



**Weatherford**

**MEASURED DEPTH  
COMPENSATED PHOTO DENSITY  
COMPENSATED DUAL NEUTRON**

|   |                |         |                                  |          |  |
|---|----------------|---------|----------------------------------|----------|--|
| COMPANY                                   |                |         | WHITTING OIL AND GAS CORPORATION |          |  |
| WELL                                      |                |         | HORSETAIL 02D-0204               |          |  |
| FIELD                                     |                |         | REDTAIL                          |          |  |
| PROVINCE/COUNTY                           |                |         | WELD                             |          |  |
| COUNTRY/STATE                             |                |         | U.S.A. / COLORADO                |          |  |
| LOCATION                                  |                |         | SHL: 300' FNL & 750' FWL         |          |  |
| PERMIT NUMBER                             |                |         | AFE: 14-1601                     |          |  |
| SEC 2                                     | TWP 10N        | RGE 57W | Other Services<br>MICRO IMAGER   |          |  |
| API Number                                |                |         | 05-123-39383                     |          |  |
| Permanent Datum G.L., Elevation 4778 feet |                |         | Elevations:                      |          |  |
| Log Measured From KB                      |                |         | KB 4795.00                       |          |  |
| Drilling Measured From K.B. @ 17 FEET     |                |         | DF 4795.00                       |          |  |
| Date                                      | 14-OCT-2014    |         | GL 4778.00                       |          |  |
| Run Number                                | ONE            |         |                                  |          |  |
| Service Order                             | 2577-100430125 |         |                                  |          |  |
| Depth Driller                             | 9948.00        |         | feet                             |          |  |
| Depth Logger                              | 9948.00        |         | feet                             |          |  |
| First Reading                             | 9859.00        |         | feet                             |          |  |
| Last Reading                              | 6031.00        |         | feet                             |          |  |
| Casing Driller                            | 6028.00        |         | feet                             |          |  |
| Casing Logger                             | 6031.00        |         | feet                             |          |  |
| Bit Size                                  | 6.000          |         | inches                           |          |  |
| Hole Fluid Type                           | WBM            |         |                                  |          |  |
| Density / Viscosity                       | 9.30           | lb/USg  | 41.00                            | type in  |  |
| PH / Fluid Loss                           | 9.70           |         | 6.80                             | ml/30Min |  |
| Sample Source                             | FLOWLINE       |         |                                  |          |  |
| Rm @ Measured Temp                        | 1.37 @ 78.2    |         | ohm-m                            |          |  |
| Rmf @ Measured Temp                       | 1.09 @ 78.2    |         | ohm-m                            |          |  |
| Rmc @ Measured Temp                       | 1.64 @ 78.2    |         | ohm-m                            |          |  |
| Source Rmf / Rmc                          | CALC           |         | CALC                             |          |  |
| Rm @ BHT                                  | 0.53 @205.0    |         | ohm-m                            |          |  |
| Time Since Circulation                    | .5 HOURS       |         |                                  |          |  |
| Max Recorded Temp                         | 205.00         |         | deg F                            |          |  |
| Equipment / Base                          | 18063          |         | Casper                           |          |  |
| Recorded By                               | M.RICHINS      |         |                                  |          |  |
| Witnessed By                              | M.ODEGARD      |         |                                  |          |  |
|   |                |         | GEOLOGIST                        |          |  |

| BOREHOLE RECORD    |                |                    |                    |                     | Last Edited: 14-OCT-2014 17:22 |
|--------------------|----------------|--------------------|--------------------|---------------------|--------------------------------|
| Bit Size<br>inches |                | Depth From<br>feet |                    | Depth To<br>feet    |                                |
| 6.000              |                | 6028.00            |                    | 9948.00             |                                |
| CASING RECORD      |                |                    |                    |                     |                                |
| Type               | Size<br>inches | Depth From<br>feet | Shoe Depth<br>feet | Weight<br>pounds/ft |                                |
| SURFACE            | 7.000          | 0.00               | 6028.00            | 29.00               |                                |

| REMARKS   |
|---|
| LOGGED WITH WLS 14.01.3220  |
| LOGGED USING MESSENGER SHUTTLE METHOD OF DEPLOYMENT   |
| HARDWARE:<br>MDN: MIS-A DOUBLE BOWSPRING USED ABOVE MDN<br>MPD: 4INCH PROFILE PLATE USED, MIS-A SINGLE BOWSPRING USED BELOW MPD<br>CMI: OVER BODY BASKET AND MIS-D BASKETS PLACED ABOVE AND BELOW FOR CENTRALIZATION<br>SGS: RAN BELOW CMI. ECCENTRALIZED WITH SKJ. |
| 2.71 G/CC DENSITY MATRIX USED TO CALCULATE POROSITY   |
| ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST  |
| LONGITUDE: -103.723214<br>LATITUDE: 40.862739   |
| ANNULAR HOLE VOLUME FROM TD TO CASING AT 6031 FEET = 390 CUBIC FEET   |

ANNULAR HOLE VOLUME FROM TD TO CASING AT 6031 FEET = 810 CUBIC FEET.

DRILL PIPE DEPTH DURING DEPLOYMENT: 9833.21 FEET  
LOGGING TOOL DEPTH AFTER DEPLOYMENT: 9935.39FEET

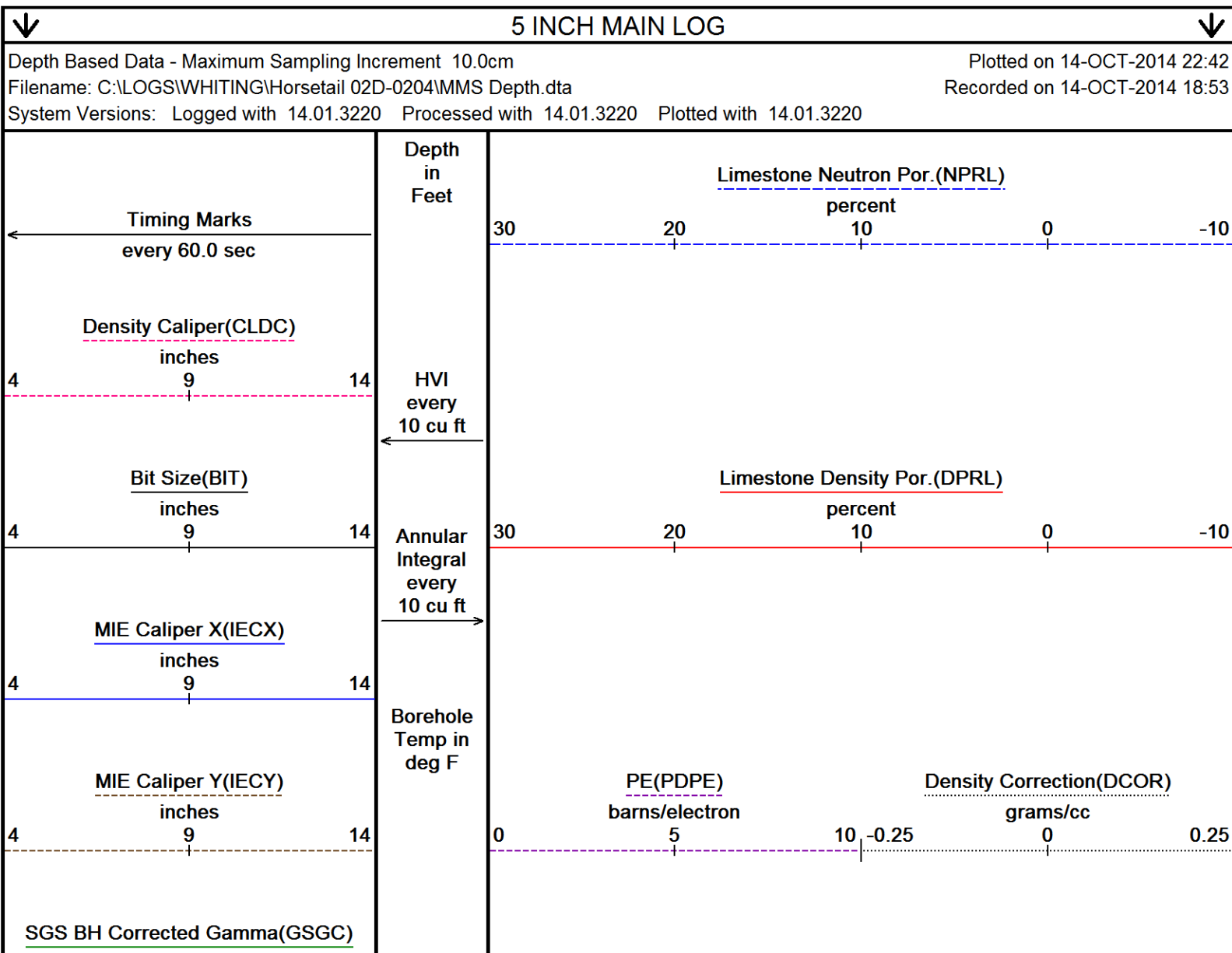
SLOWLY ROTATED LAST STAND DOWN AT 20-30 RPM TO REACH TD - EXCESSIVE STICK/SLIP LOW HOOKLOAD WHEN NOT ROTATING.

PIPE ROTATED AT 30 RPM FOR FIRST 10 STANDS DURING LOGGING RUN

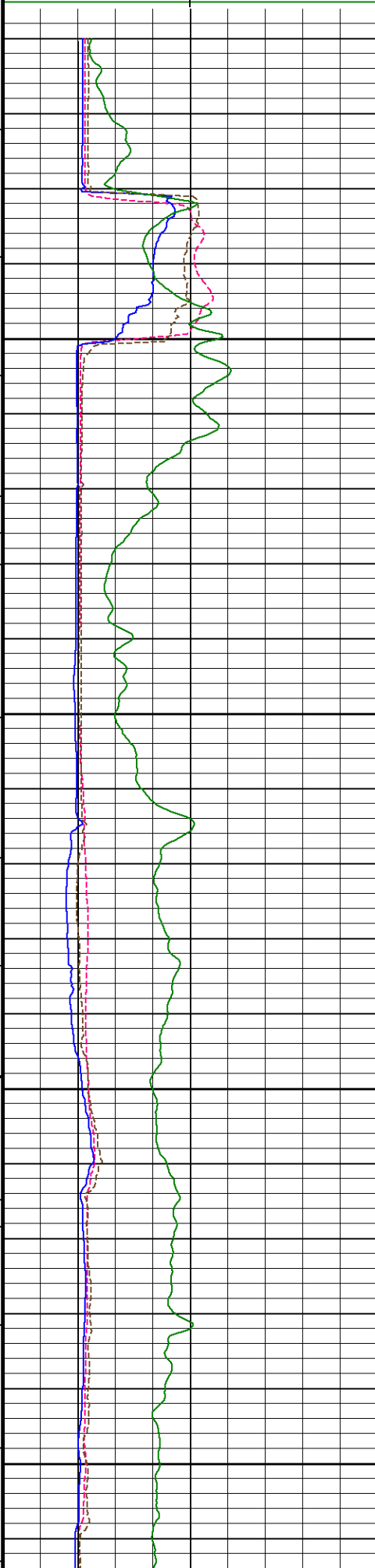
OPERATORS: D.SMITH, B.GOODMAN

RIG: PIONEER 54

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.

