



Weatherford

**COMPENSATED SONIC
WITH INTEGRATED TRANSIT TIME**

COMPANY										MURFIN DRILLING COMPANY, INC.									
WELL										COLUMBINE #8-24									
FIELD										WILDCAT									
PROVINCE/COUNTY										LINCOLN									
COUNTRY/STATE										U.S.A. / COLORADO									
LOCATION										2040' FNL & 600' FEL									
SEC 24		TWP 9S		RGE 56W		Other Services				MPD/MDN									
Latitude						MAI/MFE													
Longitude						MML													
API Number		05-073-06753																	
Permanent Datum GL, Elevation 5380 feet																			
Log Measured From KB, 13.00 feet above Permanent Datum																			
Drilling Measured From KB																			
Date		15-NOV-2018								Elevations:		feet							
Run Number		ONE								KB		5393.00							
Service Order		4558-229462509								DF		5391.00							
Depth Driller		8574.00				feet				GL		5380.00							
Depth Logger		8566.00				feet													
First Reading		8553.00				feet													
Last Reading		456.00				feet													
Casing Driller		455.00				feet													
Casing Logger		456.00				feet													
Bit Size		7.875				inches													
Hole Fluid Type		CHEMICAL																	
Density / Viscosity		9.40		lb/USg		70.00		CP											
PH / Fluid Loss		10.50				6.40		ml/30Min											
Sample Source		FLOWLINE																	
Rm @ Measured Temp		0.85 @ 75.0				ohm-m													
Rmf @ Measured Temp		0.68 @ 75.0				ohm-m													
Rmc @ Measured Temp		1.02 @ 75.0				ohm-m													
Source Rmf / Rmc		CALC				CALC													
Rm @ BHT		0.35 @180.0				ohm-m													
Time Since Circulation		5 HOURS																	
Max Recorded Temp		180.00				deg F													
Equipment / Base		13096		LIB															
Recorded By		ADAM SILL																	
Witnessed By		GREGG SMITH																	

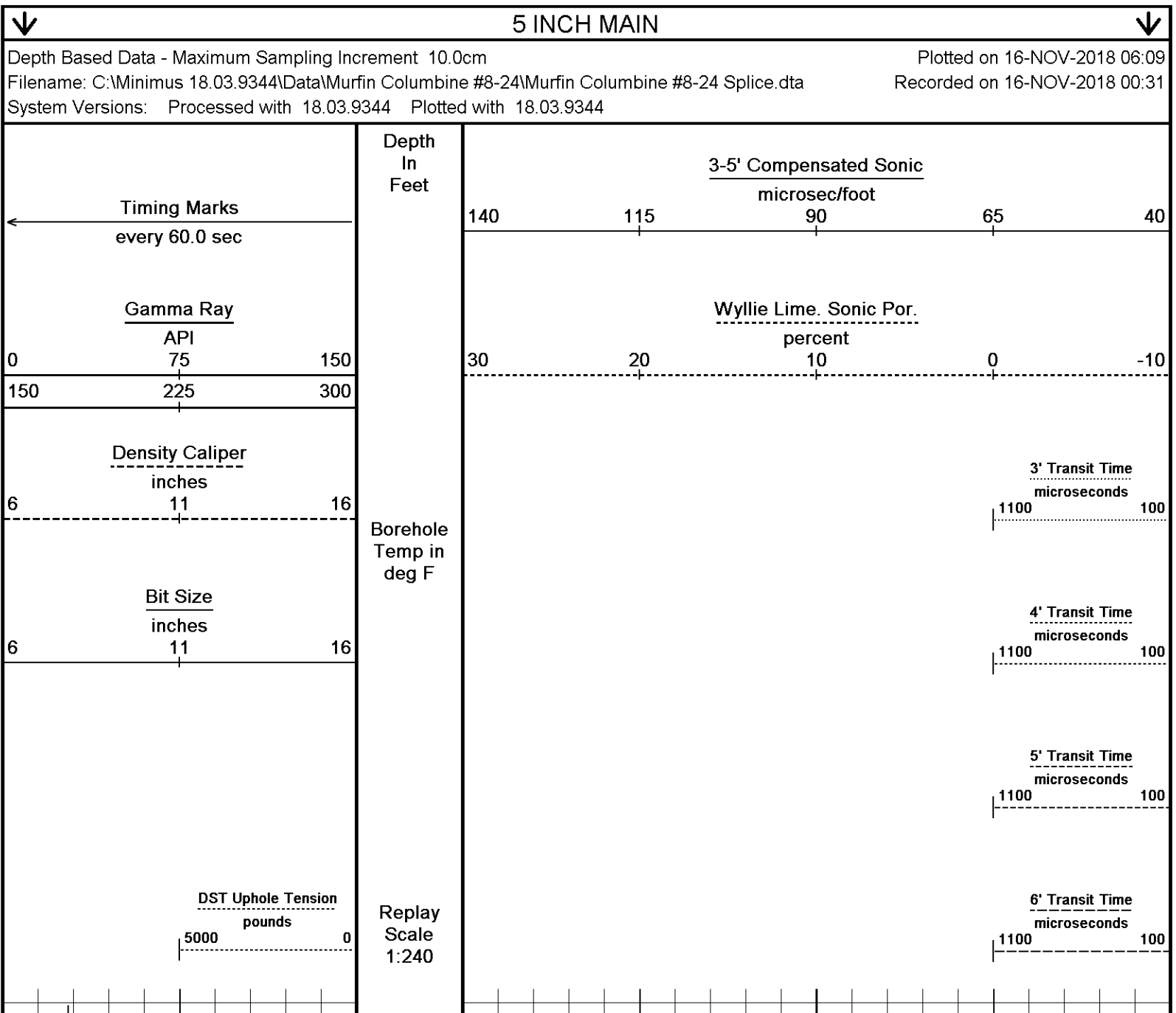
BOREHOLE RECORD					Last Edited: 15-NOV-2018 20:38
Bit Size inches		Depth From feet		Depth To feet	
7.875		455.00		8574.00	
CASING RECORD					
Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft	
SURFACE	8.625	0.00	455.00	24.00	

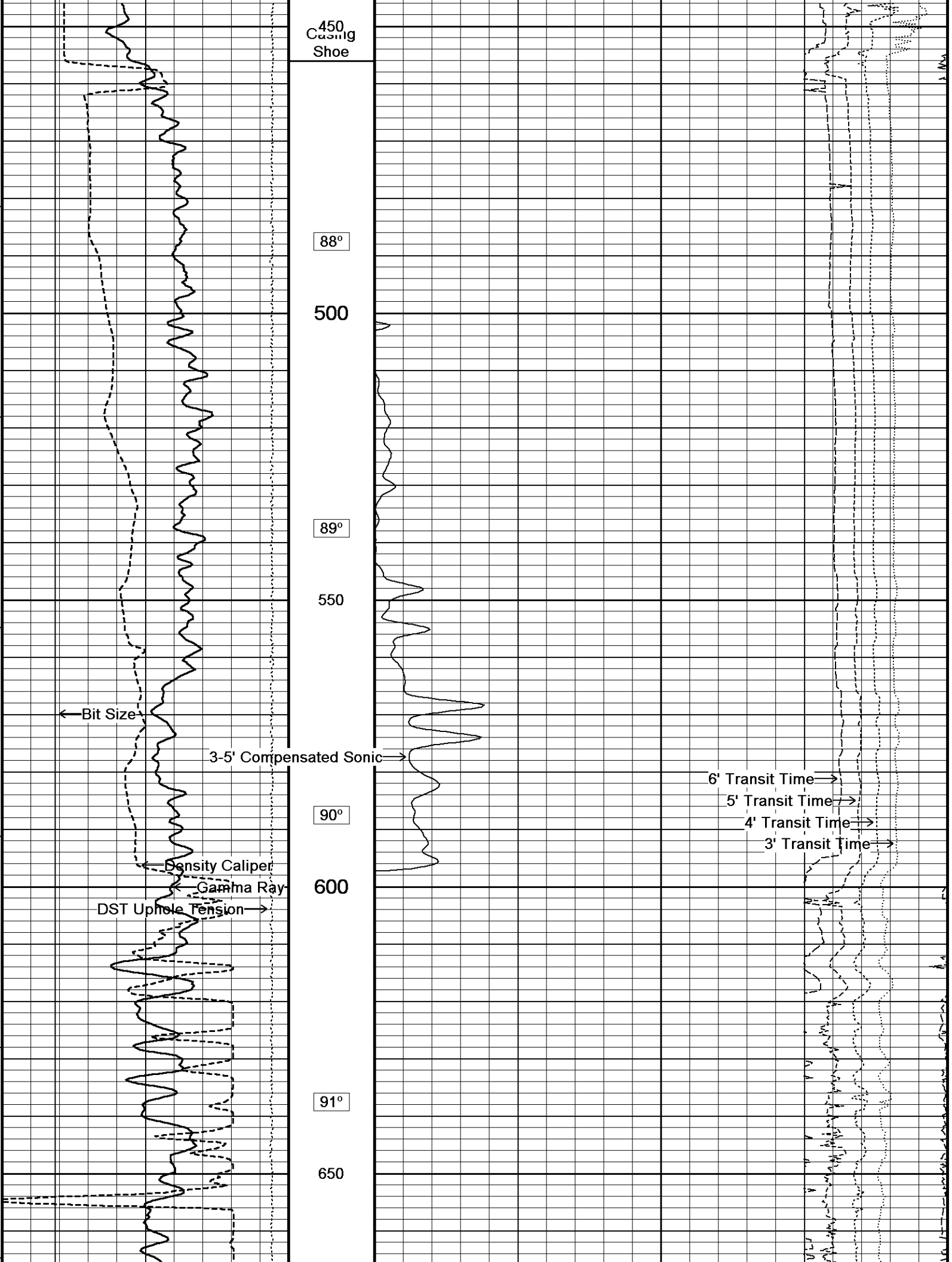
REMARKS
- SOFTWARE ISSUE: WLS 18.03.9344.
- RUN ONE: MCG, MML, MDN, MPD, MFE, MSS, MAI RUN IN COMBINATION. - HARDWARE: DUAL BOWSPRING USED ON MDN. 0.5 INCH STANDOFF USED ON MFE. TWO 0.5 INCH STANDOFFS USED ON MSS. 0.5 INCH STANDOFF USED ON MAI.
- 2.71 G/CC LIMESTONE DENSITY MATRIX USED TO CALCULATE POROSITY.
- BOREHOLE RUGOSITY, TIGHT PULLS, AND WASHOUTS WILL AFFECT DATA QUALITY.
- ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST.
- TOTAL HOLE VOLUME FROM TD TO SURFACE CASING: 4041 CU.FT.
- ANNULAR HOLE VOLUME WITH 5.5 INCH PRODUCTION CASING FROM TD TO 4200 FEET: 913 CU.FT.

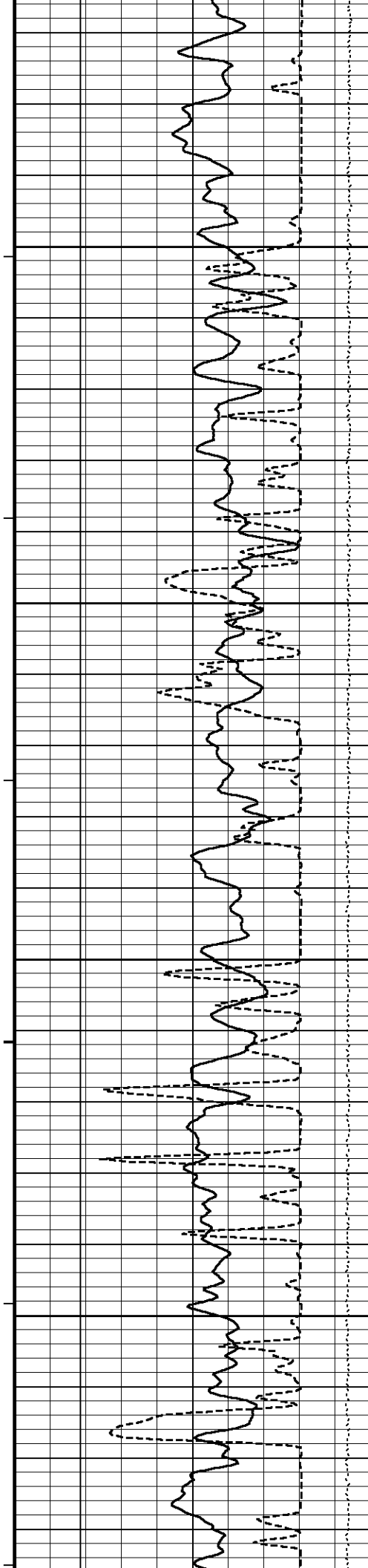
- RIG: MURFIN #25.
- ENGINEER: A. SILL.
- OPERATOR: B. TOVAR, B. COPELAND.

**** CALIPERS WERE CLOSED BETWEEN 5725 FEET AND 5900 FEET AS PER CUSTOMER'S REQUEST, DUE TO HOLE CONDITIONS THROUGH THAT INTERVAL. TOOL READINGS MAY NOT BE ACCURATE THOUGH THIS INTERVAL. ****

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







93°

700

95°

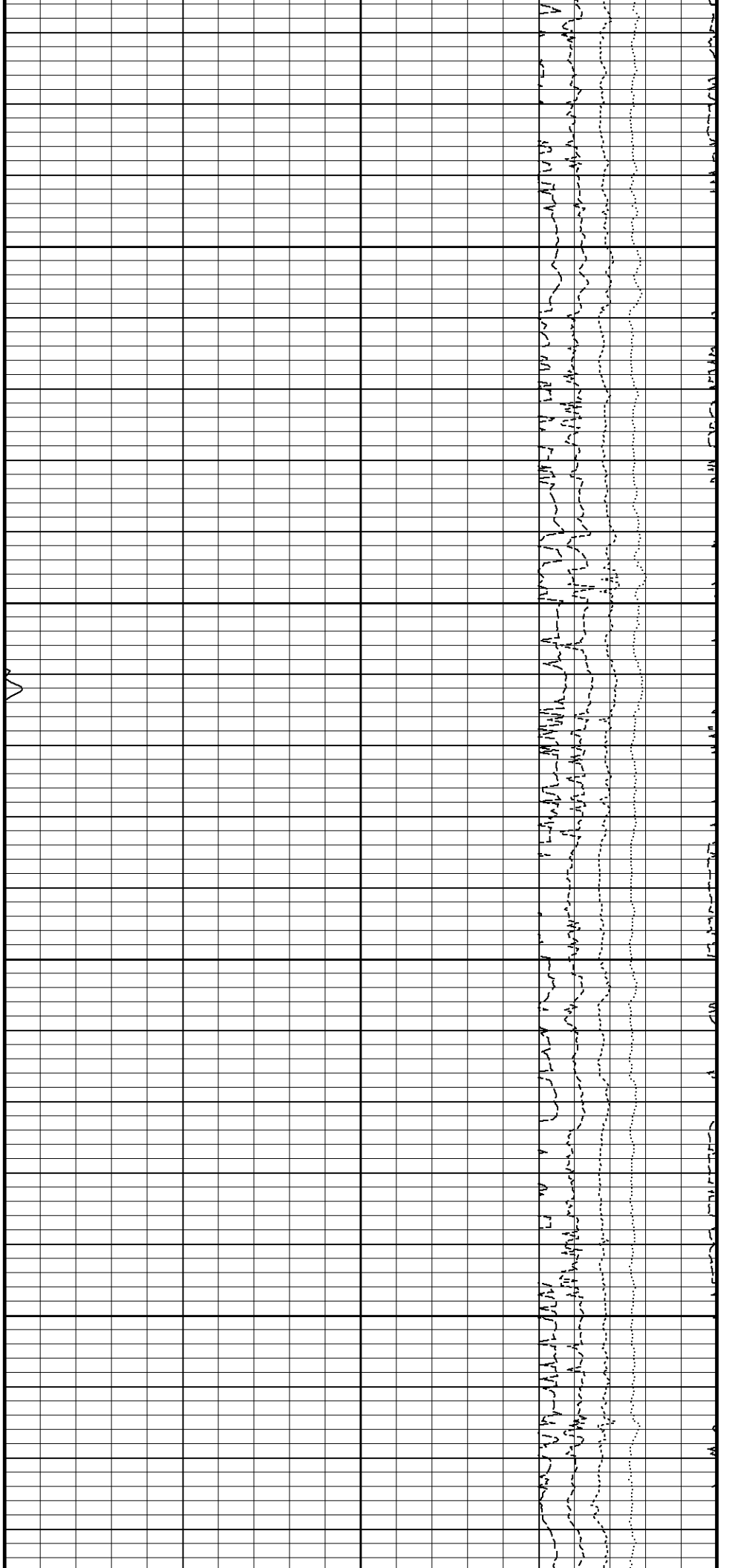
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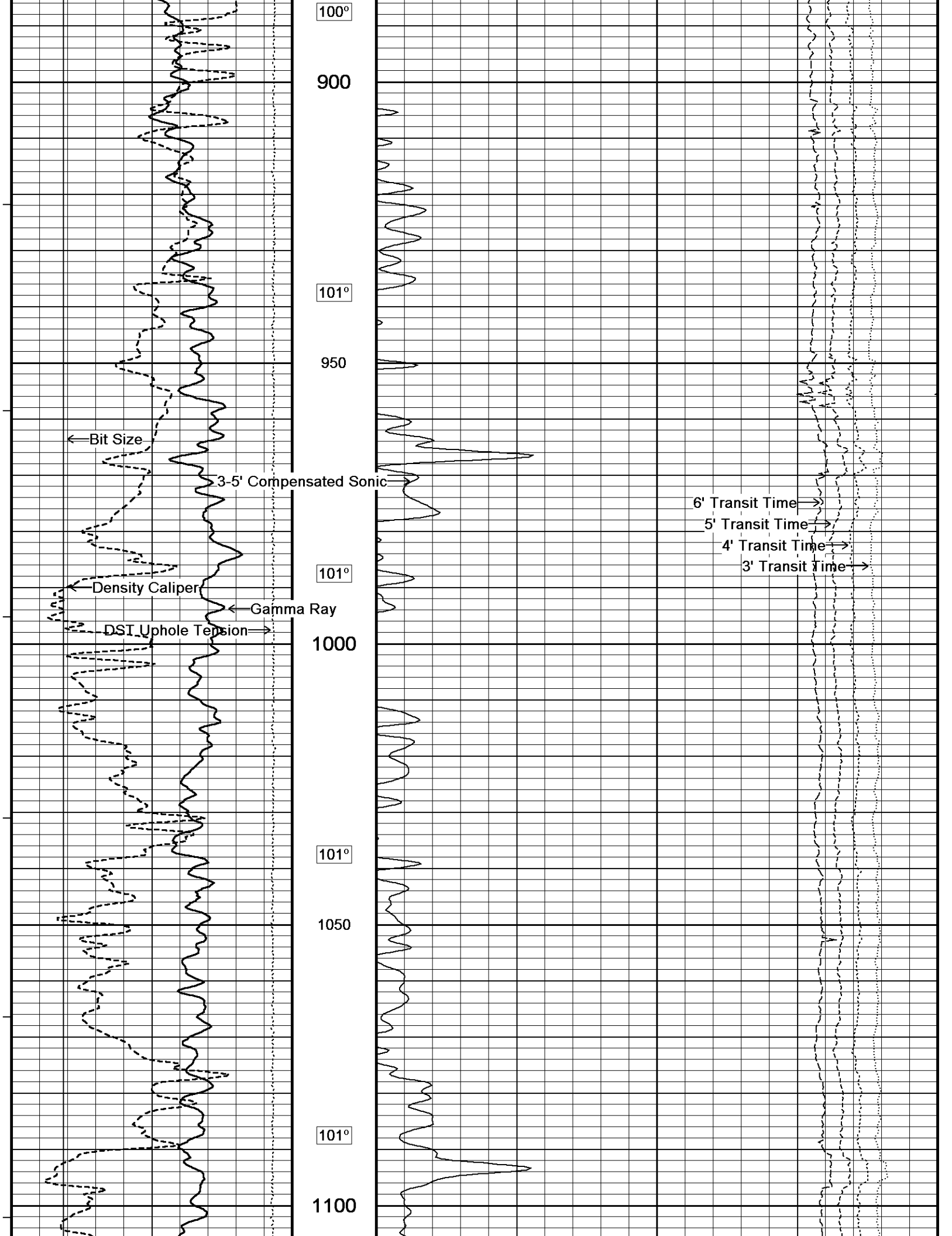
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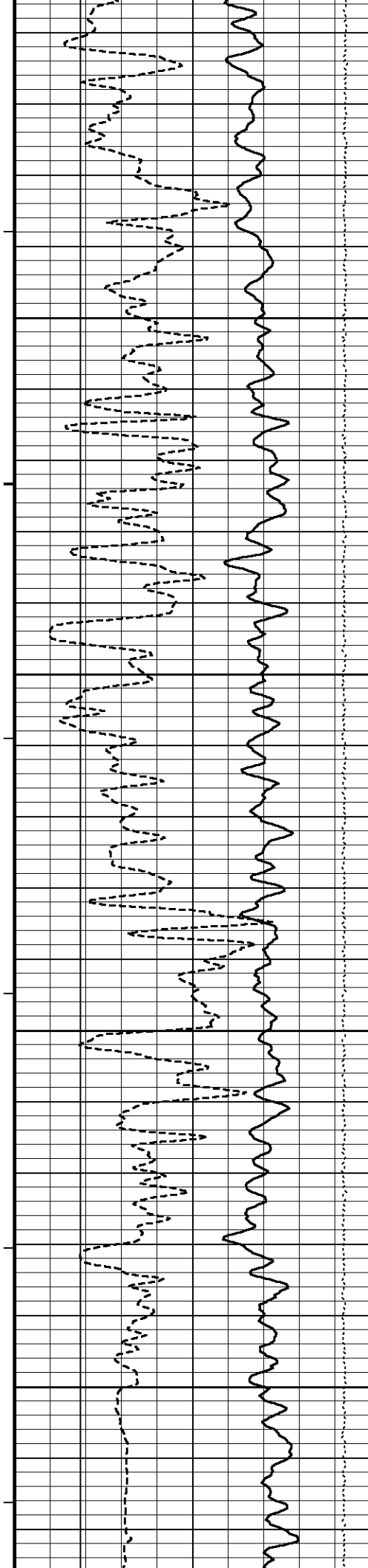
800

100°

850







101°

1150

102°

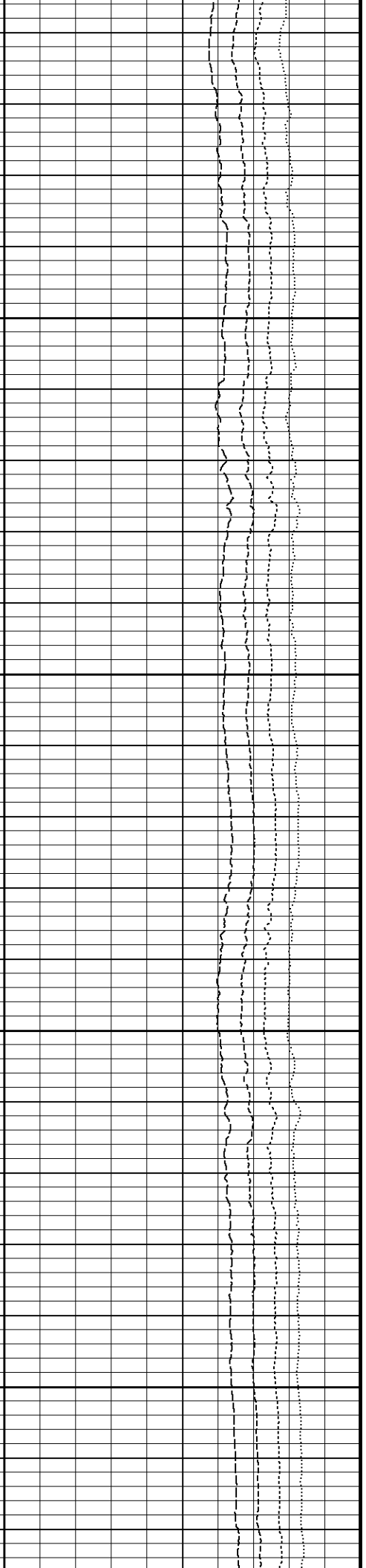
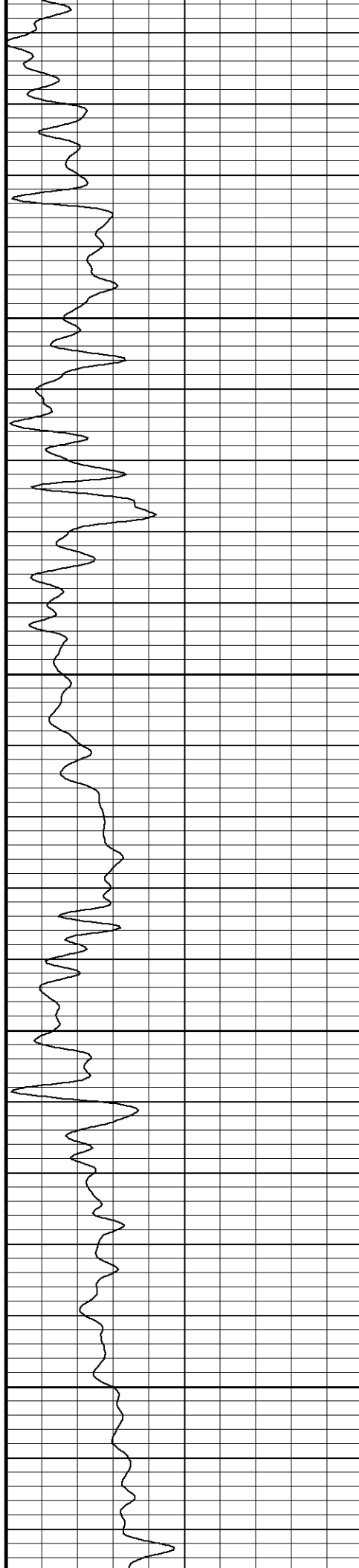
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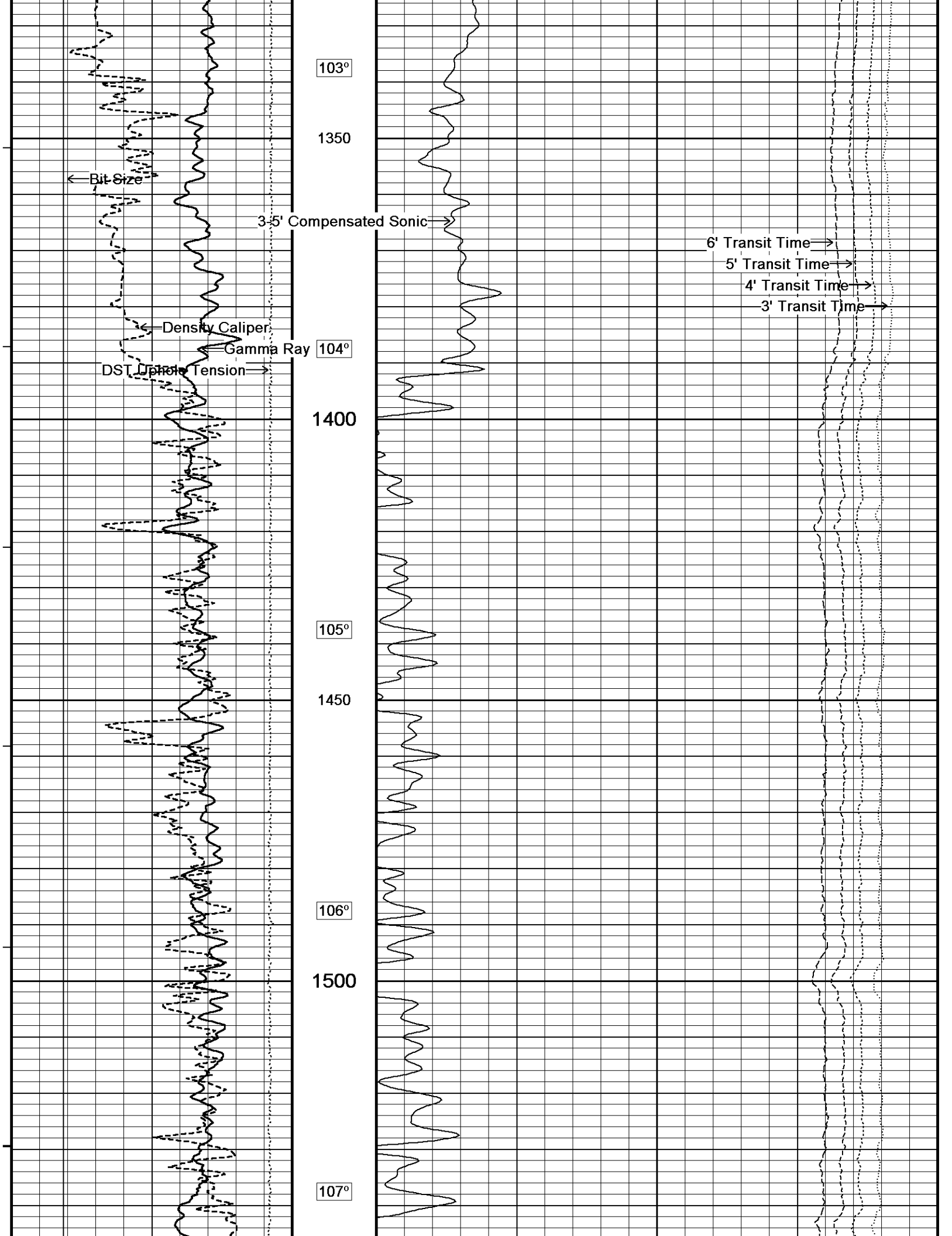
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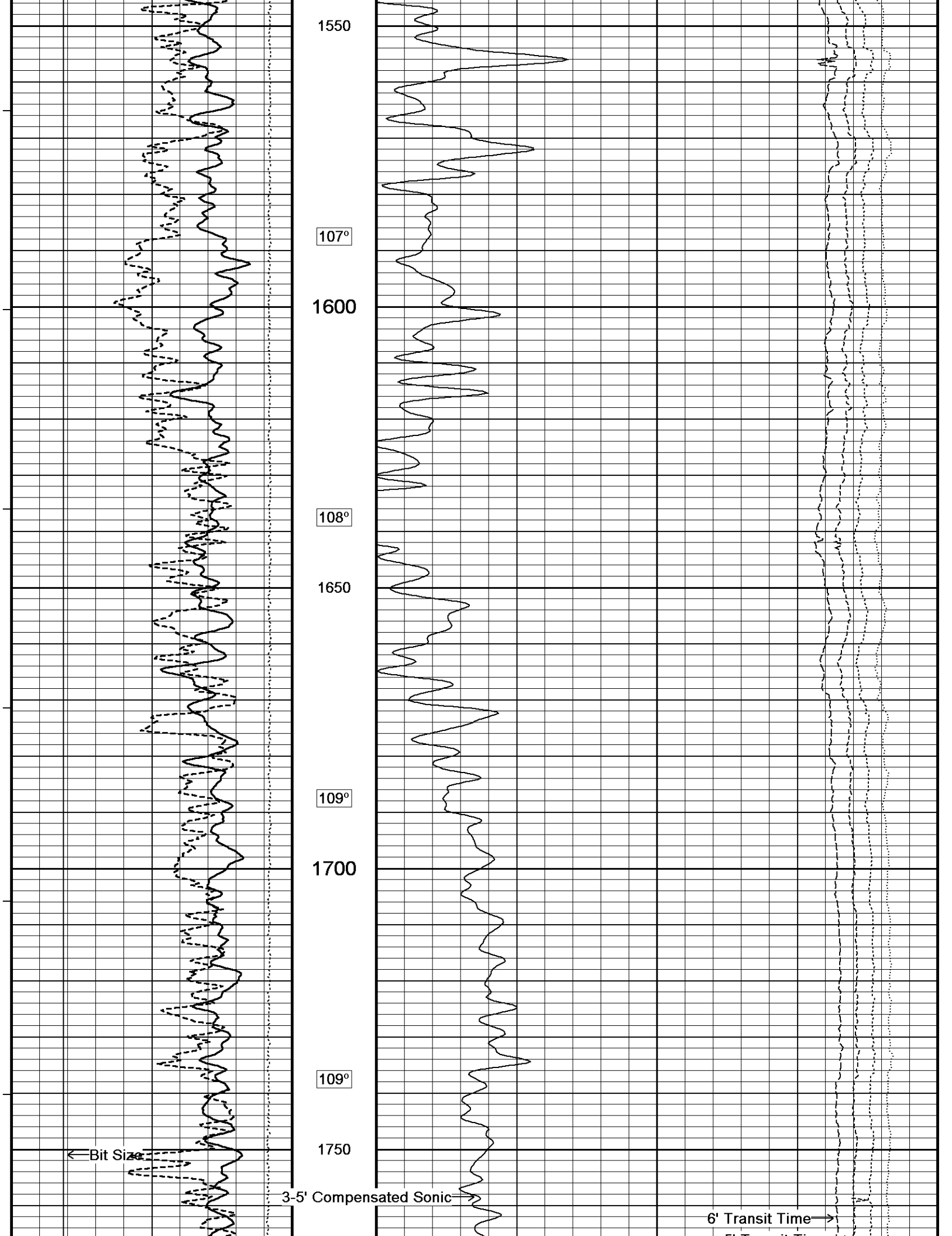
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103°

