Weatherford®

# COMPACT PHOTO DENSITY COMPENSATED NEUTRON MICRORESISTIVITY LOG

| | |
|---|---|
| COMPANY | GRAND MESA OPERATING CO. |
| WELL | RIO LOBO 1-30 |
| FIELD | WILDCAT |
| PROVINCE/COUNTY | WASHINGTON |
| COUNTRY/STATE | U.S.A. / COLORADO |
| LOCATION | SHL: 2474' FNL & 610' FWL |

| SEC 30 | TWP 5S | RGE 53W | Other Services |
|---|---|---|---|
| Latitude | | 39.586820 | ARRAY INDUCTION — COMPENSATED SONIC |
| Longitude | | -103.366370 | |
| API Number | | 05-121-11065 | |

Permanent Datum GL, Elevation 5138 feet
Log Measured From KB, 19.00 feet above Permanent Datum
Drilling Measured From KB

| Elevations: | feet |
|---|---|
| KB | 5157.00 |
| DF | 5157.00 |
| GL | 5138.00 |

| | | | | |
|---|---|---|---|---|
| Date | 04-JUL-2017 | | | |
| Run Number | ONE | | | |
| Service Order | 8367-186414219 | | | |
| Depth Driller | 8099.00 | feet | | |
| Depth Logger | 8095.00 | feet | | |
| First Reading | 8051.00 | feet | | |
| Last Reading | 376.00 | feet | | |
| Casing Driller | 386.00 | feet | | |
| Casing Logger | 386.00 | feet | | |
| Bit Size | 7.875 | inches | | |
| Hole Fluid Type | CHEMICAL | | | |
| Density / Viscosity | 9.40 lb/USg | | 76.00 CP | |
| PH / Fluid Loss | --- | | --- | |
| Sample Source | FLOWLINE | | | |
| Rm @ Measured Temp | 1.20 @ 50.0 | ohm-m | | |
| Rmf @ Measured Temp | 0.96 @ 50.0 | ohm-m | | |
| Rmc @ Measured Temp | 1.44 @ 50.0 | ohm-m | | |
| Source Rmf / Rmc | CALC | | CALC | |
| Rm @ BHT | 0.347 @183.0 | ohm-m | | |
| Time Since Circulation | 12 HOURS | | | |
| Max Recorded Temp | 183.00 | deg F | | |
| Equipment / Base | 13174 | | CASPER | |
| Recorded By | ANDREW EASTAUGHFFE | | | |
| Witnessed By | KENT MATSON | | | |

## BOREHOLE RECORD

Last Edited: 05-JUL-2017 02:23

| Bit Size inches | Depth From feet | Depth To feet |
|---|---|---|
| 7.875 | 386.00 | 8099.00 |

## CASING RECORD

| Type | Size inches | Depth From feet | Shoe Depth feet | Weight pounds/ft |
|---|---|---|---|---|
| SURFACE | 8.625 | 0.00 | 386.00 | 24.00 |

## REMARKS

- SOFTWARE: LOGGED WITH WLS 17.01.7206

- RUN ONE: MAI, MFE, MSS, SKJ, MISE, SKJ, MISD, MPD, MDN, MMR(MML), MCG, SHA, MTA, CBH RUN IN COMBINATION.
  - HARDWARE: MDN: DUAL BOWSPRING ECCENTRALIZER
    MPD: 8 INCH PROFILE PLATE
    MFE: 1 X 0.5 INCH STANDOFF
    MSS: 3 X 0.5 INCH STANDOFFS
    MAI 1 X 0.5 INCH STANDOFF AT TOP, 1 X 0.5 INCH PINEAPPLE STANDOFF AT BOTTOM.

- RUN TWO: HFS, MISD, MIE, MIM, MCG, SHA, MTA, CBH RUN IN COMBINATION.
  HARDWARE: MIM: OVERBODY CENTRALIZER BASKET
  MIE: PROTECTIVE STANDOFF AT BASE

- 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: 3440 CU.FT.

- ANNULAR HOLE VOLUME WITH 5.5 INCH PRODUCTION CASING FROM TD TO SURFACE CASING: 2190 CU.FT.

- LATITUDE: 39.586820

- LONGITUDE: -103.366370

- MAG DEC FROM NOAA WEBSITE:  7.38 DEG EAST

- RIG: WW DRILLING #20.

- ENGINEER: A. A. EASTAUGHFFE

- OPERATOR: P. B. MEYER

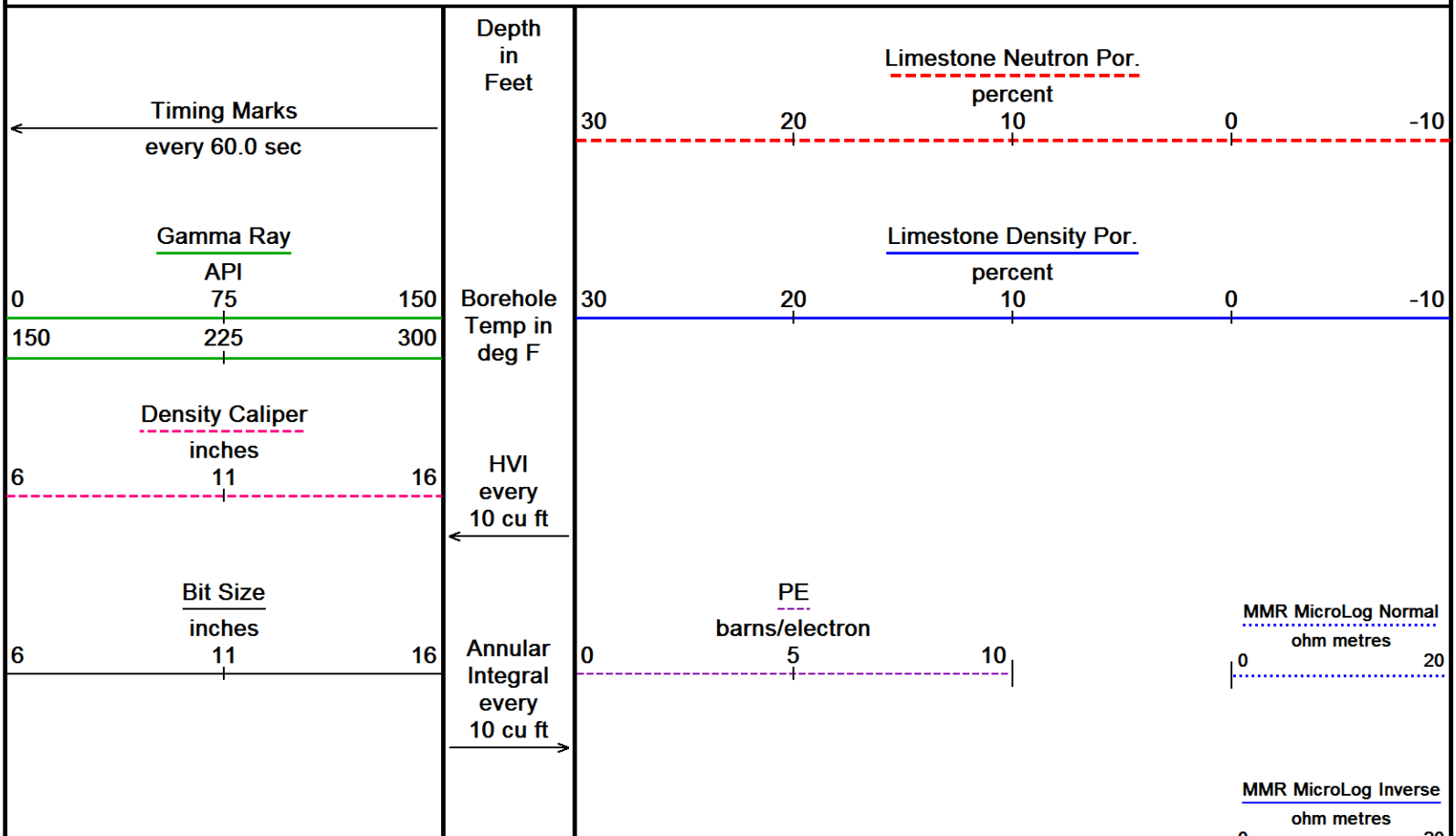


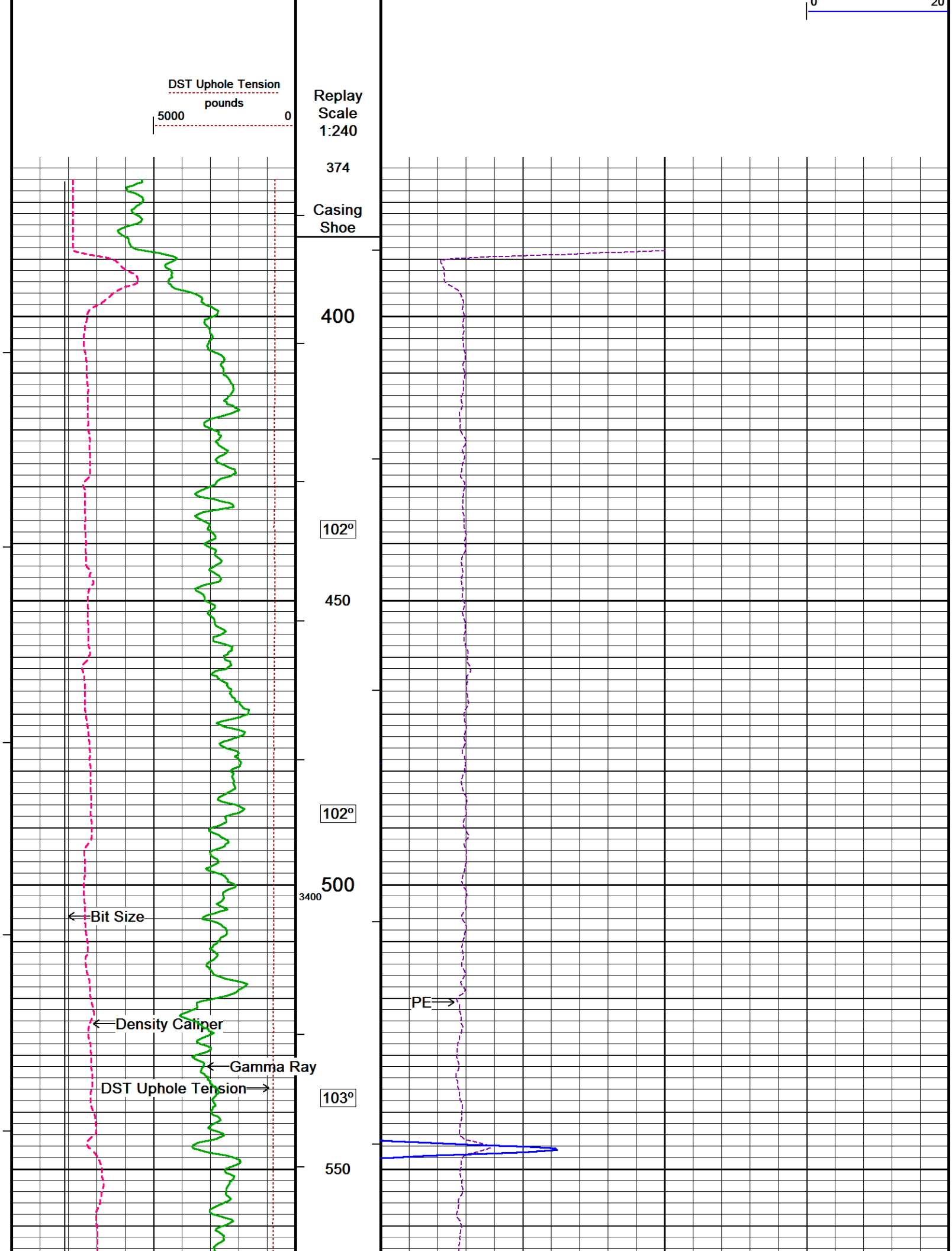
## 5 INCH LIMESTONE MAIN

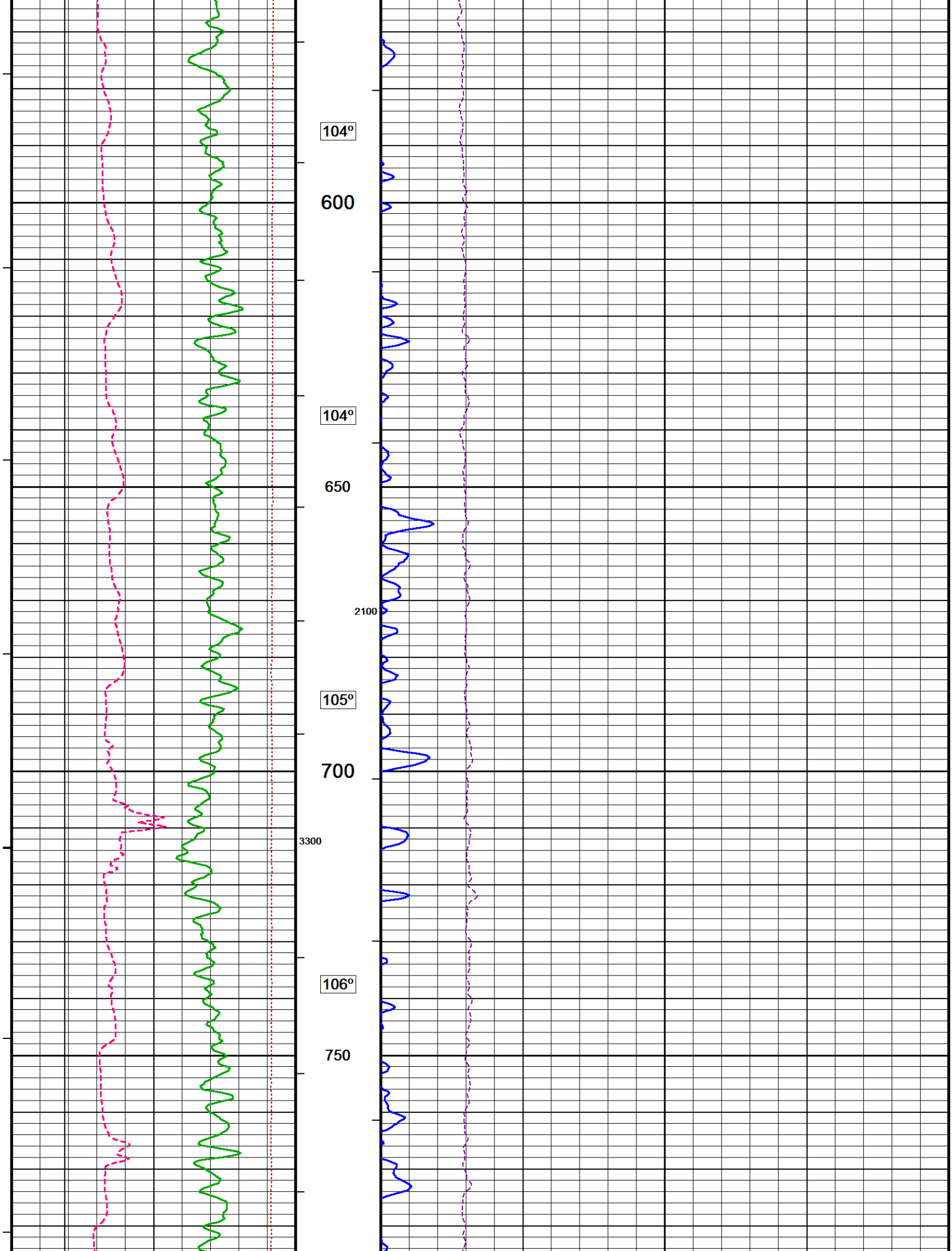
Depth Based Data - Maximum Sampling Increment  10.0cm — Plotted on 05-JUL-2017 13:24

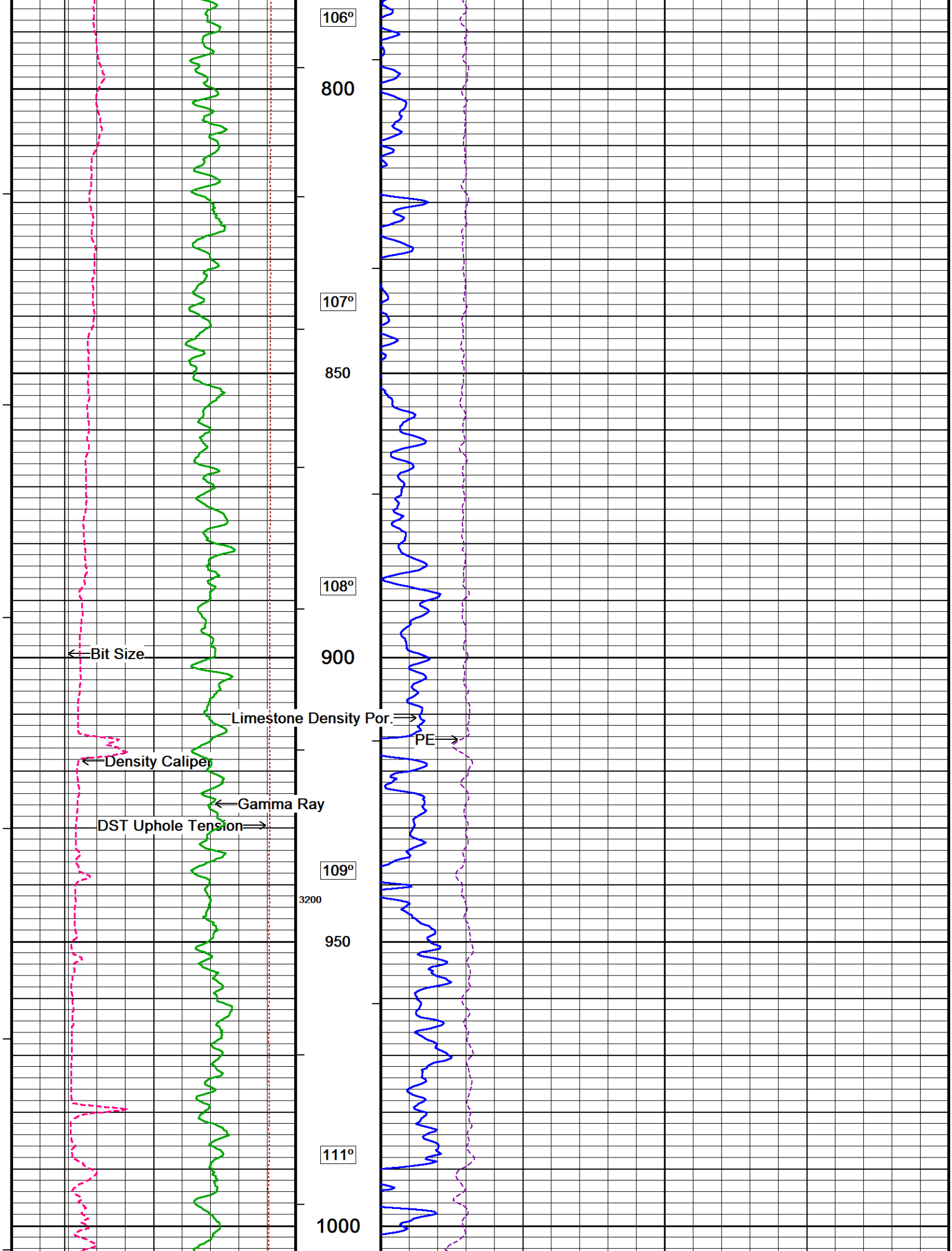
Filename: C:\Logs\GRAND MESA OPERATING\RIO LOB...\MAIN PASS QUAD COMBO SPLICED.dta — Recorded on 05-JUL-2017 02:31

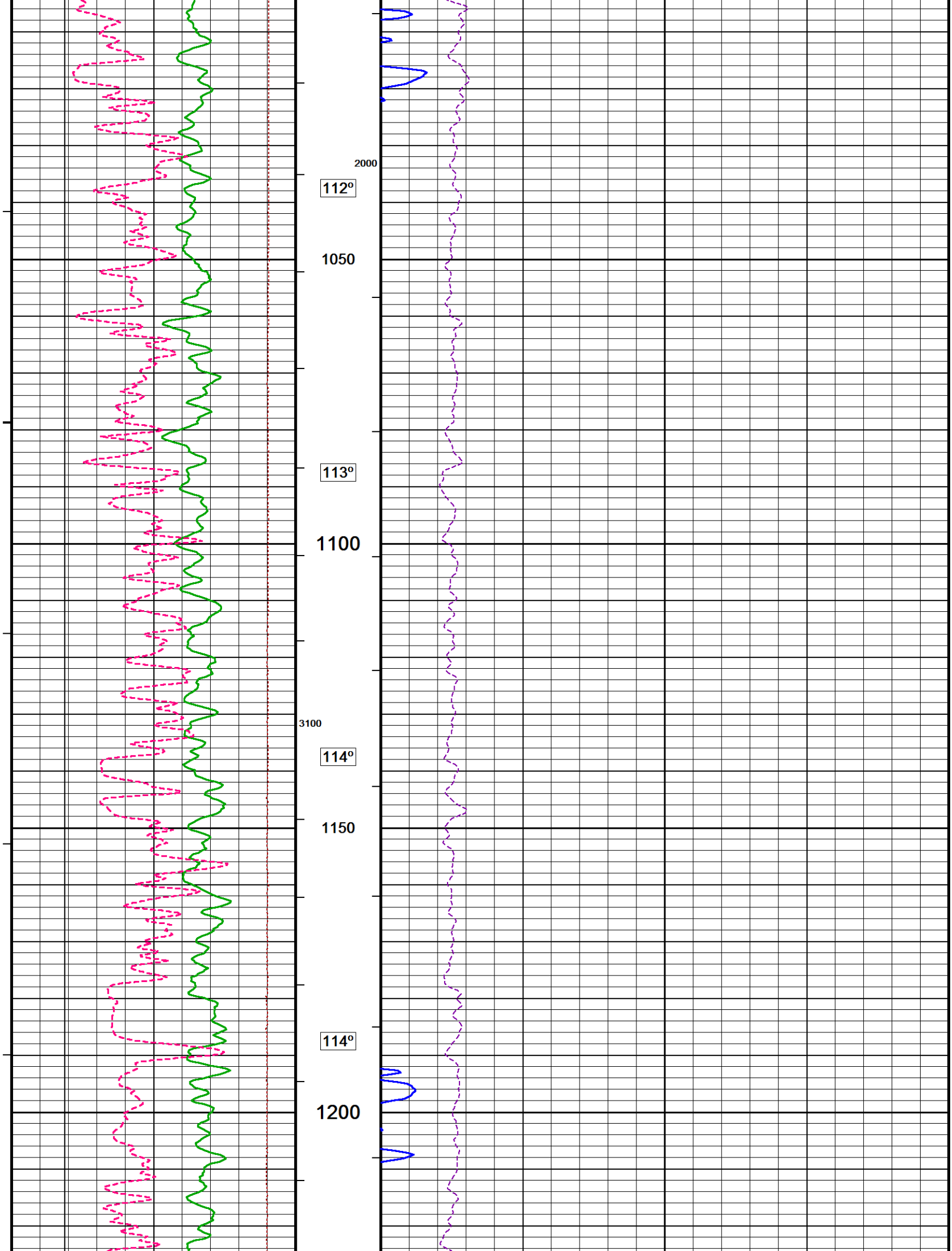
System Versions:  Processed with  17.01.7206  Plotted with  17.01.7206

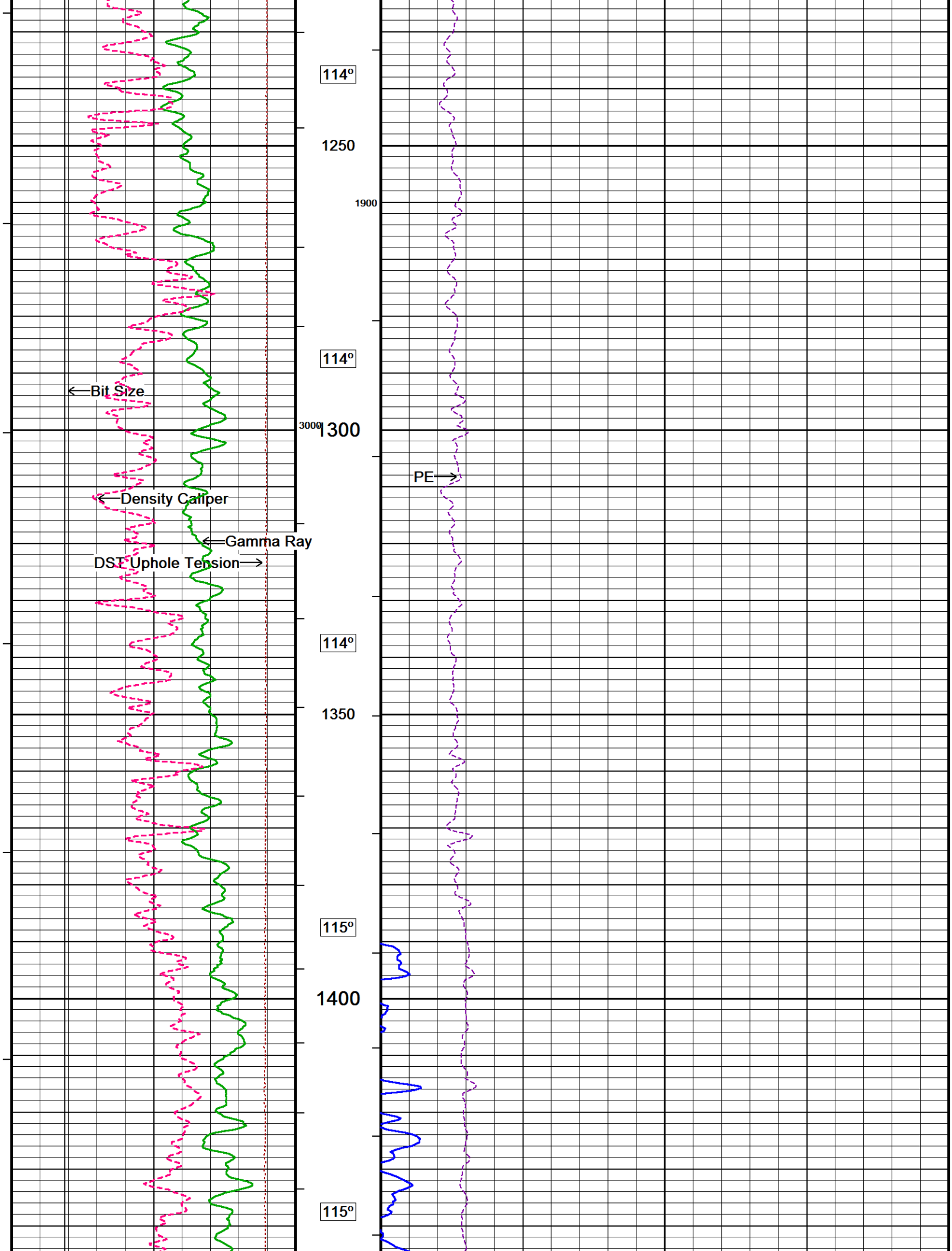


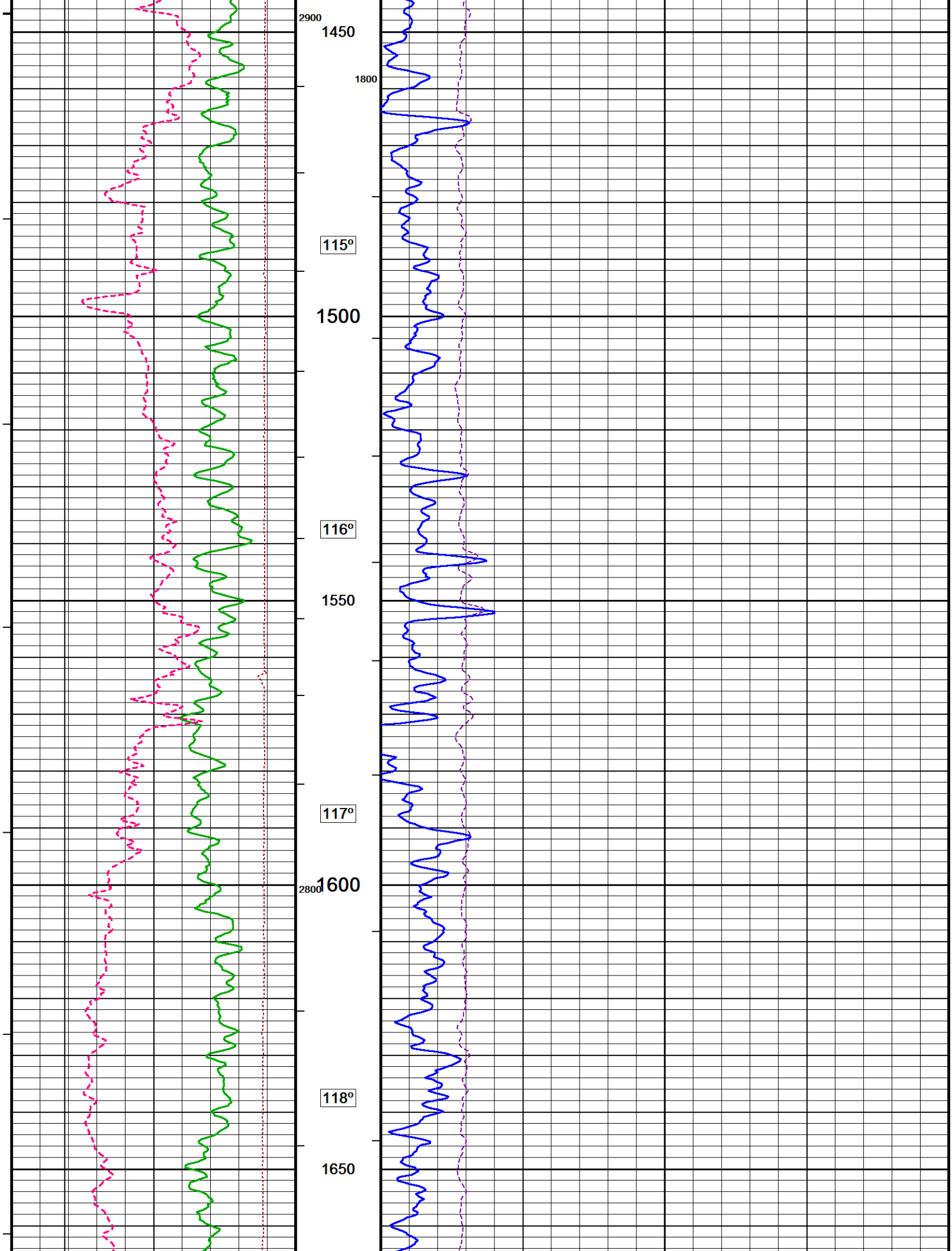

DST Uphole Tension
pounds
5000
0
Replay
Scale
1:240
374
Casing
Shoe
400
102°
450
102°
500
3400
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
103°
550
PE
0
20

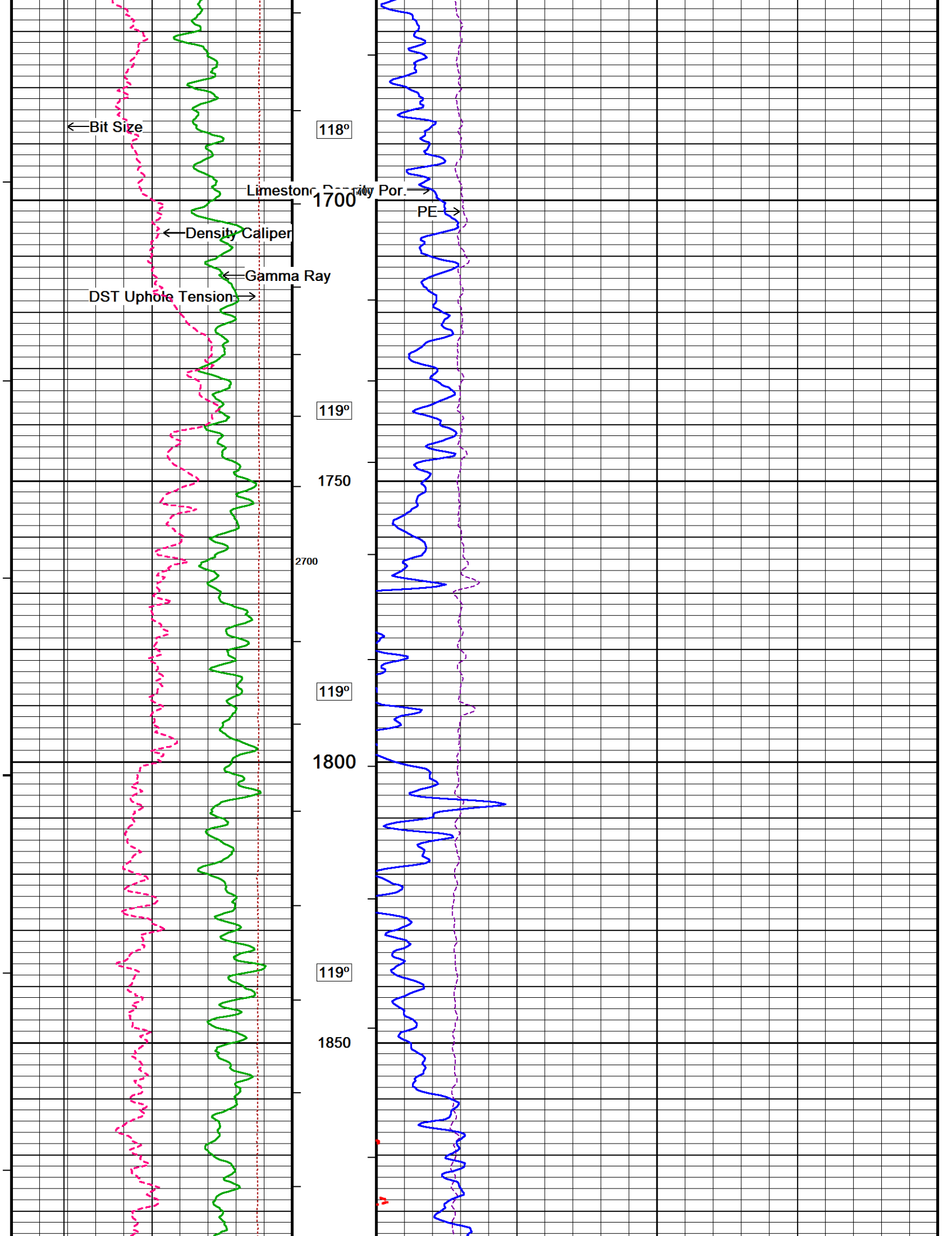

104°
600
104°
650
2100
105°
700
3300
106°
750

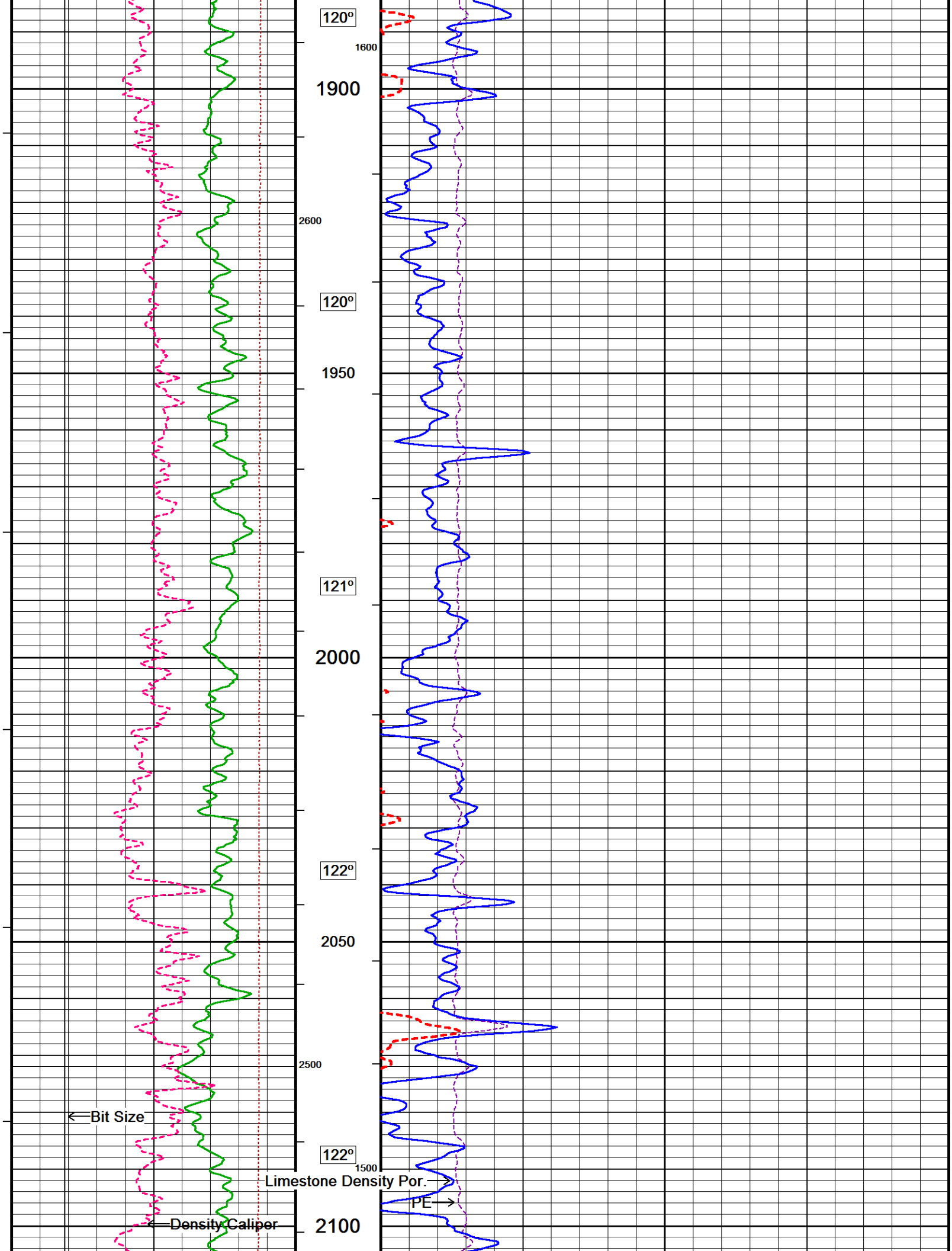

106°
800
107°
850
108°
900
109°
3200
950
111°
1000
Bit Size
Limestone Density Por.
PE
Density Caliper
Gamma Ray
DST Uphole Tension

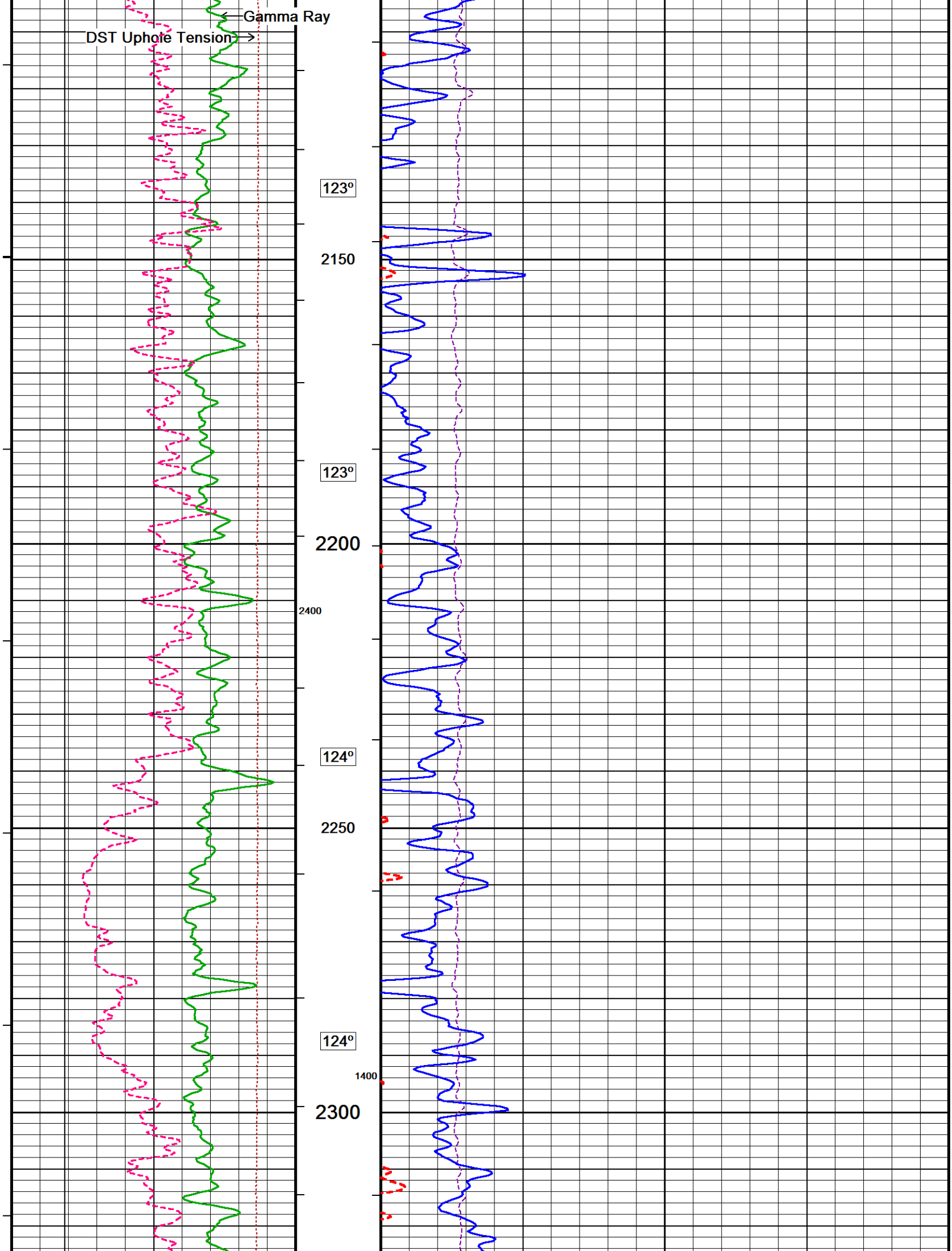

2000
112°
1050
113°
1100
3100
114°
1150
114°
1200

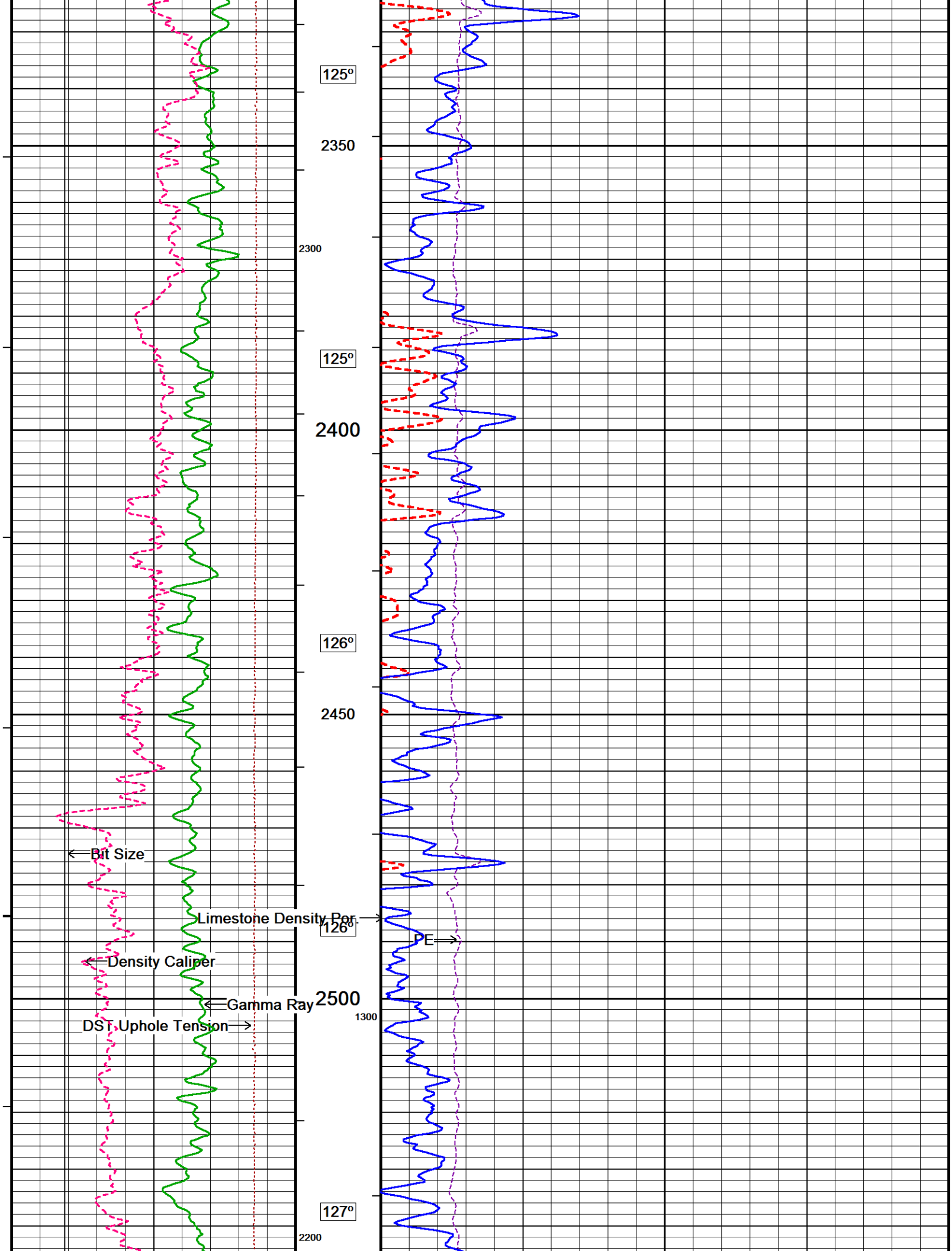

114°
1250
1900
114°
←Bit Size
3000
1300
PE→
←Density Caliper
←Gamma Ray
DST Uphole Tension→
114°
1350
115°
1400
115°

