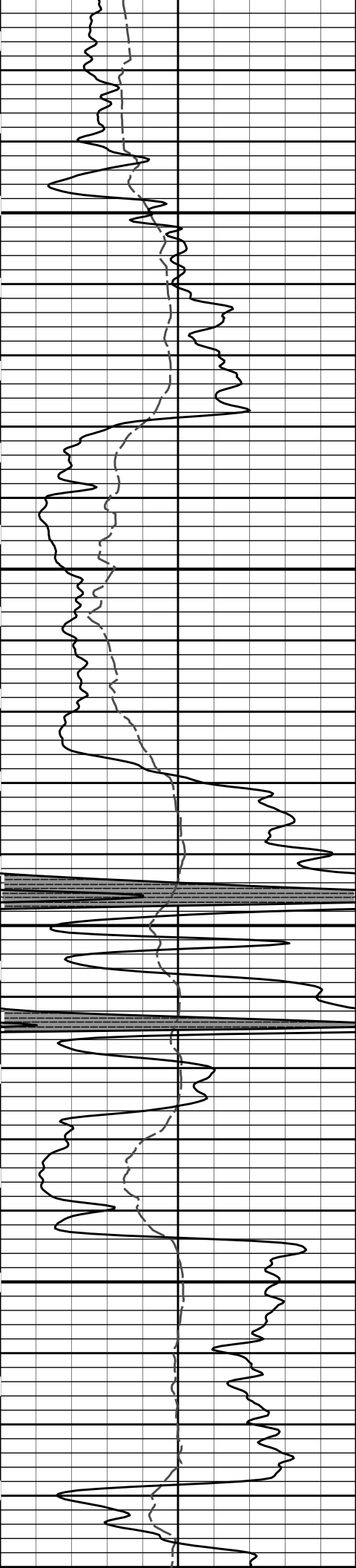


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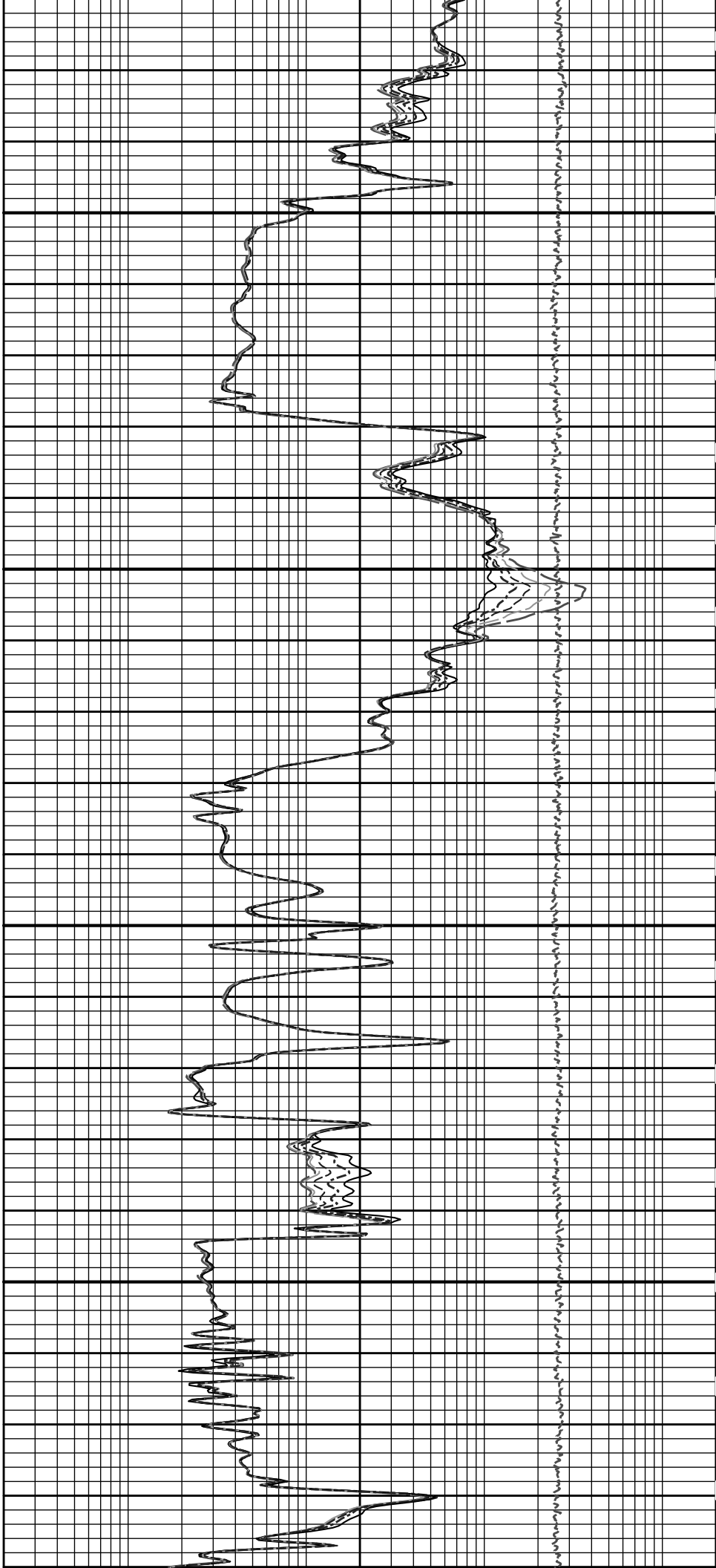
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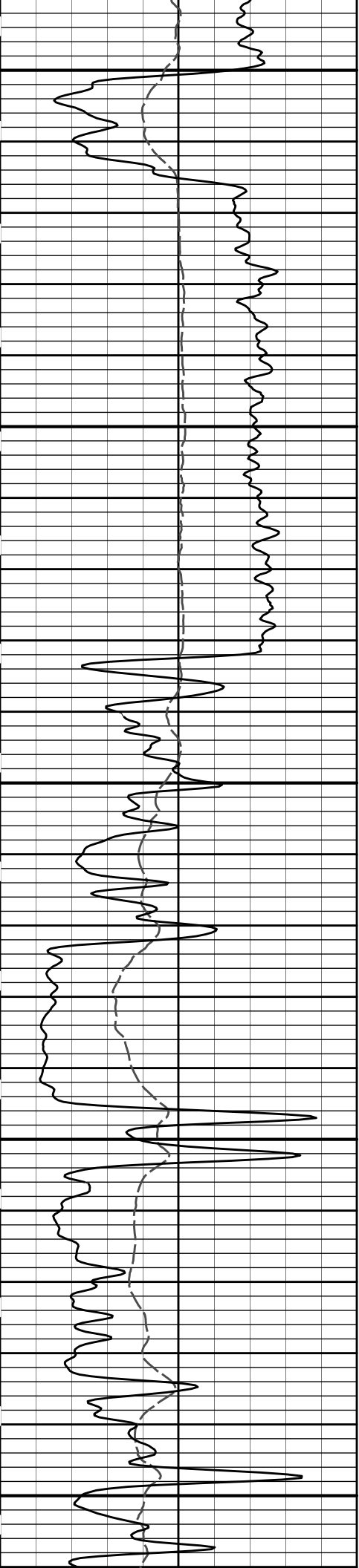




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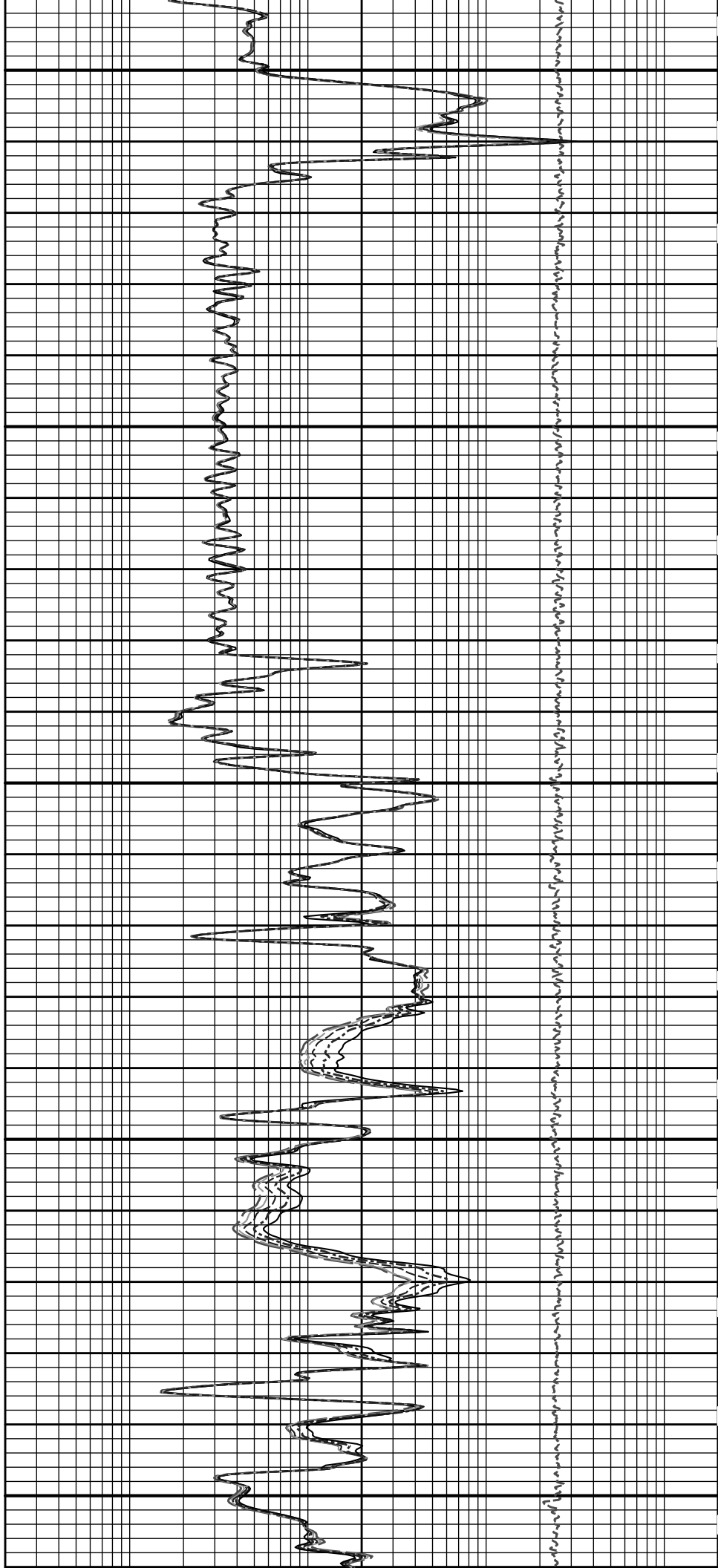
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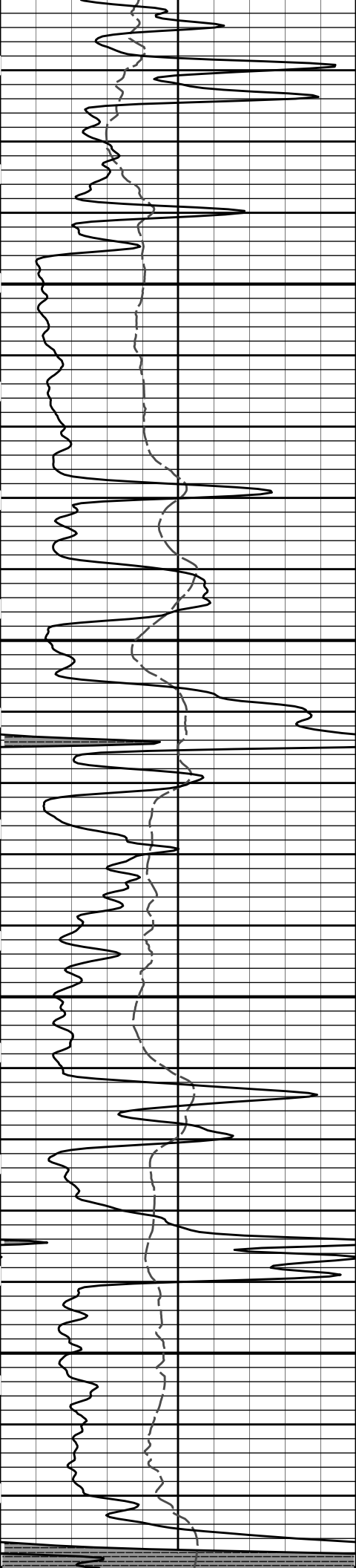




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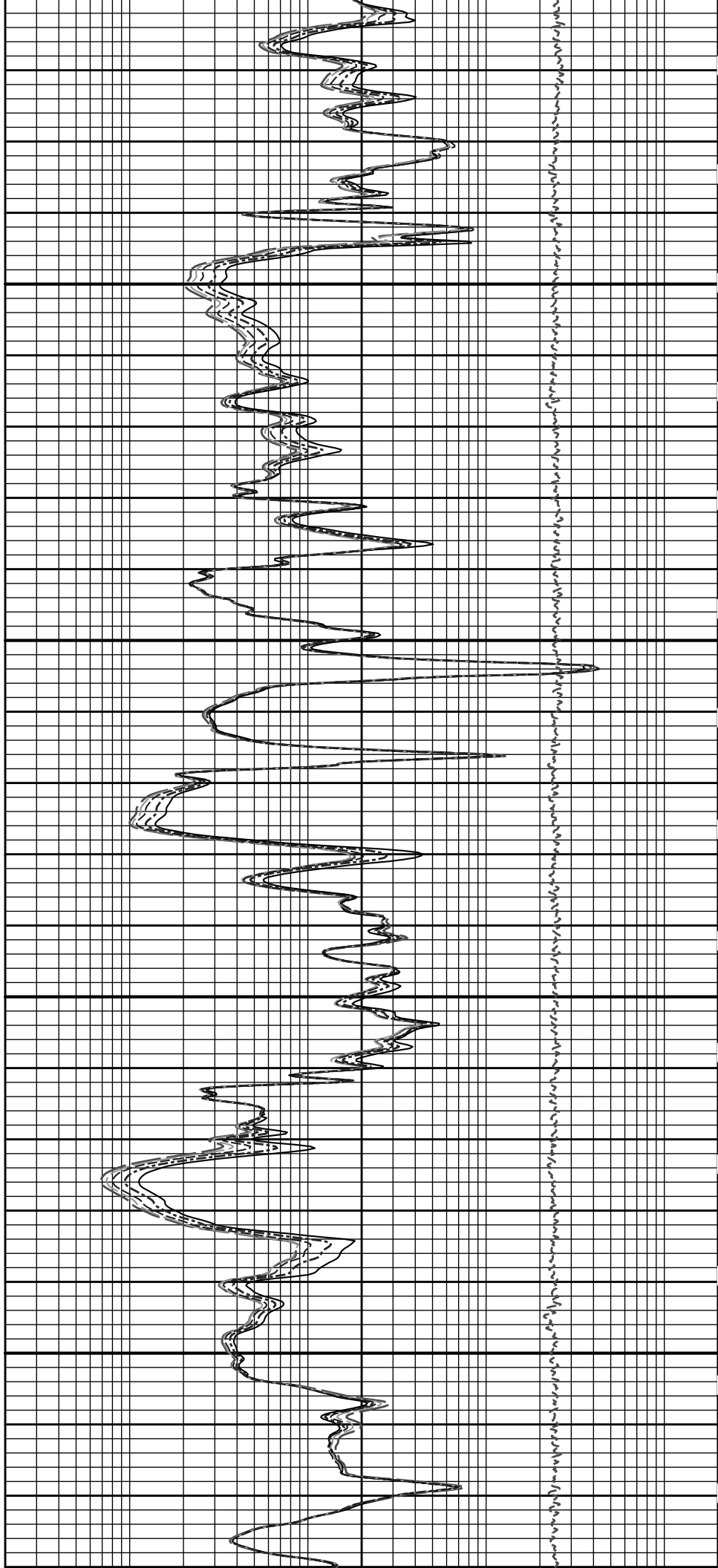
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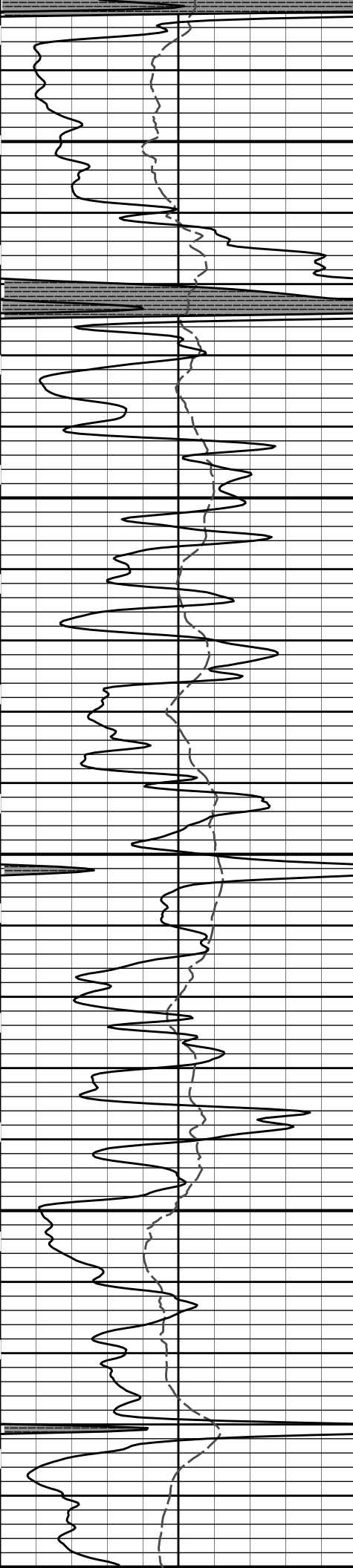




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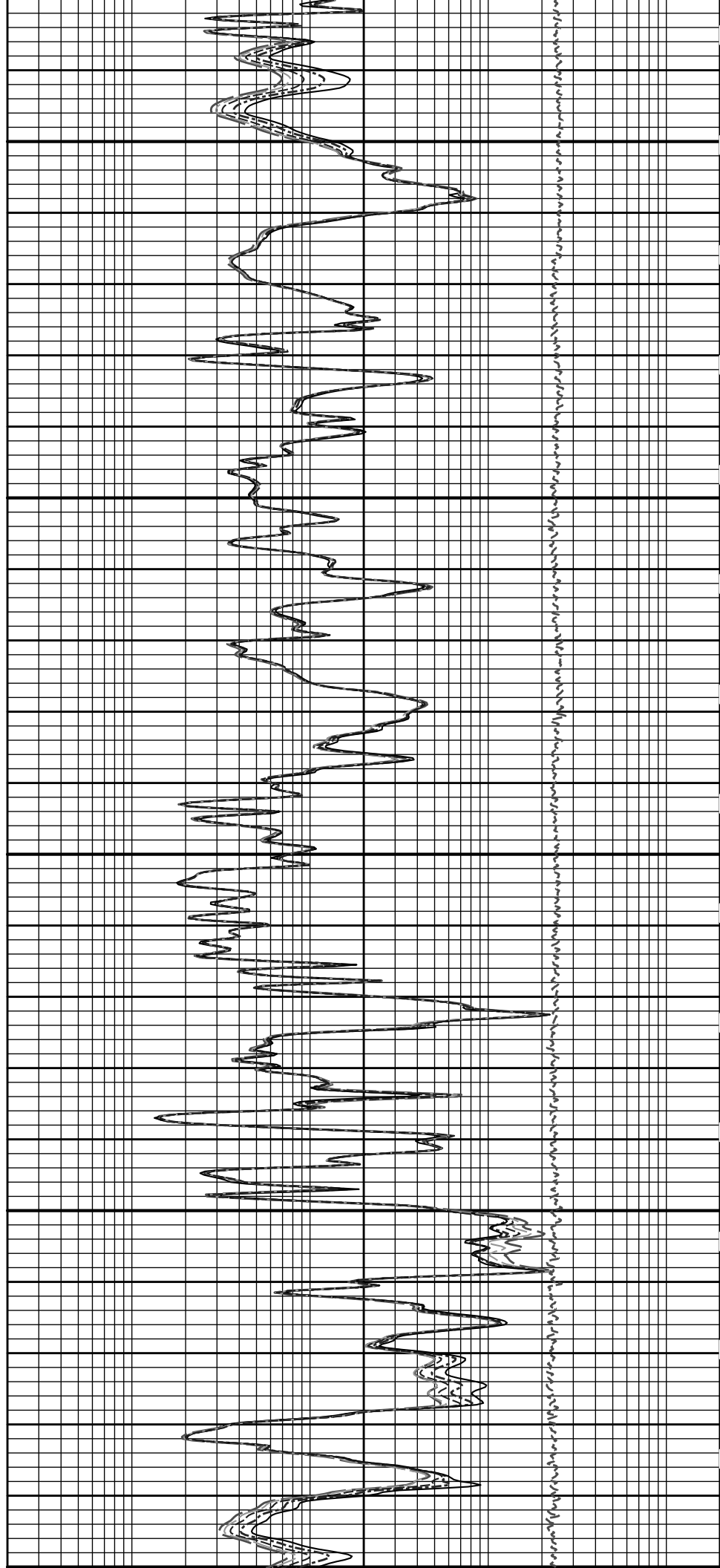


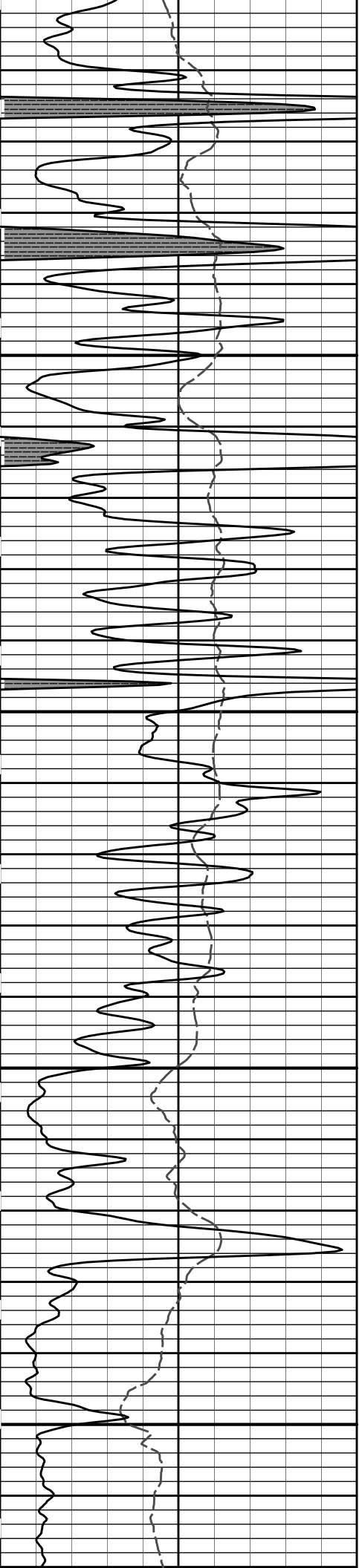


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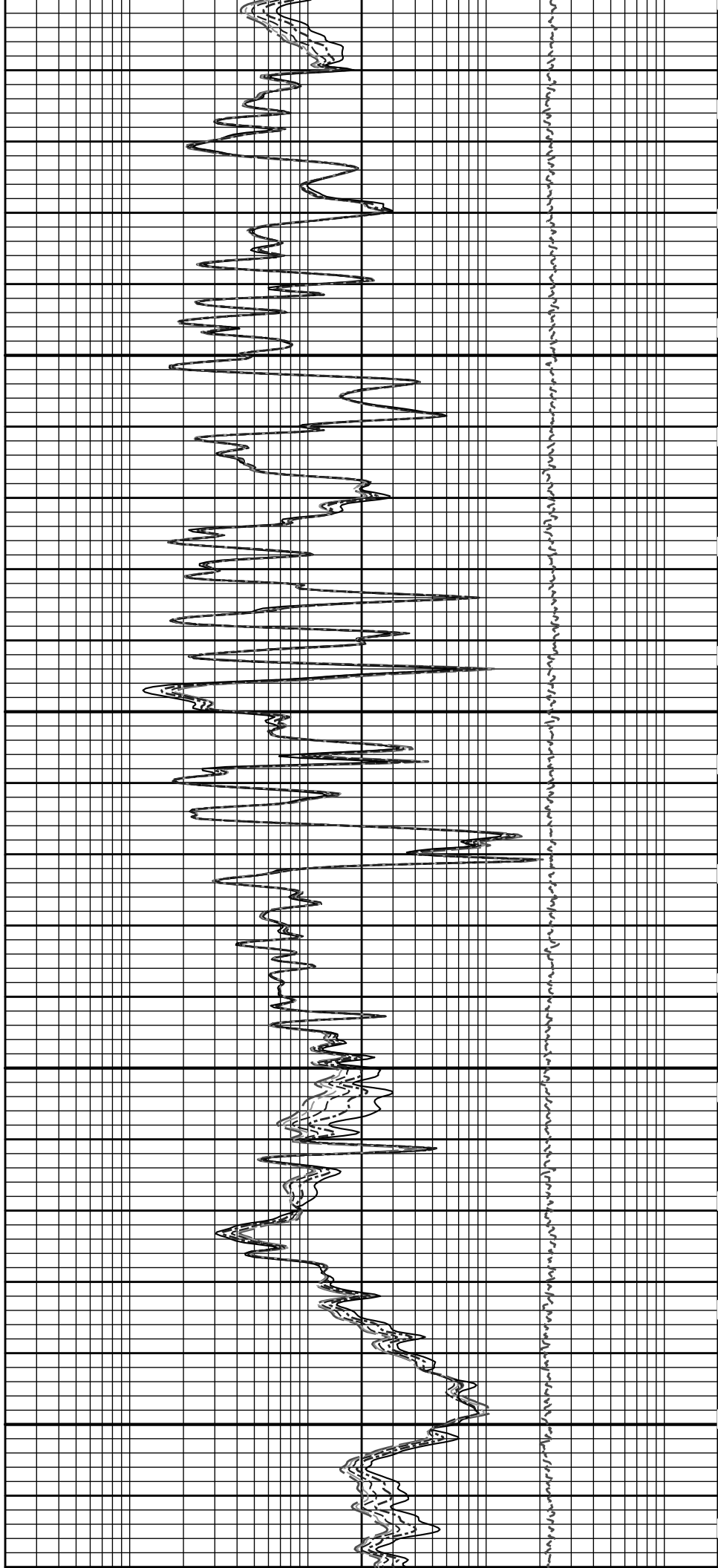