1300







Density Caliper
Gamma Ray
DST Uphole Tension

109°

1800

110°

1850

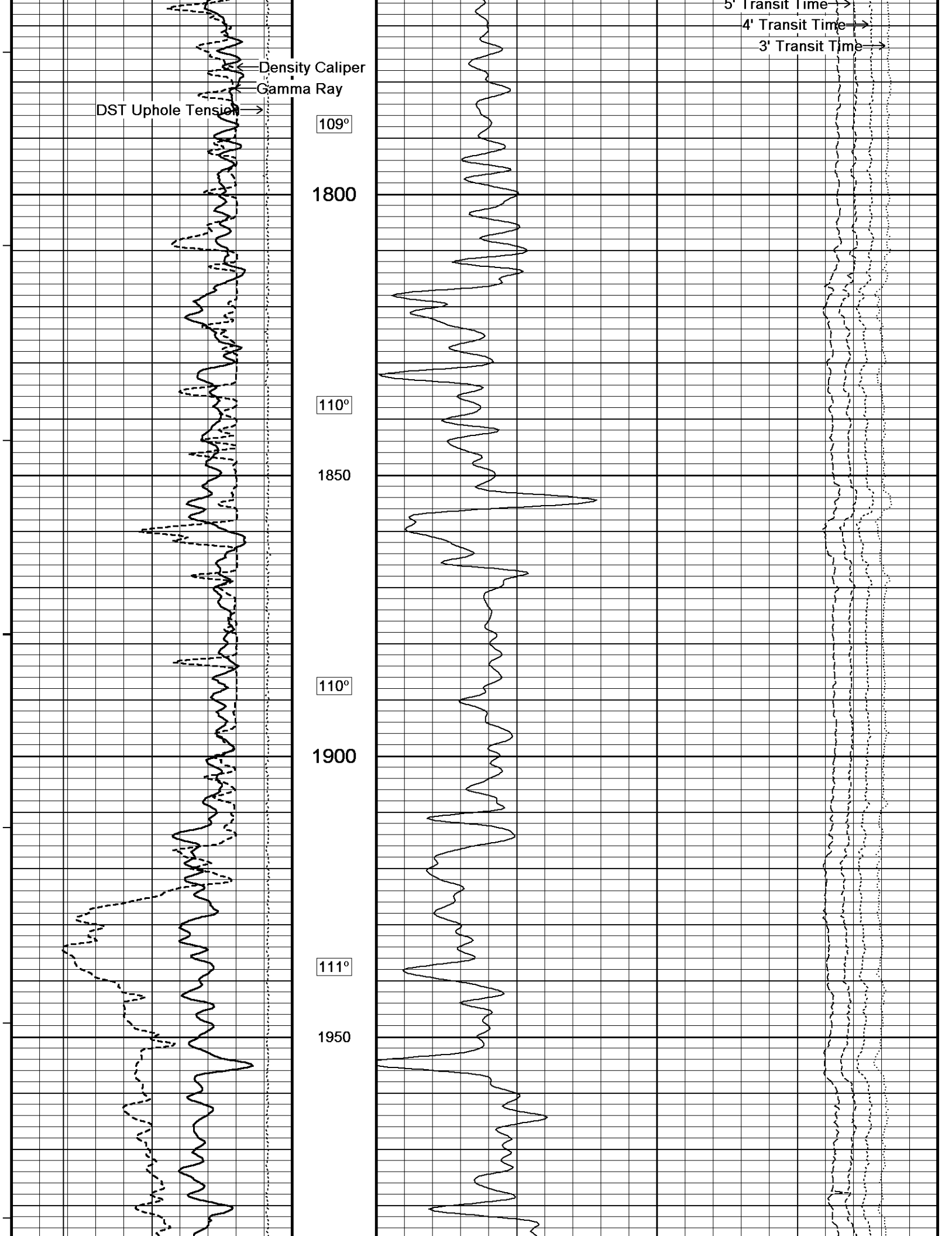
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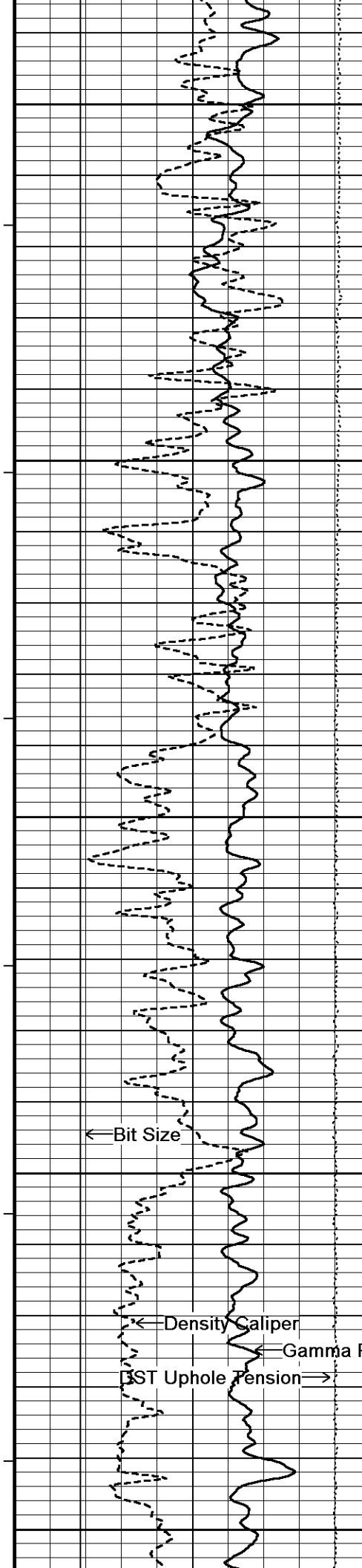
1900

111°

1950

5' Transit Time
4' Transit Time
3' Transit Time





111°

2000

112°

2050

112°

2100

113°

2150

113°

2200

← Bit Size

← Density Caliper

← Gamma Ray

→ ST Uphole Tension

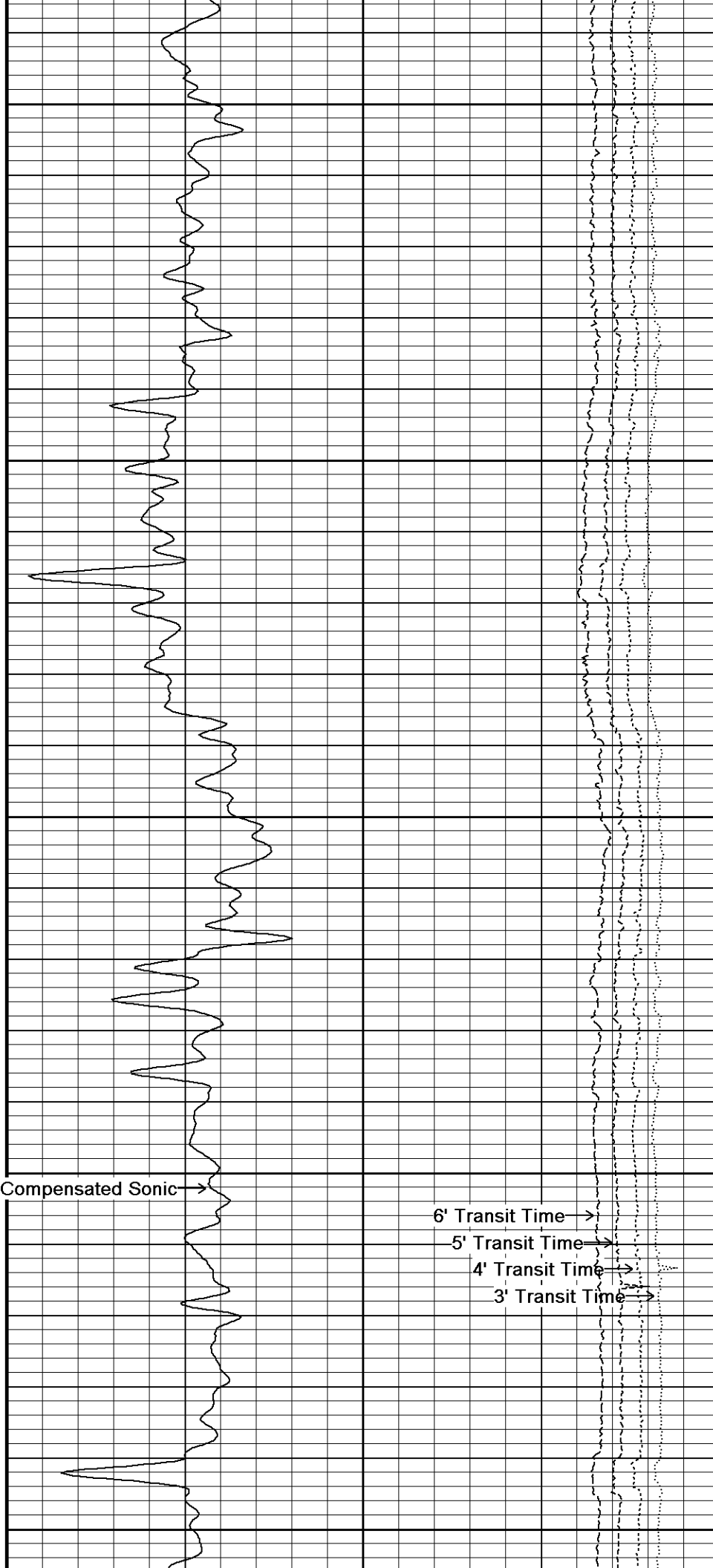
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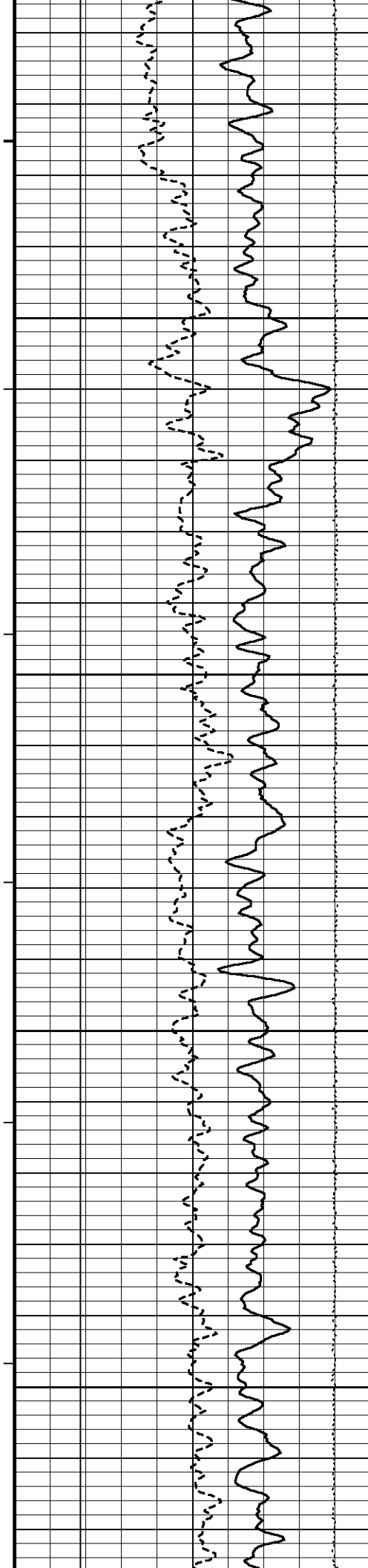
6' Transit Time →

5' Transit Time →

4' Transit Time →

3' Transit Time →





114°

2250

114°

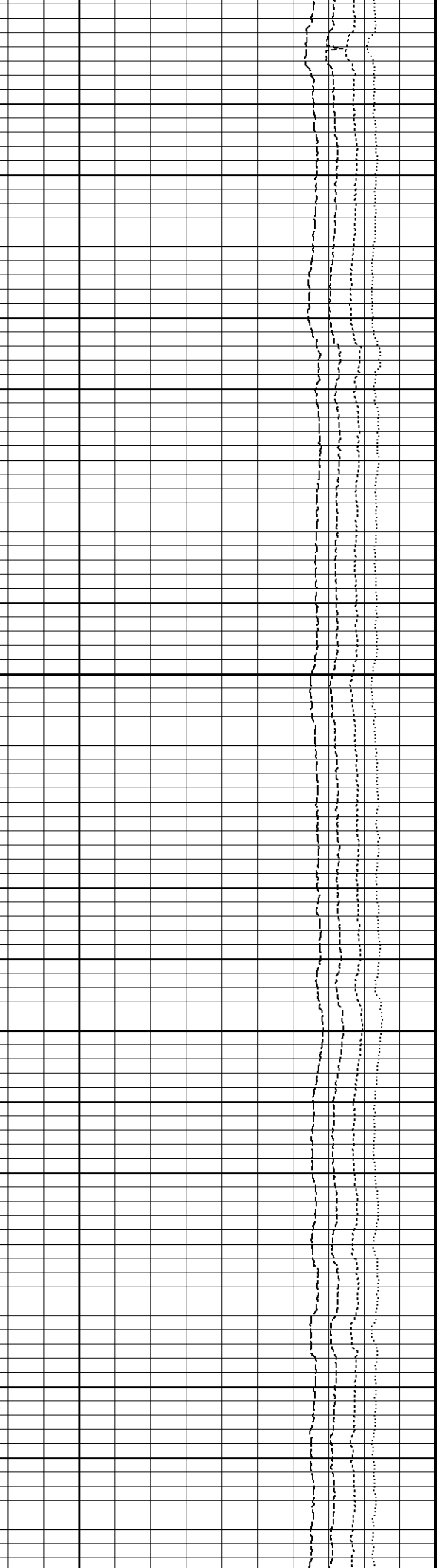
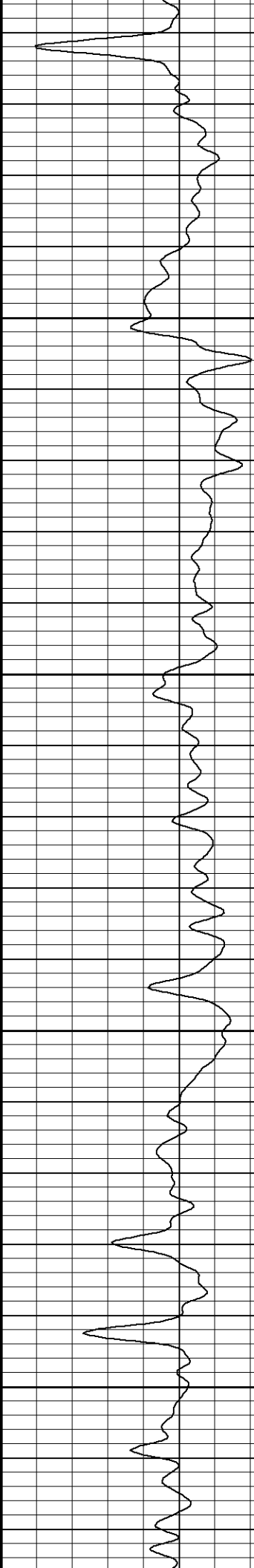
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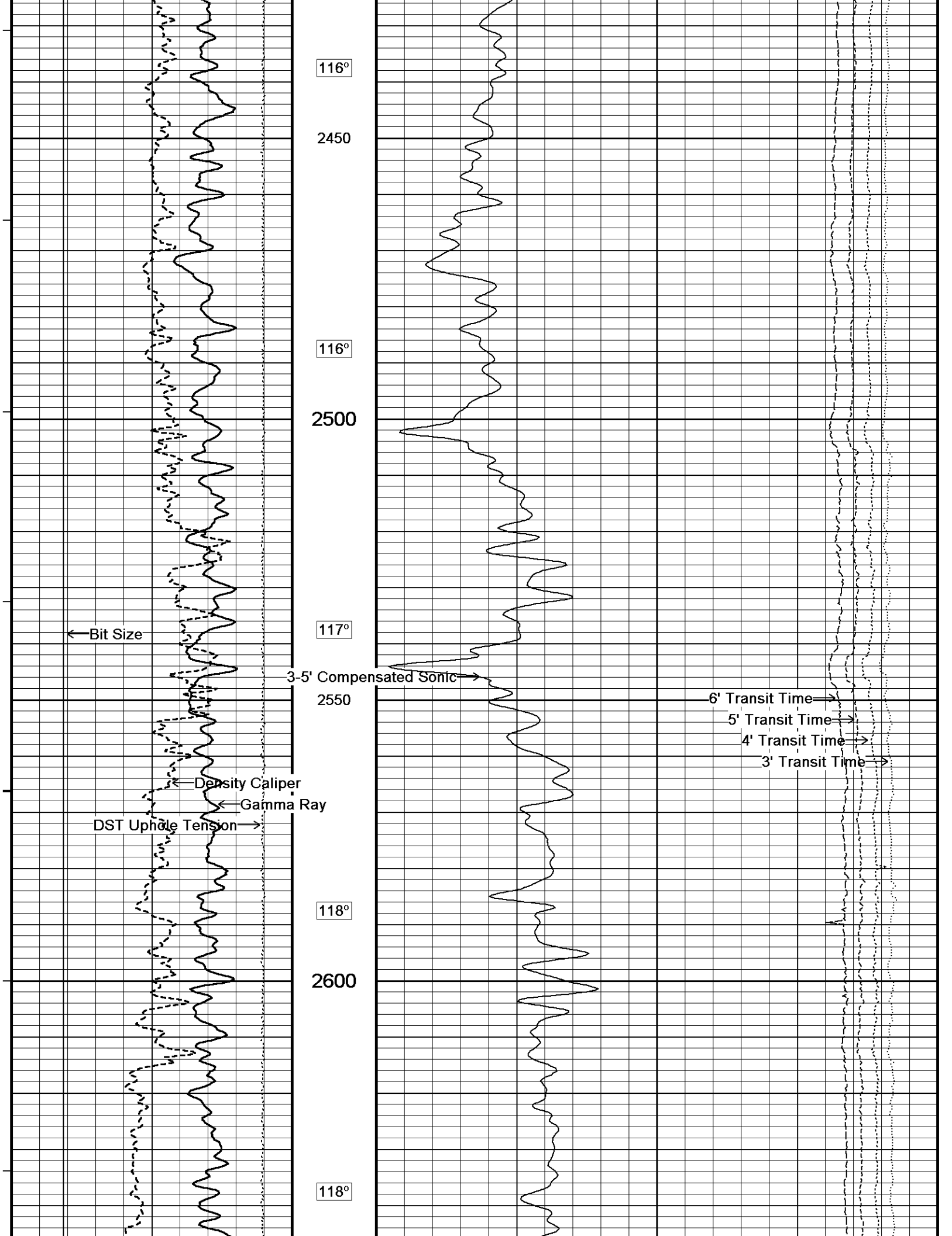
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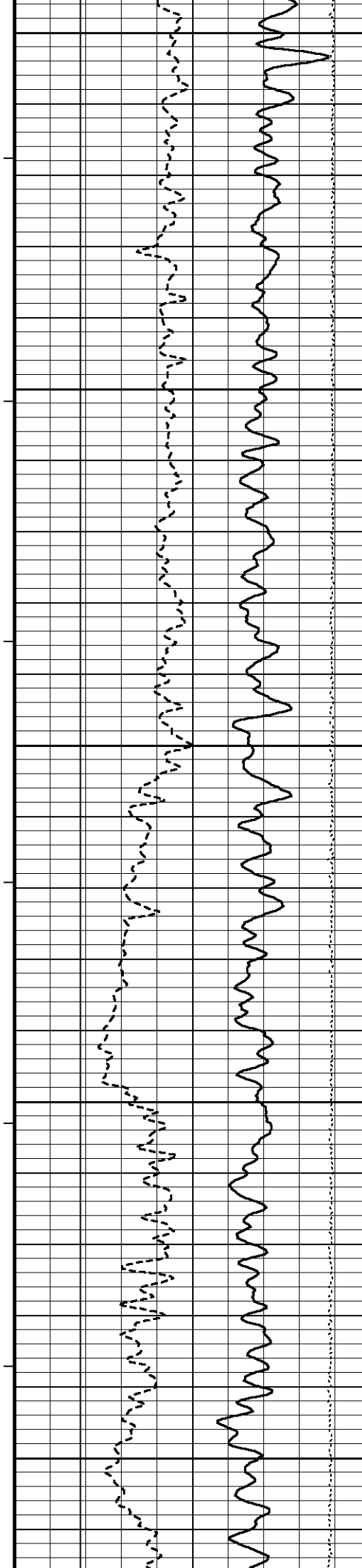
2350

115°

2400







2650

119°

2700

119°

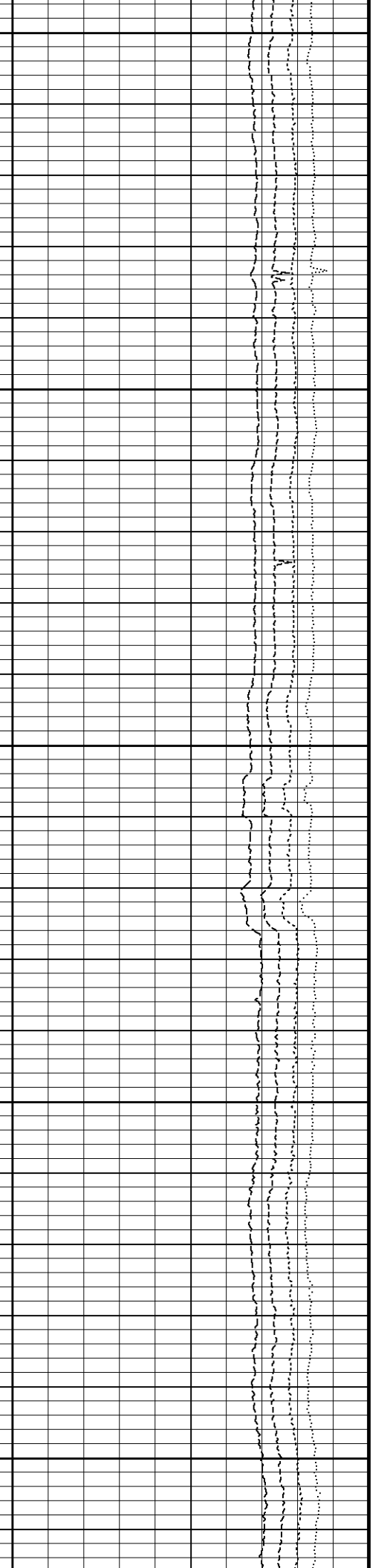
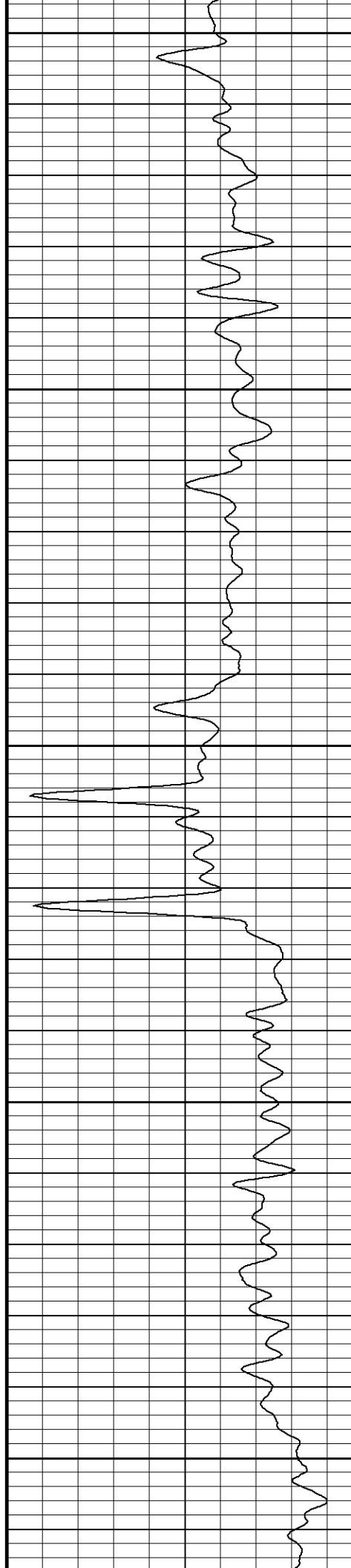
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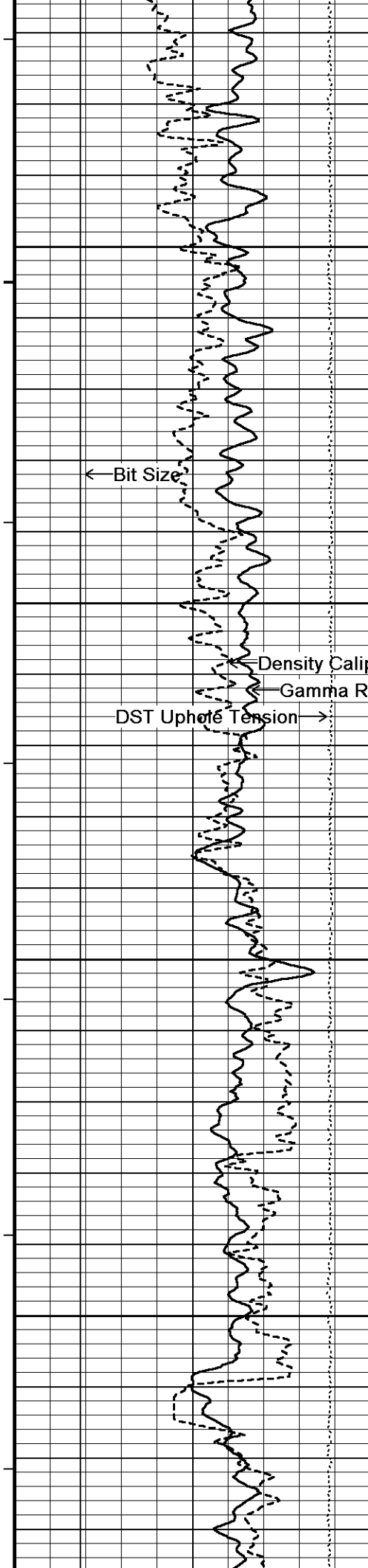
120°