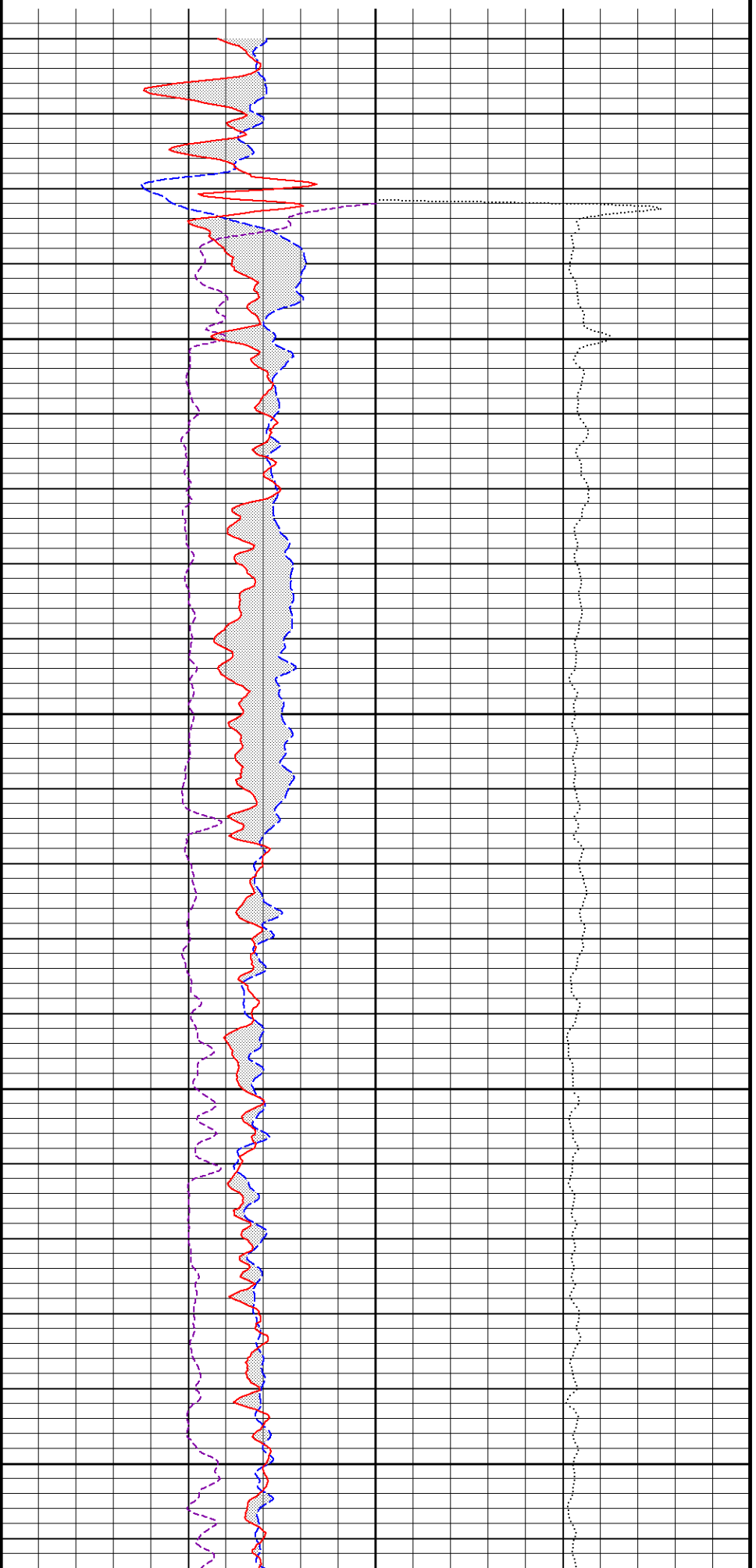


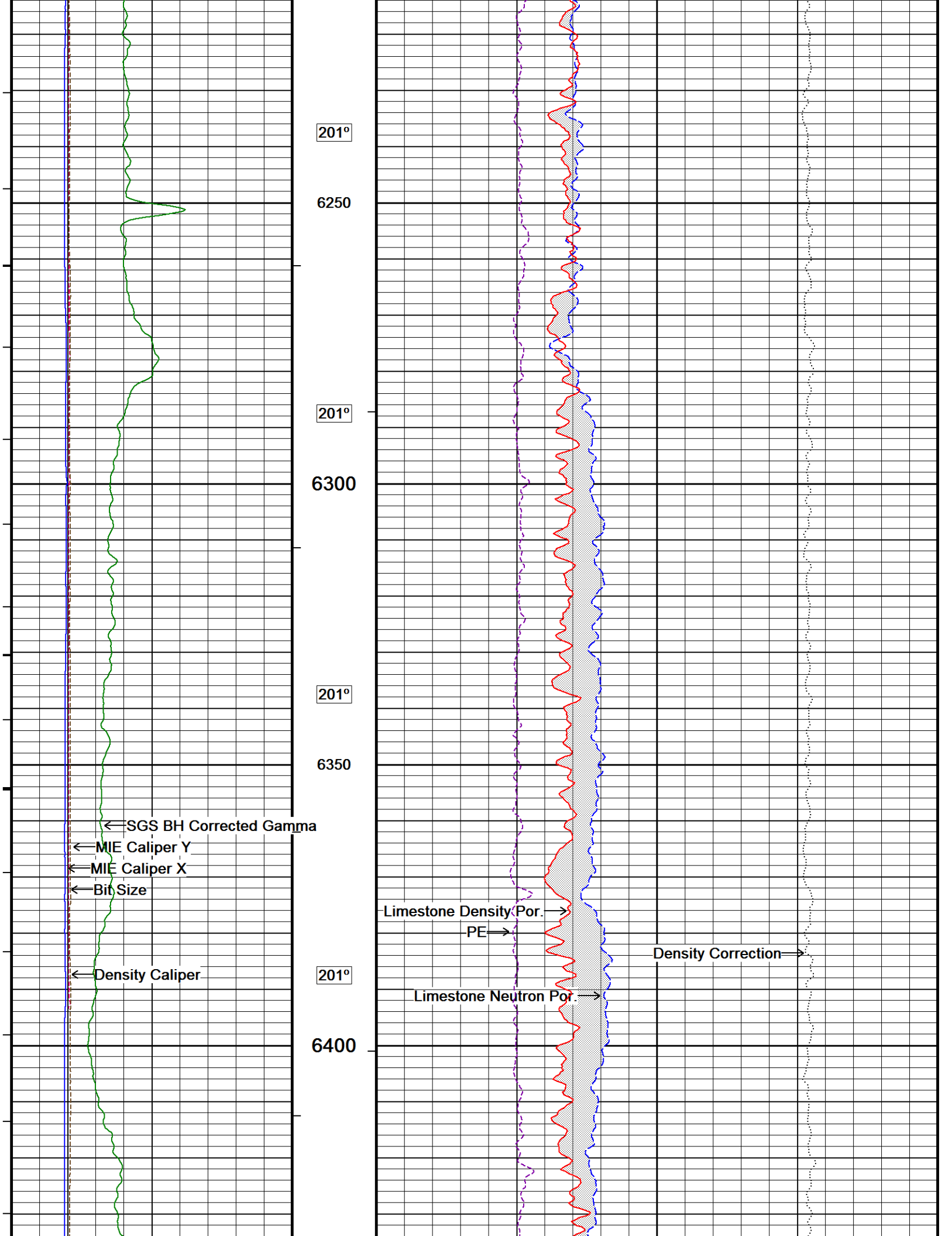
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300 450 600