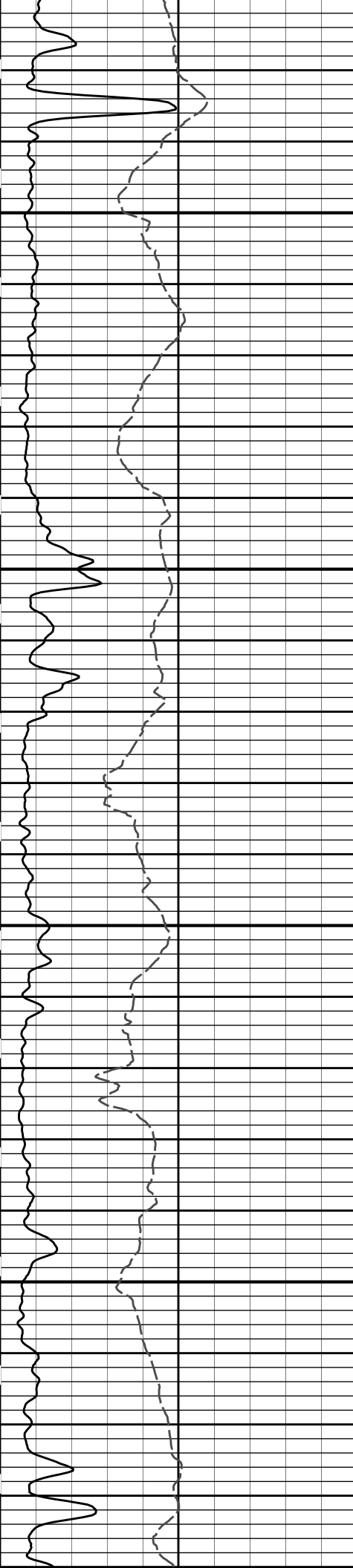


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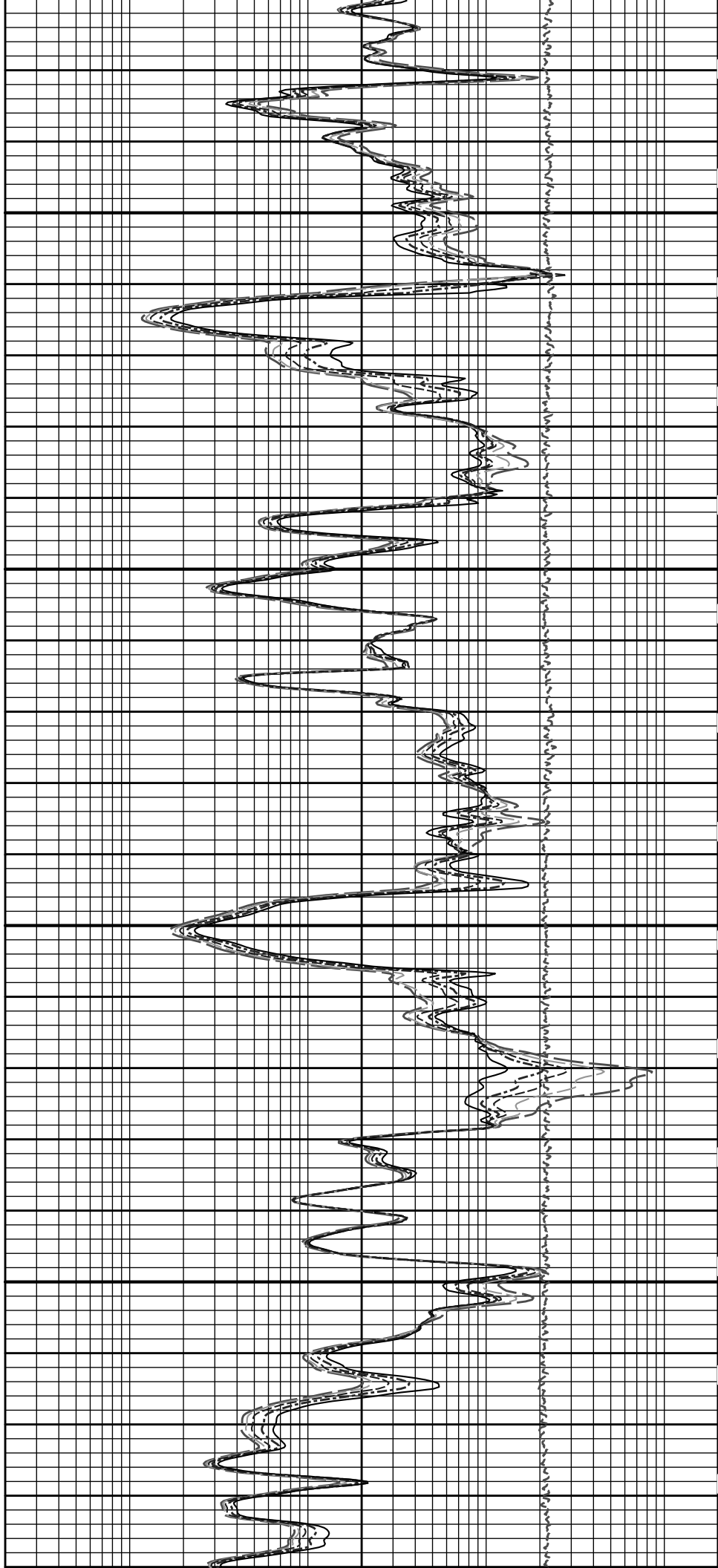
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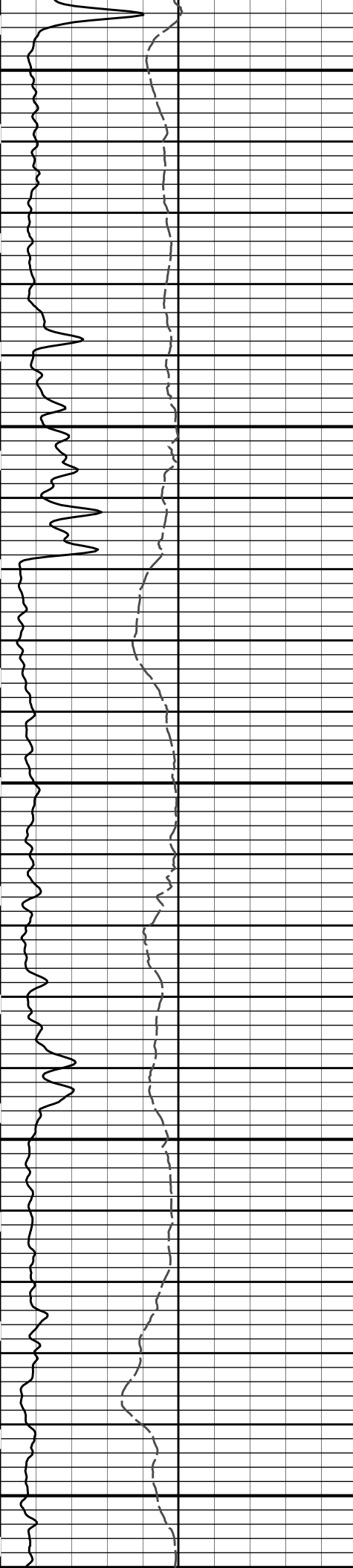




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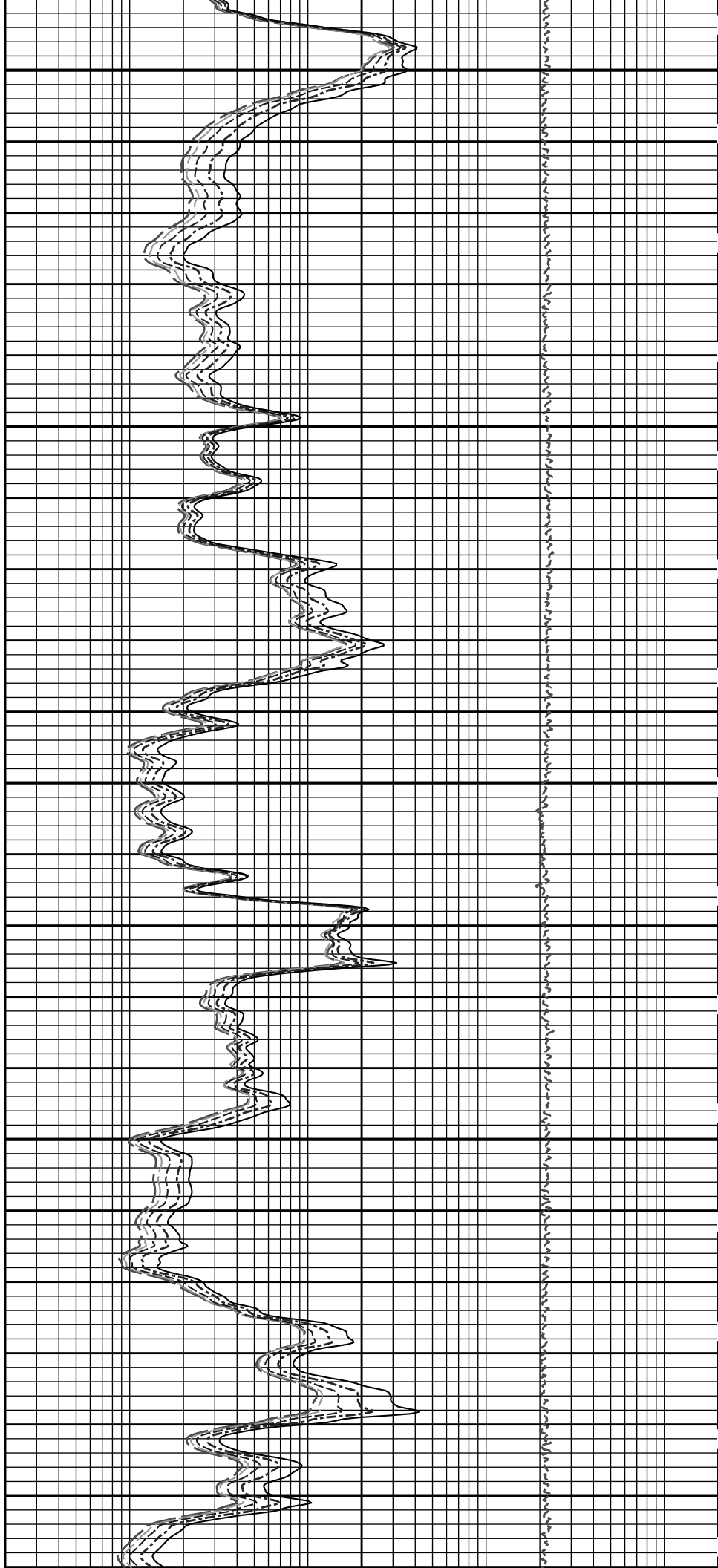
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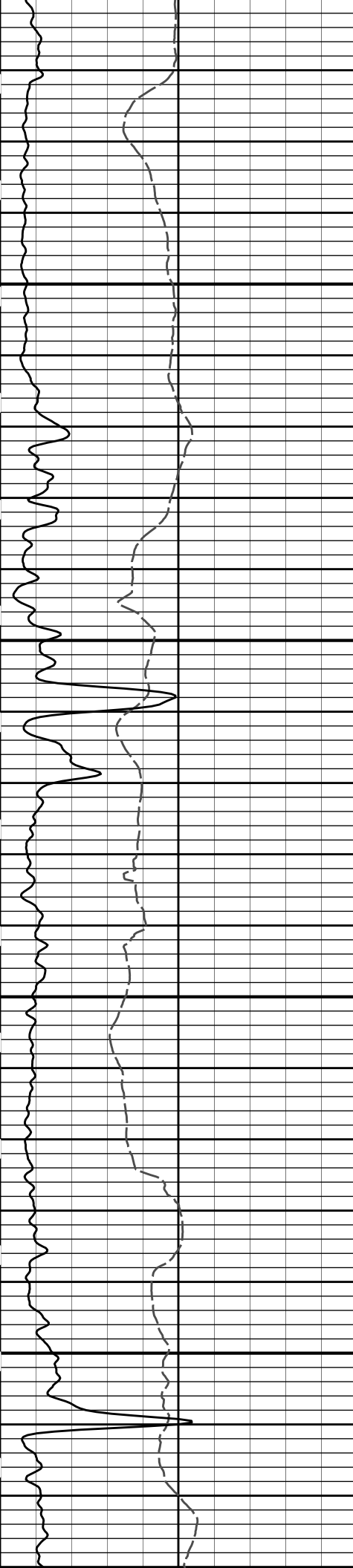




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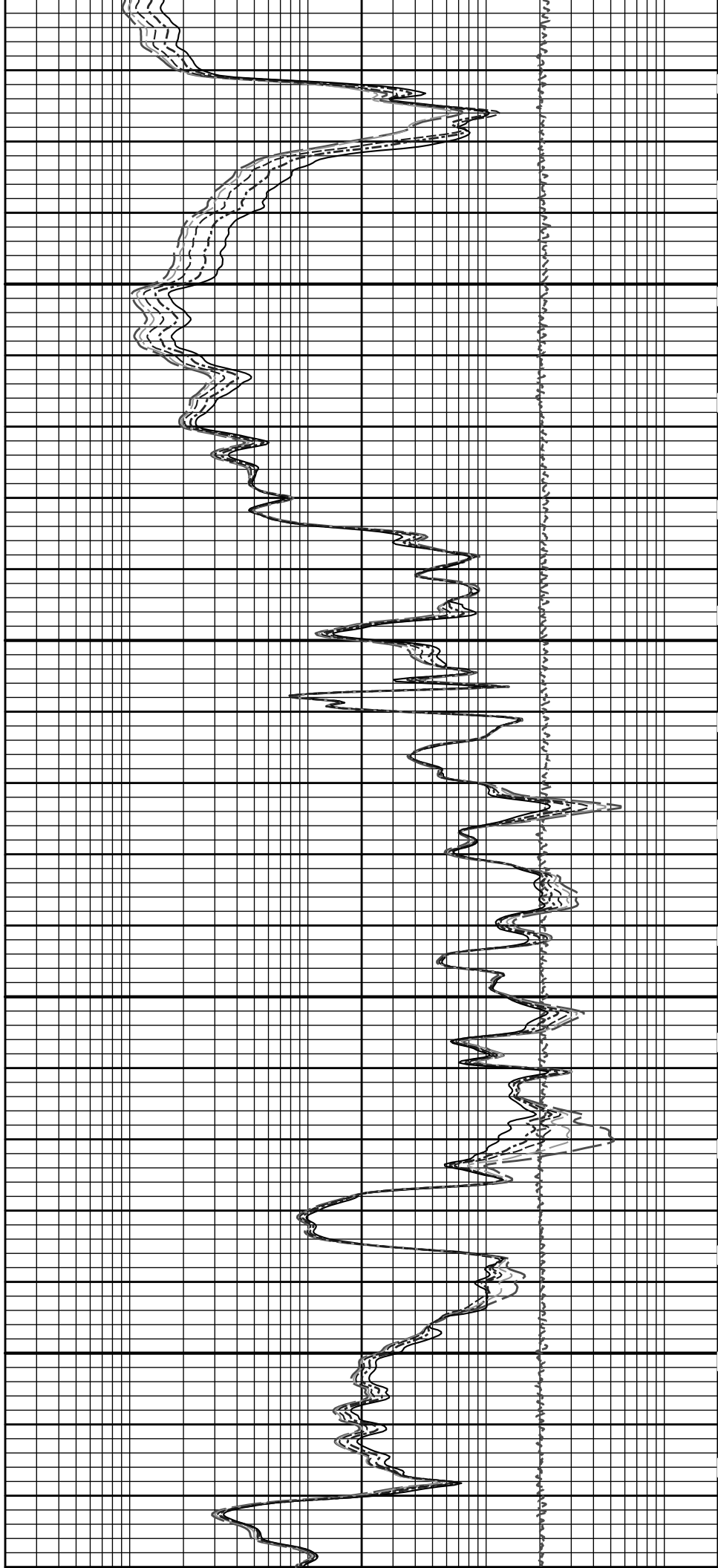
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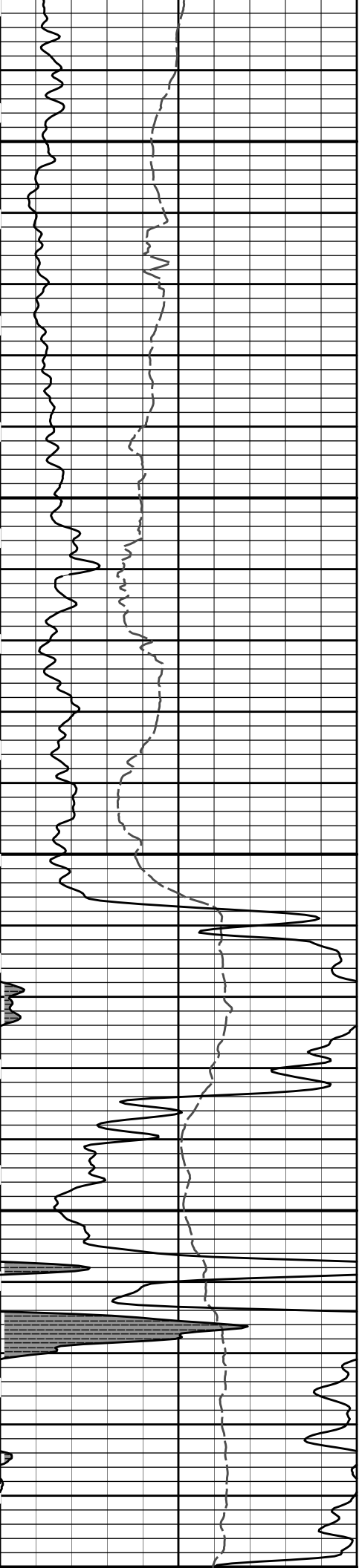




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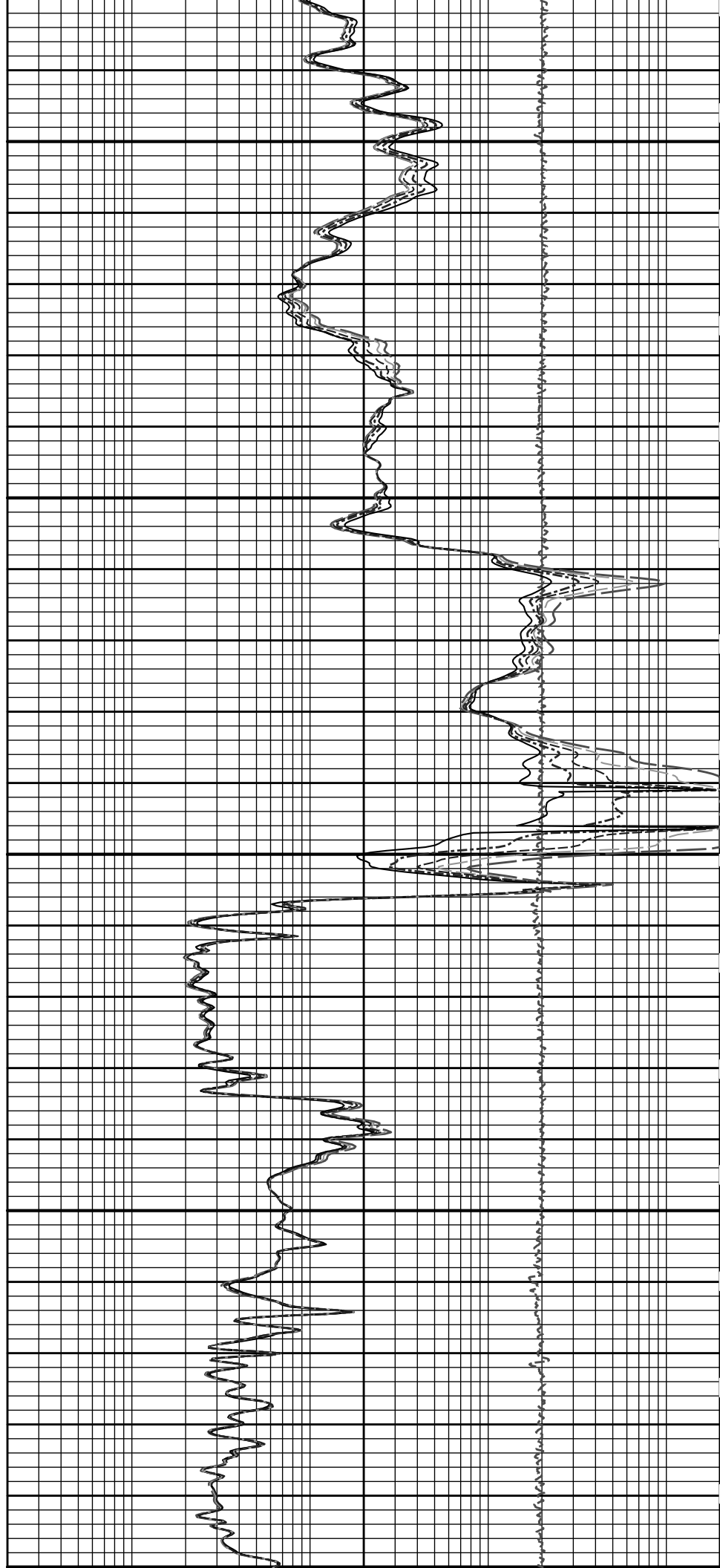


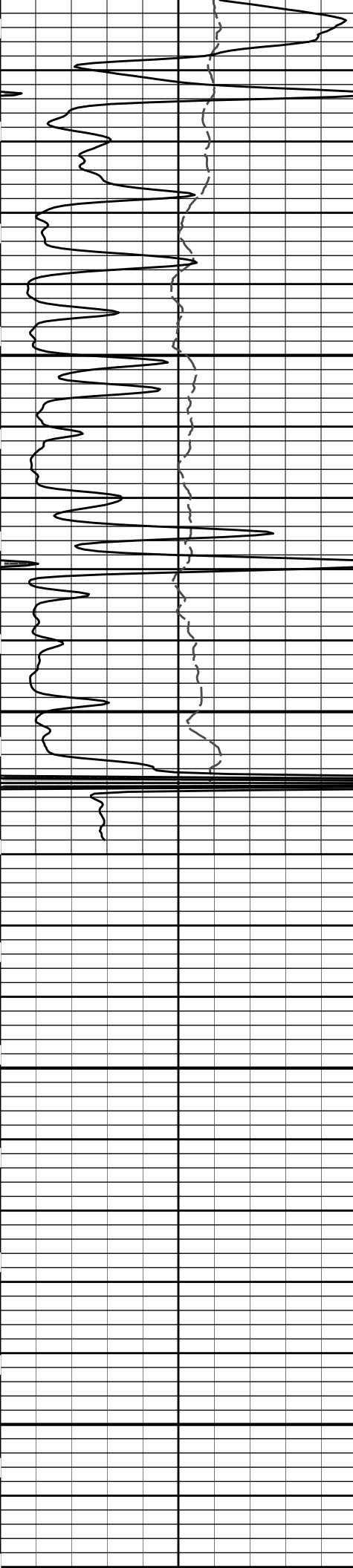


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6000

6100

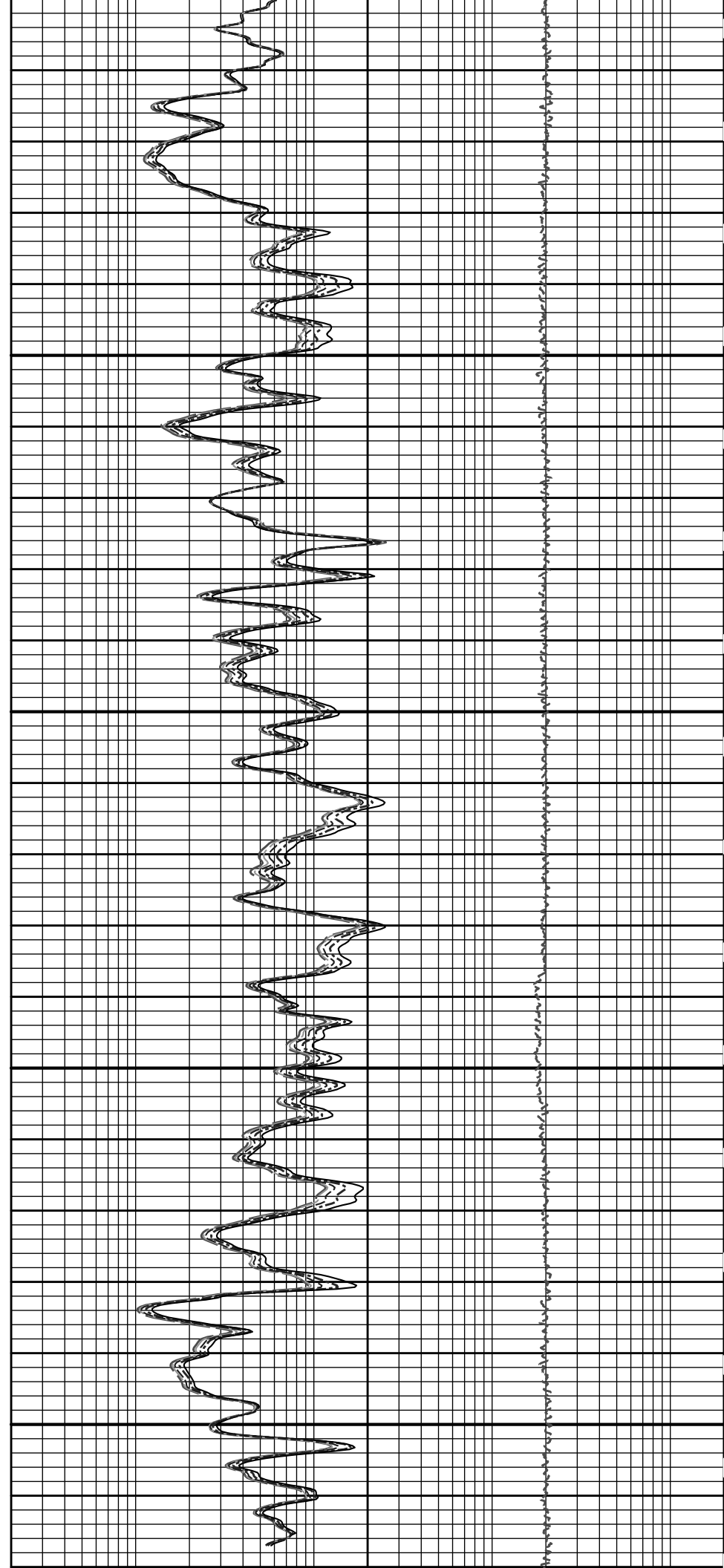




6100

6200

6300



SP -]20[+		MD 1 : 240 ft	10K Tension pounds		0
0	Gamma API 150		0.2	10in Resistivity 2ft Res	2000
api		SHALE	0.2	ohmm	
			0.2	20in Resistivity 2ft Res	2000
				ohmm	
			0.2	30in Resistivity 2ft Res	2000
				ohm-metre	
			0.2	60in Resistivity 2ft Res	2000
			ohmm		
		0.2	90in Resistivity 2ft Res	2000	
			ohmm		