2800

120°

2850





121°

2900

121°

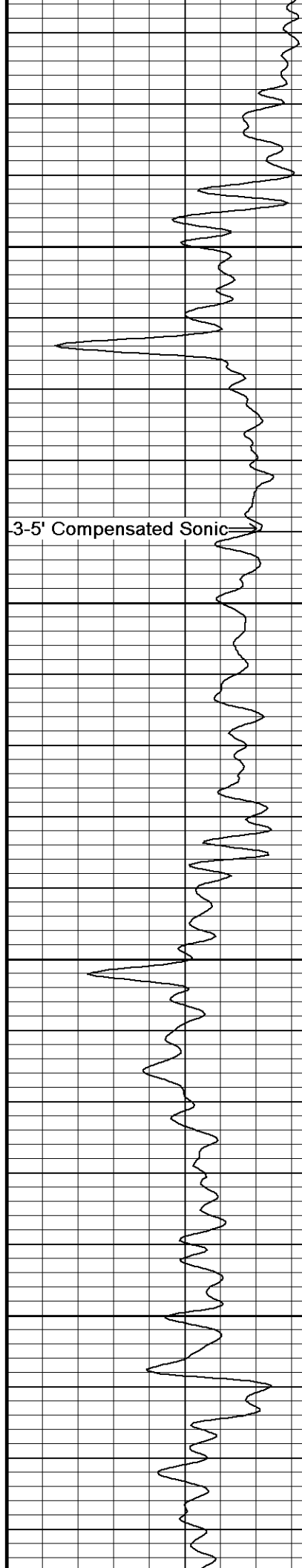
2950

122°

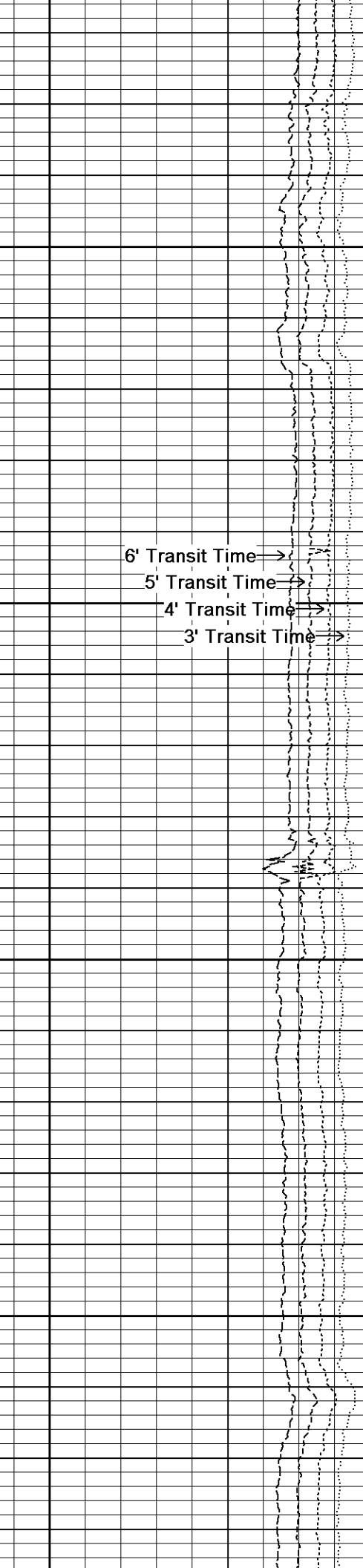
3000

123°

3050



3-5' Compensated Sonic

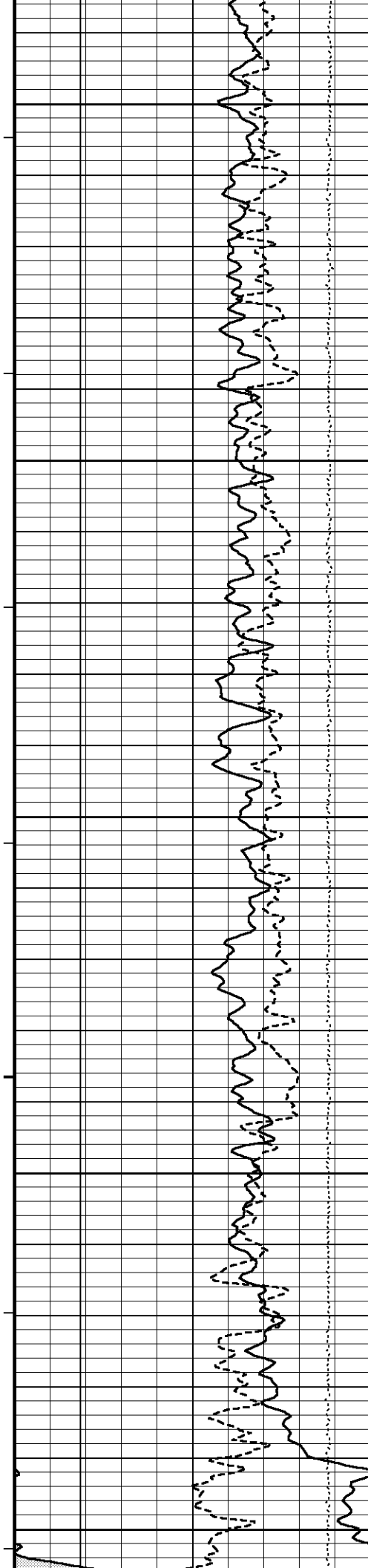


6' Transit Time

5' Transit Time

4' Transit Time

3' Transit Time



123°

3100

124°

3150

125°

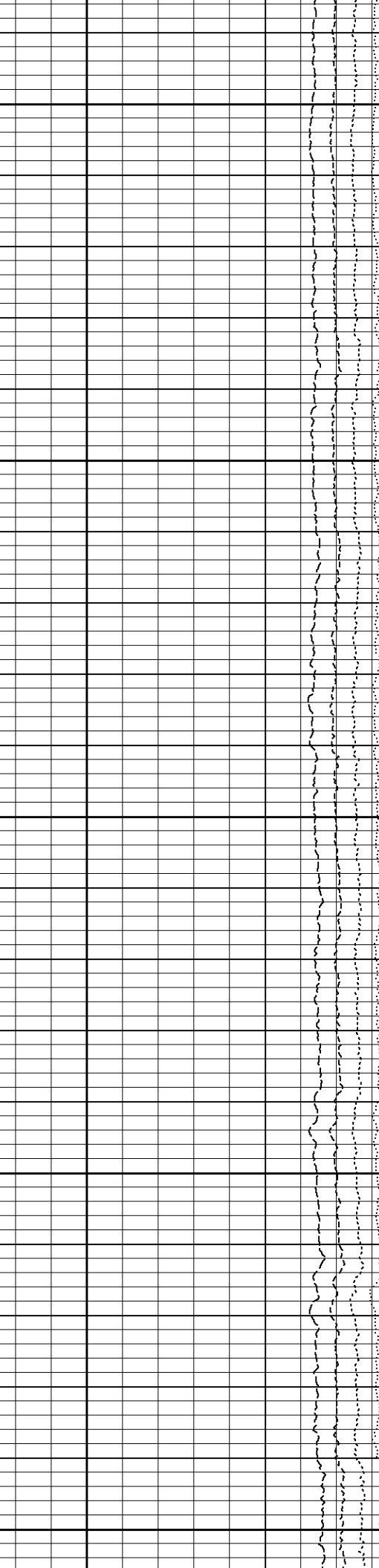
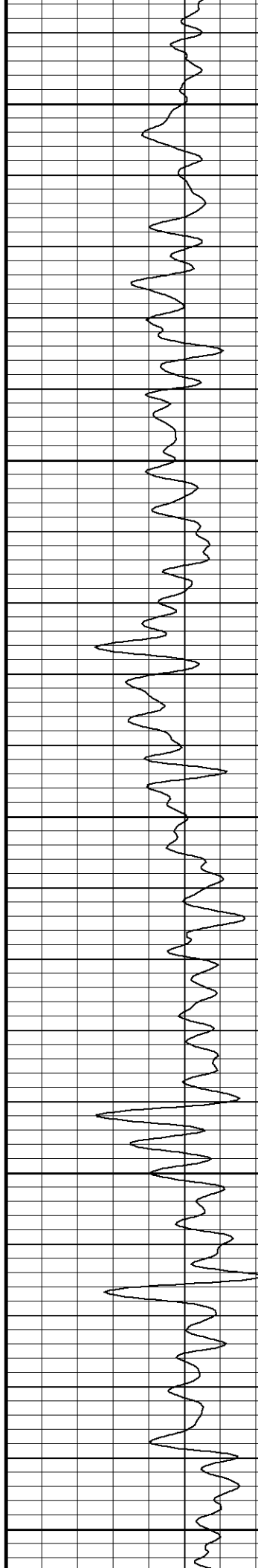
3200

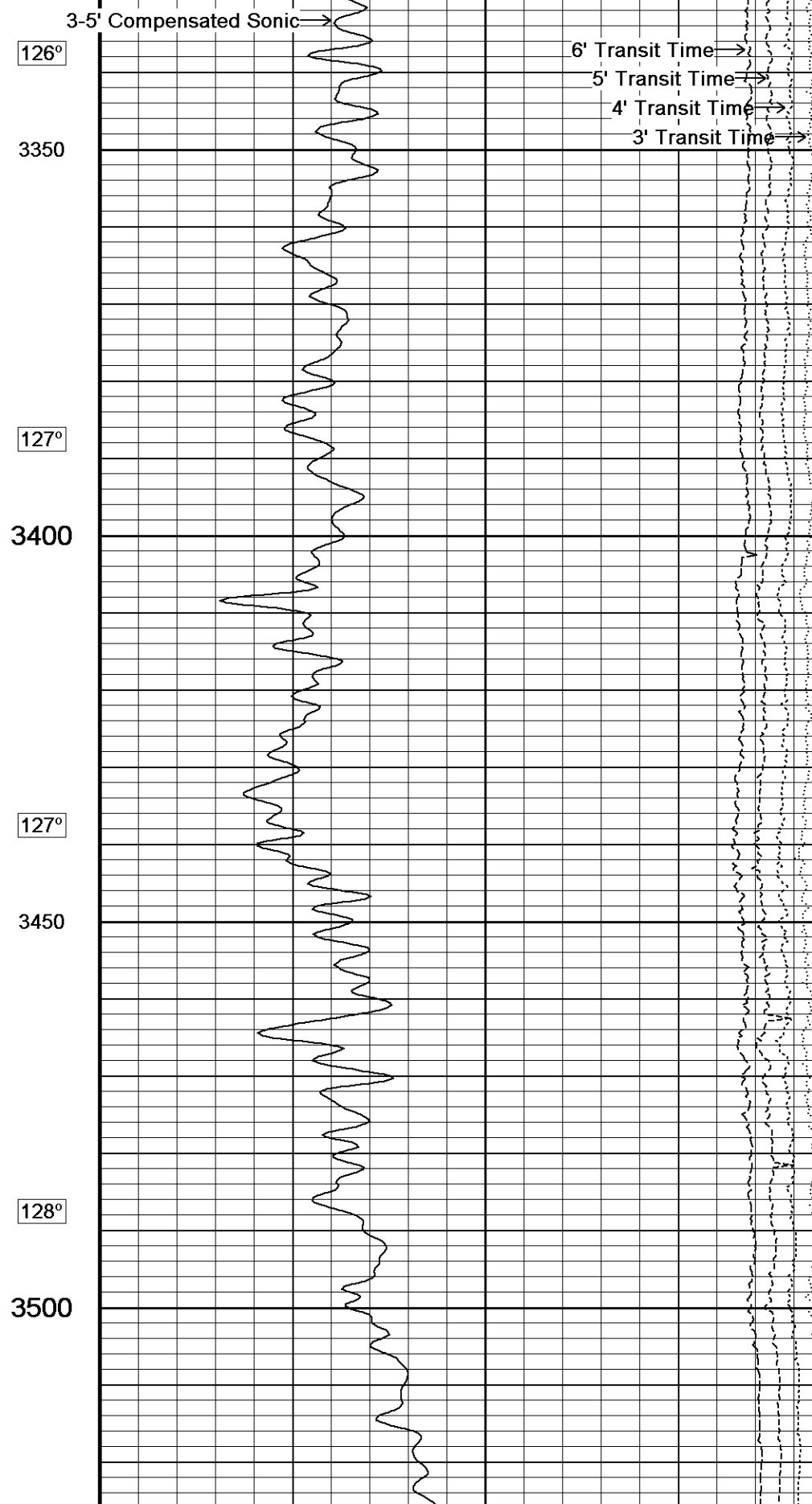
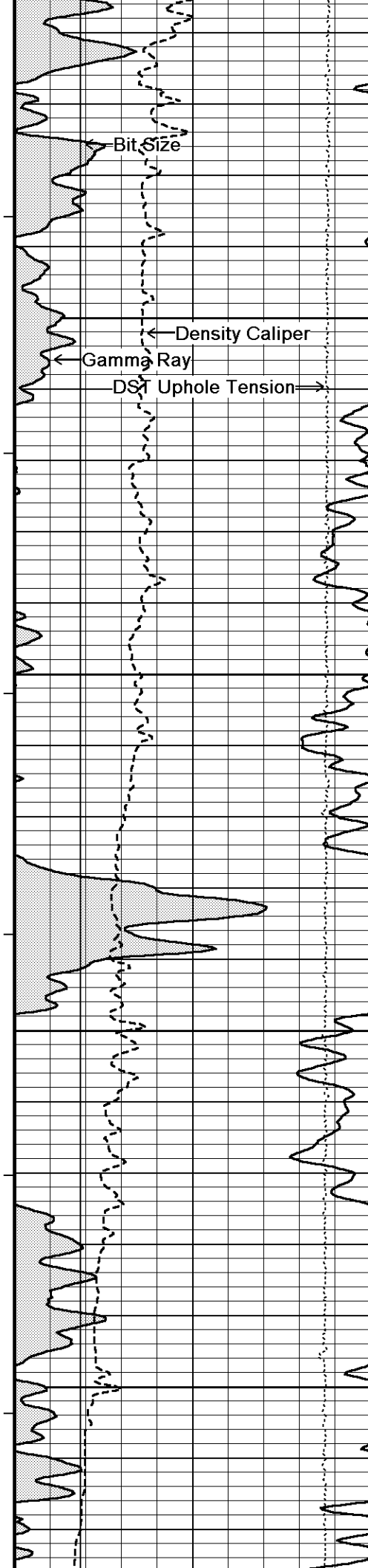
125°

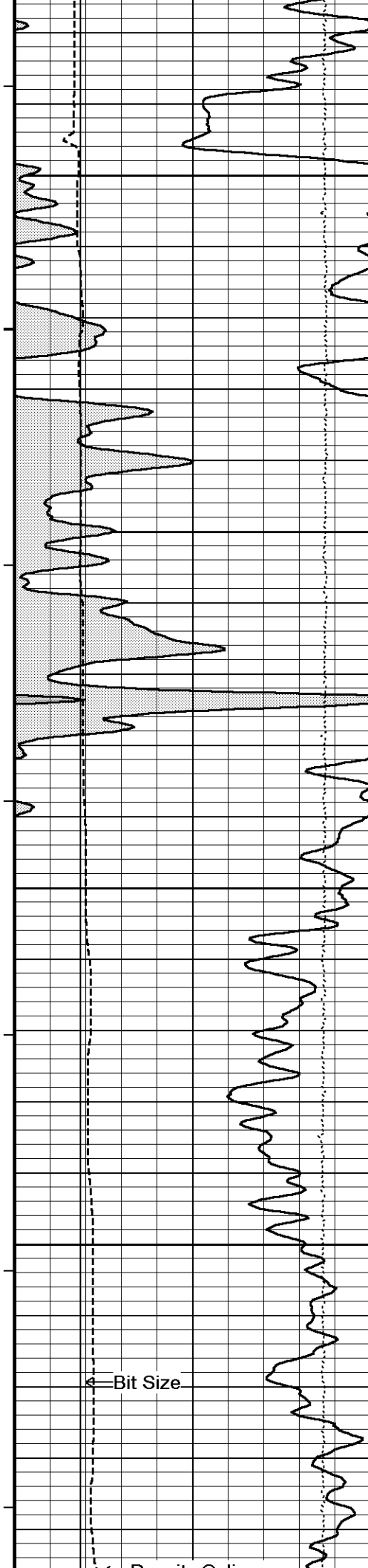
3250

126°

3300







128°

3550

129°

3600

130°

3650

131°

3700

132°

Bit Size

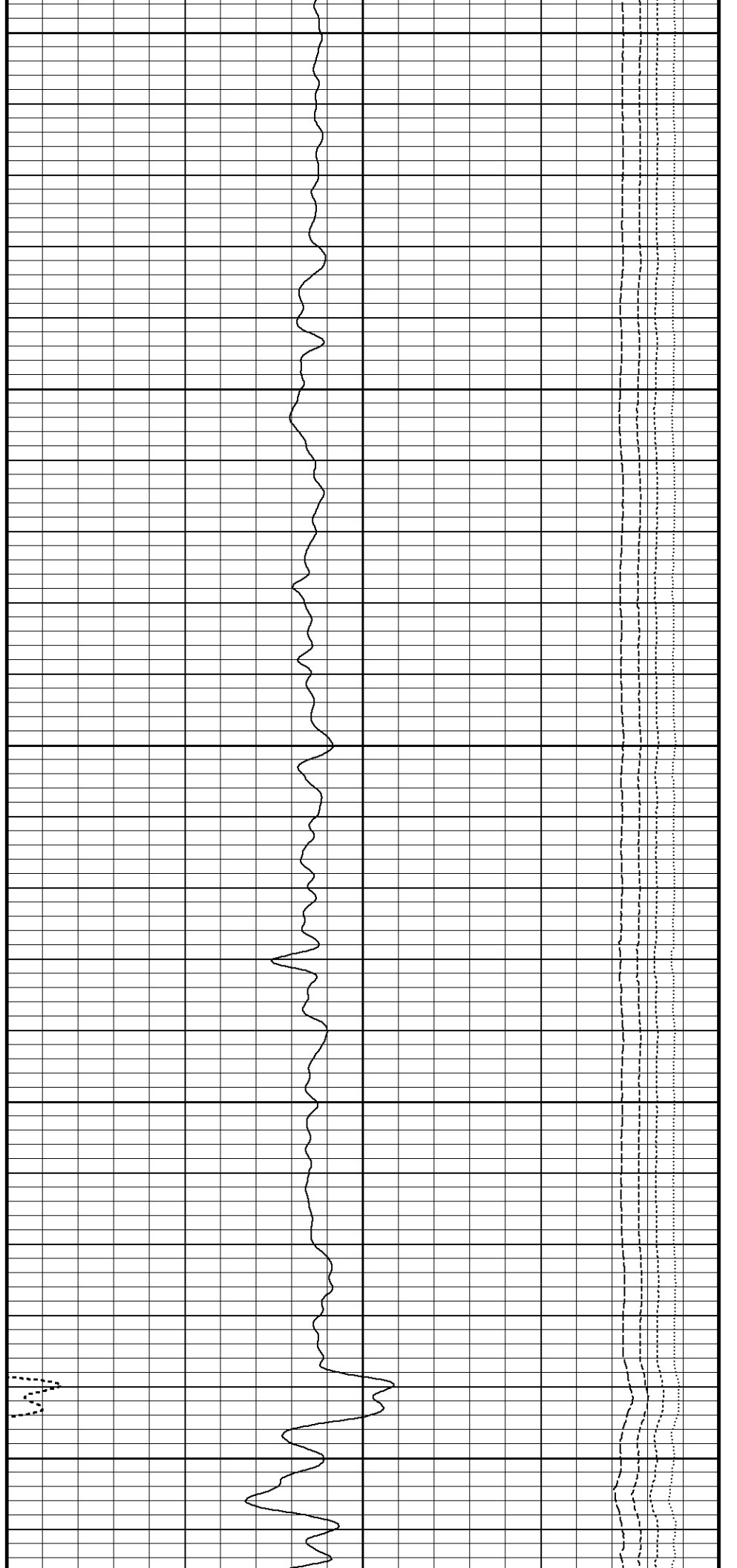
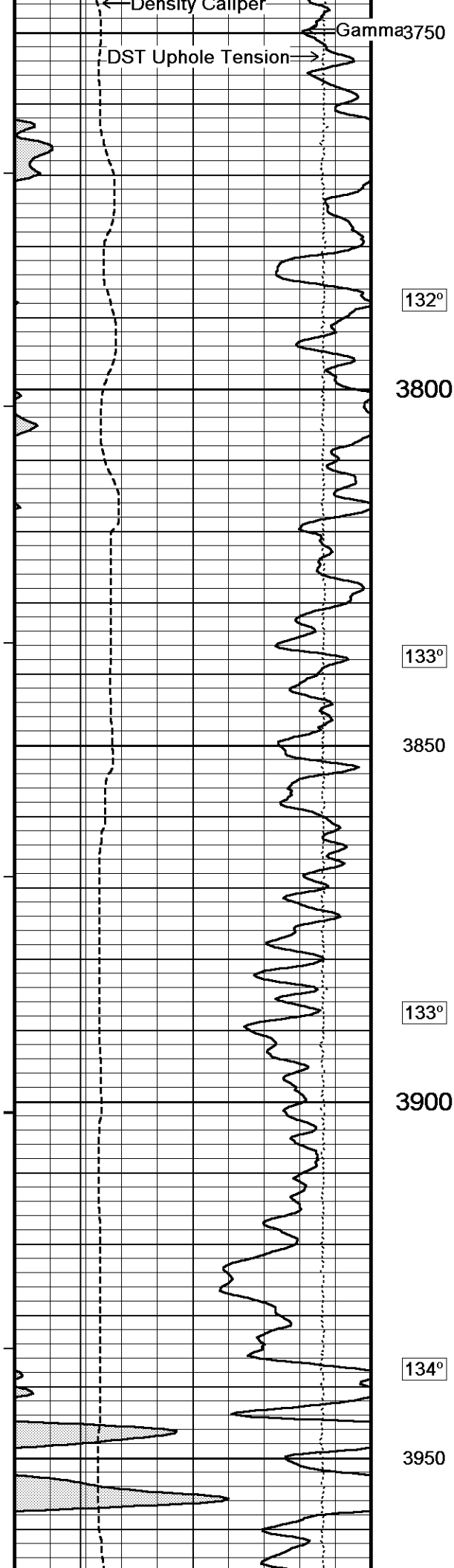
3-5' Compensated Sonic