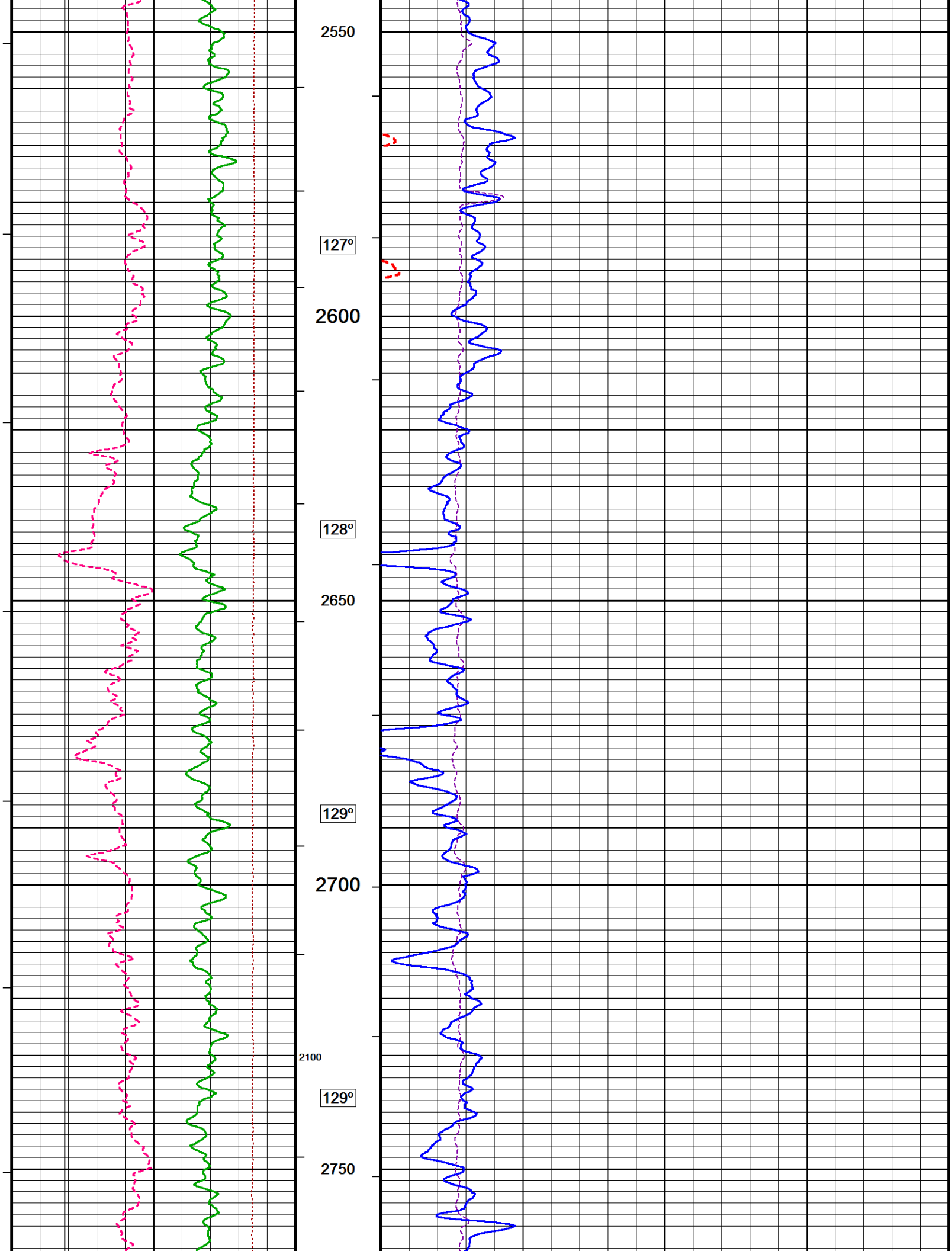

2900
1450
1800
115°
1500
116°
1550
117°
2800
1600
118°
1650


Bit Size
118°
Limestone Density Por.
1700
PE
Density Caliper
Gamma Ray
DST Uphole Tension
119°
1750
2700
119°
1800
119°
1850


120°
1600
1900
2600
120°
1950
121°
2000
122°
2050
2500
122°
1500
2100
⟸Bit Size
⟸Density Caliper
Limestone Density Por.⟶
PE⟶


Gamma Ray
DST Uphole Tension
123°
2150
123°
2200
2400
124°
2250
124°
1400
2300


125°
2350
2300
125°
2400
126°
2450
Bit Size
Limestone Density Por
126°
PE
Density Caliper
Gamma Ray
2500
1300
DST Uphole Tension
127°
2200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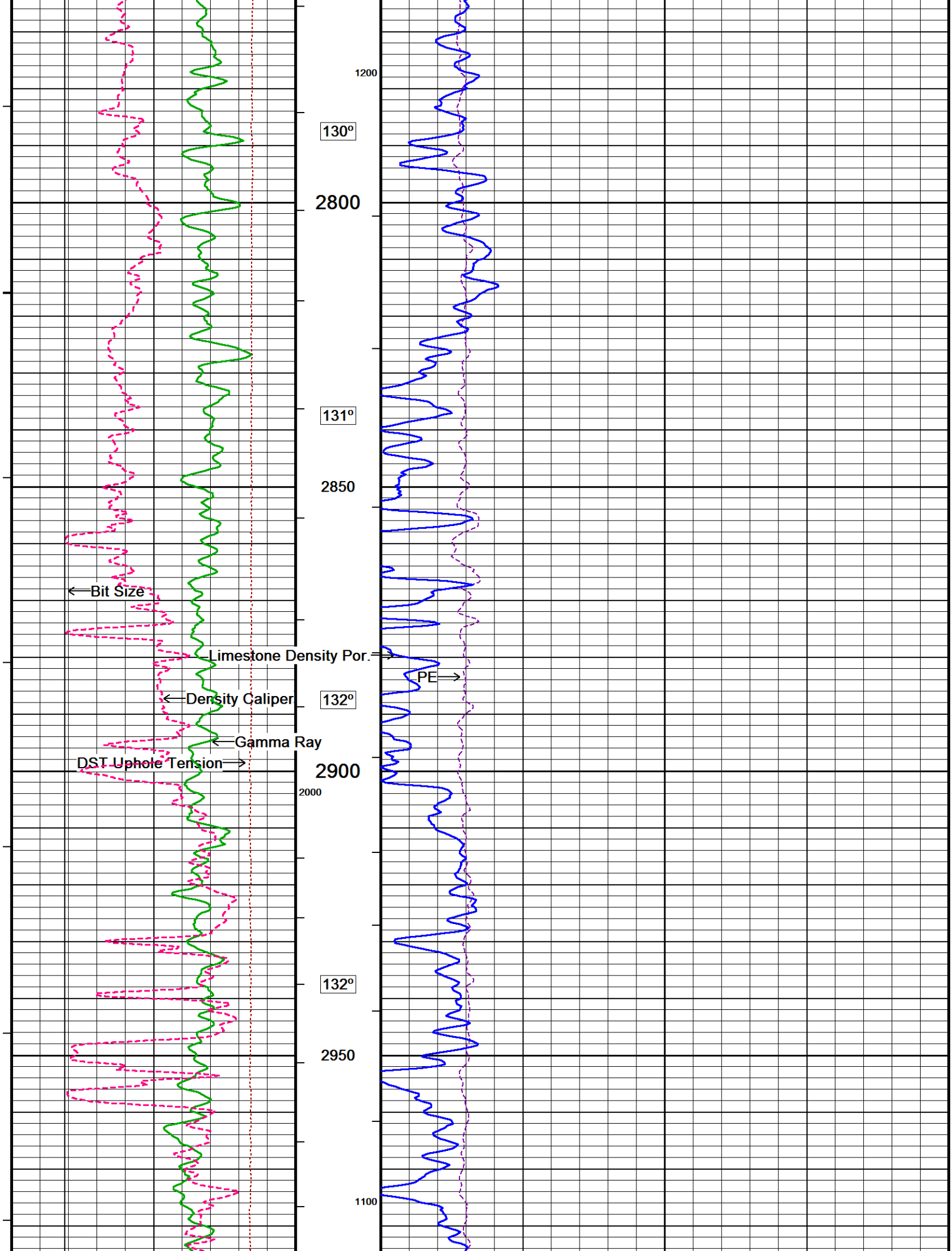
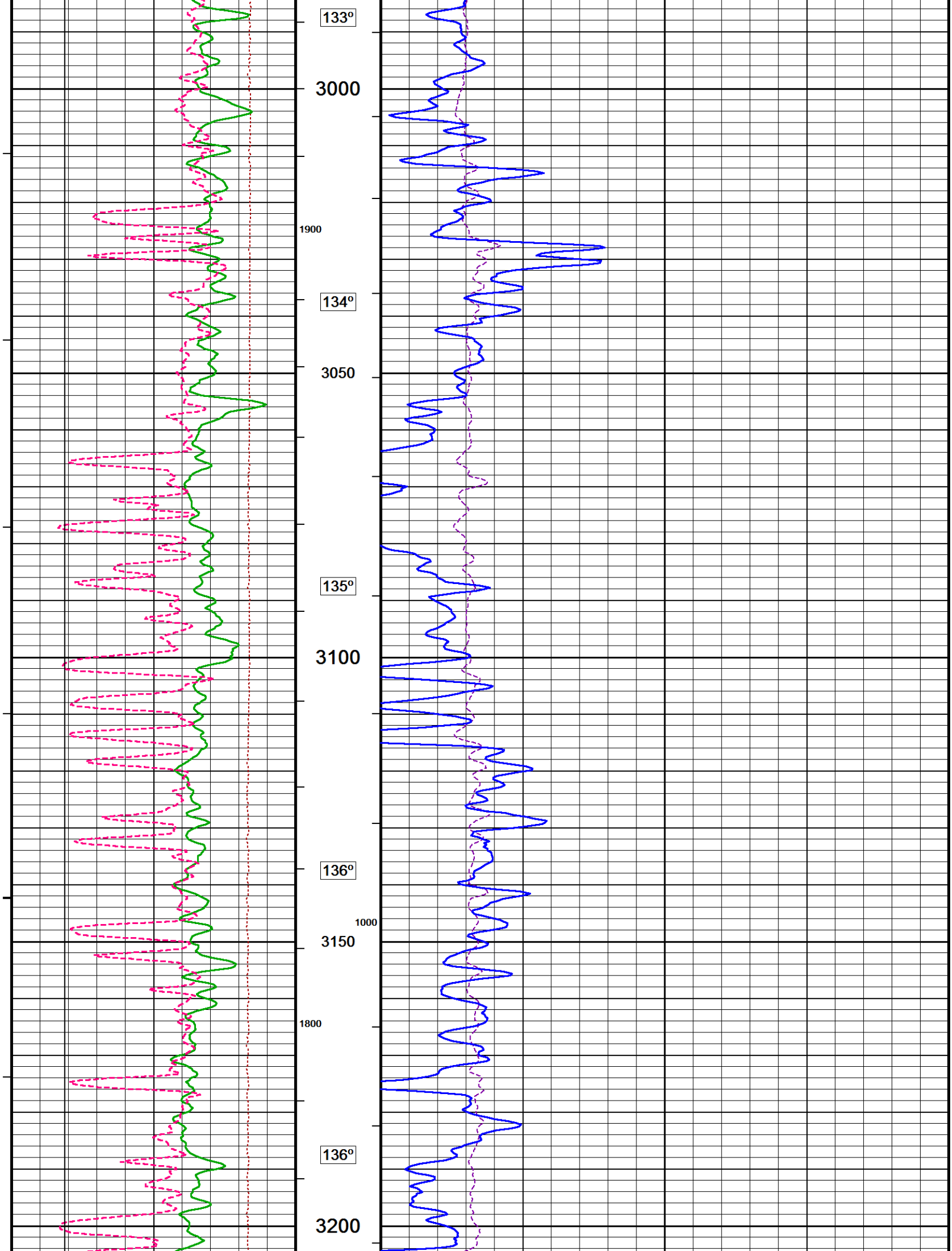
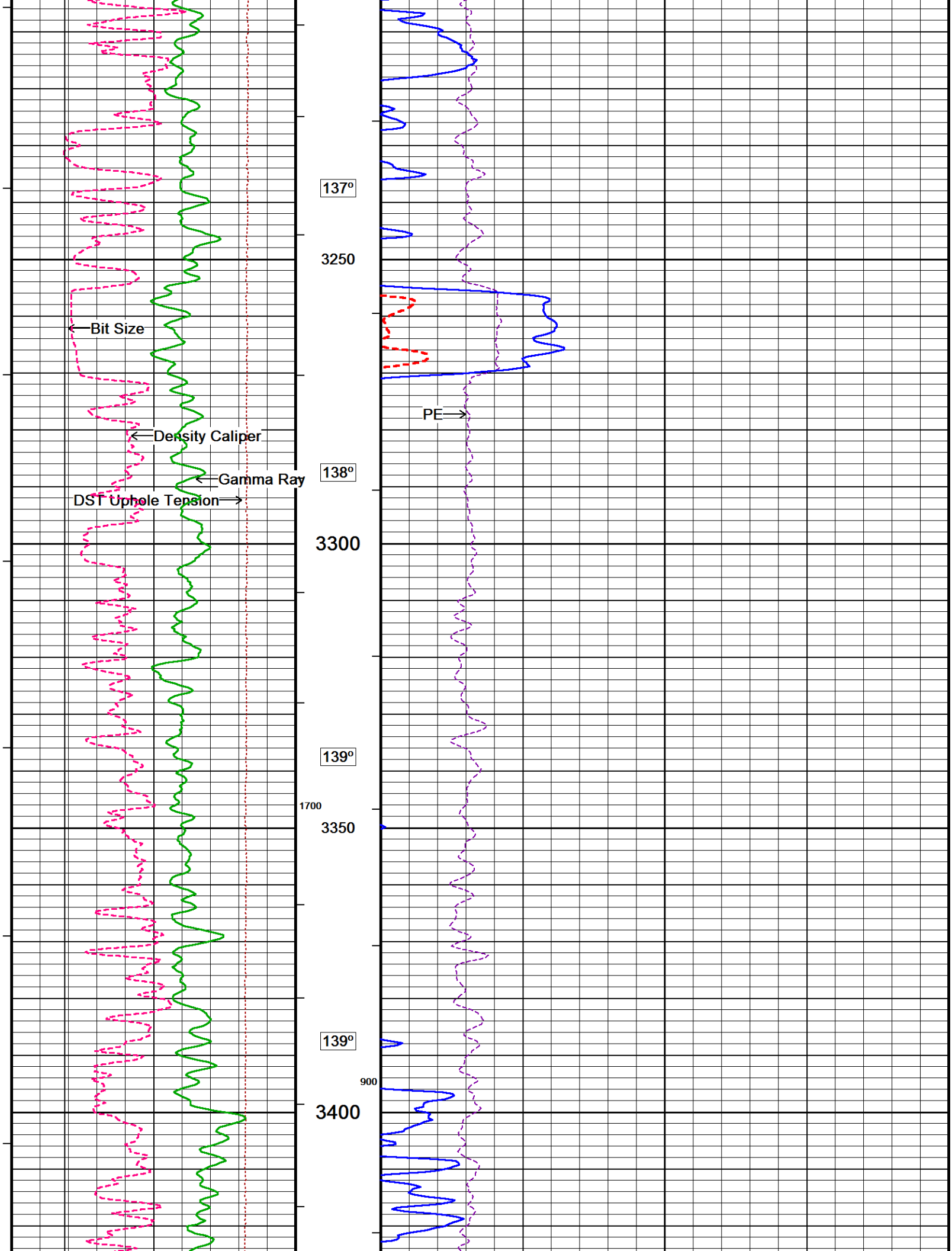
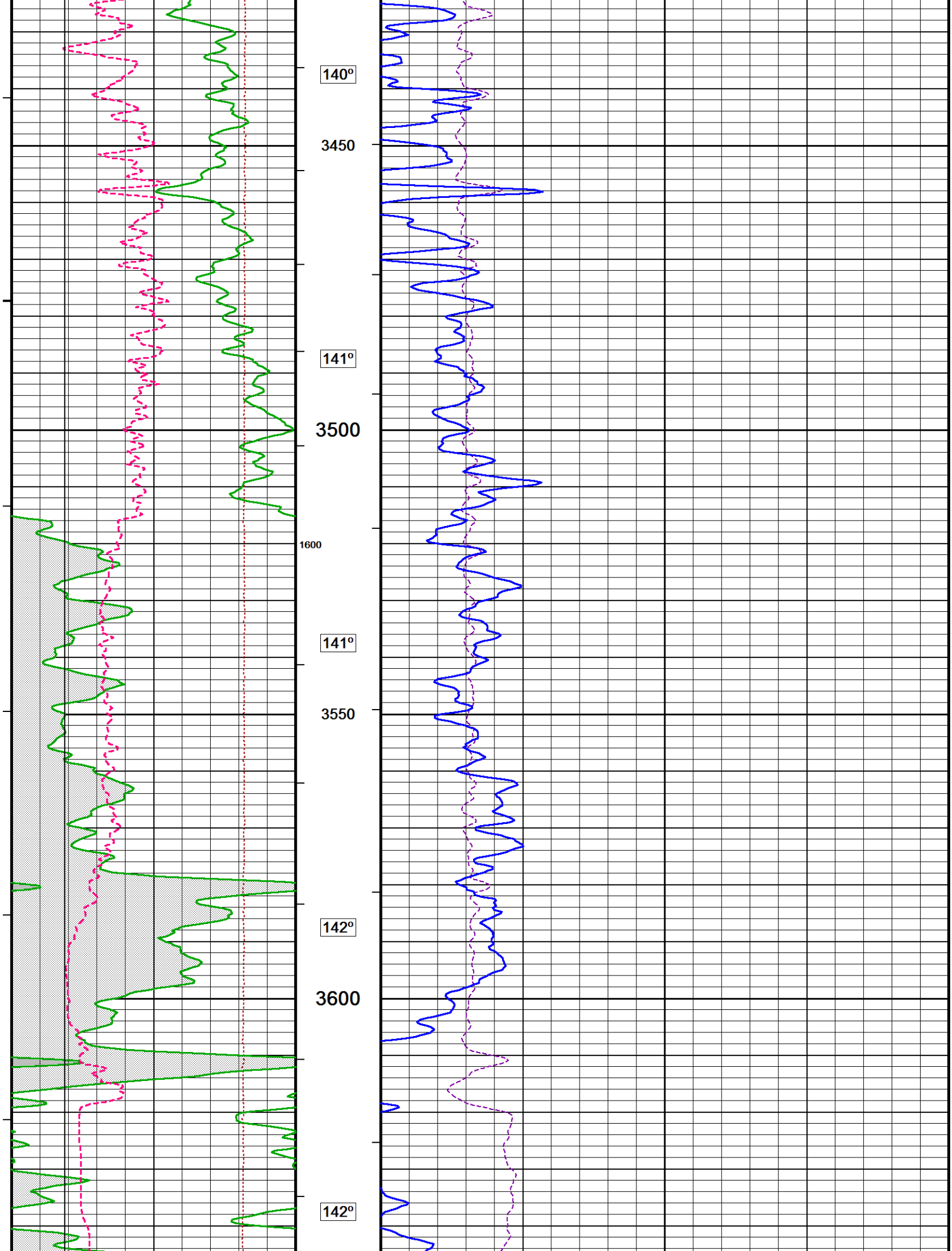
127°
2600
128°
2650
129°
2700
2100
129°
2750


1200
130°
2800
131°
2850
Bit Size
Limestone Density Por.
PE
Density Caliper
132°
Gamma Ray
DST Uphole Tension
2900
2000
132°
2950
1100


133°
3000
1900
134°
3050
135°
3100
136°
1000
3150
1800
136°
3200


137°
3250
Bit Size
PE
Density Caliper
138°
Gamma Ray
DST Uphole Tension
3300
139°
1700
3350
139°
900
3400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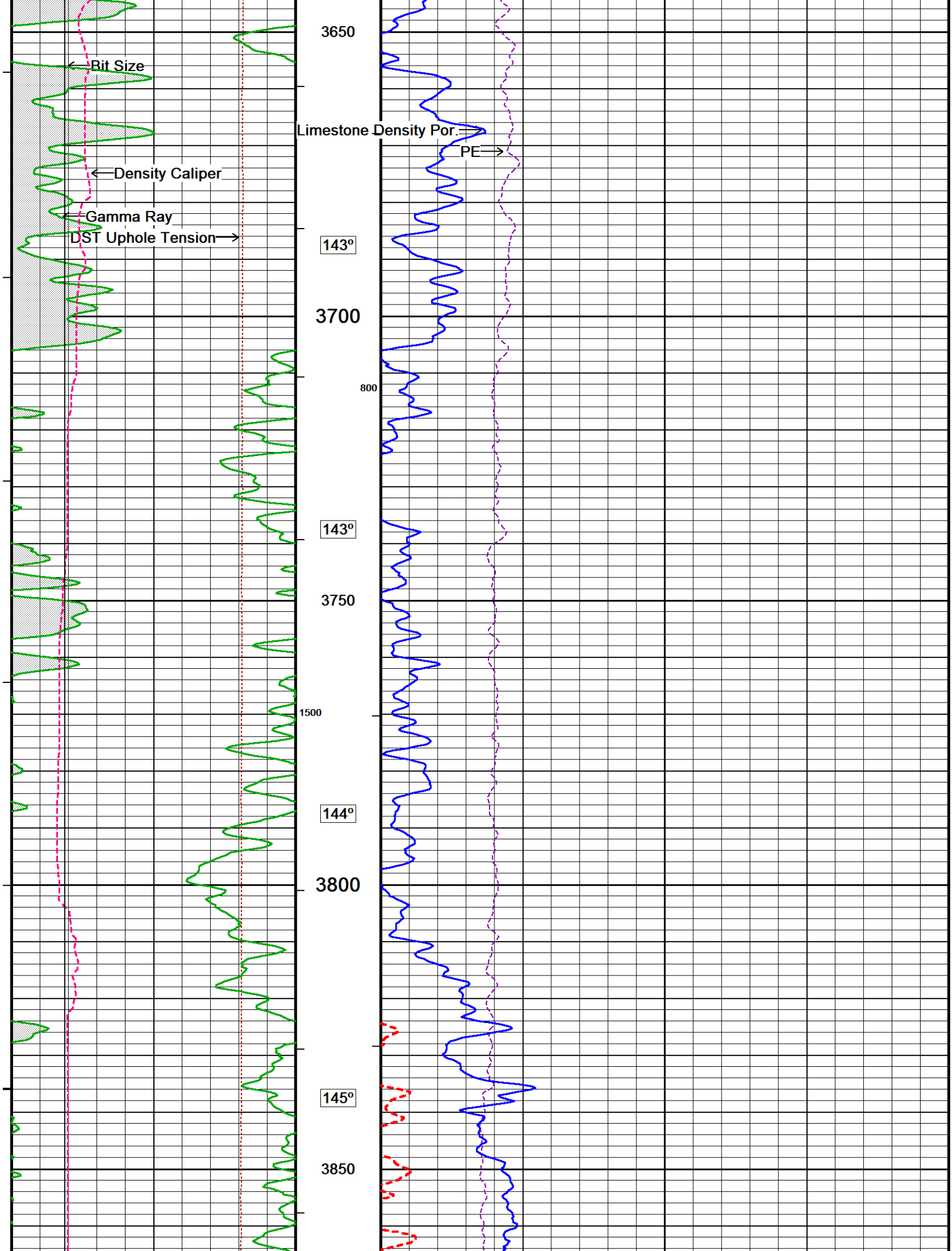
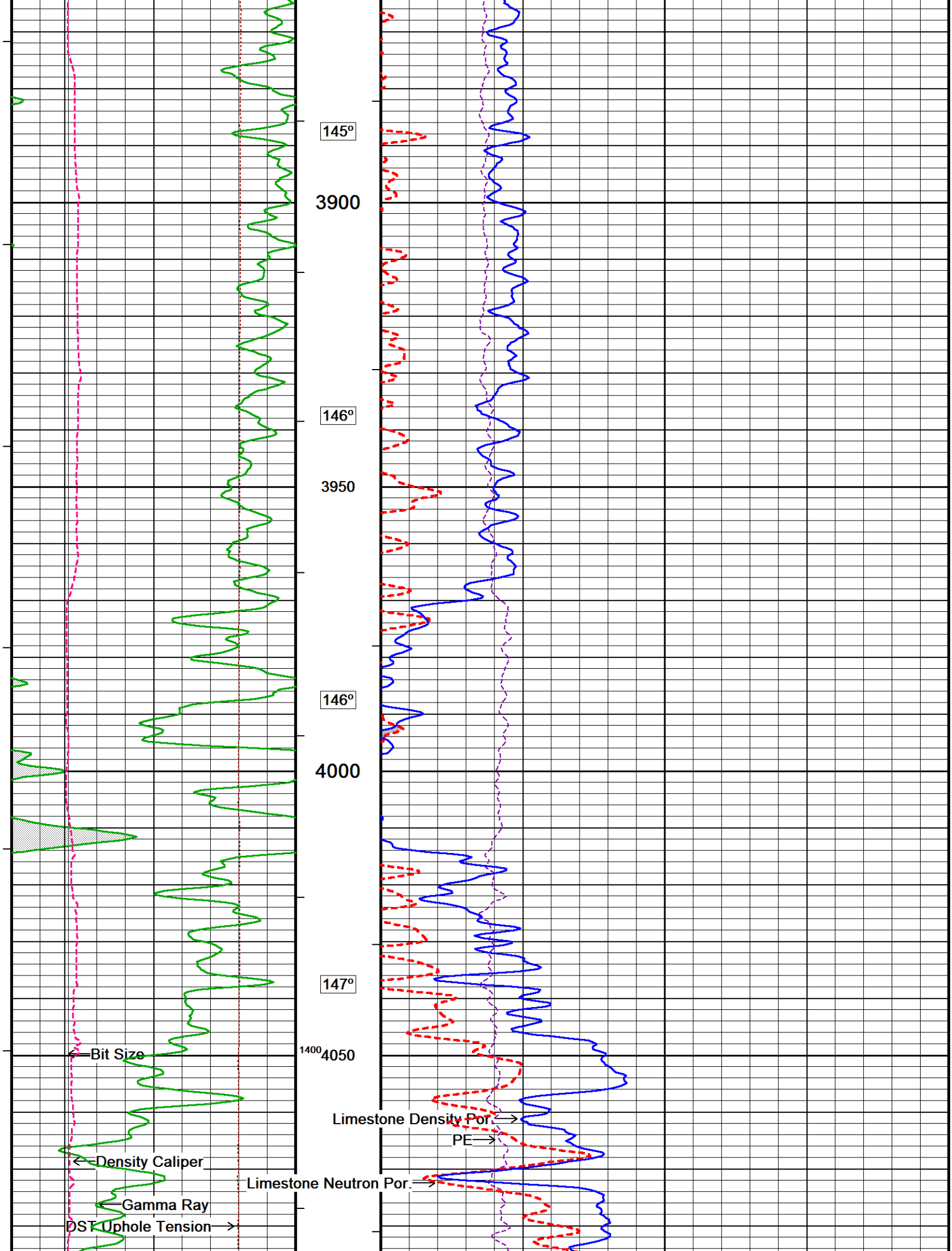
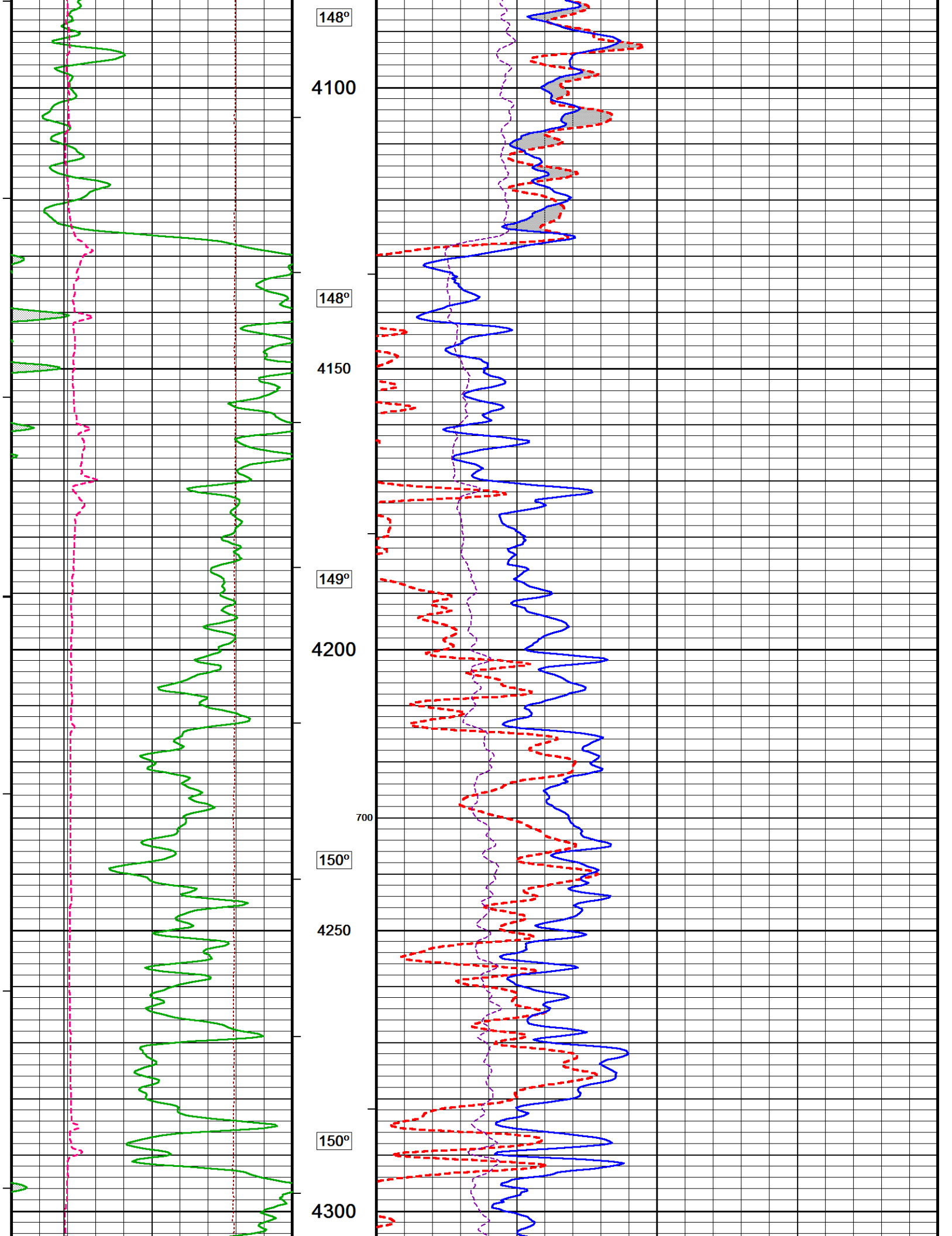
3450
141°
3500
1600
141°
3550
142°
3600
142°


Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
Limestone Density Por
PE
3650
143°
3700
800
143°
3750
1500
144°
3800
145°
3850