**HALLIBURTON**

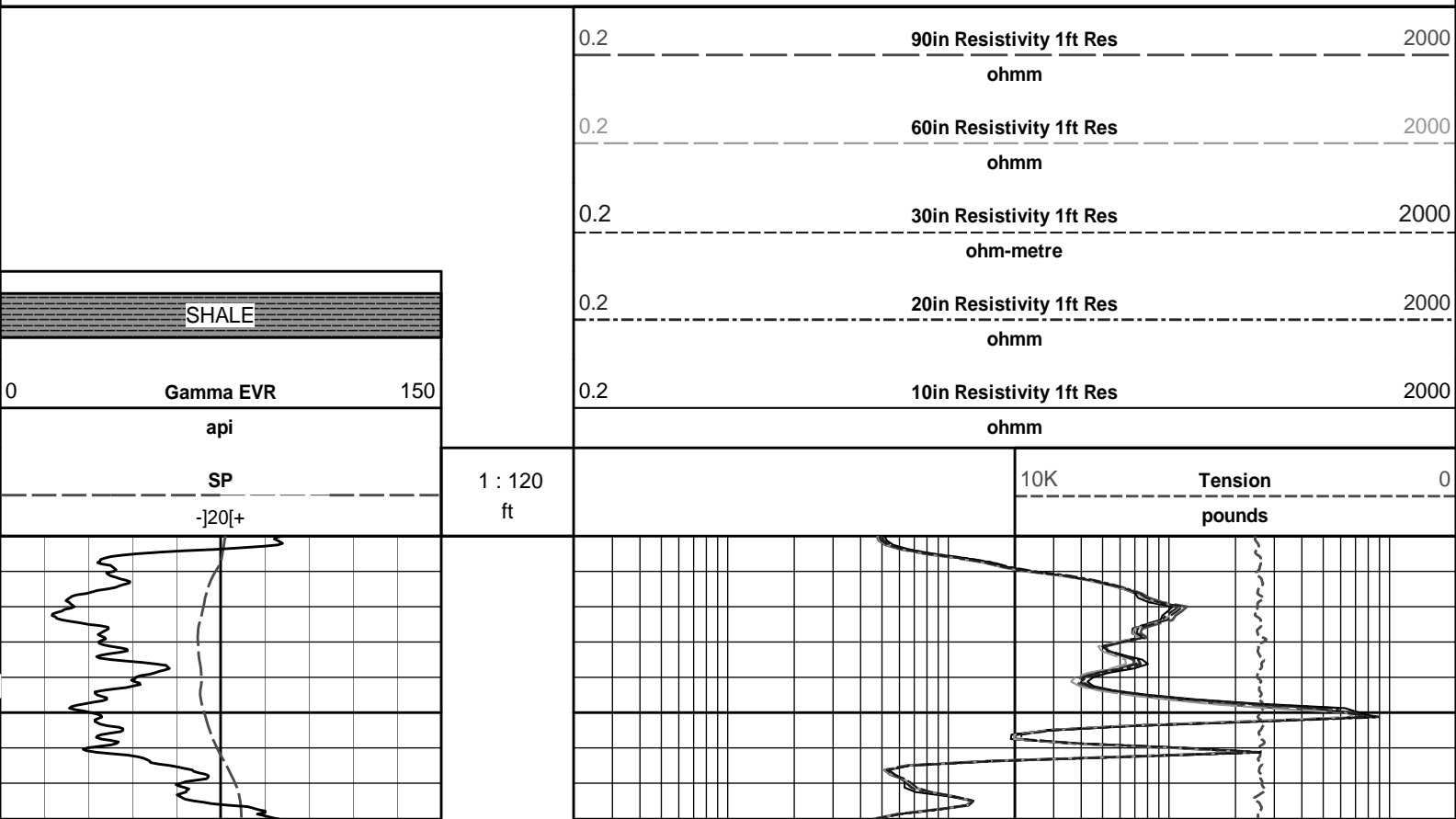
Plot Time: 16-Aug-13 13:23:25  
 Plot Range: 730 ft to 6327.75 ft  
 Data: MILLY\_3020\_1-19\Well Based\R1 CASING\  
 Plot File: \\-LOCAL-MILLY\_3020\_1-19\Well Based\ACRT\ACRT\_5\_main\_lib

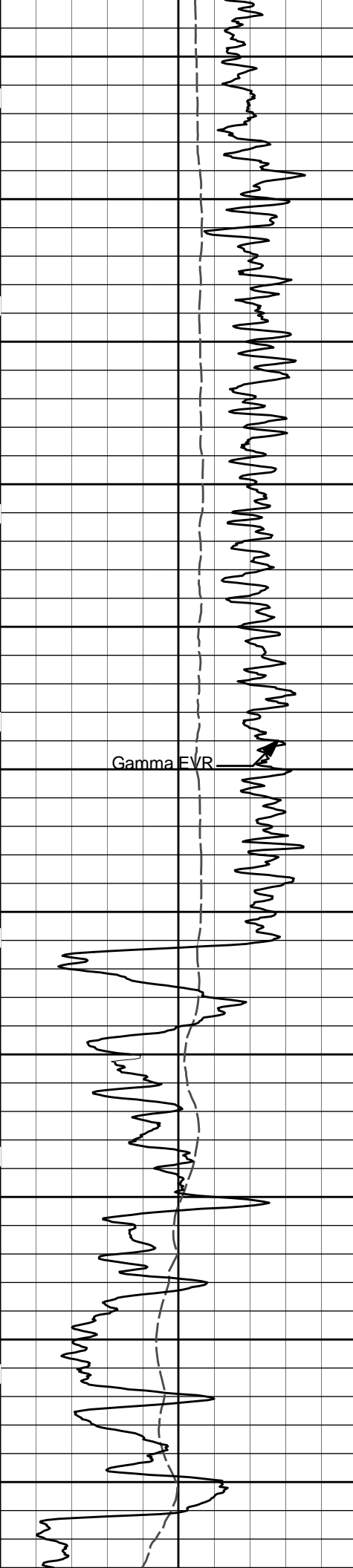
## 5 INCH MAIN LOG

**HALLIBURTON**

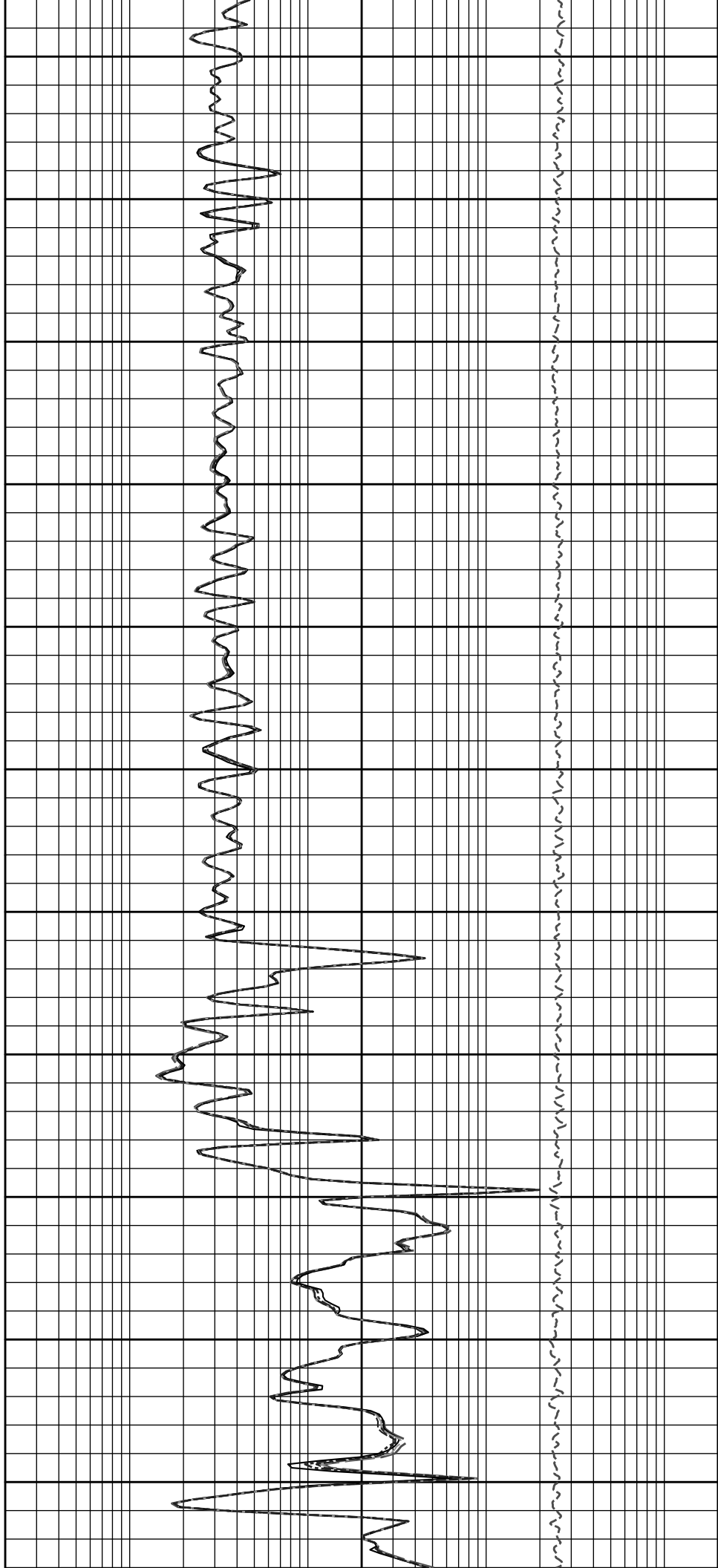
Plot Time: 16-Aug-13 13:23:25  
 Plot Range: 4350 ft to 6327.75 ft  
 Data: MILLY\_3020\_1-19\Well Based\R1 EVR\  
 Plot File: \\-LOCAL-MILLY\_3020\_1-19\Well Based\ACRT\ACRT\_5\_EVR\_LIB

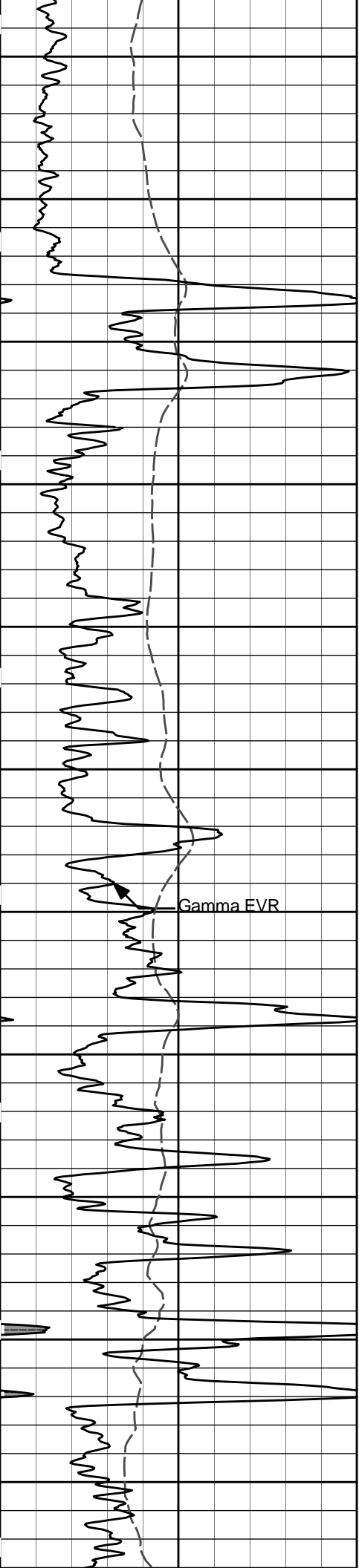
## MAIN SECTION 10" PER 100'