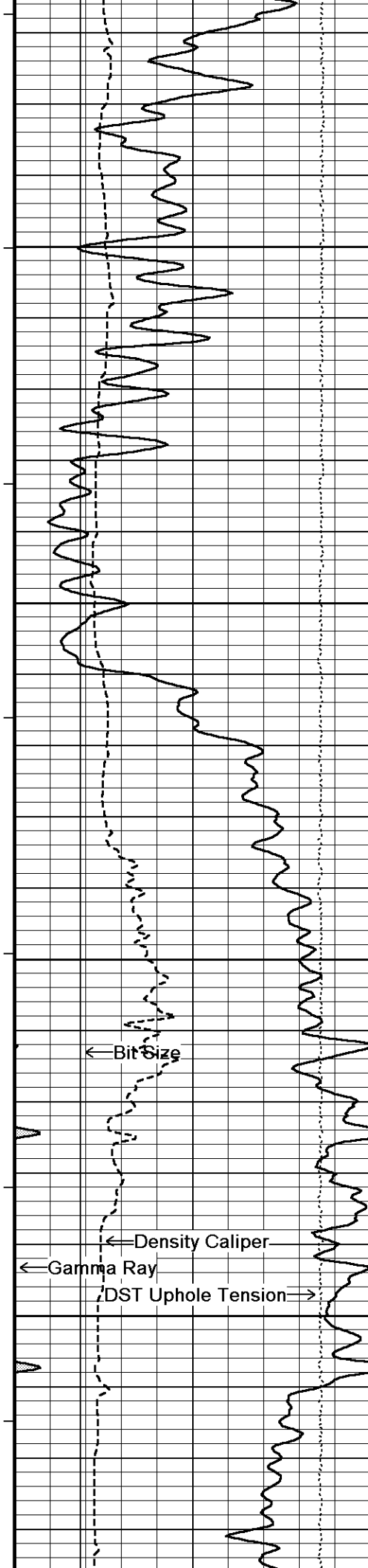
6' Transit Time

5' Transit Time

4' Transit Time

3' Transit Time





134°

4000

135°

4050

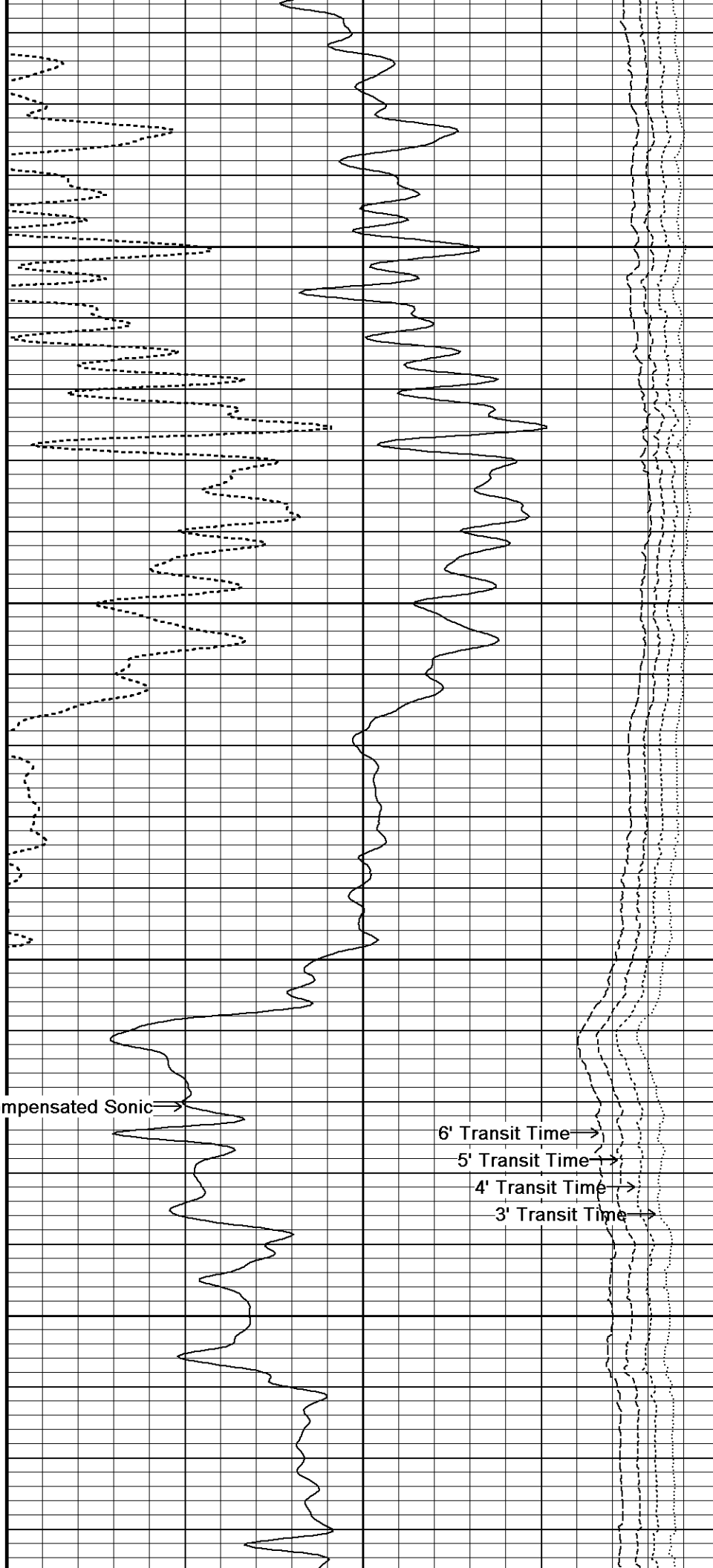
135°

4100

3-5' Compensated Sonic →

136°

4150

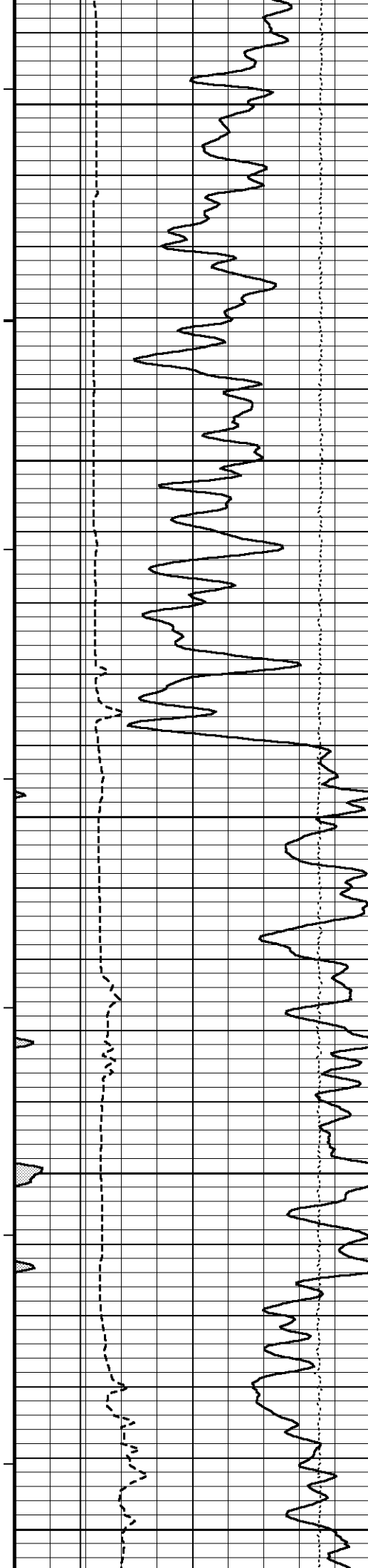


6' Transit Time →

5' Transit Time →

4' Transit Time →

3' Transit Time →



137°

4200

137°

4250

138°

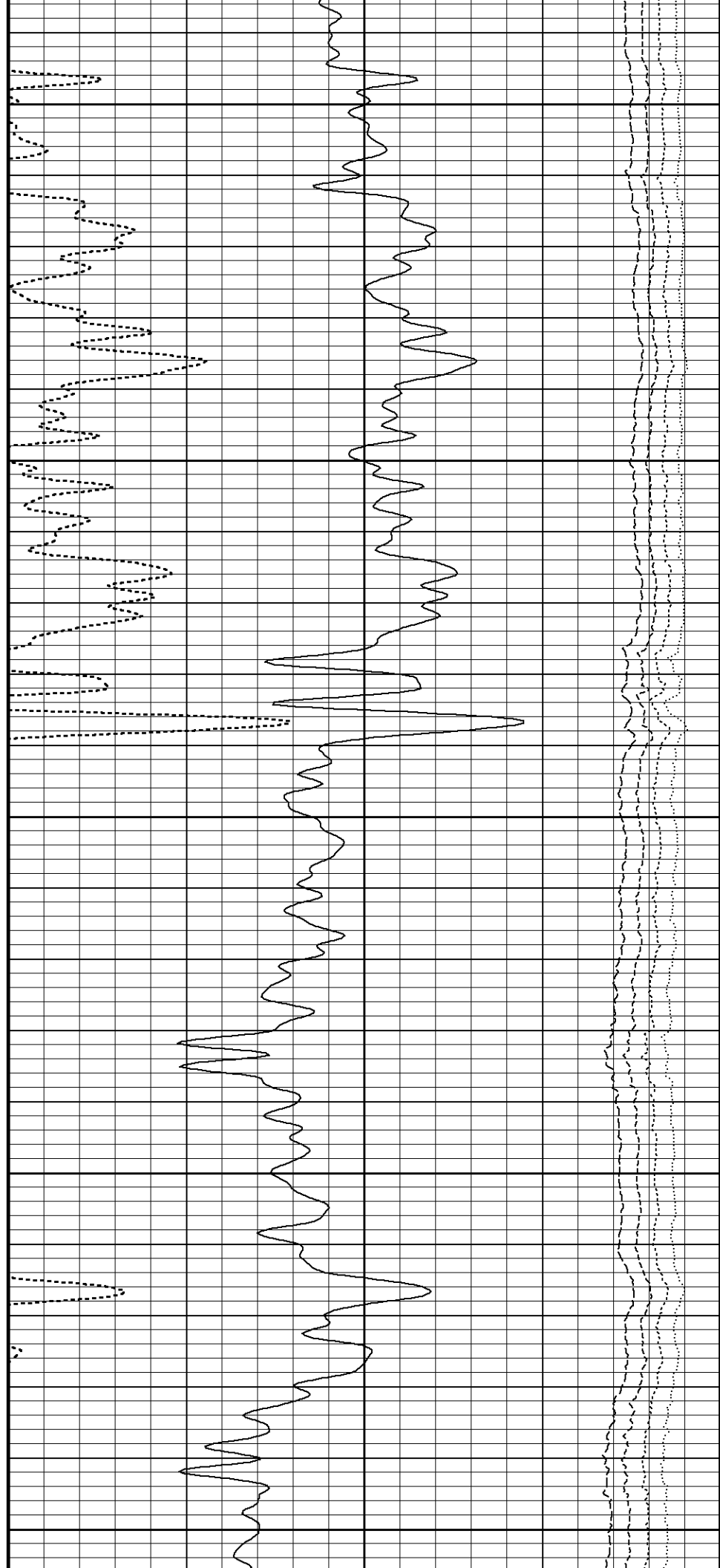
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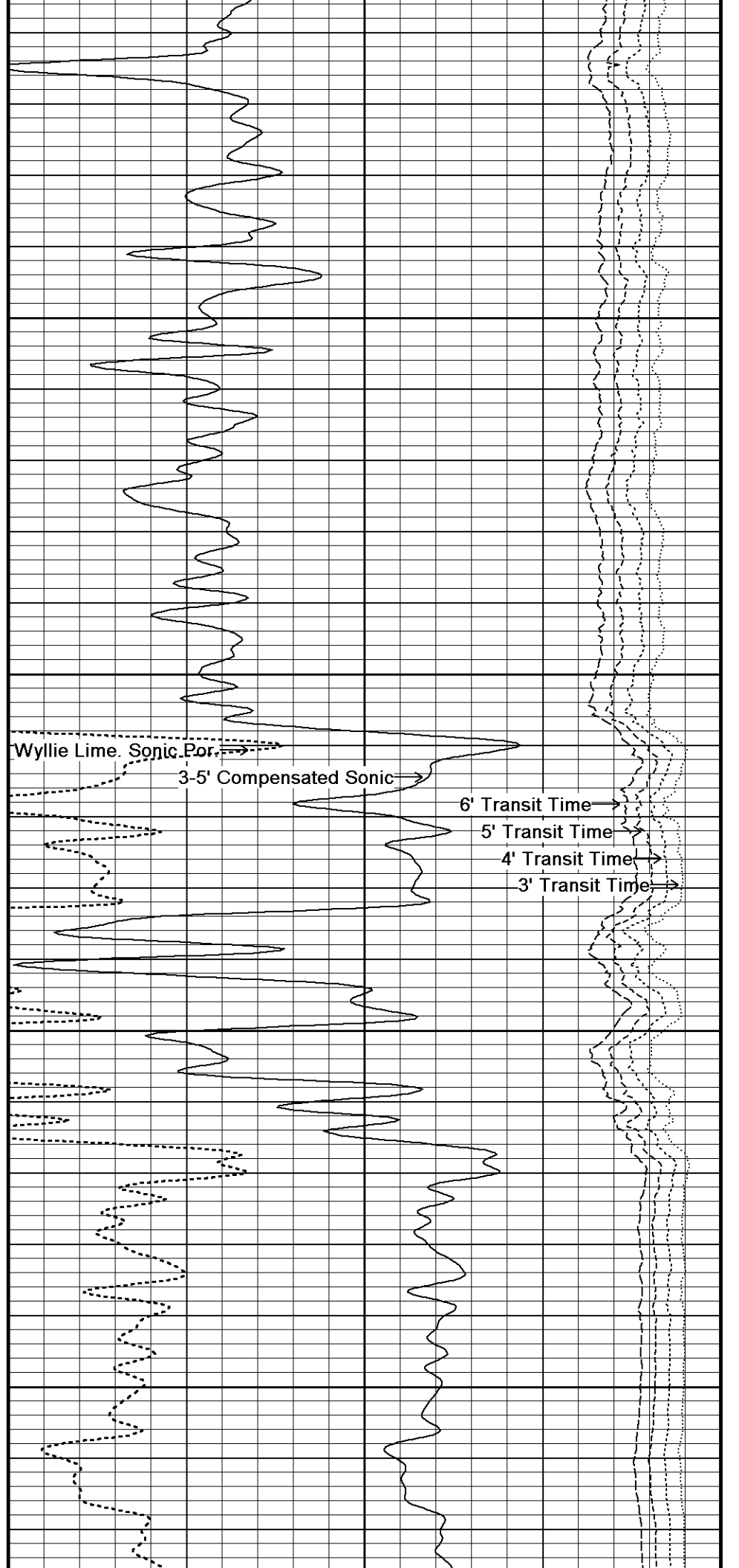
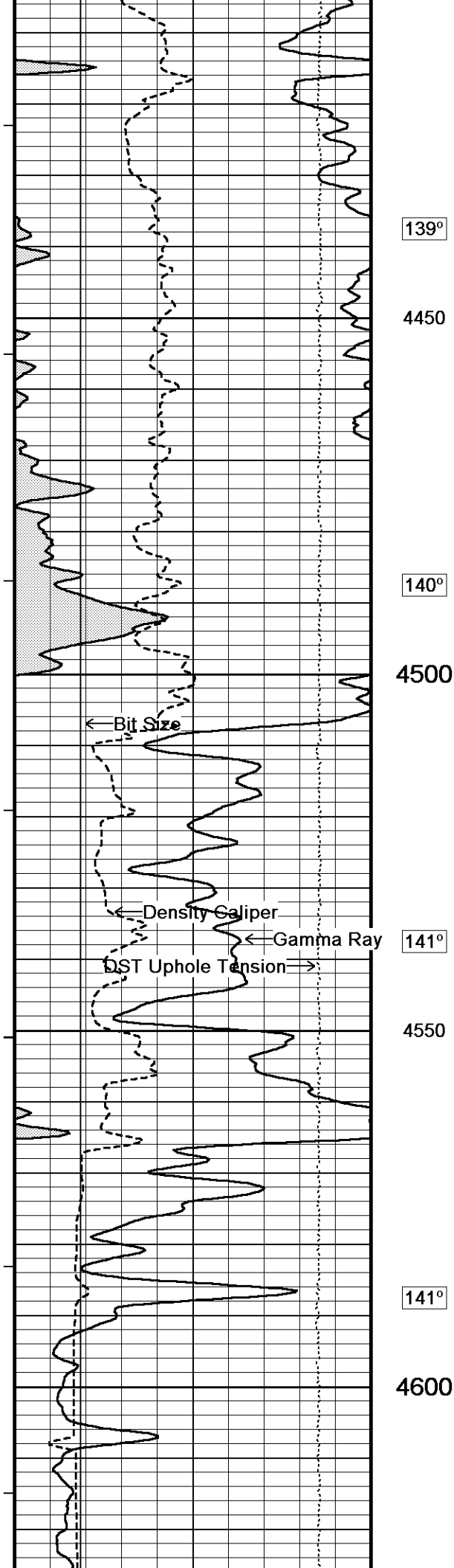
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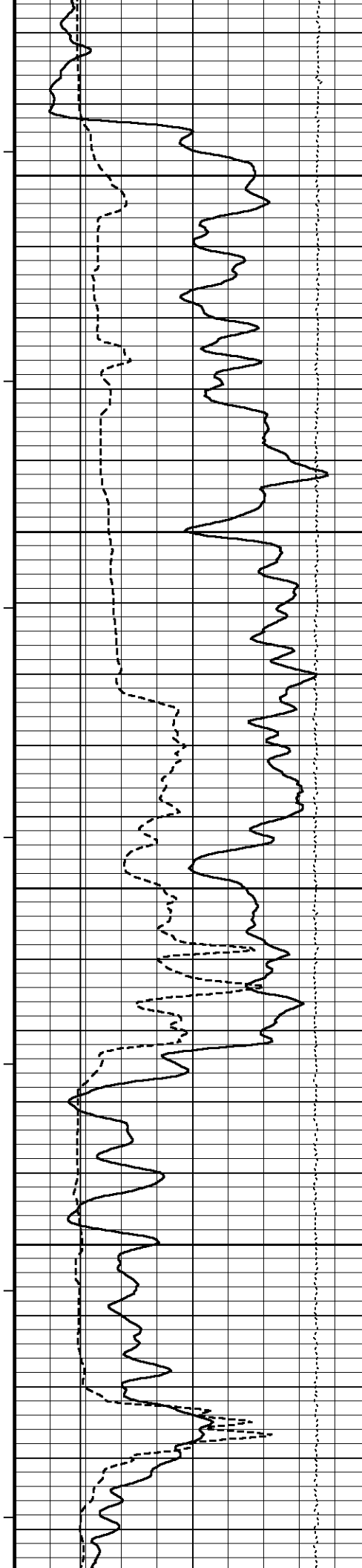
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139°

4400







142°

4650

143°

4700

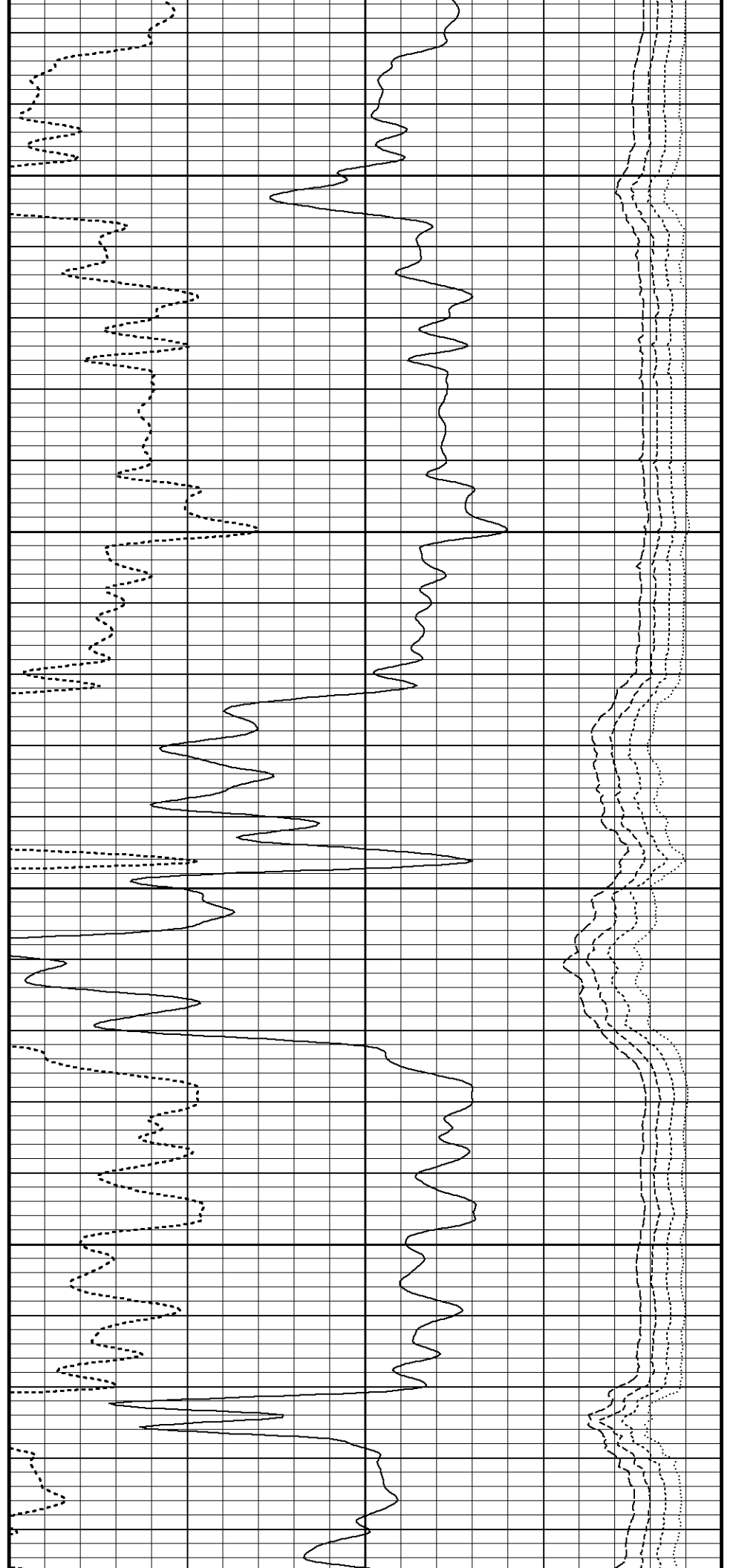
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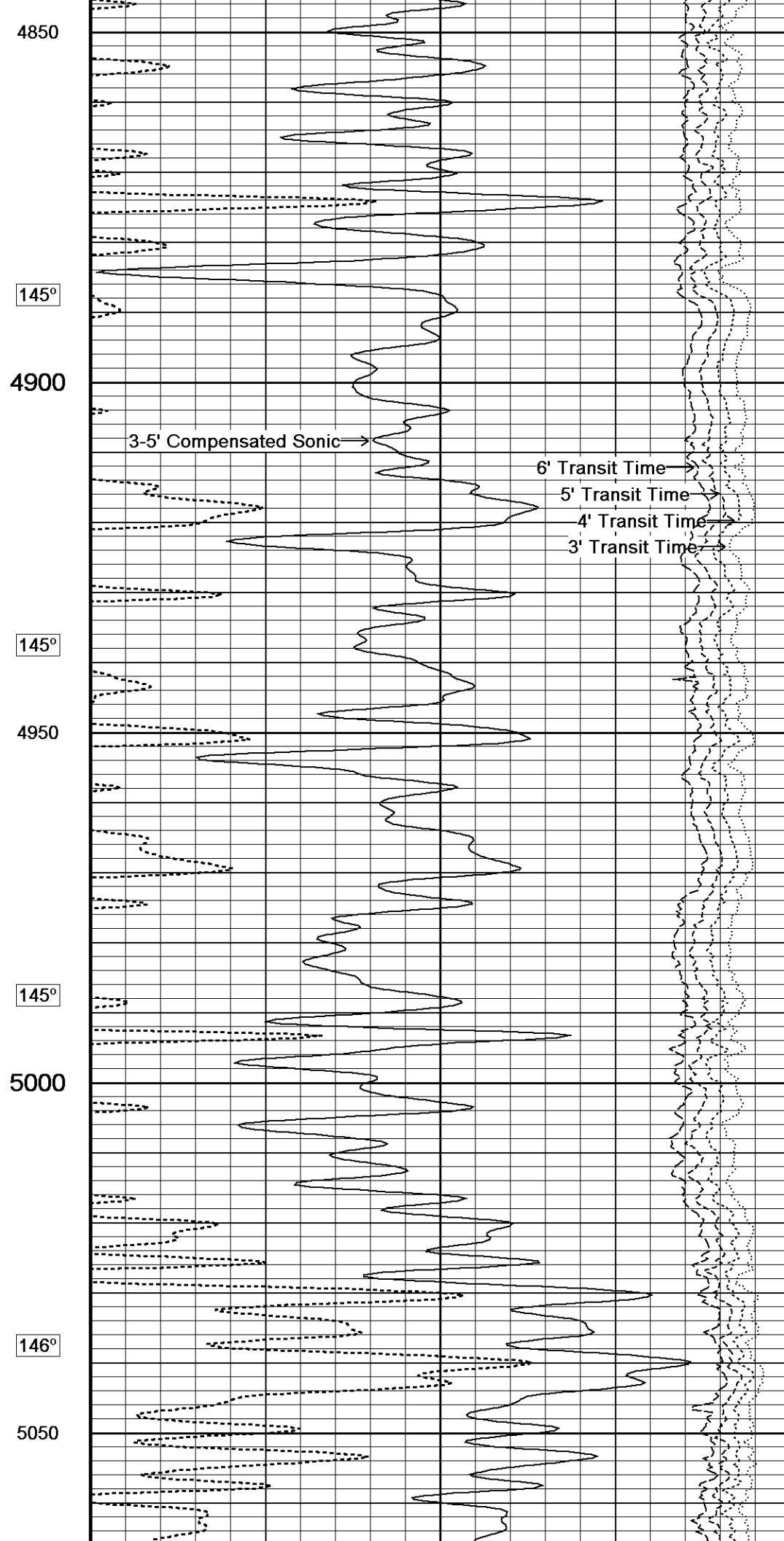
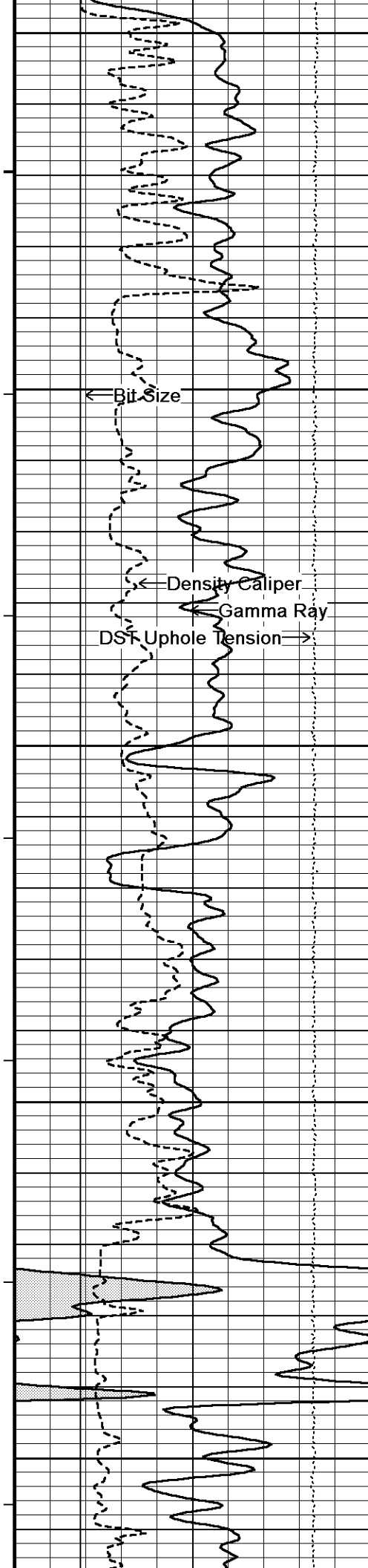
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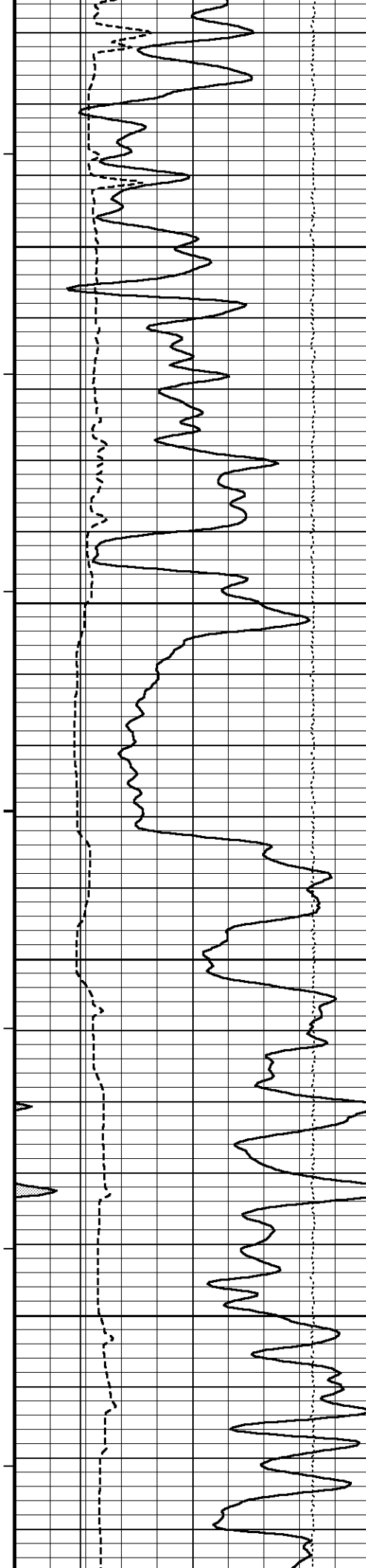
144°

4800

144°







147°

5100

148°

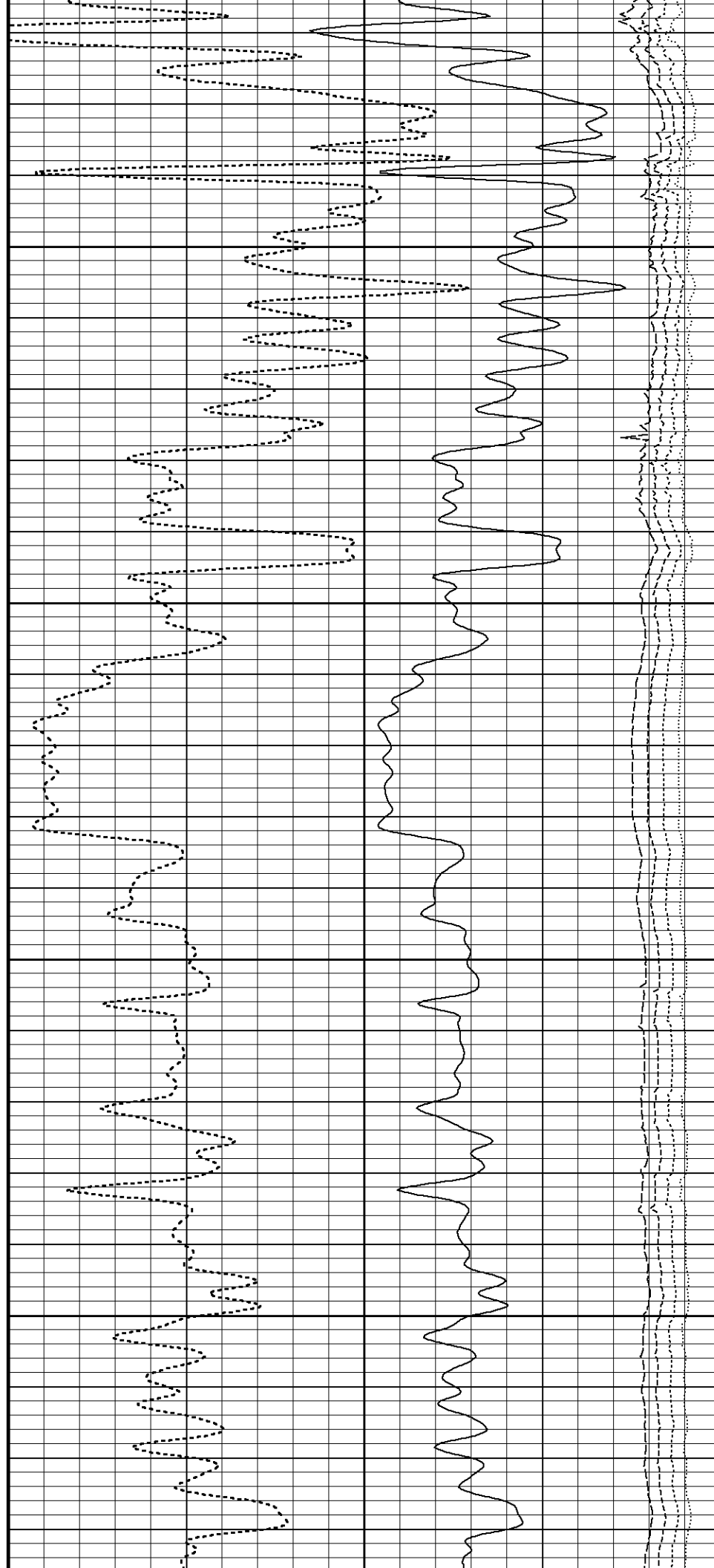
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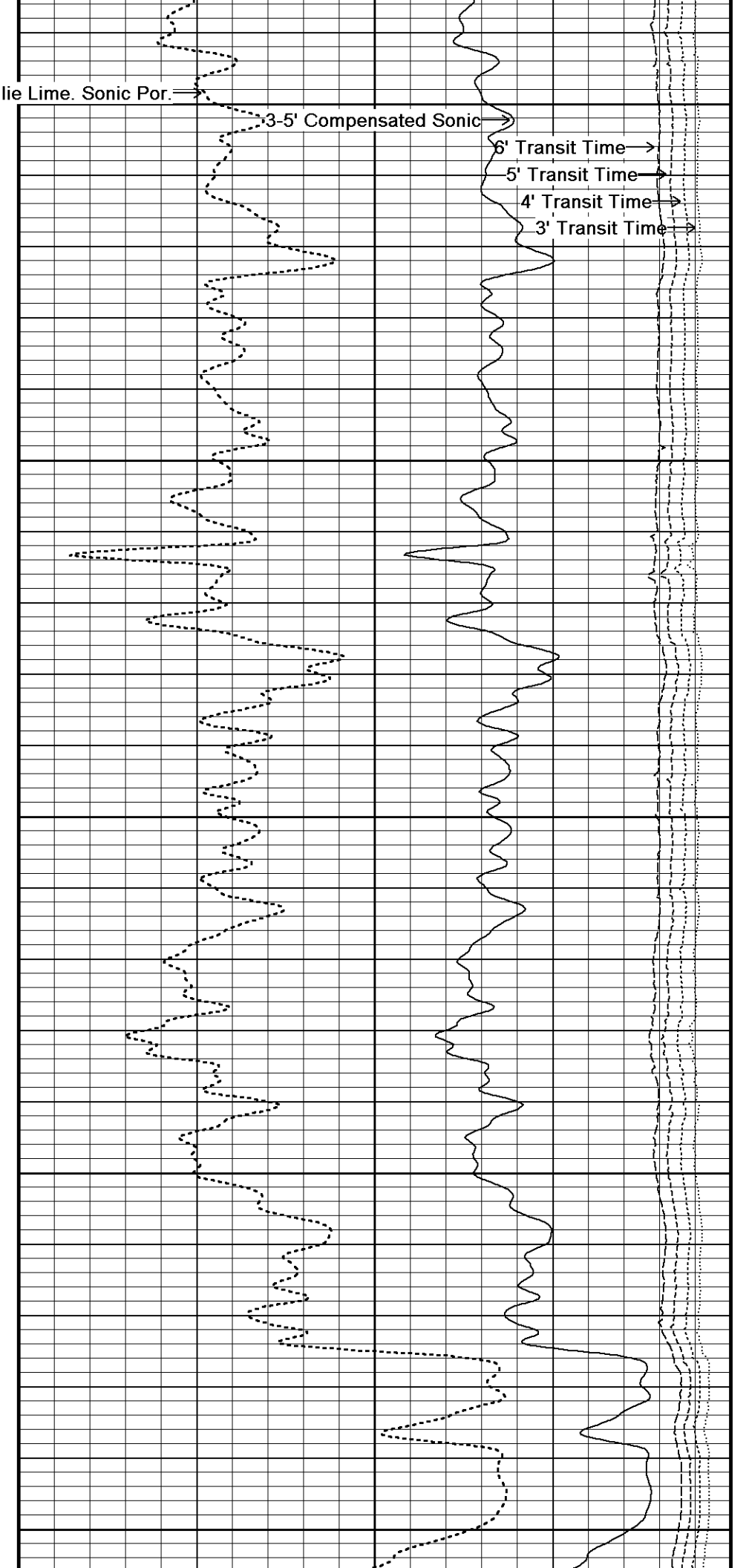
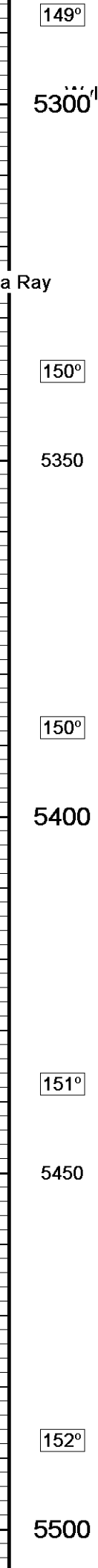
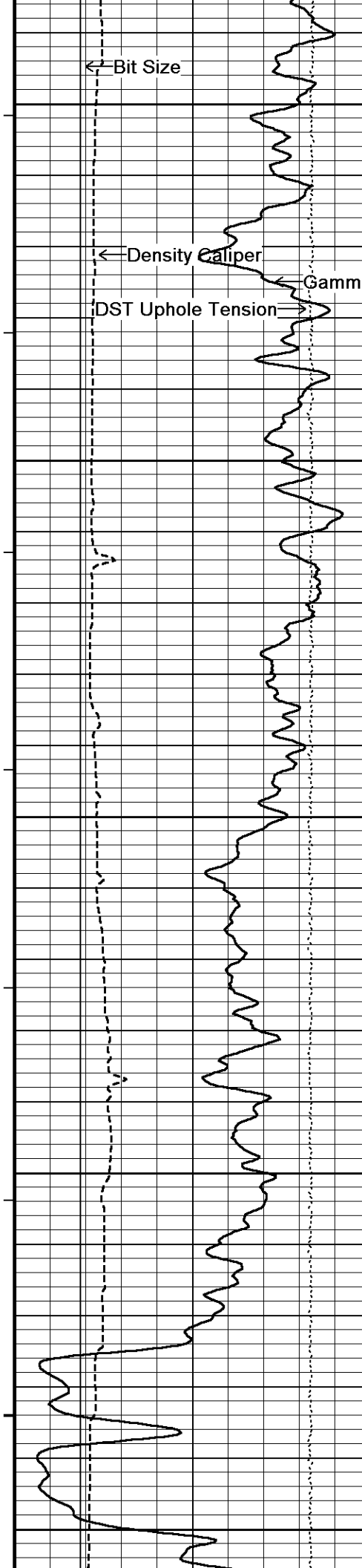
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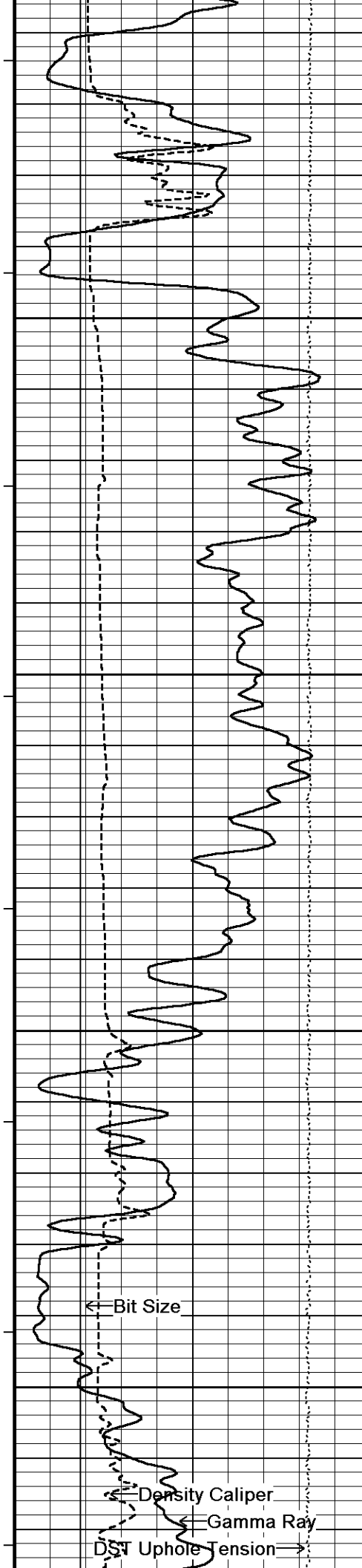
5200