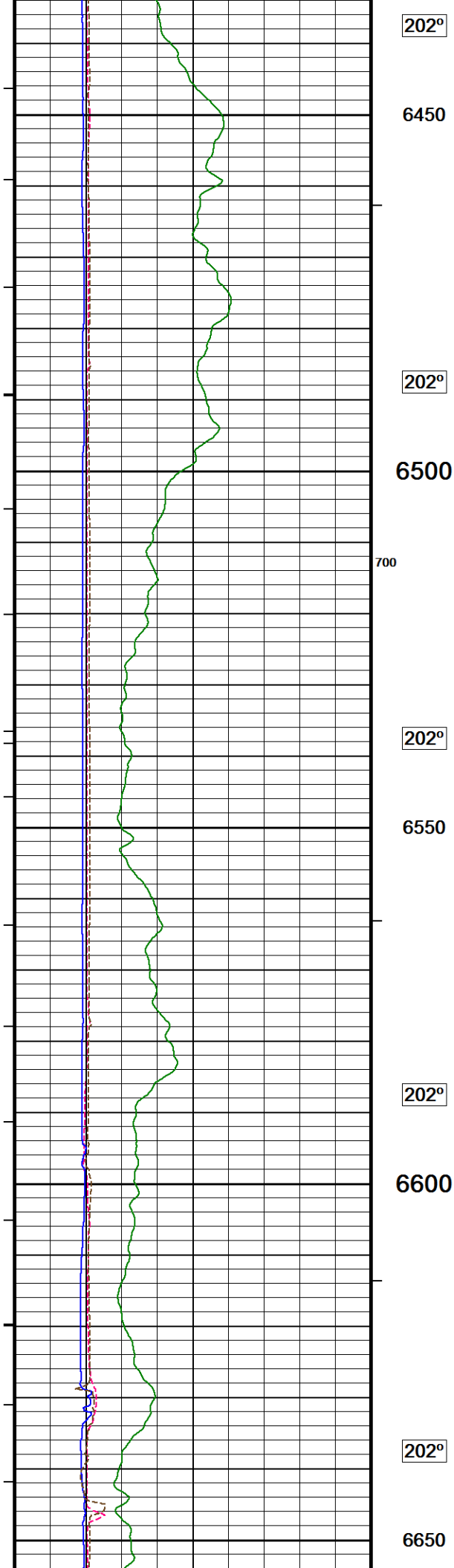


Replay  
Scale  
1:240

6008  
Casing  
Shoe  
800  
6050  
200°  
6100  
201°  
6150  
201°  
6200







202°

6450

202°

6500

700

202°

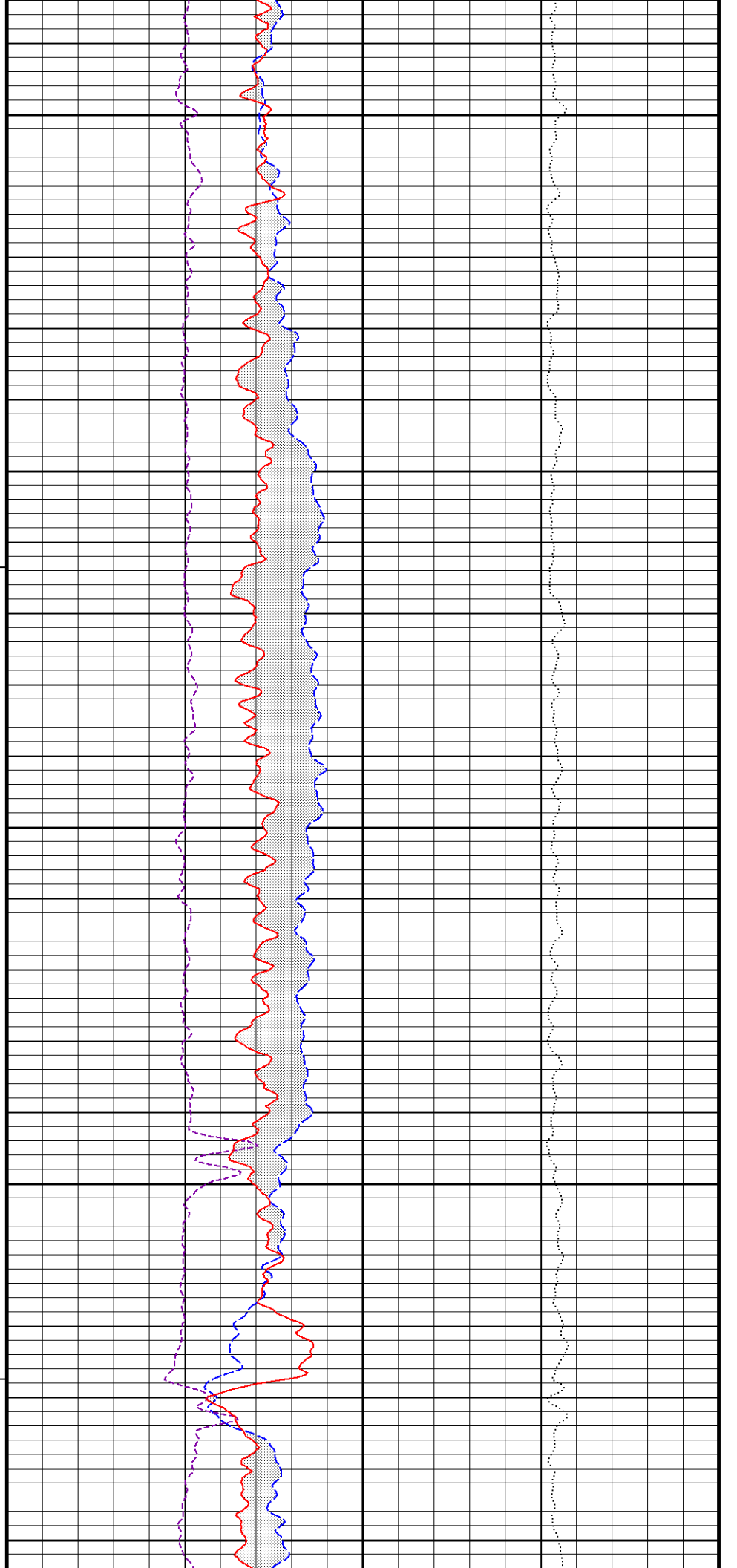
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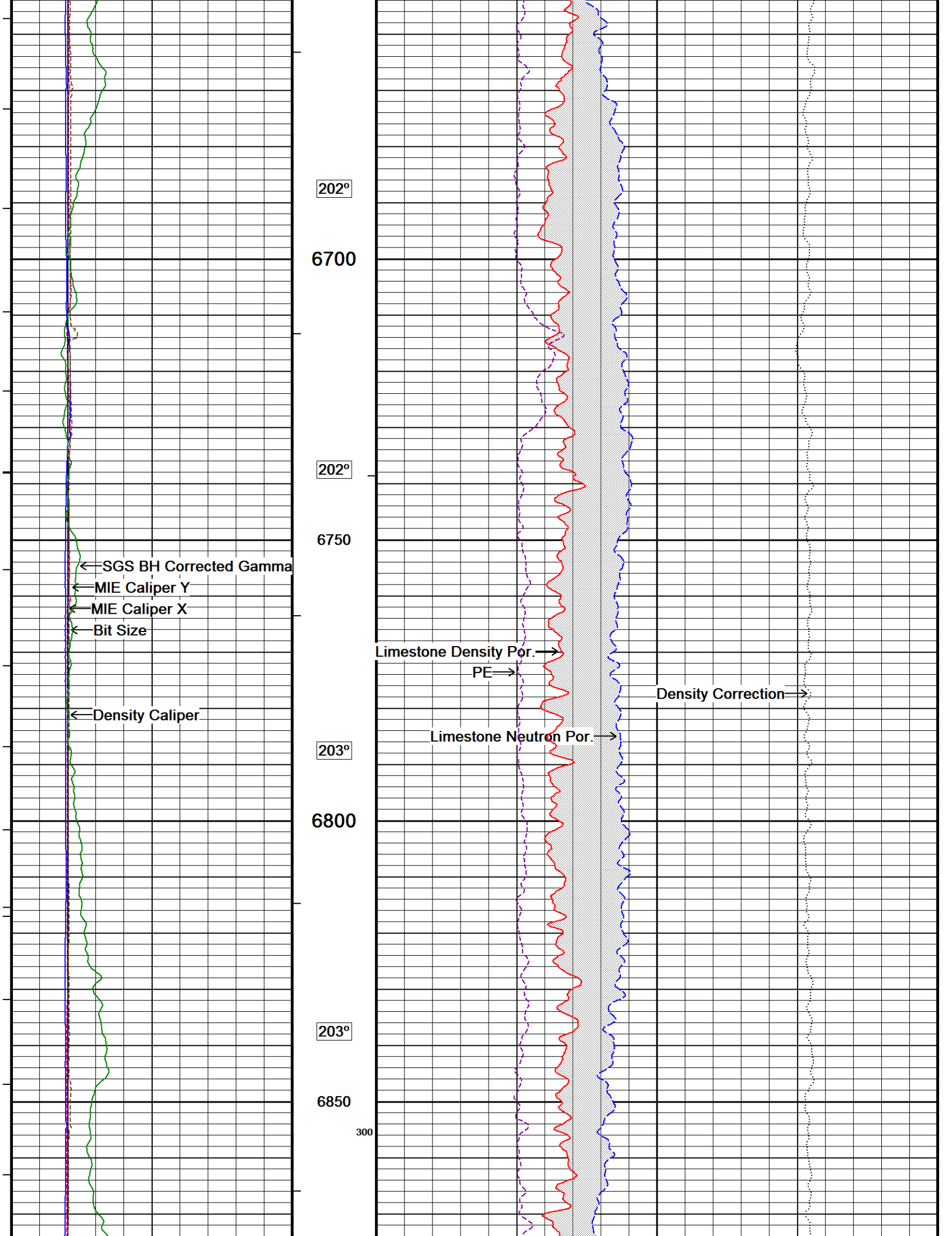
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6600