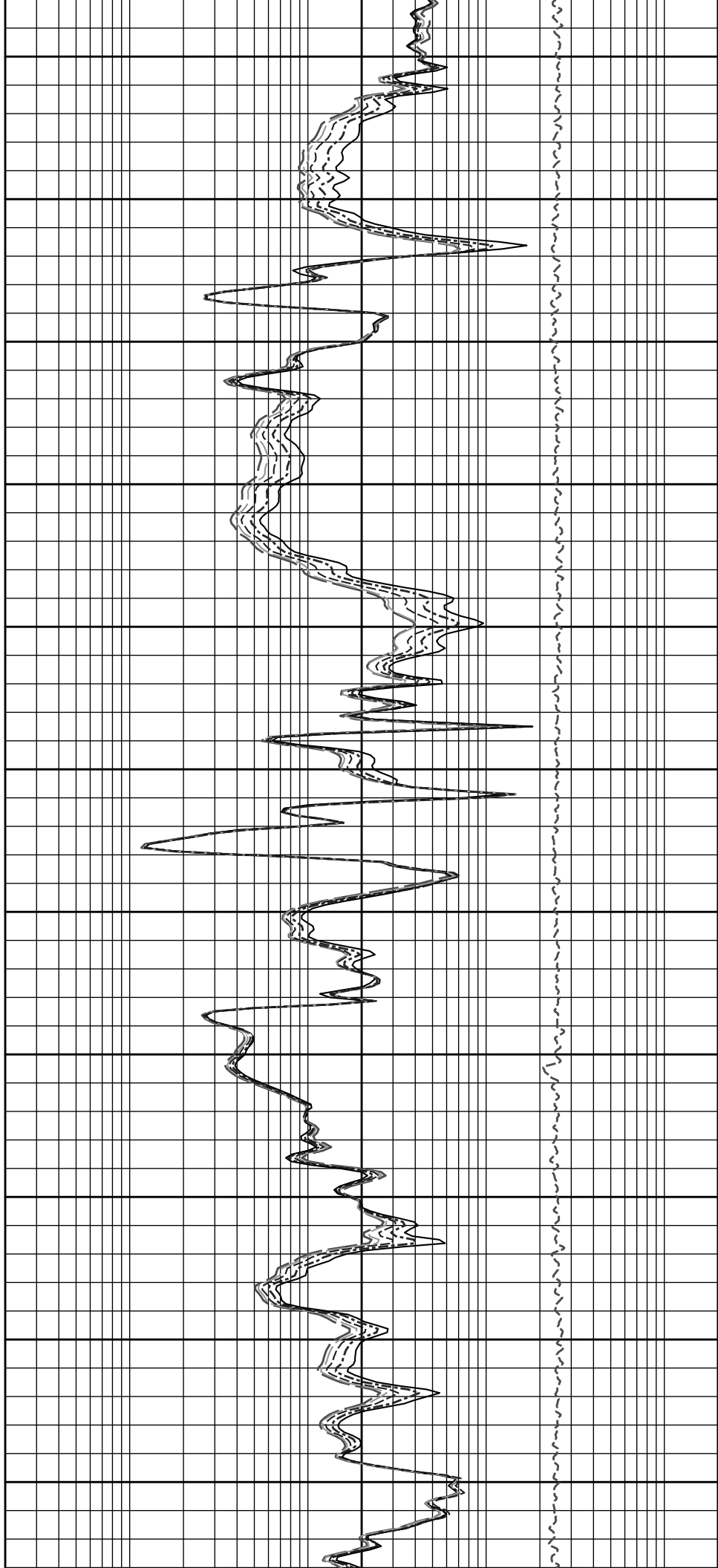


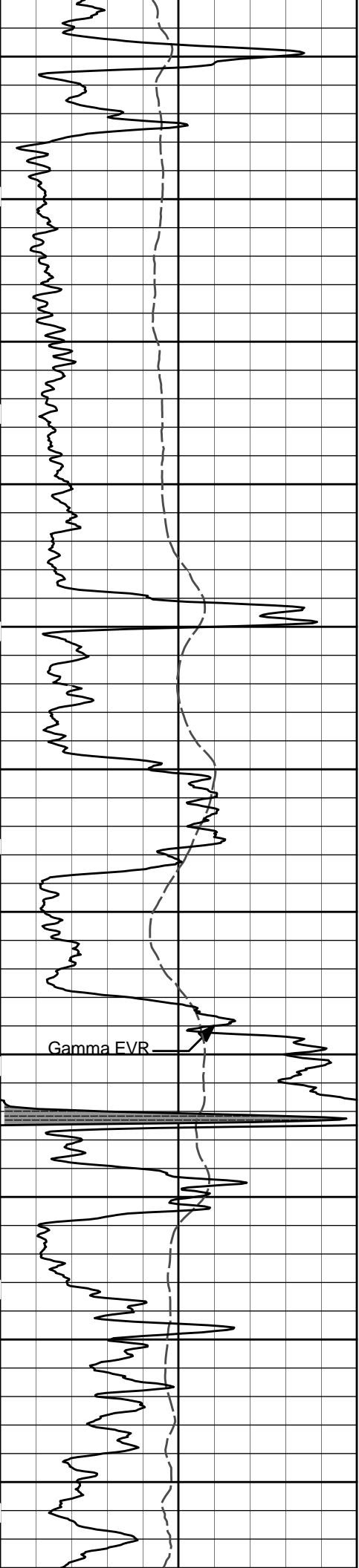
4400



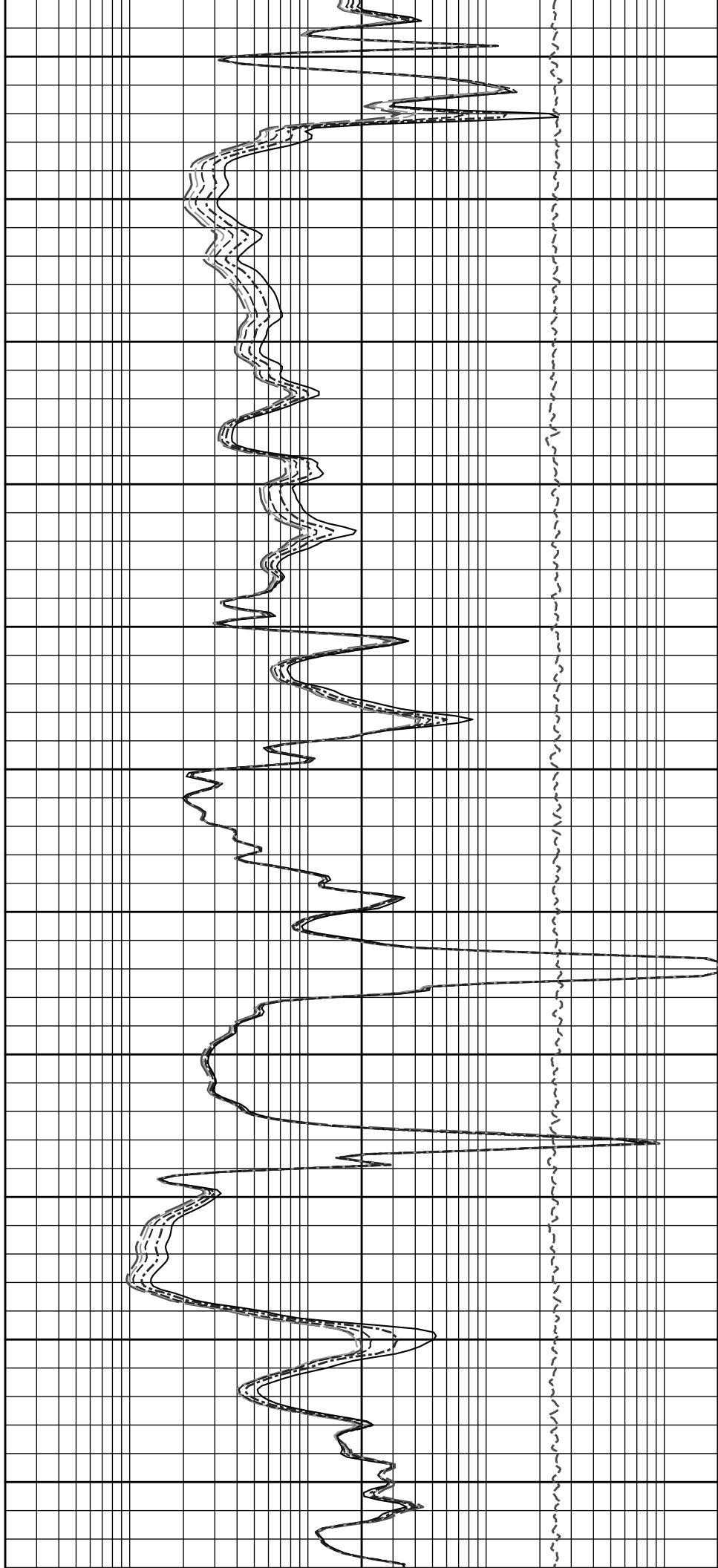


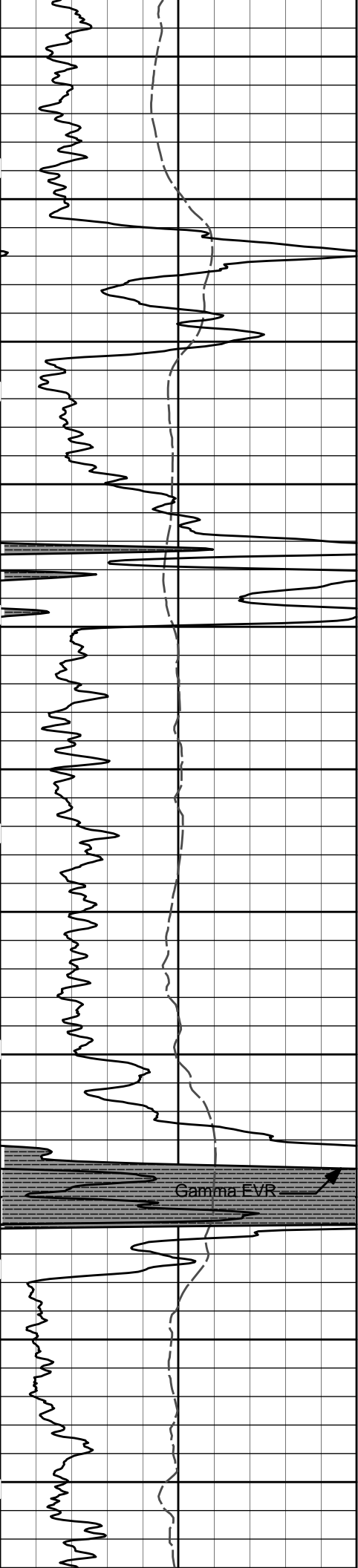
4500





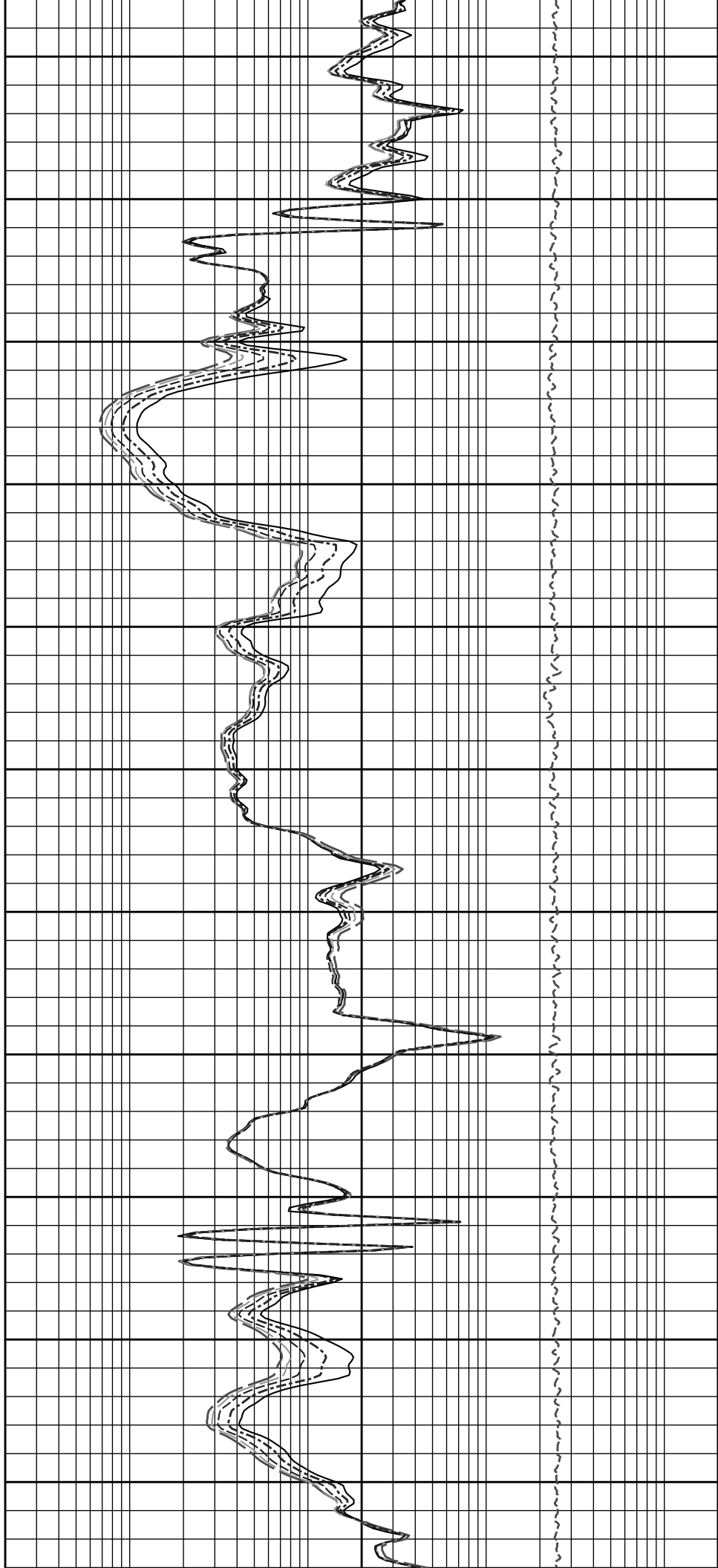
4600

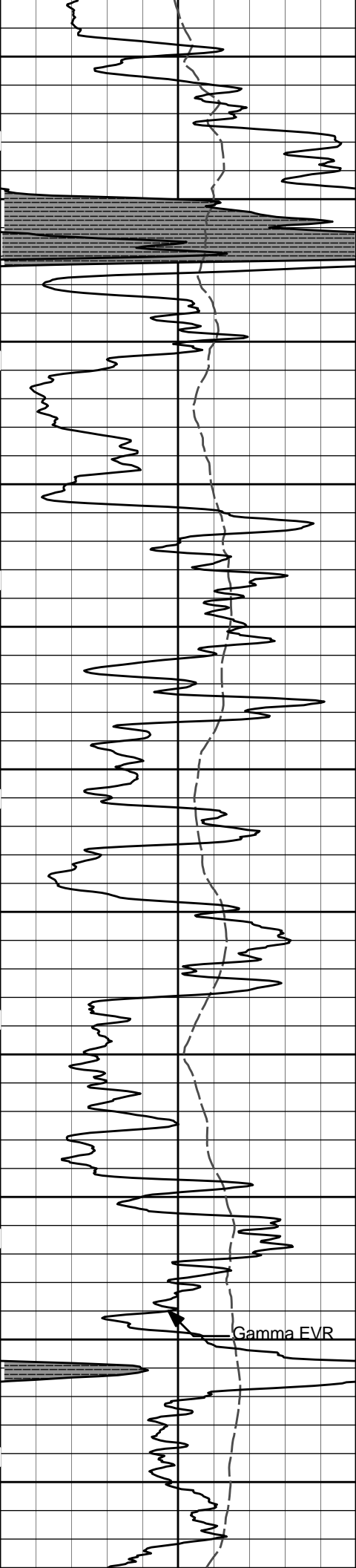




4700

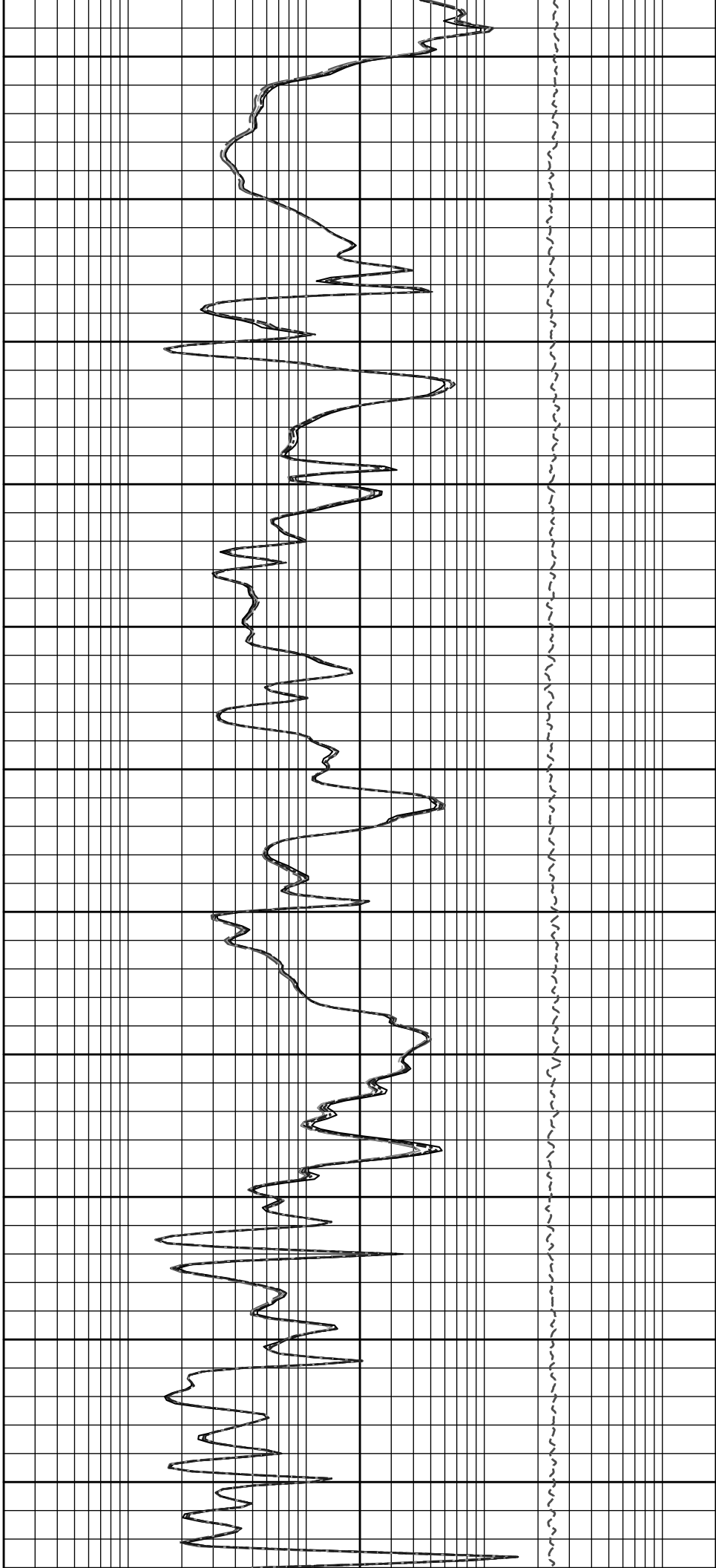
4800





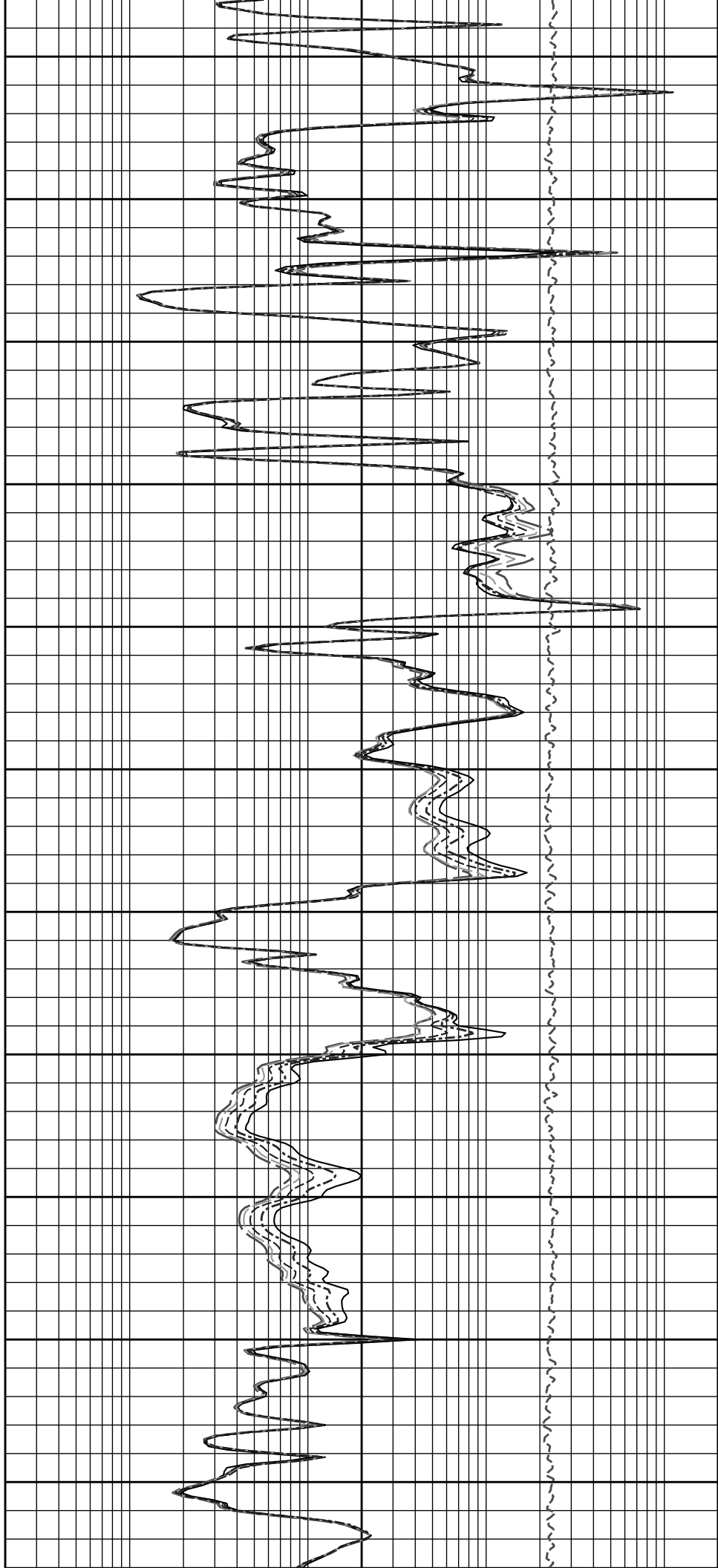
Gamma EVR

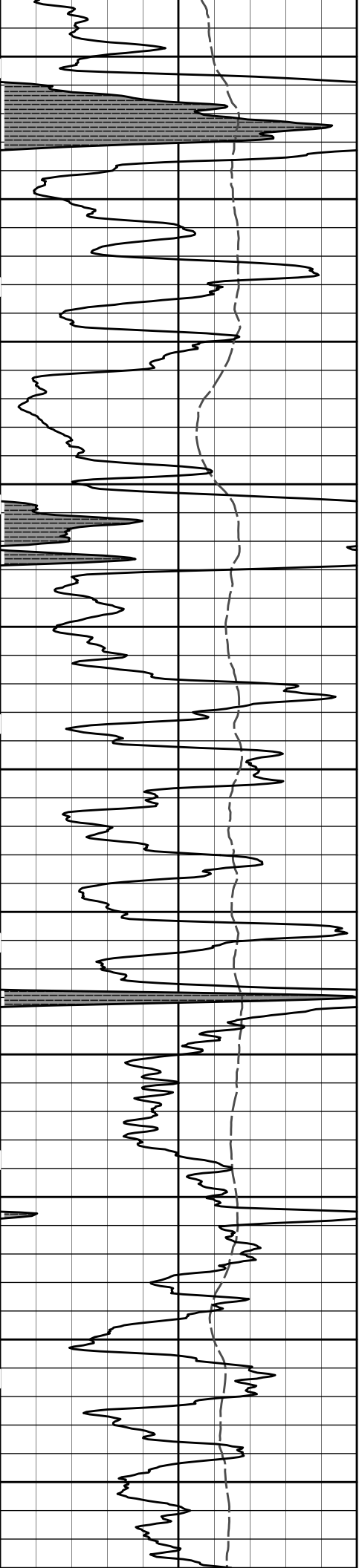
4900



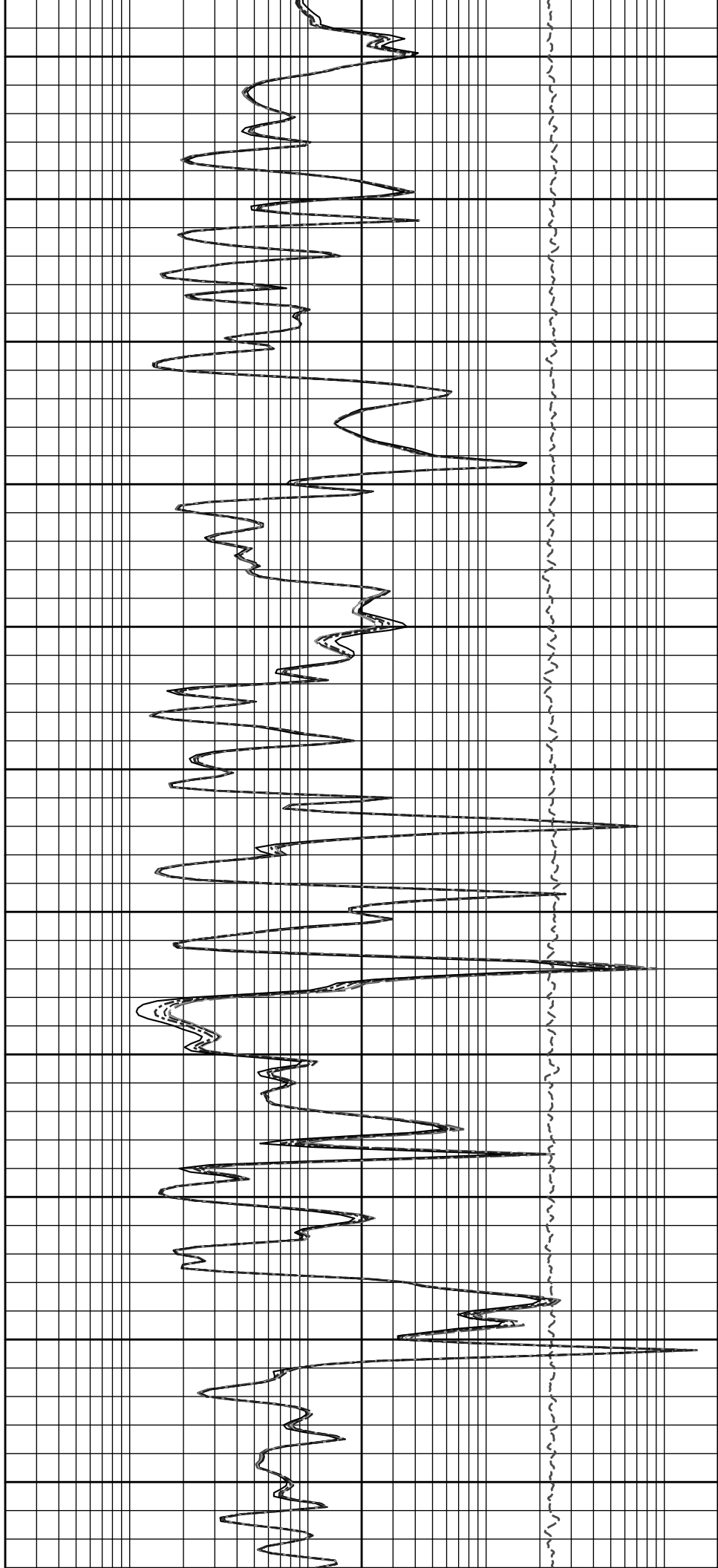


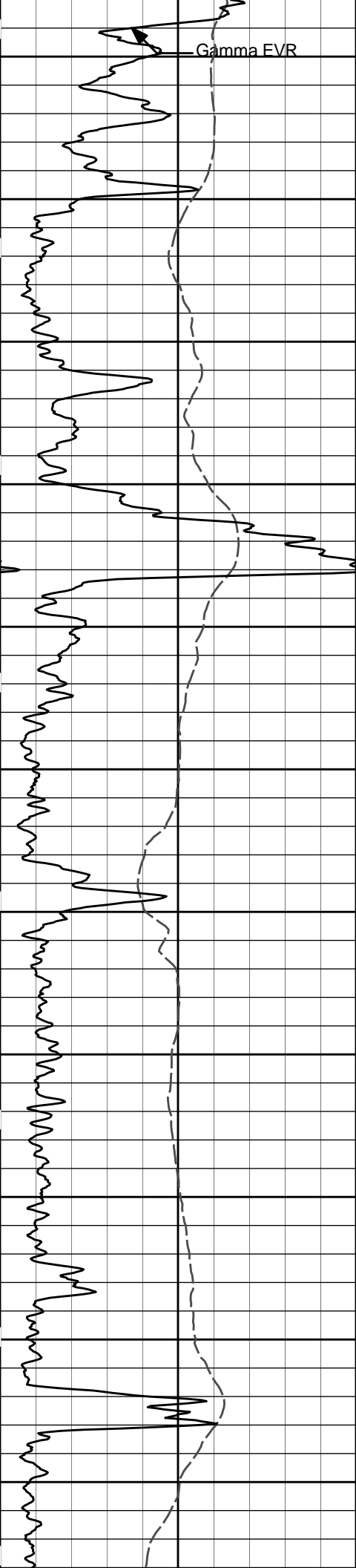
5000



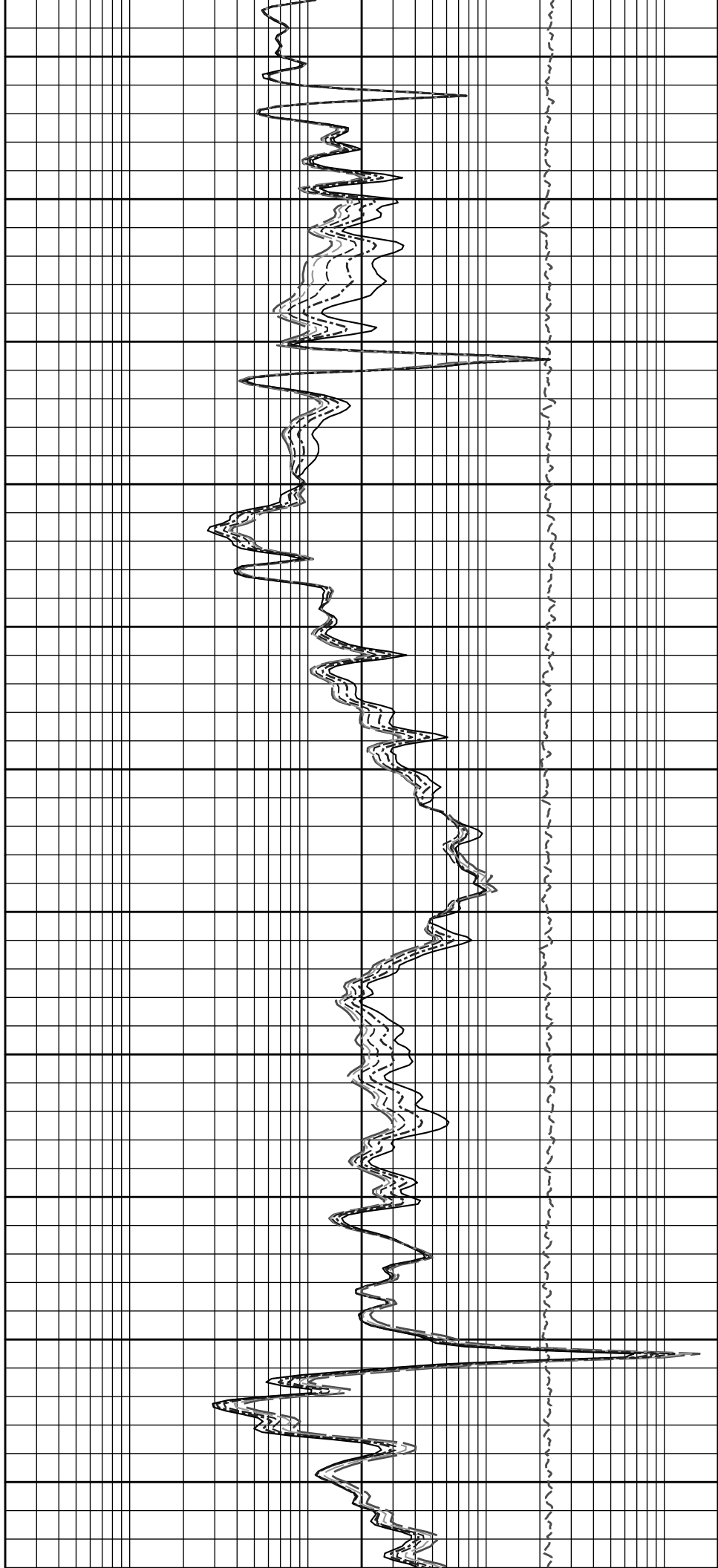