145°
3900
146°
3950
146°
4000
147°
1400
4050
←Bit Size
Limestone Density Por→
PE→
←Density Caliper
Limestone Neutron Por→
←Gamma Ray
DST Uphole Tension→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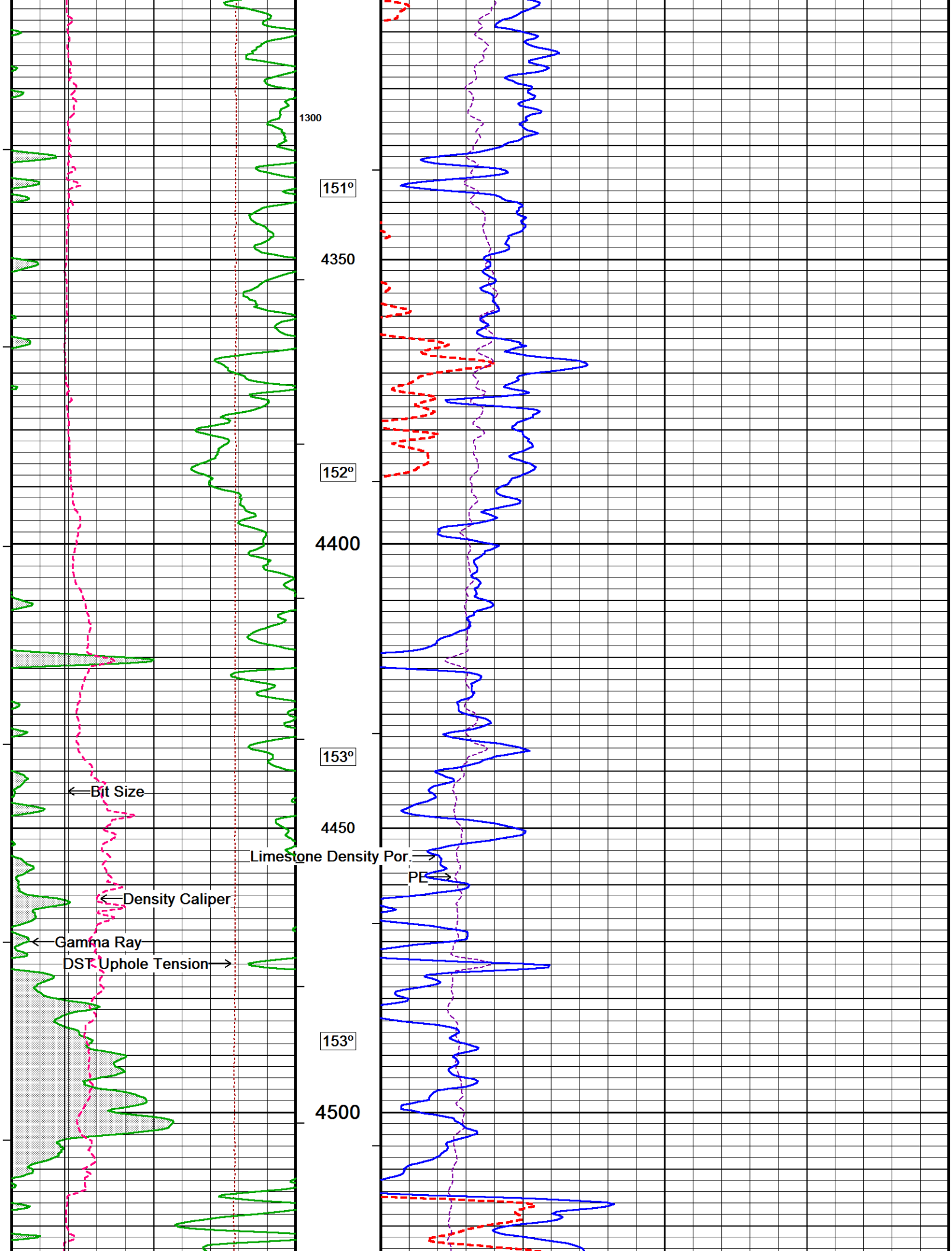
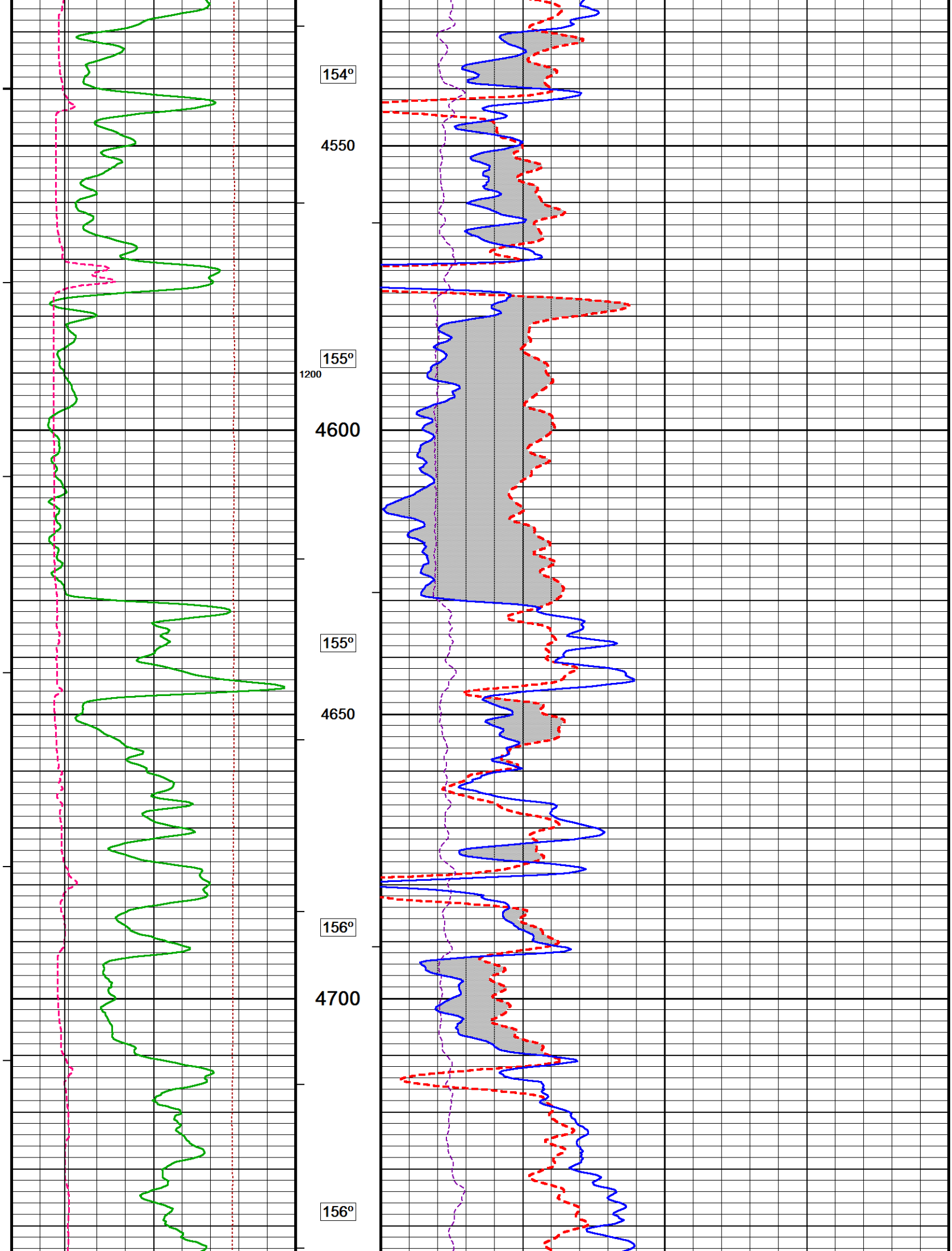
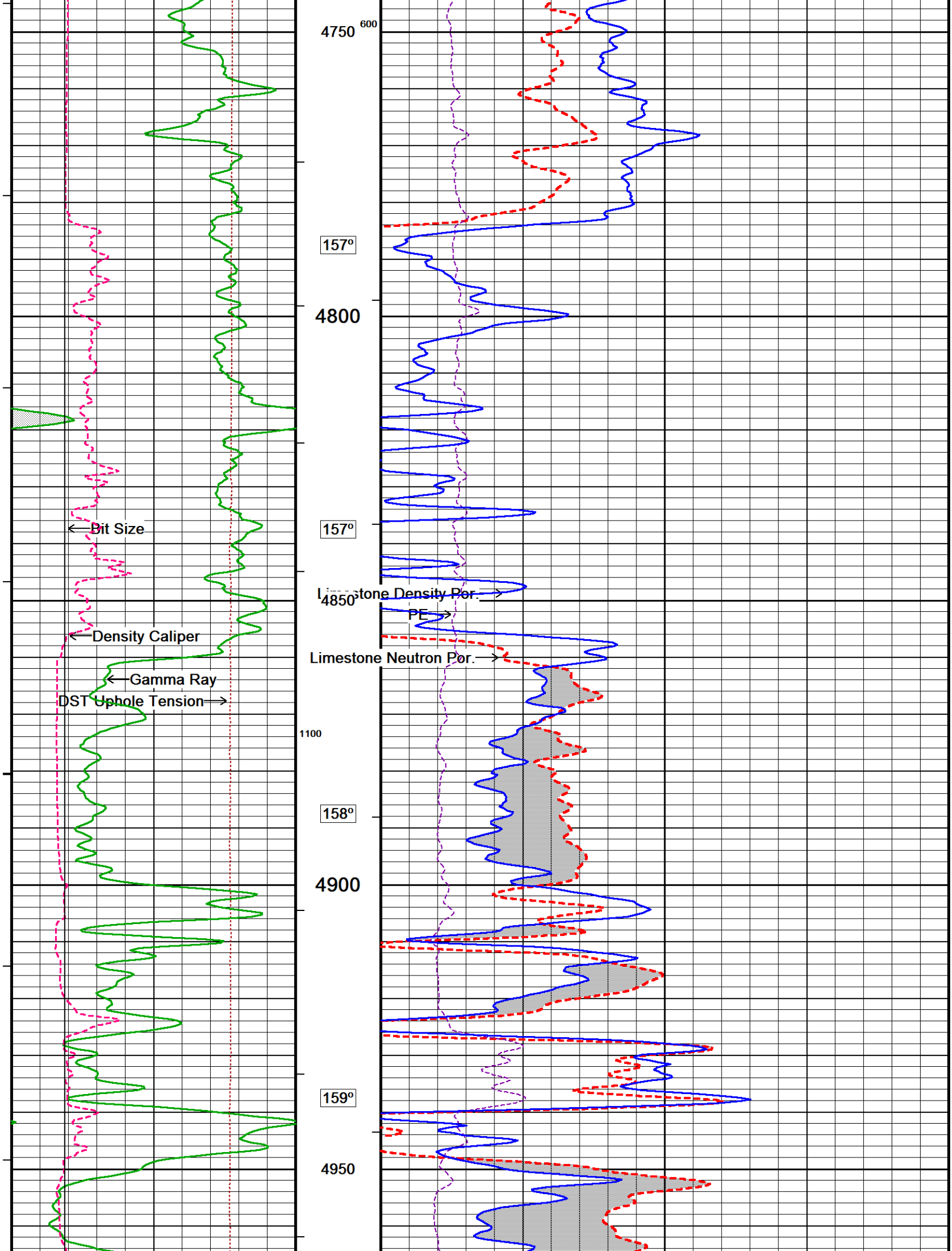
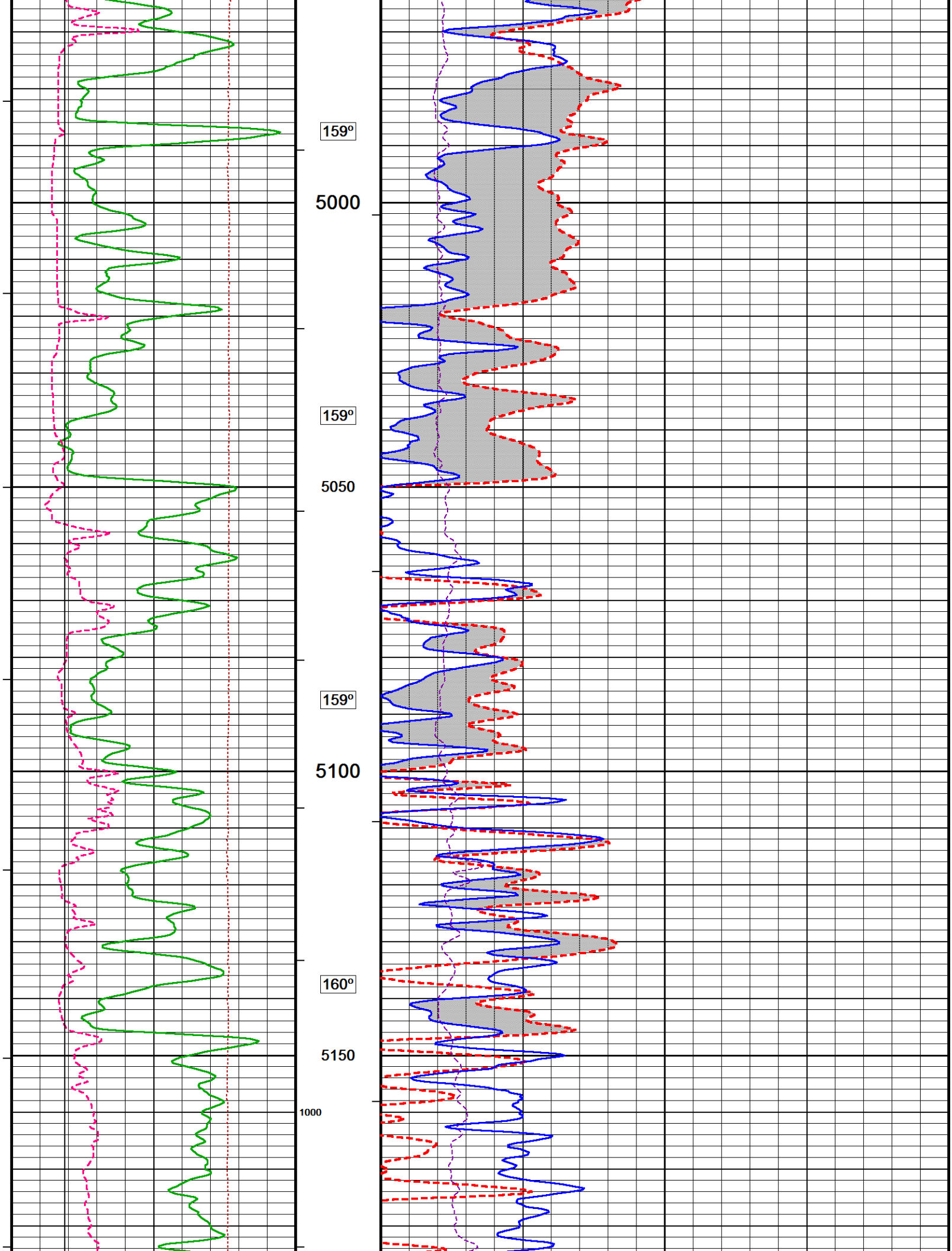
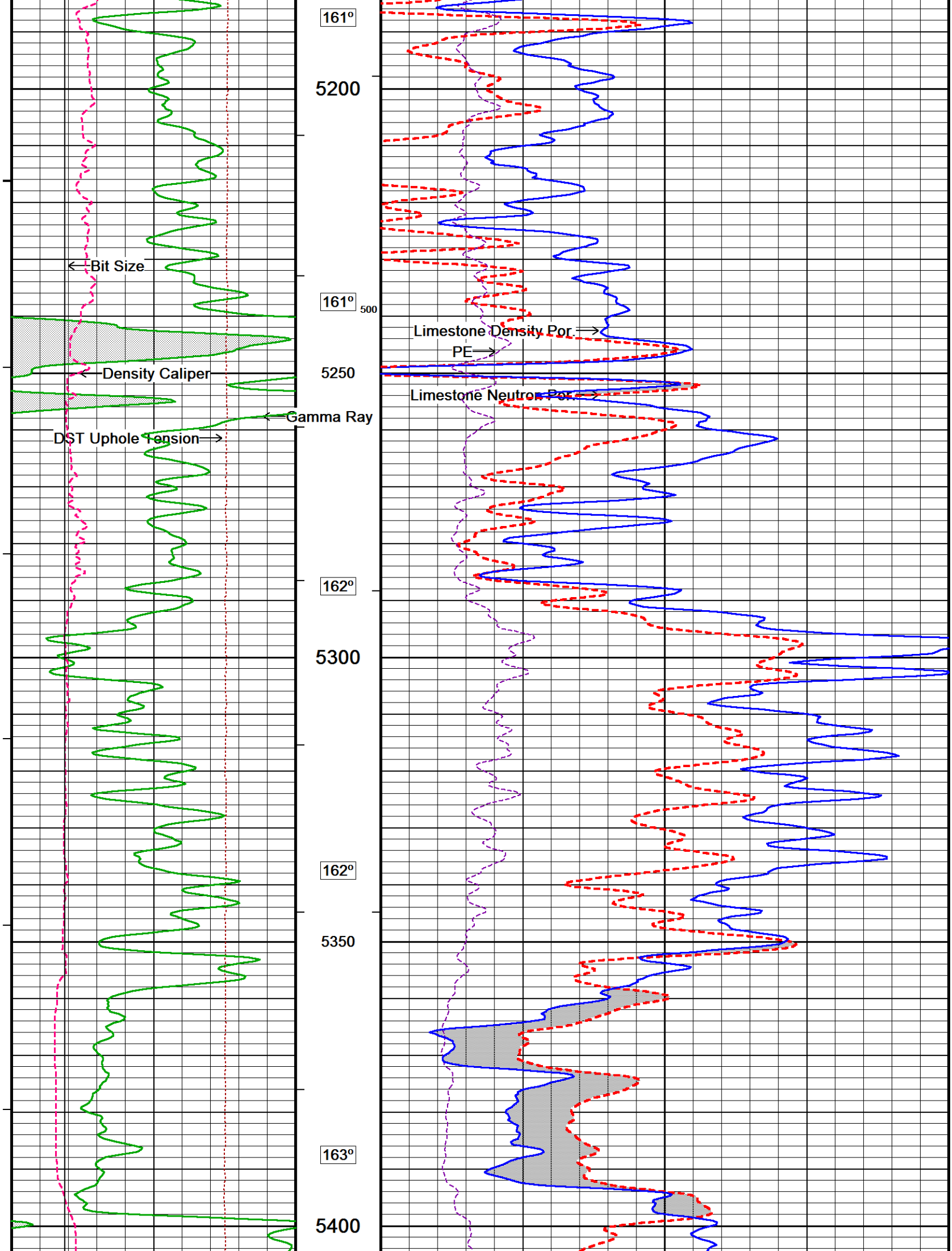
4100
148°
4150
149°
4200
700
150°
4250
150°
4300

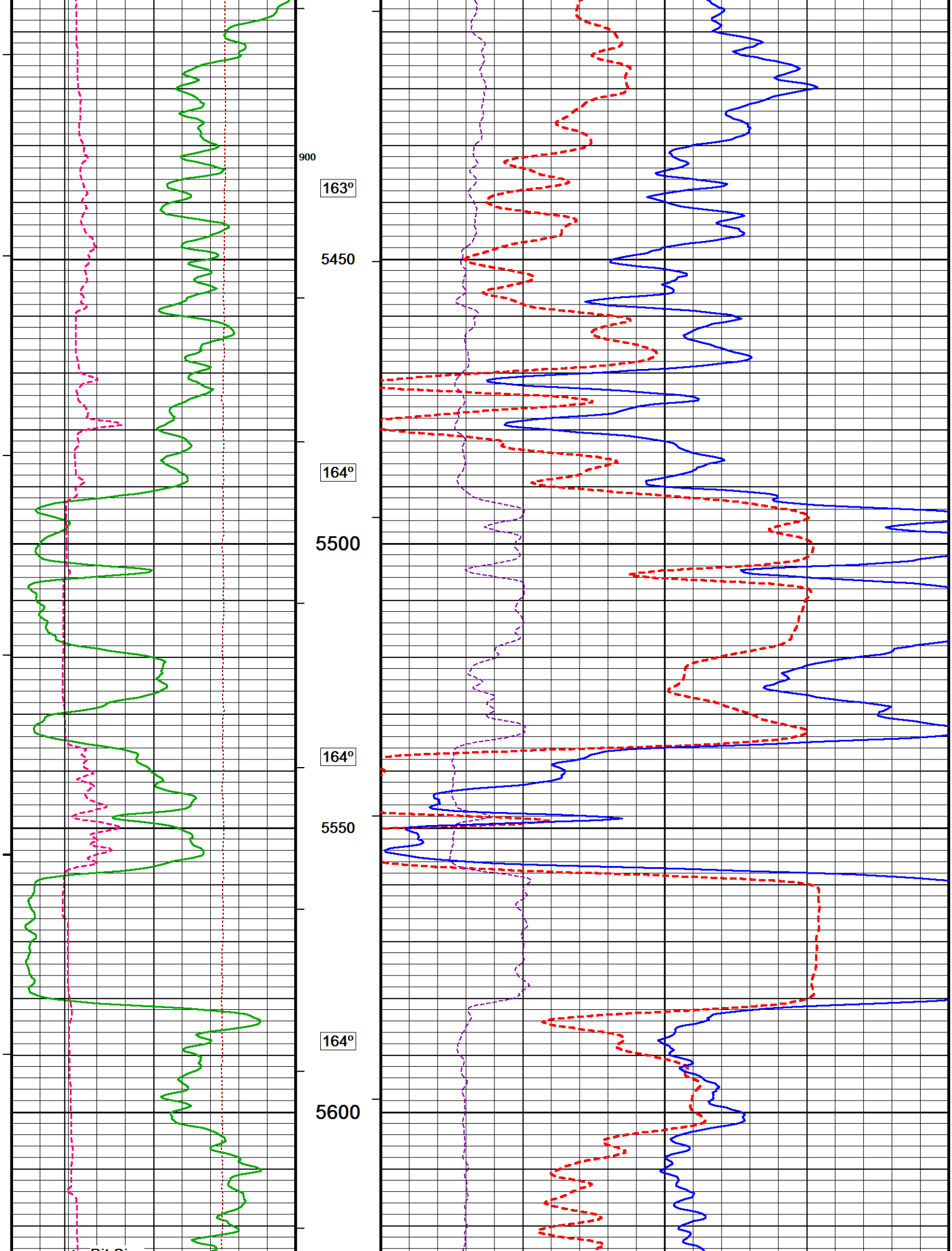

1300
151º
4350
152º
4400
153º
⟸Bit Size
4450
Limestone Density Por⟹
PE⟹
⟸Density Caliper
⟸Gamma Ray
DST Uphole Tension⟹
153º
4500

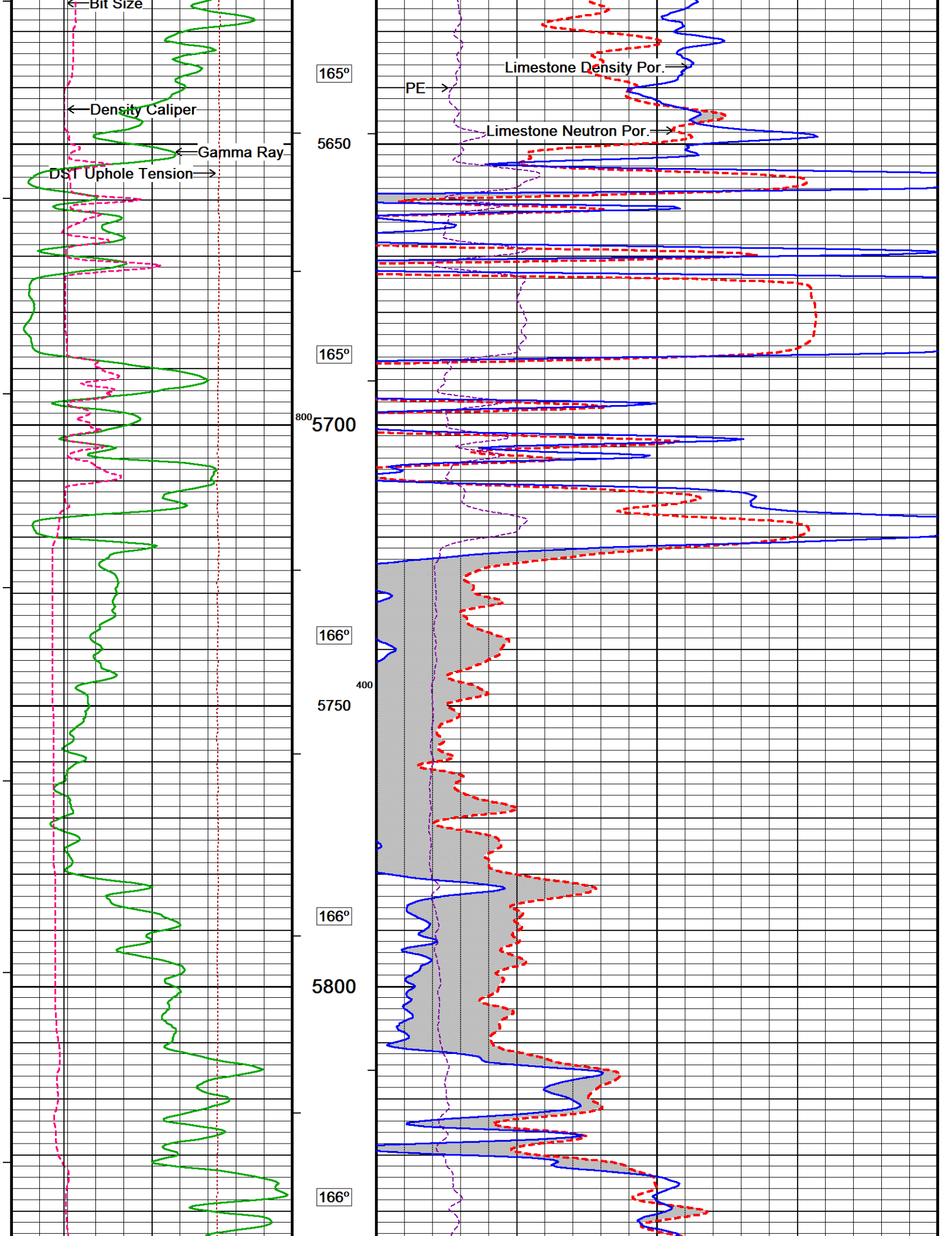

154°
4550
155°
1200
4600
155°
4650
156°
4700
156°

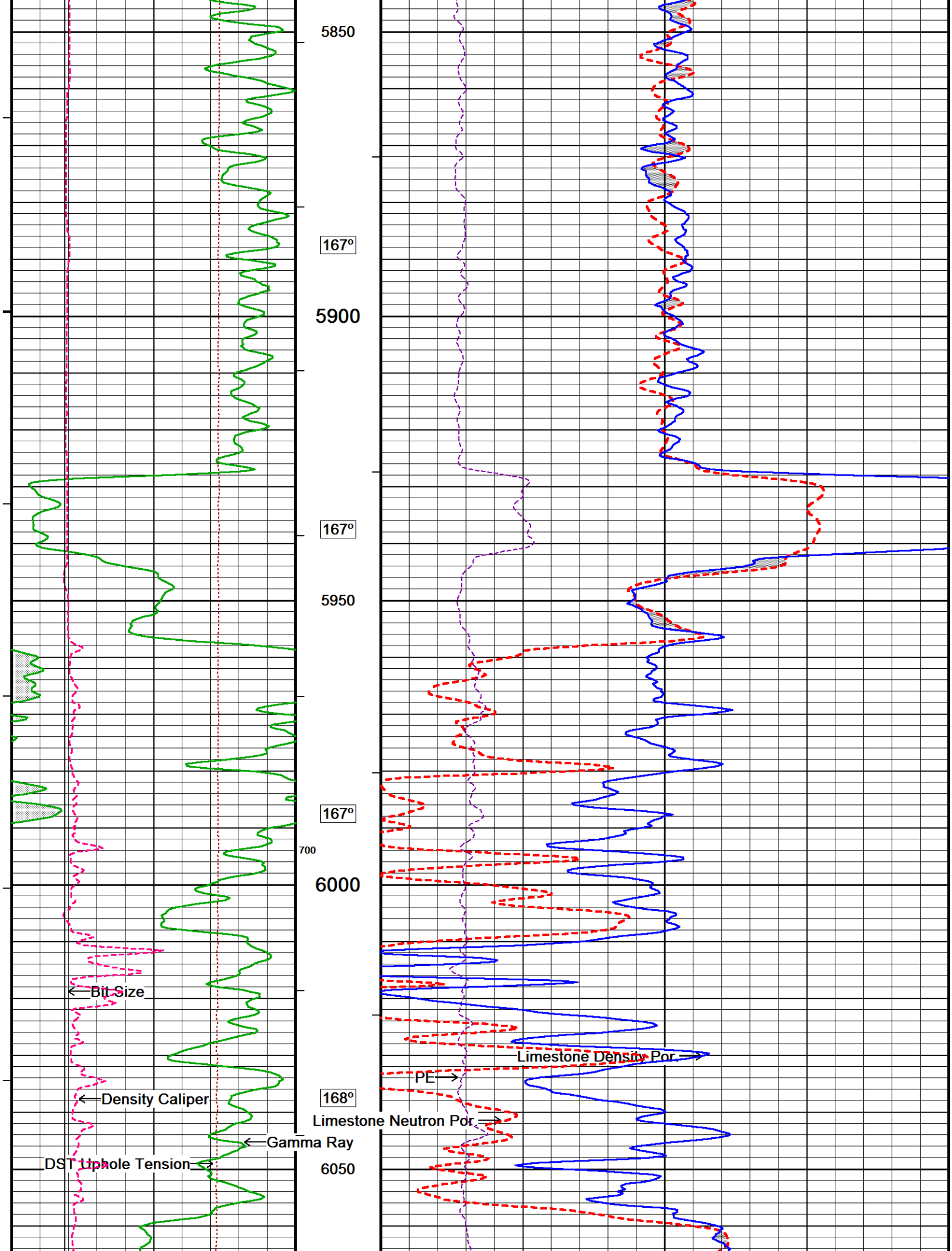

4750
600
157°
4800
157°
4850
Limestone Density Por.
PE
Limestone Neutron Por.
←Bit Size
←Density Caliper
←Gamma Ray
DST Uphole Tension→
1100
158°
4900
159°
4950

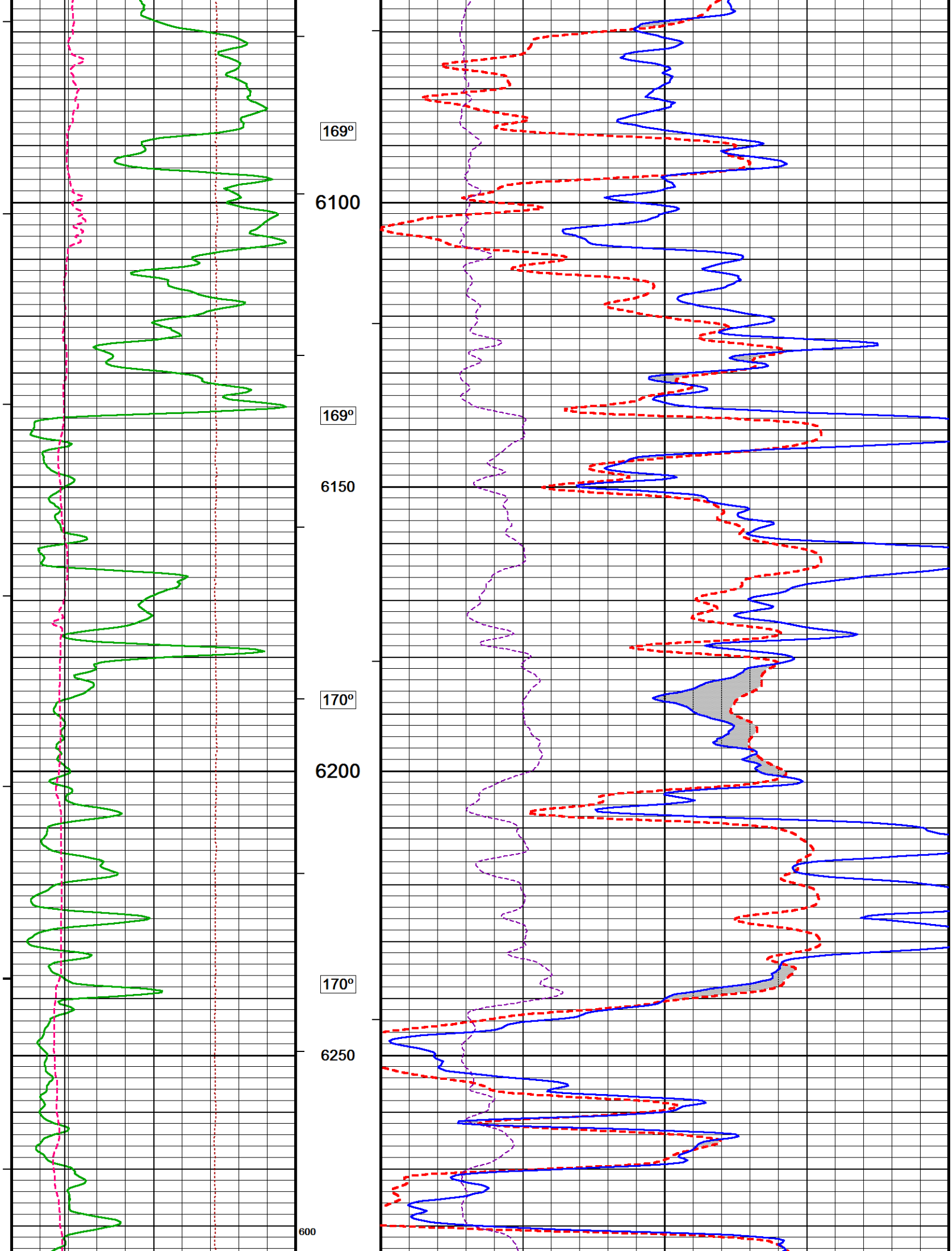

159º
5000
159º
5050
159º
5100
160º
5150
1000


161°
5200
Bit Size
161°
500
Limestone Density Por.
PE
Density Caliper
5250
Limestone Neutron Por.
Gamma Ray
DST Uphole Tension
162°
5300
162°
5350
163°
5400


900
163º
5450
164º
5500
164º
5550
164º
5600


Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
165°
5650
165°
800
5700
166°
400
5750
166°
5800
166°
PE
Limestone Density Por.
Limestone Neutron Por.


5850
167°
5900
167°
5950
167°
700
6000
168°
6050
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
Limestone Density Por
PE
Limestone Neutron Por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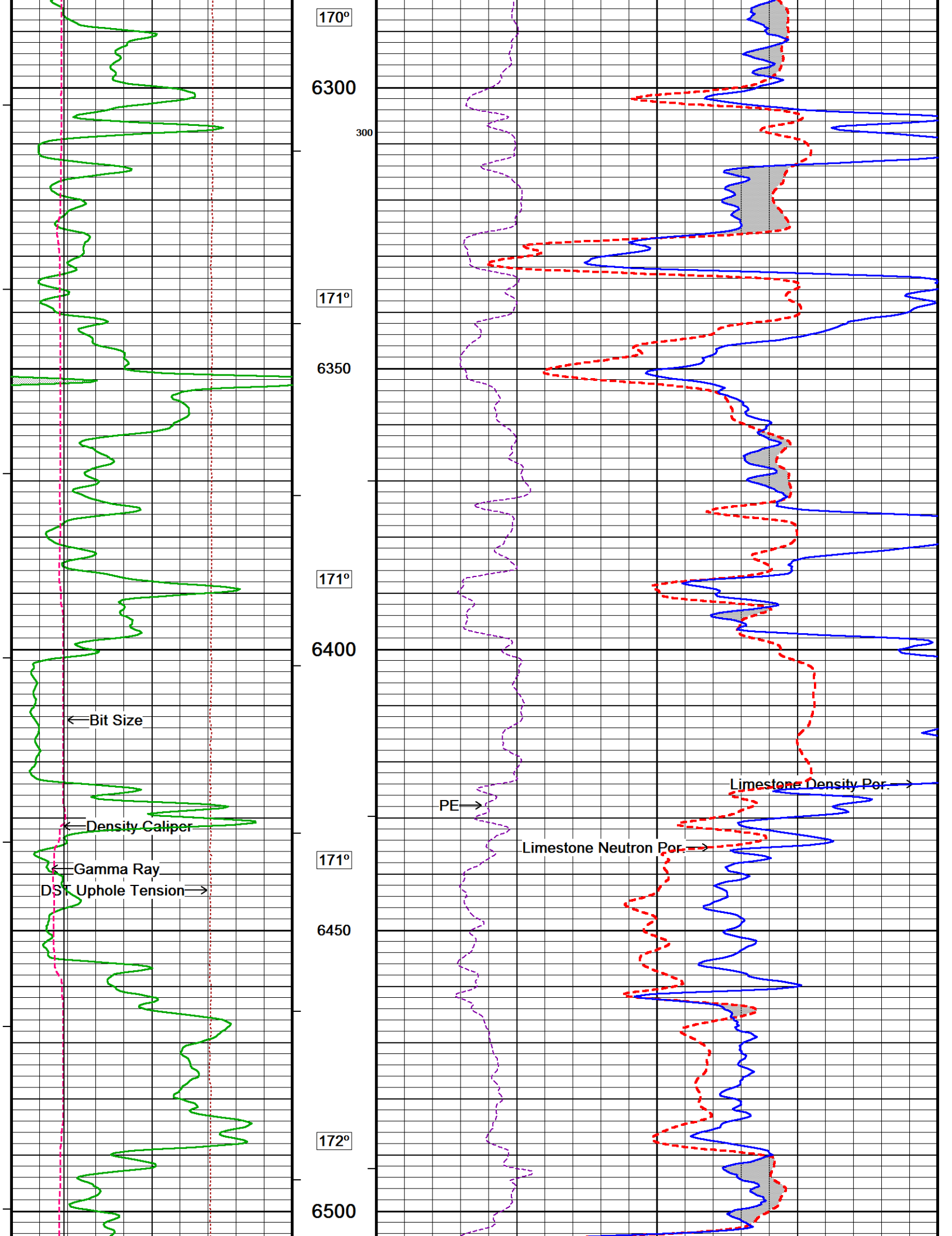
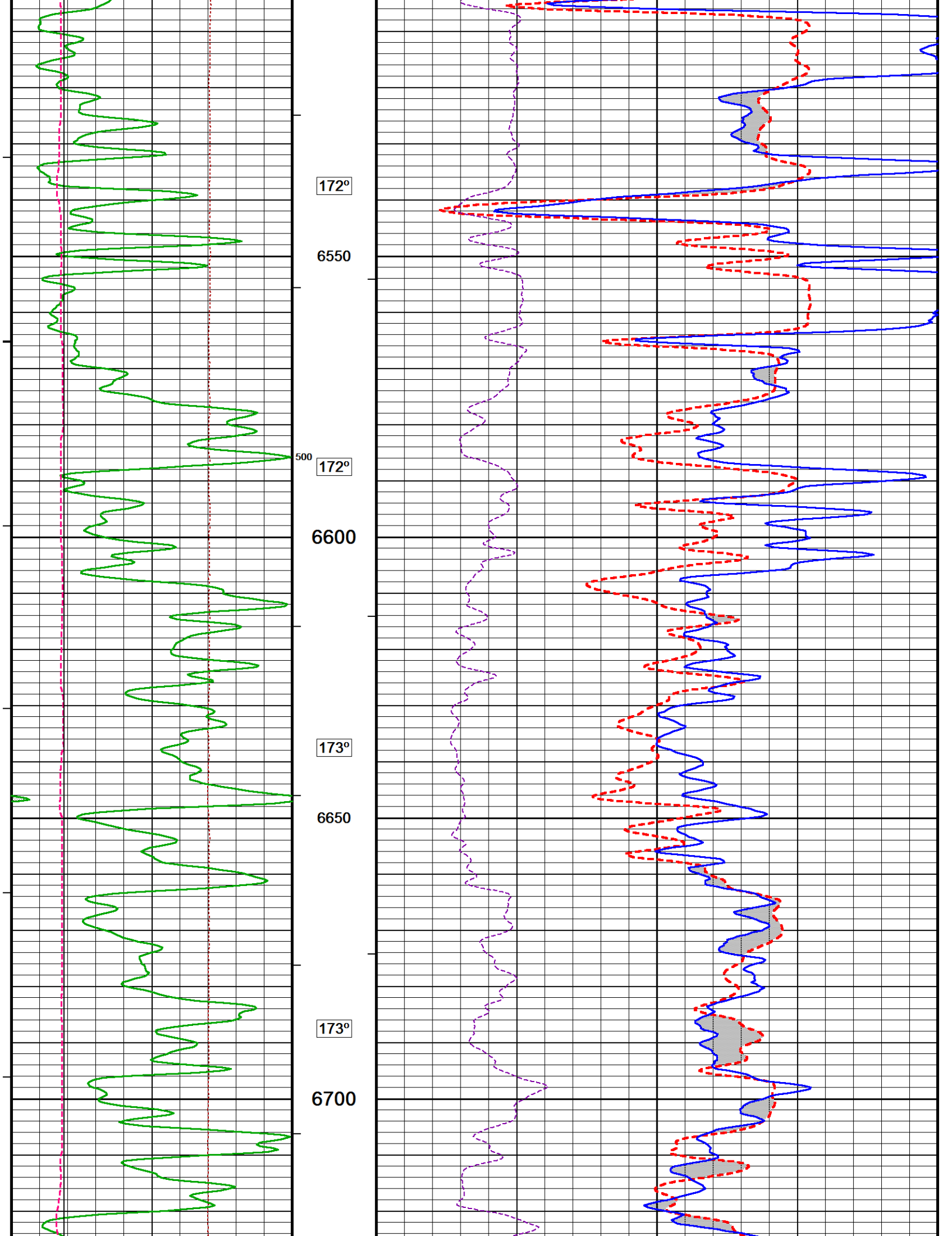
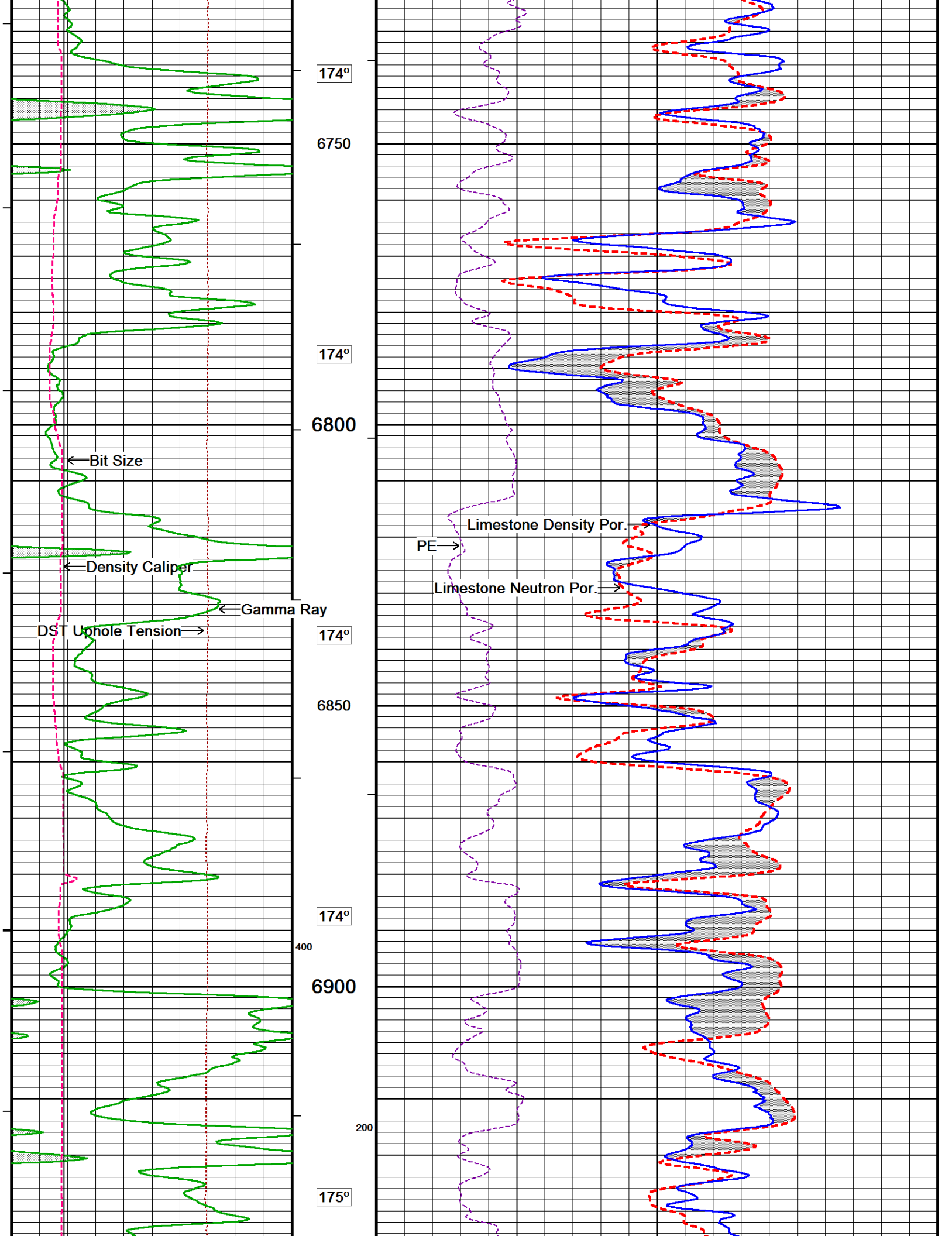
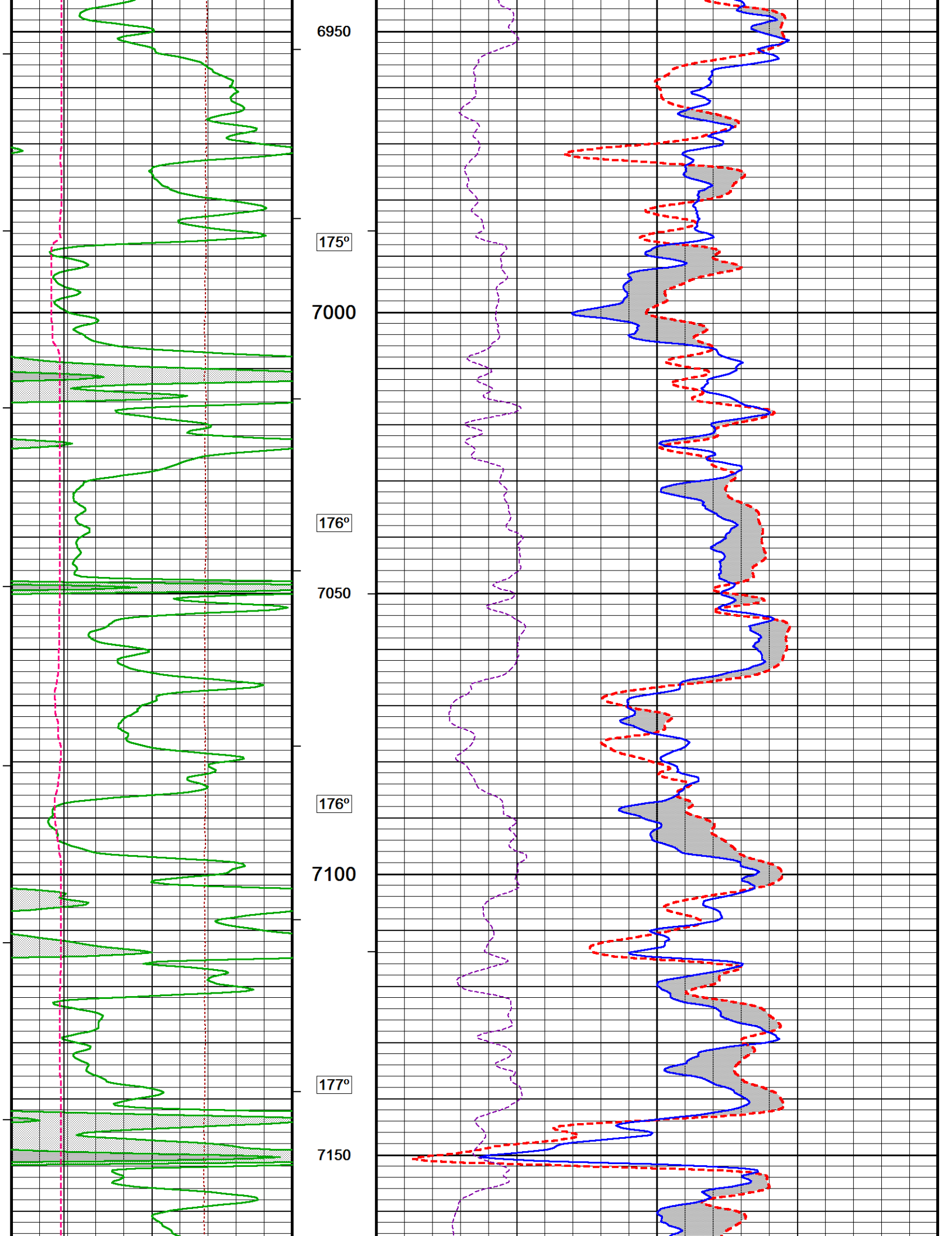
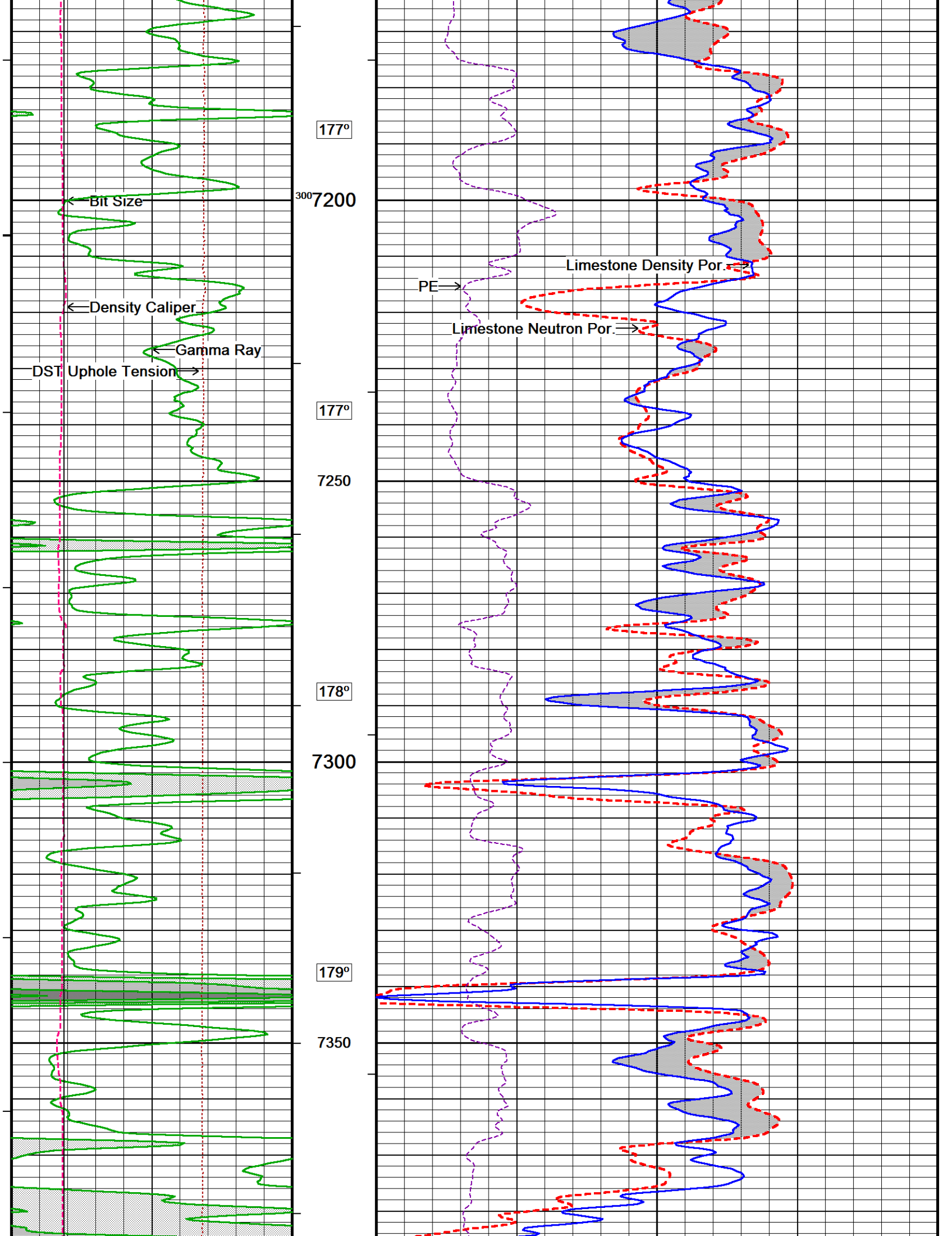
169°
6150
170°
6200
170°
6250
600