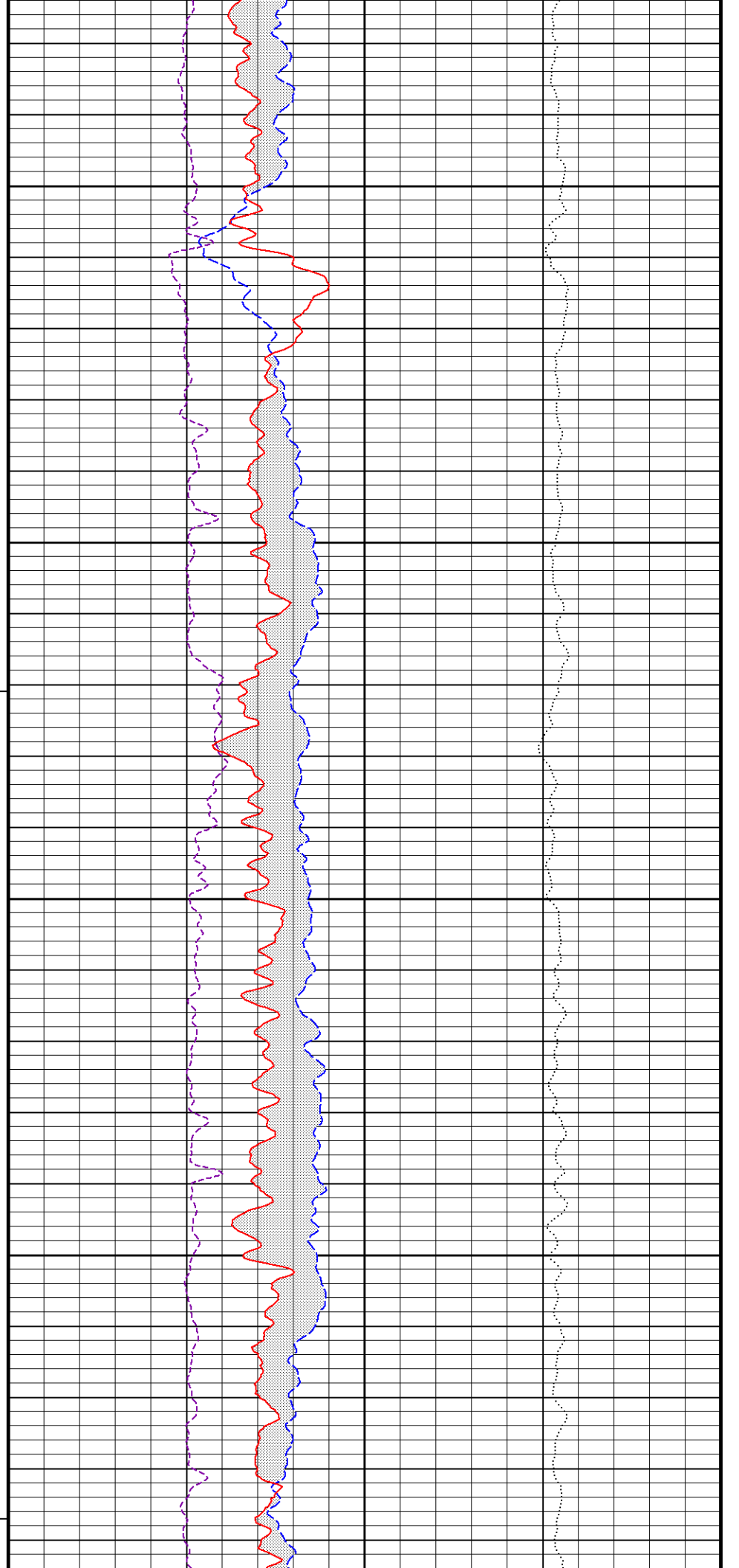
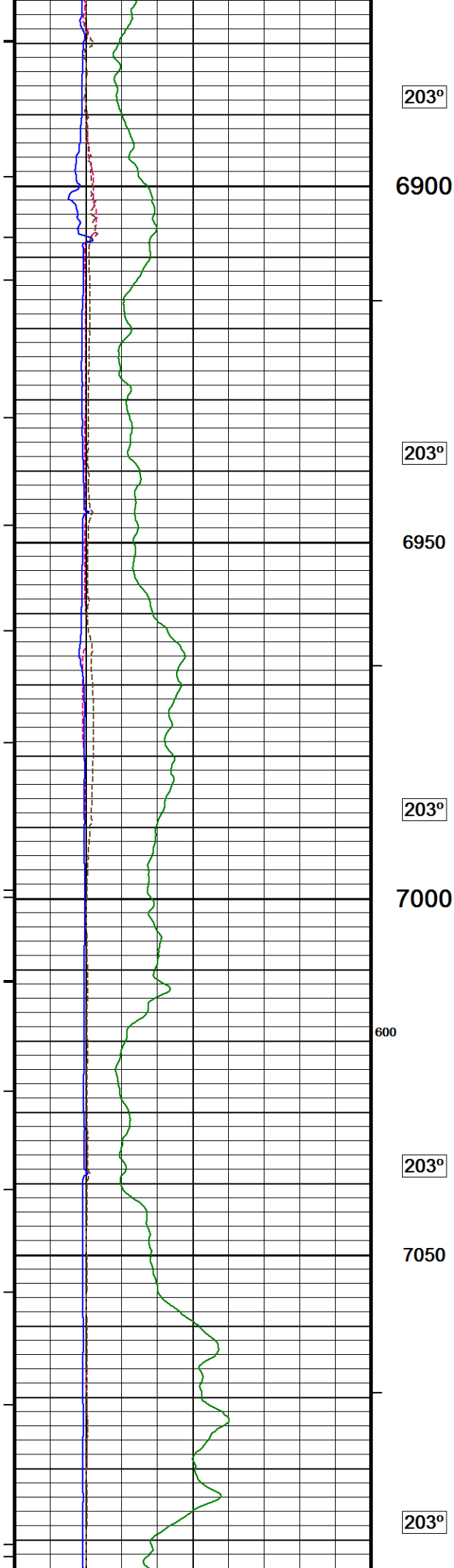
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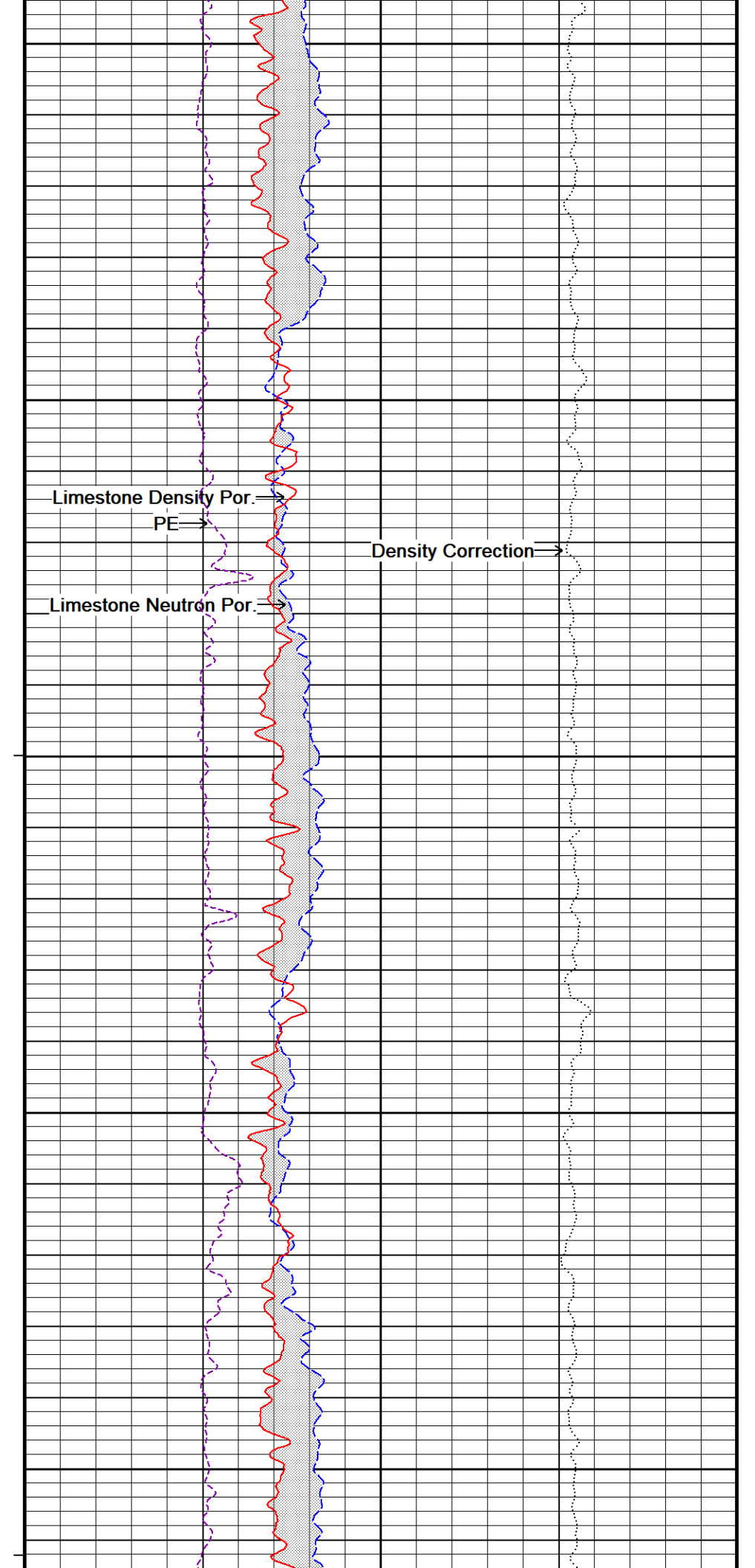