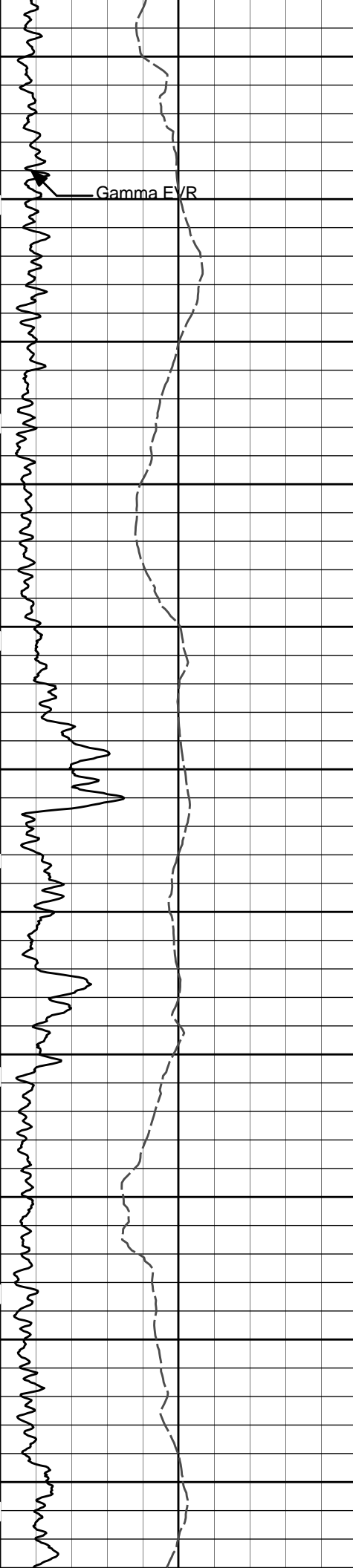
5100



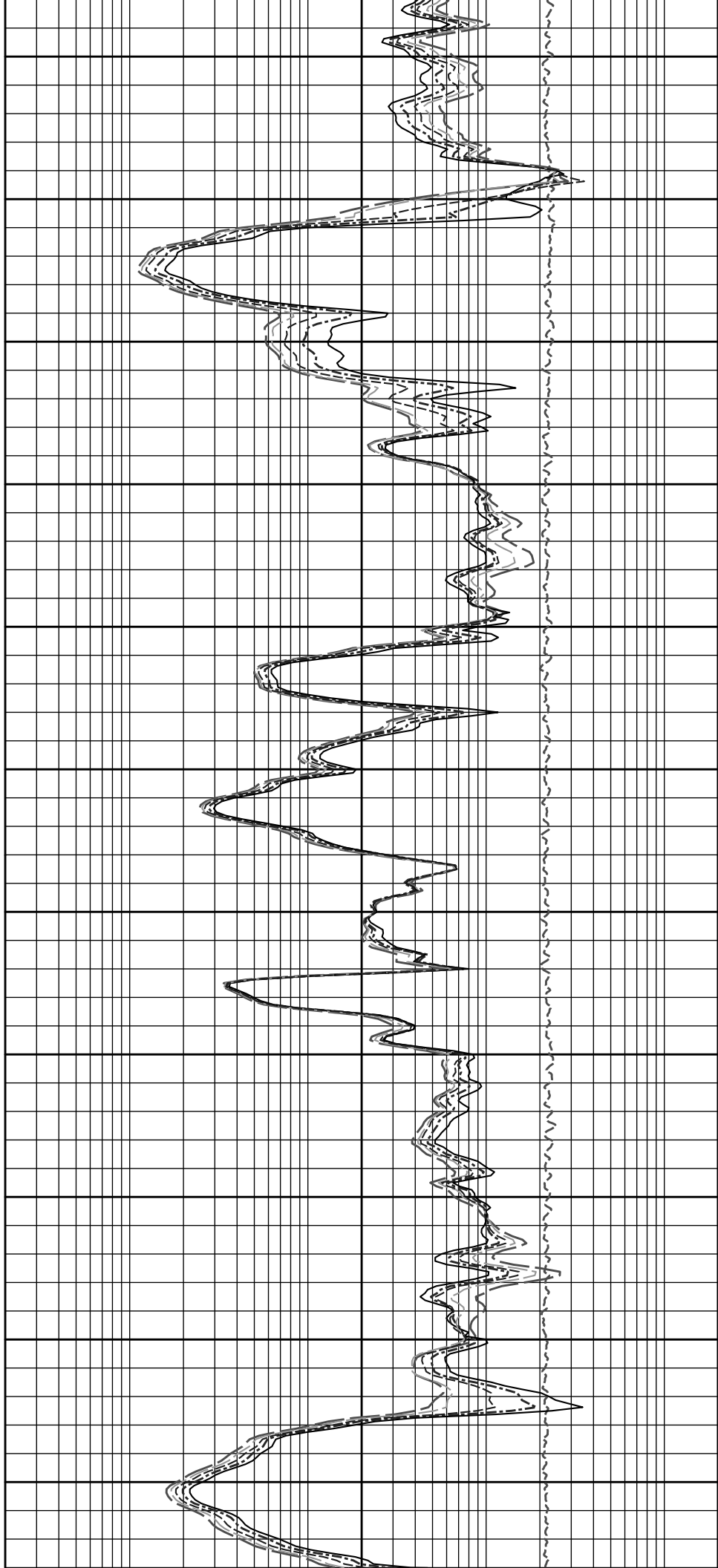


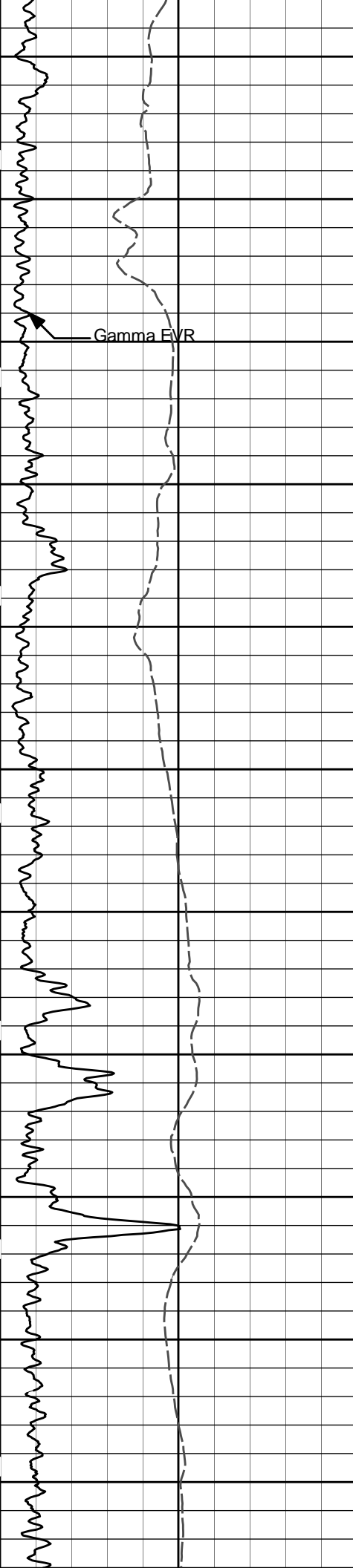
5200



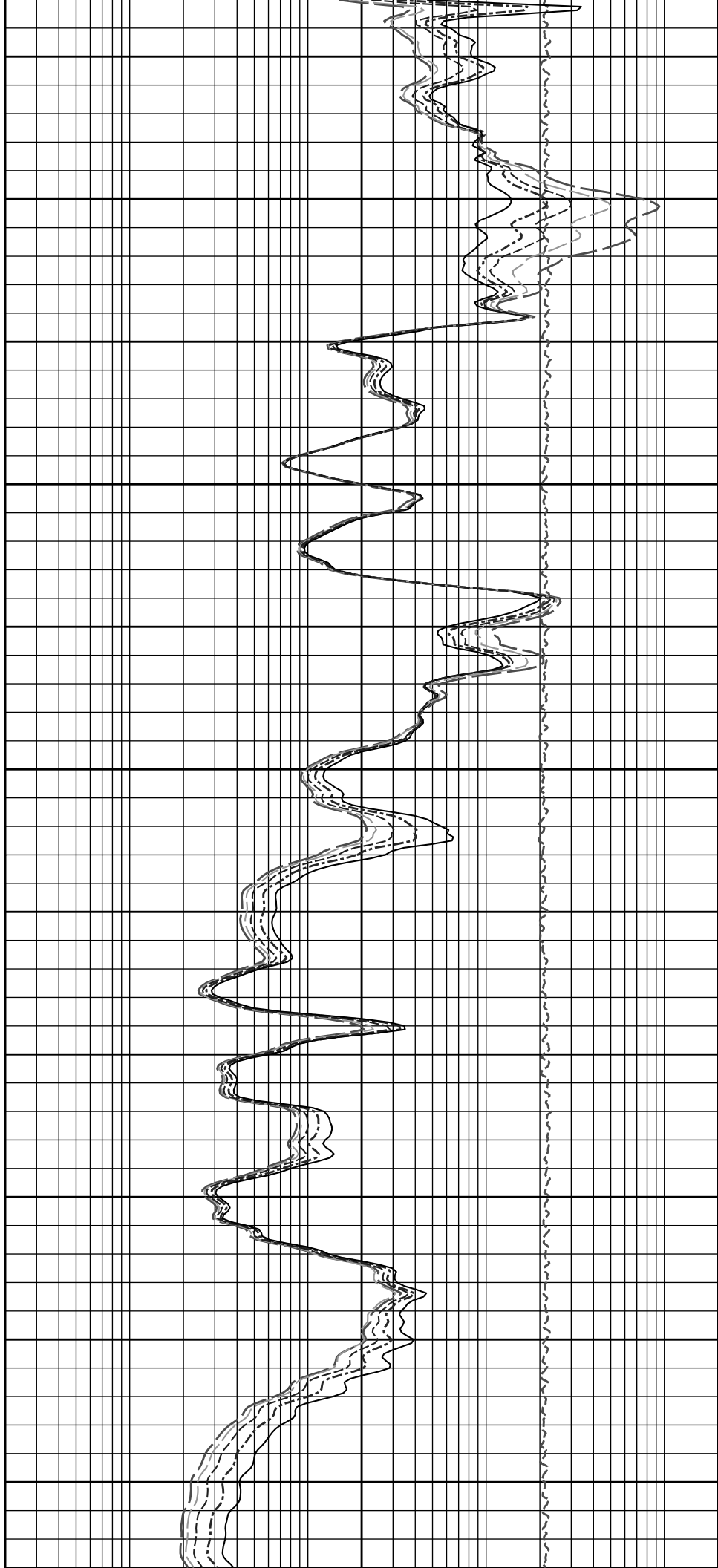


5300



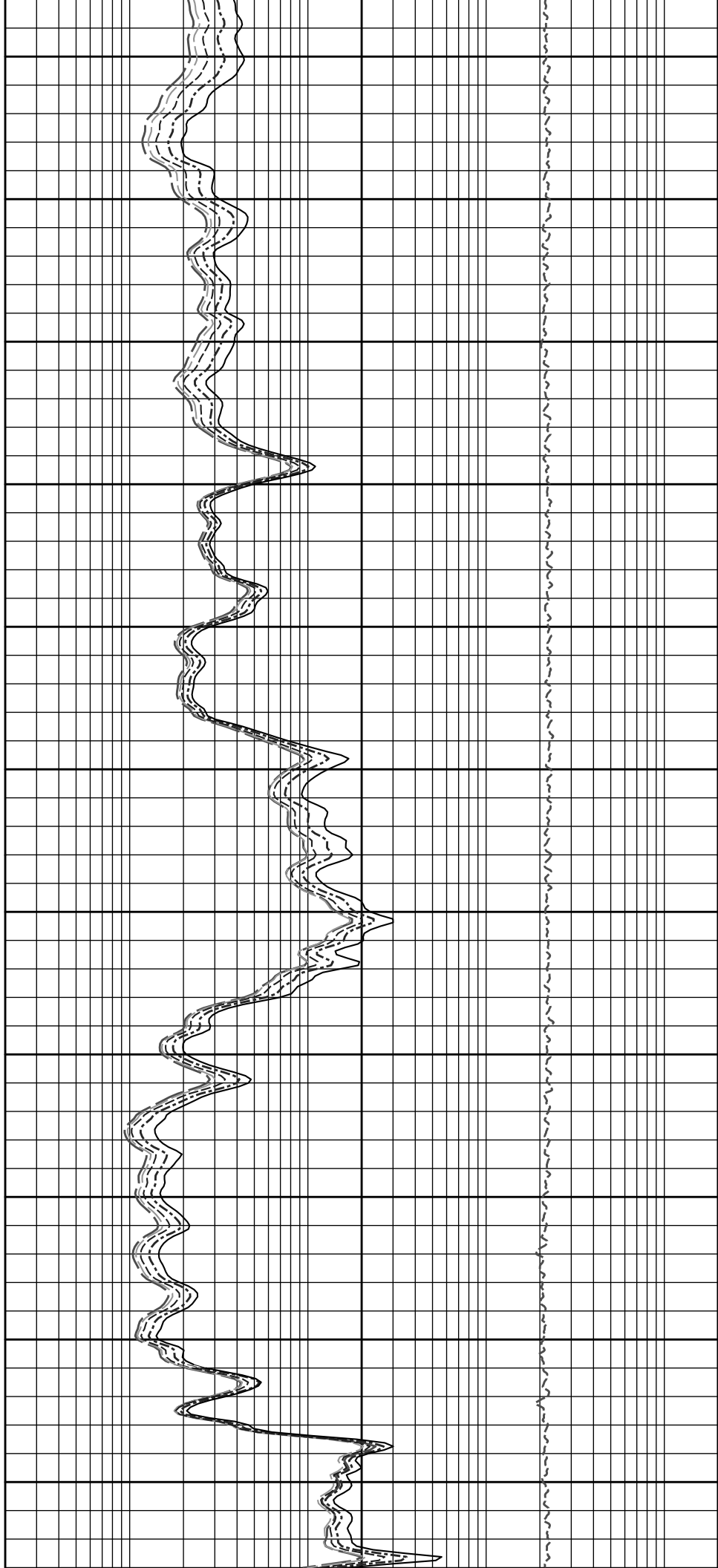


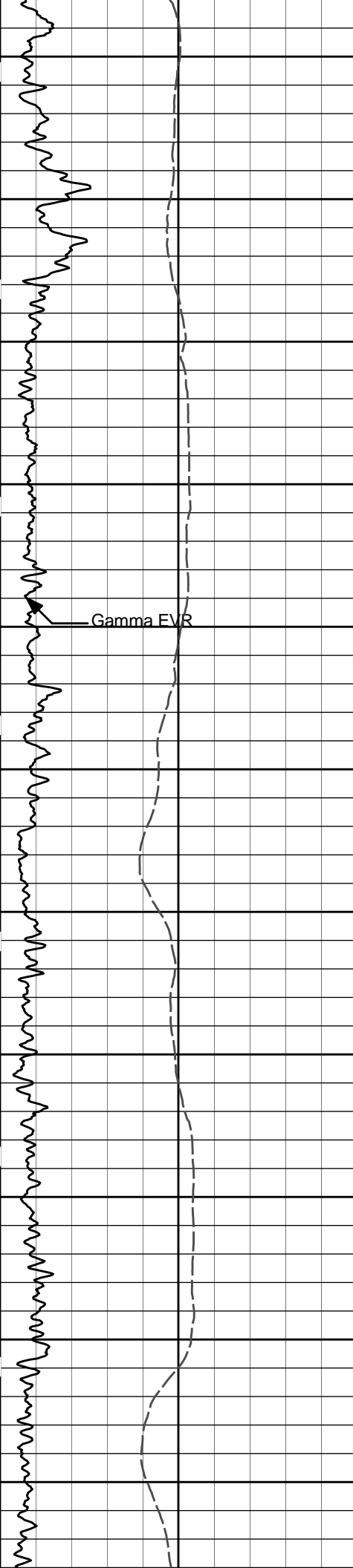
5400



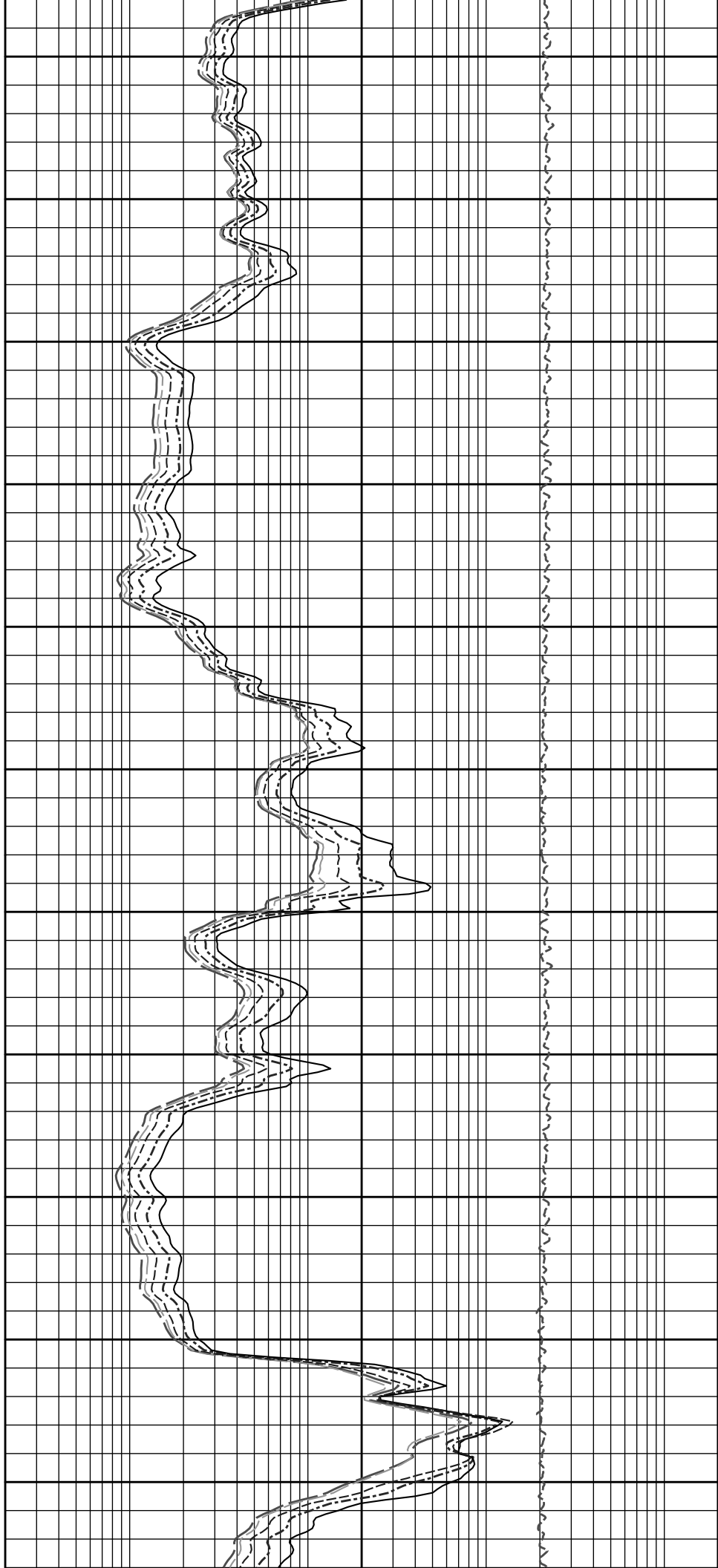


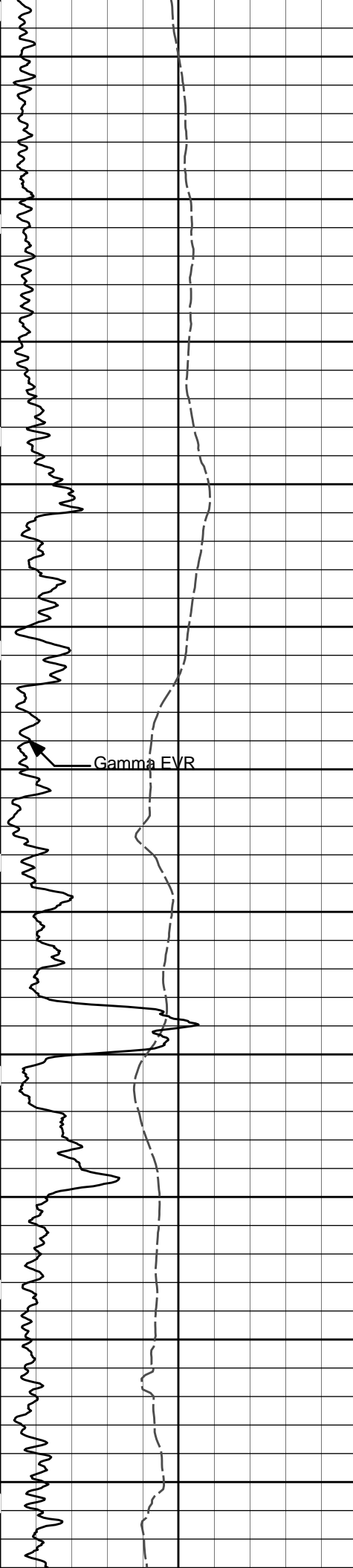
5500



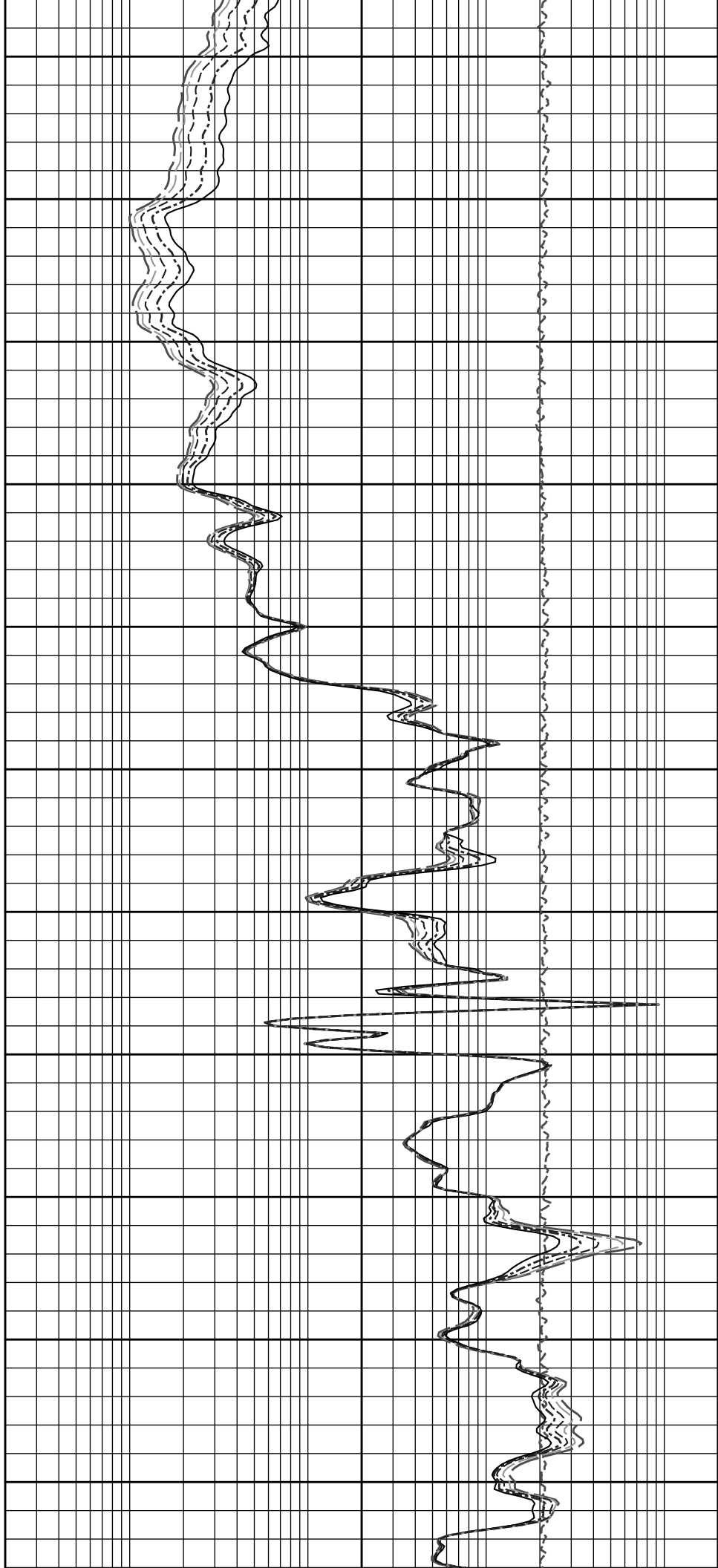


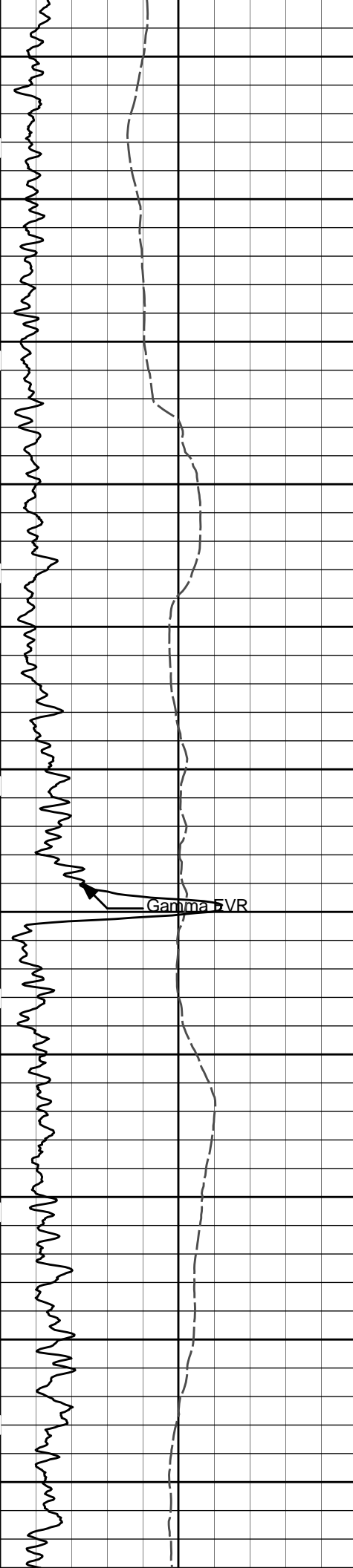
5600





5700

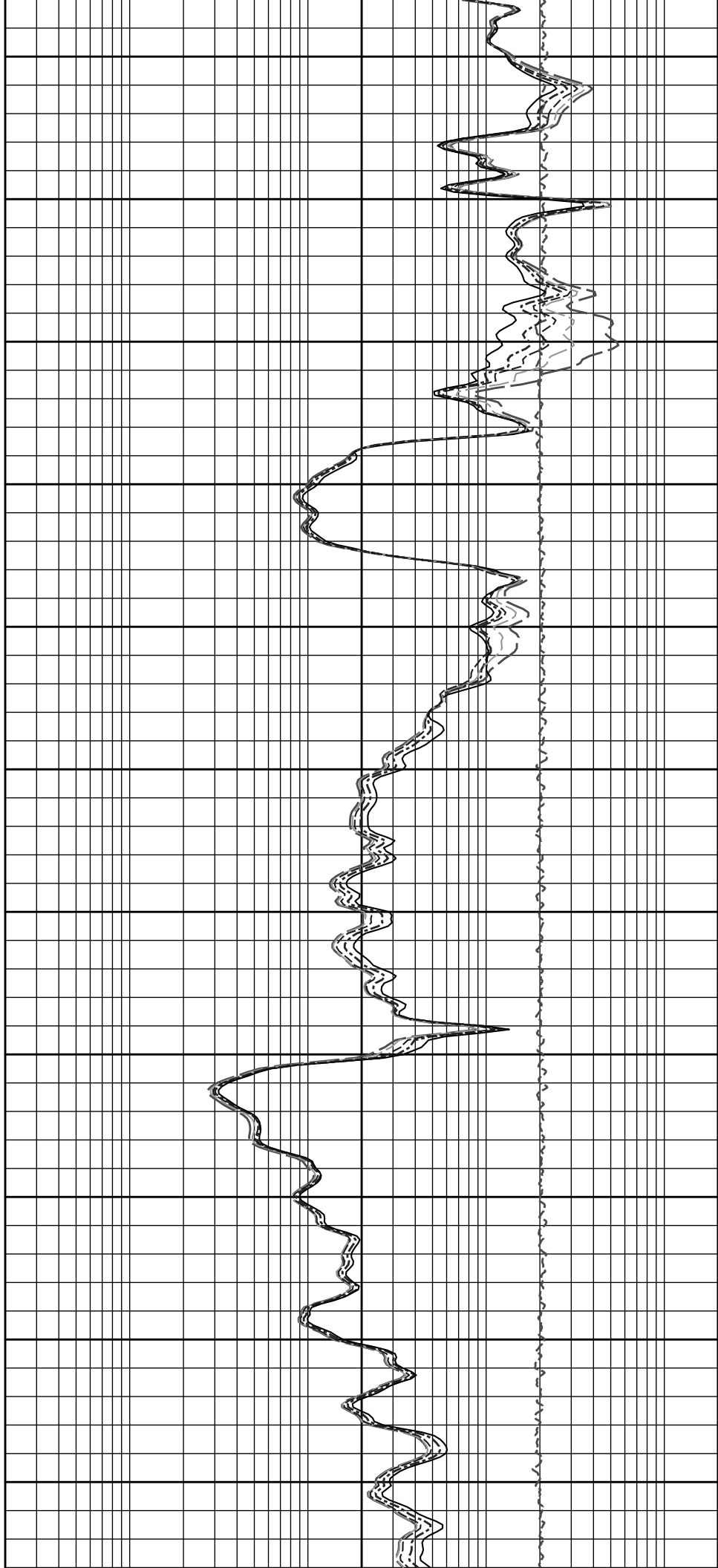


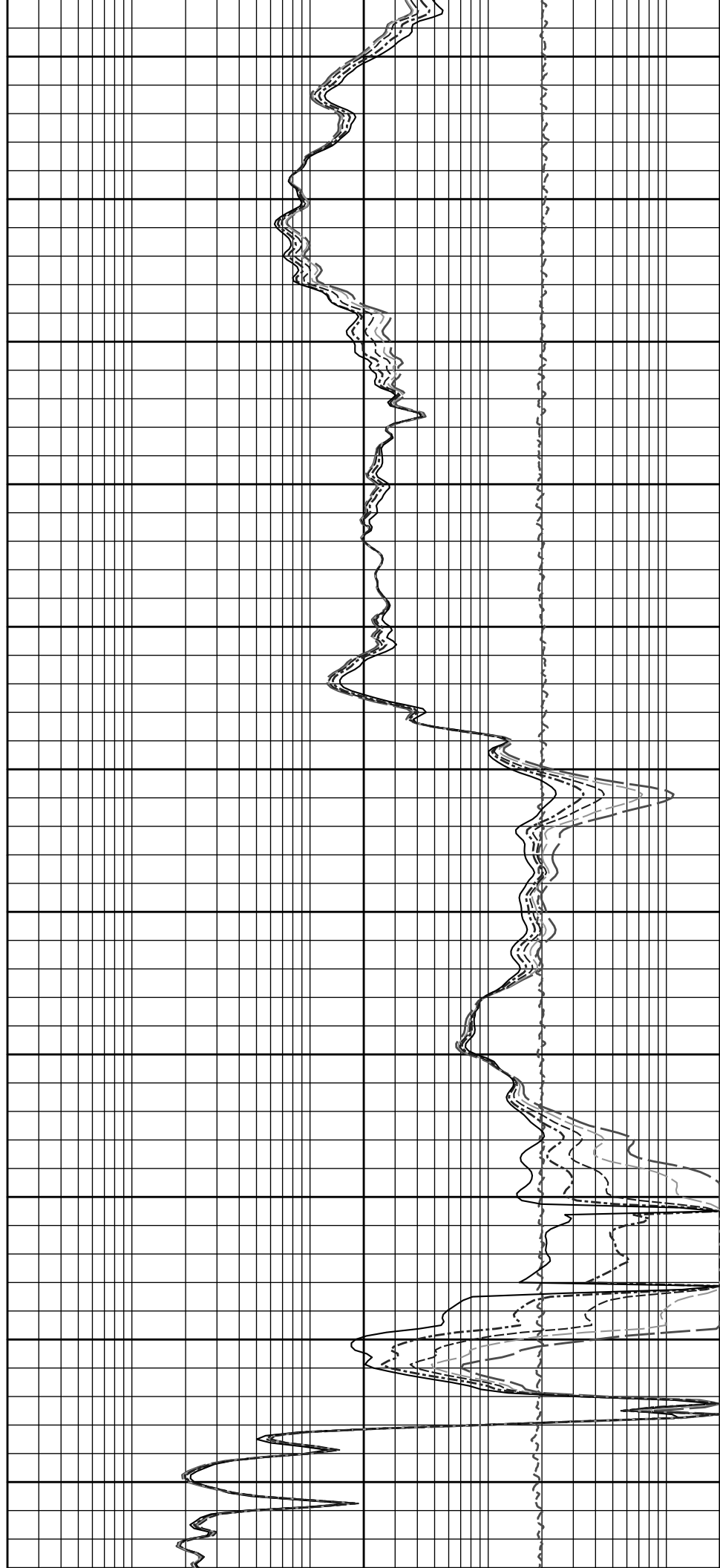
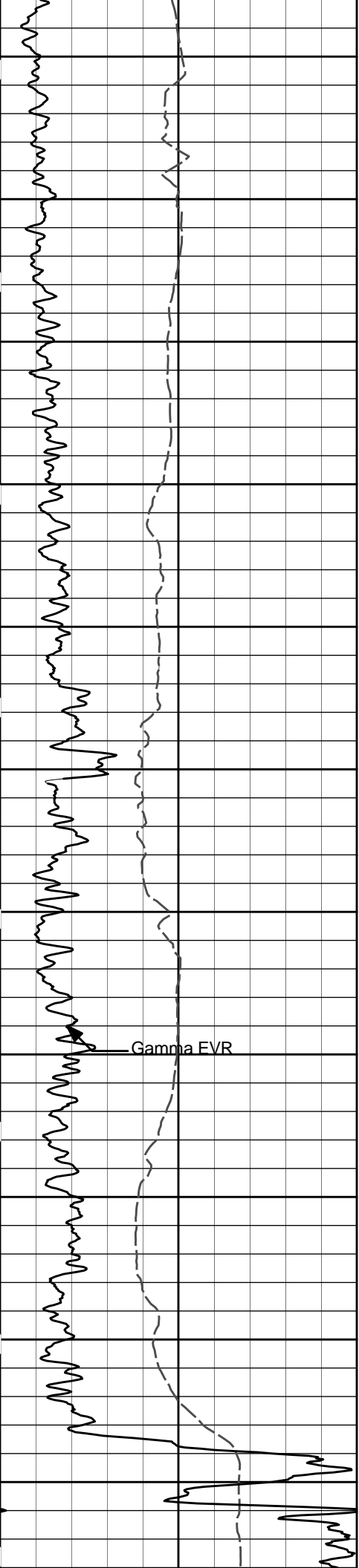