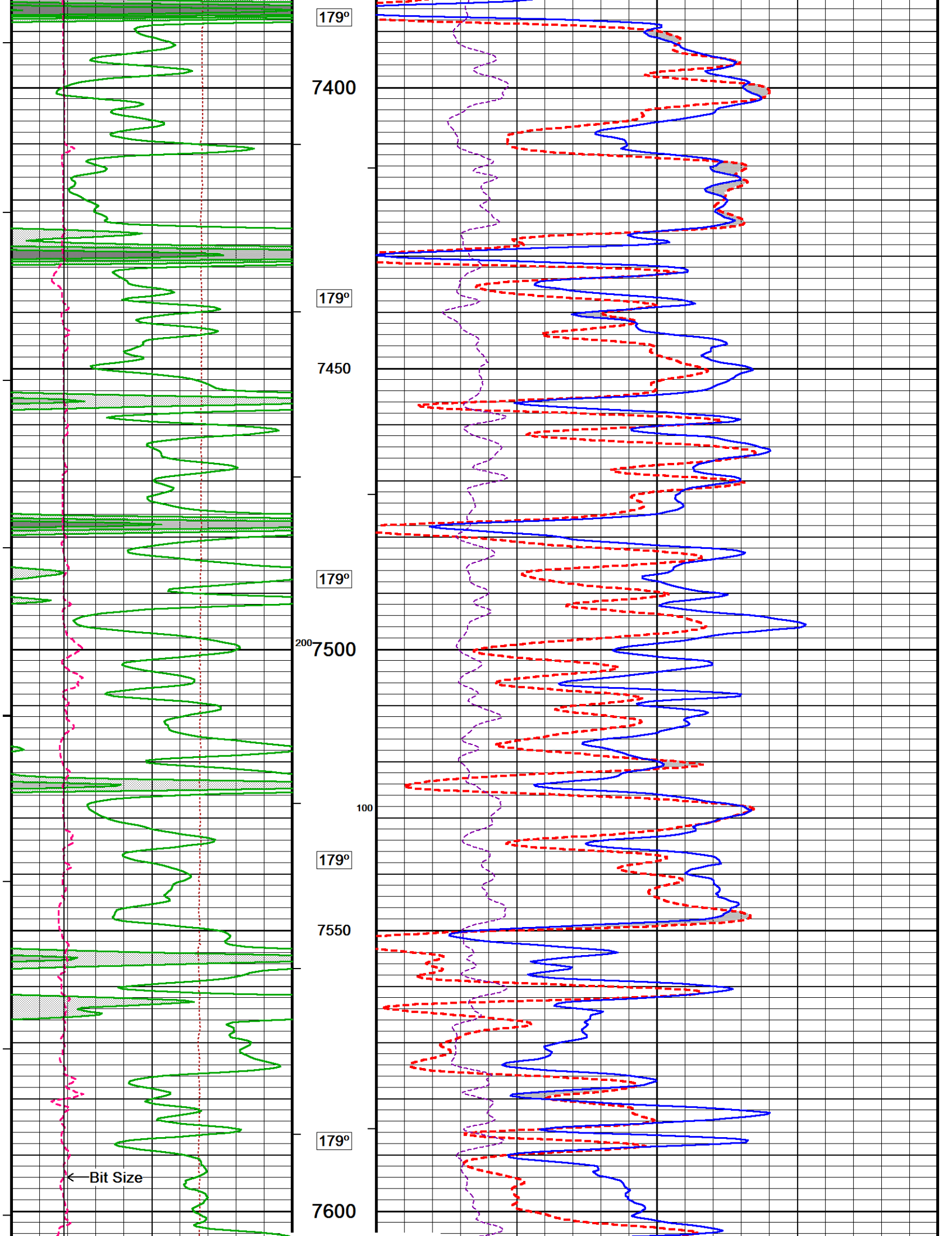

170°
6300
300
171°
6350
171°
6400
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
PE
Limestone Density Por.
Limestone Neutron Por.
171°
6450
172°
6500

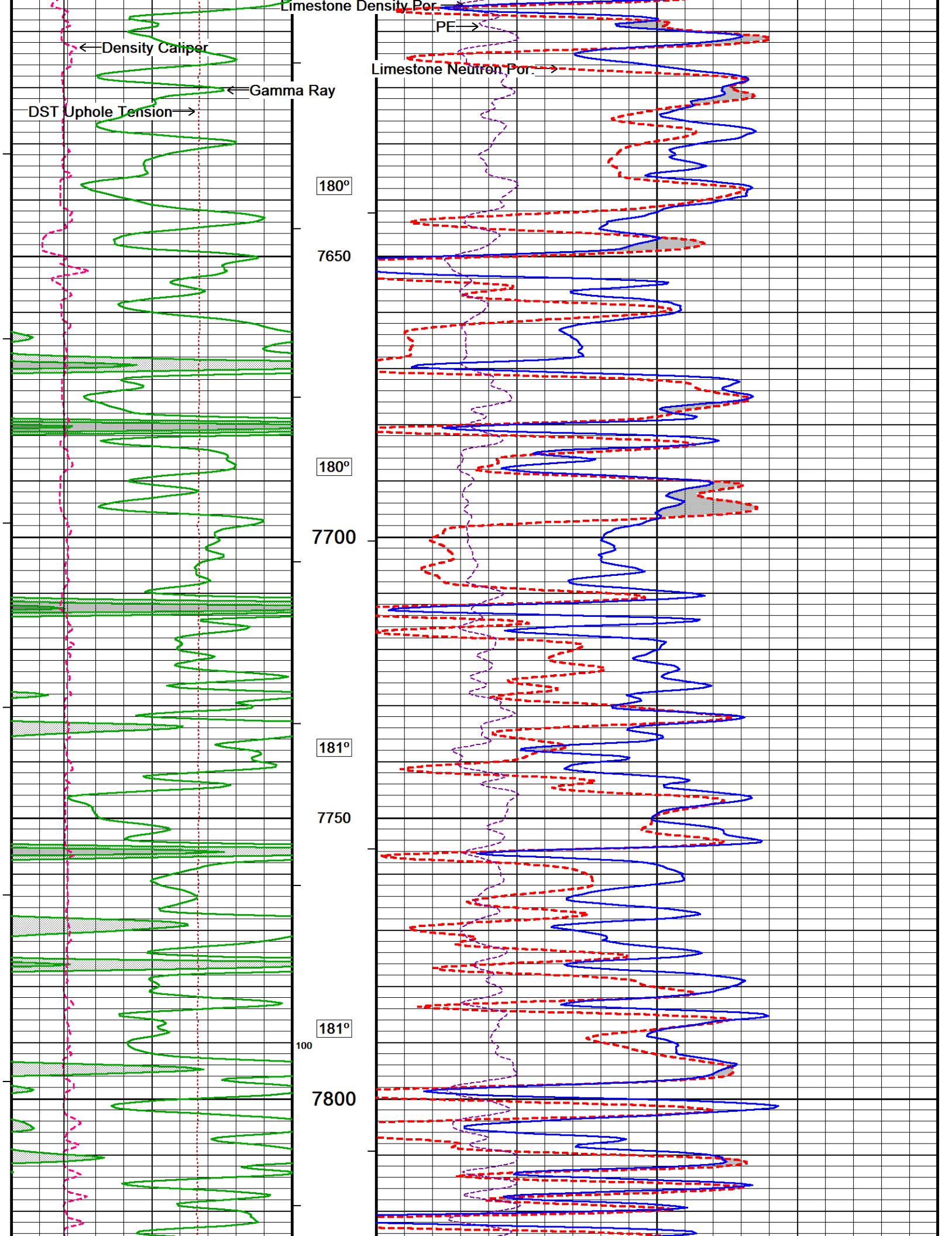

172°
6550
500
172°
6600
173°
6650
173°
6700

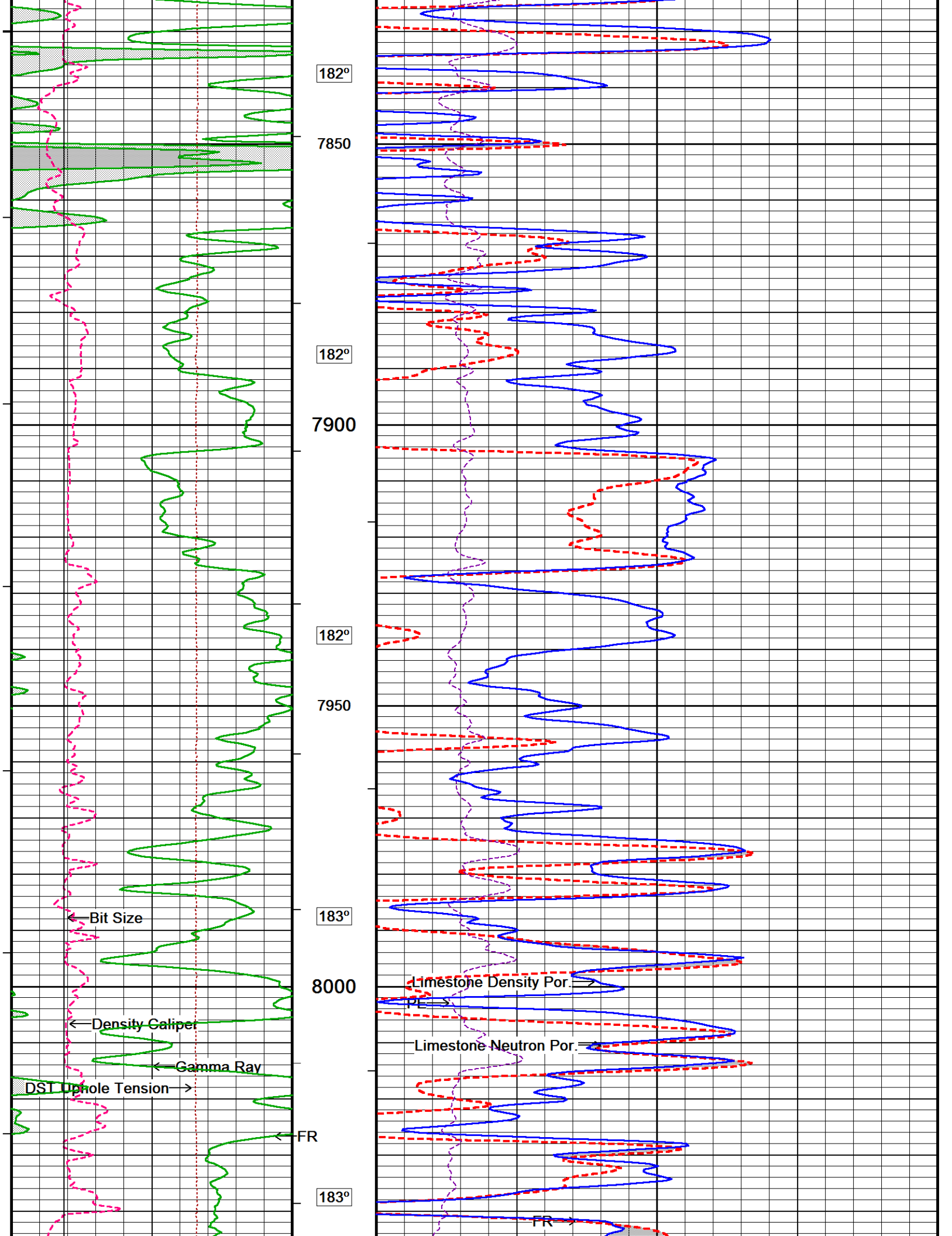

174°
6750
174°
6800
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
174°
6850
174°
400
6900
200
175°
Limestone Density Por.
PE
Limestone Neutron Por.

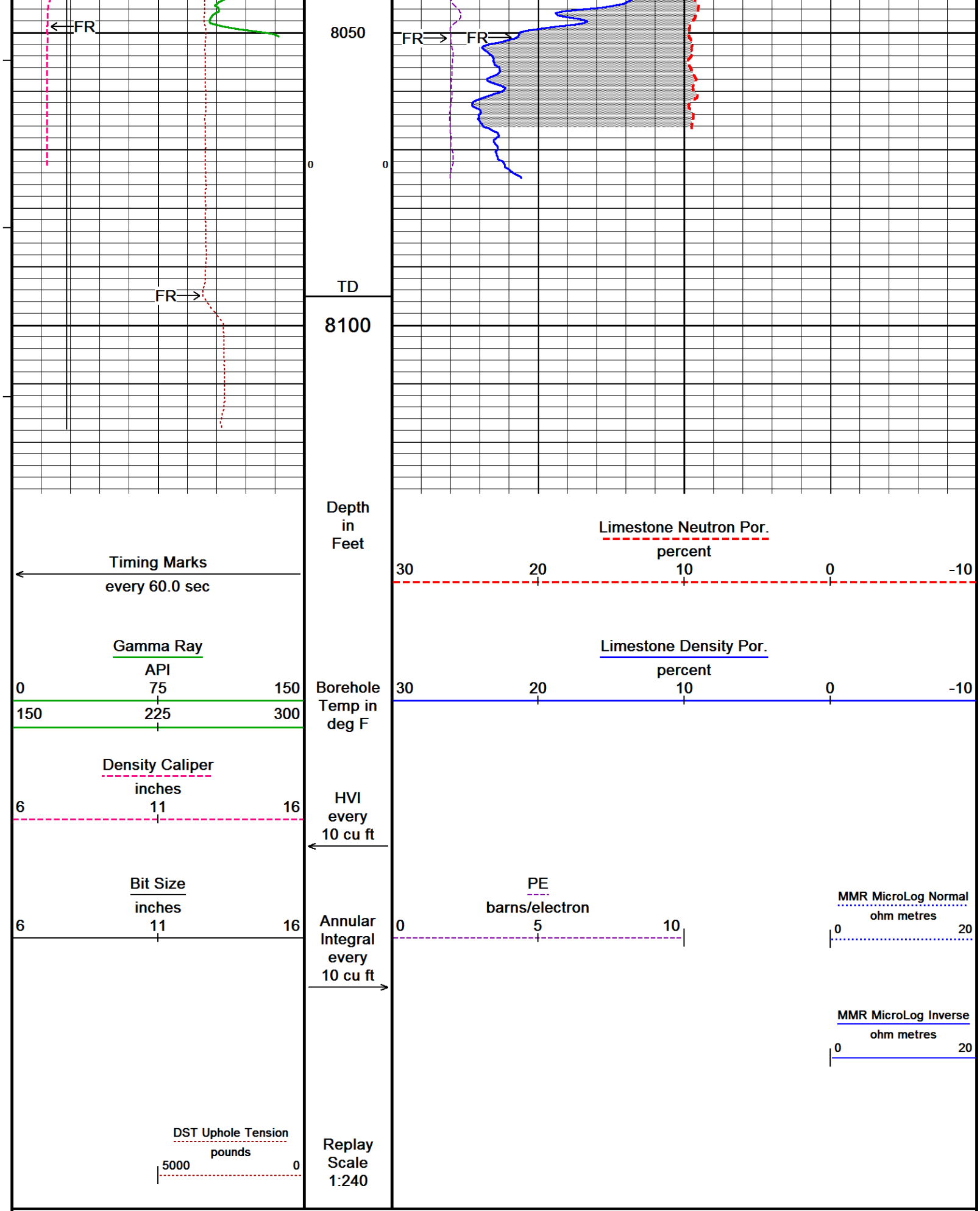

6950
175°
7000
176°
7050
176°
7100
177°
7150


177°
300
7200
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
PE
Limestone Density Por.
Limestone Neutron Por.
177°
7250
178°
7300
179°
7350


179°
7400
179°
7450
179°
200
7500
100
179°
7550
179°
Bit Size
7600


Limestone Density Por
PE
Density Caliper
Limestone Neutron Por
Gamma Ray
DST Uphole Tension
180°
7650
180°
7700
181°
7750
181°
100
7800


182°
7850
182°
7900
182°
7950
183°
8000
183°
←Bit Size
←Density Caliper
←Gamma Ray
DST Uphole Tension→
←FR
Limestone Density Por.→
PE→
Limestone Neutron Por.→
FR→



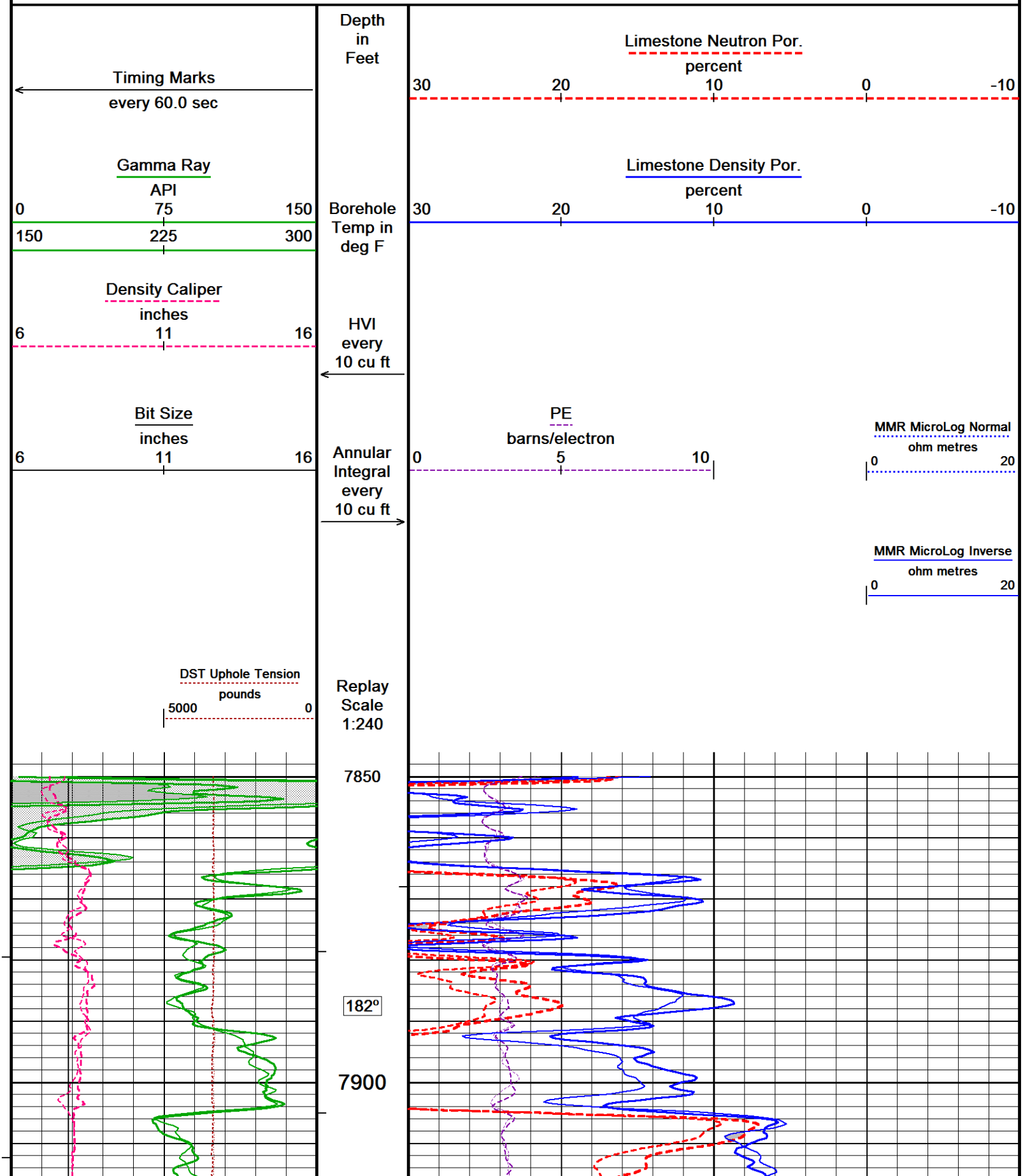

Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 05-JUL-2017 13:24
Filename: C:\Logs\GRAND MESA OPERATING\RIO LOB...\MAIN PASS QUAD COMBO SPLICED.dta
Recorded on 05-JUL-2017 02:31
System Versions: Processed with 17.01.7206 Plotted with 17.01.7206

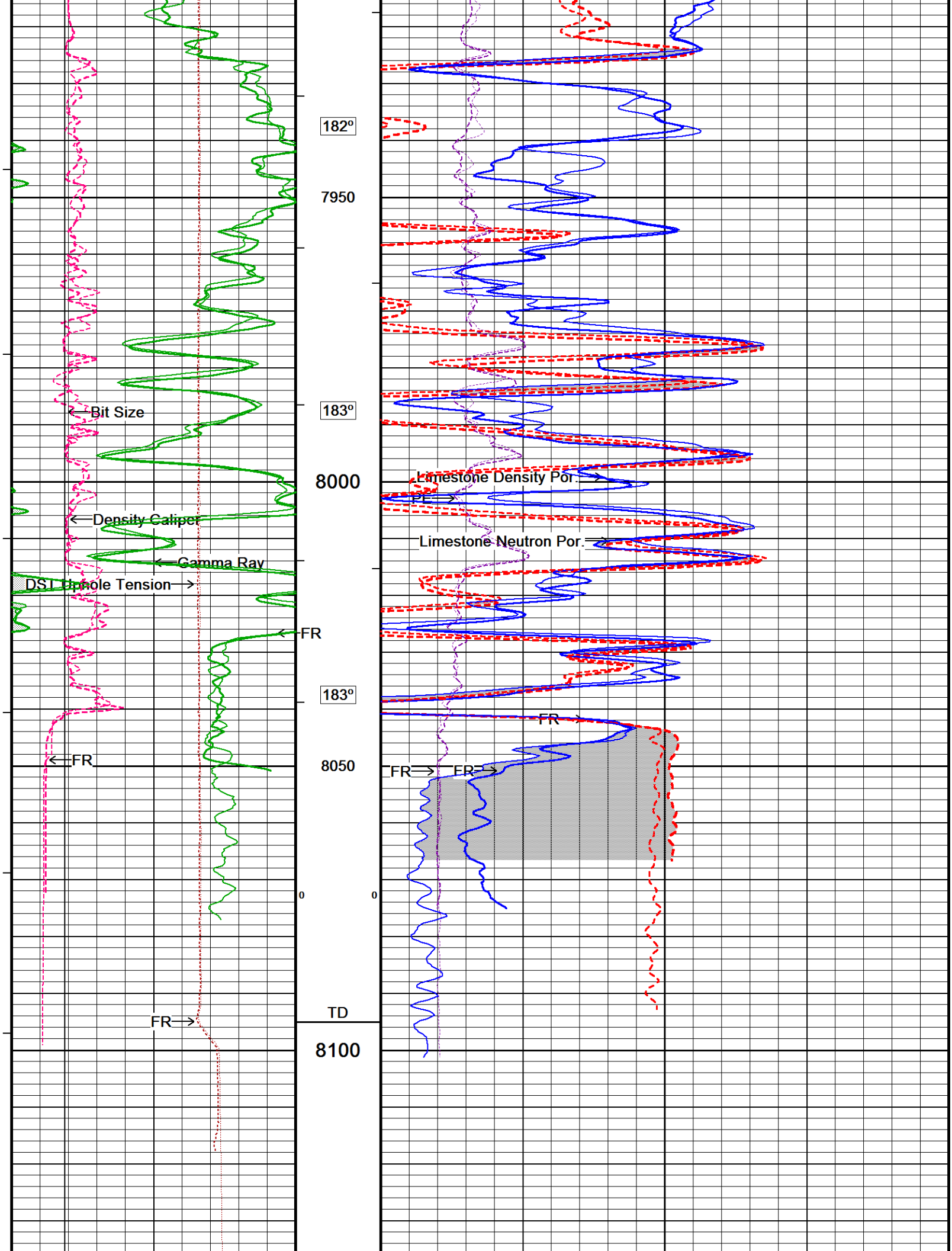
5 INCH LIMESTONE MAIN

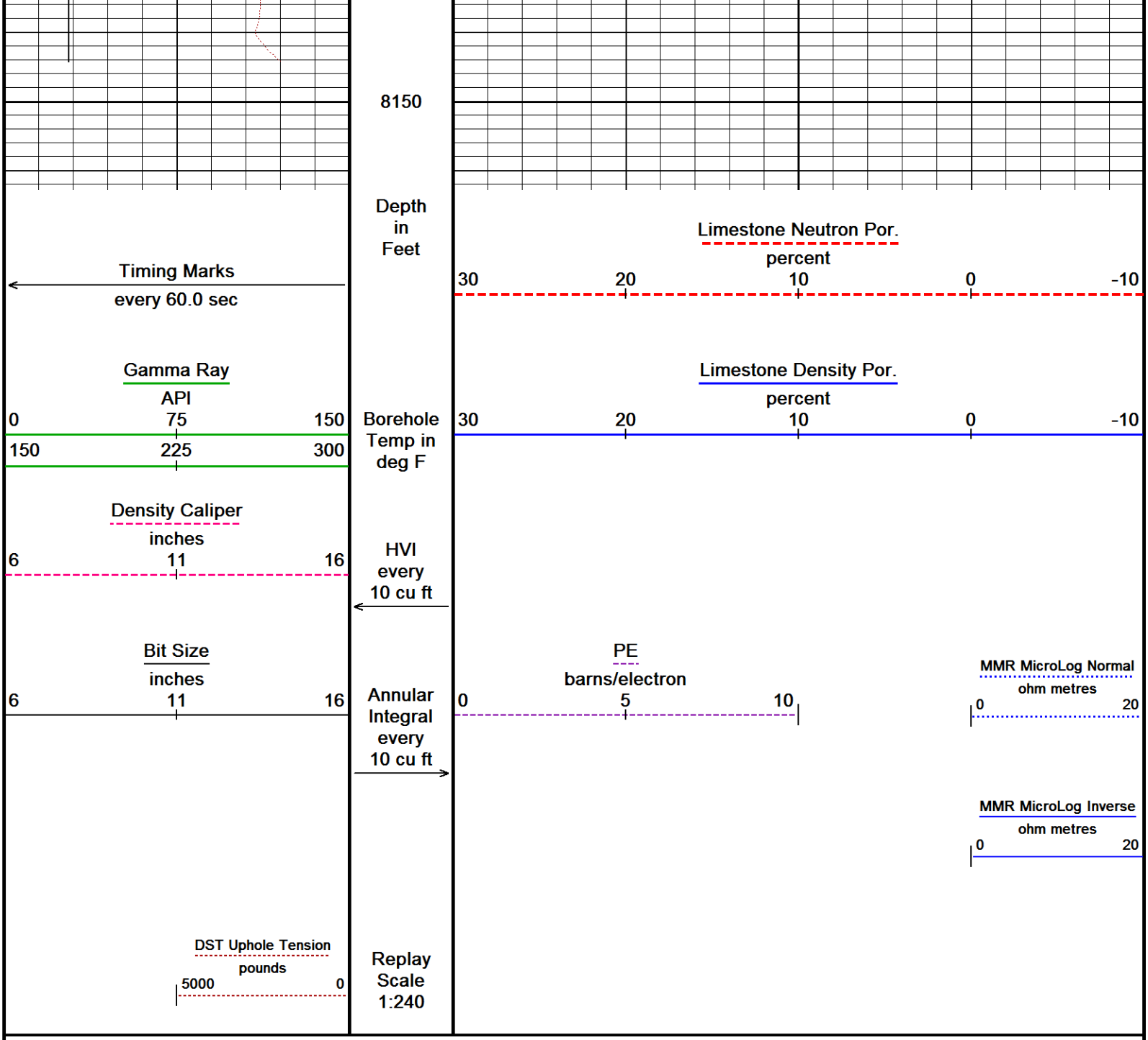
5 INCH LIMESTONE MAIN

# REPEAT SECTION

Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 05-JUL-2017 13:24
Filename: C:\Logs\GRAND MESA OPERATING\RIO LOB...\MAIN PASS QUAD COMBO SPLICED.dta
Recorded on 05-JUL-2017 02:31
Filename: C:\Logs\GRAND MESA OPERATIN...\RIO LOBO 1-30_QUAD COMBO_REPEAT PASS.dta
Recorded on 04-JUL-2017 22:36
System Versions: Processed with 17.01.7206 Plotted with 17.01.7206




182°
7950
183°
8000
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
FR
183°
FR
8050
Limestone Density Por.
PE
Limestone Neutron Por.
FR
FR
FR
0
0
TD
FR
8100

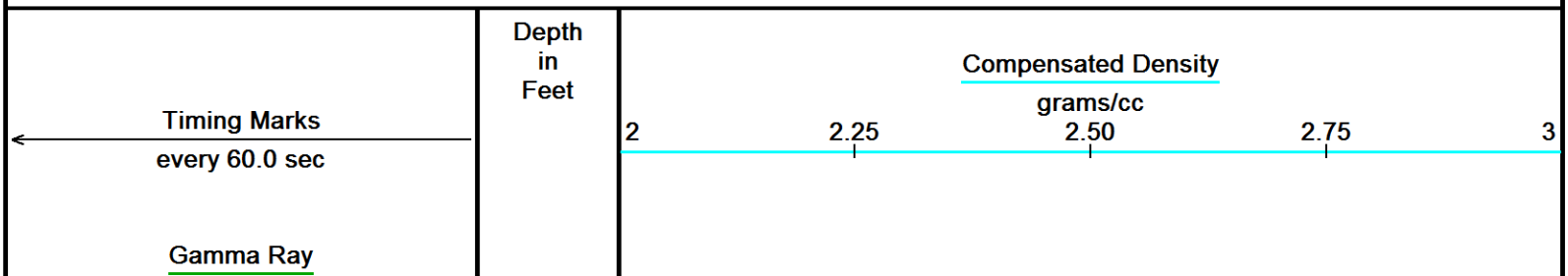


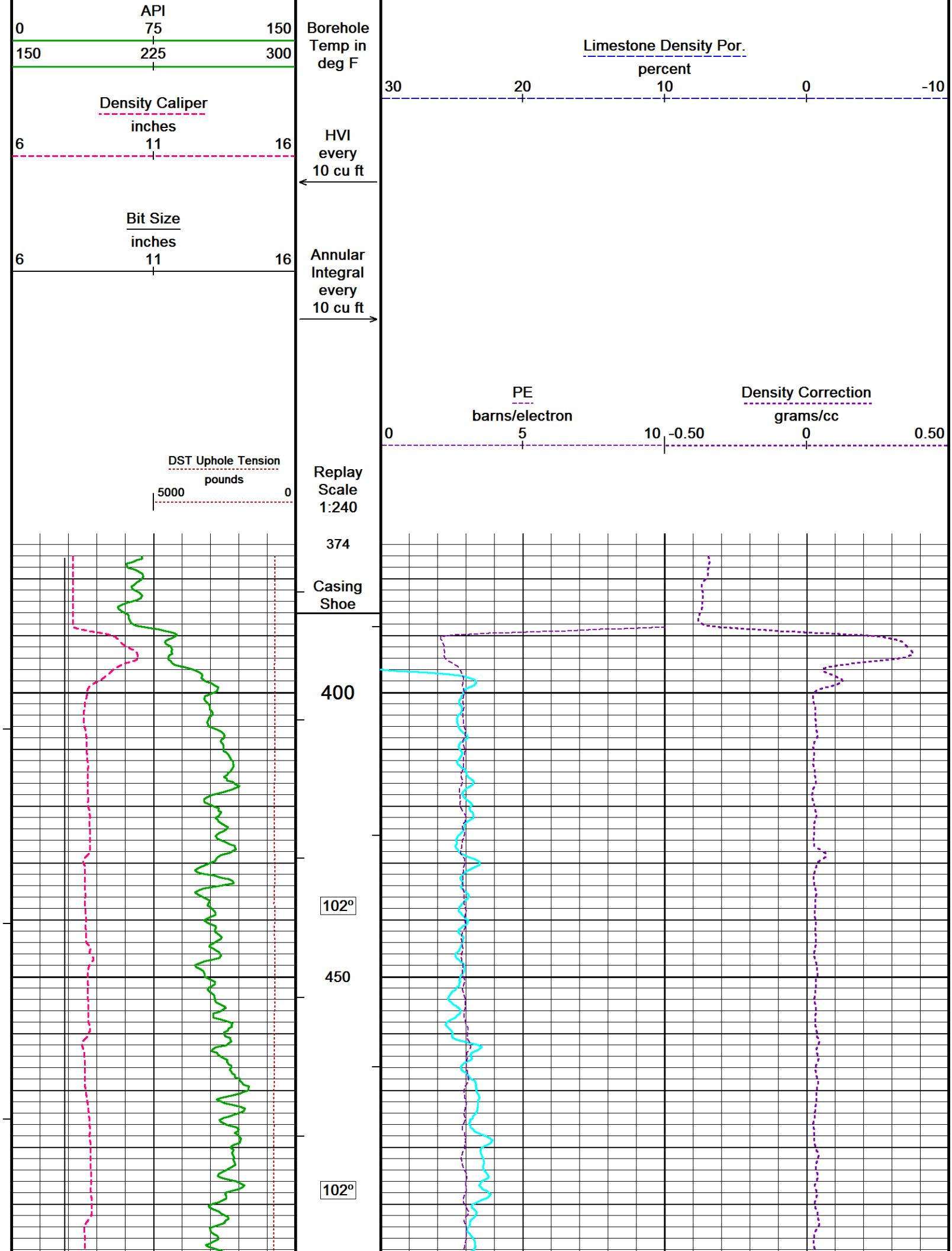

Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 05-JUL-2017 13:24
Filename: C:\Logs\GRAND MESA OPERATING\RIO LOB...\MAIN PASS QUAD COMBO SPLICED.dta — Recorded on 05-JUL-2017 02:31
Filename: C:\Logs\GRAND MESA OPERATIN...\RIO LOBO 1-30_QUAD COMBO_REPEAT PASS.dta — Recorded on 04-JUL-2017 22:36
System Versions: Processed with 17.01.7206 Plotted with 17.01.7206