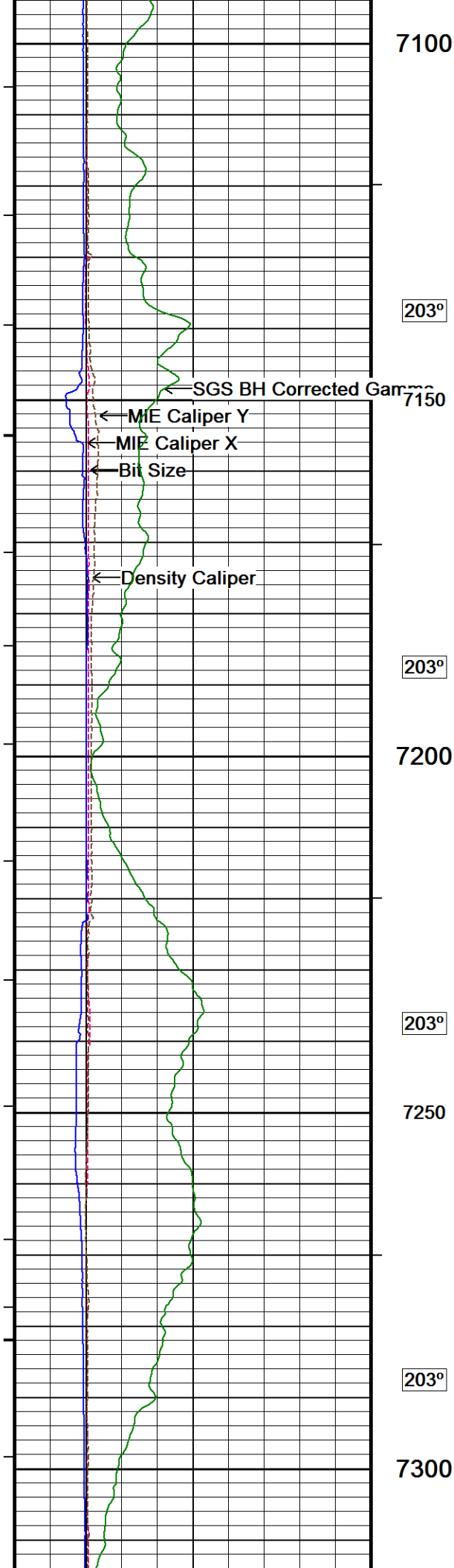
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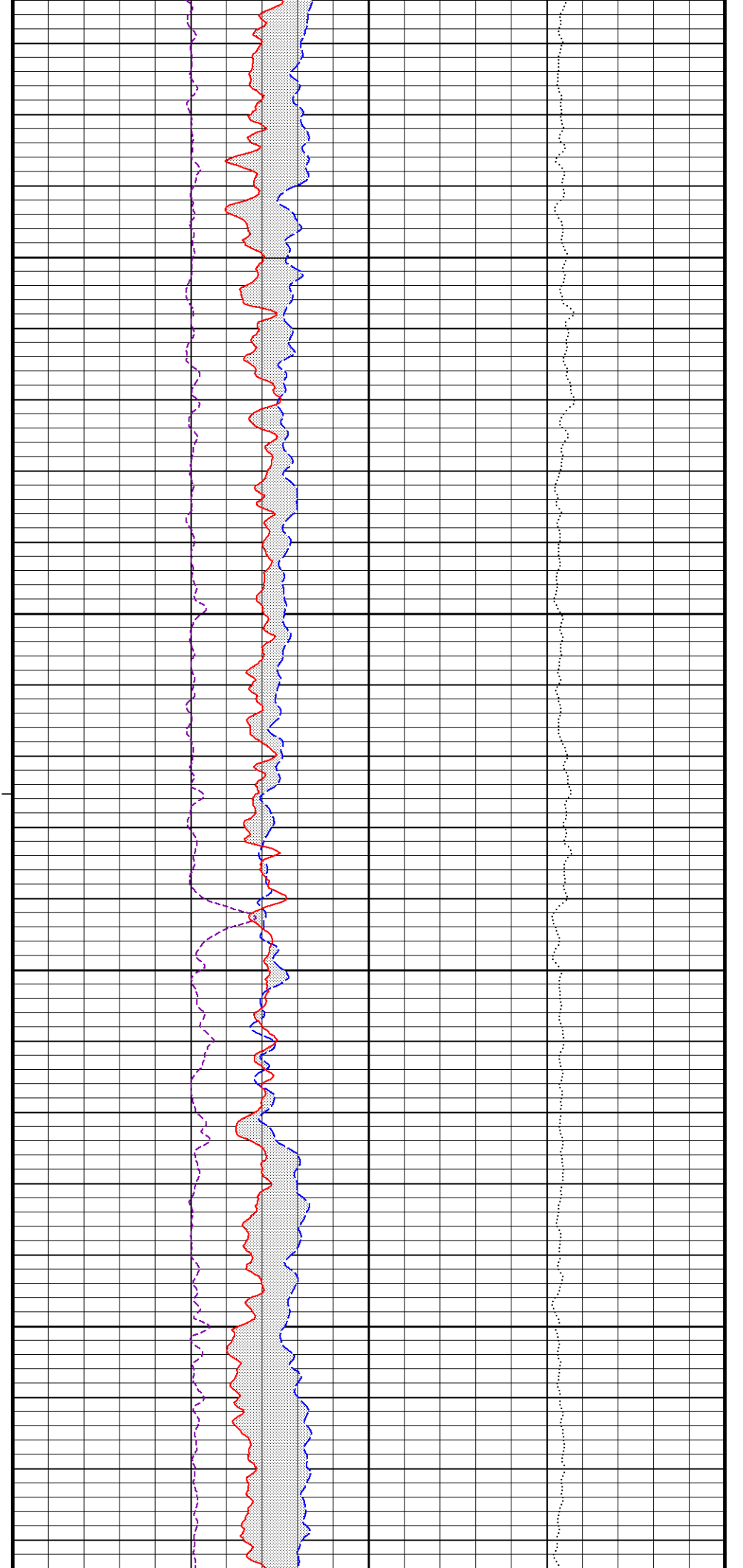
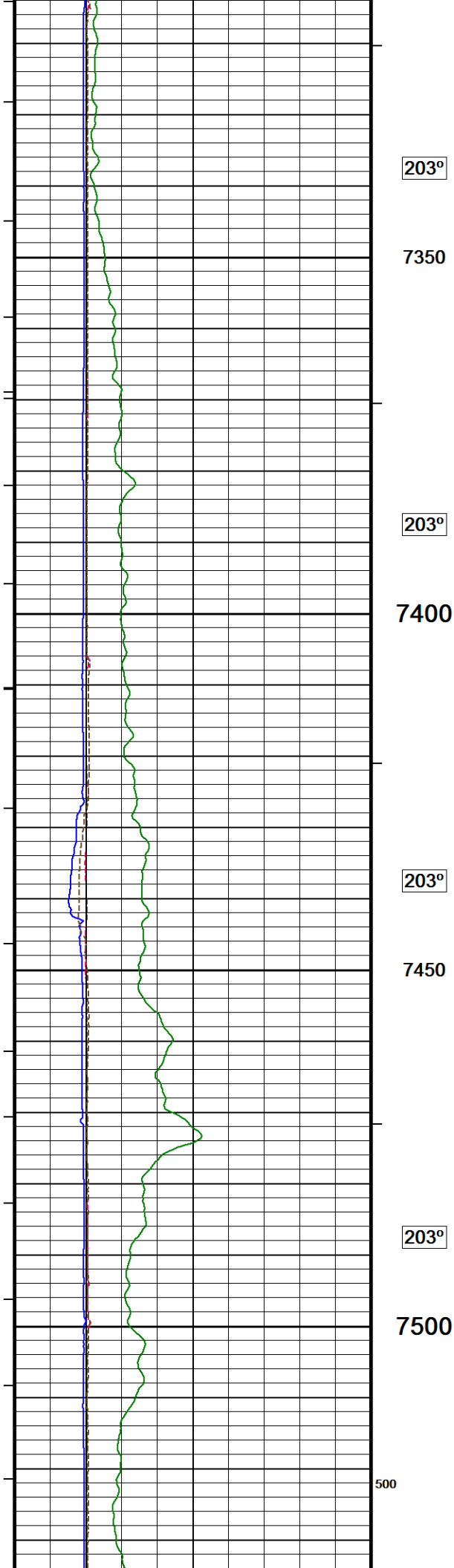