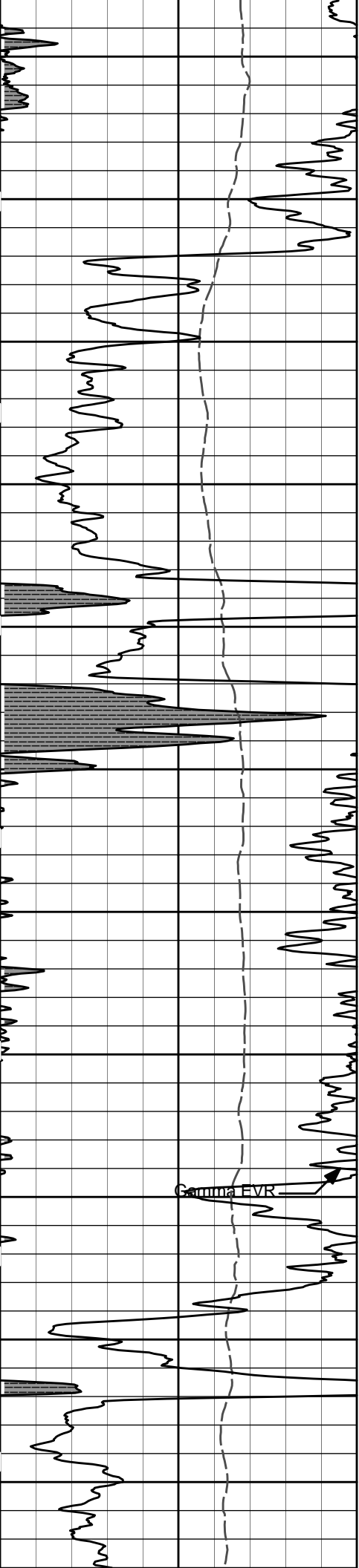
5800

Gamma 5VR

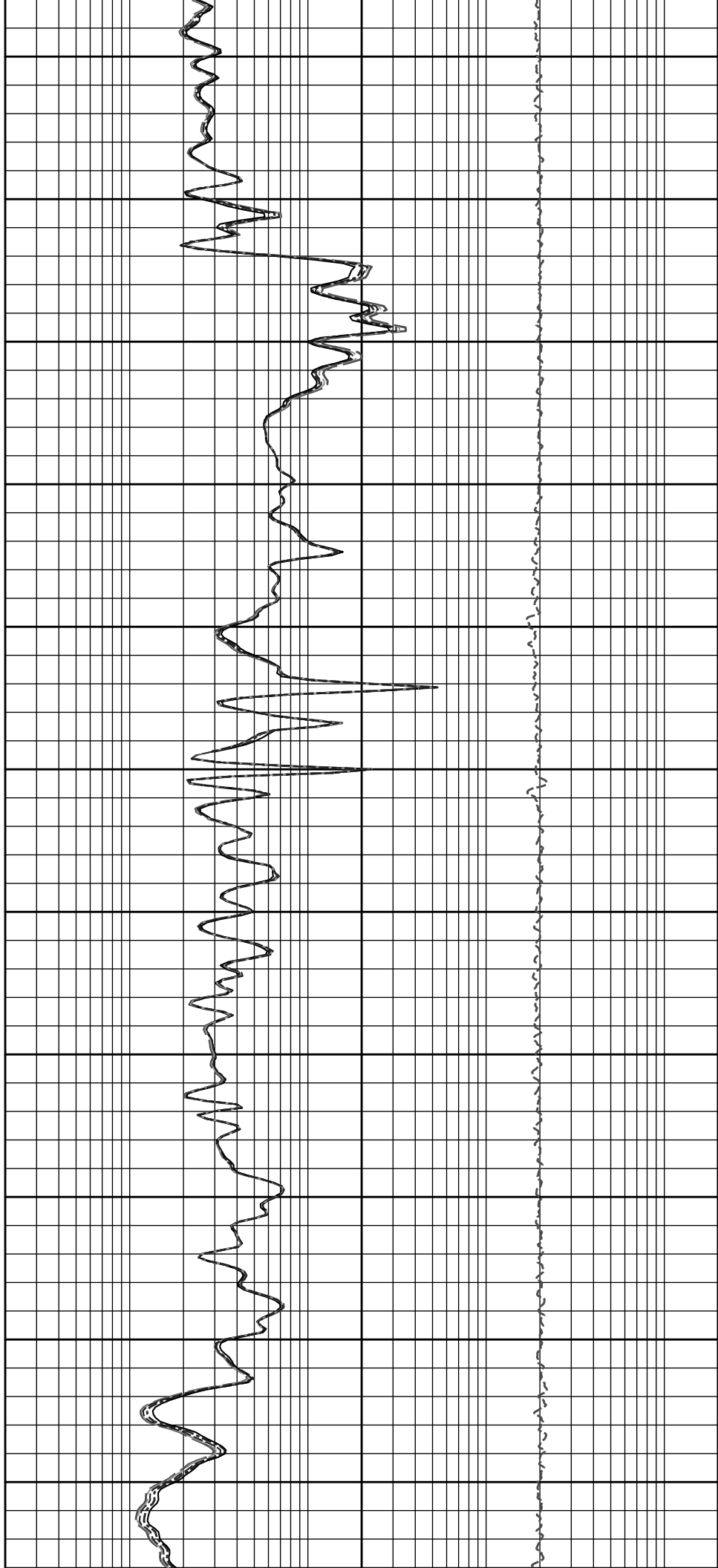
5900

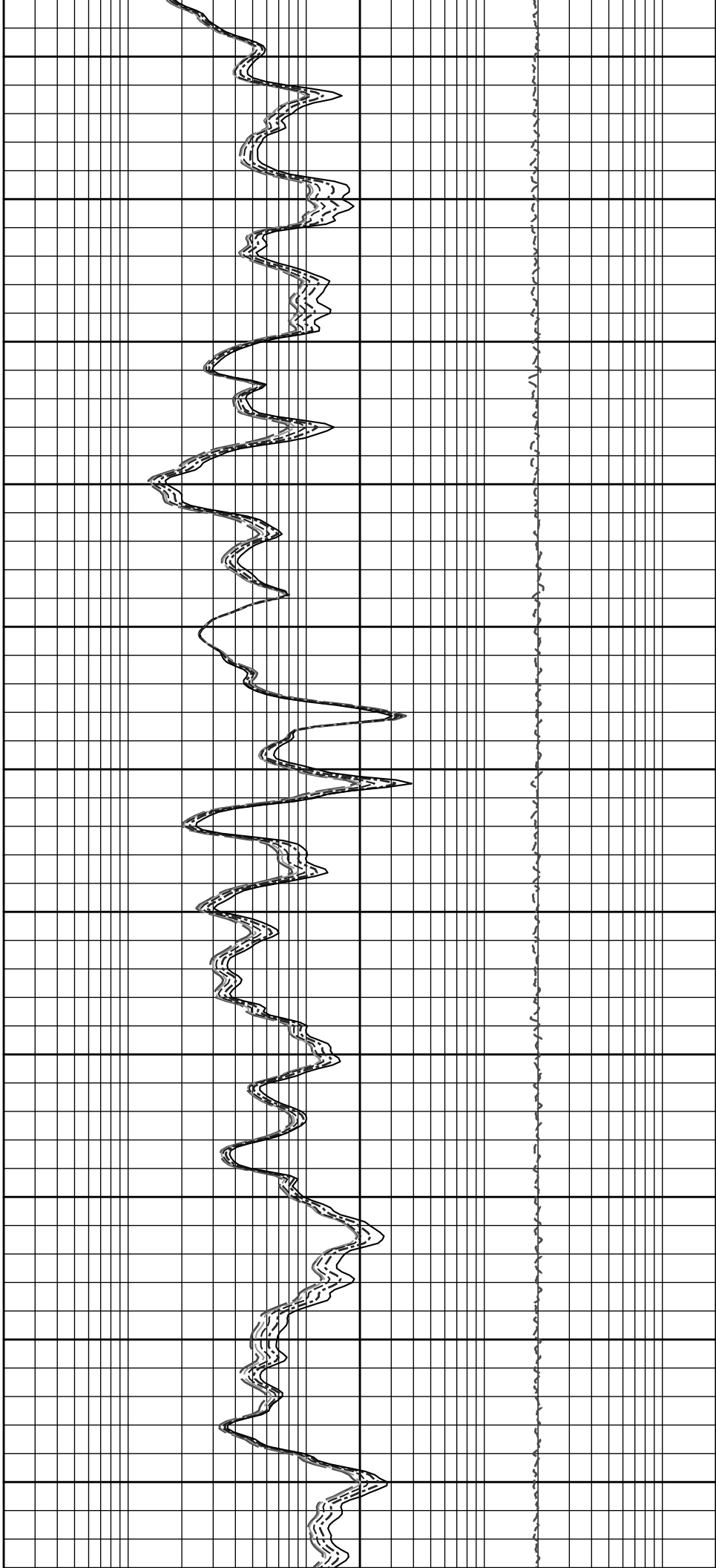
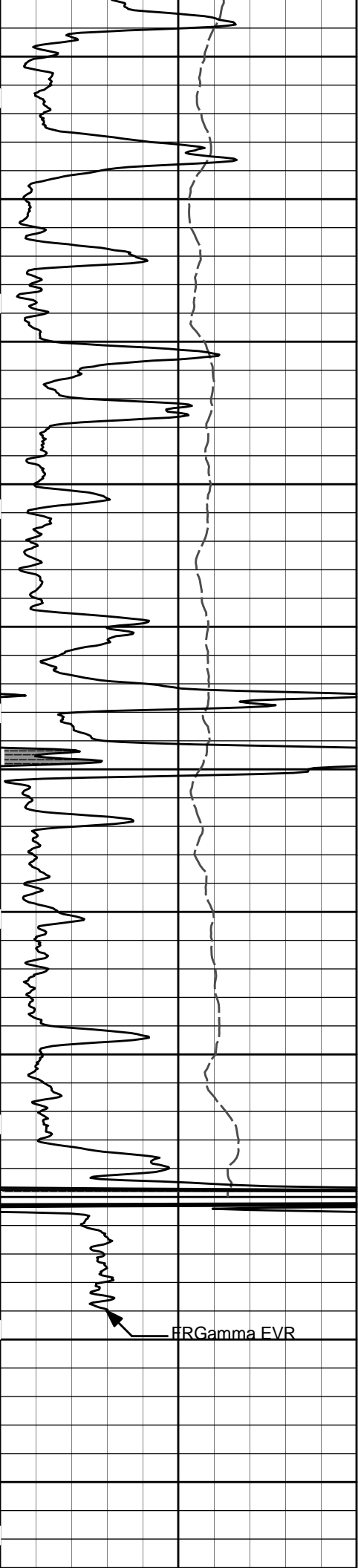


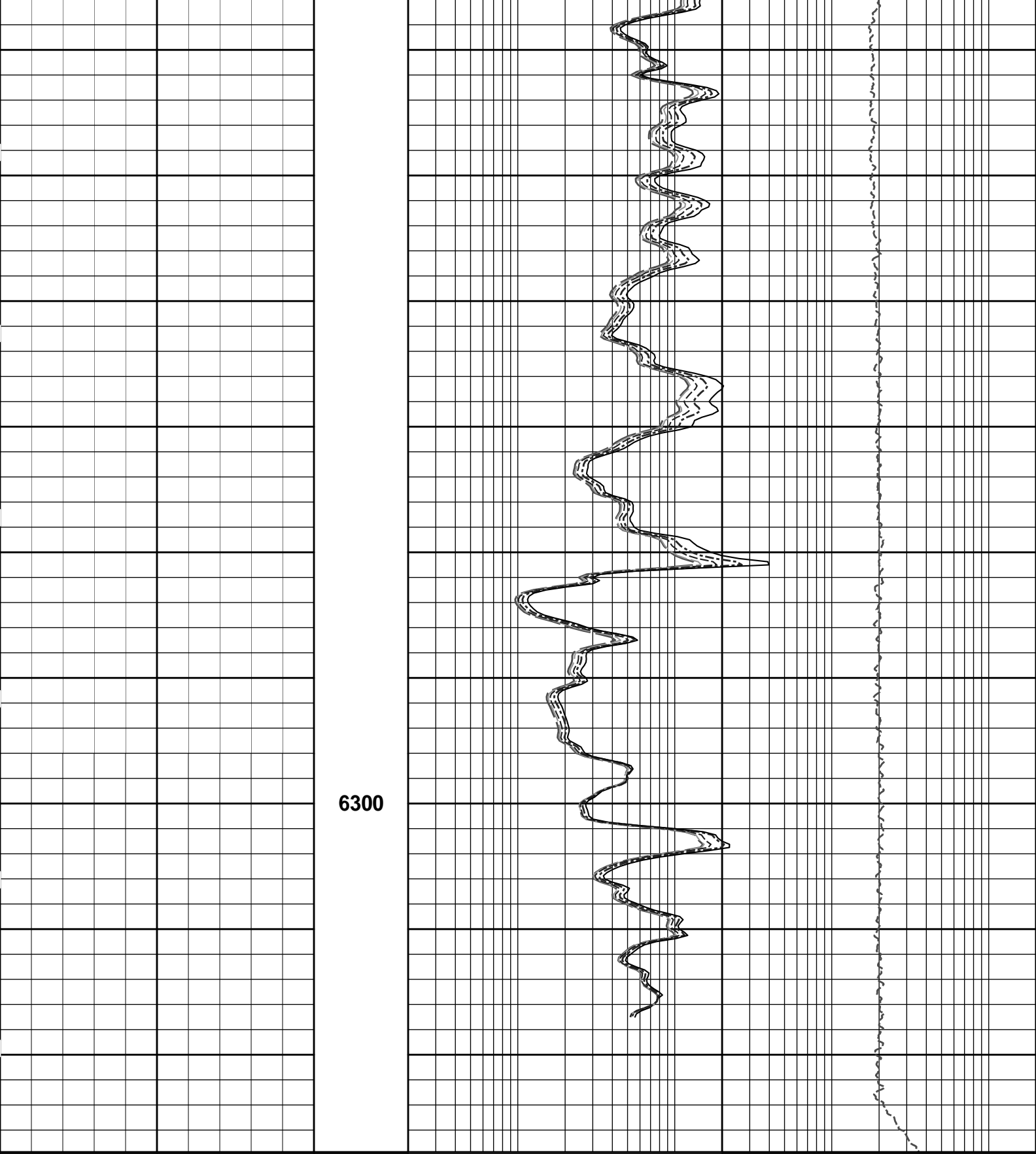




6100







<p>SP - 20 +</p>	<p>1 : 120 ft</p>	<p>10K Tension pounds 0</p>
<p>0 Gamma EVR 150 api</p>	<p>0.2 10in Resistivity 1ft Res 2000 ohmm</p>	<p>0.2 20in Resistivity 1ft Res 2000 ohmm</p>
<p>SHALE</p>	<p>0.2 30in Resistivity 1ft Res 2000</p>	

0.2	ohm-metre	2000
	60in Resistivity 1ft Res	
	ohmm	
0.2	90in Resistivity 1ft Res	2000
	ohmm	

**HALLIBURTON**

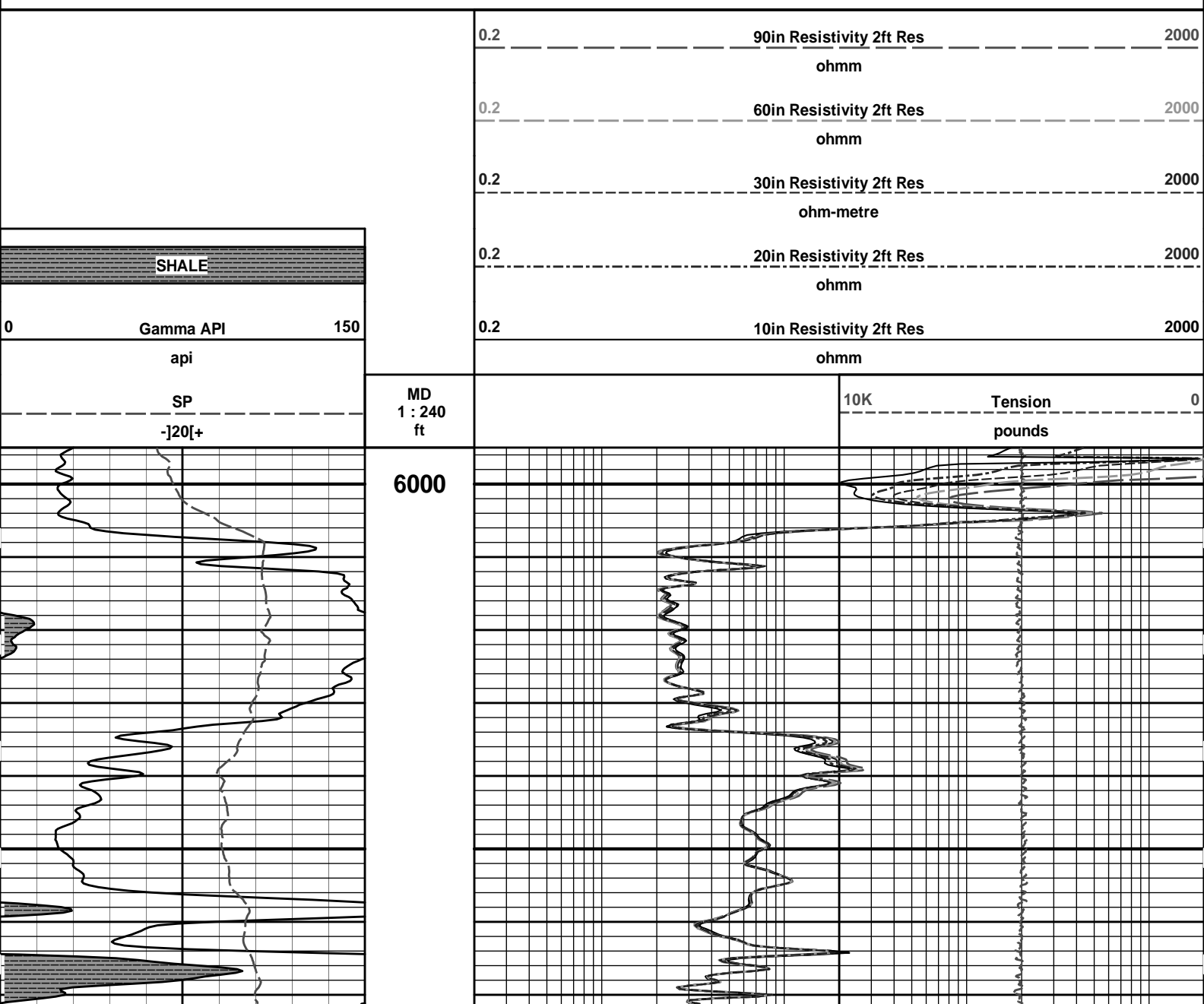
Plot Time: 16-Aug-13 13:23:54  
 Plot Range: 4350 ft to 6327.75 ft  
 Data: MILLY\_3020\_1-19\Well Based\R1 EVR\  
 Plot File: \\-LOCAL-MILLY\_3020\_1-19\Well Based\ACRT\ACRT\_5\_EVR\_LIB

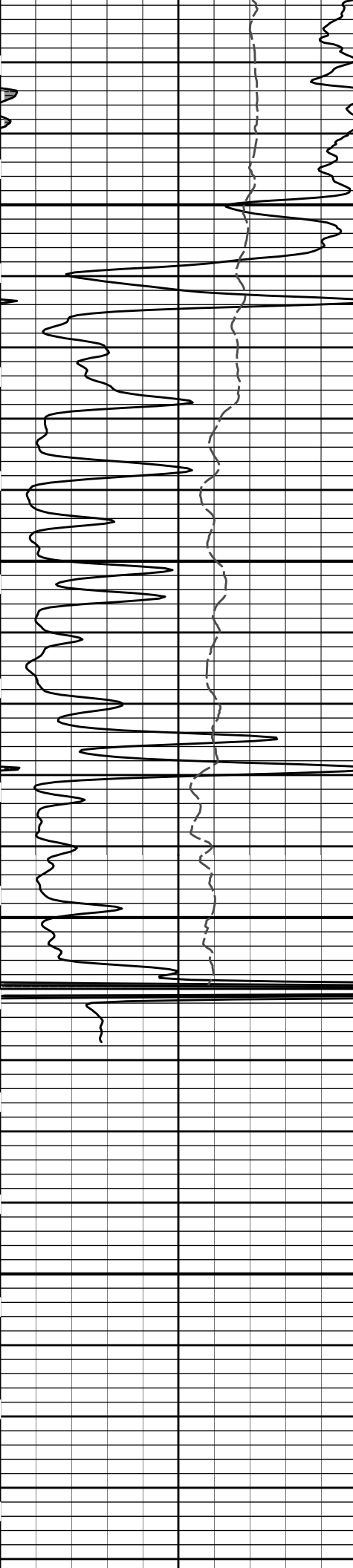
**MAIN SECTION 10" PER 100'**

**HALLIBURTON**

Plot Time: 16-Aug-13 13:23:54  
 Plot Range: 5995 ft to 6328.17 ft  
 Data: MILLY\_3020\_1-19\Well Based\R1 REPEAT\  
 Plot File: \\-LOCAL-MILLY\_3020\_1-19\Well Based\ACRT\ACRT\_5\_repeat\_lib

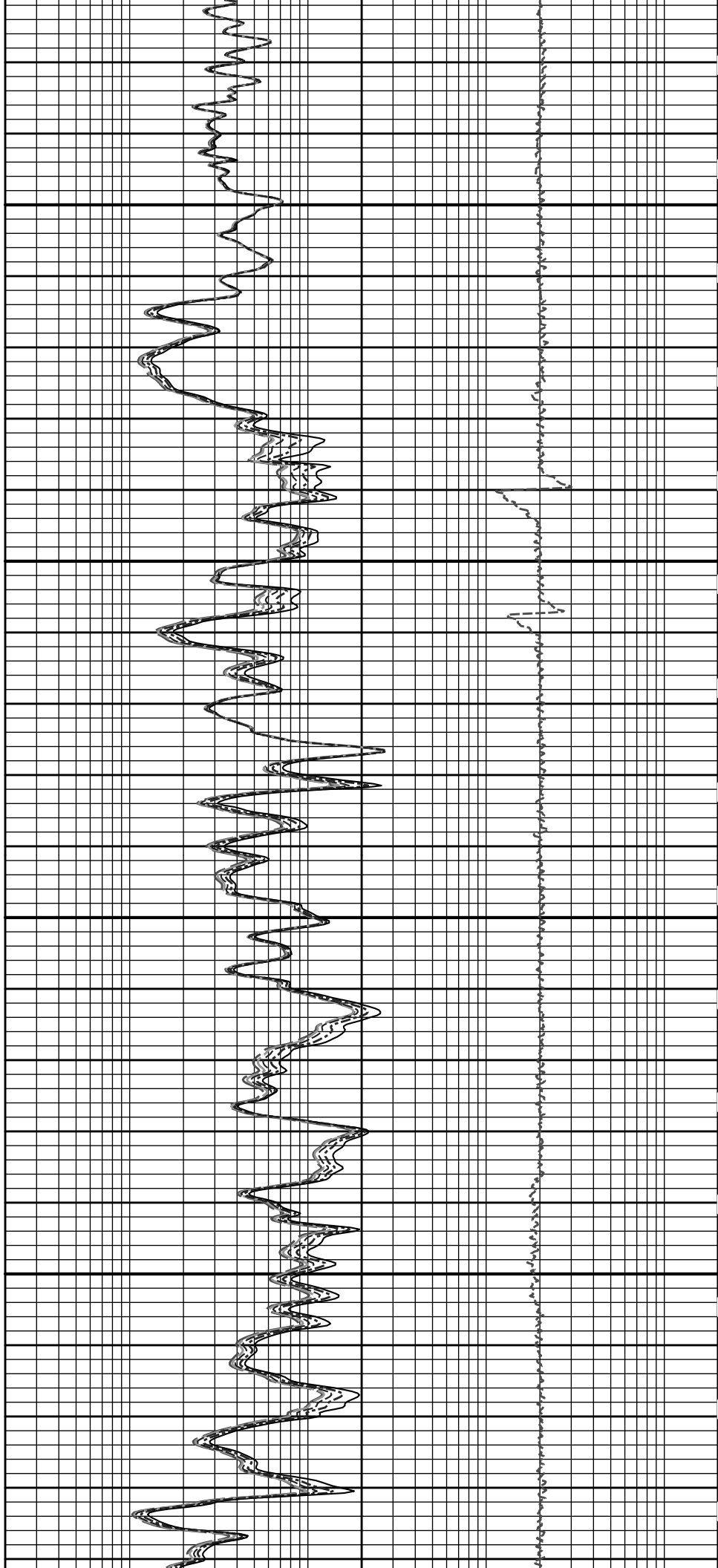
**REPEAT SECTION**



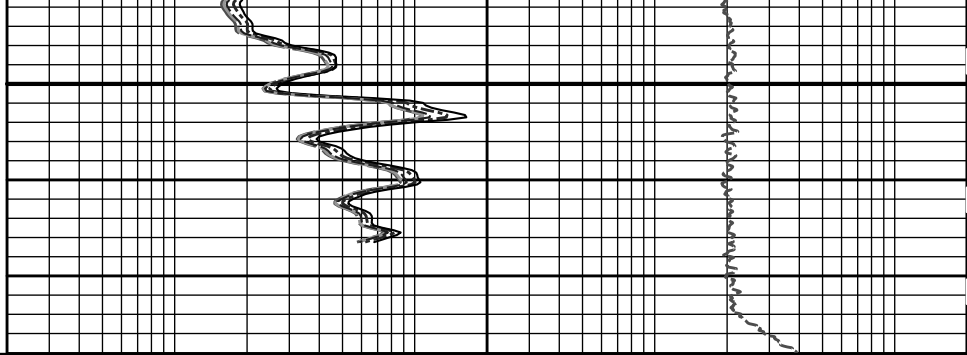


6100

6200



6300



SP -]20[+	MD 1 : 240 ft	10K	Tension pounds	0
Gamma API api	150	0.2	10in Resistivity 2ft Res ohmm	2000
SHALE		0.2	20in Resistivity 2ft Res ohmm	2000
		0.2	30in Resistivity 2ft Res ohm-metre	2000
		0.2	60in Resistivity 2ft Res ohmm	2000
		0.2	90in Resistivity 2ft Res ohmm	2000

**HALLIBURTON**

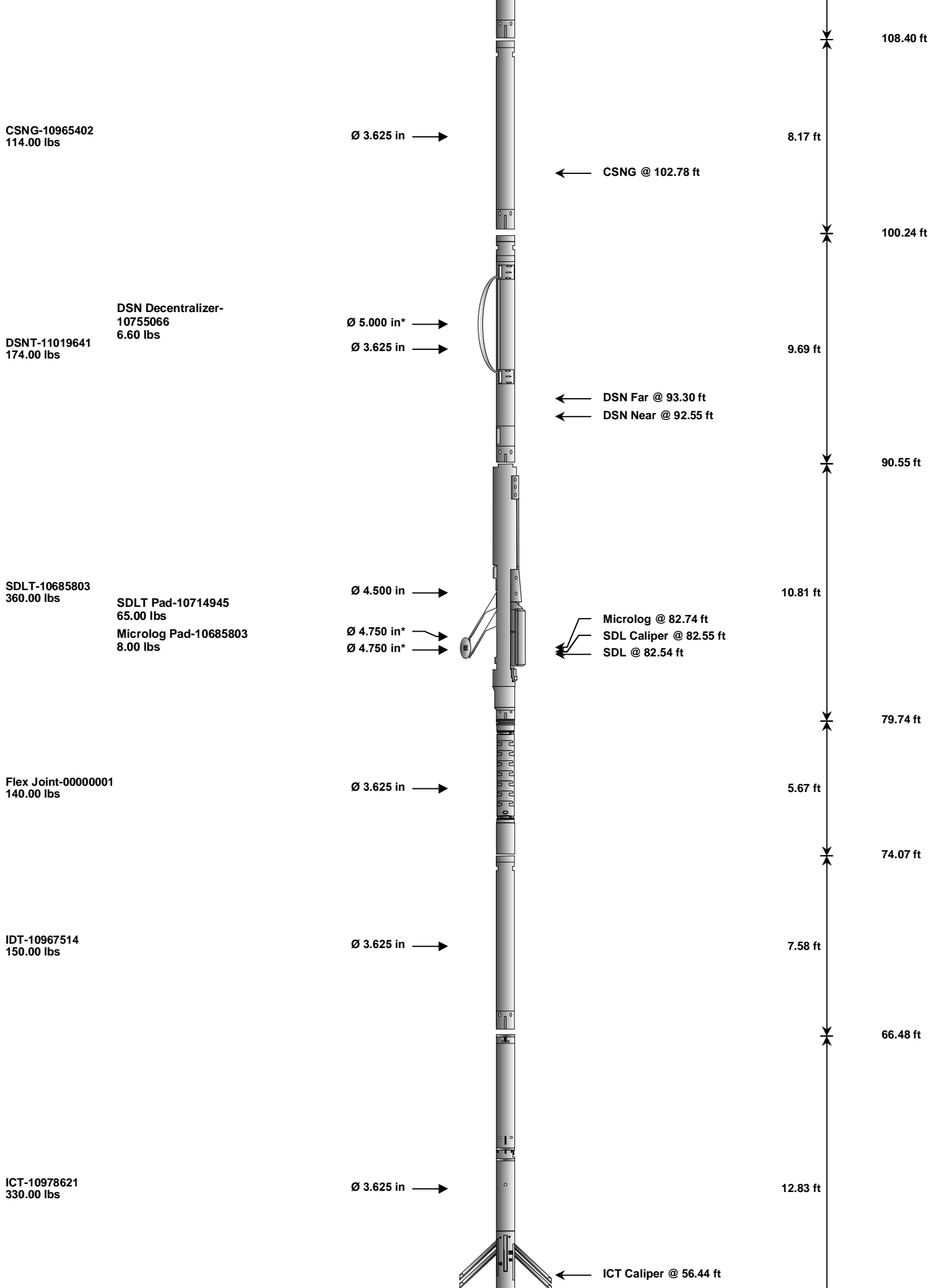
Plot Time: 16-Aug-13 13:24:02  
 Plot Range: 5995 ft to 6328.17 ft  
 Data: MILLY\_3020\_1-19Well Based\R1 REPEAT\  
 Plot File: \\-LOCAL-MILLY\_3020\_1-19Well Based\CRT\CRT\_5\_repeat\_lib