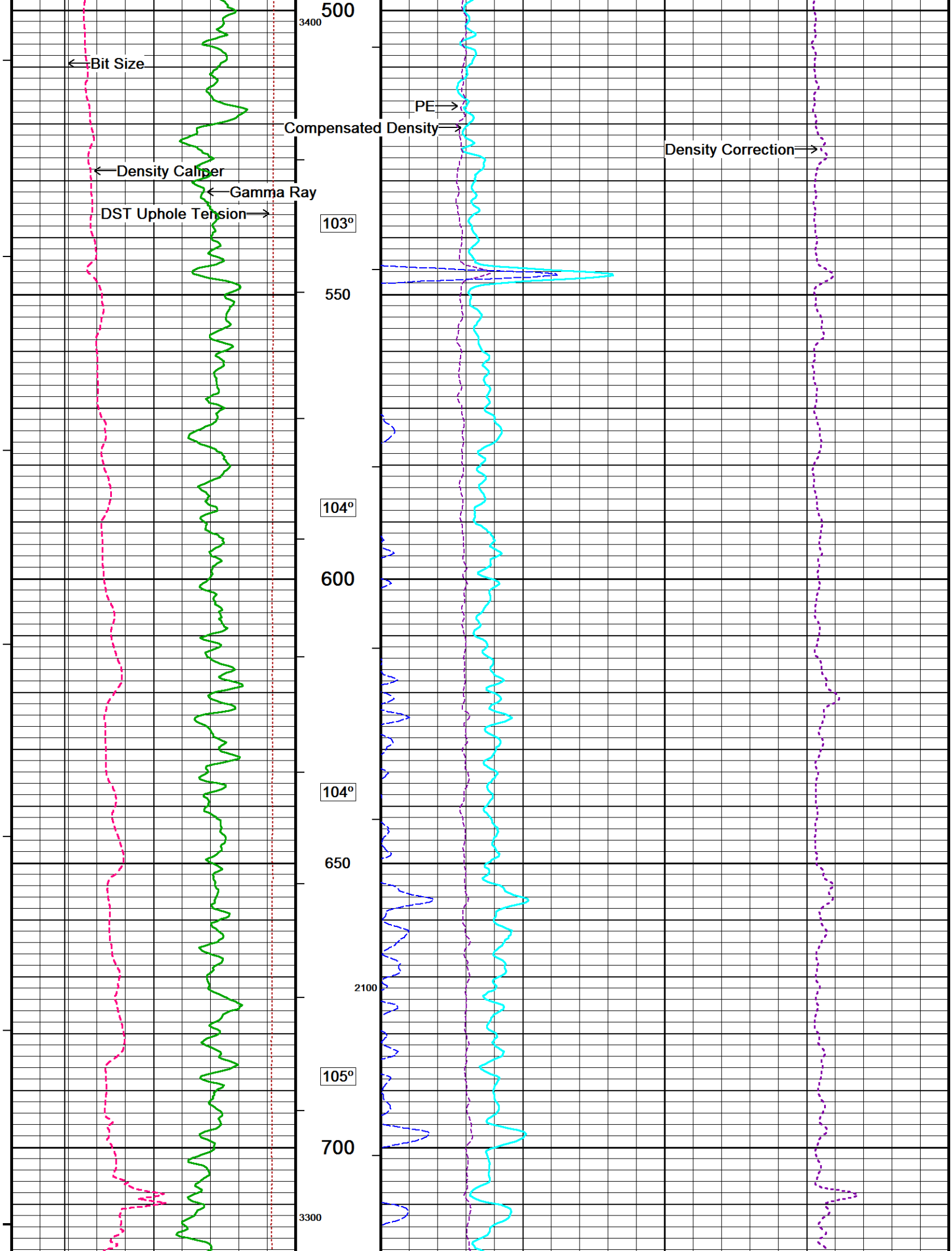
## REPEAT SECTION

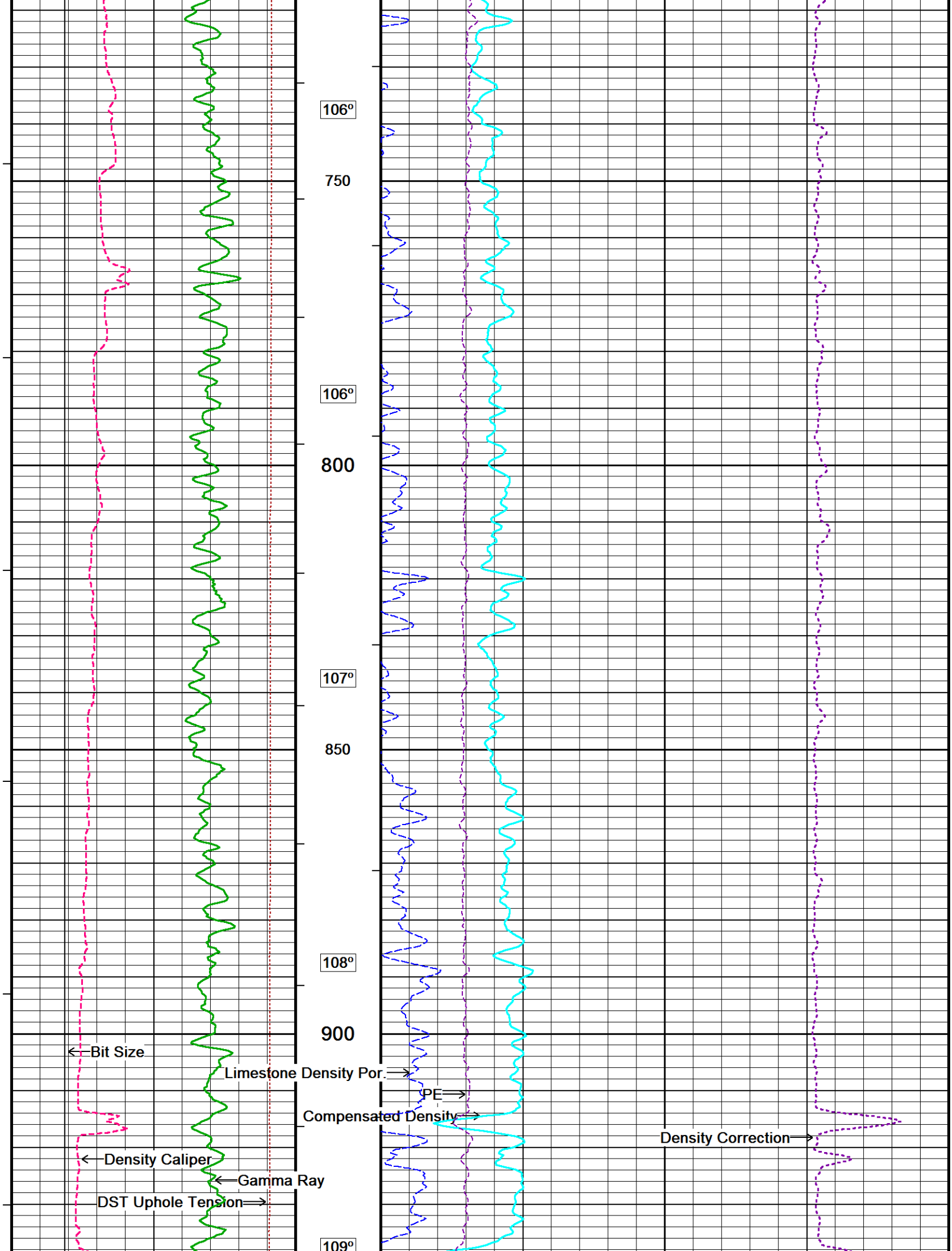
## 5 INCH BULK DENSITY MAIN

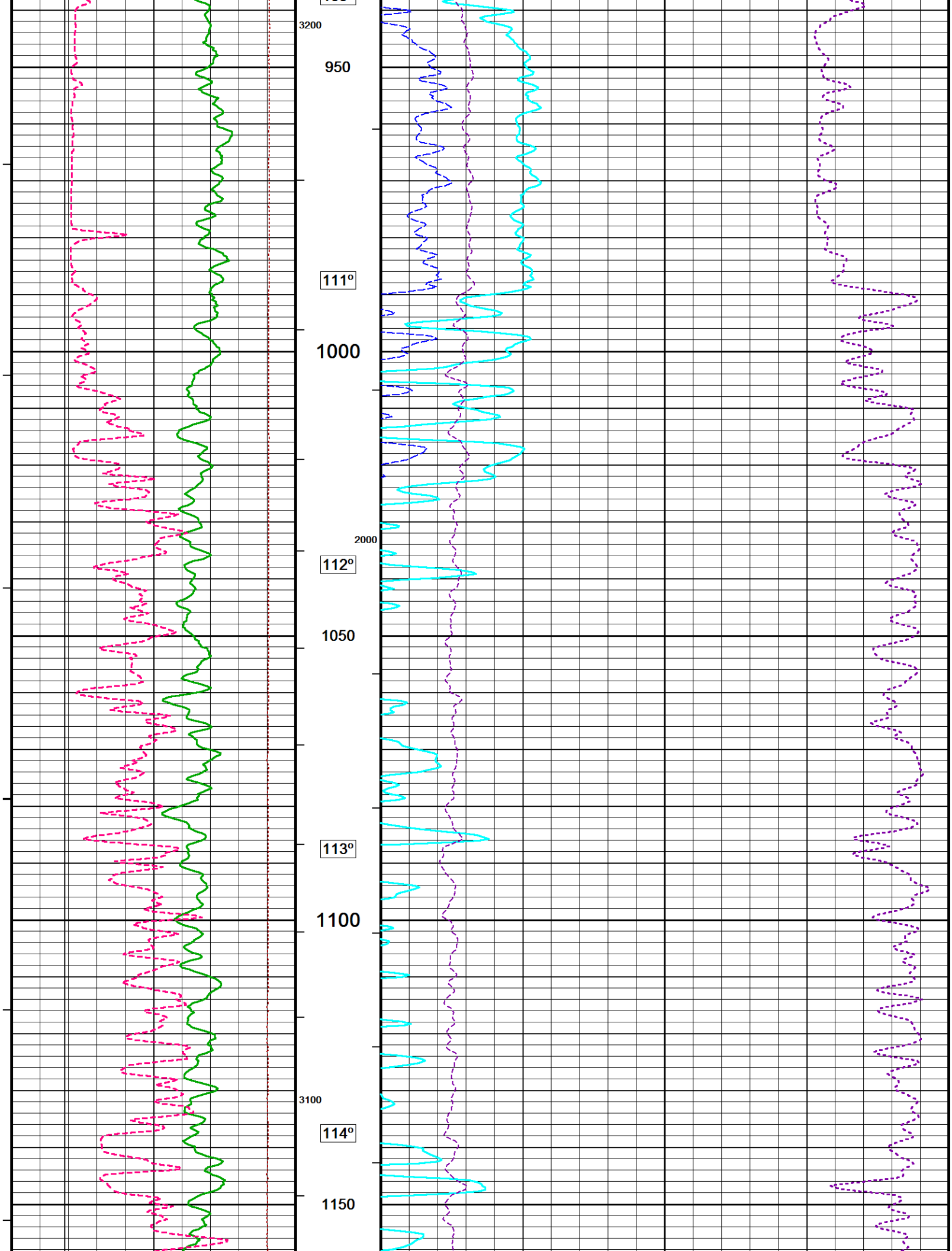
Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 05-JUL-2017 13:24
Filename: C:\Logs\GRAND MESA OPERATING\RIO LOB...\MAIN PASS QUAD COMBO SPLICED.dta — Recorded on 05-JUL-2017 02:31
System Versions: Processed with 17.01.7206 Plotted with 17.01.7206

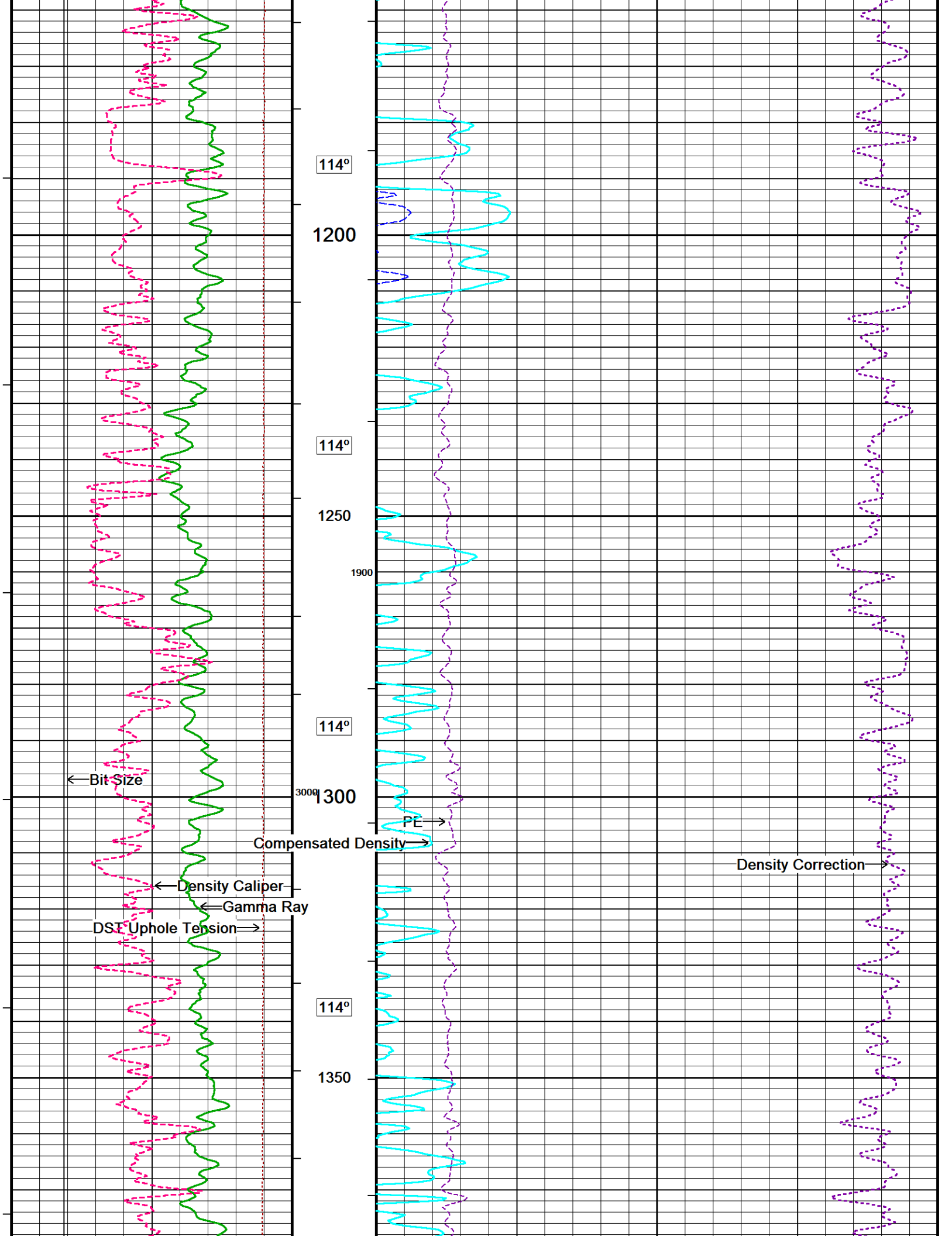


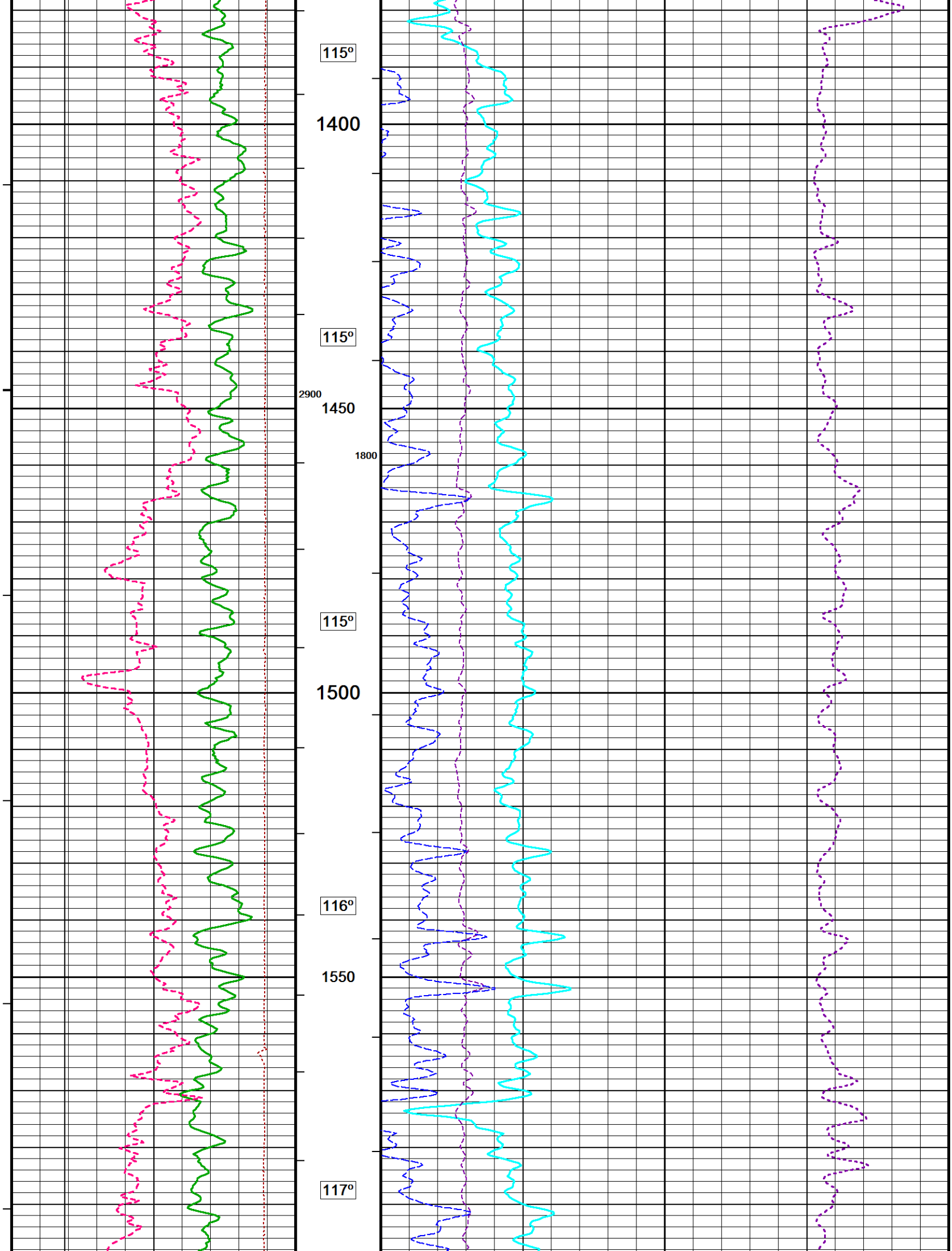

API
0
75
150
150
225
300
Borehole Temp in deg F
Limestone Density Por.
percent
30
20
10
0
-10
Density Caliper
inches
6
11
16
HVI every 10 cu ft
Bit Size
inches
6
11
16
Annular Integral every 10 cu ft
PE
barns/electron
0
5
10
Density Correction
grams/cc
-0.50
0
0.50
DST Uphole Tension
pounds
5000
0
Replay Scale 1:240
374
Casing Shoe
400
102°
450
102°

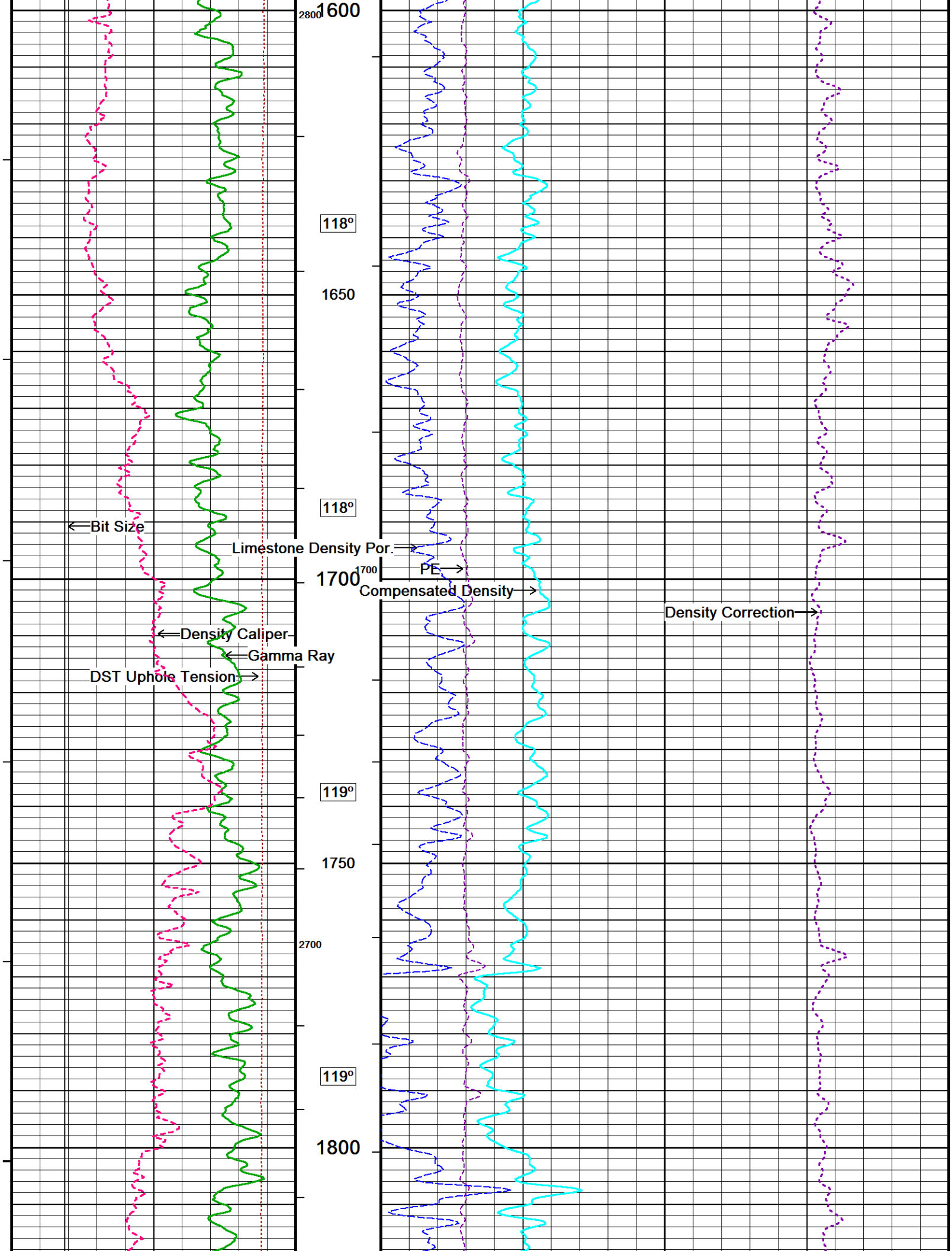

500
3400
Bit Size
PE
Compensated Density
Density Correction
Density Caliper
Gamma Ray
DST Uphole Tension
103°
550
104°
600
104°
650
2100
105°
700
3300

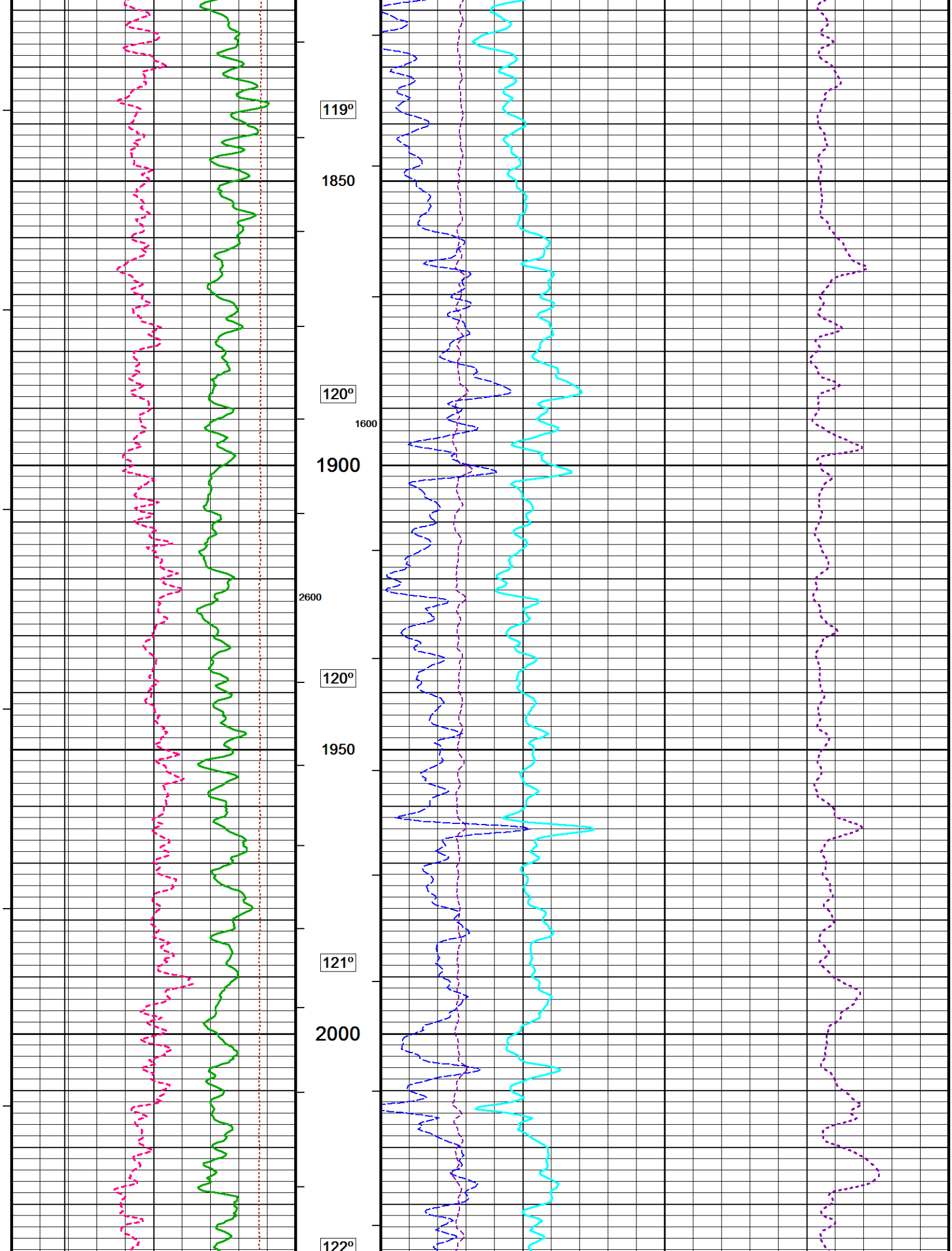

106°
750
106°
800
107°
850
108°
900
109°
Bit Size
Limestone Density Por.
PE
Compensated Density
Density Correction
Density Caliper
Gamma Ray
DST Uphole Tension

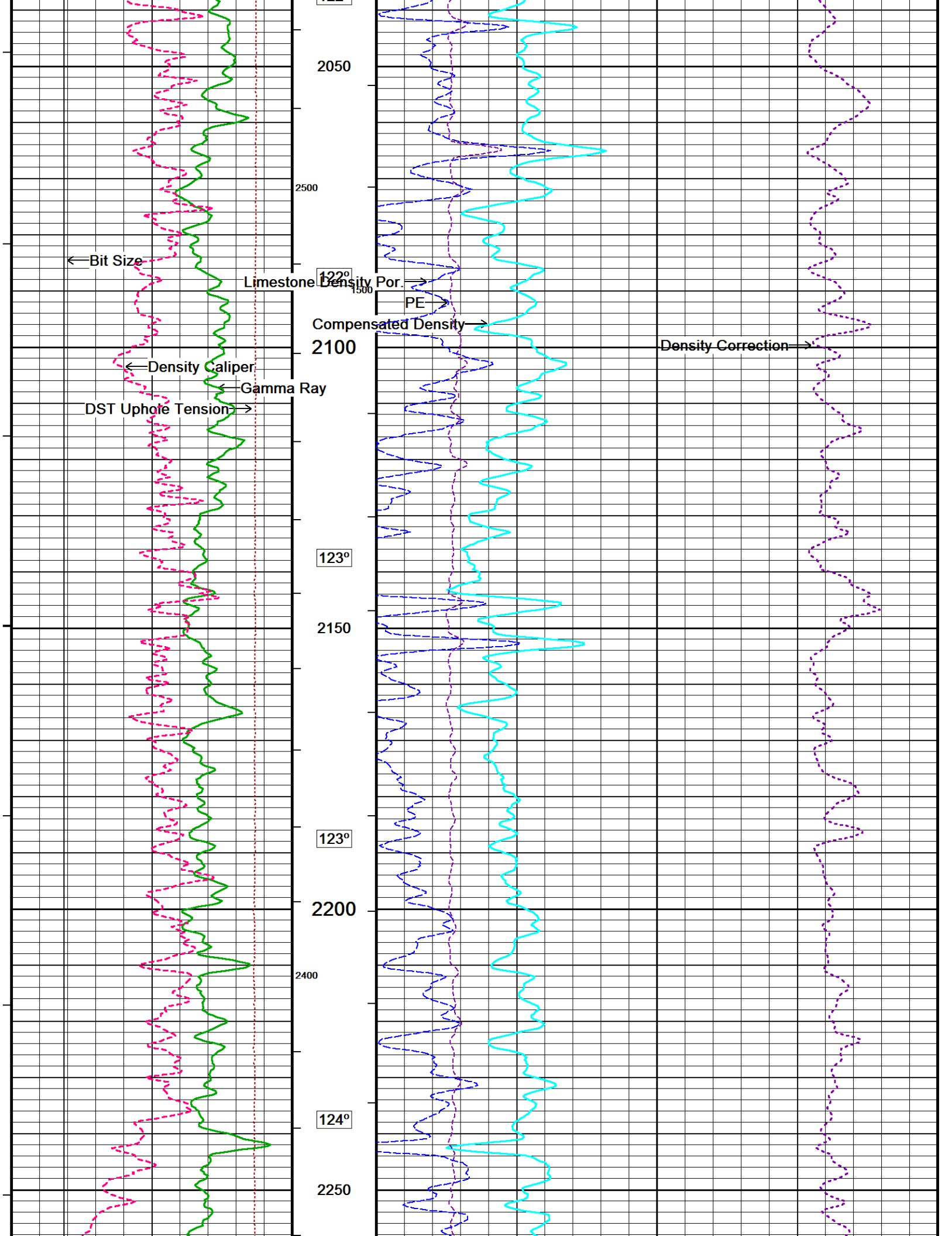

3200
950
111°
1000
2000
112°
1050
113°
1100
3100
114°
1150

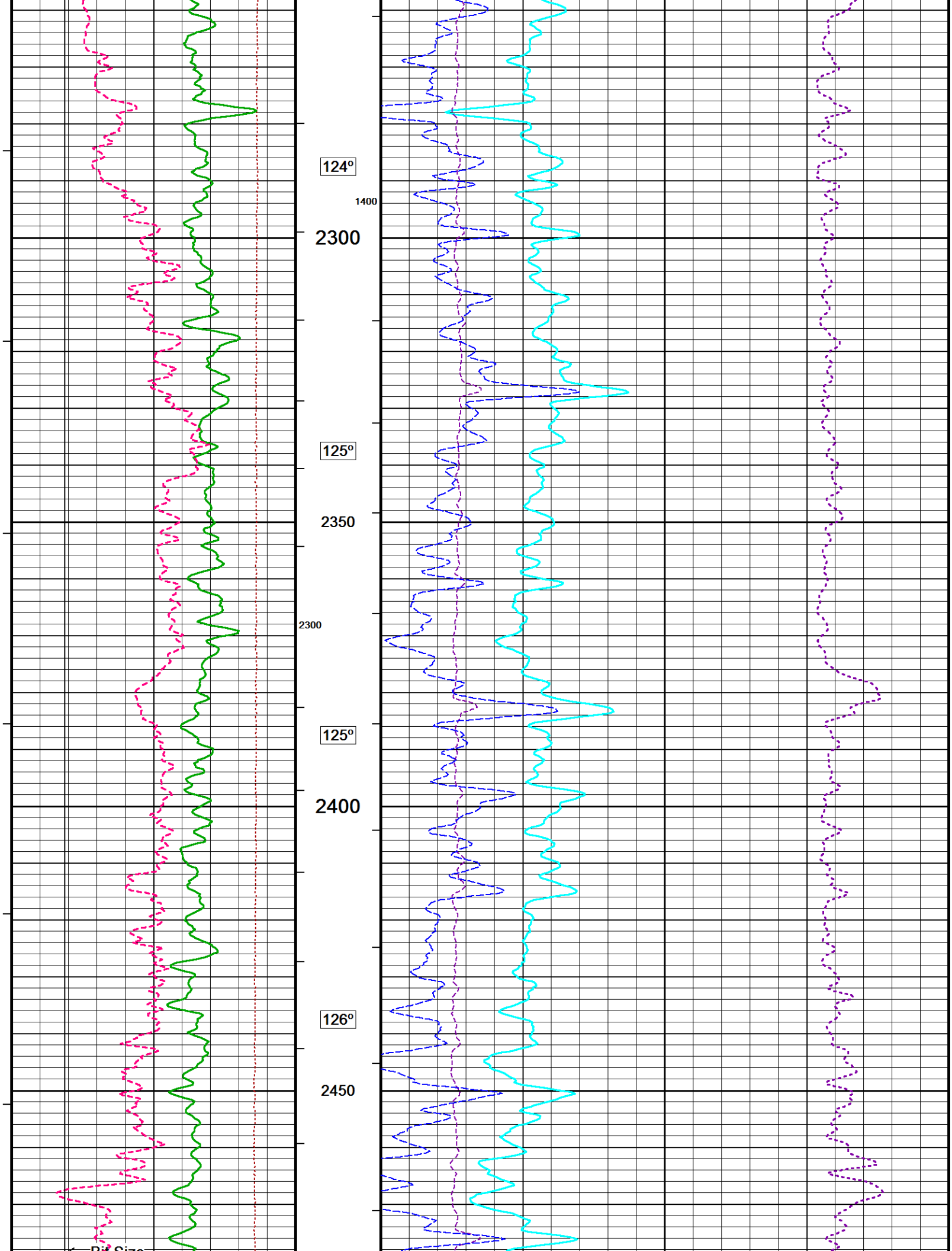

114°
1200
114°
1250
1900
114°
Bit Size
3000
1300
PE
Compensated Density
Density Correction
Density Caliper
Gamma Ray
DST Uphole Tension
114°
1350

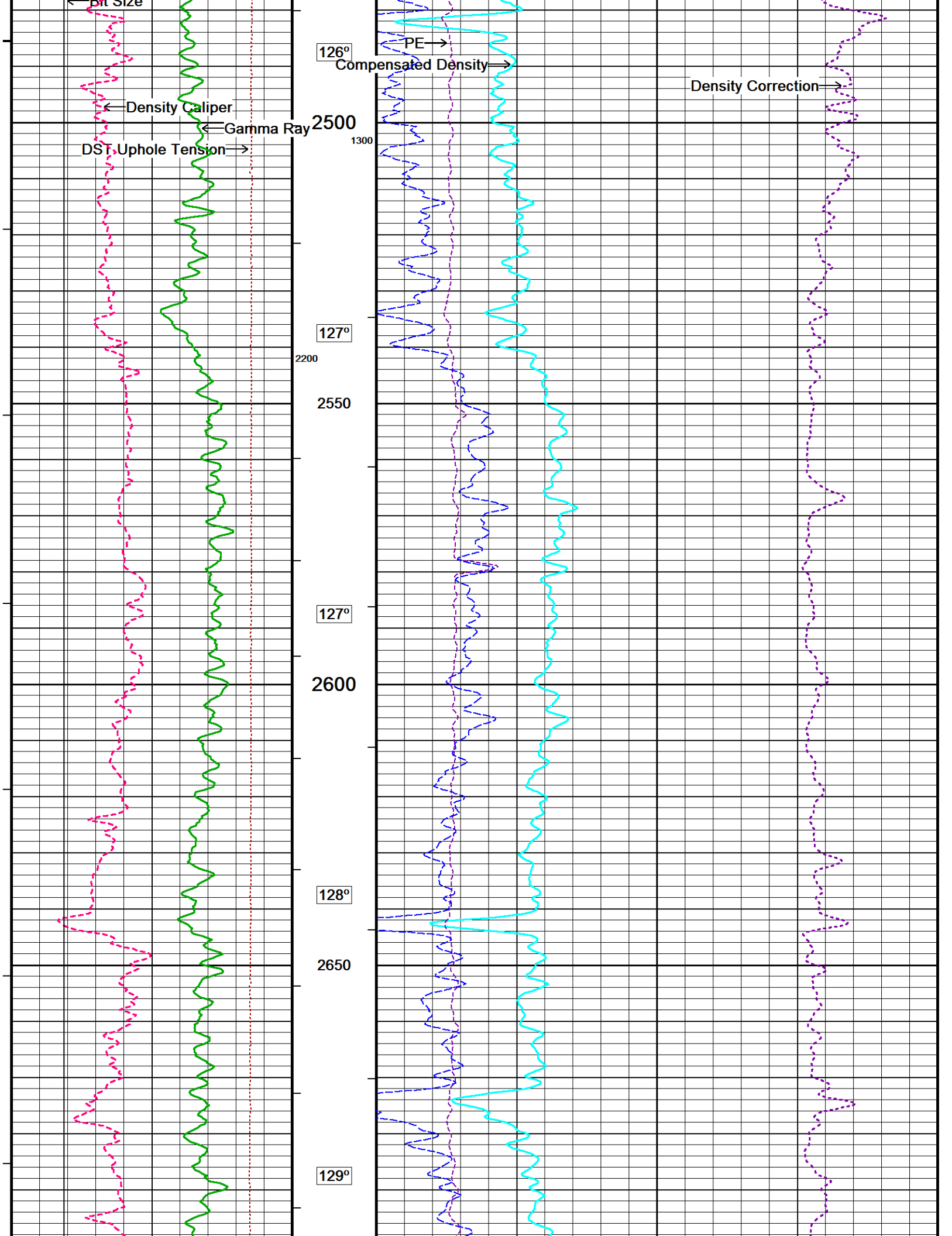

115°
1400
115°
2900
1450
1800
115°
1500
116°
1550
117°

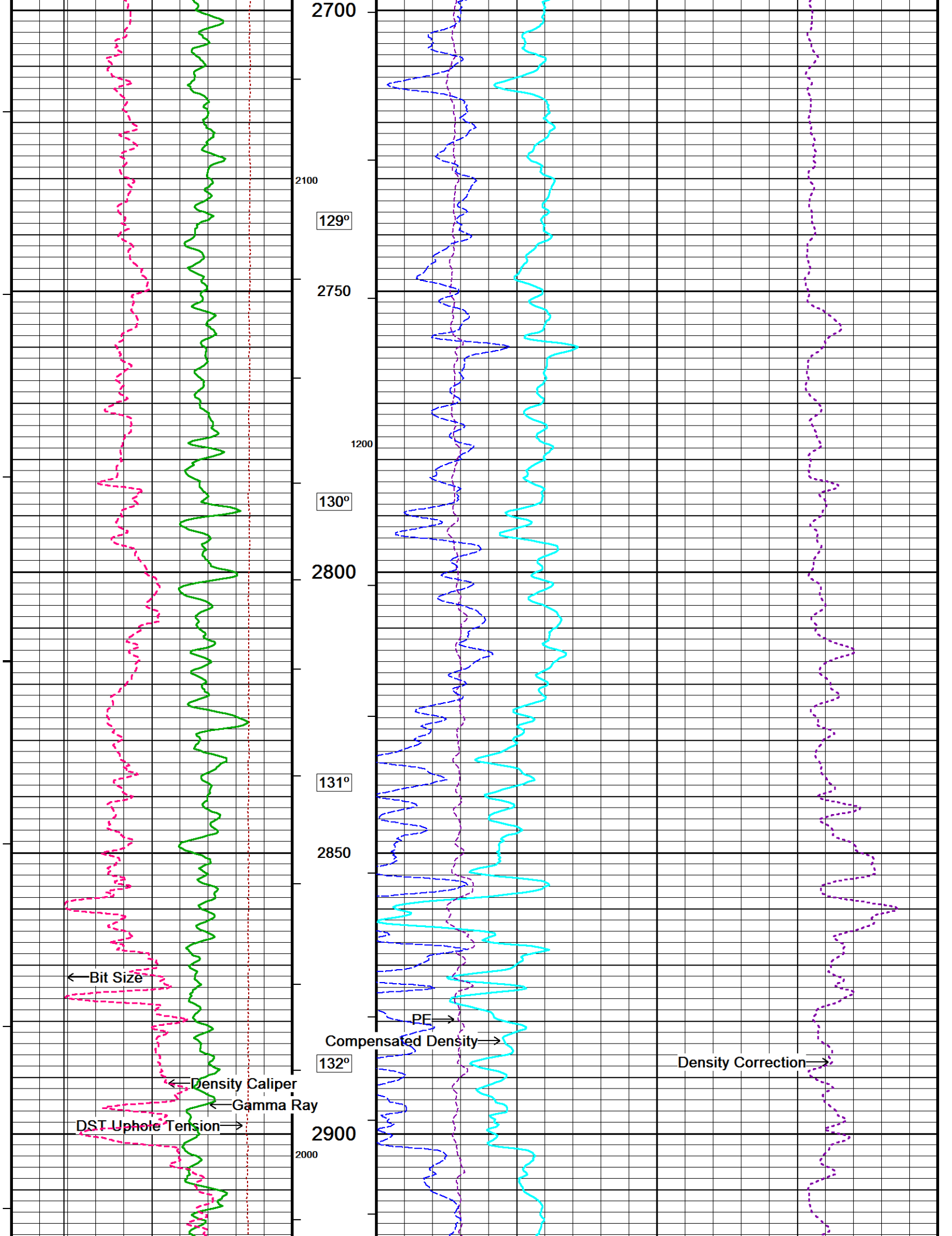

2800
1600
118°
1650
118°
Bit Size
Limestone Density Por.
PE
1700
1700
Compensated Density
Density Correction
Density Caliper
Gamma Ray
DST Uphole Tension
119°
1750
2700
119°
1800

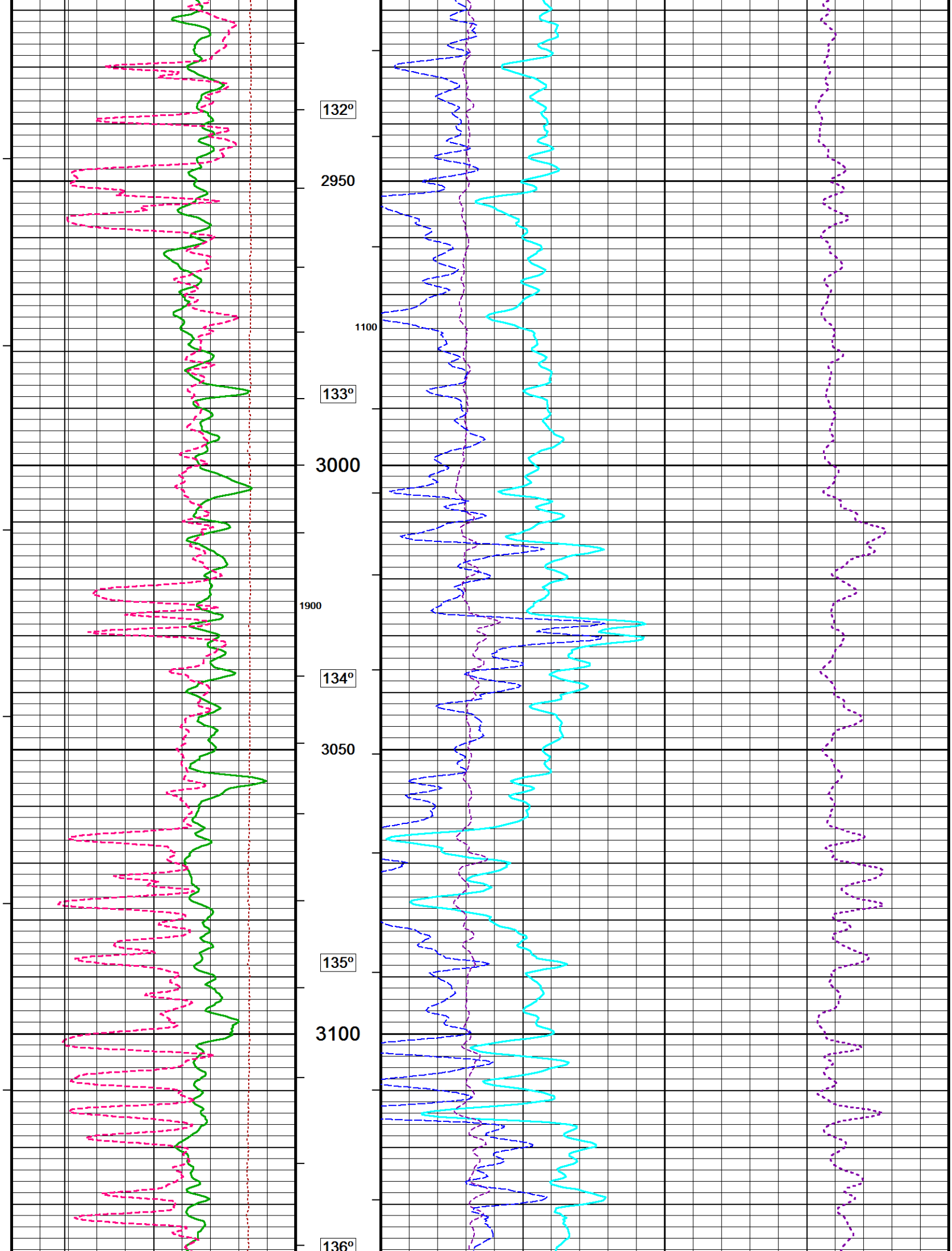

119°
1850
120°
1600
1900
2600
120°
1950
121°
2000
122°

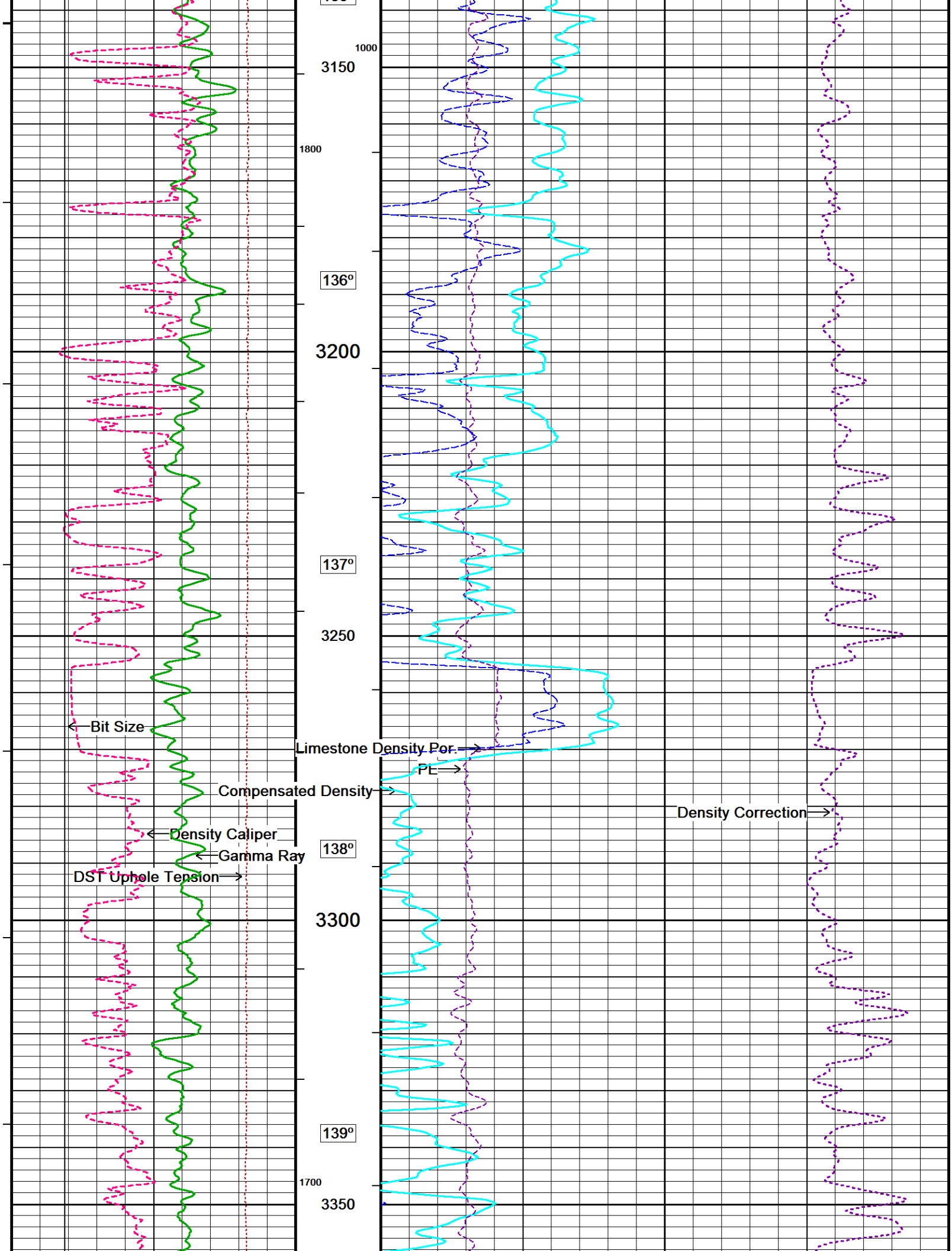

2050
2500
Bit Size
122°
Limestone Density Por.
1500
PE
Compensated Density
2100
Density Correction
Density Caliper
Gamma Ray
DST Uphole Tension
123°
2150
123°
2200
2400
124°
2250