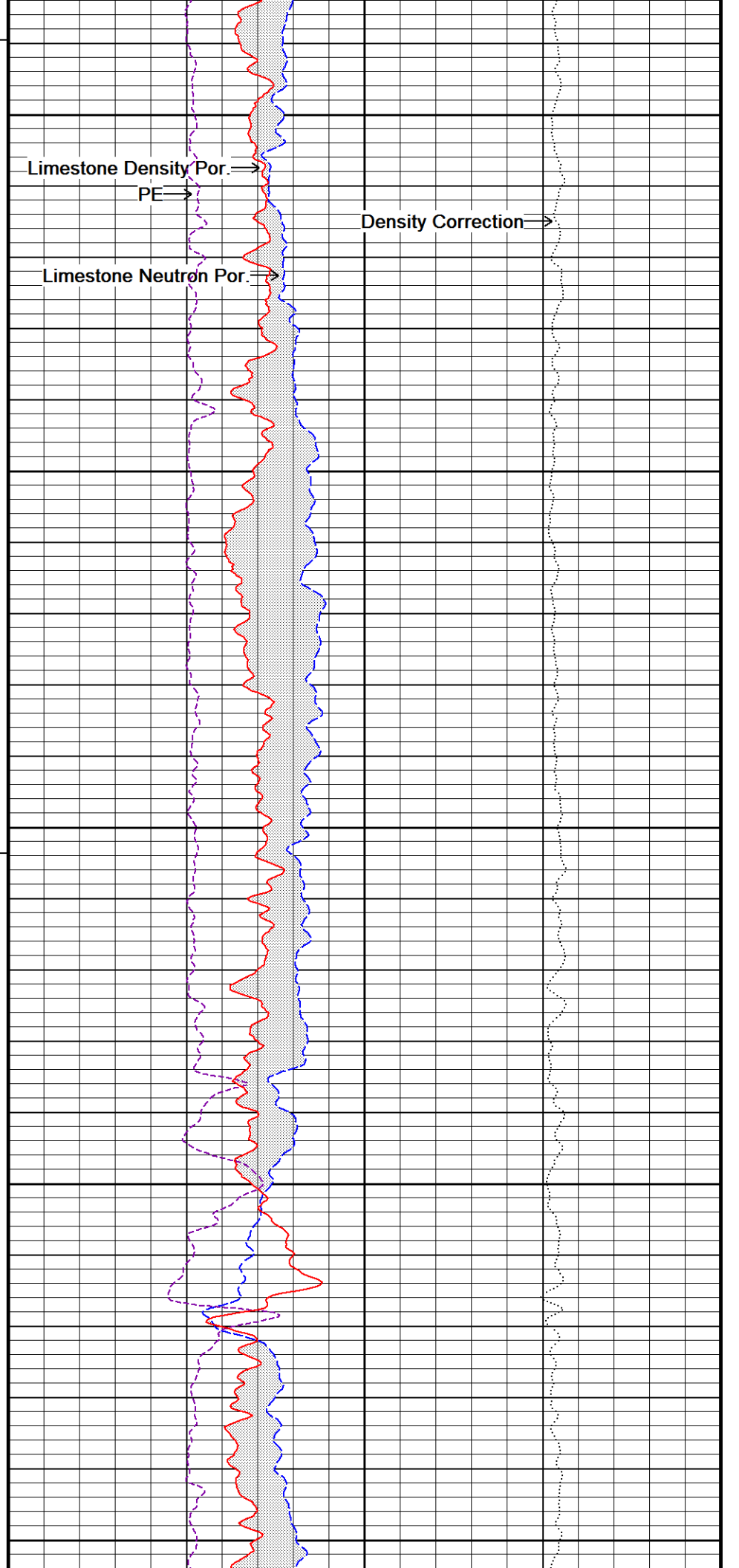
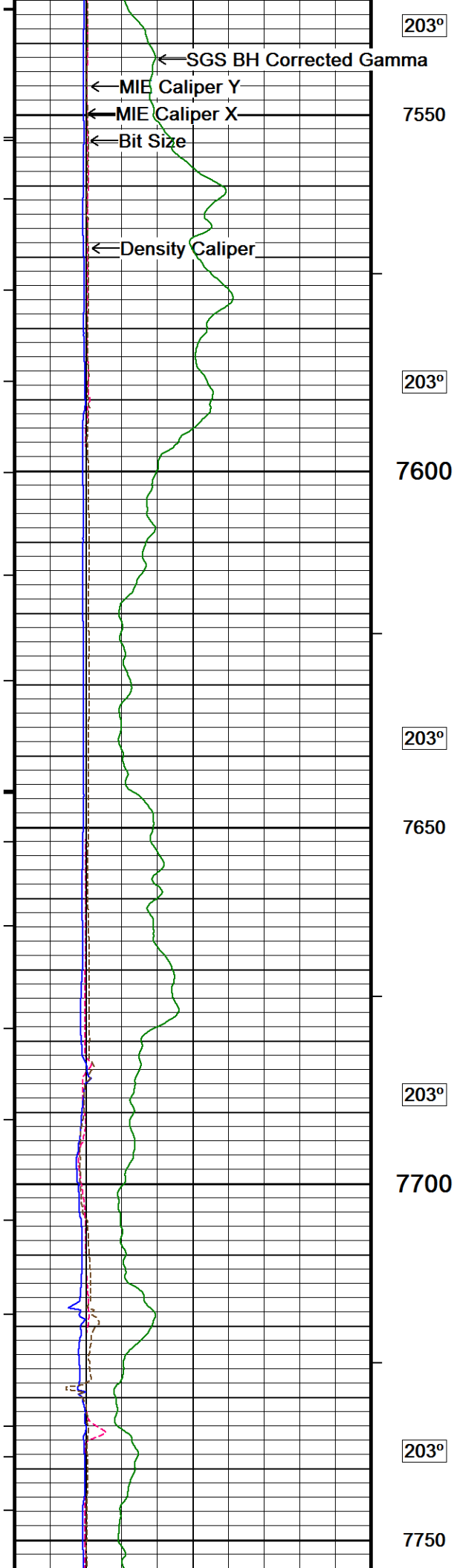


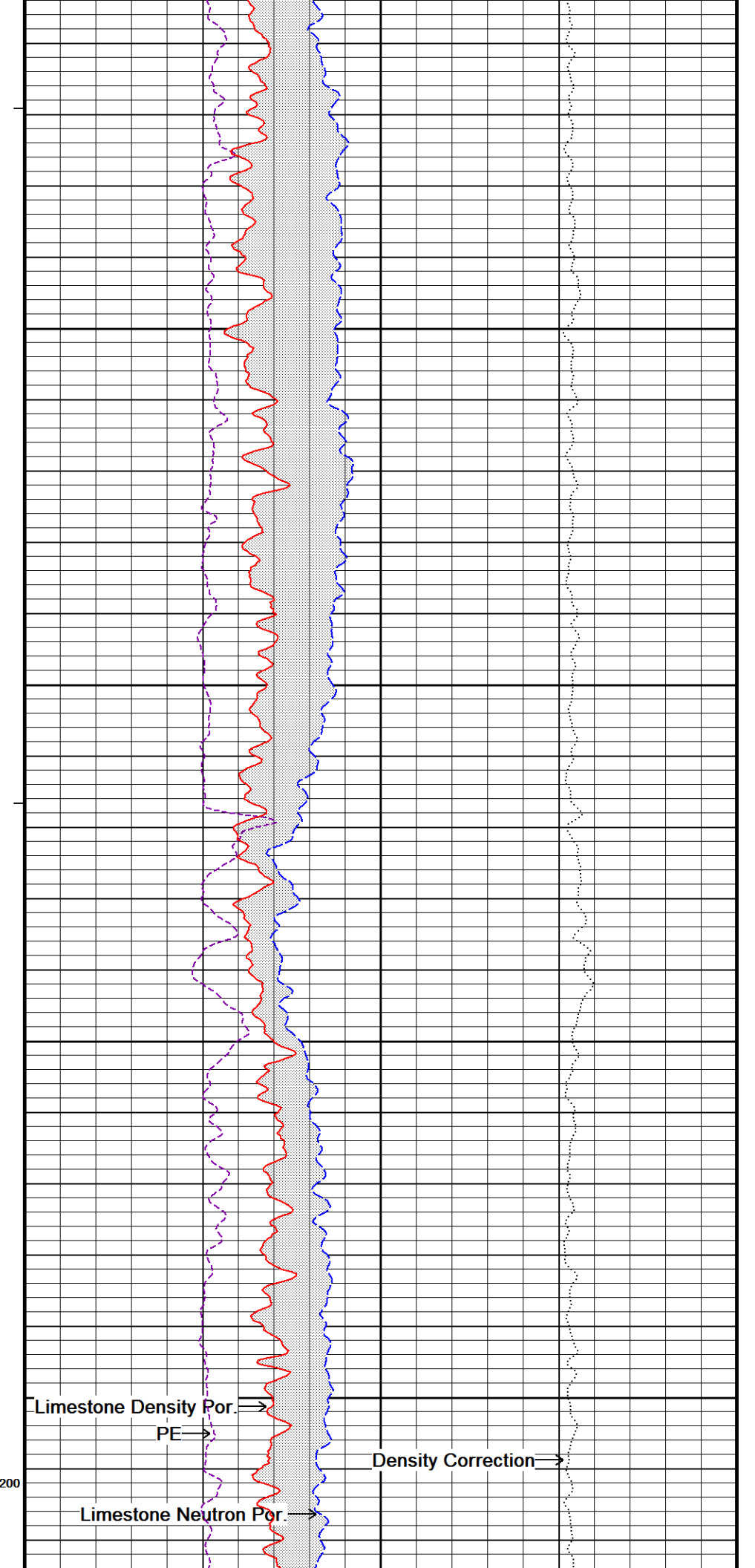
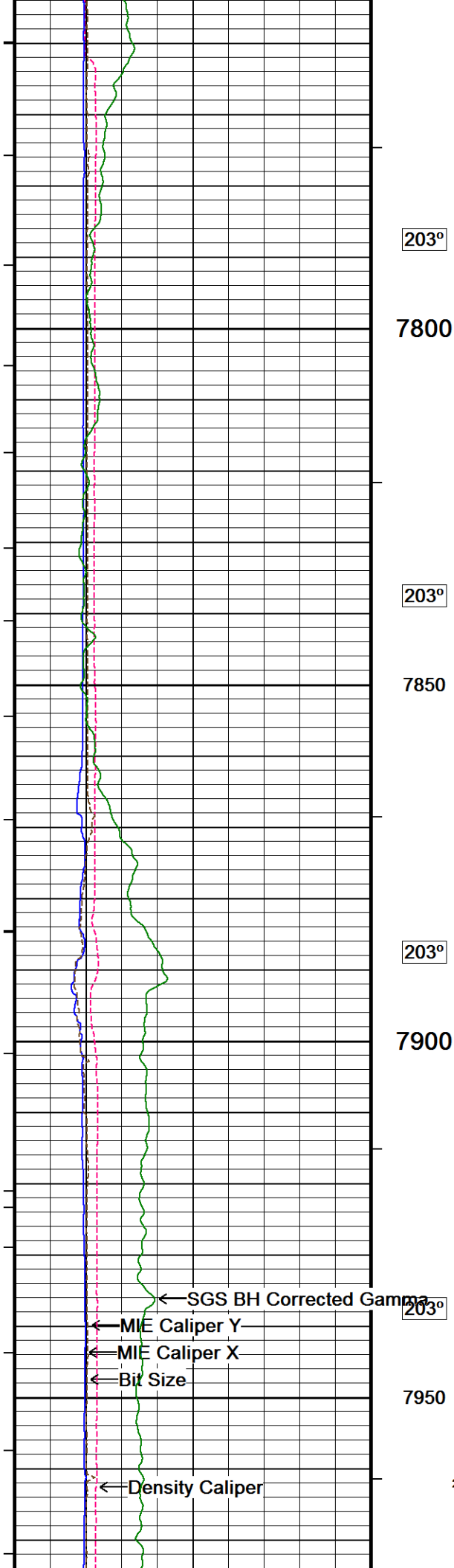