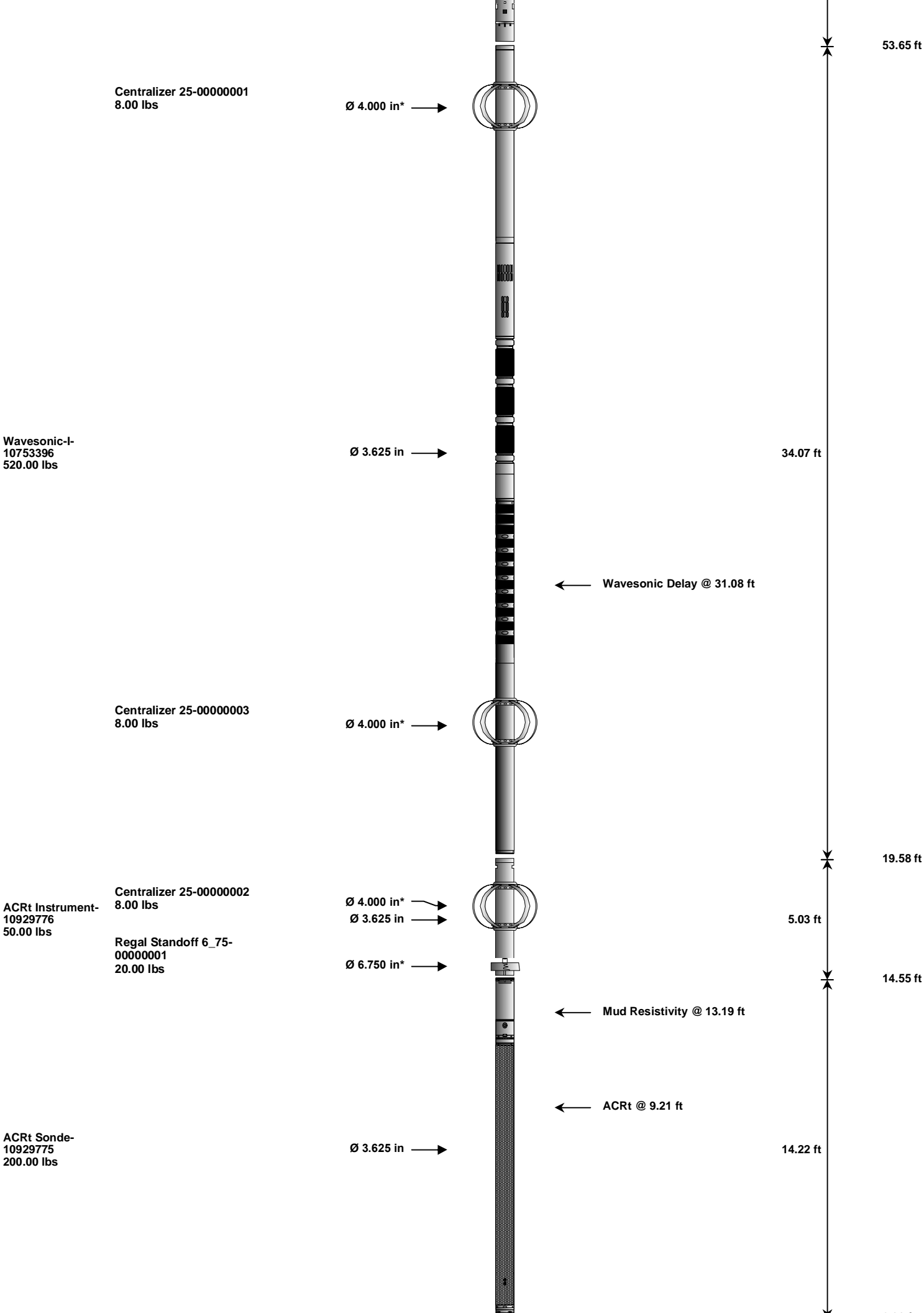
## REPEAT SECTION

**HALLIBURTON**

## TOOL STRING DIAGRAM REPORT

Description	Overbody Description	O.D.	Diagram	Sensors @ Delays	Length	Accumulated Length
RWCH-12027542 135.00 lbs		Ø 3.625 in →		← Load Cell @ 123.23 ft ← BH Temperature @ 122.66 ft	6.25 ft	126.91 ft
SP Sub-12345678 60.00 lbs		Ø 3.625 in →		← SP @ 118.88 ft	3.74 ft	120.66 ft
GTET-10748374 165.00 lbs		Ø 3.625 in →		← GammaRay @ 110.86 ft	8.52 ft	116.92 ft





Bull Nose-00000001  
5.00 lbs

Ø 2.750 in →



0.33 ft  
↑  
↓

0.33 ft  
0.00 ft

Mnemonic	Tool Name	Serial Number	Weight (lbs)	Length (ft)	Accumulated Length (ft)	Max.Log. Speed (fpm)
RWCH	Releasable Wireline Cable Head	12027542	135.00	6.25	120.66	300.00
SP	SP Sub	12345678	60.00	3.74	116.92	300.00
GTET	Gamma Telemetry Tool	10748374	165.00	8.52	108.40	60.00
CSNG	Compensated Spectral Natural Gamma	10965402	114.00	8.17	100.24	15.00
DSNT	Dual Spaced Neutron	11019641	174.00	9.69	90.55	60.00
DCNT	DSN Decentralizer	10755066	6.60	5.13	* 93.88	300.00
SDLT	Spectral Density Tool	10685803	360.00	10.81	79.74	60.00
MICP	Microlog Pad	10685803	8.00	1.00	* 82.24	60.00
SDLP	Density Insite Pad	10714945	65.00	2.55	* 81.95	60.00
FLEX	Flex Joint	00000001	140.00	5.67	74.07	300.00
IDT	Insite Directional Tool	10967514	150.00	7.58	66.48	30.00
ICT	Six Independent Arm Caliper	10978621	330.00	12.83	53.65	30.00
WSTT	WaveSonic Insite	10753396	520.00	34.07	19.58	30.00
OBCEN	Centralizer - 25 in. Overbody	00000001	8.00	2.08	* 50.05	300.00
OBCEN	Centralizer - 25 in. Overbody	00000003	8.00	2.08	* 24.17	300.00
ACRt	Array Compensated True Resistivity Instrument Section	10929776	50.00	5.03	14.55	300.00
RSOF	Regal Standoff 6.75in	00000001	20.00	0.52	* 14.87	300.00
OBCEN	Centralizer - 25 in. Overbody	00000002	8.00	2.08	* 16.55	300.00
ACRt	Array Compensated True Resistivity Sonde Section	10929775	200.00	14.22	0.33	300.00
BLNS	Bull Nose	00000001	5.00	0.33	0.00	300.00
<b>Total</b>			<b>2,526.60</b>	<b>126.91</b>		
* Not included in Total Length and Length Accumulation.						
Data: MILLY_3020_1-19\0003 SP-GTET-CSNG-DSN-SDL-FLEX-IDT-ICT-WAVE-ACRT-BNIDLE						Date: 15-Aug-13 20:02:16

# HALLIBURTON

## CALIBRATION REPORT

### NATURAL GAMMA RAY TOOL SHOP CALIBRATION

Tool Name: GTET - 10748374

Reference Calibration Date: 25-Jul-13 22:09:38

Engineer: THOMAS HYDE

Calibration Date: 02-Aug-13 14:20:06

Software Version: WL INSITE R3.8.4 (Build 5)

Calibration Version: 1

Calibrator Source S/N: TB-185

Calibrator API Reference:228.00 api

Equivalent Calibrator API Reference:232.0 api

Measurement	Measured	Calibrated	Units
Background	41.8	41.9	api
Background + Calibrator	273.2	273.9	api
Calibrator	231.4	232.0	api

### NATURAL GAMMA RAY TOOL FIELD CALIBRATION

Tool Name: GTET - 10748374

Reference Calibration Date: 02-Aug-13 14:20:06

Engineer: S. INGERSOLL

Calibration Date: 14-Aug-13 12:44:26

Software Version: WL INSITE R3.8.4 (Build 5)

Calibration Version: 1

Calibrator Source S/N: TB-185

Calibrator API Reference:228.00 api

Equivalent Calibrator API Reference:232.0 api

Field Verification	Shop	Field	Units
Background	41.9	56.8	api
Background + Calibrator	273.2	299.9	api
Calibrator	231.4	232.0	api

Background + Calibrator	273.9	290.3	api
Calibrator	232.0	233.5	api

Shop	Field	Difference	Tolerance
232.0	233.5	-1.5	+/- 9.00

### ARRAY COMPENSATED TRUE RESISTIVITY SHOP CALIBRATION

<b>Tool Name:</b> ACRt Sonde - 10929775	<b>Reference Calibration Date:</b> 04-May-13 10:38:01
<b>Engineer:</b> J. BOLLLOM	<b>Calibration Date:</b> 21-Jun-13 11:07:27
<b>Software Version:</b> WL INSITE R3.8.4 (Build 5)	<b>Calibration Version:</b> 1
<b>Host Tool Name:</b> ACRt Instrument - 10929776	

#### TYPICAL GAIN RANGE

Subarray	R12KHz			R36KHz			R72KHz		
	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper
A1 (80")	0.95	1.02	1.05	0.95	1.02	1.05	0.95	1.01	1.05
A2 (50")	0.95	1.02	1.05	0.95	1.02	1.05	0.95	1.02	1.05
A3 (29")	0.95	1.00	1.05	0.95	1.01	1.05	0.95	1.00	1.05
A4 (17")	0.95	1.01	1.05	0.95	1.01	1.05	0.95	1.01	1.05
A5 (10")	N/A	N/A	N/A	0.95	1.02	1.05	0.95	1.02	1.05
A6 (6")	N/A	N/A	N/A	0.95	1.00	1.05	0.95	1.00	1.05

#### TYPICAL SONDE OFFSET RANGE

Subarray	R12KHz			R36KHz			R72KHz		
	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper
A1 (80")	-5	-1.85	2	-6	-4.44	-2	-8	-4.49	-2
A2 (50")	-7	-2.92	0	-7	-4.22	0	-7	-4.27	0
A3 (29")	-27	-14.77	-9	-9	-4.64	-3	-7	-2.81	-1
A4 (17")	-180	-103.87	-60	-45	-32.62	-15	-39	-25.57	-13
A5 (10")	N/A	N/A	N/A	-150	-120.52	-50	-80	-55.86	-10
A6 (6")	N/A	N/A	N/A	175	277.84	525	90	137.99	270

#### TRANSMITTER CURRENT GAIN

Signal	Lower	R	Upper
12K	0.6	0.88	1.3
36K	1.0	1.20	2.0
72K	1.0	1.46	2.0

#### R-MUD VERIFICATION

Signal	Lower (ohm-m)	Measured (ohm-m)	Upper (ohm-m)
Mud Cell	0.95	0.99	1.05

#### PASS/FAIL SUMMARY

GAIN RANGE CHK	PASS
SONDE OFFSET RANGE CHK	PASS
Tx CURRENT GAIN	PASS
Rmud VERIFICATION	PASS

TOOL OK TO LOG

#### CALIBRATION SUMMARY

Sensor	Shop	Field	Post	Difference	Tolerance	Units
GTET-10748374						
Gamma Ray Calibrator	232.0	233.5	-----	-1.5	+/- 9.00	api
ACRt Sonde-10929775						

# HALLIBURTON

## PARAMETERS REPORT

Depth (ft)	Tool Name	Mnemonic	Description	Value	Units
TOP					
	GTET	GEOK	Process Gamma Ray EVR?	No	
	DSNT	DEOK	Process DSN EVR?	No	
	SDLT Pad	DNOK	Process Density EVR?	No	
4200.00					
	SHARED	BS	Bit Size	7.875	in
	SHARED	UBS	Use Bit Size instead of Caliper for all applications.	No	
	SHARED	MDBS	Mud Base	Water	
	SHARED	MDWT	Borehole Fluid Weight	9.200	ppg
	SHARED	WAGT	Weighting Agent	Natural	
	SHARED	BSAL	Borehole salinity	0.00	ppm
	SHARED	FSAL	Formation Salinity NaCl	0.00	ppm
	SHARED	KPCT	Percent K in Mud by Weight?	0.00	%
	SHARED	RMUD	Mud Resistivity	0.200	ohmm
	SHARED	TRM	Temperature of Mud	75.0	degF
	SHARED	CSD	Logging Interval is Cased?	No	
	SHARED	ICOD	AHV Casing OD	5.500	in
	SHARED	ST	Surface Temperature	75.0	degF
	SHARED	TD	Total Well Depth	6322.00	ft
	SHARED	BHT	Bottom Hole Temperature	150.0	degF
	SHARED	SVTM	Navigation and Survey Master Tool	IDT	
	SHARED	AZTM	High Res Z Accelerometer Master Tool	IDT	
	SHARED	TEMM	Temperature Master Tool	NONE	
	SHARED	BHSM	Borehole Size Master Tool	ICT	
	Rwa / CrossPlot	XPOK	Process Crossplot?	Yes	
	Rwa / CrossPlot	FCHO	Select Source of F	Automatic	
	Rwa / CrossPlot	AFAC	Archie A factor	0.6200	
	Rwa / CrossPlot	MFAC	Archie M factor	2.1500	
	Rwa / CrossPlot	RMFR	Rmf Reference	0.10	ohmm
	Rwa / CrossPlot	TMFR	Rmf Ref Temp	75.00	degF
	Rwa / CrossPlot	RWA	Resistivity of Formation Water	0.05	ohmm
	Rwa / CrossPlot	ADP	Use Air Porosity to calculate CrossplotPhi	No	
	GTET	GROK	Process Gamma Ray?	Yes	
	GTET	GRSO	Gamma Tool Standoff	0.000	in
	GTET	GEOK	Process Gamma Ray EVR?	Yes	
	GTET	TPOS	Tool Position for Gamma Ray Tools.	Eccentered	
	CSNG	CGOK	Process CSNG Data?	Yes	
	CSNG	CENT	Is Tool Centralized?	No	
	CSNG	GBOK	Gamma Enviromental Corrections?	Yes	
	CSNG	BARF	Barite Correction Factor	1.00	
	CSNG	ORDG	Use Fixed Gain	No	
	CSNG	ORDO	Use Fixed Offset	No	

CSNG	ORDR	Use Fixed Resolution Degradation Factor	No	
DSNT	DNOK	Process DSN?	Yes	
DSNT	DEOK	Process DSN EVR?	Yes	
DSNT	NLIT	Neutron Lithology	Limestone	
DSNT	DNSO	DSN Standoff - 0.25 in (6.35 mm) Recommended	0.250	in
DSNT	DNTP	Temperature Correction Type	None	
DSNT	DPRS	DSN Pressure Correction Type	None	
DSNT	SHCO	View More Correction Options	No	
DSNT	UTVD	Use TVD for Gradient Corrections?	No	
DSNT	LHWT	Logging Horizontal Water Tank?	No	
SDLT	CLOK	Process Caliper Outputs?	Yes	
SDLT Pad	DNOK	Process Density?	Yes	
SDLT Pad	DNOK	Process Density EVR?	Yes	
SDLT Pad	CB	Logging Calibration Blocks?	No	
SDLT Pad	SPVT	SDLT Pad Temperature Valid?	Yes	
SDLT Pad	DTWN	Disable temperature warning	No	
SDLT Pad	DMA	Formation Density Matrix	2.710	g/cc
SDLT Pad	DFL	Formation Density Fluid	1.000	g/cc
Microlog Pad	MLOK	Process MicroLog Outputs?	Yes	
IDT	WRTI	Survey Writing Interval	30	ft
IDT	SOPT	Smoothing Option	None	
ICT	CLOK	Process Caliper Outputs?	Yes	
ICT	DARM	Disable Caliper Arm	No	
ICT	ATDS	Arm To Disable	0	
ICT	REPM	Method to replace arm?	Caliper Average	
ICT	ARMV	Diameter to use for disabled arm	0.00	in
ICT	DARM	Disable Second Caliper Arm	No	
ICT	ATDS	Second Arm To Disable	0	
ICT	REPM	Method to replace second arm?	Caliper Average	
ICT	ARMV	Diameter to use for second disabled arm	0.00	in
ICT	NAVS	Navigation Source Tool	IDT	
ICT	CL10	Radius 1 Offset	0.0	in
ICT	CL20	Radius 2 Offset	0.0	in
ICT	CL30	Radius 3 Offset	0.0	in
ICT	CL40	Radius 4 Offset	0.0	in
ICT	CL50	Radius 5 Offset	0.0	in
ICT	CL60	Radius 6 Offset	0.0	in
ICT	BHVC	Radius type for borehole volume calcuations	Elliptical	
Wavesonic-I	WSOK	Process WSTT?	Yes	
Wavesonic-I	AFIL	Adaptive Filtering?	No	
Wavesonic-I	PINT	Process 1 Sample and Skip	0	
Wavesonic-I	PROM	Process Mode: M=1,MX=2,MY=3,MXY=4	4	
Wavesonic-I	DTSH	Delta -T Shale	100.00	uspf
Wavesonic-I	DTMT	Delta -T Matrix Type	User define	
Wavesonic-I	DTMA	Delta -T Matrix	47.60	uspf
Wavesonic-I	DTFL	Delta -T Fluid	189.00	uspf
Wavesonic-I	RHOM	Matrix Density	2.7100	g/cc
Wavesonic-I	RHOF	Fluid Density	1.0000	g/cc
Wavesonic-I	SMTH	Semblance Threshold	0.25	
Wavesonic-I	VPVS	VPVS Ratio for Porosity	1.40	
Wavesonic-I	APEQ	Acoustic Porosity Equation	Wylie	
Wavesonic-I	NAVS	Navigation Source Tool	IDT	
ACRt Sonde	RTOK	Process ACRt?	Yes	
ACRt Sonde	MNSO	Minimum Tool Standoff	1.50	in
ACRt Sonde	TCS1	Temperature Correction Source	FP Lwr & FP Upr	

ACRt Sonde	TPOS	Tool Position	Free Hanging	
ACRt Sonde	RMOP	Rmud Source	Mud Cell	
ACRt Sonde	RMIN	Minimum Resistivity for MAP	0.20	ohmm
ACRt Sonde	RMIN	Maximum Resistivity for MAP	200.00	ohmm
ACRt Sonde	THQY	Threshold Quality	0.50	
ACRt Sonde	MRFX	Fixed mud resistivity	2000	ohmm

BOTTOM

Data: MILLY\_3020\_1-19\0003 SP-GTET-CSNG-DSN-SDL-FLEX-IDT-ICT-WAVE-ACRT-BN\004 15-Aug-13 22:31 Up @6330.0f Date: 16-Aug-13 04:34:33

# HALLIBURTON

## INPUTS, DELAYS AND FILTERS TABLE

Mnemonic	Input Description	Delay (ft)	Filter Type	Filter Length (ft)
<b>Depth Panel</b>				
TENS	Tension	0.00	NO	
<b>RWCH</b>				
DHTN	Downhole Tension	0.00	BLK	0.000
<b>SP Sub</b>				
PLTC	Plot Control Mask	118.88	NO	
SP	Spontaneous Potential	118.88	BLK	1.250
SPR	Raw Spontaneous Potential	118.88	NO	
SPO	Spontaneous Potential Offset	118.88	NO	
<b>GTET</b>				
TPUL	Tension Pull	110.86	NO	
GR	Natural Gamma Ray API	110.86	TRI	1.750
GRU	Unfiltered Natural Gamma Ray API	110.86	NO	
EGR	Natural Gamma Ray API with Enhanced Vertical Resolution	110.86	W	1.416 , 0.750
ACCZ	Accelerometer Z	0.00	BLK	0.083
DEVI	Inclination	0.00	NO	
<b>CSNG</b>				
TPUL	Tension Pull	102.78	NO	
STAT	Status	102.78	NO	
FRMC	Tool Frame Count	102.78	BLK	0.250
TFRM	Total Frames	102.78	NO	
LSPD	Line Speed	102.78	BLK	0.250
CTIM	Accumulation time for sample	102.78	BLK	0.250
NOIS	Spectral Noise	102.78	BLK	0.250
STAB	Stabilizer Voltage in mv	102.78	BLK	0.250
STBP	Stabilizer 60 KEV Peak	102.78	BLK	0.250
AMER	Americium	102.78	BLK	0.250
FTMP	Flask PCB Temperature	102.78	BLK	0.250
SPEL	Low Energy Spectrum	102.78	BLK	0.250
SPEH	High Energy Spectrum	102.78	BLK	0.250
SSP	Stabilization Energy Spectrum	102.78	BLK	0.250
CSPC	CSNG Lo Hi Spectrum Data	102.78	NO	
<b>DSNT</b>				
TPUL	Tension Pull	92.45	NO	
RNDS	Near Detector Telemetry Counts	92.55	BLK	1.417

RFDS	Far Detector Telemetry Counts	93.30	TRI	0.583
DNTT	DSN Tool Temperature	92.55	NO	
DSNS	DSN Tool Status	92.45	NO	
ERND	Near Detector Telemetry Counts EVR	92.55	BLK	0.000
ERFD	Far Detector Telemetry Counts EVR	93.30	BLK	0.000
ENTM	DSN Tool Temperature EVR	92.55	NO	
<b>SDLT</b>				
TPUL	Tension Pull	82.55	NO	
PCAL	Pad Caliper	82.55	TRI	0.250
ACAL	Arm Caliper	82.55	TRI	0.250
<b>IDT</b>				
TPUL	Tension Pull	67.48	NO	
ACCX	Accelerometer X	67.48	NO	
ACCY	Accelerometer Y	67.48	NO	
ACCZ	Accelerometer Z	67.48	NO	
MAGX	magnetometer x with unit	67.48	NO	
MAGY	Magnetometer Y with unit	67.48	NO	
MAGZ	magnetometer z with unit	67.48	NO	
IAMP	Accelerometer Temperature	67.48	NO	
MTMP	Magnetometer Temperature	67.48	NO	
<b>ICT</b>				
TPUL	Tension Pull	56.44	NO	
	Arm Potentiometer excitation V	53.65	NO	
	Caliper 1 measurement	56.44	BLK	1.250
	Caliper 2 measurement	56.44	BLK	1.250
	Caliper 3 measurement	56.44	BLK	1.250
	Caliper 4 measurement	56.44	BLK	1.250
	Caliper 5 measurement	56.44	BLK	1.250
	Caliper 6 measurement	56.44	BLK	1.250
	Caliper Global measurement	56.44	BLK	1.250
MOTI	Motor Current	53.65	NO	
MOT1	Motor Voltage Monitor 1	53.65	NO	
STA1	Status word #1	53.65	NO	
STA2	Status word #2	53.65	NO	
PRES	Caliper percentage of total compression of the spring	53.65	NO	
HAZI	Hole Azimuth	56.44	NO	
RB	Relative Bearing	56.44	NO	
AZI1	PAD1 Azimuth	56.44	NO	
DEVI	Inclination	56.44	NO	
<b>Wavesonic-I</b>				
TPUL	Tension Pull	31.08	NO	
DPSX	Dipole Source X StructureI	19.58	NO	
DPSY	Dipole Source Y StructureI	19.58	NO	
DPSM	Monopole Source Structure	19.58	NO	
WVST	Wavesonic Compressed Data	31.08	NO	
TPUL	Tension Pull	31.08	NO	
XMS1	Wave Sonic Status Word 1	19.58	NO	
XMS2	Wave Sonic Status Word 2	19.58	NO	
XMS1	Wave Sonic XMITStatus Word 1	19.58	NO	
XMS1	Wave Sonic XMITStatus Word 2	19.58	NO	
F1HA	Dipole 1 HV After	19.58	NO	
F1HB	Dipole 1 HV Before	19.58	NO	

F2HA	Dipole 2 HV After	19.58	NO
F2HB	Dipole 2 HV Before	19.58	NO
F3HA	Monopole HV After	19.58	NO
F3HB	Monopole HV Before	19.58	NO
INVT	Input Voltage	19.58	NO
5VOL	5 Volts	19.58	NO
MI5A	Minus 5 Volts Analog	19.58	NO
ITMP	Instrument Temperature	19.58	NO
PL5A	Plus 5 Volts Analog	19.58	NO
5VD	Plus 5 Volts Digital	19.58	NO
TCUR	Tool Current	19.58	NO
SUPV	Supply Voltage	19.58	NO
PRVT	Preregulated voltage	19.58	NO
PRVT	Pre-regulated voltage Xmter	19.58	NO
TEMP	Temperature	19.58	NO
ACQN	Acquisition Number	19.58	NO
XDP	Delay Reference	31.08	NO
MITM	MIT Mode	31.08	NO
VERS	Version	19.58	NO
D1CT	Dipole 1 Compressed Word Count	31.08	NO
D2CT	Dipole 2 Compressed Word Count	31.08	NO
MCNT	Monopole Compressed Word Count	31.08	NO
SEQN	Sequence Number	19.58	NO
FREV	Firmware Revision	19.58	NO
MSMP	Monopole Sample Rate	19.58	NO
MSMP	Dipole Sample Rate	19.58	NO
MFWF	Monopole Firing Waveform	19.58	NO
MFRQ	Monopole Frequency	19.58	NO
MDLY	Monopole Delay	19.58	NO
DXWF	Dipole X Firing Waveform	19.58	NO
XFRQ	Dipole X Frequency	19.58	NO
XDLY	Dipole X Delay	19.58	NO
DYWF	Dipole Y Firing Waveform	19.58	NO
YFRQ	Dipole Y Frequency	19.58	NO
YDLY	Dipole Y Delay	19.58	NO
DPSX	Dipole Source X Structurel	19.58	NO
DPSY	Dipole Source Y Structurel	19.58	NO
DPSM	Monopole Source Structure	19.58	NO
WVST	Wavesonic Compressed Data	31.08	NO
AUTM	Auto Mode	19.58	NO
SONM	tool mode for sonic - 0 for normal or 3 for calibration	19.58	NO
MSL	Monopole Lower Travel Time	31.08	NO
MSH	Monopole Upper Travel Time	31.08	NO
MLFC	Monopole-1 Lower Filter Bandpass Frequency Cut-off	19.58	NO
MUFC	Monopole-1 Upper Filter Bandpass Frequency Cut-off	19.58	NO
DLTT	Dipole Lower Travel Time	19.58	NO
DUTT	Dipole Upper Travel Time	19.58	NO
DLFC	Dipole Lower Filter Bandpass Frequency Cut-off	19.58	NO
DUFC	Dipole Upper Filter Bandpass Frequency Cut-off	19.58	NO
MUTE	WaveSonic Mute/Enable Channels and Sides map	19.58	NO
MUTS	Mute/Enable Sides	19.58	NO
WSRB	Relative Bearing	31.08	NO
WSAZ	WSX Azimuth Pad 1	31.08	NO
TPUL	Tension Pull	31.08	NO
WMP	Summed array of Monopole for SIDES - A,B,C,D	31.08	NO