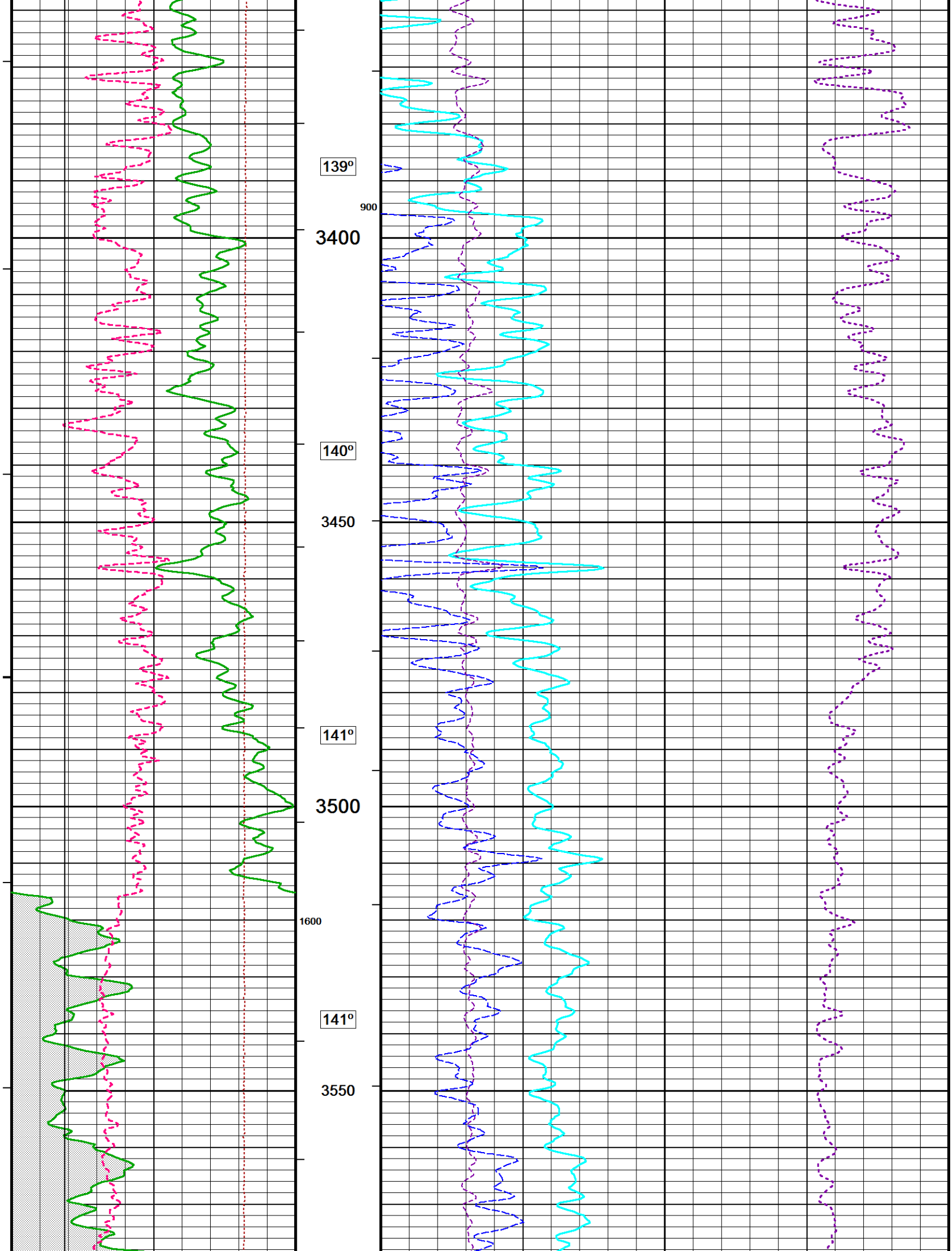

124°
1400
2300
125°
2350
2300
125°
2400
126°
2450

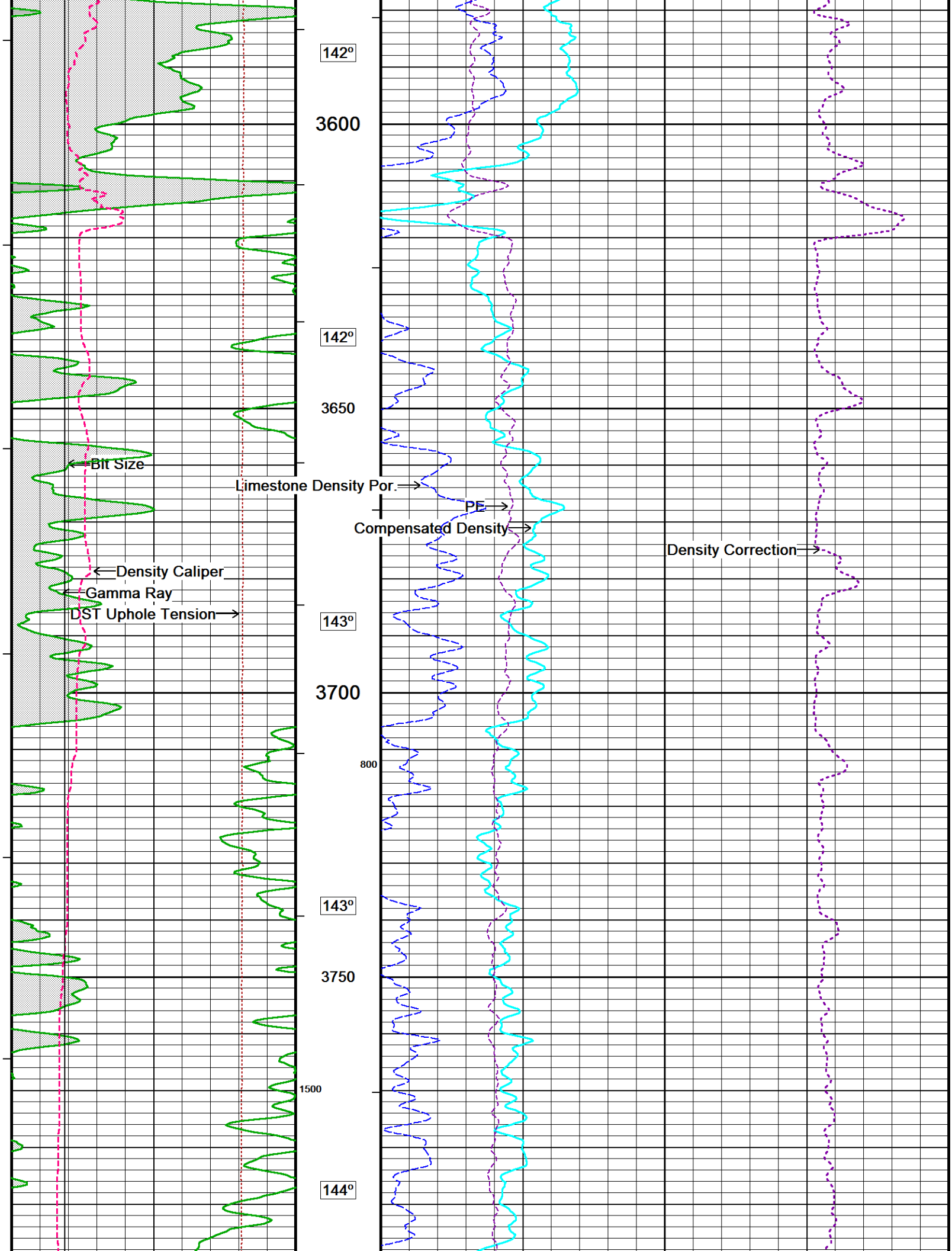

Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
126°
PE
Compensated Density
Density Correction
2500
1300
127°
2200
2550
127°
2600
128°
2650
129°

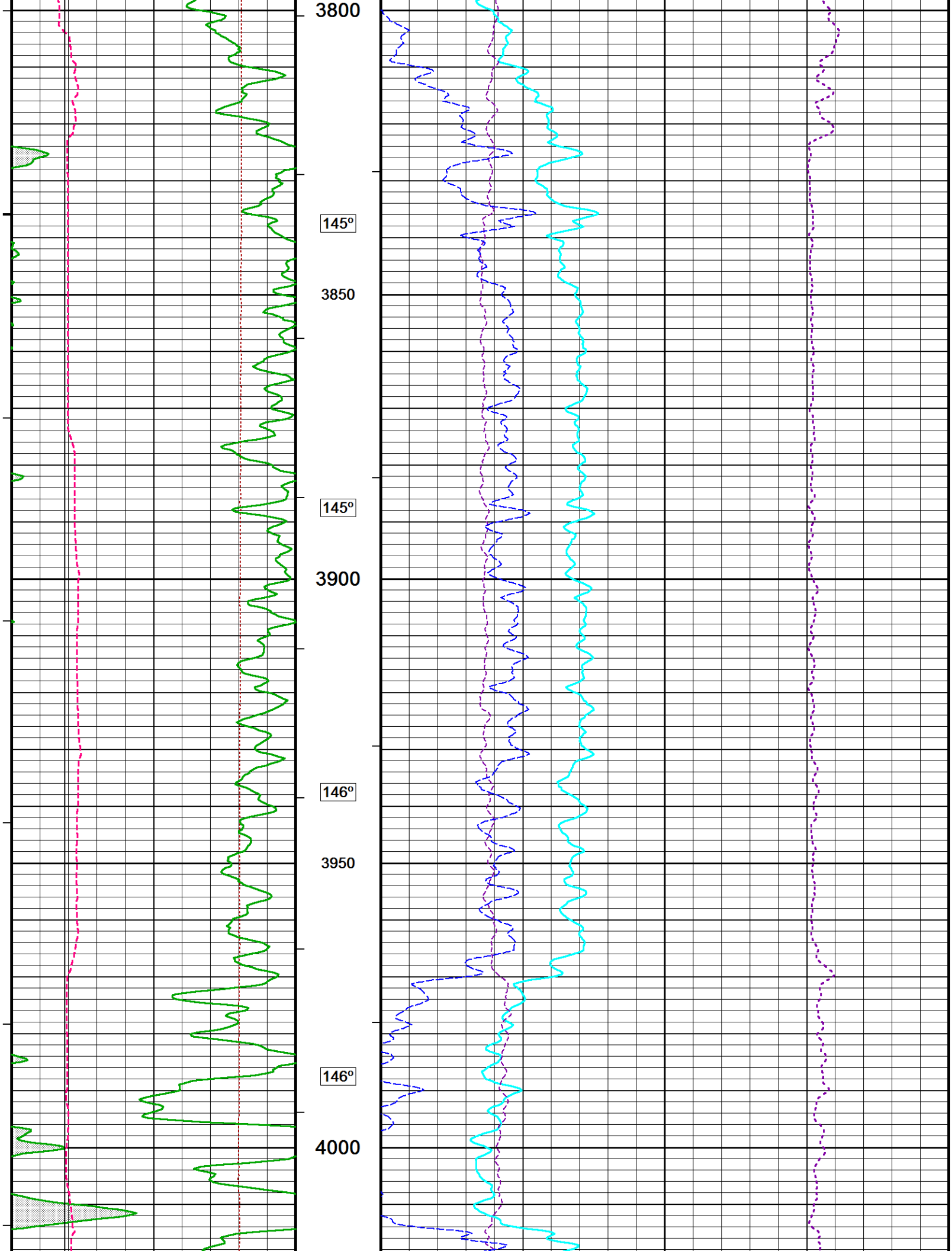

2700
2100
129°
2750
1200
130°
2800
131°
2850
132°
2900
2000
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
PE
Compensated Density
Density Correction

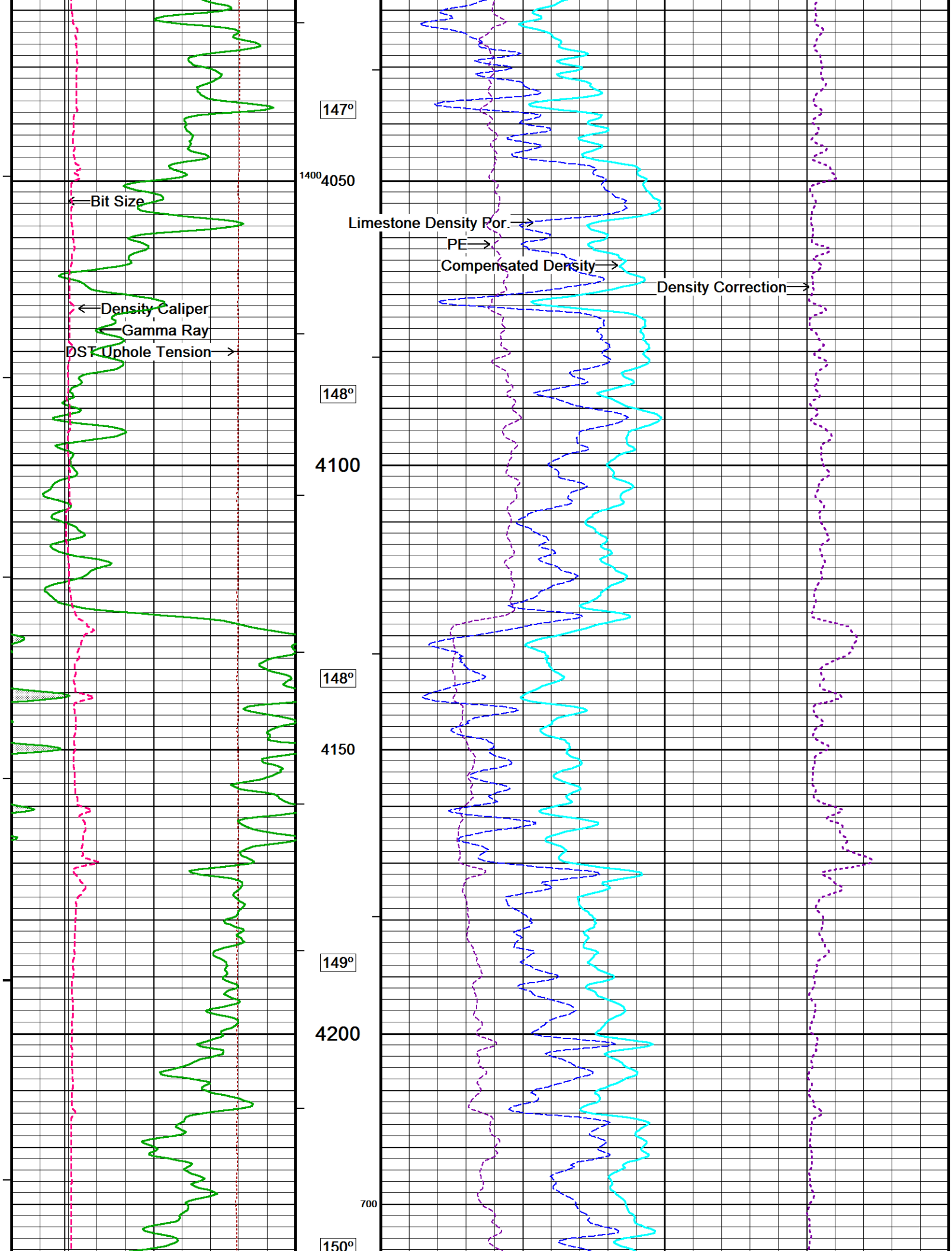

132°
2950
1100
133°
3000
1900
134°
3050
135°
3100
136°

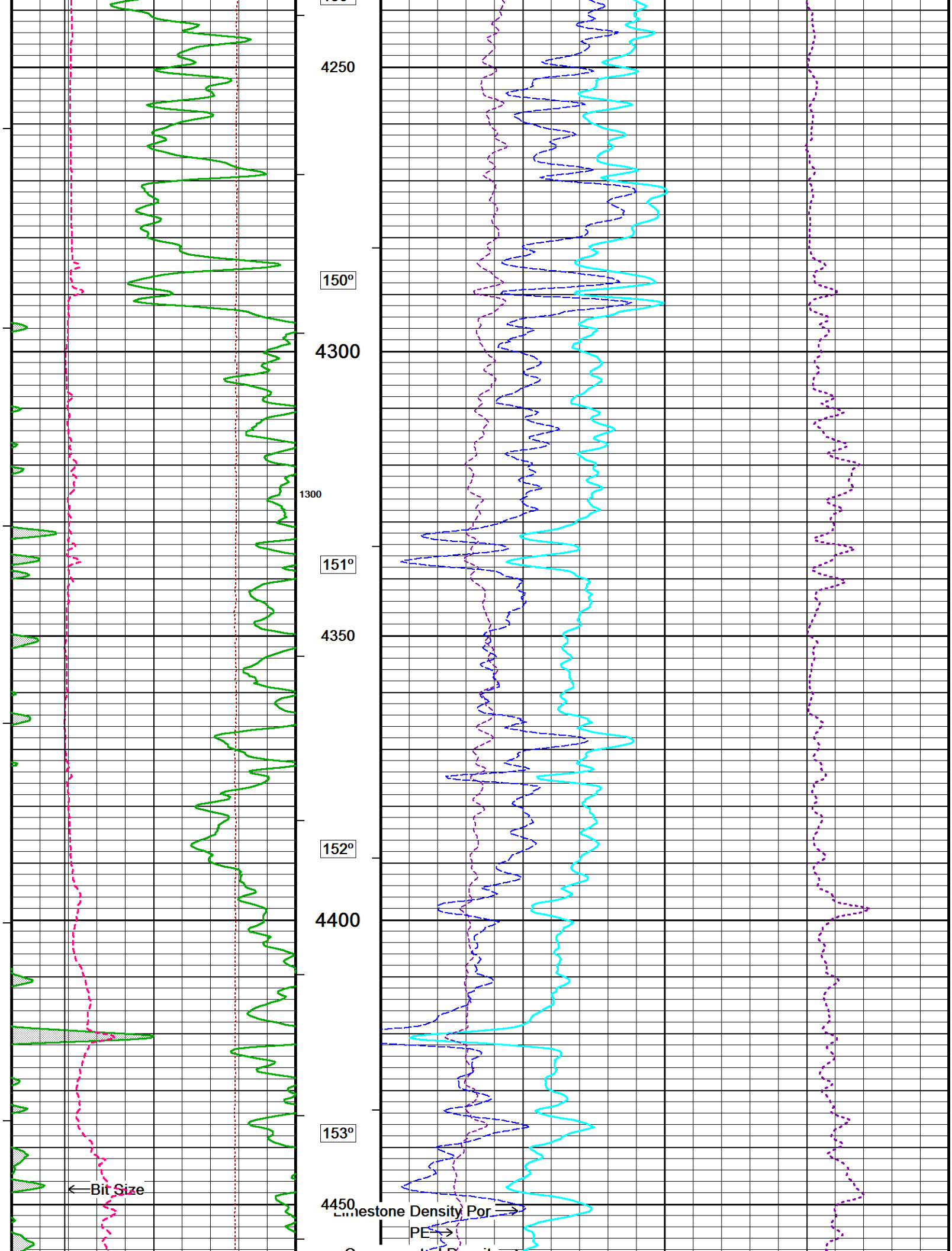

1000
3150
1800
136°
3200
137°
3250
Bit Size
Limestone Density Por
PL
Compensated Density
Density Correction
Density Caliper
Gamma Ray
138°
DST Uphole Tension
3300
139°
1700
3350

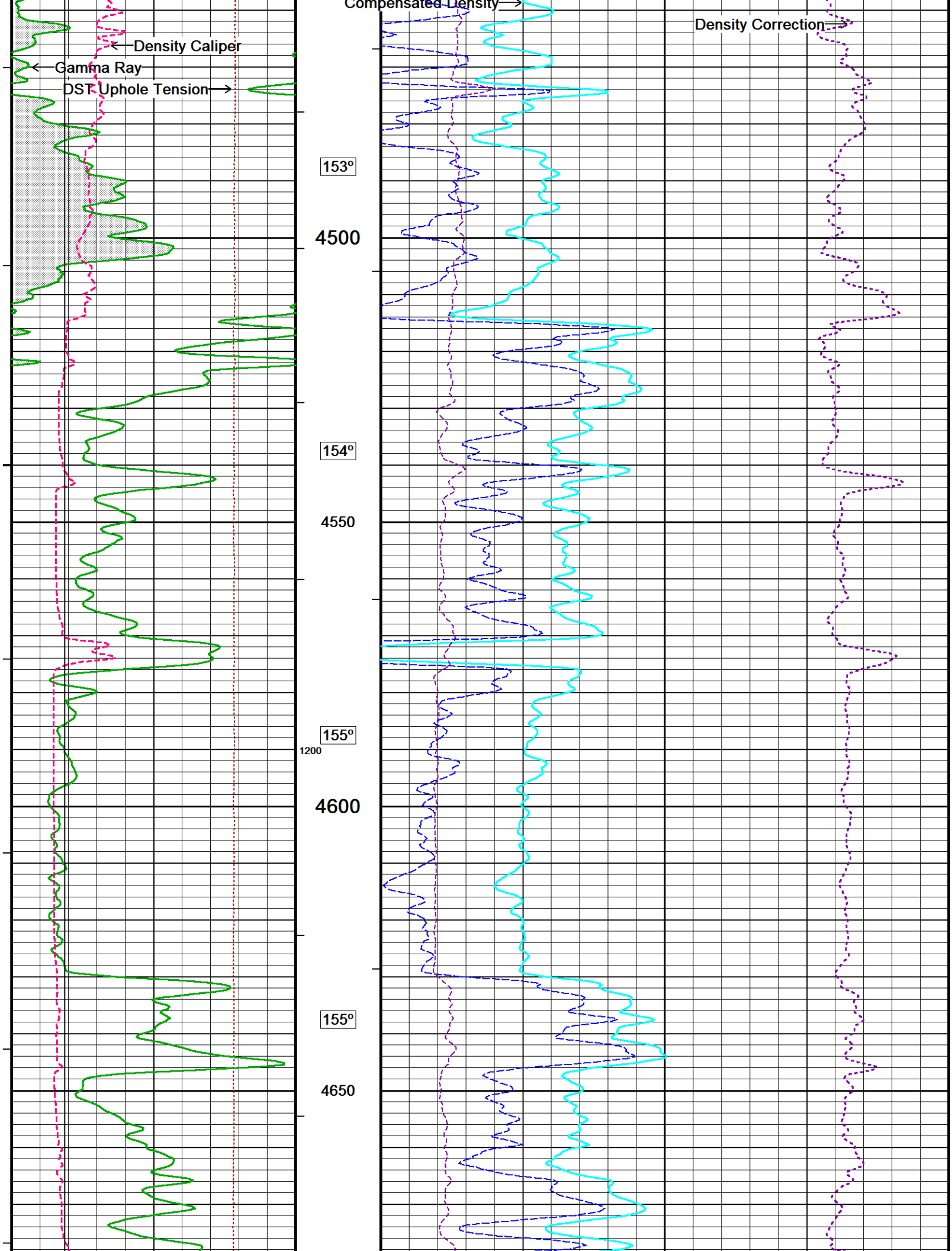

139°
900
3400
140°
3450
141°
3500
1600
141°
3550

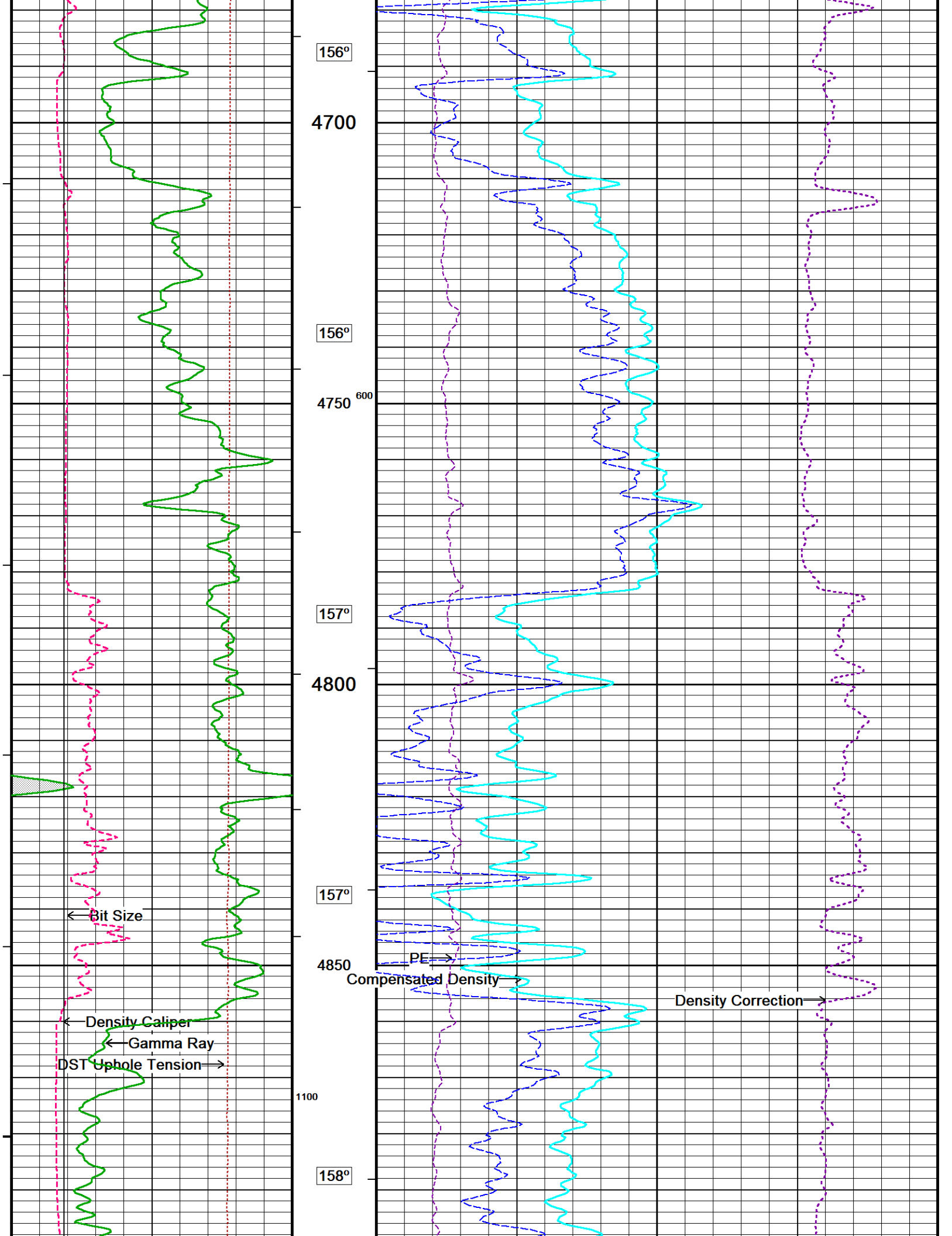

142°
3600
142°
3650
Bit Size
Limestone Density Por.
PE
Compensated Density
Density Correction
Density Caliper
Gamma Ray
DST Uphole Tension
143°
3700
800
143°
3750
1500
144°

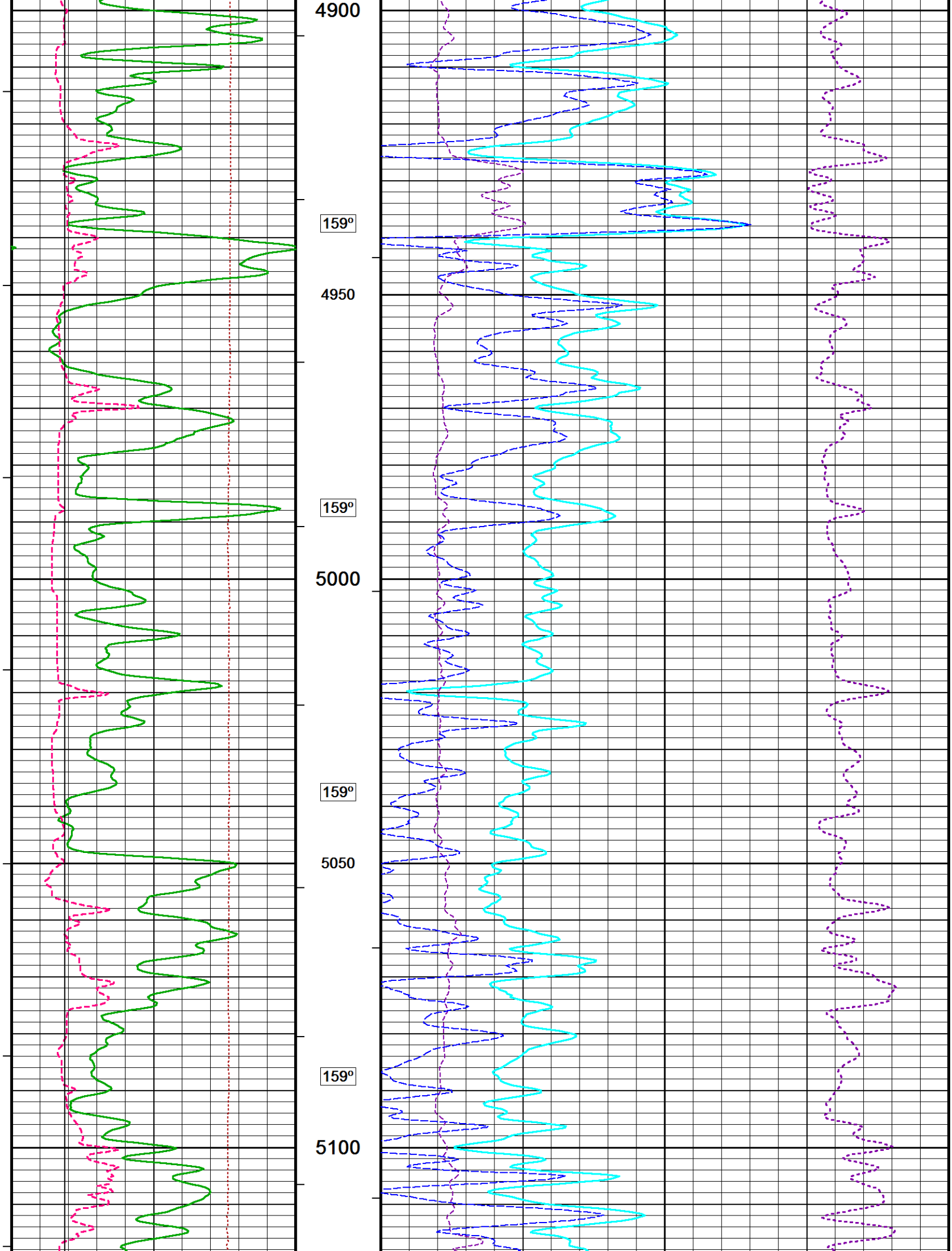

3800
145°
3850
145°
3900
146°
3950
146°
4000

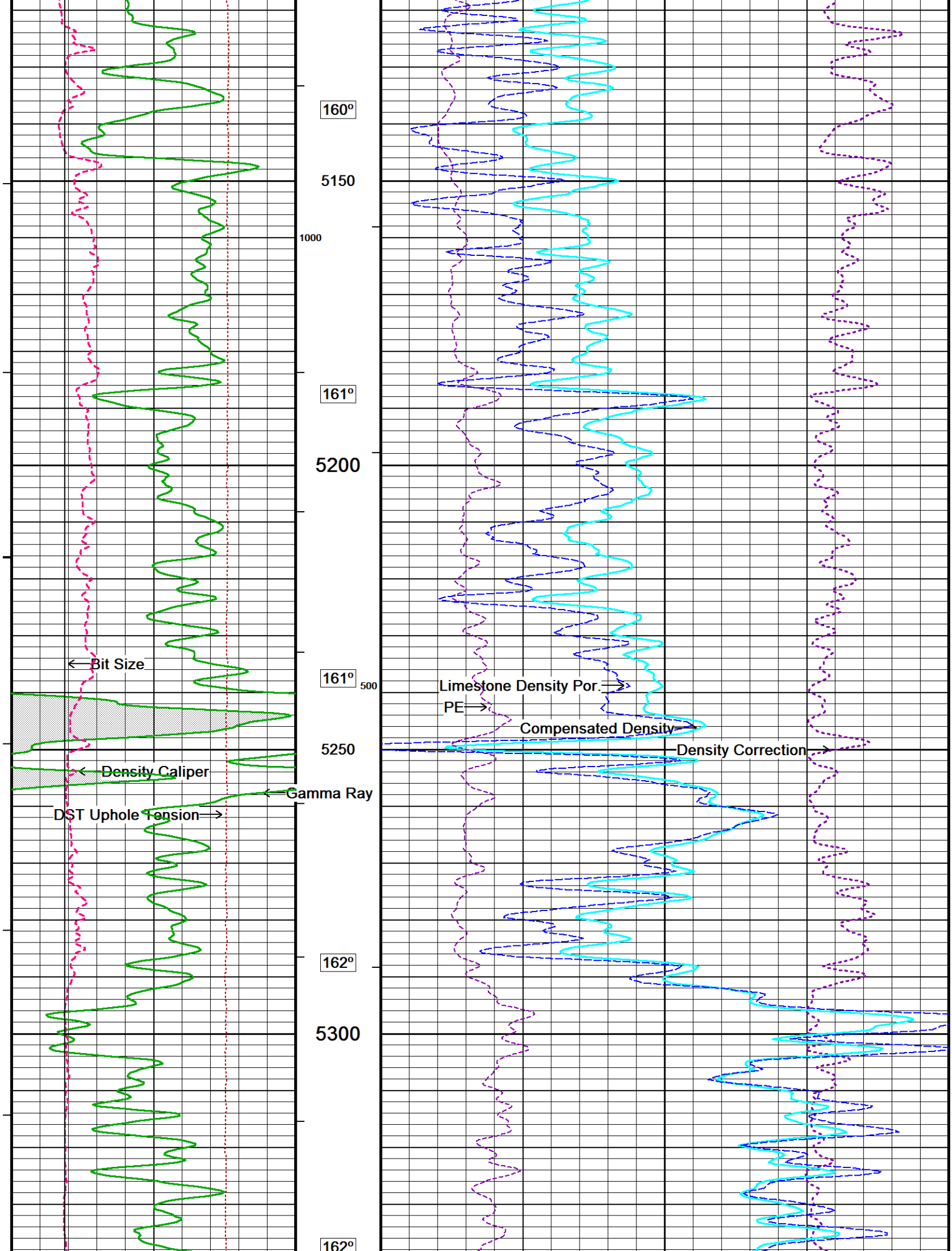

147°
1400
4050
Bit Size
Limestone Density Por.
PE
Compensated Density
Density Correction
Density Caliper
Gamma Ray
DST Uphole Tension
148°
4100
148°
4150
149°
4200
700
150°

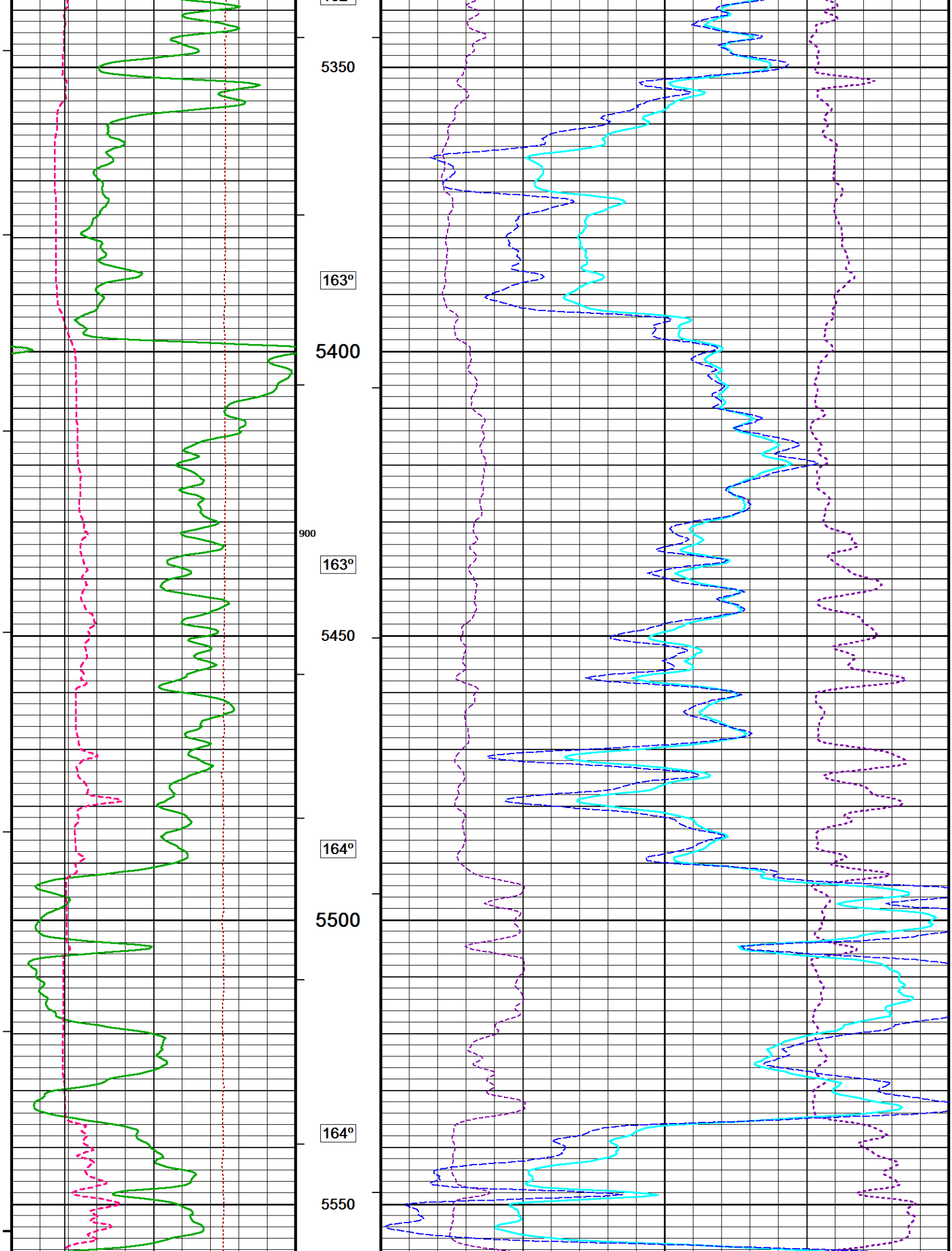

4250
150°
4300
1300
151°
4350
152°
4400
153°
4450
←Bit Size
Limestone Density Por →
PE →

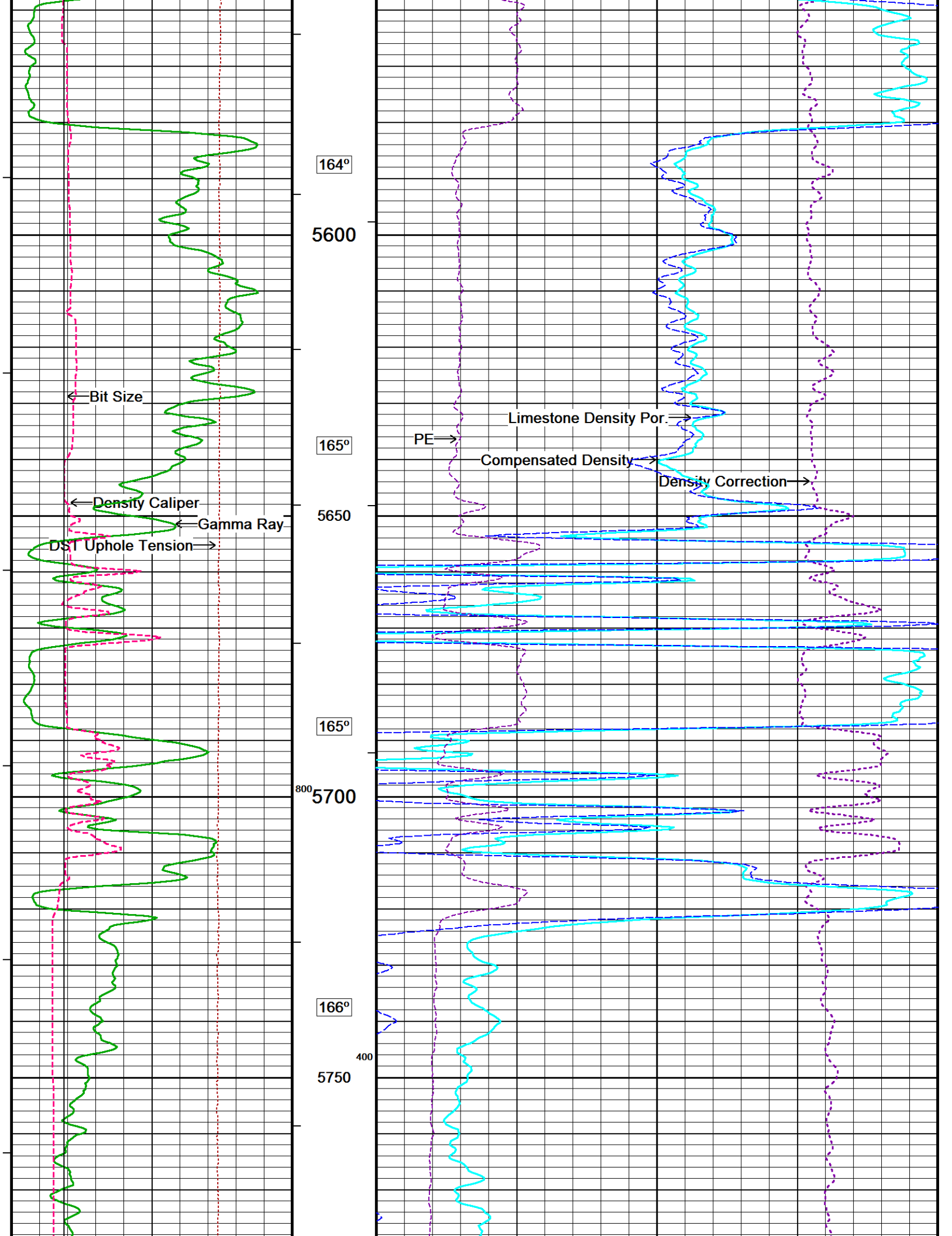

Density Caliper
Gamma Ray
DST Uphole Tension
Compensated Density
Density Correction
153°
4500
154°
4550
155°
1200
4600
155°
4650