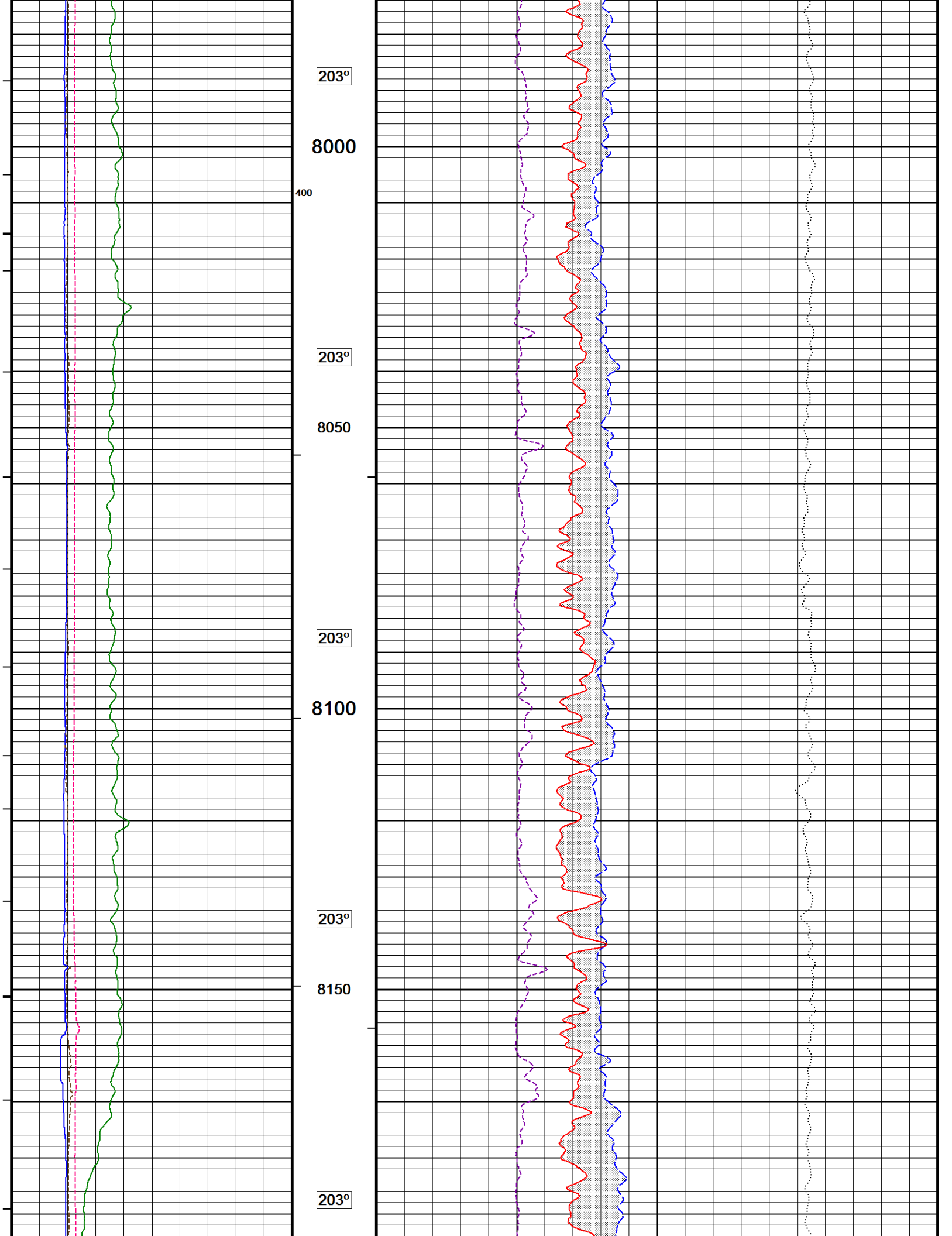


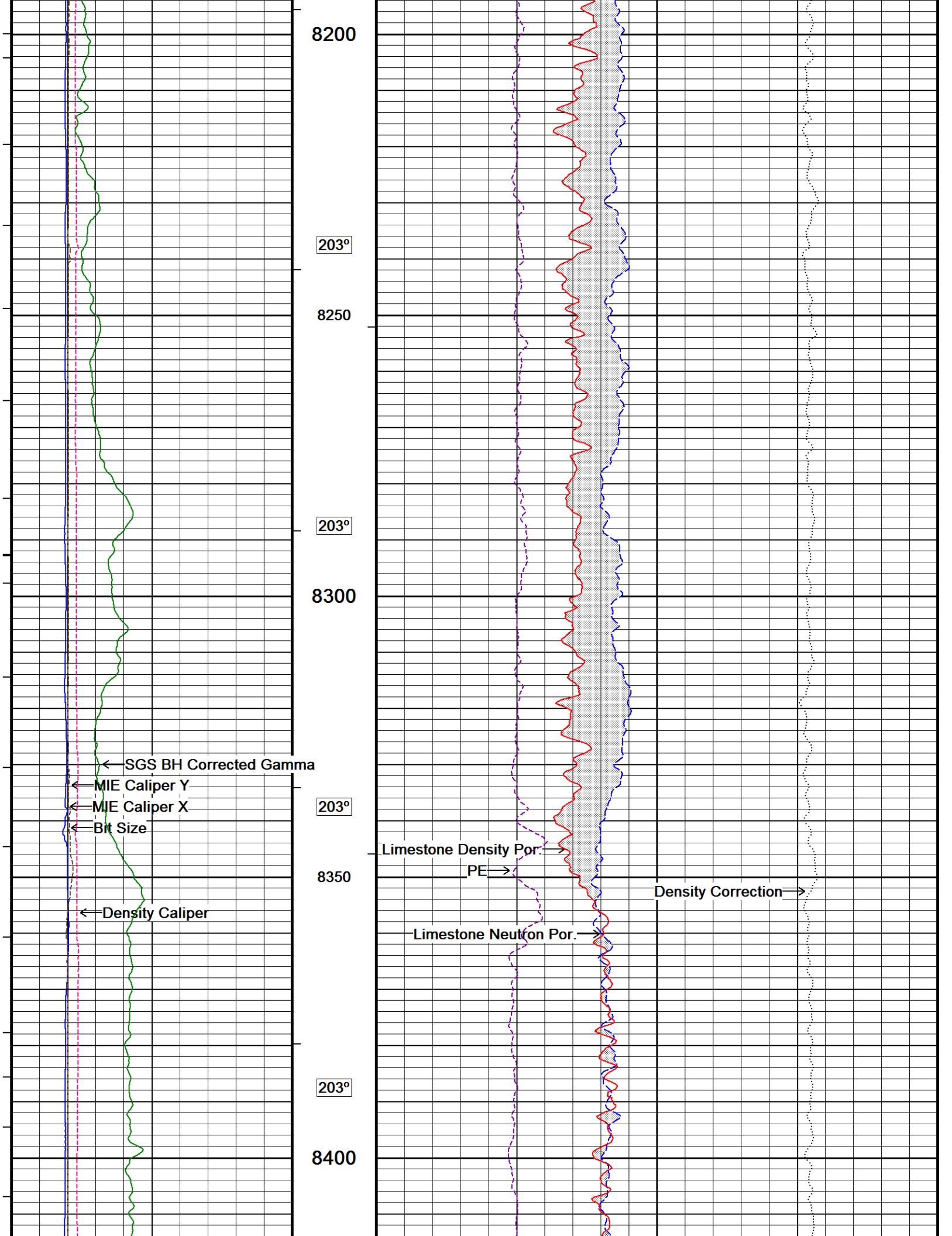


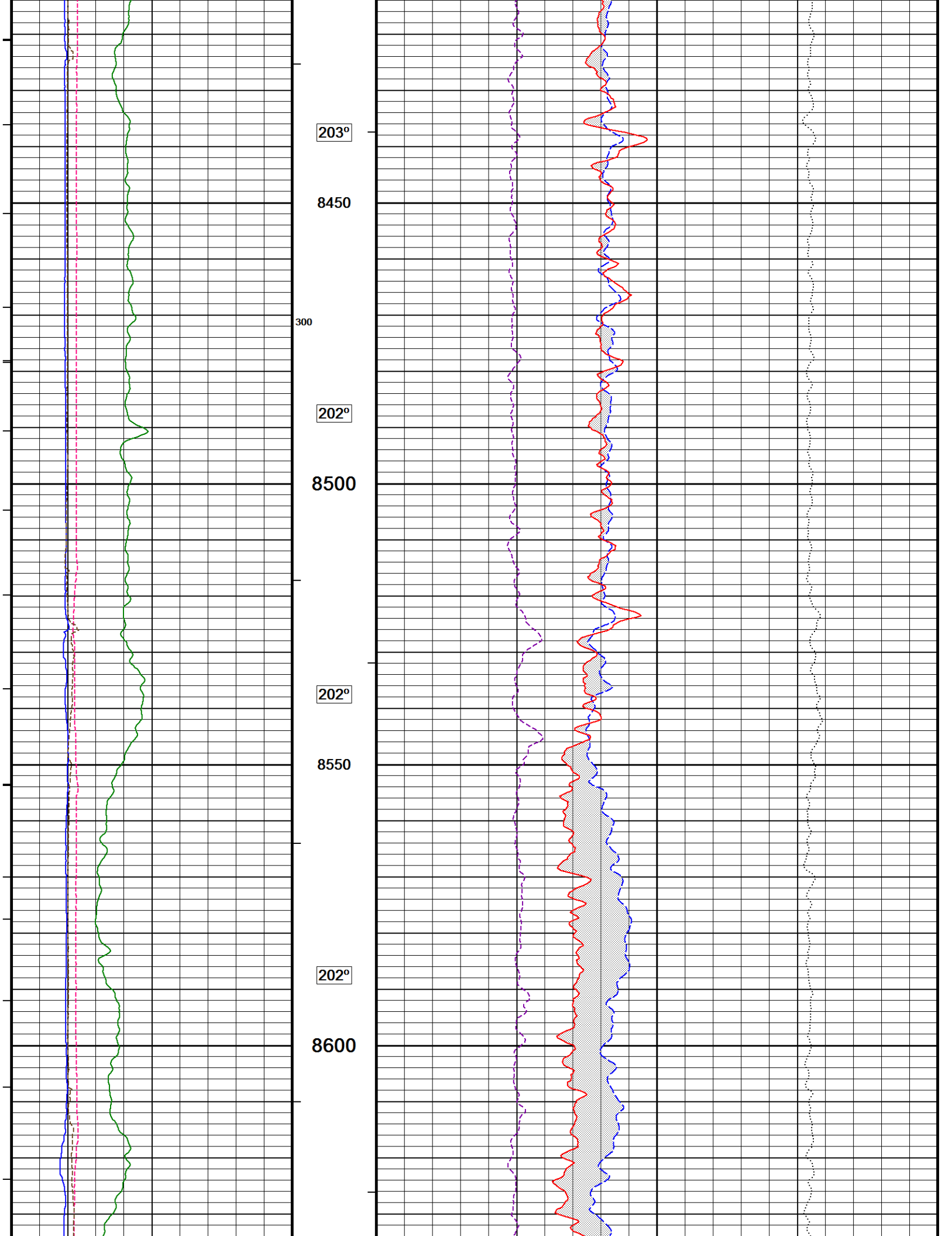


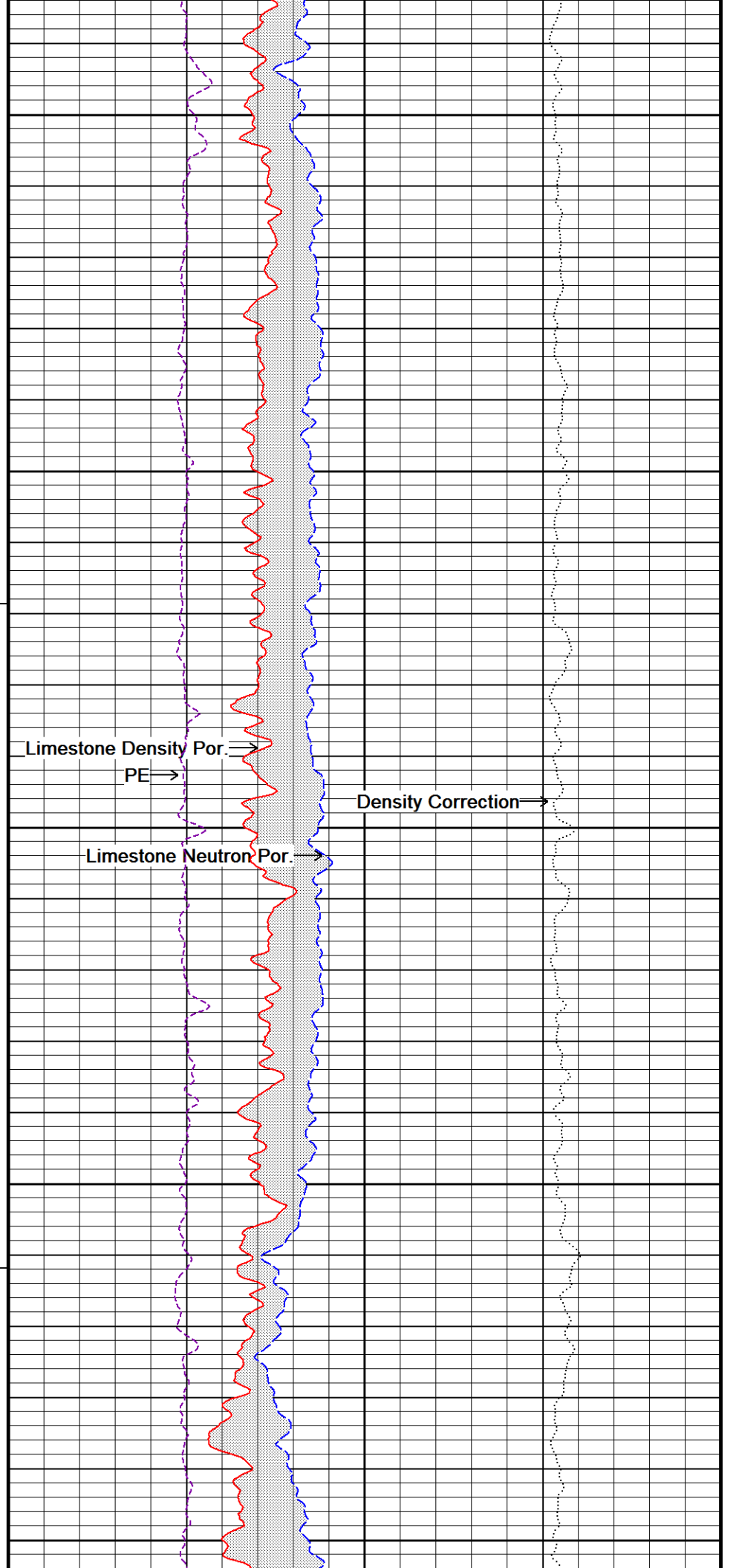
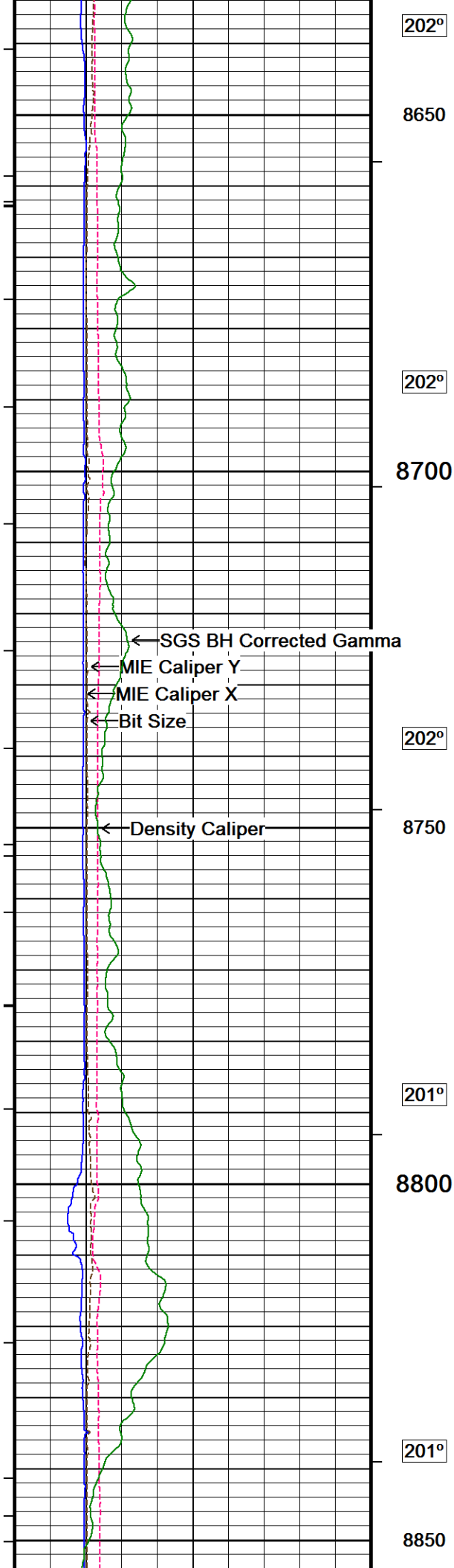