149°

5250







152°

5550

152°

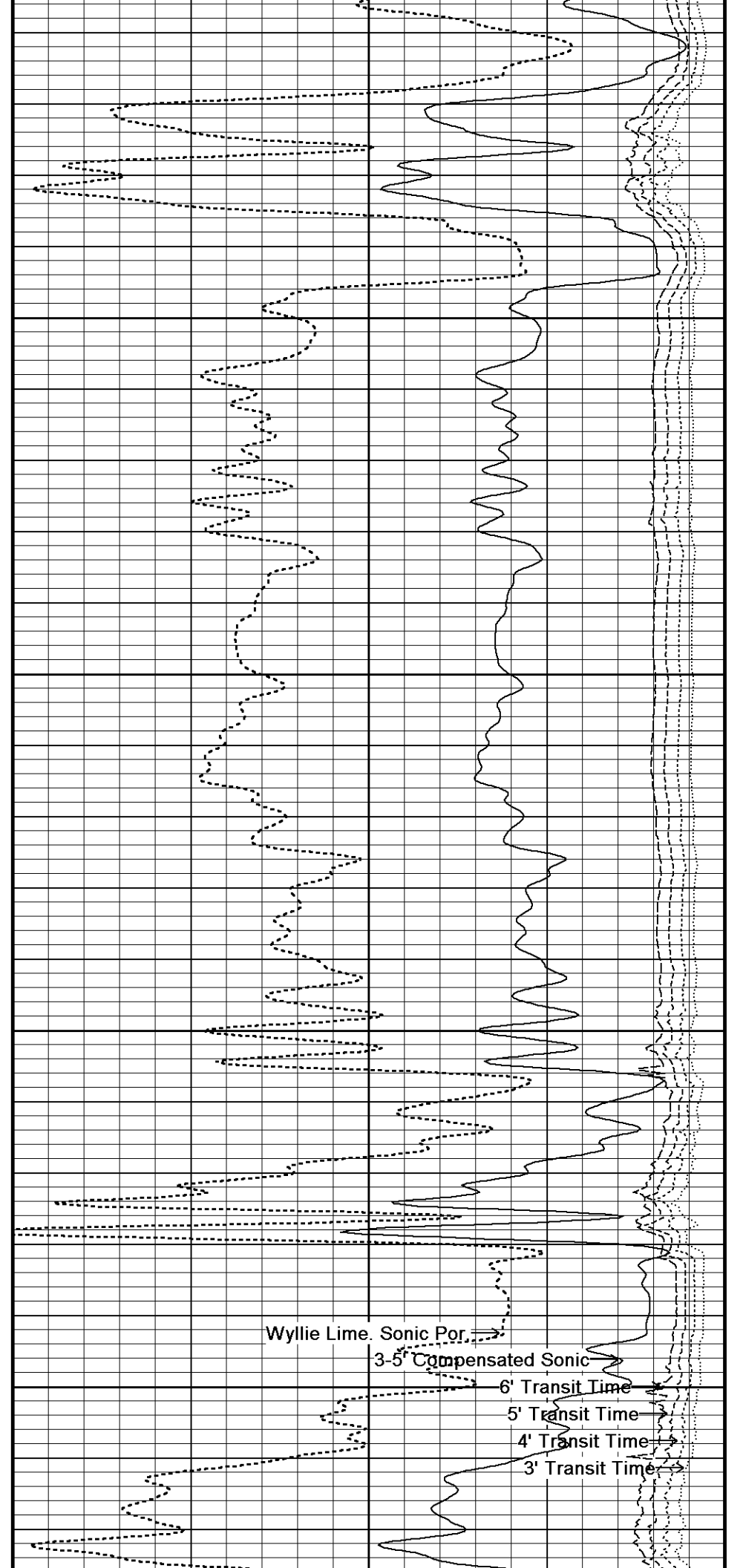
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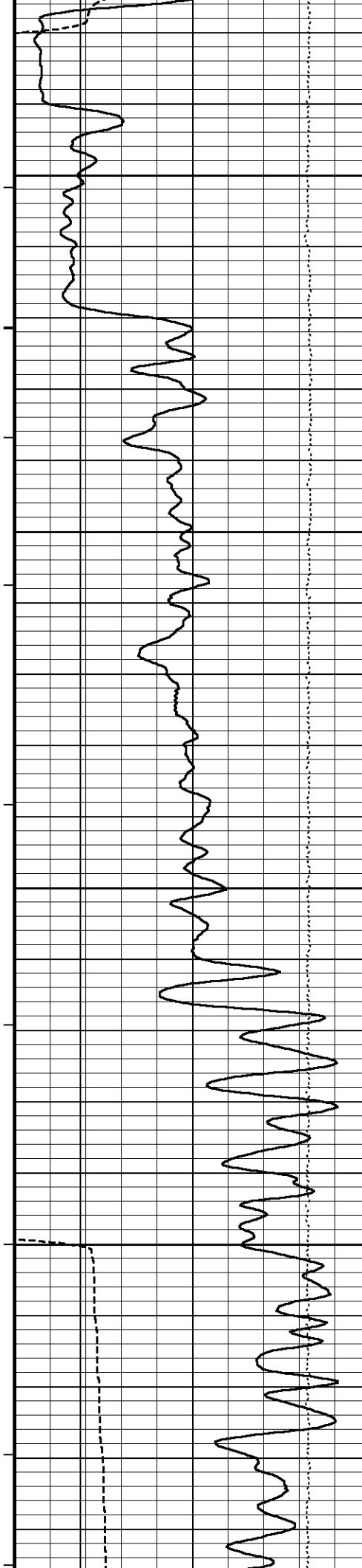
153°

5650

153°

5700





153°

5750

154°

5800

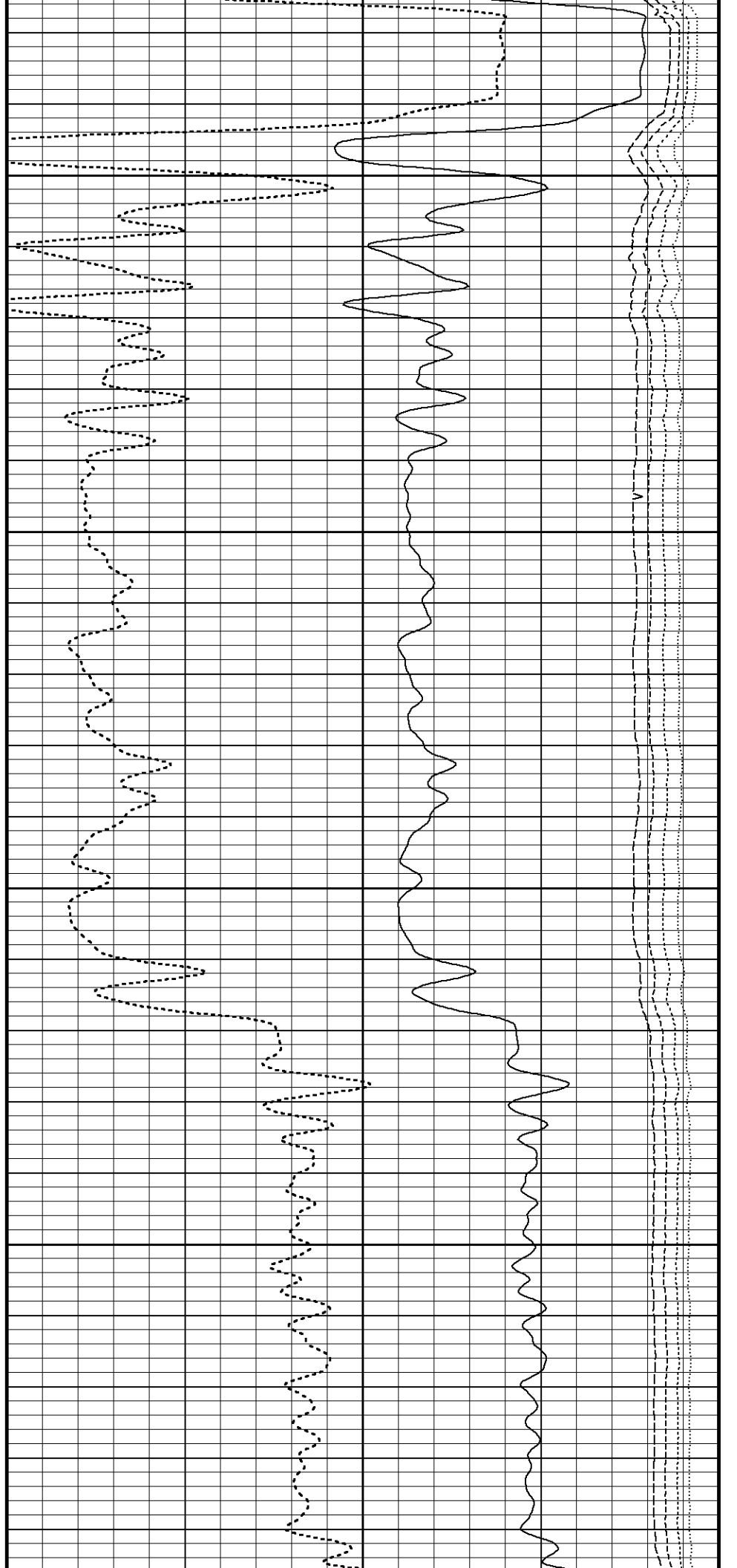
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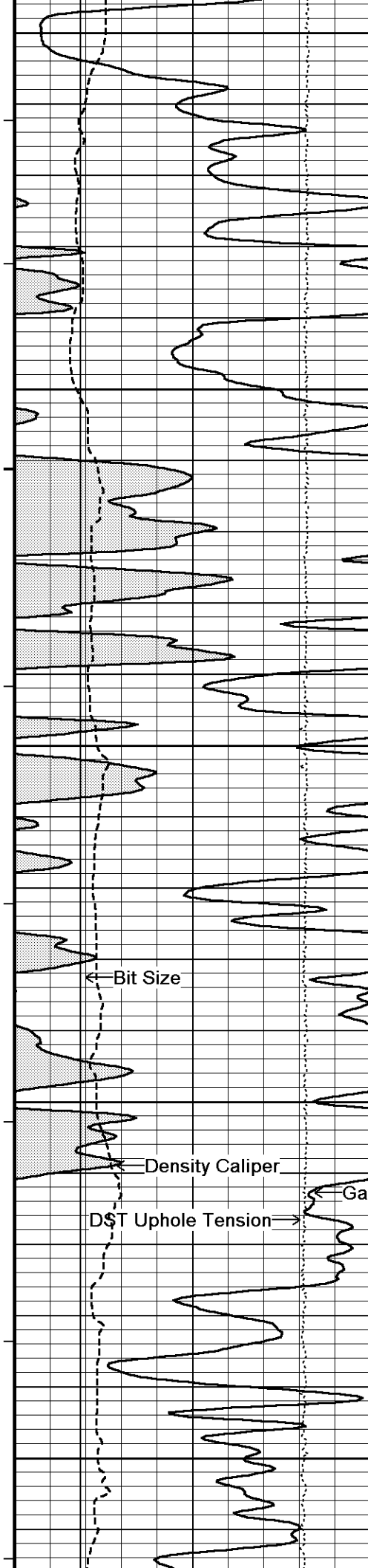
5850

156°

5900

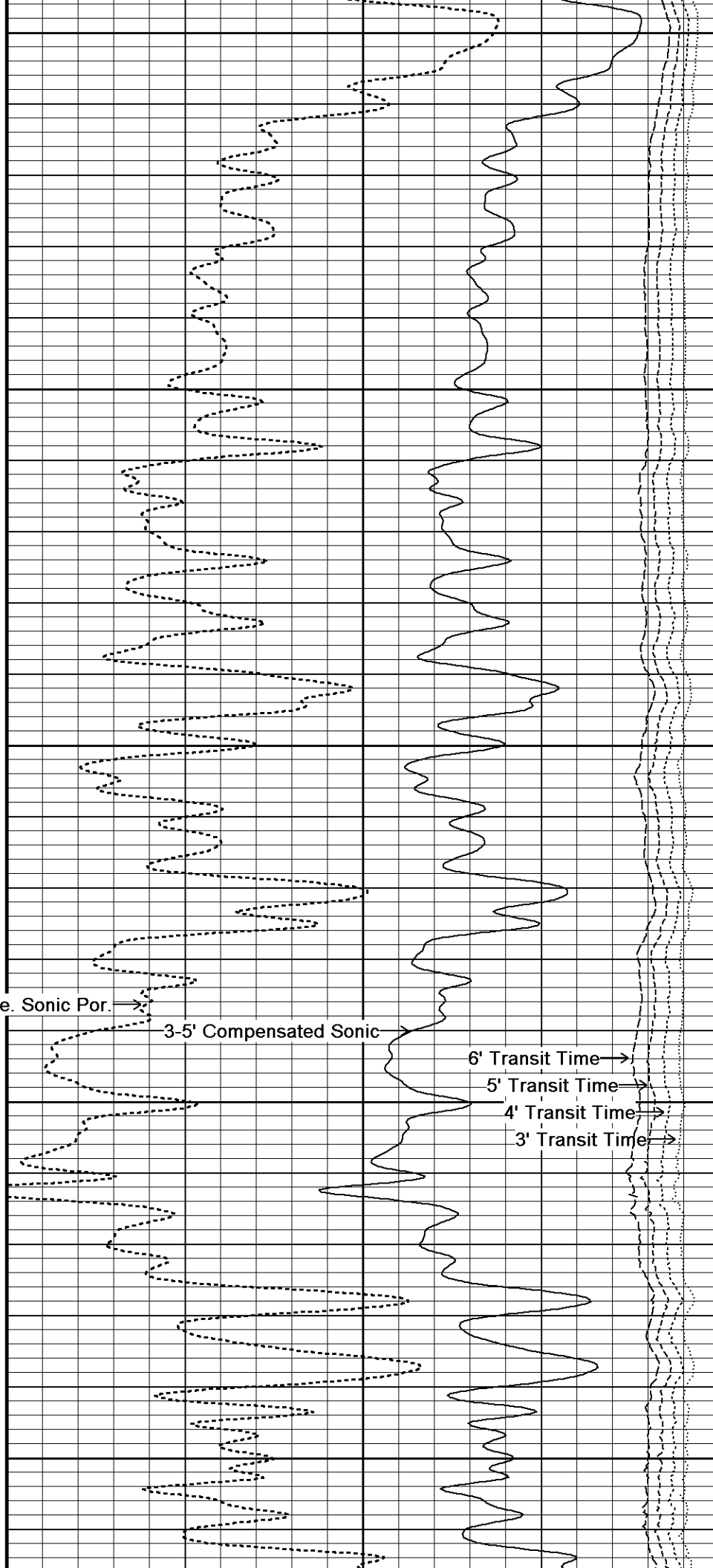
156°





5950
156°
6000
156°
6050
156°
6100
157°
6150

Wyllie Time, Sonic Por. →



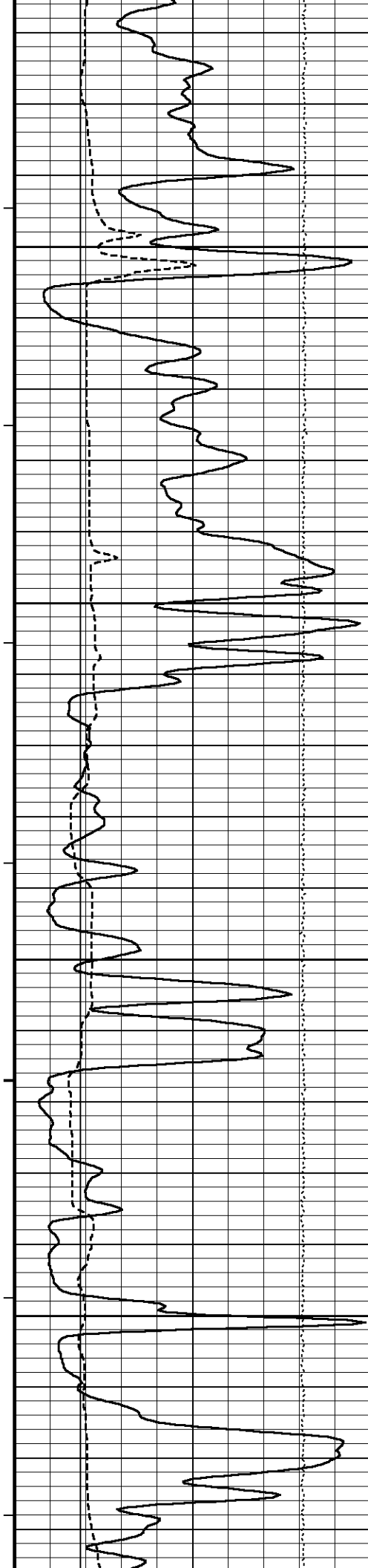
3-5' Compensated Sonic →

6' Transit Time →

5' Transit Time →

4' Transit Time →

3' Transit Time →



158°

6200

158°

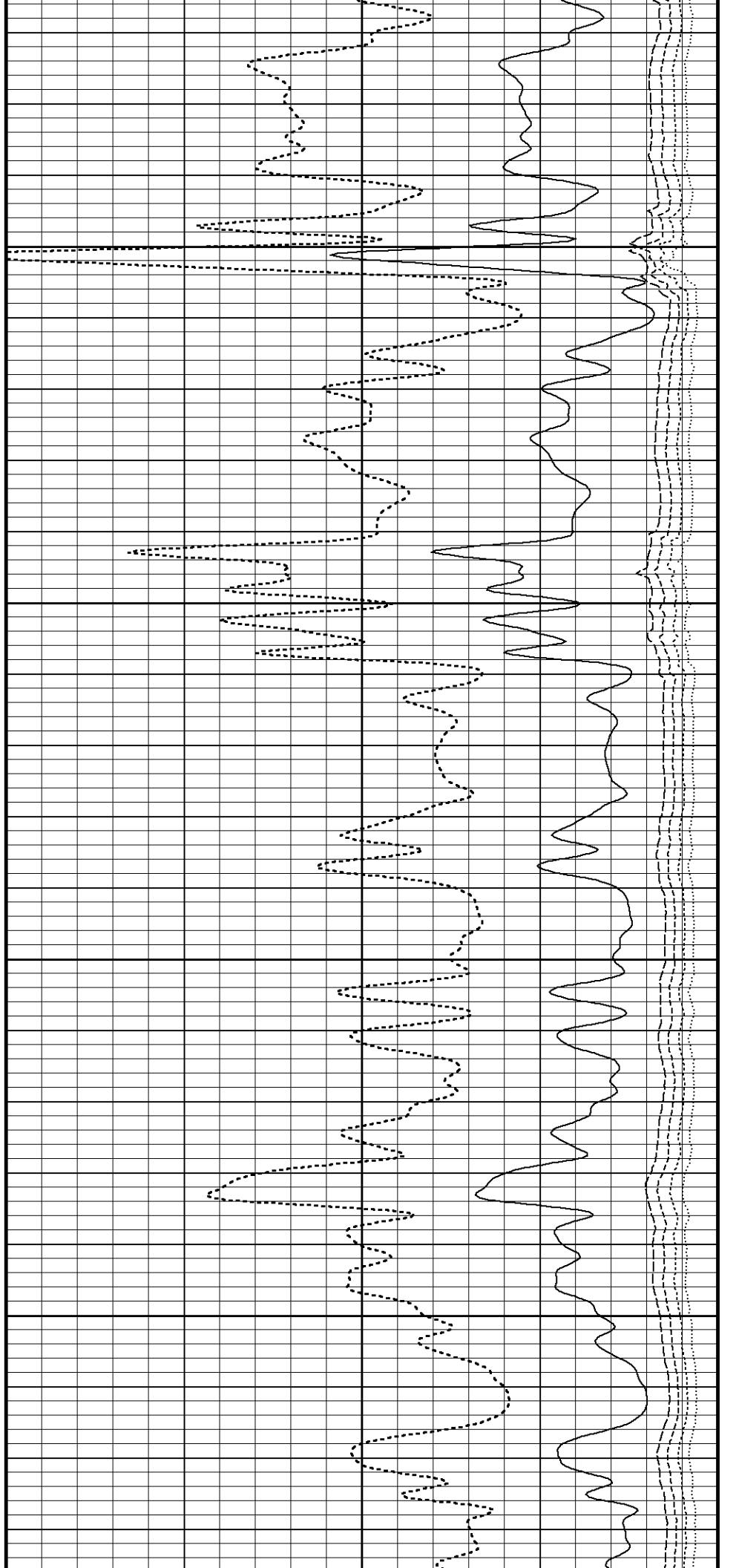
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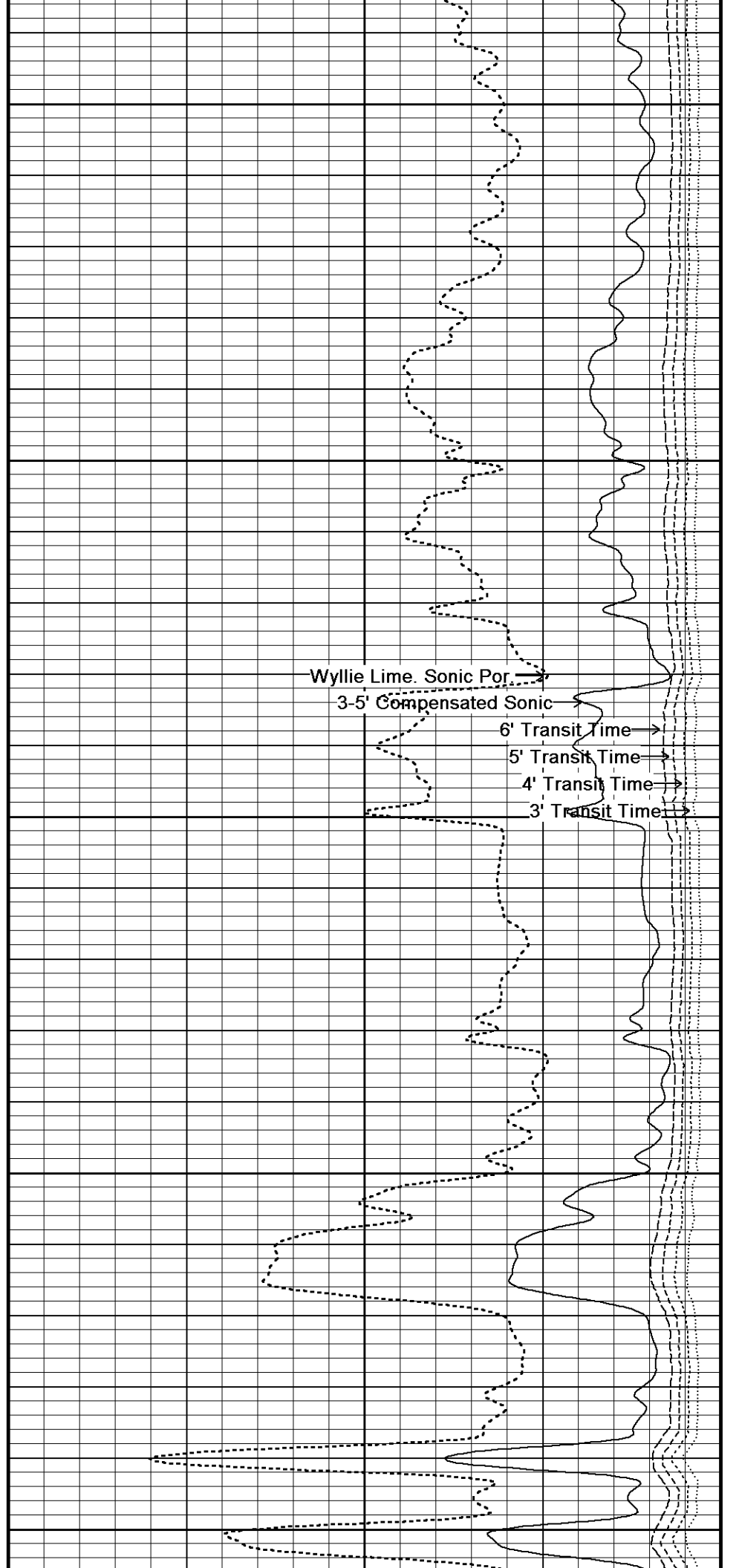
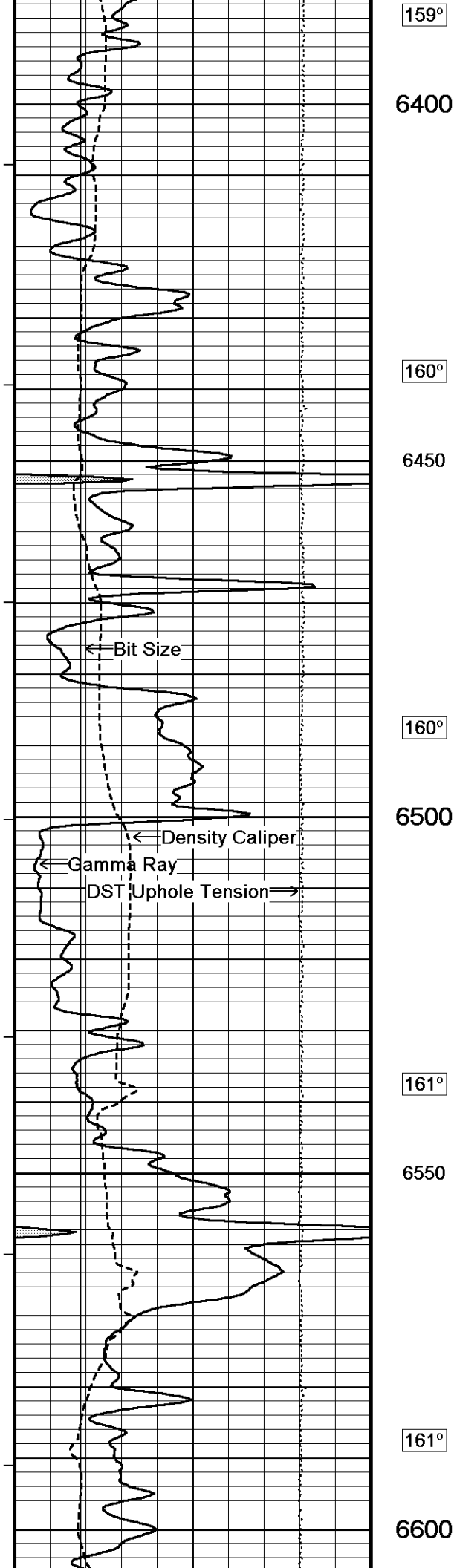
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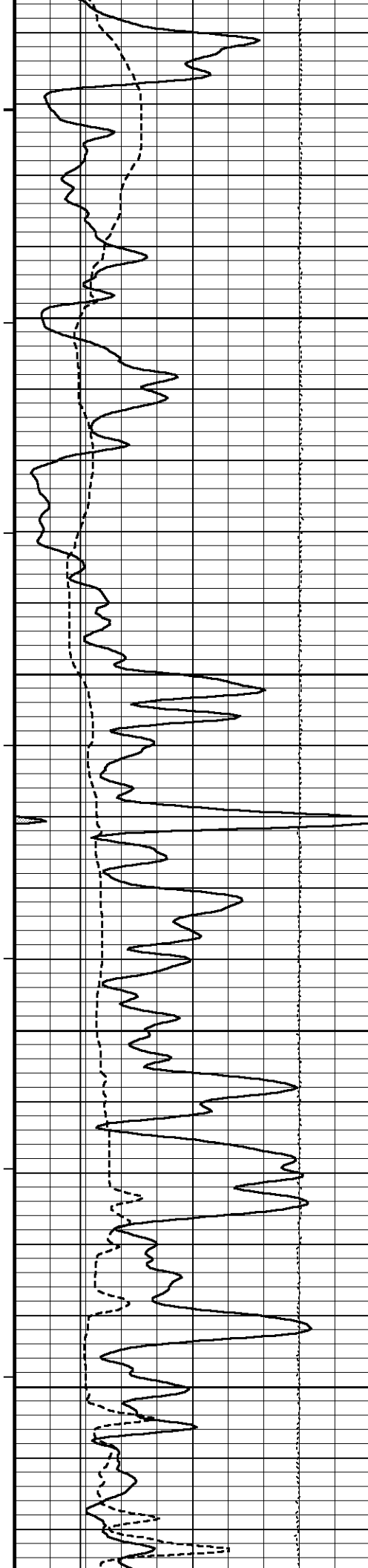
6300

159°

6350







161°

6650

162°

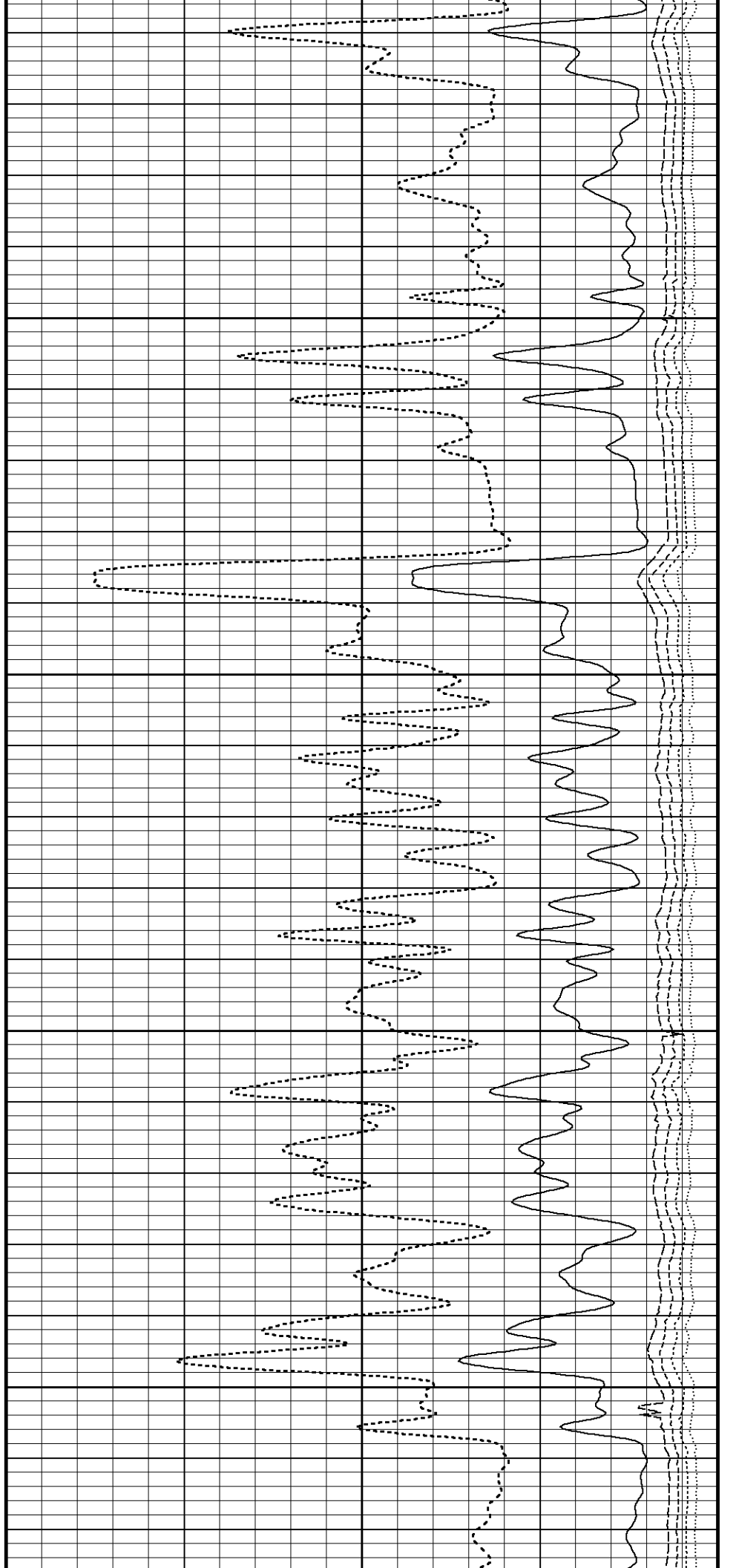
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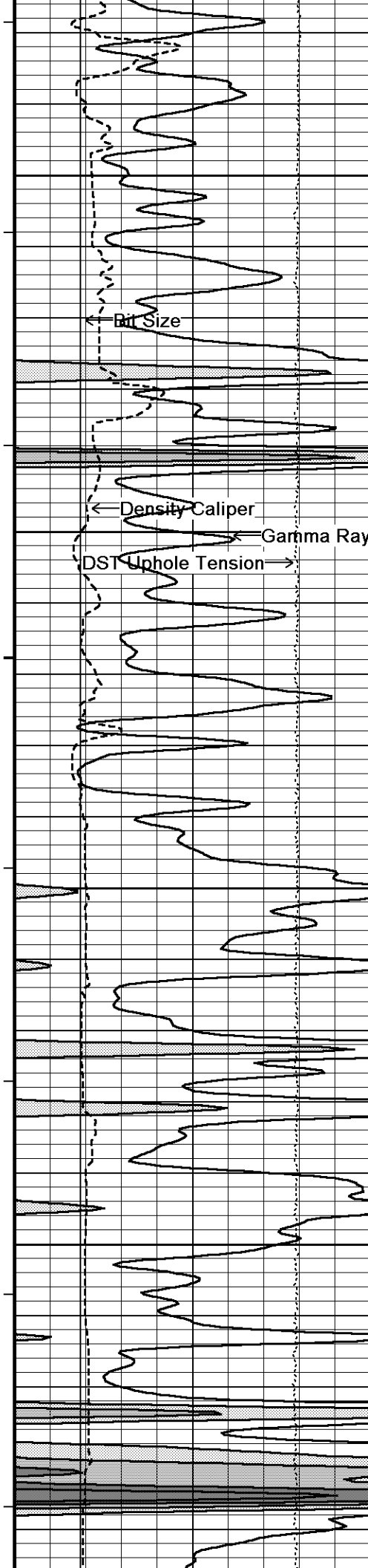
162°