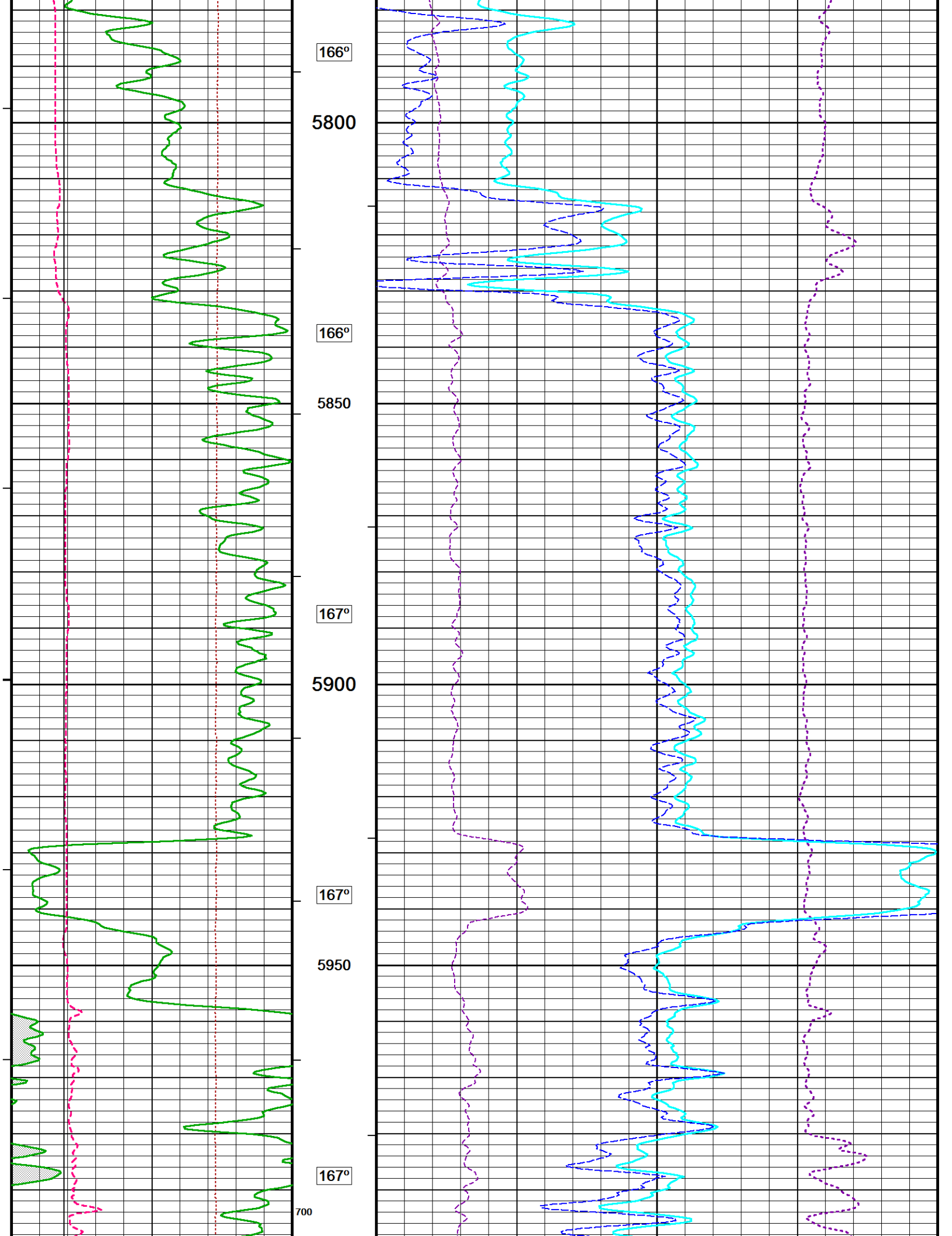

156°
4700
156°
4750
600
157°
4800
157°
4850
158°
1100
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
PE
Compensated Density
Density Correction

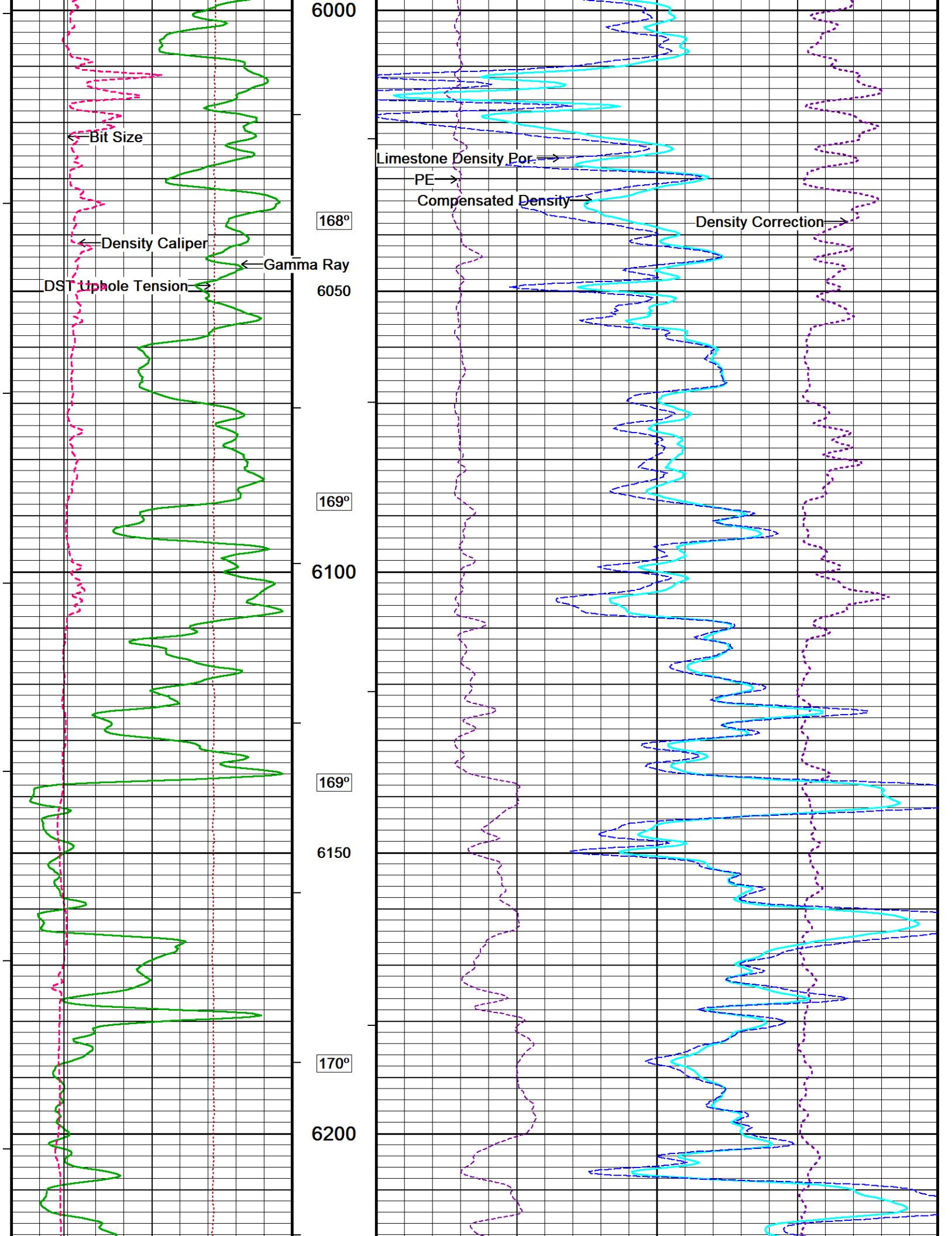

4900
159°
4950
159°
5000
159°
5050
159°
5100

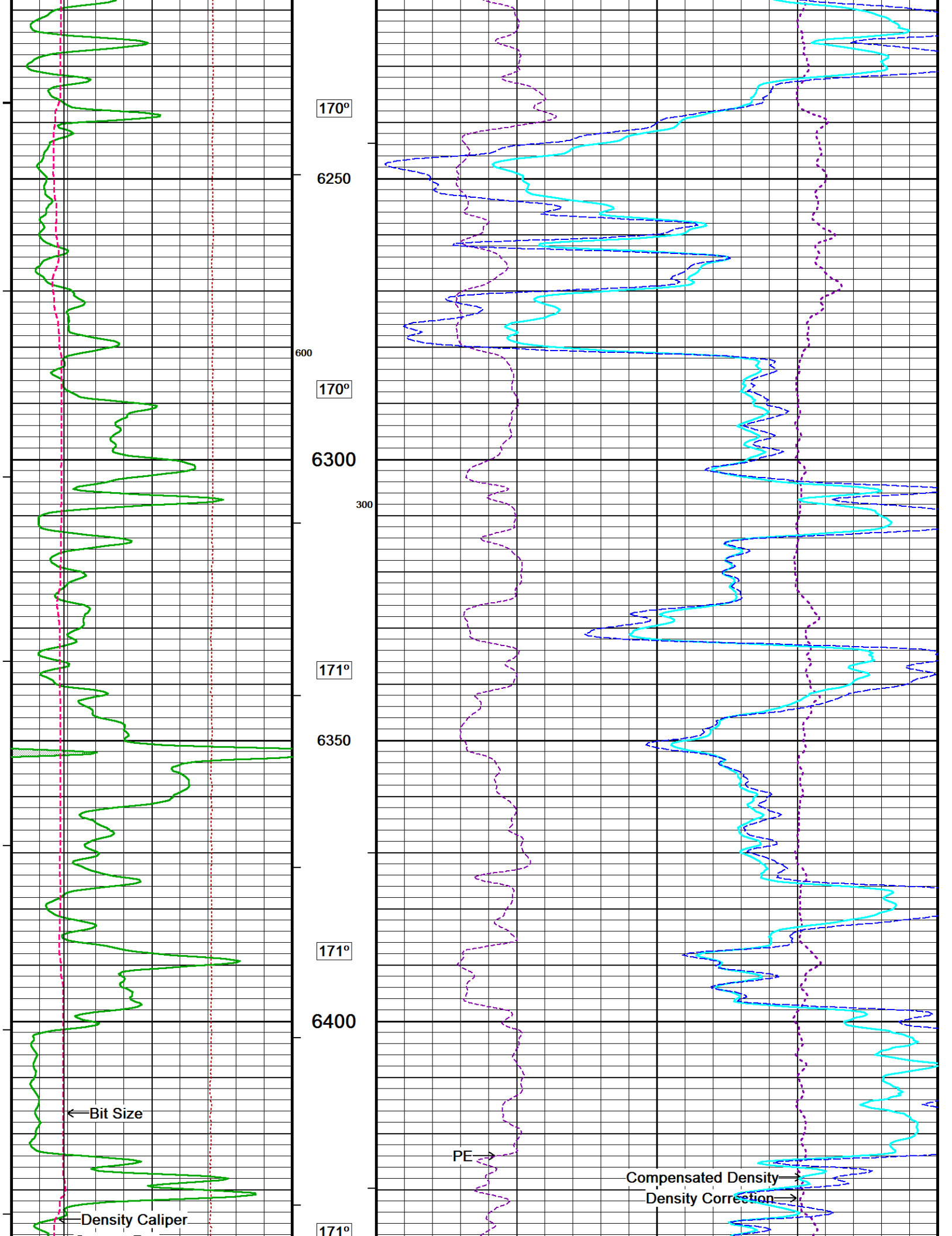

160°
5150
1000
161°
5200
Bit Size
161°
500
Limestone Density Por.
PE
Compensated Density
5250
Density Correction
Density Caliper
Gamma Ray
DST Uphole Tension
162°
5300
162°

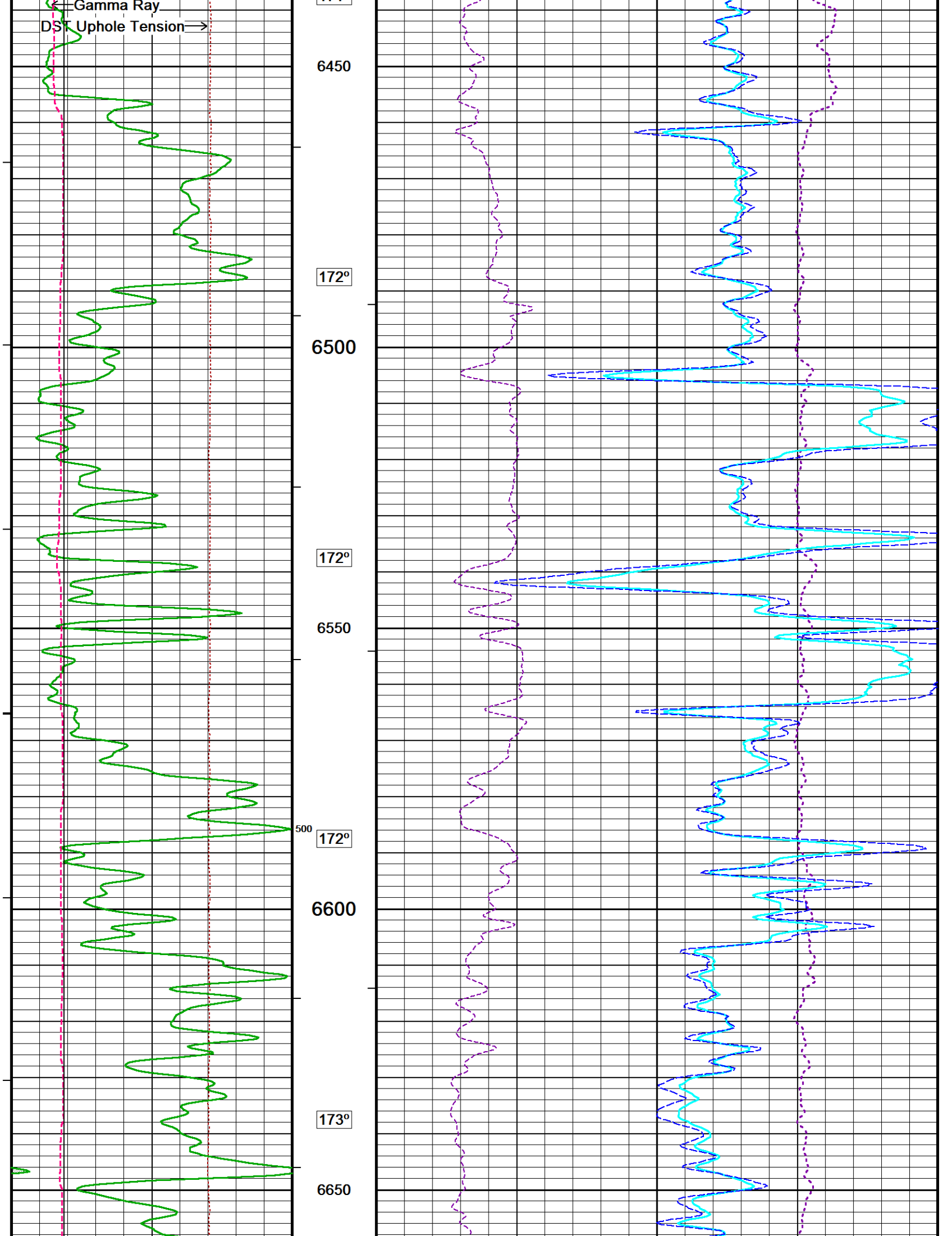

5350
163°
5400
900
163°
5450
164°
5500
164°
5550

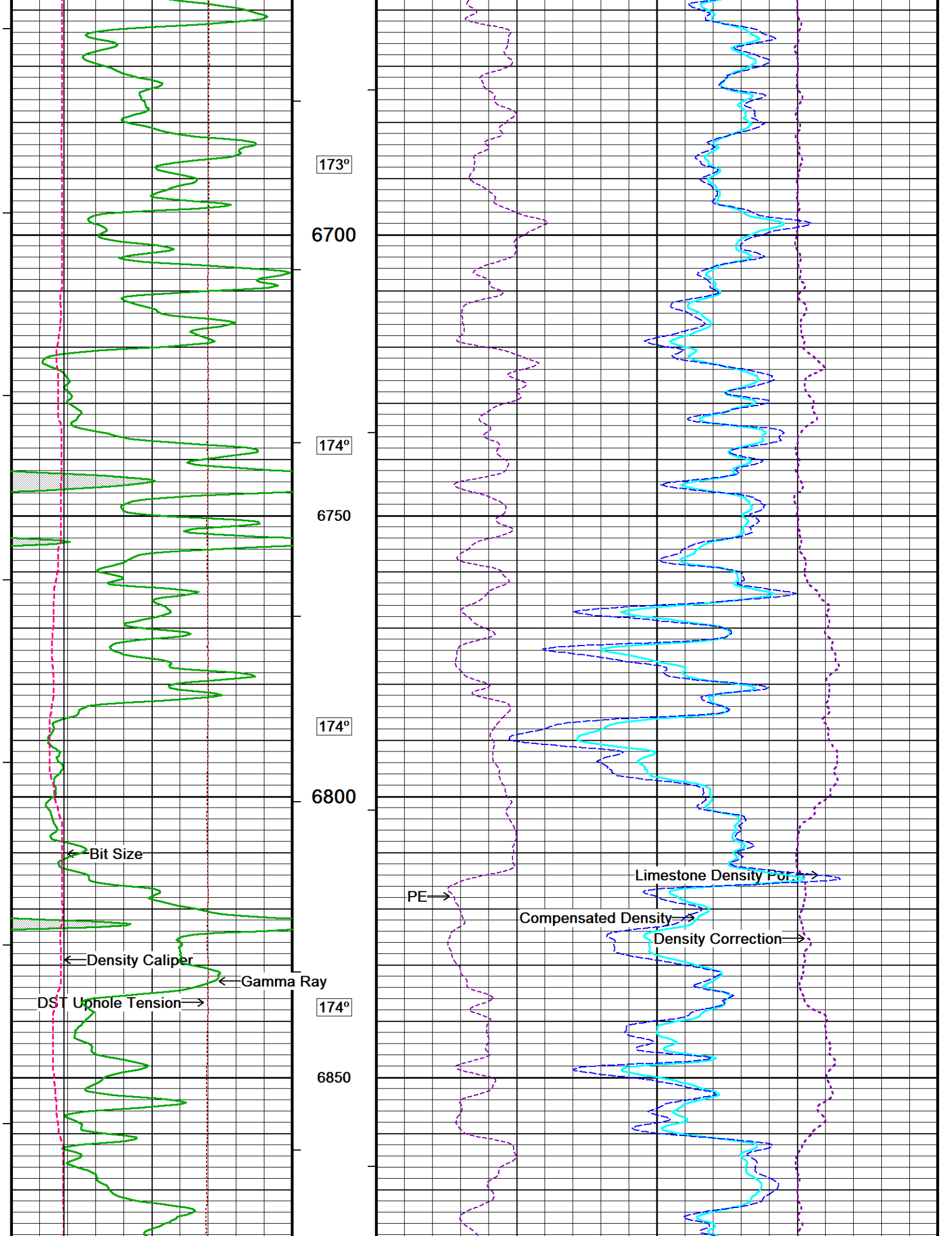

164°
5600
165°
5650
165°
800
5700
166°
400
5750
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
Limestone Density Por.
PE
Compensated Density
Density Correction

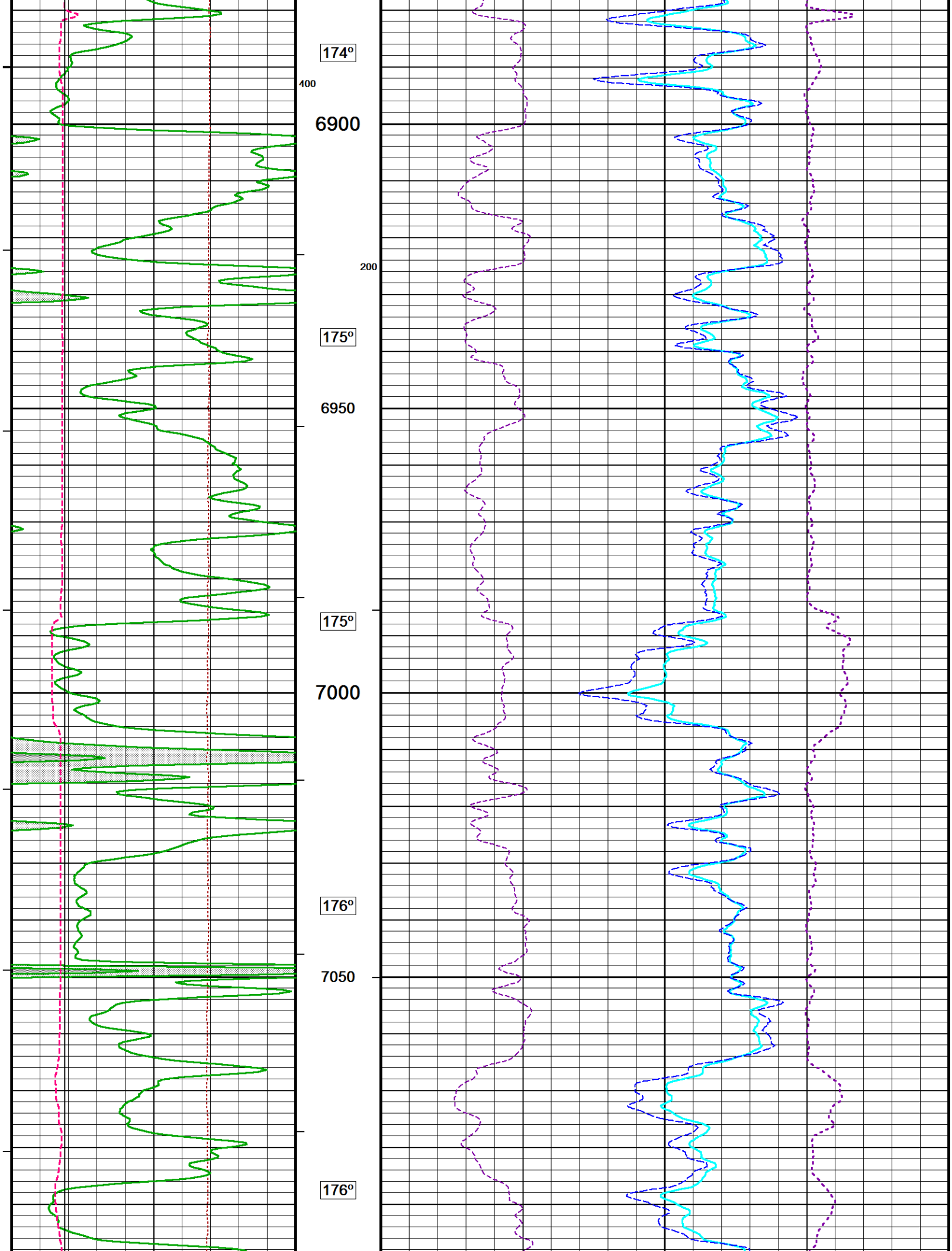

166°
5800
166°
5850
167°
5900
167°
5950
167°
700

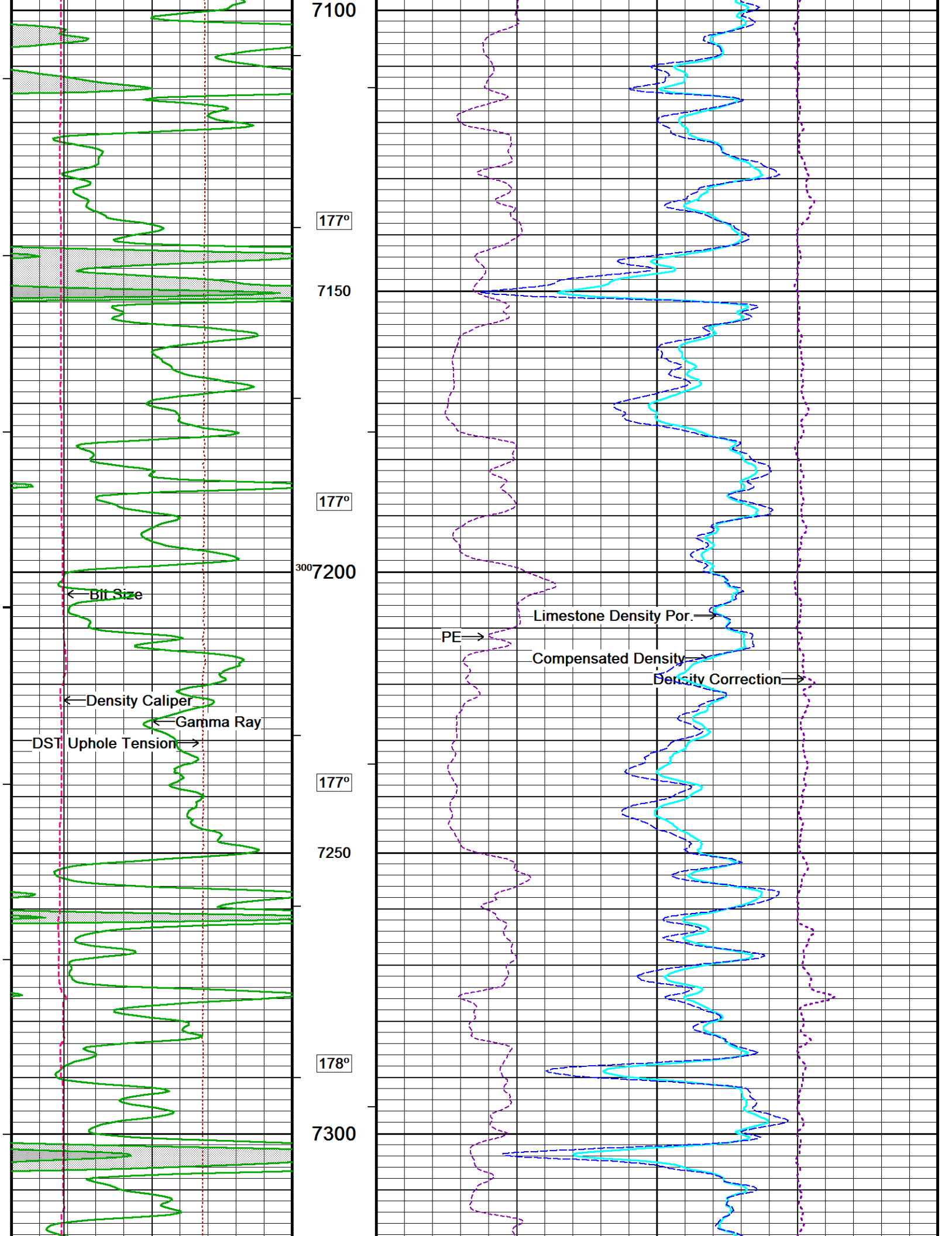

6000
Bit Size
Limestone Density Por
PE
Compensated Density
168º
Density Caliper
Density Correction
Gamma Ray
DST Uphole Tension
6050
169º
6100
169º
6150
170º
6200

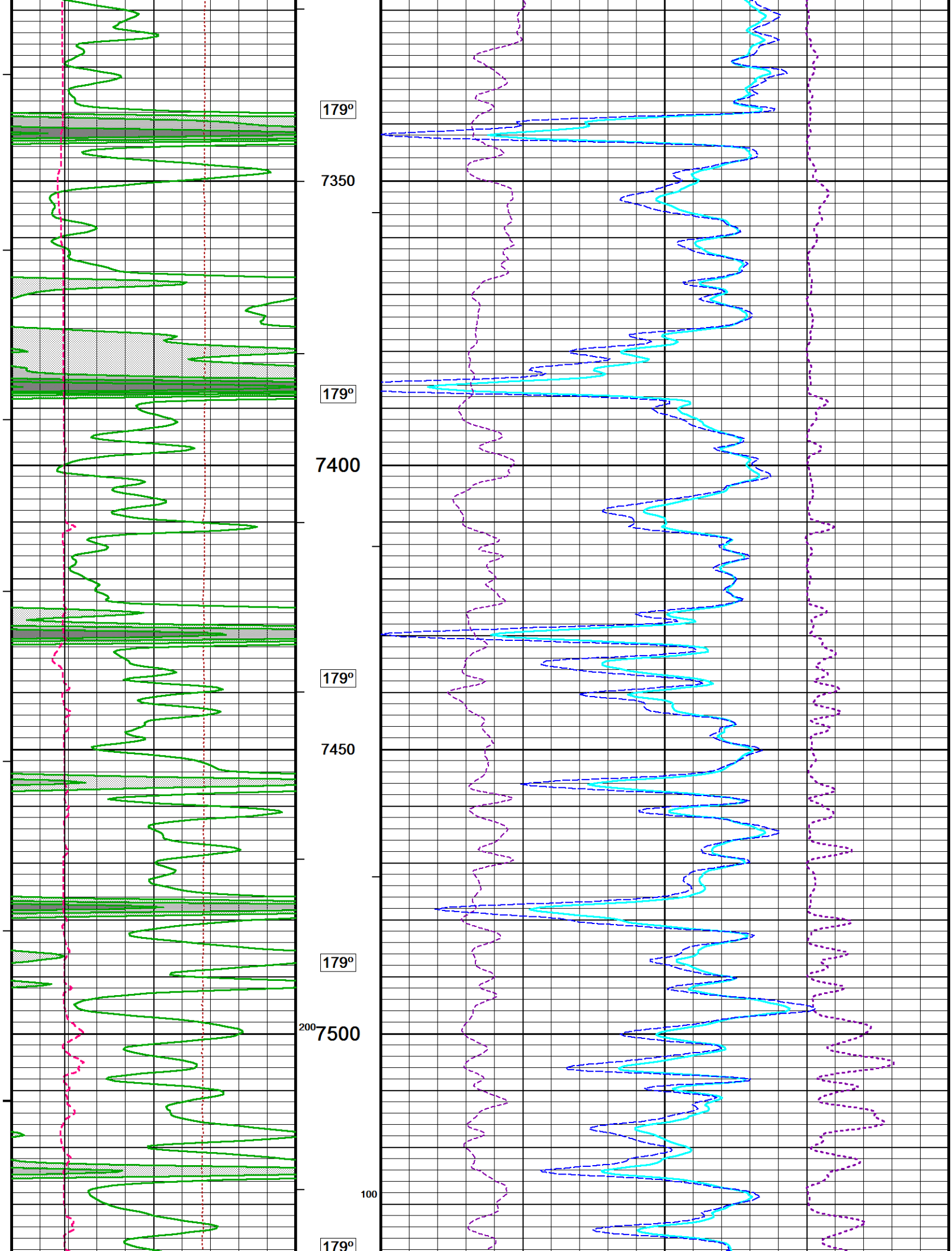

170°
6250
600
170°
6300
300
171°
6350
171°
6400
171°
Bit Size
Density Caliper
PE
Compensated Density
Density Correction

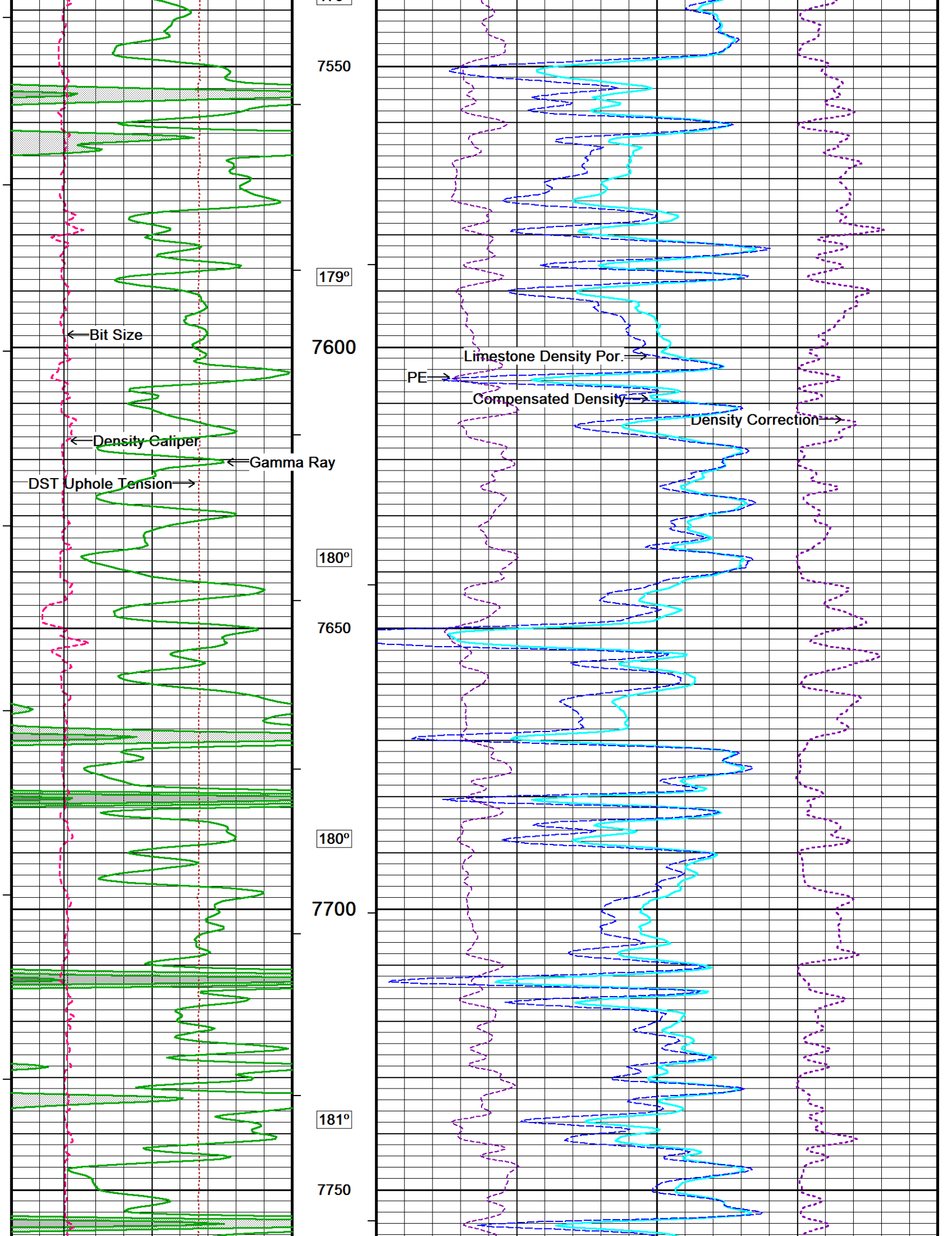

Gamma Ray
DST Uphole Tension
6450
172°
6500
172°
6550
500
172°
6600
173°
6650

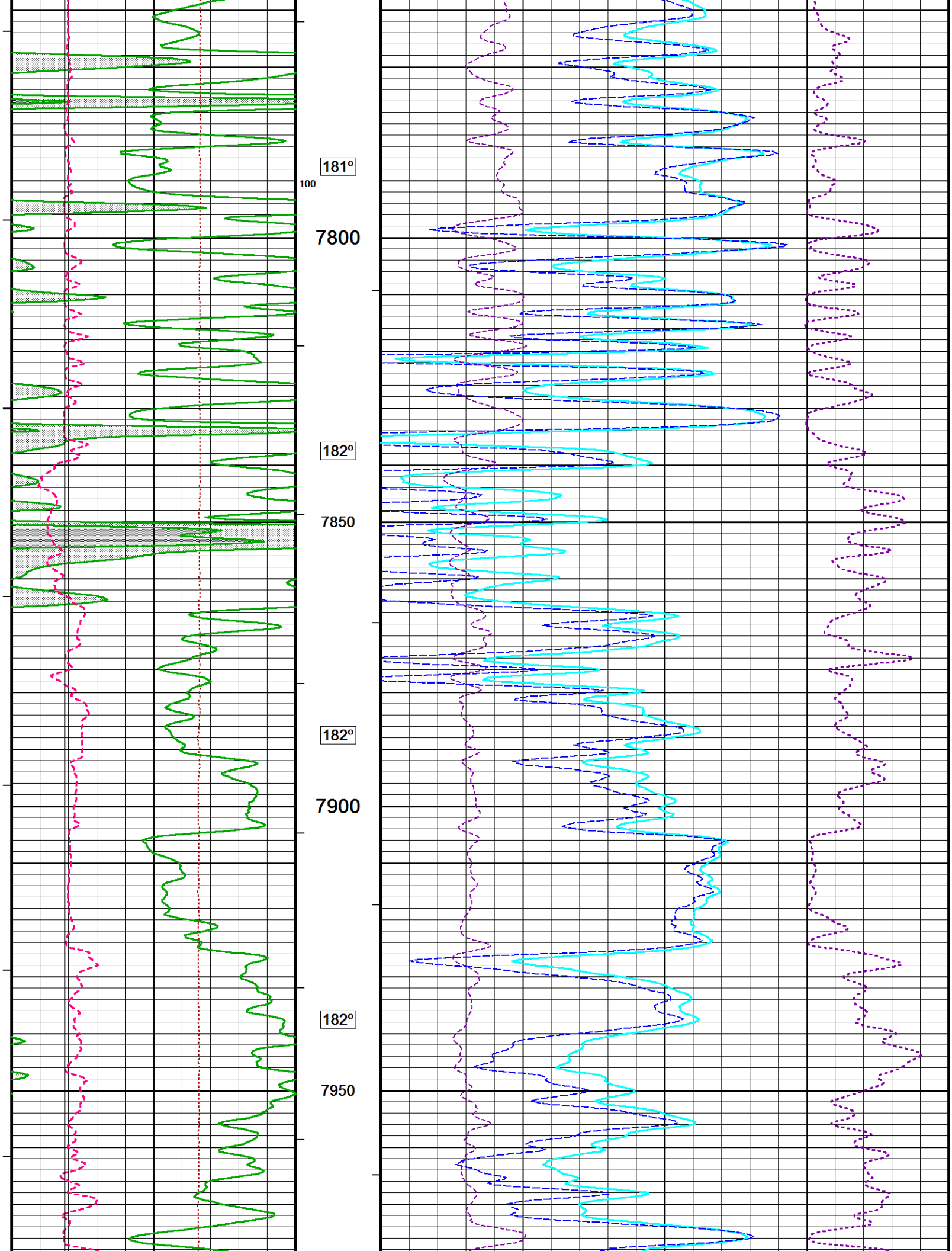

173°
6700
174°
6750
174°
6800
174°
6850
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
PE
Compensated Density
Limestone Density Por.
Density Correction