WXX	Dipole X for SIDES - A-C	31.08	NO
WYY	Dipole Y for SIDES - B-D	31.08	NO
WXY	Dipole X for SIDES - B-D	31.08	NO
WYX	Dipole Y for SIDES - A-C	31.08	NO
TPUL	Tension Pull	31.08	NO
WMA	Monopole Waveform Side A - Channel 1 to Channel 8 Receivers	31.08	NO
WMB	Monopole Waveform Side B - Channel 1 to Channel 8 Receivers	31.08	NO
WMC	Monopole Waveform Side C - Channel 1 to Channel 8 Receivers	31.08	NO
WMD	Monopole Waveform Side D - Channel 1 to Channel 8 Receivers	31.08	NO
WXA	Dipole X Waveform Side A - Channel 1 to Channel 8 Receivers	31.08	NO
WXB	Dipole X Waveform Side B - Channel 1 to Channel 8 Receivers	31.08	NO
WXC	Dipole X Waveform Side C - Channel 1 to Channel 8 Receivers	31.08	NO
WXD	Dipole X Waveform Side D - Channel 1 to Channel 8 Receivers	31.08	NO
WYA	Dipole Y Waveform Side A - Channel 1 to Channel 8 Receivers	31.08	NO
WYB	Dipole Y Waveform Side B - Channel 1 to Channel 8 Receivers	31.08	NO
WYC	Dipole Y Waveform Side C - Channel 1 to Channel 8 Receivers	31.08	NO
WYD	Dipole Y Waveform Side D - Channel 1 to Channel 8 Receivers	31.08	NO
GAR1	Gain Side A Receiver 1	19.58	NO
GAR2	Gain Side A Receiver 2	19.58	NO
GAR3	Gain Side A Receiver 3	19.58	NO
GAR4	Gain Side A Receiver 4	19.58	NO
GAR5	Gain Side A Receiver 5	19.58	NO
GAR6	Gain Side A Receiver 6	19.58	NO
GAR7	Gain Side A Receiver 7	19.58	NO
GAR8	Gain Side A Receiver 8	19.58	NO
GBR1	Gain Side B Receiver 1	19.58	NO
GBR2	Gain Side B Receiver 2	19.58	NO
GBR3	Gain Side B Receiver 3	19.58	NO
GBR4	Gain Side B Receiver 4	19.58	NO
GBR5	Gain Side B Receiver 5	19.58	NO
GBR6	Gain Side B Receiver 6	19.58	NO
GBR7	Gain Side B Receiver 7	19.58	NO
GBR8	Gain Side B Receiver 8	19.58	NO
GCR1	Gain Side C Receiver 1	19.58	NO
GCR2	Gain Side C Receiver 2	19.58	NO
GCR3	Gain Side C Receiver 3	19.58	NO
GCR4	Gain Side C Receiver 4	19.58	NO
GCR5	Gain Side C Receiver 5	19.58	NO
GCR6	Gain Side C Receiver 6	19.58	NO
GCR7	Gain Side C Receiver 7	19.58	NO
GCR8	Gain Side C Receiver 8	19.58	NO
GDR1	Gain Side D Receiver 1	19.58	NO
GDR2	Gain Side D Receiver 2	19.58	NO
GDR3	Gain Side D Receiver 3	19.58	NO
GDR4	Gain Side D Receiver 4	19.58	NO
GDR5	Gain Side D Receiver 5	19.58	NO
GDR6	Gain Side D Receiver 6	19.58	NO
GDR7	Gain Side D Receiver 7	19.58	NO
GDR8	Gain Side D Receiver 8	19.58	NO

## ACRt Sonde

TPUL	Tension Pull	2.73	NO	
F1R1	ACRT 12KHz - 80in R value	8.98	BLK	0.000
F1X1	ACRT 12KHz - 80in X value	8.98	BLK	0.000
F1R2	ACRT 12KHz - 50in R value	6.48	BLK	0.000
F1X2	ACRT 12KHz - 50in X value	6.48	BLK	0.000
F1R3	ACRT 12KHz - 29in R value	4.98	BLK	0.000
F1X3	ACRT 12KHz - 29in X value	4.98	BLK	0.000
F1R4	ACRT 12KHz - 17in R value	3.98	BLK	0.000
F1X4	ACRT 12KHz - 17in X value	3.98	BLK	0.000
F1R5	ACRT 12KHz - 10in R value	3.48	BLK	0.000
F1X5	ACRT 12KHz - 10in X value	3.48	BLK	0.000
F1R6	ACRT 12KHz - 6in R value	3.23	BLK	0.000
F1X6	ACRT 12KHz - 6in X value	3.23	BLK	0.000
F2R1	ACRT 36KHz - 80in R value	8.98	BLK	0.000
F2X1	ACRT 36KHz - 80in X value	8.98	BLK	0.000
F2R2	ACRT 36KHz - 50in R value	6.48	BLK	0.000
F2X2	ACRT 36KHz - 50in X value	6.48	BLK	0.000
F2R3	ACRT 36KHz - 29in R value	4.98	BLK	0.000
F2X3	ACRT 36KHz - 29in X value	4.98	BLK	0.000
F2R4	ACRT 36KHz - 17in R value	3.98	BLK	0.000
F2X4	ACRT 36KHz - 17in X value	3.98	BLK	0.000
F2R5	ACRT 36KHz - 10in R value	3.48	BLK	0.000
F2X5	ACRT 36KHz - 10in X value	3.48	BLK	0.000
F2R6	ACRT 36KHz - 6in R value	3.23	BLK	0.000
F2X6	ACRT 36KHz - 6in X value	3.23	BLK	0.000
F3R1	ACRT 72KHz - 80in R value	8.98	BLK	0.000
F3X1	ACRT 72KHz - 80in X value	8.98	BLK	0.000
F3R2	ACRT 72KHz - 50in R value	6.48	BLK	0.000
F3X2	ACRT 72KHz - 50in X value	6.48	BLK	0.000
F3R3	ACRT 72KHz - 29in R value	4.98	BLK	0.000
F3X3	ACRT 72KHz - 29in X value	4.98	BLK	0.000
F3R4	ACRT 72KHz - 17in R value	3.98	BLK	0.000
F3X4	ACRT 72KHz - 17in X value	3.98	BLK	0.000
F3R5	ACRT 72KHz - 10in R value	3.48	BLK	0.000
F3X5	ACRT 72KHz - 10in X value	3.48	BLK	0.000
F3R6	ACRT 72KHz - 6in R value	3.23	BLK	0.000
F3X6	ACRT 72KHz - 6in X value	3.23	BLK	0.000
RMUD	Mud Resistivity	12.52	BLK	0.000
F1RT	Transmitter Current Raw 12K X Receiver	2.73	BLK	0.000
F1XT	Transmitter Reference 12 KHz Imaginary Signal	2.73	BLK	0.000
F2RT	Transmitter Reference 36 KHz Real Signal	2.73	BLK	0.000
F2XT	Transmitter Reference 36 KHz Imaginary Signal	2.73	BLK	0.000
F3RT	Transmitter Reference 72 KHz Real Signal	2.73	BLK	0.000
F3XT	Transmitter Reference 72 KHz Imaginary Signal	2.73	BLK	0.000
TFPU	Upper Feedpipe Temperature Calculated	2.73	BLK	0.000
TFPL	Lower Feedpipe Temperature Calculated	2.73	BLK	0.000
ITMP	Instrument Temperature	2.73	BLK	0.000
TCVA	Temperature Correction Values Loop Off	2.73	NO	
TIDV	Instrument Temperature Derivative	2.73	NO	
TUDV	Upper Temperature Derivative	2.73	NO	
TLDV	Lower Temperature Derivative	2.73	NO	
TRBD	Receiver Board Temperature	2.73	NO	

**SDLT Pad**

TPUL	Tension Pull	82.54	NO	
NAB	Near Above	82.37	BLK	0.920
NHI	Near Cesium High	82.37	BLK	0.920
NLO	Near Cesium Low	82.37	BLK	0.920
NVA	Near Valley	82.37	BLK	0.920
NBA	Near Barite	82.37	BLK	0.920
NDE	Near Density	82.37	BLK	0.920
NPK	Near Peak	82.37	BLK	0.920
NLI	Near Lithology	82.37	BLK	0.920
NBAU	Near Barite Unfiltered	82.37	BLK	0.250
NLIU	Near Lithology Unfiltered	82.37	BLK	0.250
FAB	Far Above	82.72	BLK	0.250
FHI	Far Cesium High	82.72	BLK	0.250
FLO	Far Cesium Low	82.72	BLK	0.250
FVA	Far Valley	82.72	BLK	0.250
FBA	Far Barite	82.72	BLK	0.250
FDE	Far Density	82.72	BLK	0.250
FPK	Far Peak	82.72	BLK	0.250
FLI	Far Lithology	82.72	BLK	0.250
PTMP	Pad Temperature	82.55	BLK	0.920
NHV	Near Detector High Voltage	81.95	NO	
FHV	Far Detector High Voltage	81.95	NO	
ITMP	Instrument Temperature	81.95	NO	
DDHV	Detector High Voltage	81.95	NO	

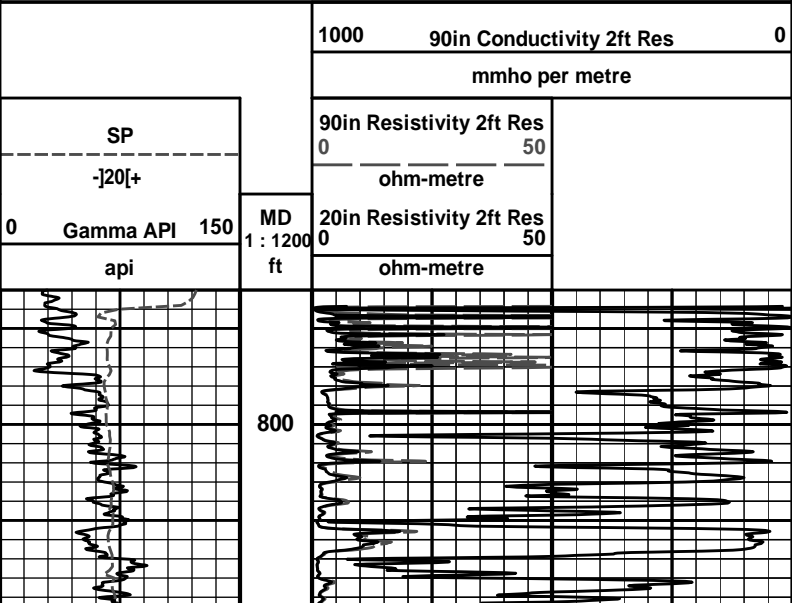
**Microlog Pad**

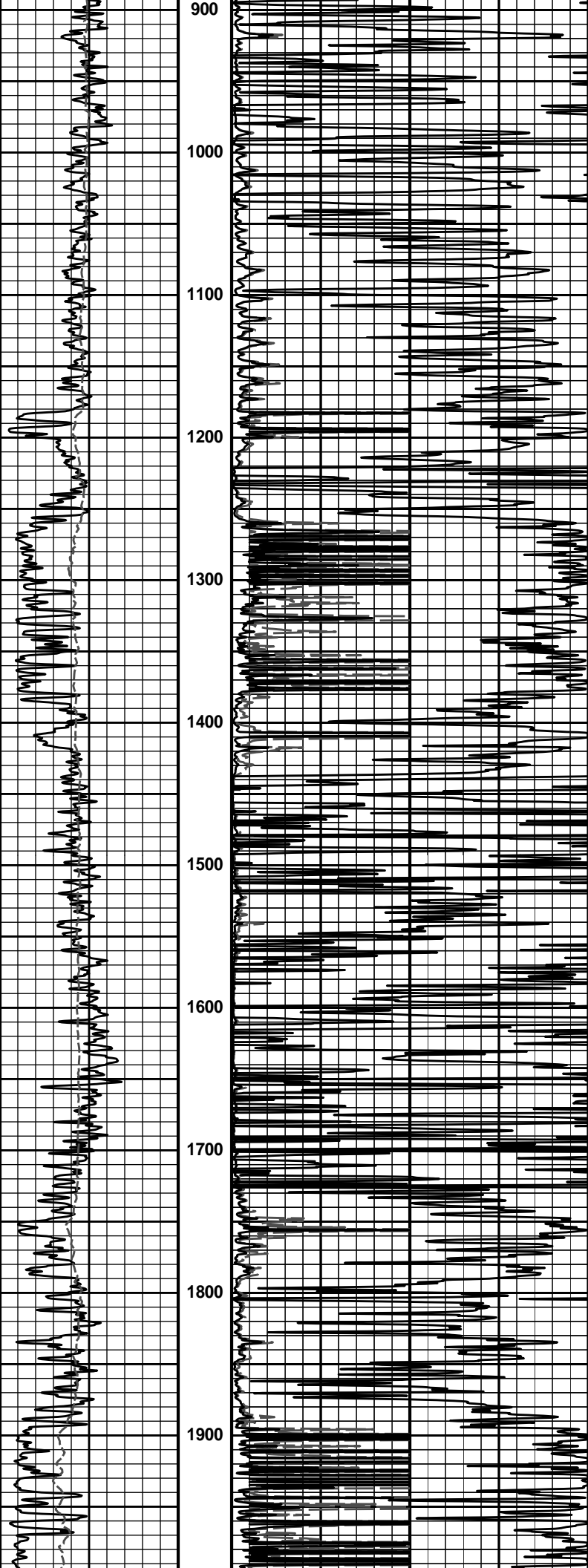
TPUL	Tension Pull	82.74	NO	
MINV	Microlog Lateral	82.74	BLK	0.750
MNOR	Microlog Normal	82.74	BLK	0.750

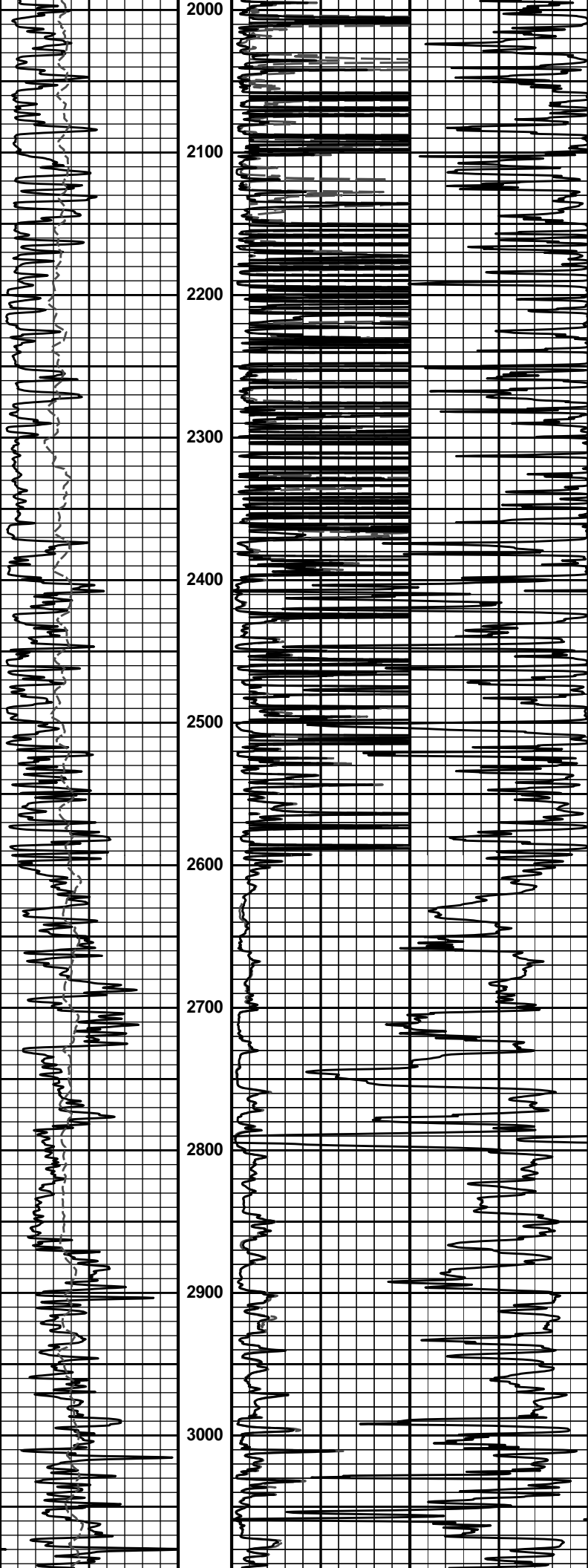
Data: MILLY\_3020\_1-19\0003 SP-GTET-CSNG-DSN-SDL-FLEX-IDT-ICT-WAVE-ACRT-BN004 15-Aug-13 22:31 Up @6330.0f Date: 16-Aug-13 04:33:55

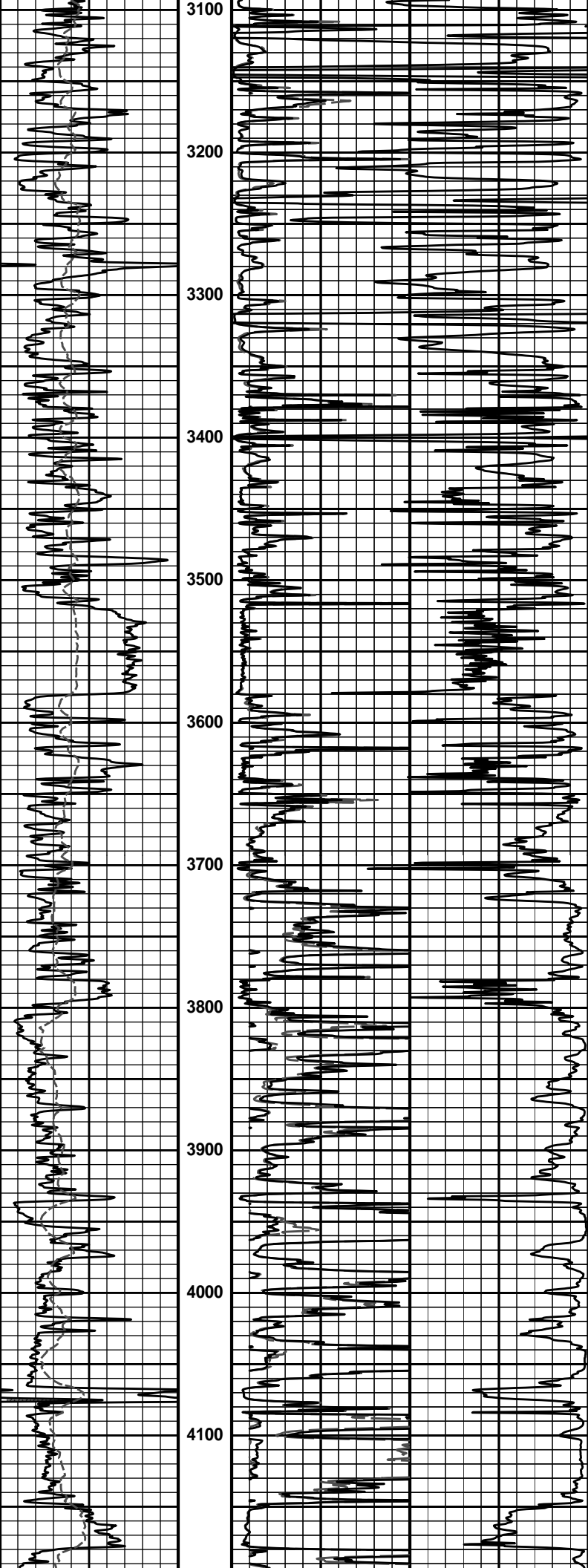
**HALLIBURTON**  
 Plot Time: 16-Aug-13 13:24:03  
 Plot Range: 730 ft to 6317 ft  
 Data: MILLY\_3020\_1-19\Well Based\R1 CASING\  
 Plot File: \\-LOCAL-MILLY\_3020\_1-19\Well Based\ACRT\ACRT\_1.lib

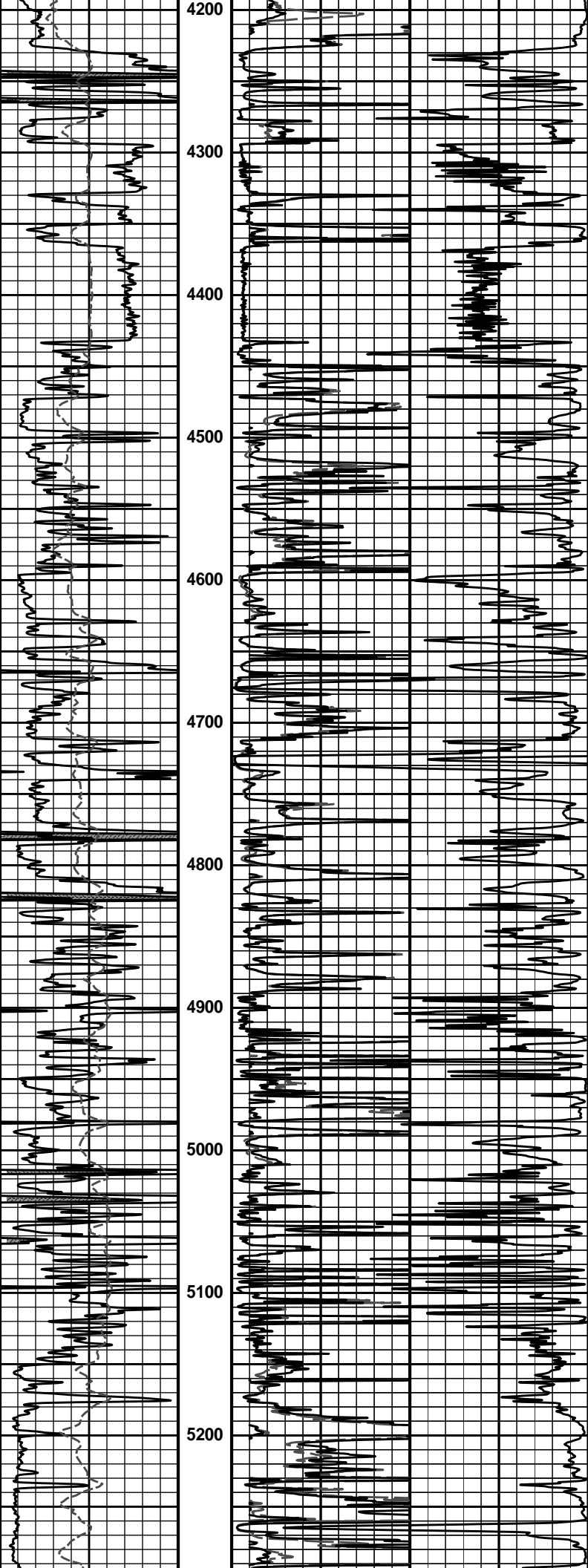
## 1 INCH MAIN LOG

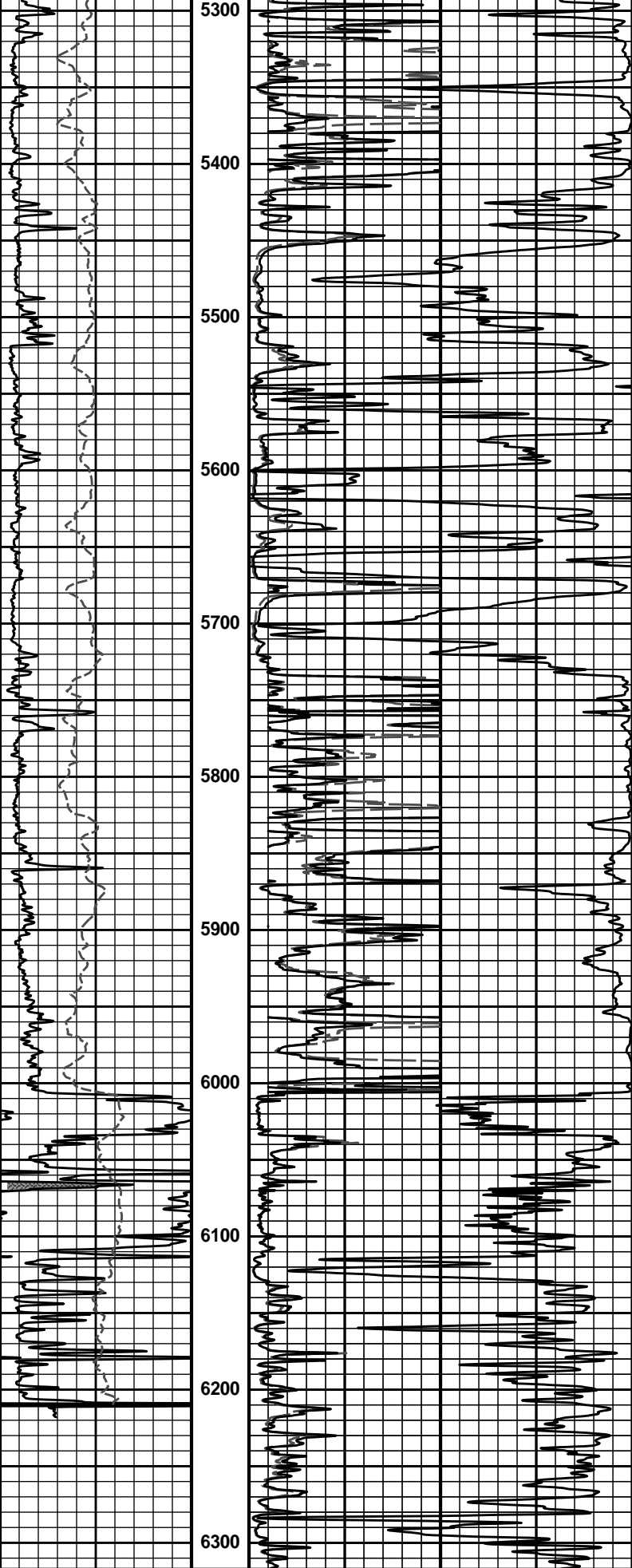












0	Gamma API	150	MD	20in Resistivity 2ft Res
	api		1 : 1200	0 50
	SP		ft	ohm-metre
				90in Resistivity 2ft Res

-]20[+	0	50
	ohm-metre	
1000	90in Conductivity 2ft Res	0
mmho per metre		

**HALLIBURTON**  
 Plot Time: 16-Aug-13 13:24:14  
 Plot Range: 730 ft to 6317 ft  
 Data: MILLY\_3020\_1-19\Well Based\R1 CASING\  
 Plot File: \\-LOCAL-MILLY\_3020\_1-19\Well Based\ACRT\ACRT\_1\_lib

**1 INCH MAIN LOG**

COMPANY	SANDRIDGE ENERGY		
WELL	MILLY 3020 1-19		
FIELD	EXCEL SOUTHWEST		
COUNTY	KIOWA	STATE	KANSAS

<b>HALLIBURTON</b>	<b>ARRAY COMPENSATED TRUE RESISTIVITY LOG</b>
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