6750

162°

6800





162°

6850

163°

6900

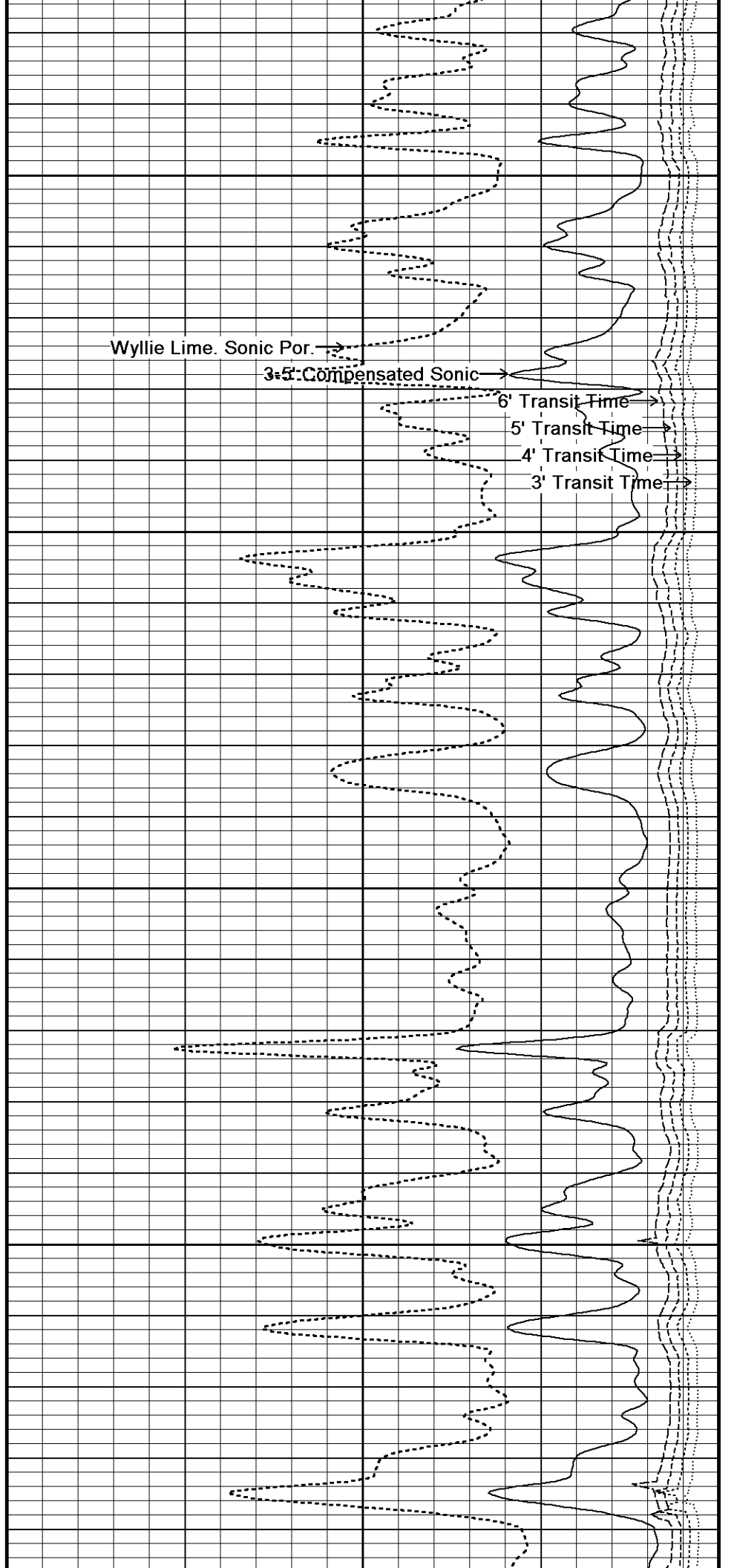
164°

6950

164°

7000

164°



Wyllie Lime. Sonic Por.

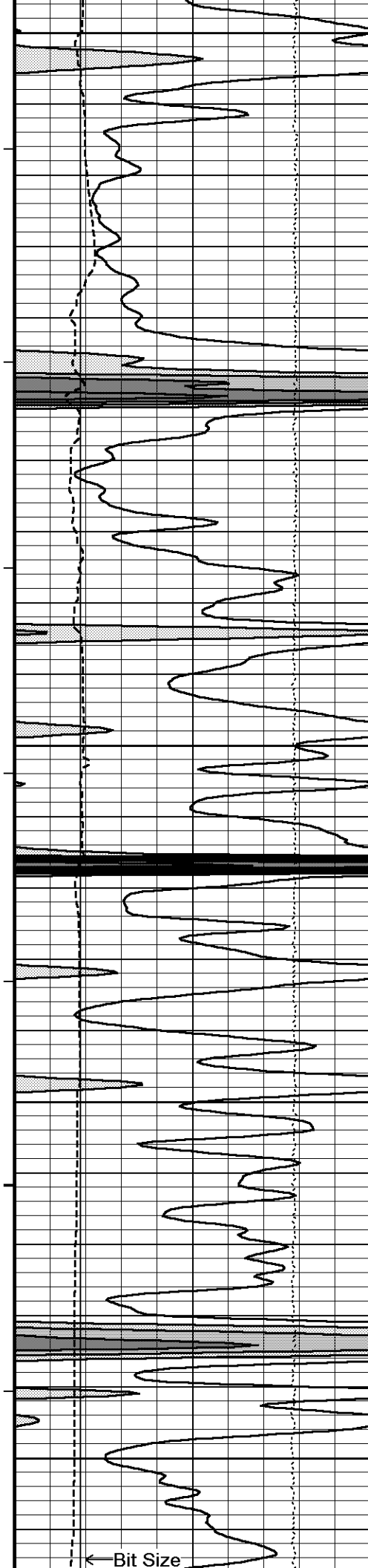
3-5 Compensated Sonic

6' Transit Time

5' Transit Time

4' Transit Time

3' Transit Time



7050

165°

7100

166°

7150

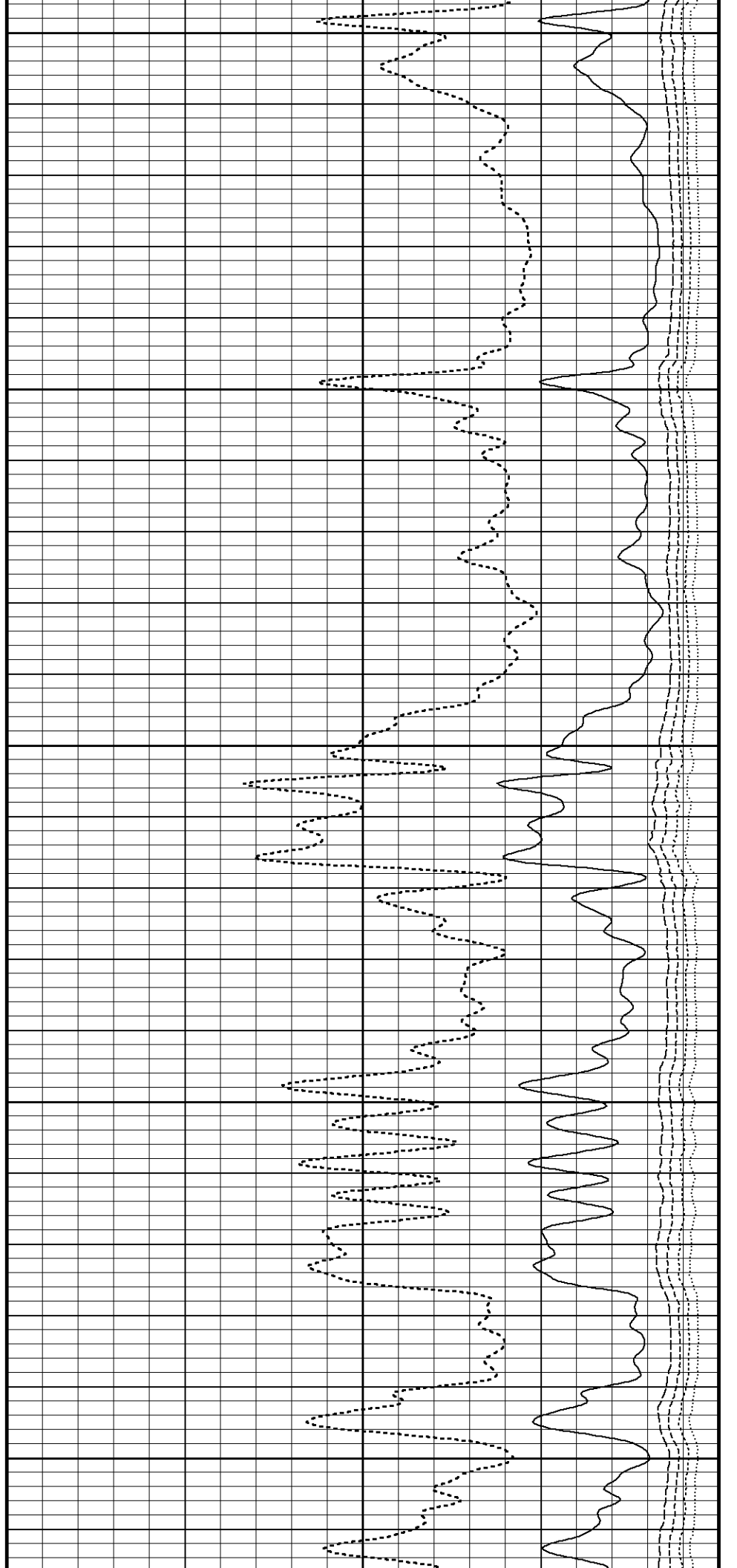
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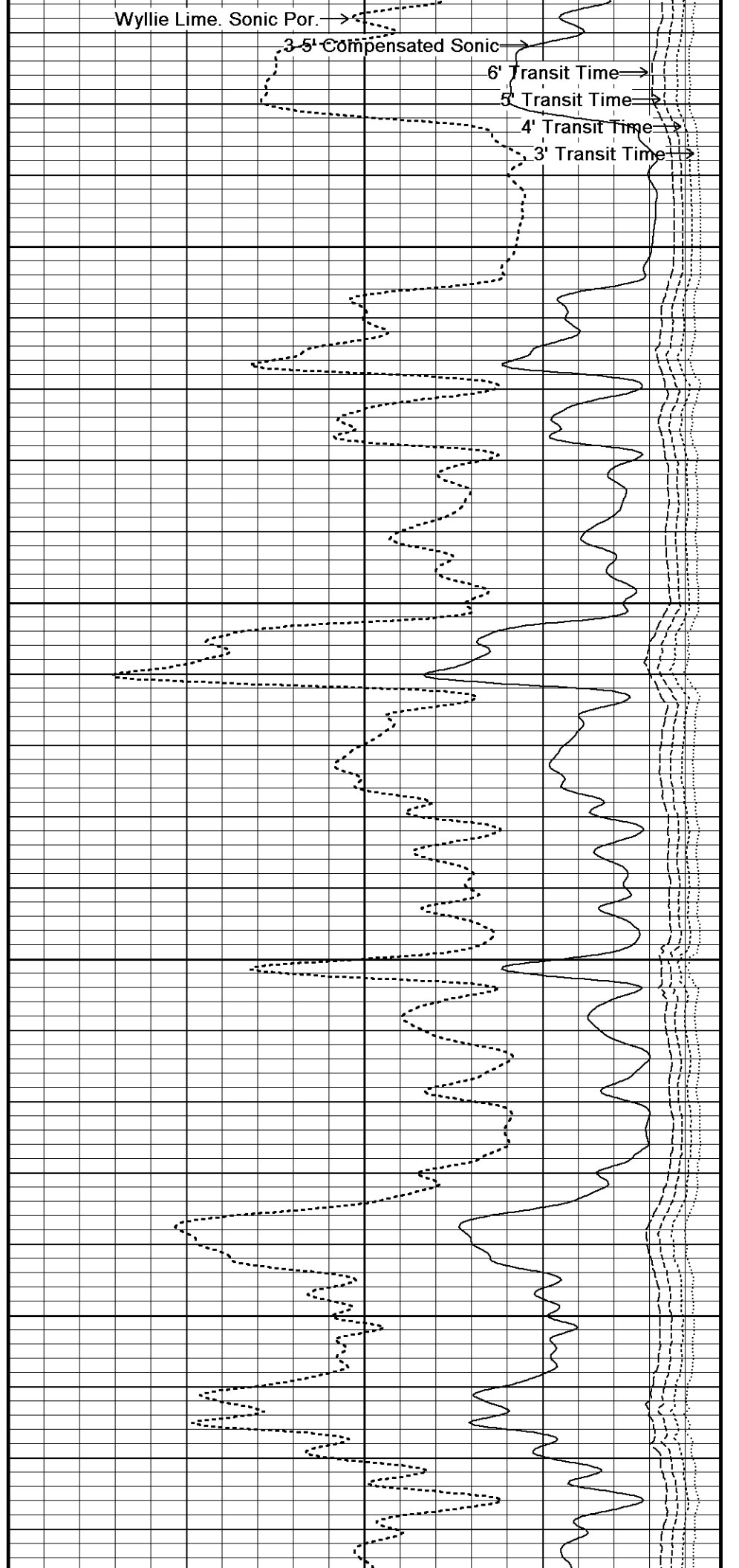
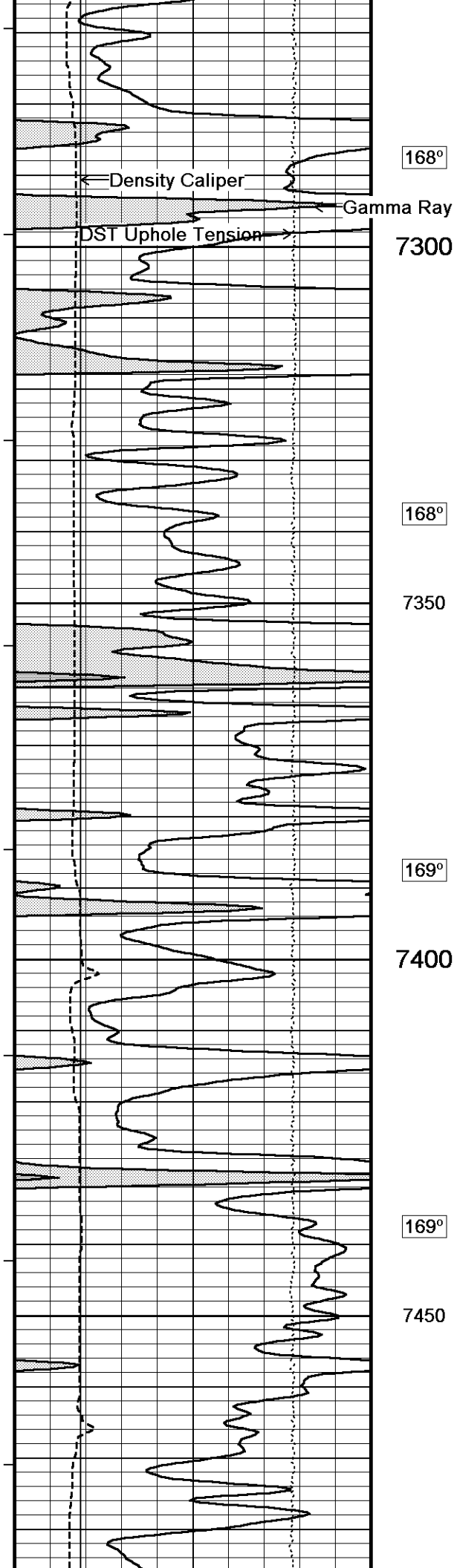
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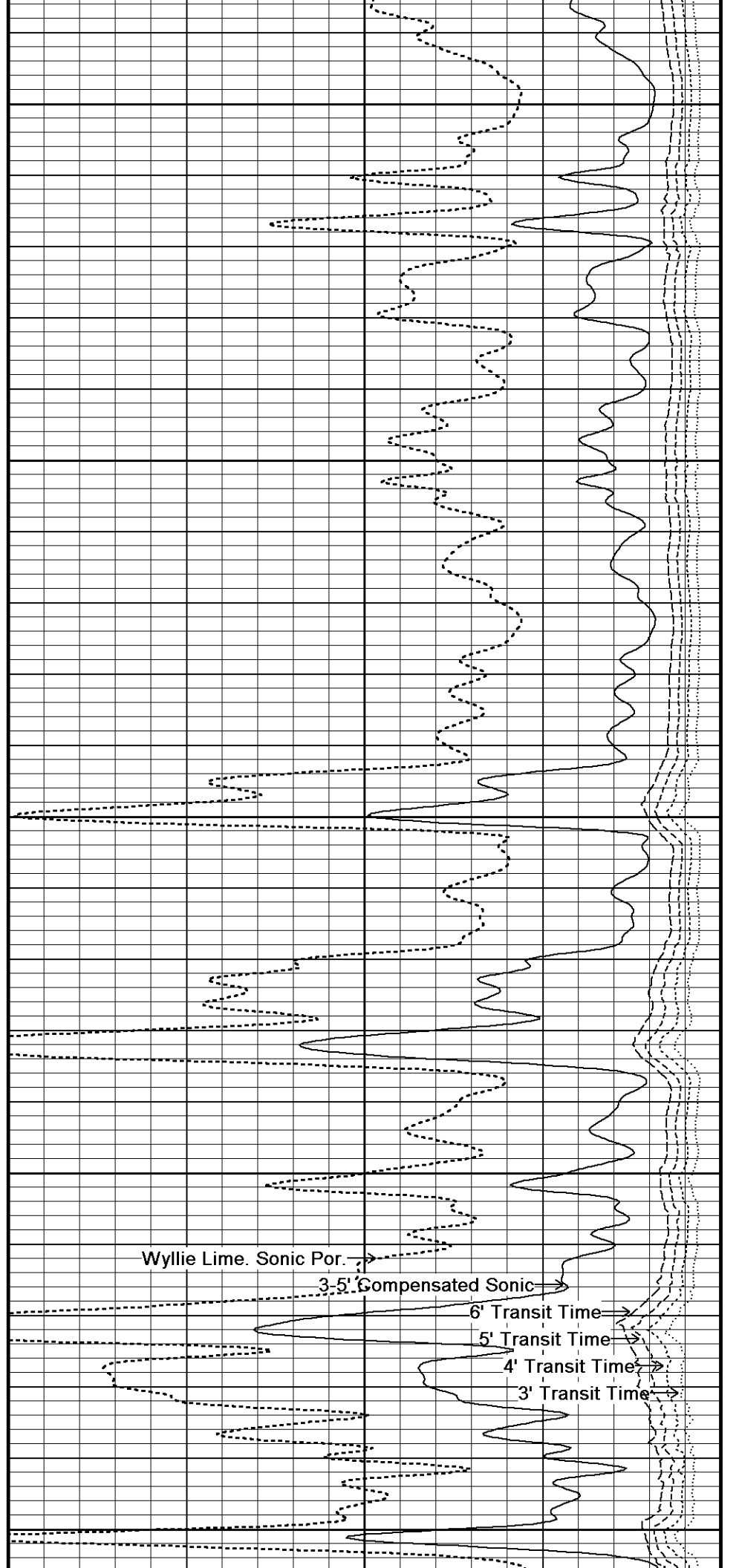
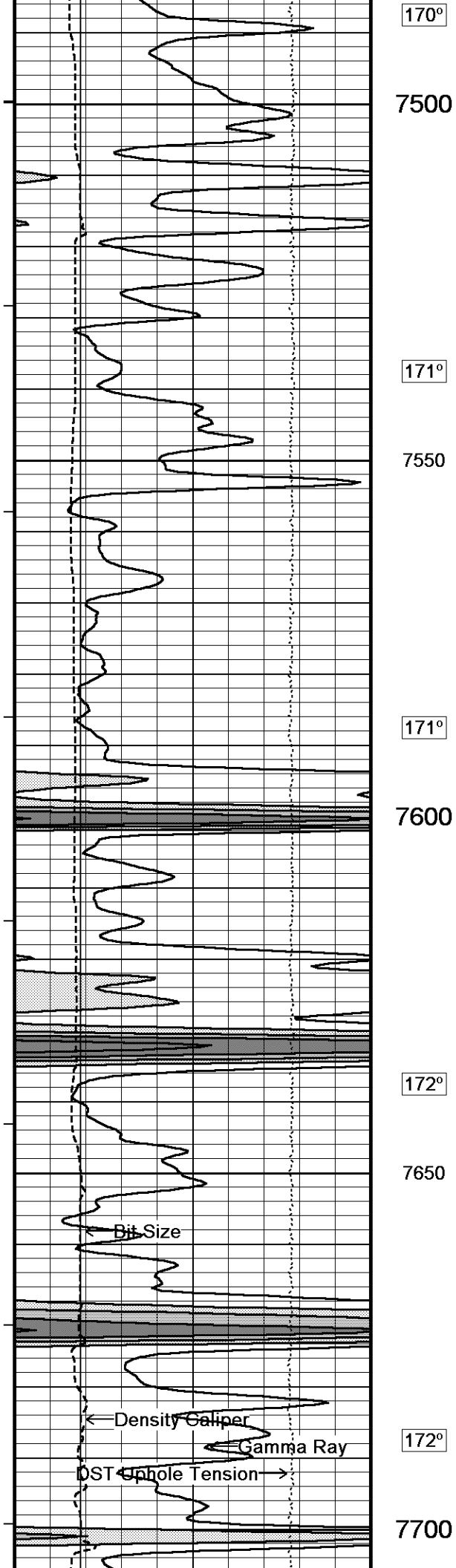
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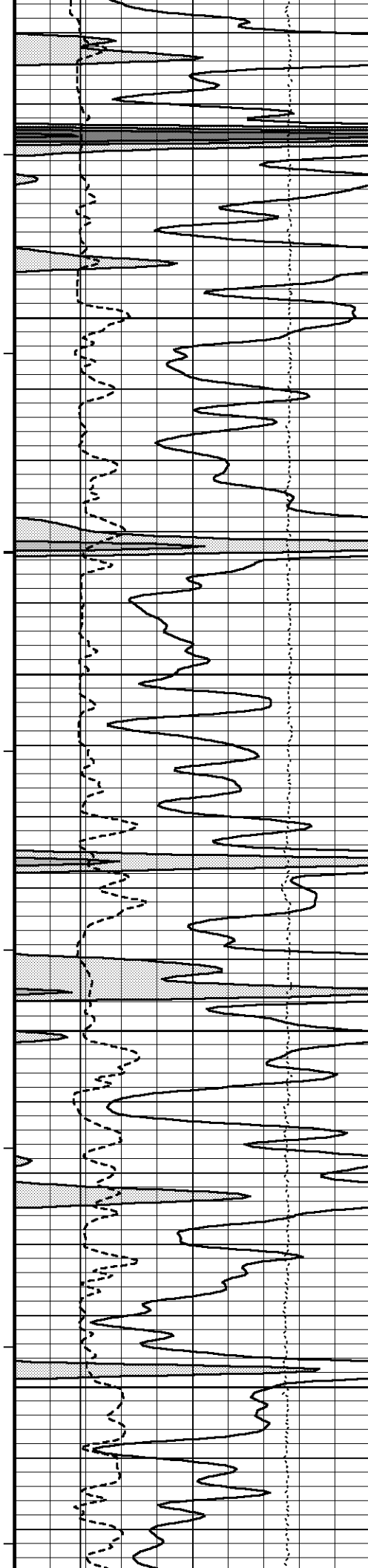
7250