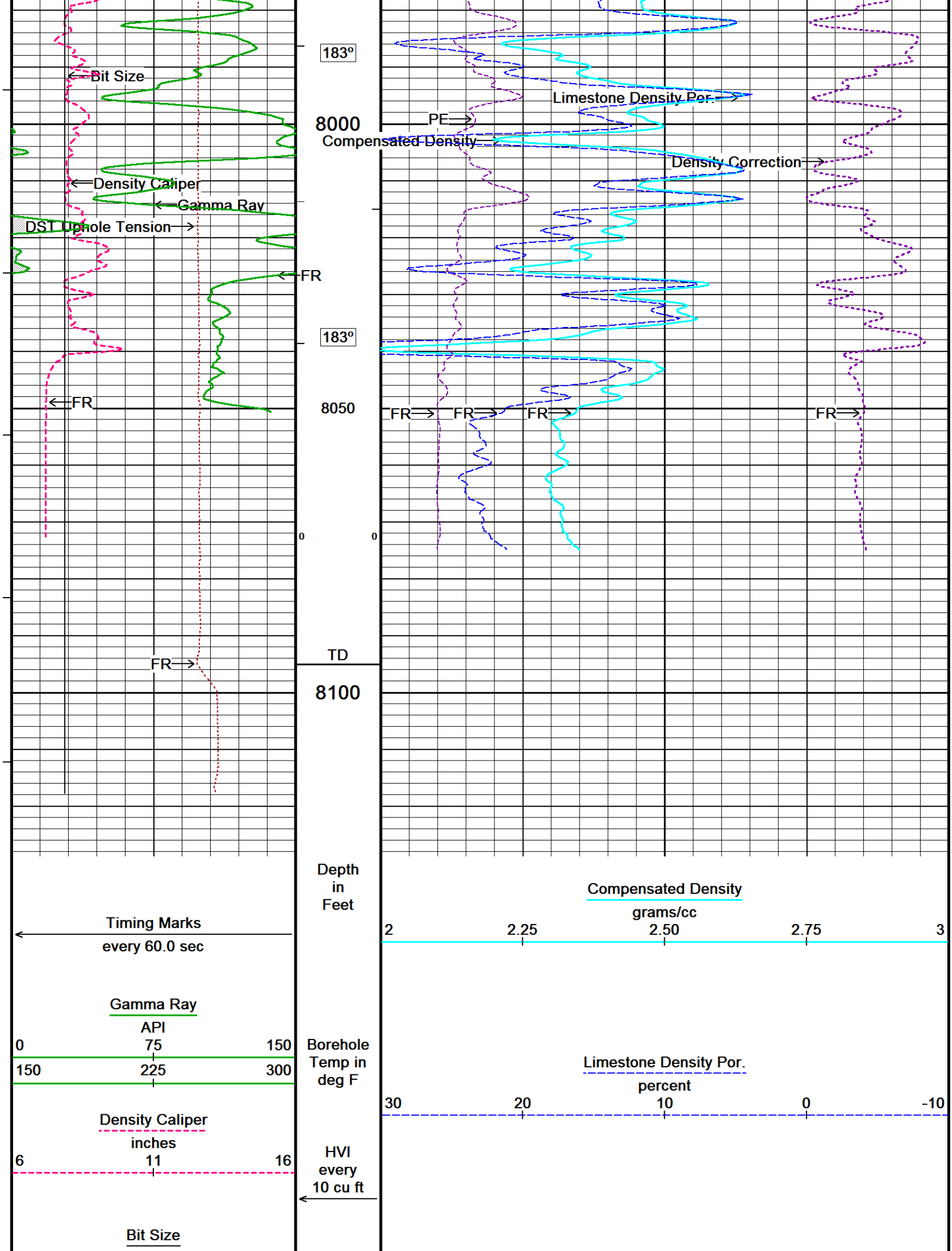

174°
400
6900
200
175°
6950
175°
7000
176°
7050
176°

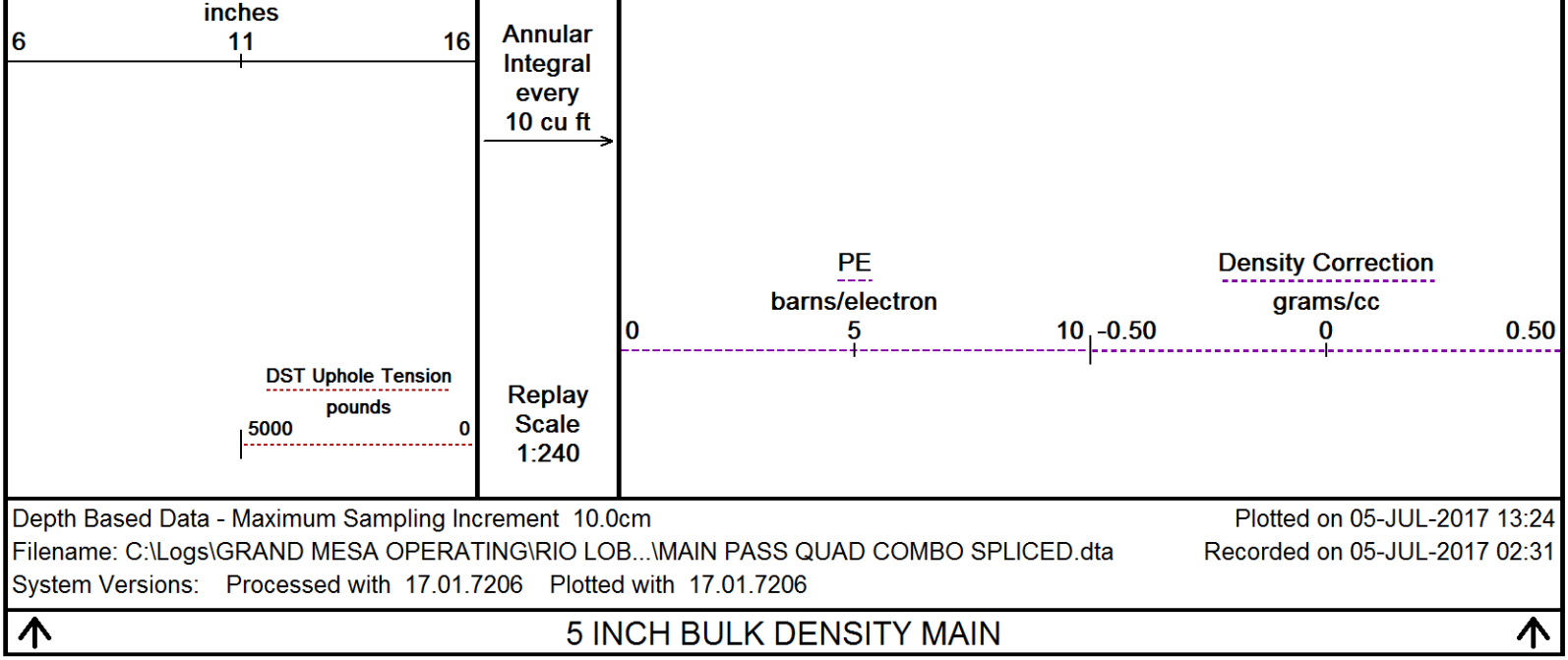

7100
177°
7150
177°
300
7200
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
177°
7250
178°
7300
Limestone Density Por.
PE
Compensated Density
Density Correction


179°
7350
179°
7400
179°
7450
179°
200
7500
100
179°


7550
179°
Bit Size
7600
Limestone Density Por.
PE
Compensated Density
Density Correction
Density Caliper
Gamma Ray
DST Uphole Tension
180°
7650
180°
7700
181°
7750


181°
100
7800
182°
7850
182°
7900
182°
7950


183°
Bit Size
8000
Limestone Density Por.
PE
Compensated Density
Density Correction
Density Caliper
Gamma Ray
DST Uphole Tension
FR
183°
FR
8050
FR
FR
FR
FR
0
0
TD
FR
8100
Depth in Feet
Compensated Density
grams/cc
2
2.25
2.50
2.75
3
Timing Marks
every 60.0 sec
Gamma Ray
API
0
75
150
150
225
300
Borehole Temp in deg F
Limestone Density Por.
percent
30
20
10
0
-10
Density Caliper
inches
6
11
16
HVI every 10 cu ft
Bit Size

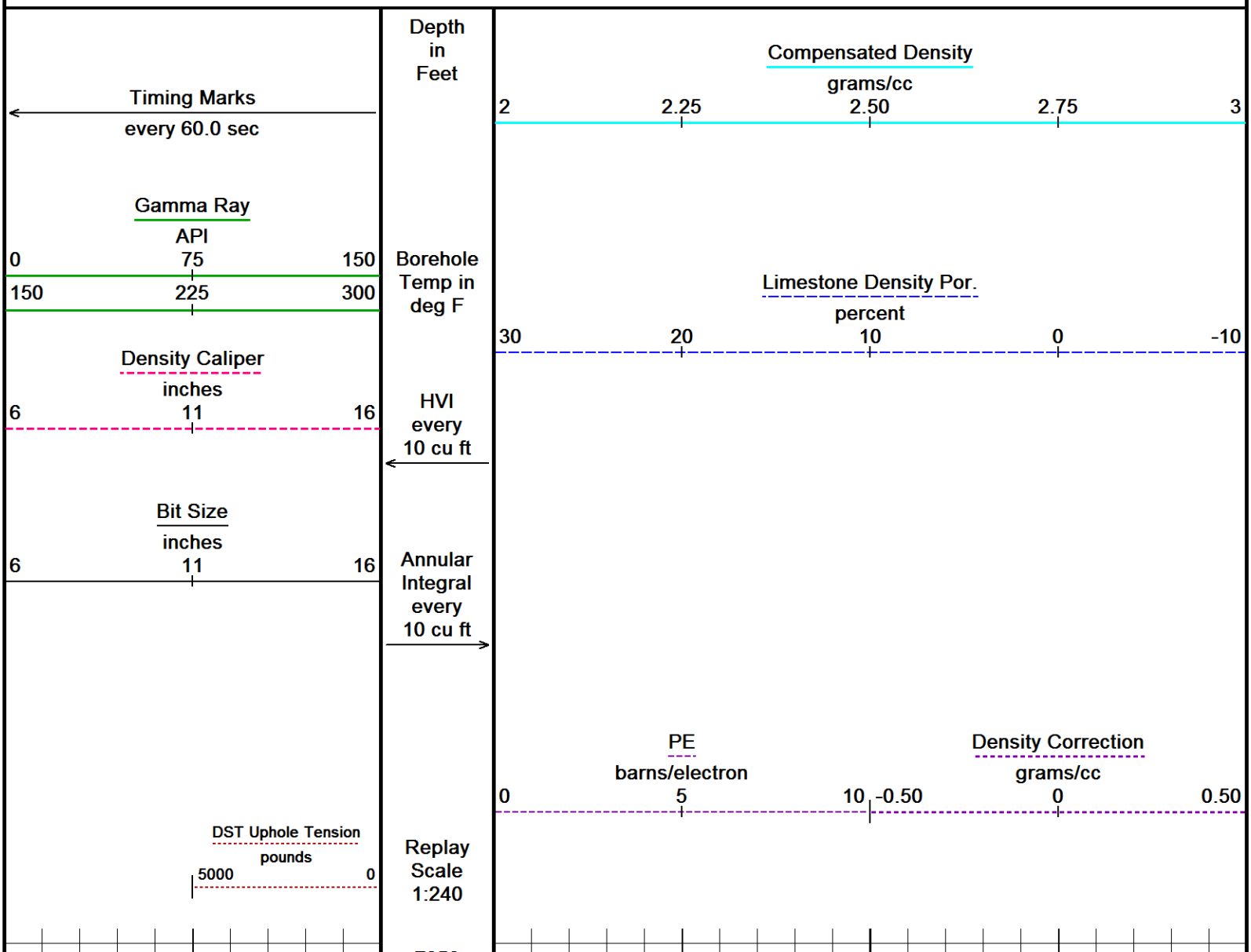


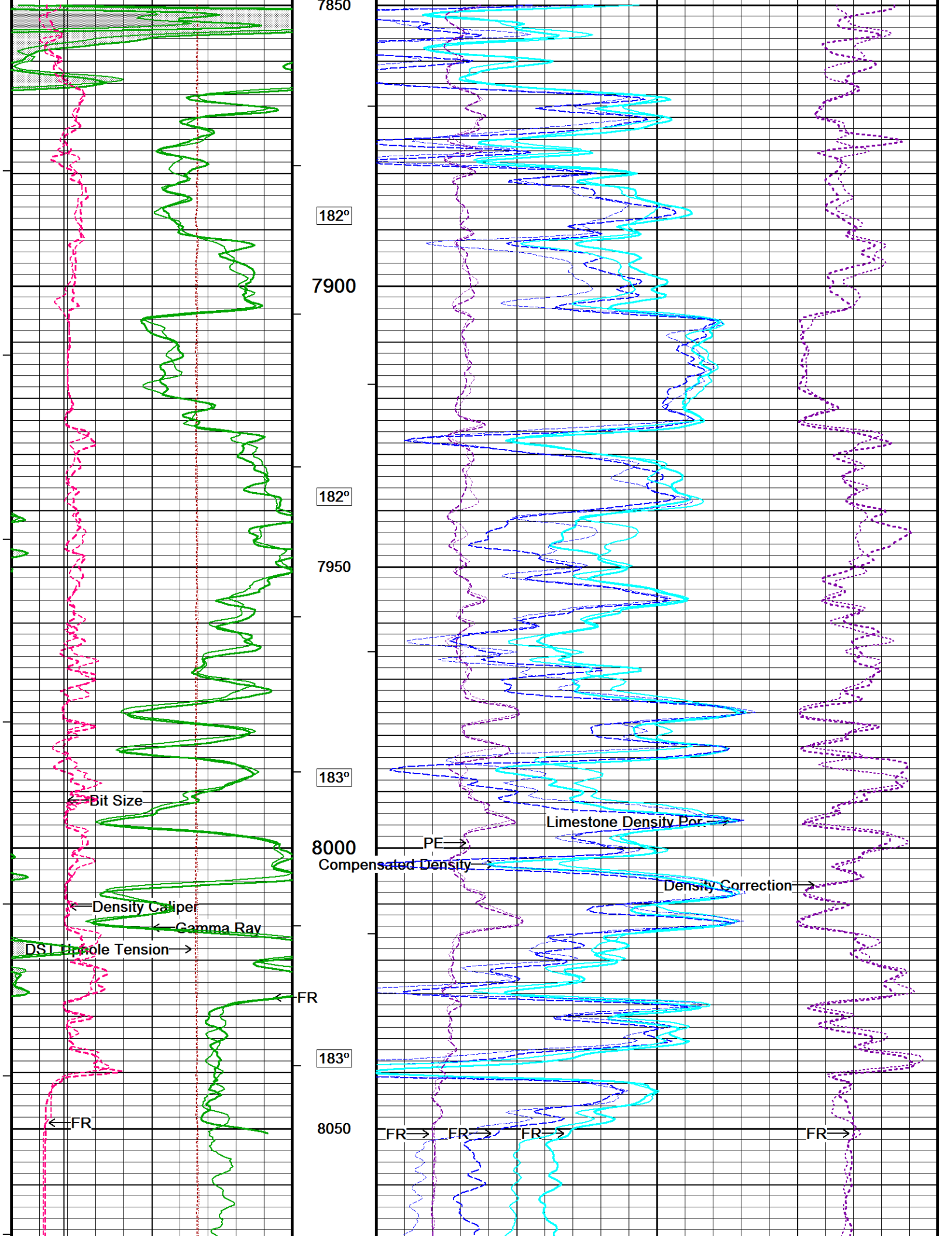

Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 05-JUL-2017 13:24
Filename: C:\Logs\GRAND MESA OPERATING\RIO LOB...\MAIN PASS QUAD COMBO SPLICED.dta — Recorded on 05-JUL-2017 02:31
System Versions: Processed with 17.01.7206 Plotted with 17.01.7206

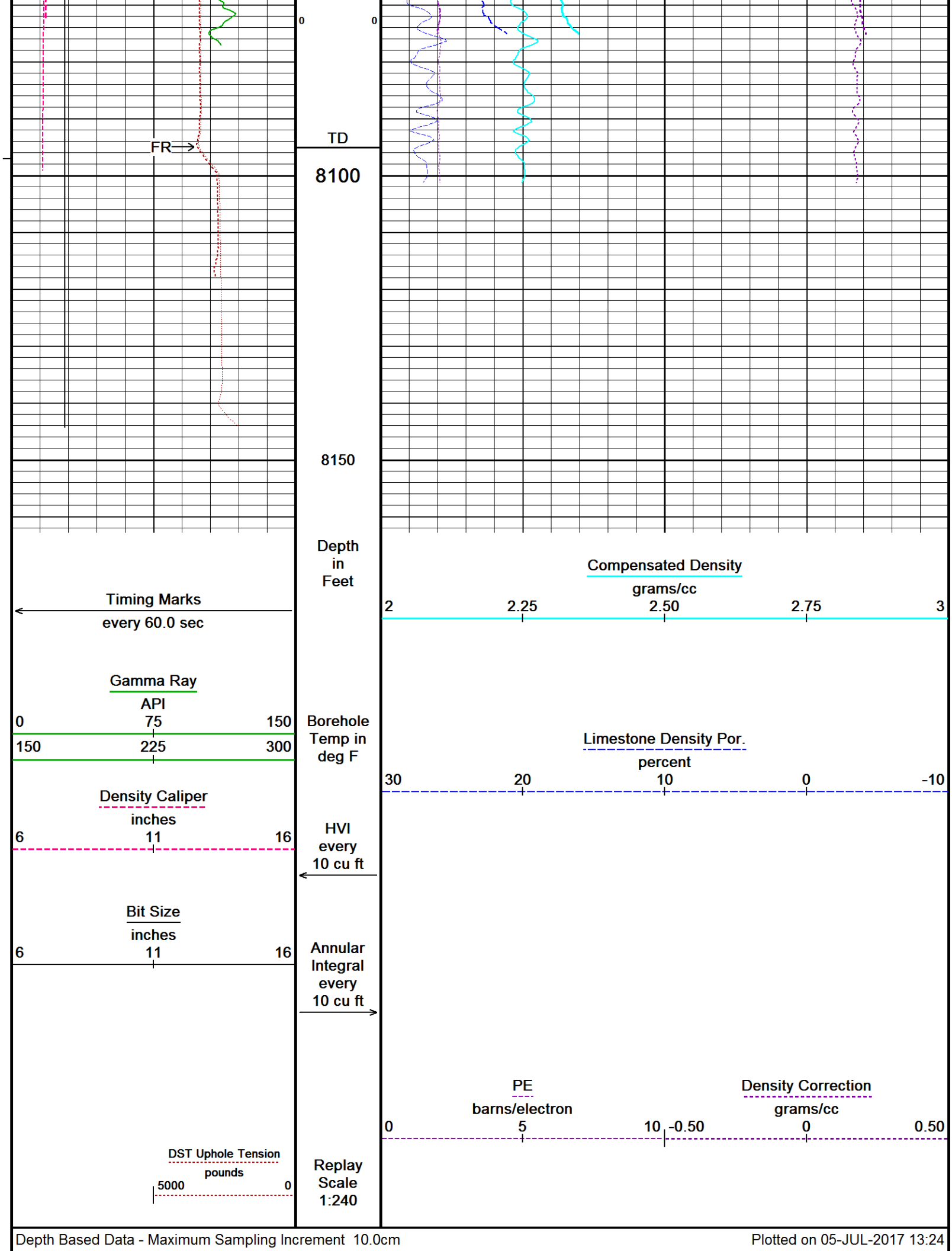
5 INCH BULK DENSITY MAIN

REPEAT SECTION

Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 05-JUL-2017 13:24
Filename: C:\Logs\GRAND MESA OPERATING\RIO LOB...\MAIN PASS QUAD COMBO SPLICED.dta — Recorded on 05-JUL-2017 02:31
Filename: C:\Logs\GRAND MESA OPERATIN...\RIO LOBO 1-30_QUAD COMBO_REPEAT PASS.dta — Recorded on 04-JUL-2017 22:36
System Versions: Processed with 17.01.7206 Plotted with 17.01.7206




7850
182°
7900
182°
7950
183°
8000
183°
8050
Bit Size
Density Caliper
Gamma Ray
DSI Uphole Tension
FR
FR
PE
Compensated Density
Limestone Density Por.
Density Correction
FR
FR
FR
FR




Depth Based Data - Maximum Sampling Increment 10.0cm

Plotted on 05-JUL-2017 13:24

Filename: C:\Logs\GRAND MESA OPERATING\RIO LOB...\MAIN PASS QUAD COMBO SPLICED.dta Recorded on 05-JUL-2017 02:31
Filename: C:\Logs\GRAND MESA OPERATIN...\RIO LOBO 1-30_QUAD COMBO_REPEAT PASS.dta Recorded on 04-JUL-2017 22:36
System Versions: Processed with 17.01.7206 Plotted with 17.01.7206

REPEAT SECTION

# BEFORE SURVEY CALIBRATION

C:\Logs\GRAND MESA OPERATING\RIO LOBO 1-30\RUN_1\8367-186414219\MAIN PASS QUAD COMBO SPLICED.dta

## Caliper Calibration MPD-C.A 310

Base Calibration on 28-JUN-2017 12:55
Field Calibration on 30-JUN-2017 14:33

Base Calibration

| Reading No | Measured | Calibrator Size (in) |
|---|---|---|
| 1 | 14863 | 3.99 |
| 2 | 23472 | 5.96 |
| 3 | 32082 | 7.96 |
| 4 | 40369 | 9.85 |
| 5 | 49632 | 11.88 |
| 6 | N/A | N/A |

Field Calibration

| Measured Caliper (in) | Actual Caliper (in) |
|---|---|
| 7.93 | 7.96 |

## Caliper Calibration Tolerances MPD-C.A 310

| | | 7.56 | 7.96 | 8.36 | |
|---|---|---|---|---|---|
| Long Arm Field Cal. | 7.93 | | | | in |

## Photo Density Calibration MPD-C.A 310

Base Calibration on 29-JUN-2017 16:53
Field Check on 30-JUN-2017 14:39

Density Calibration

| Base Calibration | Measured Near | Measured Far | Calibrated (sdu) Near | Calibrated (sdu) Far |
|---|---|---|---|---|
| Background | 1089 | 1384 | | |
| Reference 1 | 52195 | 25389 | 59443 | 30683 |
| Reference 2 | 20921 | 2506 | 24540 | 2525 |

Field Check at Base

| 1088.9 | 1383.8 |
|---|---|

Field Check

| 1091.4 | 1397.8 |
|---|---|

PE Calibration

| Base Calibration | Measured WS | Measured WH | Measured Ratio | Calibrated Ratio |
|---|---|---|---|---|
| Background | 202 | 980 | | |
| Reference 1 | 21840 | 52024 | 0.424 | 0.372 |
| Reference 2 | 6003 | 20806 | 0.293 | 0.271 |

Field Check at Base

| 202.3 | 979.7 |
|---|---|

Field Check

| 205.3 | 982.8 |
|---|---|

## Photo Density Calibration Tolerances MPD-C.A 310

| | | -5% | 2.52 | +5% | | | -5% | 21.00 | +5% |
|---|---|---|---|---|---|---|---|---|---|
| Near Density Ratio | 2.58 | | | | Far Density Ratio | 21.39 | | | |
| PE Calibration | 0.120 | 0.089 | 0.110 | 0.131 | | | | | |
| Near Den. Field Check | 1091.4 | -3% | 1088.9 | +3% | Far Den. Field Check | 1397.8 | -3% | 1383.8 | +3% |
| PE WS Field Check | 205.3 | -6% | 202.3 | +6% | PE WH Field Check | 982.8 | -6% | 979.7 | +6% |

## Density Constants MPD-C.A 310

Last Edited on 04-JUL-2017,21:40

| | |
|---|---|
| Density Source Id | P50562B |
| Nylon Calibrator Number | DNC.E.652 |

| | | |
|---|---|---|
| Aluminium Calibrator Number | DACD631 | |
| 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 | Not 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 |

## High Resolution Temperature Calibration MAI-B.J 363

Field Calibration on 19-JUN-2017,16:22

| | Measured | Calibrated(Deg F) |
|---|---|---|
| Lower | 10.00 | 10.00 |
| Upper | 100.00 | 100.00 |

## High Resolution Temperature Constants MAI-B.J 363

Last Edited on 19-JUN-2017,16:22

| | |
|---|---|
| Pre-filter Length | 11 |

## Induction Calibration MAI-B.J 363

Base Calibration on 19-JUN-2017,16:57
Field Check on 30-JUN-2017 14:44

### Base Calibration

Test Loop Calibration

| Channel | Measured Low | Measured High | Calibrated (mmho/m) Low | Calibrated (mmho/m) High |
|---|---|---|---|---|
| 1 | 17.8 | 467.2 | 9.3 | 966.2 |
| 2 | 6.3 | 374.8 | 7.6 | 821.4 |
| 3 | 3.8 | 260.7 | 5.2 | 566.0 |
| 4 | 2.0 | 132.4 | 2.6 | 279.2 |
| Array Temperature | | 69.4 | Deg F | |

Test Loop Calibration Verified

| Channel | Base Check (mmho/m) Low | Base Check (mmho/m) High | Field Check (mmho/m) Low | Field Check (mmho/m) High | |
|---|---|---|---|---|---|
| 1 | 0.0 | 0.0 | 13.2 | 3898.1 | |
| 2 | 0.0 | 0.0 | 30.7 | 3604.8 | |
| 3 | 0.0 | 0.0 | 28.1 | 3043.1 | |
| 4 | 0.0 | 0.0 | 19.6 | 2093.7 | |
| Deep | 0.0 | 0.0 | 16.5 | 1946.5 | |
| Medium | 0.0 | 0.0 | 41.2 | 4012.2 | |
| Shallow | 0.0 | 0.0 | 46.9 | 5394.3 | |
| Array Temperature | | 0.0 | | 89.9 | Deg F |

## Induction Calibration Tolerances MAI-B.J 363

| | | | | | |
|---|---|---|---|---|---|
| Low Conductivity 1 | 17.8 | 13.0 / 17.0 / 21.0 | mmho/m | High Conductivity 1 | 467.2 | 430.0 / 475.0 / 520.0 | mmho/m |
| Low Conductivity 2 | 6.3 | 4.5 / 6.0 / 7.5 | mmho/m | High Conductivity 2 | 374.8 | 345.0 / 385.0 / 425.0 | mmho/m |
| Low Conductivity 3 | 3.8 | 1.0 / 3.5 / 6.0 | mmho/m | High Conductivity 3 | 260.7 | 240.0 / 260.0 / 280.0 | mmho/m |
| Low Conductivity 4 | 2.0 | 0.0 / 2.0 / 4.0 | mmho/m | High Conductivity 4 | 132.4 | 120.0 / 135.0 / 150.0 | mmho/m |
| Background Vx 1 | 0.0 | -110.0 / -32.5 / 45.0 | mmho/m | Phase Check Loop 1 | 0.0 | -2.0 / 0.0 / 2.0 | % |
| Background Vx 2 | 0.0 | -35.0 / 20.0 / 75.0 | mmho/m | Phase Check Loop 2 | 0.0 | -2.0 / 0.0 / 2.0 | % |
| Background Vx 3 | 0.0 | -60.0 / 2.5 / 65.0 | mmho/m | Phase Check Loop 3 | 0.0 | -2.0 / 0.0 / 2.0 | % |
| Background Vx 4 | 0.0 | -50.0 / -17.5 / 15.0 | mmho/m | Phase Check Loop 4 | 0.0 | -2.0 / 0.0 / 2.0 | % |

## Induction Constants MAI-B.J 363

Last Edited on 04-JUL-2017,20:42

| | | | | | |
|---|---|---|---|---|---|
| Induction Model | | RtAP-WBM | | | |
| **Borehole Correction Constants** | | | | | |
| Tool Centred | | Yes | | | |
| Hole Size Source | | Density Caliper | | | |
| Hole Size Constant Value | | N/A | inches | | |
| Stand-off Type | | N/A | | | |
| Stand-off | | N/A | inches | | |
| Number of Fins on Stand-off | | N/A | | | |
| Stand-off Fin Angle | | N/A | degrees | | |
| Stand-off Fin Width | | N/A | inches | | |
| Rm Source | Global Value: Temperature Corrected | | | | |
| Temp. for Rm Corr. | MCG External Temperature | | | | |
| 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 | | | |

## FE Calibration MFE-C.A 417

Base Calibration on 09-MAY-2017 12:36
Field Check on 10-JUN-2017 03:57

| | Measured | Calibrated (ohm-m) |
|---|---|---|
| **Base Calibration** | | |
| Reference 1 | 0.0 | 0.0 |
| Reference 2 | 962.4 | 126.8 |
| Base Check | | 281.5 |
| Field Check | | 281.6 |

## FE Calibration Tolerances MFE-C.A 417

| | | | |
|---|---|---|---|
| Reference 2 | 962.4 | -3% 980.0 +3% | ohm |
| Base Check | 281.5 | -2% 277.0 +2% | ohm-m |
| Field Check | 281.6 | -2% 281.5 +2% | ohm-m |

## FE Constants MFE-C.A 417

Last Edited on 04-JUL-2017,20:42

| | | |
|---|---|---|
| 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-D.A 387

Last Edited on 16-JUN-2017,09:44

| | | |
|---|---|---|
| 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 | 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 | |

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 |
| Sonic Despiker | | |

## Neutron Calibration MDN-C.A 464

Base Calibration on 28-JUN-2017 15:50
Field Check on 30-JUN-2017 14:30

Base Calibration

| | Measured | | Calibrated (cps) | |
|---|---|---|---|---|
| | Near | Far | Near | Far |
| | 3028 | 93 | 3714 | 110 |
| Ratio | 32.626 | | 33.764 | |

| | | |
|---|---|---|
| Ratio | 32.626 | 33.764 |

| Field Calibrator at Base | Calibrated (cps) | |
|---|---|---|
| | 1393 | 2071 |
| Ratio | | 0.673 |

| Field Check | Calibrated (cps) | |
|---|---|---|
| | 1399 | 2063 |
| Ratio | | 0.678 |

## Neutron Calibration Tolerances MDN-C.A 464

| | | |
|---|---|---|
| Ratio | 32.626 | -5% 33 +5% |
| Base Check | 0.673 | 0.65 0.7 0.75 |
| Field Check | 0.678 | 0.653 0.673 0.693 |

## Neutron Constants MDN-C.A 464

Last Edited on 30-JUN-2017,16:18

| | | |
|---|---|---|
| Neutron Source Id | N-1057 | |
| Neutron Jig Number | 5922NE | |
| Air Hole Processing | Modified Ratio | |
| Caliper Source for Processing | Density Caliper | |
| Stand-off | 0.00 | inches |
| Mud Density | 1.00 | gm/cc |
| Limestone Sigma | 7.10 | cu |
| Sandstone Sigma | 7.00 | cu |
| Dolomite Sigma | 4.70 | cu |
| Formation Pressure Source | Constant Value | |
| Formation Pressure | 0.00 | kpsi |
| Temperature Source | Constant Value | |
| Temperature | 68.00 | degrees F |
| Mud Salinity | 0.00 | kppm |
| Salinity Correction | Not Applied | |
| Formation Fluid Salinity Source | Constant Value | |
| Formation Fluid Salinity | 0.00 | kppm |
| Barite Mud Correction | Not Applied | |

## Micro Normal and Micro Inverse Calibration MMR-C.A 229

Base Calibration on 25-MAY-2017 02:03
Field Check on 04-JUL-2017 18:58

Base Calibration

| Channel | Measured Resistor 1 | Measured Resistor 2 | Calibrated (ohm-m) Resistor 1 | Calibrated (ohm-m) Resistor 2 |
|---|---|---|---|---|
| Micro Normal | 9.9 | 49.5 | 5.1 | 25.6 |
| Micro Inverse | 10.0 | 49.5 | 3.4 | 16.9 |

| Channel | Base Check (ohm-m) | Field Check (ohm-m) |
|---|---|---|
| Micro Normal | 93.9 | 93.9 |
| Micro Inverse | 62.2 | 62.2 |

## Micro Normal & Micro Inverse Calibration Tolerance MMR-C.A 229

| | | | | | |
|---|---|---|---|---|---|
| Micro Normal Res. 1 | 9.9 | -5% 10.0 +5% | ohm | Micro Normal Res. 2 | 49.5 -5% 50.0 +5% ohm |
| Micro Inverse Res. 1 | 10.0 | -5% 10.0 +5% | ohm | Micro Inverse Res. 2 | 49.5 -5% 50.0 +5% ohm |
| Micro Normal Base Check | 93.9 | -2% 93.86 +2% | ohm-m | | |
| Micro Inverse Base Check | 62.2 | -2% 62.11 +2% | ohm-m | | |
| Micro Normal Field Check | 93.9 | -2% 93.9 +2% | ohm-m | | |
| Micro Inverse Field Check | 62.2 | -2% 62.2 +2% | ohm-m | | |

## Micro Normal and Micro Inverse Constants MMR-C.A 229

Last Edited on 25-MAY-2017,01:53

| | | |
|---|---|---|
| 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 |

## Micro Laterolog Calibration MMR-C.A 229

Base Calibration on 23-MAY-2017,23:57
Field Check on 23-MAY-2017,23:57

**Base Calibration**

| | Measured | | Calibrated (ohm-m) | |
|---|---|---|---|---|
| | Ref 1 | Ref 2 | Ref 1 | Ref 2 |
| | 0.0 | 9911.7 | 0.0 | 128.0 |

| Base Check (ohm-m) | Field Check (ohm-m) |
|---|---|
| 5.2 | 5.2 |

## Micro Laterolog Calibration Tolerances MMR-C.A 229

| | | | |
|---|---|---|---|
| Ref 2 | 9911.7 | -3% 9900.00 +3% | ohm |
| Base Check | 5.2 | -2% 5.2 +2% | ohm-m |
| Field Check | 5.2 | -2% 5.2 +2% | ohm-m |

## Micro Laterolog Constants MMR-C.A 229

Last Edited on 24-MAY-2017,12:42

| | | |
|---|---|---|
| Pad Type | 6 in Solid Nylon B23059 | |
| Micro Laterolog K Factor | 0.0128 | |
| Standoff Offset | 0.0000 | inches |

**Mudcake Thickness Correction Constants**

| | | |
|---|---|---|
| Mud Cake Source | Constant Value | |
| Mud Cake Thickness | 0.4000 | inches |
| Mud Cake Thickness Caliper | N/A | |
| Mud Cake Resistivity | 0.1500 | ohm-m |
| Mud Cake Resistivity Temp. | 68.00 | Deg F |
| Mud Cake Resistivity Source | Constant Value | |
| Temp. for Rmc Corr. | N/A | |

## Caliper Calibration MMR-C.A 229

Base Calibration on 04-JUL-2017 18:55
Field Calibration on 04-JUL-2017 18:57

**Base Calibration**

| Reading No | Measured | Calibrator Size (in) |
|---|---|---|
| 1 | 13741 | 5.96 |
| 2 | 16951 | 7.96 |
| 3 | 20207 | 9.85 |
| 4 | 24130 | 11.88 |
| 5 | 0 | 0.00 |
| 6 | N/A | N/A |

**Field Calibration**

| Measured Caliper (in) | Actual Caliper (in) |
|---|---|
| 7.98 | 7.96 |

## Caliper Calibration Tolerances MMR-C.A 229

| | | | |
|---|---|---|---|
| Short Arm Field Cal. | 7.98 | 7.76 7.96 8.16 | in |

## Micro-Resistivity Caliper Constants MMR-C.A 229

Last Edited on

| | |
|---|---|
| Sonde Configuration | Resistivity Mode |

## High Resolution Temperature Calibration MCG-D.K 483

Field Calibration on 05-MAY-2017,11:02

| | Measured | Calibrated(Deg F) |
|---|---|---|
| Lower | 66.00 | 66.00 |
| Upper | 209.00 | 209.00 |

## High Resolution Temperature Constants MCG-D.K 483

Last Edited on 28-APR-2017,13:18

| | |
|---|---|
| Pre-filter Length | 11 |

## SP Calibration MCG-D.K 483

Field Calibration on 16-MAY-2017 09:09

| | Measured | Calibrated (mV) |
|---|---|---|
| Reference 1 | 100.8 | 100.0 |
| Reference 2 | -97.0 | -97.0 |

## Gamma Calibration MCG-D.K 483

Field Calibration on 30-JUN-2017 14:25

| | Measured | Calibrated (API) |
|---|---|---|
| Background | 208 | 142 |
| Calibrator (Gross) | 1551 | 1054 |
| Calibrator (Net) | 1343 | 912 |

## Gamma Calibration Tolerances MCG-D.K 483

Ratio 1.472 (1.40 | 1.475 | 1.55) Counts/API

## Gamma Constants MCG-D.K 483

Last Edited on 01-JUL-2017,10:32

| | | |
|---|---|---|
| Gamma Calibrator Number | GRC.C.072 | |
| 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 | % |

## General Constants All 000

Last Edited on 04-JUL-2017,22:51

| | | |
|---|---|---|
| **General Parameters** | | |
| Mud Resistivity | 1.200 | ohm-metres |
| Mud Resistivity Temperature | 50.000 | degrees F |
| Water Level | 0.000 | feet |
| Borehole Fluid Processing | Wet Hole | |
| **Hole/Annular Volume and Differential Caliper Parameters** | | |
| HVOL Method | Single Caliper | |
| HVOL Caliper 1 | Density Caliper | |
| HVOL Caliper 2 | N/A | |
| Annular Volume Diameter | 5.500 | inches |
| Caliper for Differential Caliper | Density Caliper | |
| **Rwa Parameters** | | |
| Porosity used | Crossplot Porosity | |
| Resistivity used | Array Ind. One Res Rt | |
| RWA Constant A | 0.620 | |
| RWA Constant M | 2.150 | |
| SW/APOR Tool Source | 0.000 | |

## DOWNHOLE EQUIPMENT

C:\Logs\GRAND MESA OPERATING\RIO LOBO 1-30\RUN_1\8367-186414219\MAIN PASS QUAD COMBO SPLICED.dta

Cablehead, 11 pin
CBH-CA 121 LG: 2.40 ft WT: 24.3 lb OD: 2.244 in

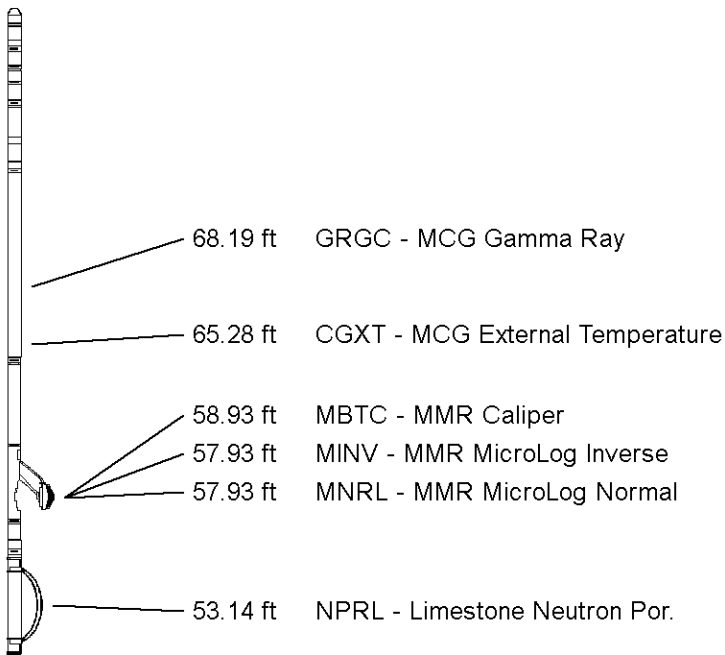
11C-11B Compact Tool Adaptor
MTA-K.A 164 LG: 1.53 ft WT: 13.2 lb OD: 2.240 in

Compact Swivel Head Adaptor
SHA-J.B 588 LG: 2.30 ft WT: 22.0 lb OD: 2.244 in

Compact Comms Gamma
MCG-D.K 483 LG: 8.70 ft WT: 63.9 lb OD: 2.244 in

Compact Micro-Resistivity
MMR-C.A 229 LG: 8.59 ft WT: 81.6 lb OD: 4.882 in

Compact Neutron
MDN-C.A 464 LG: 5.04 ft WT: 50.7 lb OD: 2.244 in



Compact Density/Caliper
MPD-C.A 310 LG: 9.59 ft WT: 90.4 lb OD: 2.449 in

Compact Inline Bowspring sub
MIS-D.B 823 LG: 5.70 ft WT: 33.1 lb OD: 2.244 in

Compact Knuckle Joint
SKJ-E.B 533 LG: 2.17 ft WT: 24.3 lb OD: 2.244 in

Compact Inline Standoff sub
MIS-E.B 784 LG: 2.14 ft WT: 15.4 lb OD: 2.244 in

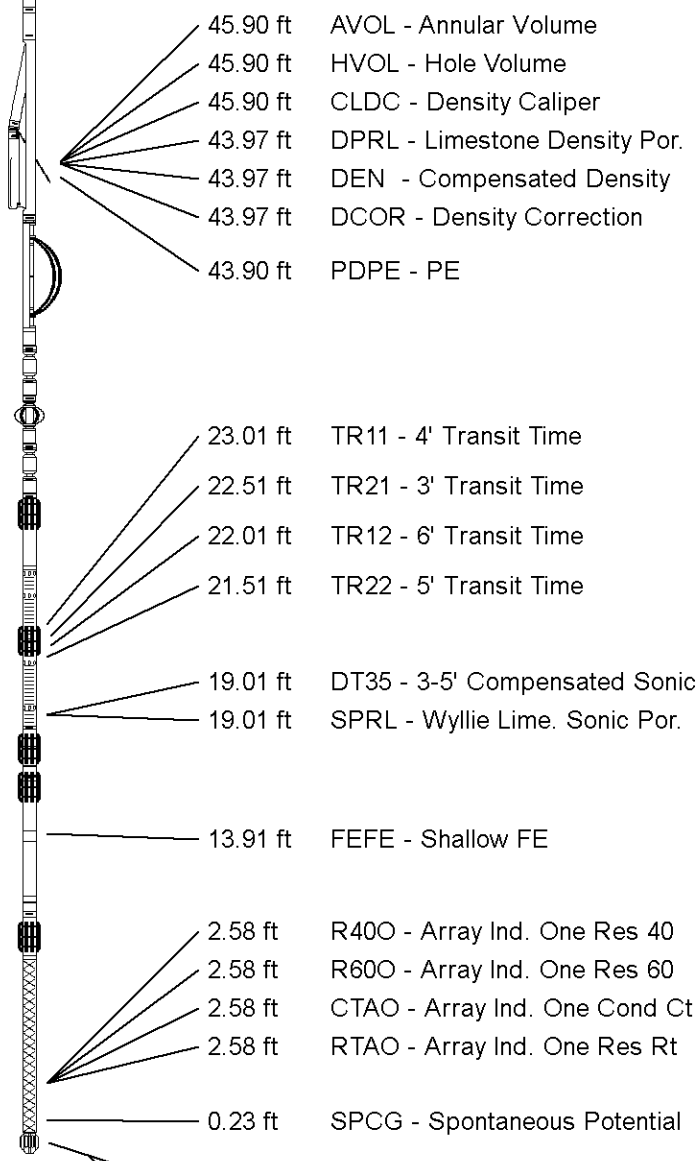
Compact Knuckle Joint
SKJ-E.A 244 LG: 2.17 ft WT: 24.3 lb OD: 2.244 in

Compact Sonic
MSS-D.A 387 LG: 12.52 ft WT: 72.8 lb OD: 2.244 in

Compact Focussed Electric
MFE-C.A 417 LG: 6.05 ft WT: 48.5 lb OD: 2.244 in

Compact Induction
MAI-B.J 363 LG: 10.81 ft WT: 48.5 lb OD: 2.244 in

Total Length: 79.69 ft Weight: 612.9 lb




All measurements relative to tool zero.

| | |
|---|---|
| COMPANY | GRAND MESA OPERATING CO. |
| WELL | RIO LOBO 1-30 |
| FIELD | WILDCAT |
| PROVINCE/COUNTY | WASHINGTON |
| COUNTRY/STATE | U.S.A. / COLORADO |

| | | | | | |
|---|---|---|---|---|---|
| Elevation Kelly Bushing | 5157 | feet | First Reading | 8051.00 | feet |
| Elevation Drill Floor | 5157 | feet | Depth Driller | 8099.00 | feet |
| Elevation Ground Level | 5138 | feet | Depth Logger | 8095.00 | feet |

Weatherford®

# COMPACT PHOTO DENSITY COMPENSATED NEUTRON MICRORESISTIVITY LOG