← Bit Size









172°

7750

172°

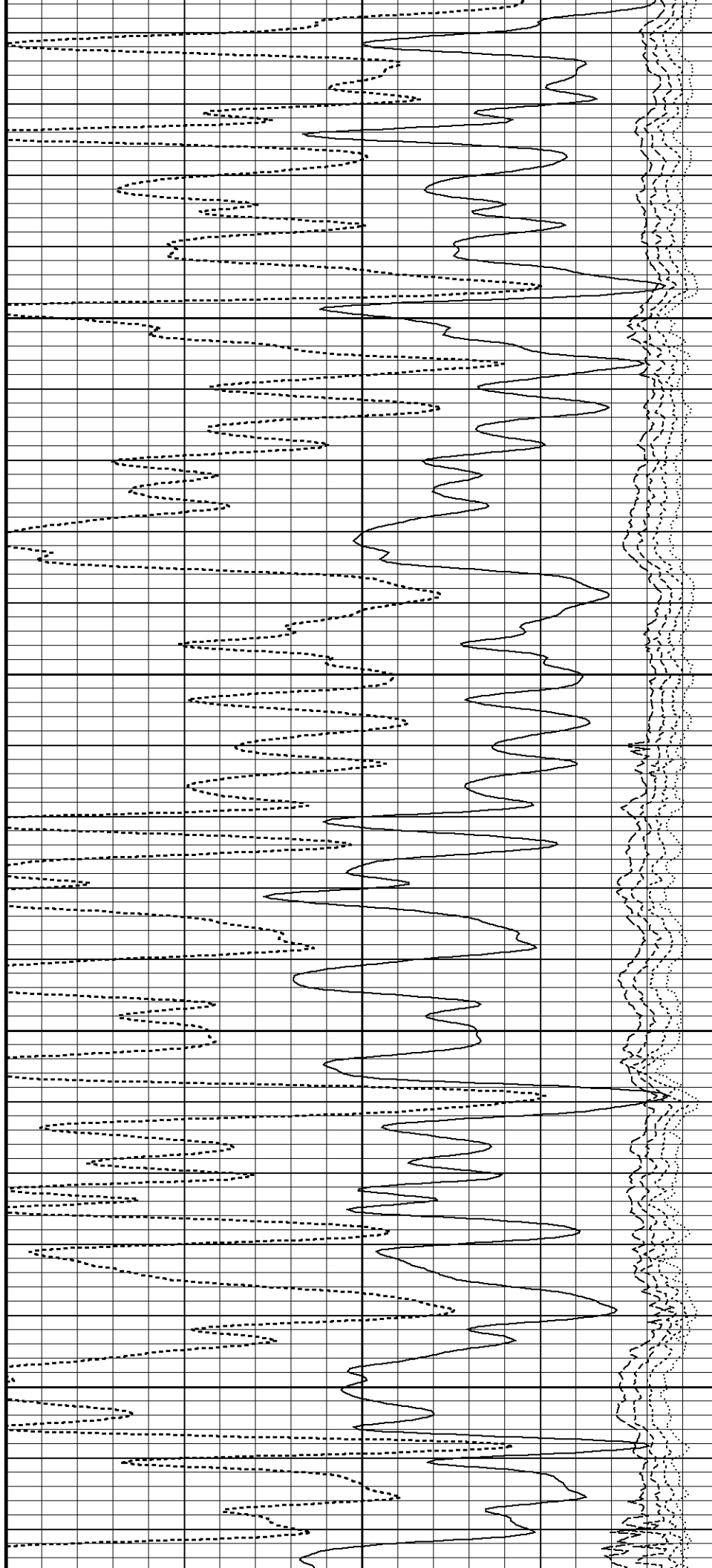
7800

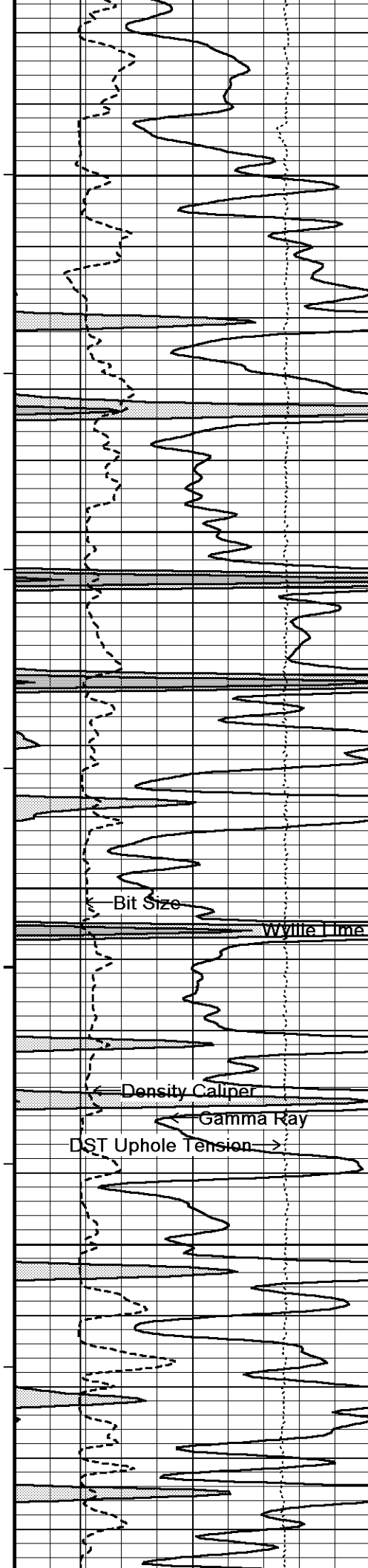
173°

7850

173°

7900





173°

7950

173°

8000

173°

8050

Bit Size

Wyllie Time

Sonic Por. →

Density Caliper

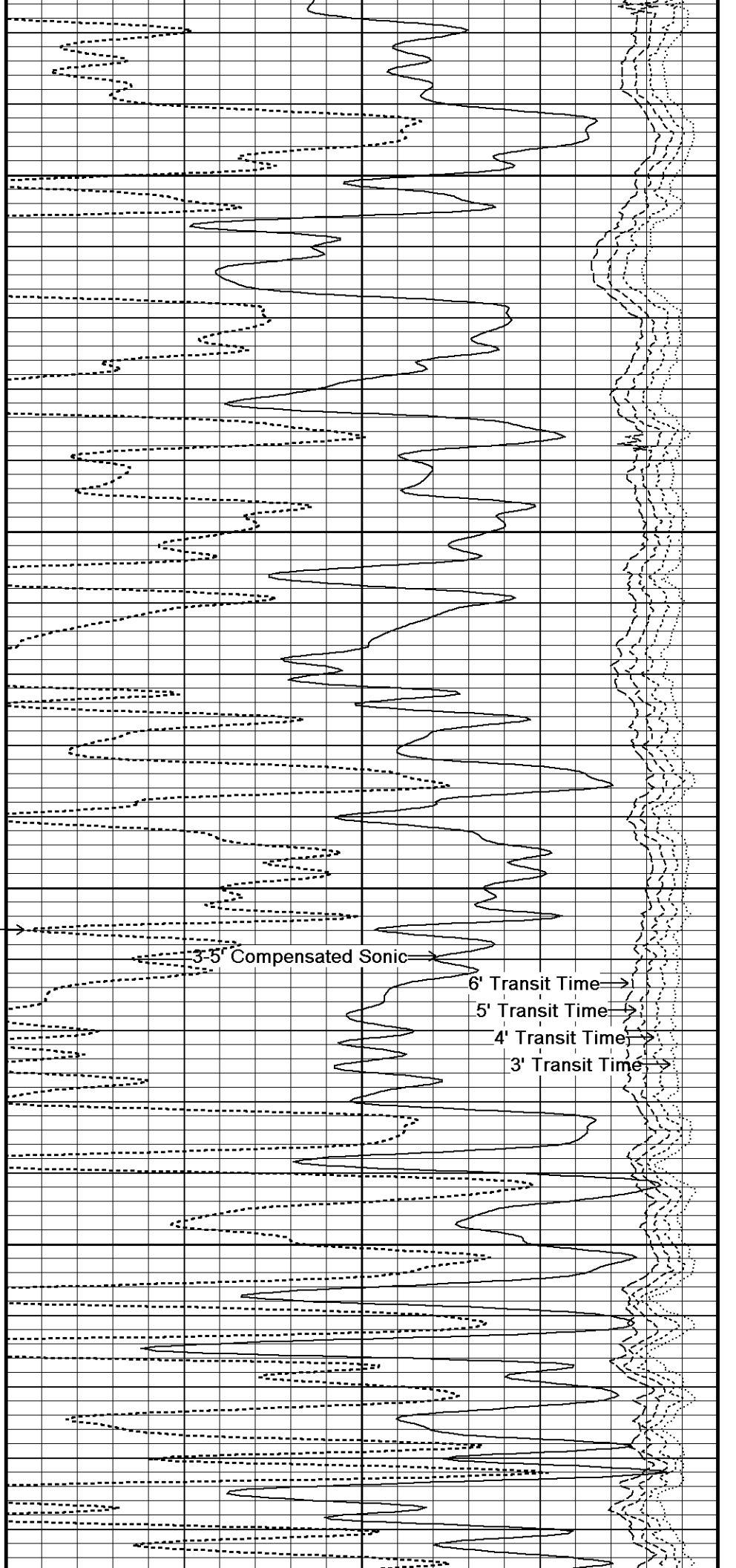
Gamma Ray

DST Uphole Tension →

173°

8100

174°



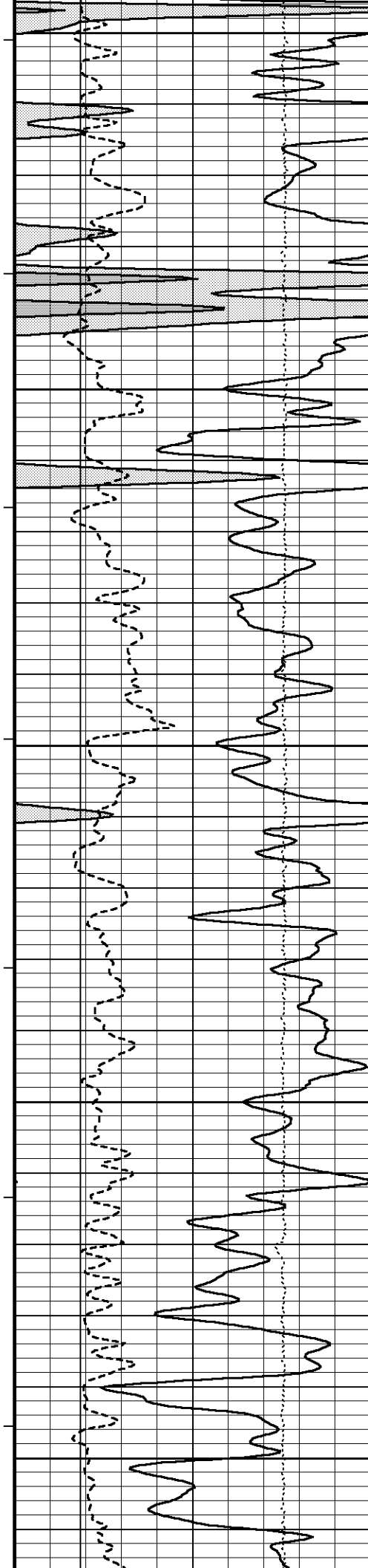
3-5' Compensated Sonic

6' Transit Time →

5' Transit Time →

4' Transit Time →

3' Transit Time →



8150

174°

8200

175°

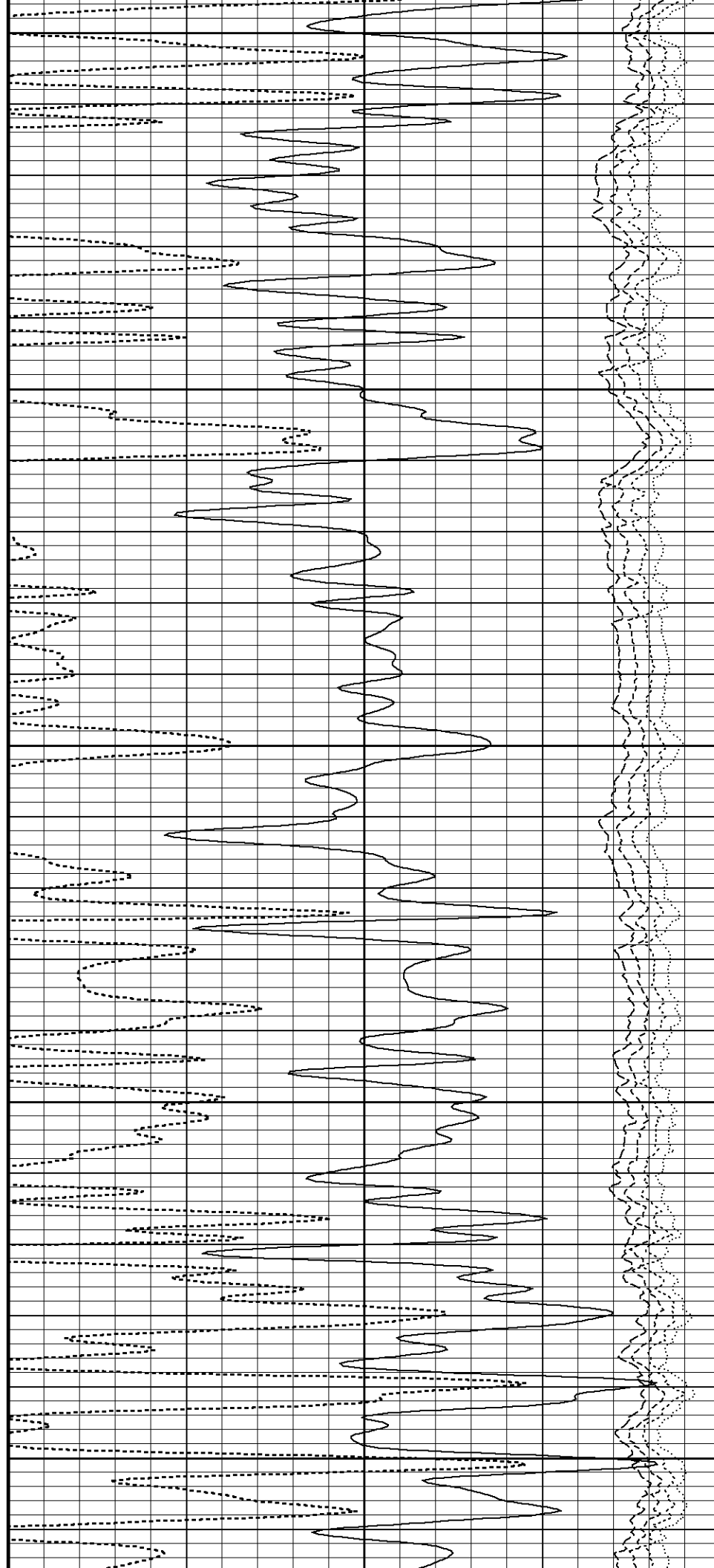
8250

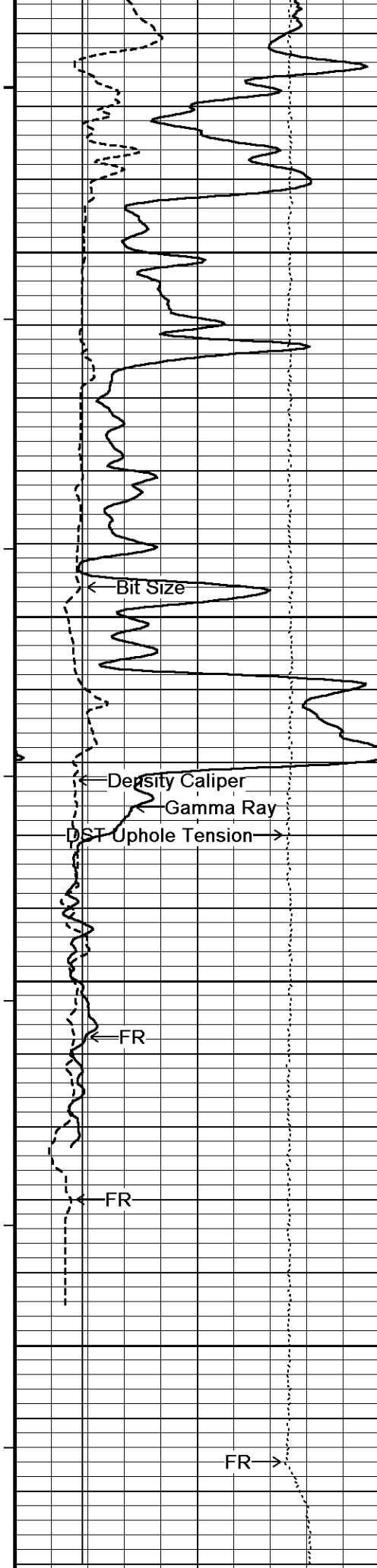
176°

8300

177°

8350





178°

8400

180°

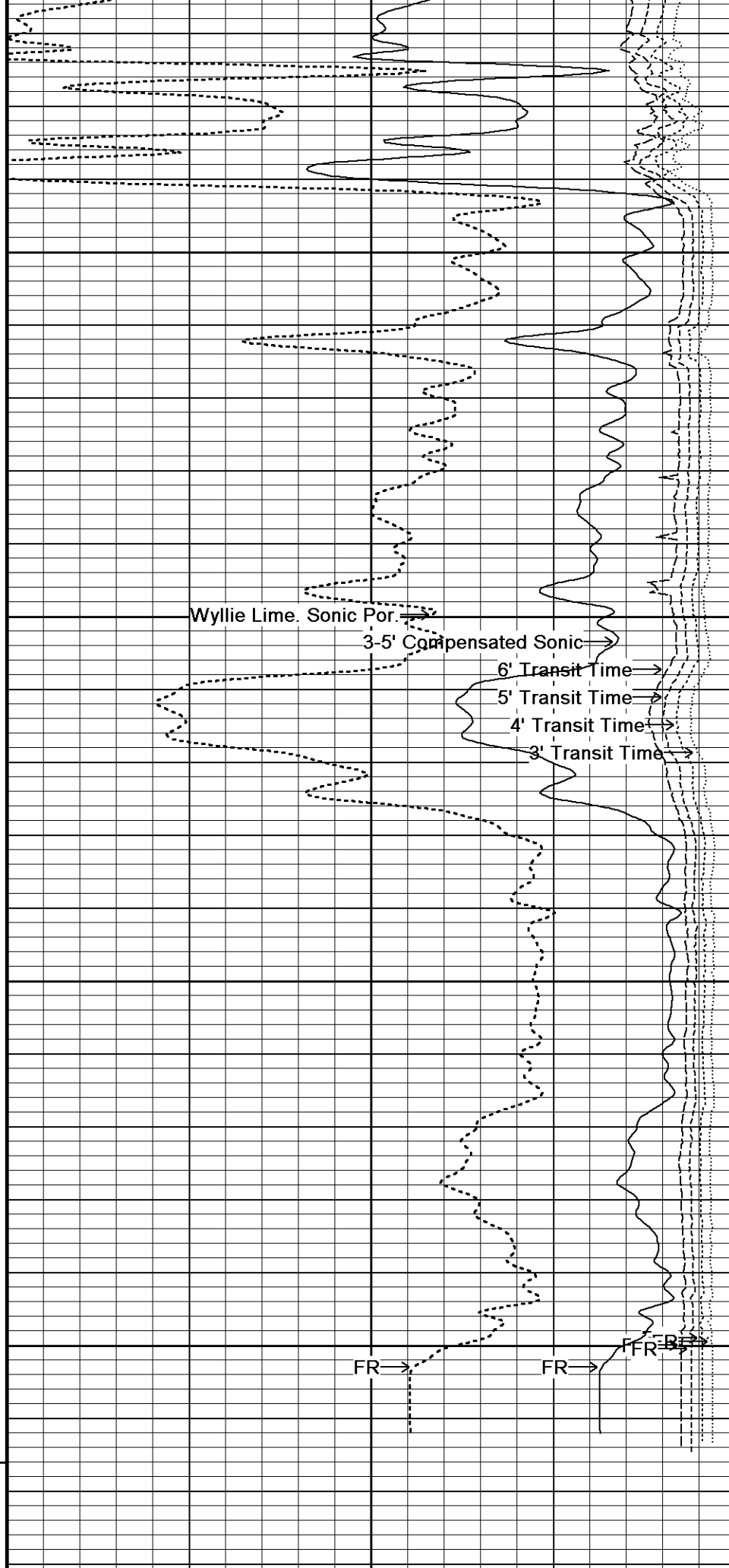
8450

180°

8500

8550

TD



Wyllie Lime. Sonic Por.

3-5' Compensated Sonic

6' Transit Time

5' Transit Time

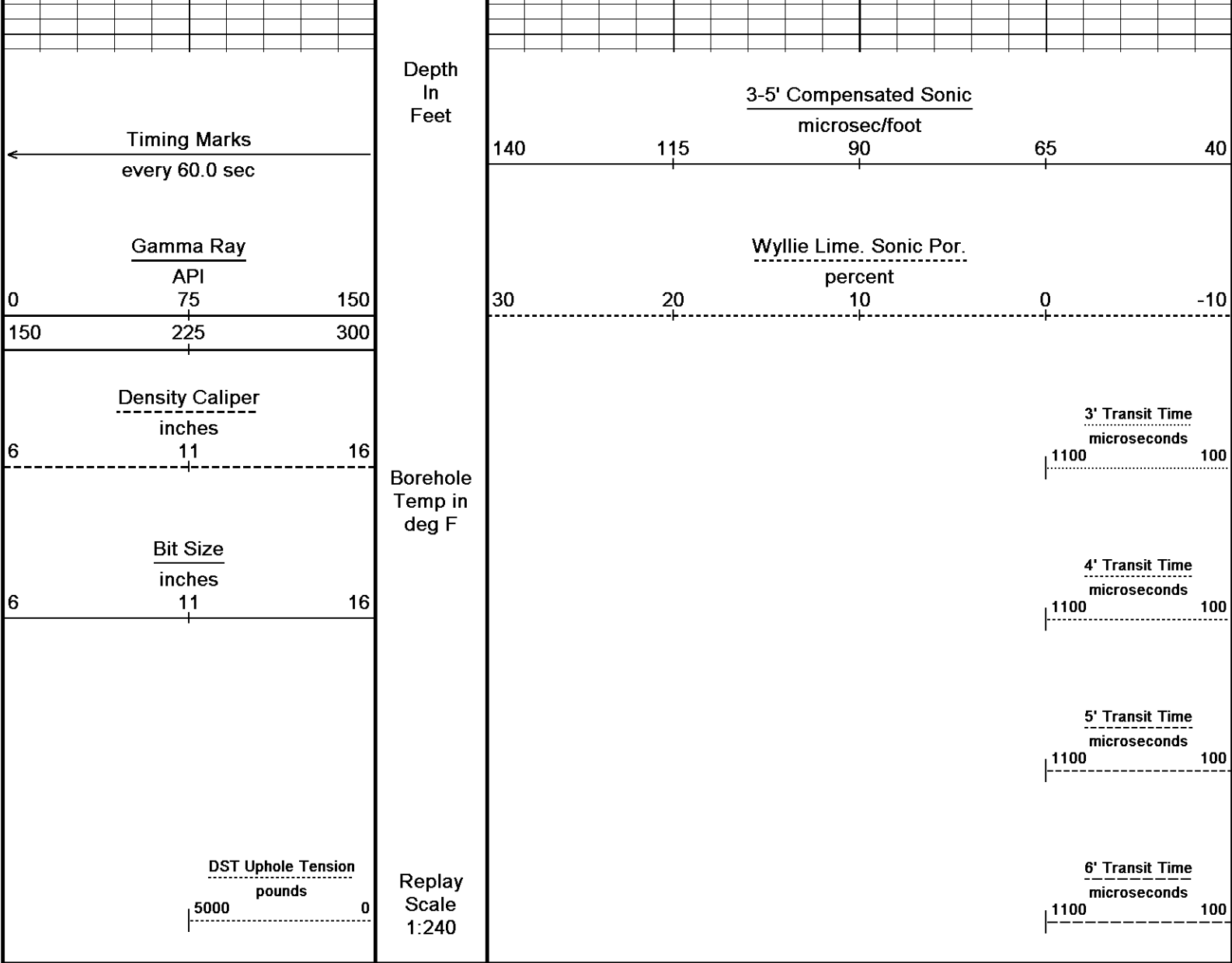
4' Transit Time

3' Transit Time

FR

FR

FFR-B

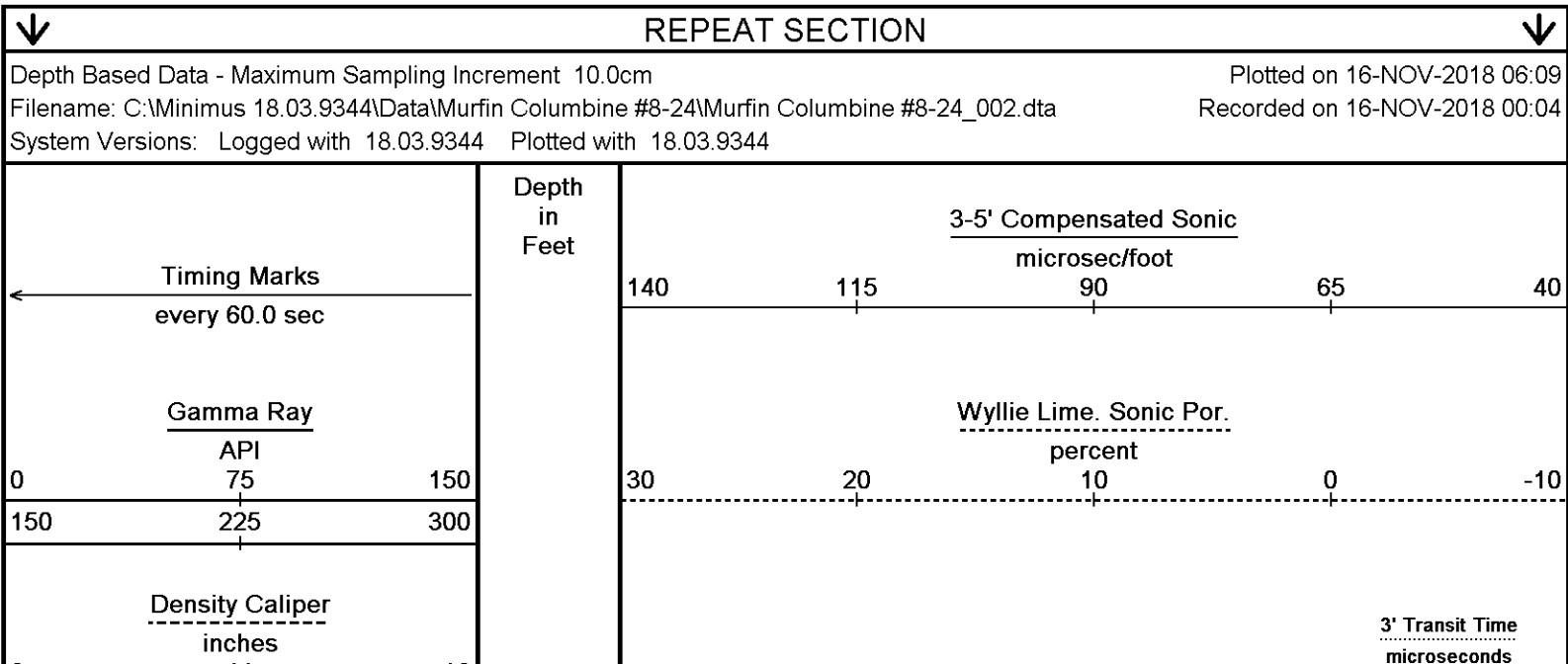


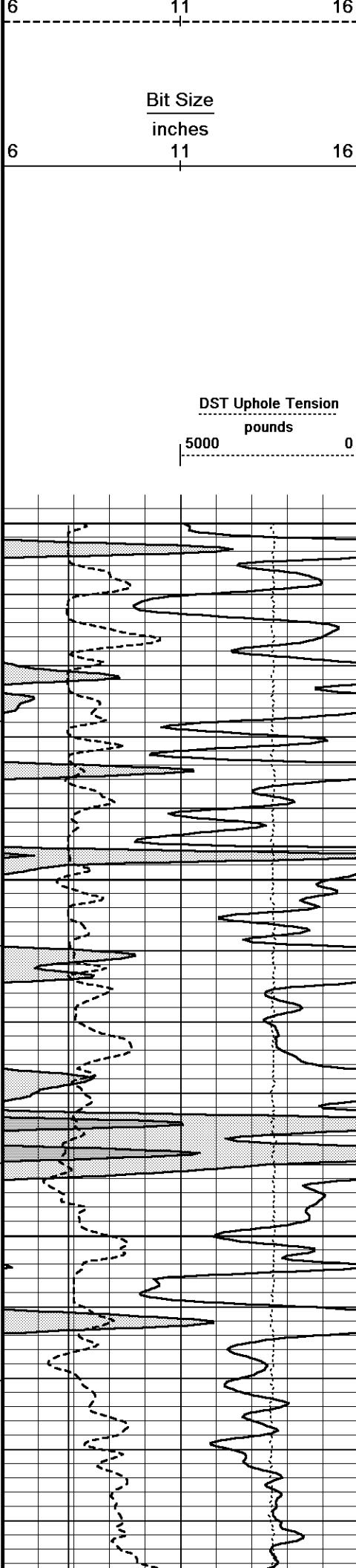
Depth Based Data - Maximum Sampling Increment 10.0cmPlotted on 16-NOV-2018 06:09

Filename: C:\Minimus 18.03.9344\Data\Murfin Columbine #8-24\Murfin Columbine #8-24 Splice.dtaRecorded on 16-NOV-2018 00:31

System Versions: Processed with 18.03.9344 Plotted with 18.03.9344

↑5 INCH MAIN↑





Borehole
Temp in
deg F

Replay
Scale
1:240

8100

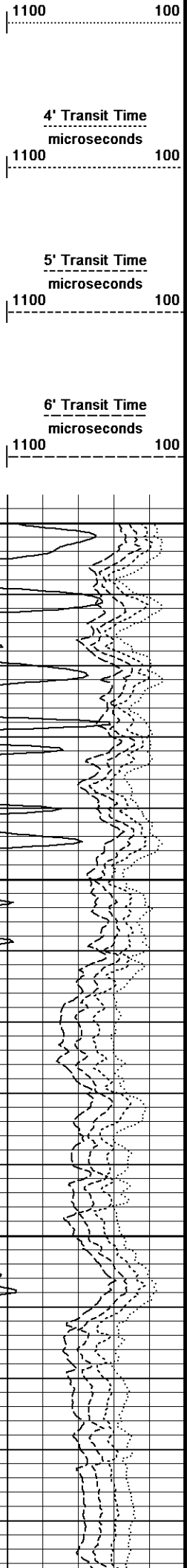
172°

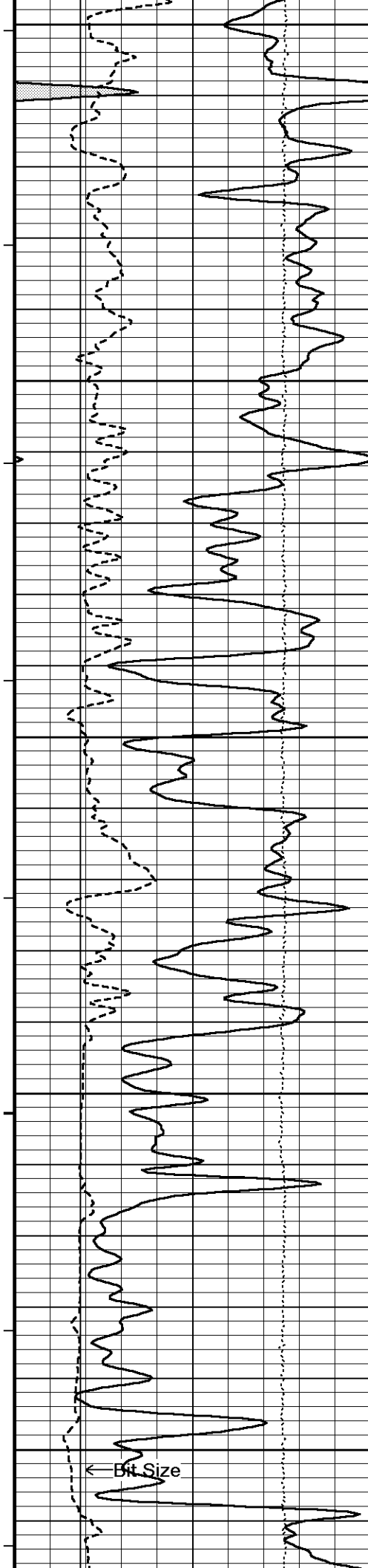
8150

173°

8200

173°





8250

174°

8300

175°

8350

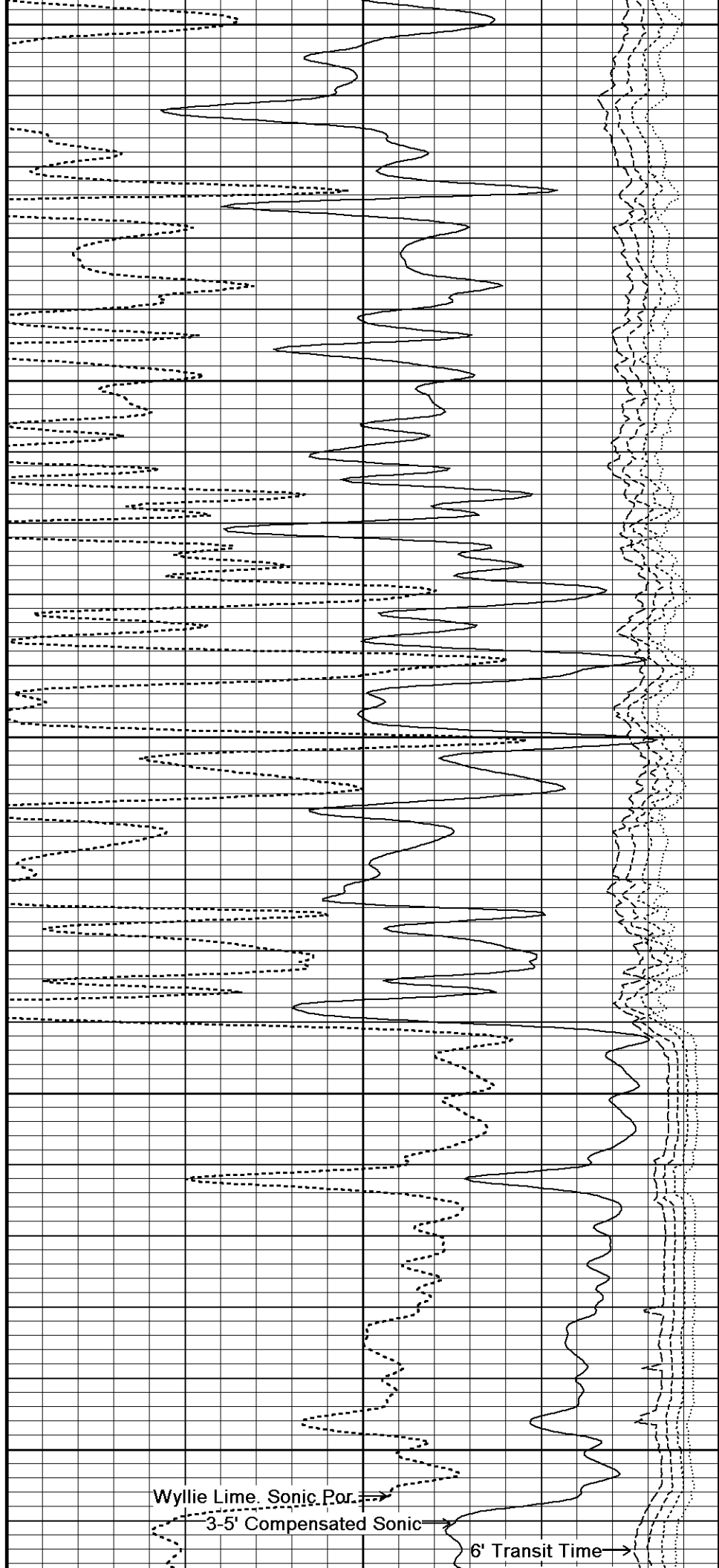
176°

8400

178°

8450

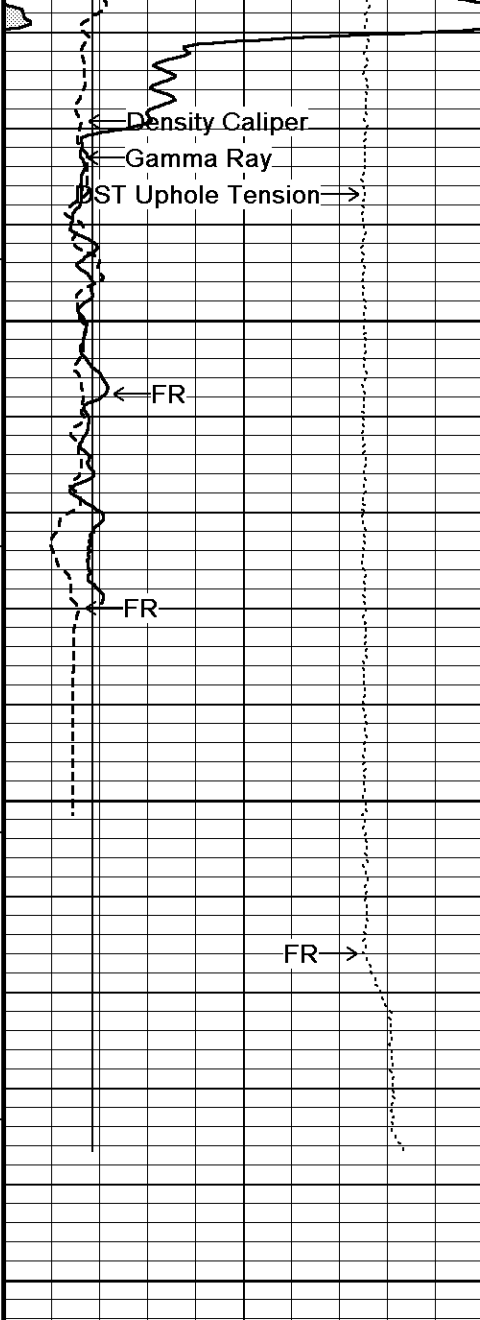
← Bit Size



Wyllie Lime. Sonic Por. →

3-5' Compensated Sonic →

6' Transit Time →



179°

8500

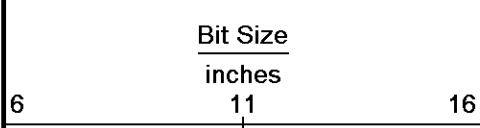
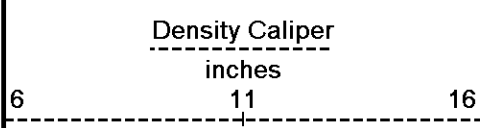
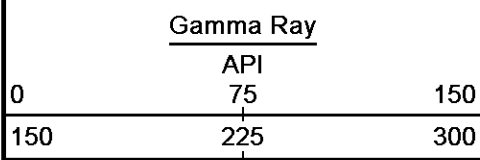
8550

TD

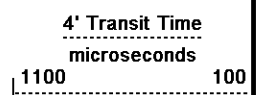
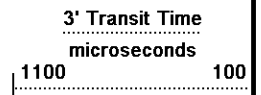
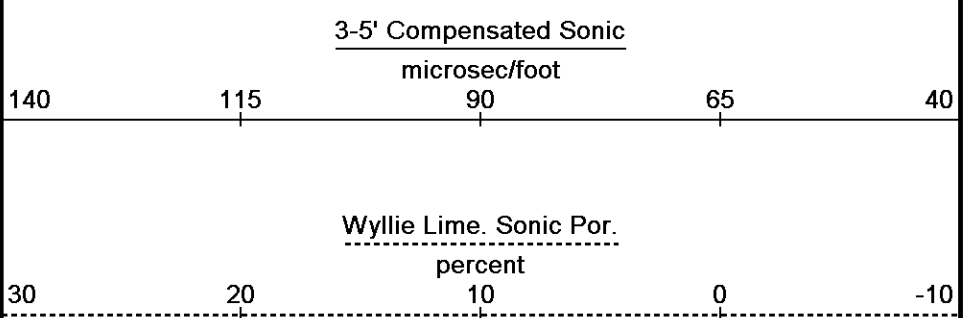
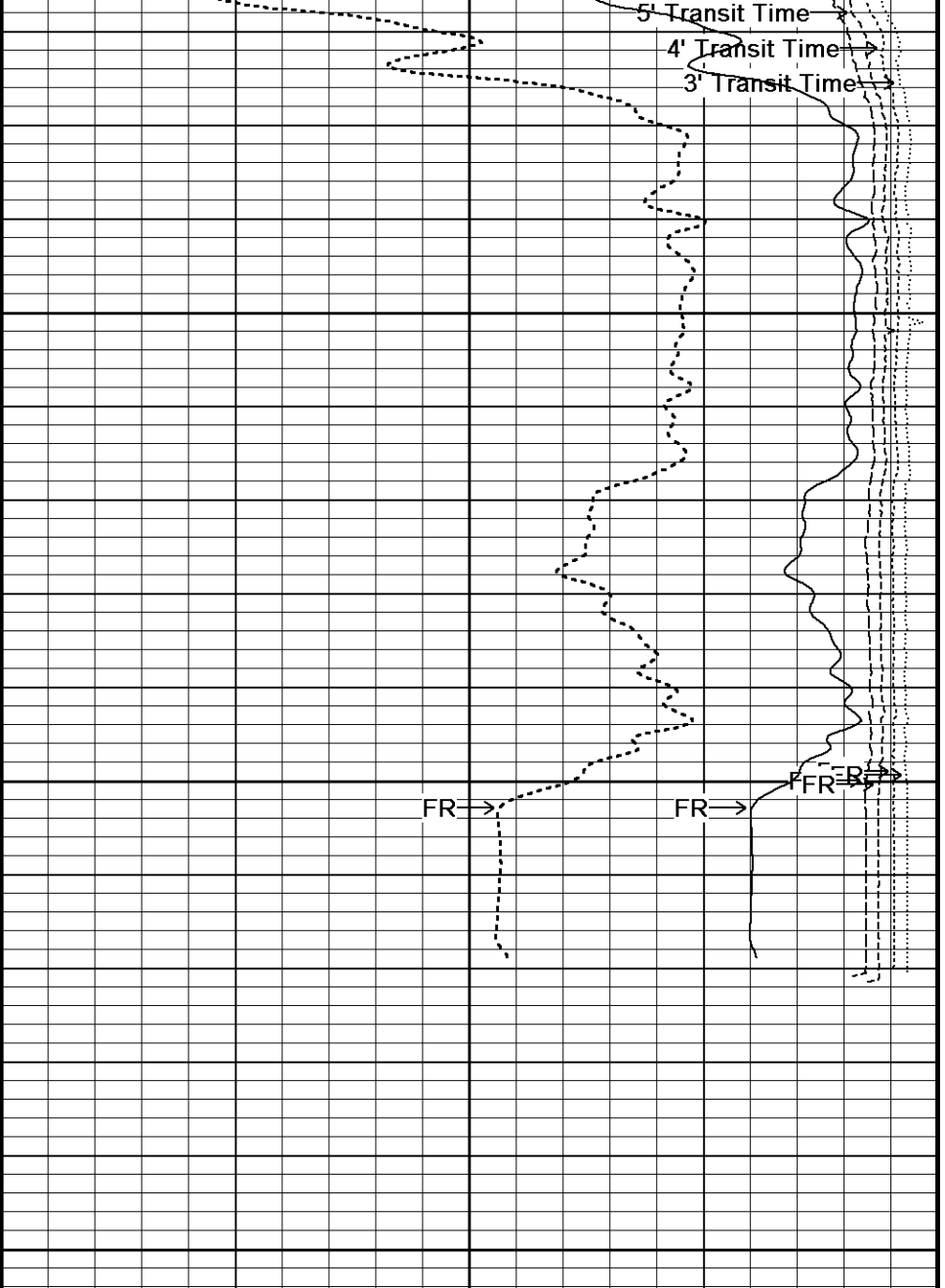
8600

Depth
in
Feet

← Timing Marks
every 60.0 sec



Borehole
Temp in
deg F



5' Transit Time

microseconds

1100 100

DST Uphole Tension

pounds

5000 0

Replay

Scale

1:240

6' Transit Time

microseconds

1100 100

Depth Based Data - Maximum Sampling Increment 10.0cm

Plotted on 16-NOV-2018 06:09

Filename: C:\Minimus 18.03.9344\Data\Murfin Columbine #8-24\Murfin Columbine #8-24_002.dta

Recorded on 16-NOV-2018 00:04

System Versions: Logged with 18.03.9344 Plotted with 18.03.9344



REPEAT SECTION



BEFORE SURVEY CALIBRATION

C:\Minimus 18.03.9344\Data\Murfin Columbine #8-24\Murfin Columbine #8-24_002.dta

General Constants All 000

Last Edited on 15-NOV-2018,23:03

General Parameters

Mud Resistivity	0.850	ohm-metres
Mud Resistivity Temperature	75.000	degrees F
Water Level	0.000	feet
Borehole Fluid Processing	Wet Hole	

Hole/Annular Volume and Differential Caliper Parameters

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

Rwa Parameters

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

Down-hole Tension Calibration SMS 0

Field Calibration on 15-NOV-2018 22:34

Reading No	Measured	Calibrated (lbs)
1	15808.85	0.00
2	17295.28	527.00

SP Calibration MCG-D.K 443

Field Calibration on 12-OCT-2018,05:20

	Measured	Calibrated (mV)
Reference 1	103.5	100.0
Reference 2	-96.9	-100.1

High Resolution Temperature Calibration MCG-D.K 443

Field Calibration on 12-OCT-2018,05:20

	Measured	Calibrated(Deg F)
Lower	50.00	50.00
Upper	212.00	212.00

High Resolution Temperature Constants MCG-D.K 443

Last Edited on 12-OCT-2018,05:20


Pre-filter Length	11
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Gamma Calibration MCG-D.K 443

Field Calibration on 14-NOV-2018 17:02

	Measured	Calibrated (API)
Background	73	51
Calibrator (Gross)	728	507
Calibrator (Net)	255	150

Gamma Calibration Tolerances MCG-D.K 443

Ratio 1.436  Counts/API

Gamma Constants MCG-D.K 443

Last Edited on 15-NOV-2018,20:40

Gamma Calibrator Number MCGGRCC141
 GRC-M Calibrator Jig in Use? NO
 Inactive Background Jig in Use? NO
 Mud Density 1.13 gm/cc
 Caliper Source for Processing Density Caliper
 Tool Position Eccentred
 Potassium Equivalence Chloride
 K Mud Concentration 0.00 %


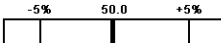
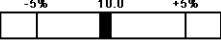
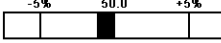
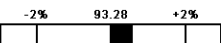
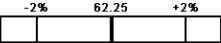
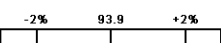
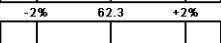
Micro Normal and Micro Inverse Calibration MMR-B.A 91

Base Calibration on 14-NOV-2018 16:15

Field Check on 14-NOV-2018 16:19

	Resistor 1 (ohm)	Resistor 2 (ohm)
Base Calibration	10.0	50.0
	Measured	Calibrated (ohm-m)
Micro Normal	10.3 49.8	5.1 25.6
Micro Inverse	9.9 49.4	3.4 16.9
Channel	Base Check (ohm-m)	Field Check (ohm-m)
Micro Normal	93.9	93.9
Micro Inverse	62.3	62.3

Micro Normal & Micro Inverse Calibration Tolerance MMR-B.A 91

Micro Normal Res. 1	10.3		ohm	Micro Normal Res. 2	49.8		ohm
Micro Inverse Res. 1	9.9		ohm	Micro Inverse Res. 2	49.4		ohm
Micro Normal Base Check	93.9		ohm-m				
Micro Inverse Base Check	62.3		ohm-m				
Micro Normal Field Check	93.9		ohm-m				
Micro Inverse Field Check	62.3		ohm-m				

Micro Normal and Micro Inverse Constants MMR-B.A 91

Last Edited on 13-APR-2018,05:04

Pad Type 8-12 in Soft Rubber Inflatable 006-9011-159
 Micro Normal K Factor 0.5110
 Micro Inverse K Factor 0.3380
 Standoff Offset 0.0000 inches

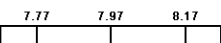
Caliper Calibration MMR-B.A 91

Base Calibration on 14-NOV-2018 16:08

Field Calibration on 14-NOV-2018 16:09

Base Calibration	Reading No	Measured	Calibrator Size (in)
	1	14000	5.98
	2	17358	7.97
	3	20707	9.86
	4	24750	11.92
	5	0	0.00
	6	N/A	N/A
Field Calibration		Measured Caliper (in)	Actual Caliper (in)
		7.97	7.97

Caliper Calibration Tolerances MMR-B.A 91

Short Arm Field Cal. 7.97  in

Micro-Resistivity Caliper Constants MMR-B.A 91

Sonde Configuration Resistivity Mode

Micro Laterolog Calibration MMR-B.A 91			Base Calibration on 31-DEC-1999 00:00	
			Field Check on 31-DEC-1999 00:00	
Base Calibration	Resistor 1 (ohm)		Resistor 2 (ohm)	
	0.0		0.0	
	Measured		Calibrated (ohm-m)	
	Ref 1	Ref 2	Ref 1	Ref 2
	0.0	0.0	0.0	0.0
Base Check (ohm-m)		Field Check (ohm-m)		
0.0		0.0		

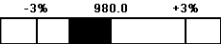
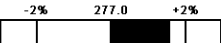
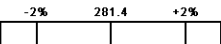
Micro Laterolog Constants MMR-B.A 91			
Pad Type	6 in Solid Nylon B23059		
Standoff Offset	0.0000	inches	
Micro Laterolog K Factor	0.0128		
Micro Laterolog Rm K Factor	N/A		
Mudcake Thickness Correction Constants			
Mud Cake Source	Constant Value		
Mud Cake Thickness	0.4000	inches	
Mud Cake Thickness Caliper			
Mud Cake Resistivity	0.1500	ohm-m	
Mud Cake Resistivity Temp.	20.00	Degrees C	
Mud Cake Resistivity Source	Constant Value		
Temp. for Rmc Corr.	MCG External Temperature		

Neutron Calibration MDN-B.A 292				Base Calibration on 25-OCT-2018,14:15	
				Field Check on 14-NOV-2018 17:08	
Base Calibration					
		Measured		Calibrated (cps)	
	Near	Far		Near	Far
	2910	91		3714	110
Ratio	31.871			33.764	
Field Calibrator at Base					
				Calibrated (cps)	
				2207	3209
Ratio				0.688	
Field Check					
				Calibrated (cps)	
				2170	3165
Ratio				0.686	

Neutron Calibration Tolerances MDN-B.A 292				
Ratio	31.871	<div> <div>-5%</div> <div>33</div> <div>+5%</div> </div>		
Base Check	0.688	<div> <div>0.65</div> <div>0.7</div> <div>0.75</div> </div>		
Field Check	0.686	<div> <div>0.668</div> <div>0.688</div> <div>0.708</div> </div>		

Neutron Constants MDN-B.A 292		Last Edited on 15-NOV-2018,20:40	
Neutron Source Id	P0204NN		
Neutron Jig Number	NJ5736		
Air Hole Processing	Legacy		
Caliper Source for Processing	Density Caliper		
Stand-off	0.00	inches	
Mud Density	1.00	gm/cc	
Limestone Sigma	7.10	cu	
Sandstone Sigma	4.26	cu	
Dolomite Sigma	4.70	cu	
Formation Pressure Source	None		
Formation Pressure	N/A	kpsi	
Temperature Source	Constant Value		
Temperature	68.00	degrees F	
Mud Salinity	0.00	kppm	
Salinity Correction	Not Applied		
Formation Fluid Salinity Source	None		

Formation Fluid Salinity	N/A	kppm
Barite Mud Correction	Not Applied	
FE Calibration MFE-B.J 352		Base Calibration on 25-OCT-2018 13:00 Field Check on 14-NOV-2018 16:37
	Resistor 1 (ohm)	Resistor 2 (ohm)
	0.0	1000.0
Base Calibration		
	Measured	Calibrated (ohm-m)
Reference 1	0.0	0.0
Reference 2	963.2	126.8
Base Check		281.4
Field Check		281.4

FE Calibration Tolerances MFE-B.J 352	
Reference 2	963.2  ohm
Base Check	281.4  ohm-m
Field Check	281.4  ohm-m

FE Constants MFE-B.J 352		Last Edited on 15-NOV-2018,20:39
Running Mode	No Sleeve	
MFE K Factor	0.1268	
Borehole Correction Constants		
Sonde Position	0.5	inches
Hole Size Source	Density Caliper	
Hole Size Constant Value	N/A	inches
Rm Source	Global Value: Temperature Corrected	
Temp. for Rm Corr.	MCG External Temperature	

Sonic Constants MSS-C.K 319		Last Edited on 08-JUL-2018,09:57			
Maximum Boundary Contrast	70.00	micro-sec/ft			
Fluid Transit Time	189.00	micro-sec/ft			
Limestone Transit Time	47.50	micro-sec/ft			
Sandstone Transit Time	55.50	micro-sec/ft			
Dolomite Transit Time	43.50	micro-sec/ft			
Sonic used for Porosities	3-5' Compensated				
Correction for Sonde Skew	Applied				
Cycle Stretch Algorithm	Applied				
MN3FT	0.00	micro-sec			
MX3FT	1500.00	micro-sec			
Hunt-Raymer Constant	83.13	micro-sec/ft			
Sonde Mode	Compensated				
Hole Type	Open Hole				
Sonde Parameters					
	Measured	Calibrated			
Offset		0.0000			
Free Pipe	0.0000				
Peak Amplitude Source					
Waveform	Start Time (micro-sec)	Width (micro-sec)	Pre Gain	Start Gain	Discriminator (mV)
3'	N/A	N/A	N/A	N/A	N/A
4'	N/A	N/A	N/A	N/A	N/A
5'	N/A	N/A	N/A	N/A	N/A
6'	N/A	N/A	N/A	N/A	N/A
Processed Fixed Gate Parameters					
Waveform Used For Processing	N/A				
Start Time (micro-sec)	End Time (micro-sec)	Discriminator (mV)	Depth (ft)		
0.00	0.00	0.00	0.00		
0.00	0.00	0.00	0.00		

0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00

Full Waveform Parameters

Use 3' Waveform to derive TR	No	
Use 4' Waveform to derive TR	No	
Use 5' Waveform to derive TR	No	
Use 6' Waveform to derive TR	No	
3' Waveform Discriminator Level	0.30	mV
4' Waveform Discriminator Level	0.30	mV
5' Waveform Discriminator Level	0.15	mV
6' Waveform Discriminator Level	0.15	mV
Waveform Discriminator Filter	Not Applied	
Semblance Window Width	150.00	micro-sec
Semblance Processing Enabled	Yes	
Tracking Boxes Enabled In Processing	Yes	

Induction Calibration MAI-B.J 390

Factory Loop Calibration 25-OCT-2018 13:24

Field Check on 14-NOV-2018 16:35

Factory Loop Calibration

High Conductivity Reference Resistor	3.3	ohm
Low Conductivity Reference Resistor	333.3	ohm

Array	Measured Signal (unitless)		Reference Conductivity (mmho/m)		Calibration	
	Low	High	Low	High	Gain	Offset
1 (near)	16.8	458.6	9.3	966.2	2.166	-27.2
2	6.3	377.7	7.6	821.4	2.191	-6.2
3	3.8	258.6	5.2	566.0	2.200	-3.0
4 (far)	1.9	132.3	2.6	279.2	2.121	-1.4
Array Temperature	77.9		Deg F			

Tool Checks

Array	Factory Reference (mmho/m)		Before Survey (mmho/m)		
	Low	High	Low	High	
1 (near)	11.3	3958.7	10.4	3957.3	
2	28.3	3562.5	27.6	3561.2	
3	26.5	3060.2	25.8	3059.6	
4 (far)	18.8	2087.1	18.3	2086.7	
Array Temperature	61.2		65.5		Deg F

Induction Check Tolerances MAI-B.J 390

Low Array 1	10.4	<div><div>9.8 11.3 12.8</div></div>	mmho/m	High Array 1	3957.3	<div><div>-0.5% 3958.7 +0.5%</div></div>	mmho/m
Low Array 2	27.6	<div><div>26.8 28.3 29.8</div></div>	mmho/m	High Array 2	3561.2	<div><div>-0.5% 3562.5 +0.5%</div></div>	mmho/m
Low Array 3	25.8	<div><div>25.0 26.5 28.0</div></div>	mmho/m	High Array 3	3059.6	<div><div>-0.5% 3060.2 +0.5%</div></div>	mmho/m
Low Array 4	18.3	<div><div>17.3 18.8 20.3</div></div>	mmho/m	High Array 4	2086.7	<div><div>-0.5% 2087.1 +0.5%</div></div>	mmho/m

Induction Constants MAI-B.J 390

Last Edited on 15-NOV-2018,20:39

Induction Model	RtAP-WBM
Borehole Correction Constants	
Tool Centred	No
Hole Size Source	Density Caliper
Hole Size Constant Value	N/A
Stand-off Type	Fins
Stand-off	0.50
Number of Fins on Stand-off	8.0000
Stand-off Fin Angle	45.00
Stand-off Fin Width	0.5000
Rm Source	Global Value: Constant Temperature
Temp. for Rm Corr.	N/A
Borehole Correction Method	Default
Squasher Start	0.0020
	mhos/metre

Squasher Offset		N/A		mhos/metre	
Borehole Normalisation					
DRM1	0.0000	DRC1		0.0000	
DRM2	0.0000	DRC2		0.0000	
MRM1	0.0000	MRC1		0.0000	
MRM2	0.0000	MRC2		0.0000	
SRM1	0.0000	SRC1		0.0000	
SRM2	0.0000	SRC2		0.0000	
Calibration Site Corrections					
Channel 1		0.00		mmhos/metre	
Channel 2		0.00		mmhos/metre	
Channel 3		0.00		mmhos/metre	
Channel 4		0.00		mmhos/metre	
Symmetrised Receiver Gains					
Receiver 1		1.00			
Receiver 2		1.00			
Receiver 3		1.00			
Receiver 4		1.00			
Apparent Porosity and Water Saturation Constants					
Archie Constant (A)		1.00			
Cementation Exponent (M)		2.00			
Saturation Exponent (N)		2.00			
Saturation of Water for Apor		100.00		percent	
Resistivity of Water for Apor and Sw		0.05		ohm-m	
Resistivity of Mud Filtrate for Sw		0.00		ohm-m	
Source for Rt		0.00			
Source for Rxo		0.00			

High Resolution Temperature Calibration MAI-B.J 390			Field Calibration on 15-MAY-2018,12:48		
	Measured	Calibrated(Deg F)			
Lower	10.00	10.00			
Upper	100.00	100.00			

High Resolution Temperature Constants MAI-B.J 390			Last Edited on 06-MAR-2018,13:01		
Pre-filter Length	11				

Caliper Calibration MPD-C.A 216			Base Calibration on 25-OCT-2018 13:33 Field Calibration on 14-NOV-2018 16:41		
Base Calibration					
Reading No	Measured	Calibrator Size (in)			
1	15197	3.99			
2	23984	5.98			
3	32561	7.97			
4	40928	9.86			
5	50160	11.92			
6	N/A	N/A			
Field Calibration					
	Measured Caliper (in)	Actual Caliper (in)			
	7.97	7.97			

Caliper Calibration Tolerances MPD-C.A 216					
Long Arm Field Cal.	7.97	<div><div>7.57</div><div>7.97</div><div>8.37</div></div>	in		

Photo Density Calibration MPD-C.A 216			Base Calibration on 25-OCT-2018 13:50 Field Check on 14-NOV-2018 16:47		
Density Calibration					
Base Calibration	Measured	Calibrated (sdu)			
	Near	Far	Near	Far	
Background	1004	1211			
Reference 1	49178	24022	59556	30836	
Reference 2	19804	2279	24941	2541	
Field Check at Base					
	1003.7	1210.8			

Field Check

995.0 1181.9

PE Calibration

Base Calibration

	WS	Measured WH	Ratio	Calibrated Ratio
Background	184	904		
Reference 1	20688	49027	0.426	0.371
Reference 2	5715	19697	0.294	0.272

Field Check at Base

183.9 904.0

Field Check

181.4 892.8

Photo Density Calibration Tolerances MPD-C.A 216

Near Density Ratio	2.56	-5% 2.52 +5%
PE Calibration	0.123	0.089 0.110 0.131

Far Density Ratio	21.36	-5% 21.00 +5%
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Near Den. Field Check	995.0	-3% 1003.7 +3%
PE WS Field Check	181.4	-6% 183.9 +6%

Far Den. Field Check	1181.9	-3% 1210.8 +3%
PE WH Field Check	892.8	-6% 904.0 +6%

Density Constants MPD-C.A 216

Last Edited on 15-NOV-2018,20:40

Density Source Id	P50557B
Nylon Calibrator Number	DNCE695
Aluminium Calibrator Number	DACD698
Density Shoe Profile	8 inch
Caliper Source for Processing	Density Caliper
PE Correction to Density	Not Applied
Mud Density	1.13 gm/cc
Mud Density Type	
Mud Filtrate Density	1.00 gm/cc
Dry Hole Mud Filtrate Density	1.00 gm/cc
DNCT	0.00 gm/cc
CRCT	0.00 gm/cc
Density Z/A Correction	Hybrid
Precision Enhanced Density Processing	Applied
Matrix Density (gm/cc)	Depth (ft)
2.71	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00

DOWNHOLE EQUIPMENT

C:\Minimus 18.03.9344\Data\Murfin Columbine #8-24\Murfin Columbine #8-24_002.dta

Cablehead, 11 pin
CBH-CB 264 LG: 2.40 ft WT: 24.3 lb OD: 2.244 in

Compact Swivel Head Adaptor
SHA-J.B 595 LG: 2.30 ft WT: 22.0 lb OD: 2.244 in

Compact Comms Gamma
MCG-D.K 443 LG: 8.70 ft WT: 63.9 lb OD: 2.244 in

Compact Micro-Resistivity
MMP-B.A 01 LG: 8.50 ft WT: 81.6 lb OD: 4.882 in



58.18 ft GRGC - MCG Gamma Ray

55.28 ft CGXT - MCG External Temperature

MMR-B.A 91 LG: 8.59 ft WT: 81.6 lb OD: 4.882 in

Compact Neutron
MDN-B.A 292 LG: 5.04 ft WT: 50.7 lb OD: 2.244 in

Compact Density/Caliper
MPD-C.A 216 LG: 9.59 ft WT: 90.4 lb OD: 2.913 in

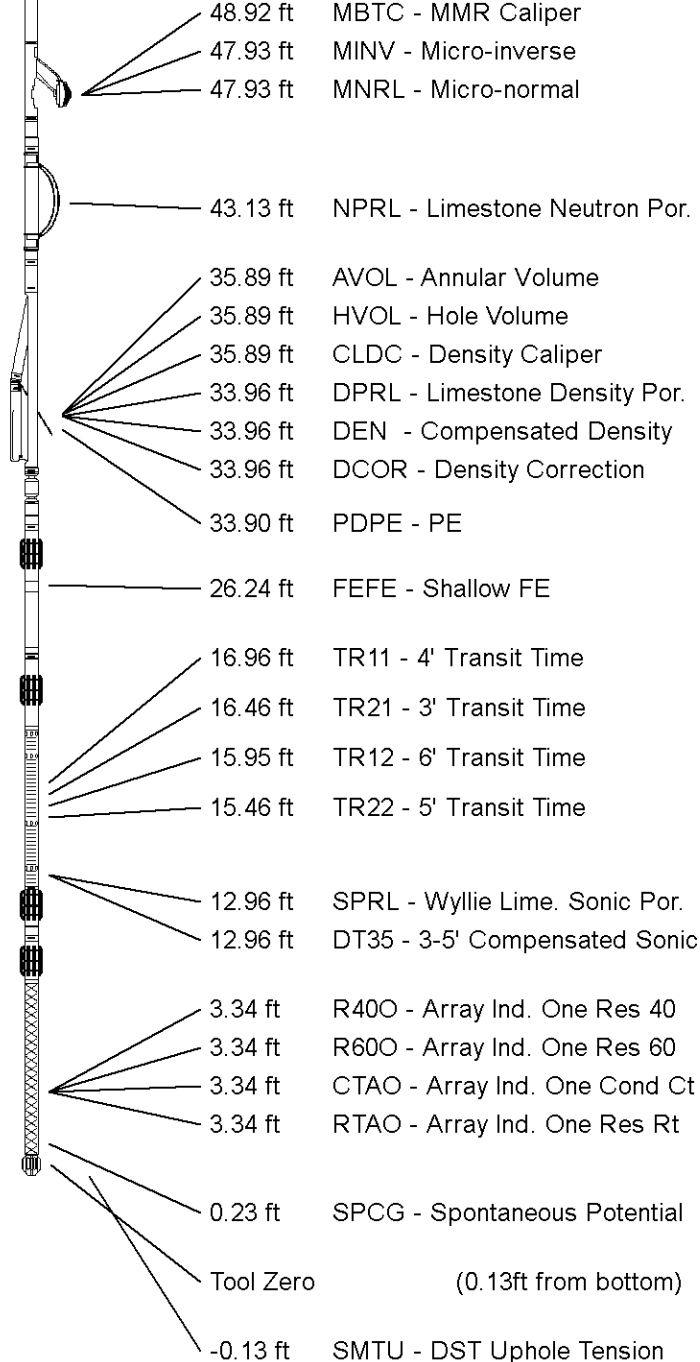
Compact Knuckle Joint
SKJ-D.A 167 LG: 2.17 ft WT: 24.3 lb OD: 2.244 in

Compact Focussed Electric
MFE-B.J 352 LG: 6.05 ft WT: 48.5 lb OD: 2.244 in

Compact Sonic
MSS-C.K 319 LG: 12.52 ft WT: 72.8 lb OD: 2.244 in

Compact Induction
MAI-B.J 390 LG: 10.81 ft WT: 48.5 lb OD: 2.244 in

Total Length: 68.16 ft Weight: 526.9 lb



All measurements relative to tool zero.

COMPANY	MURFIN DRILLING COMPANY, INC.
WELL	COLUMBINE #8-24
FIELD	WILDCAT
PROVINCE/COUNTY	LINCOLN
COUNTRY/STATE	U.S.A. / COLORADO

Elevation Kelly Bushing	5393	feet	First Reading	8553.00	feet
Elevation Drill Floor	5391	feet	Depth Driller	8574.00	feet
Elevation Ground Level	5380	feet	Depth Logger	8566.00	feet



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