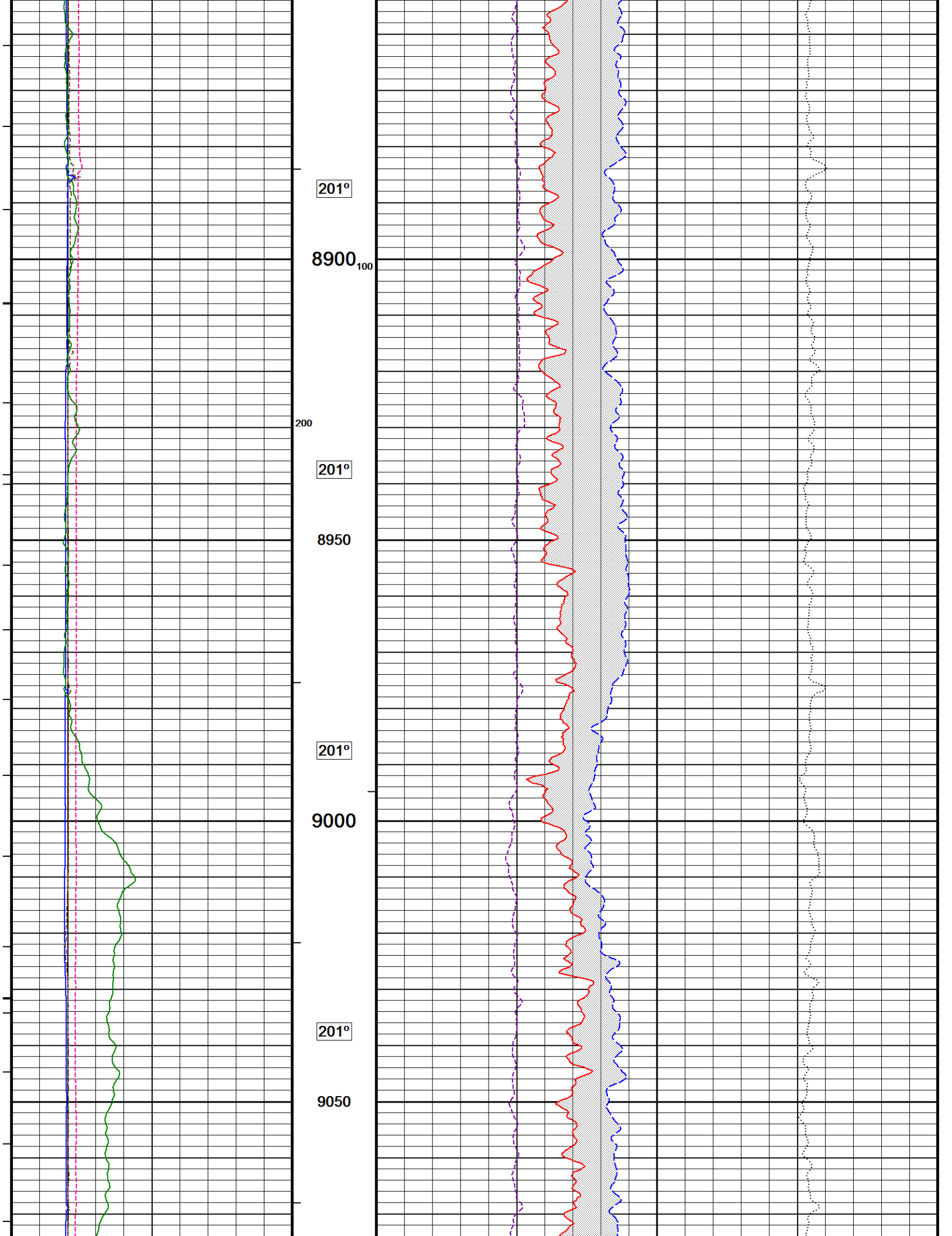


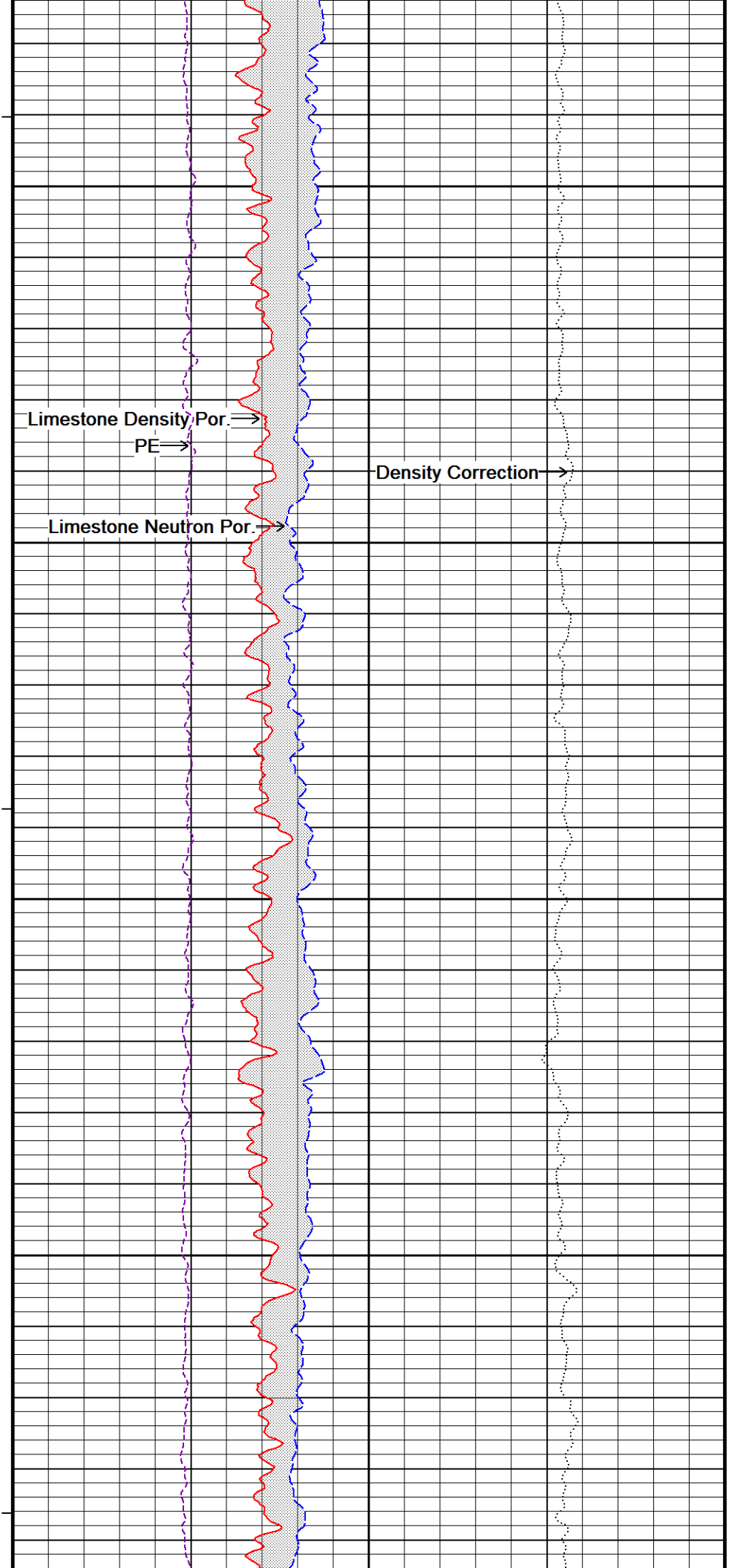
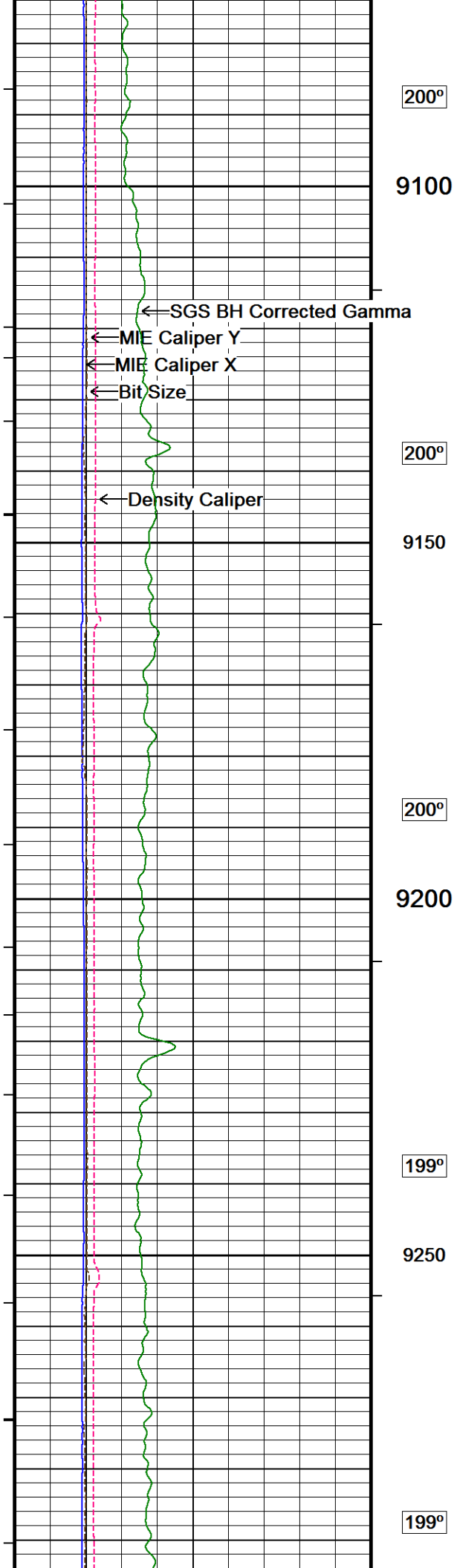


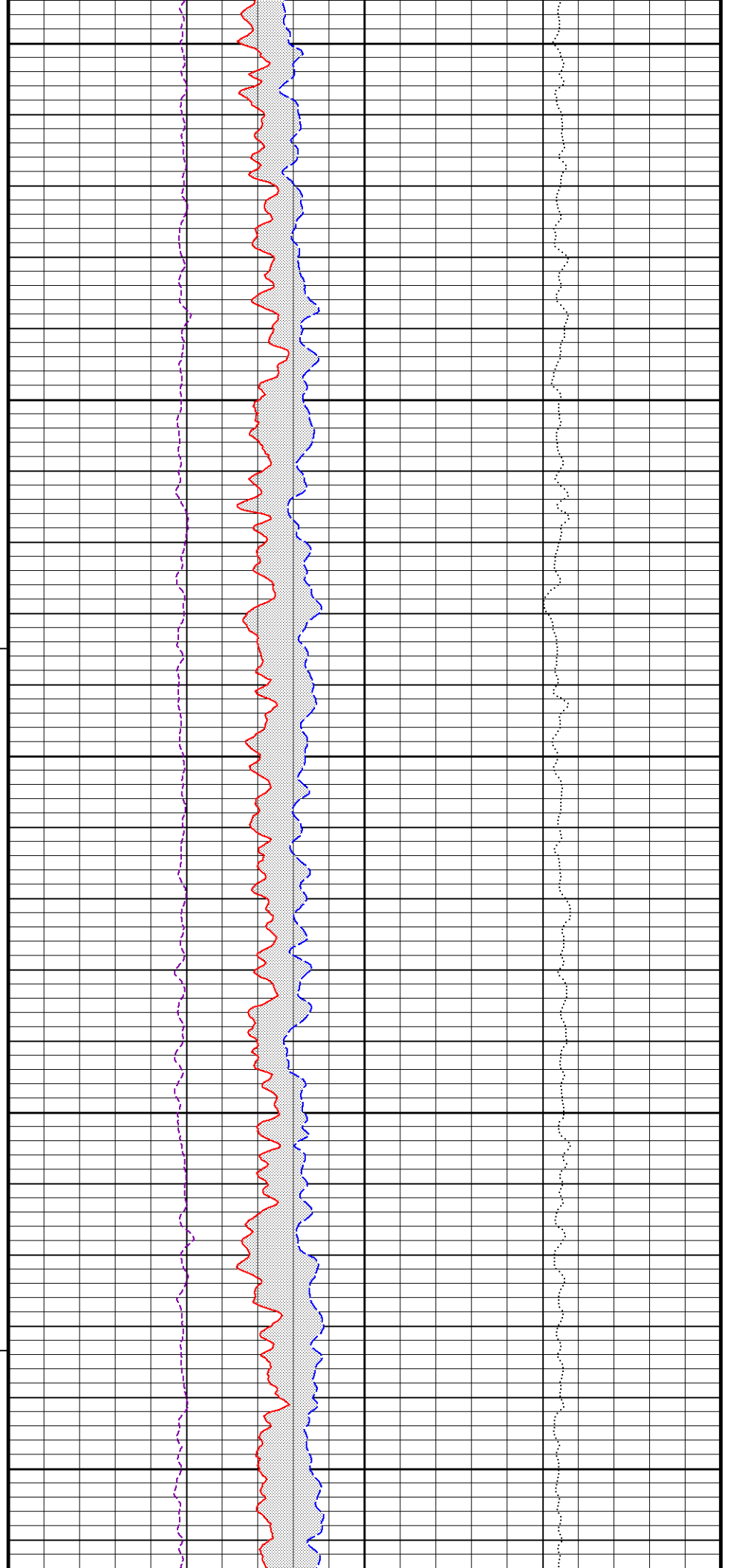
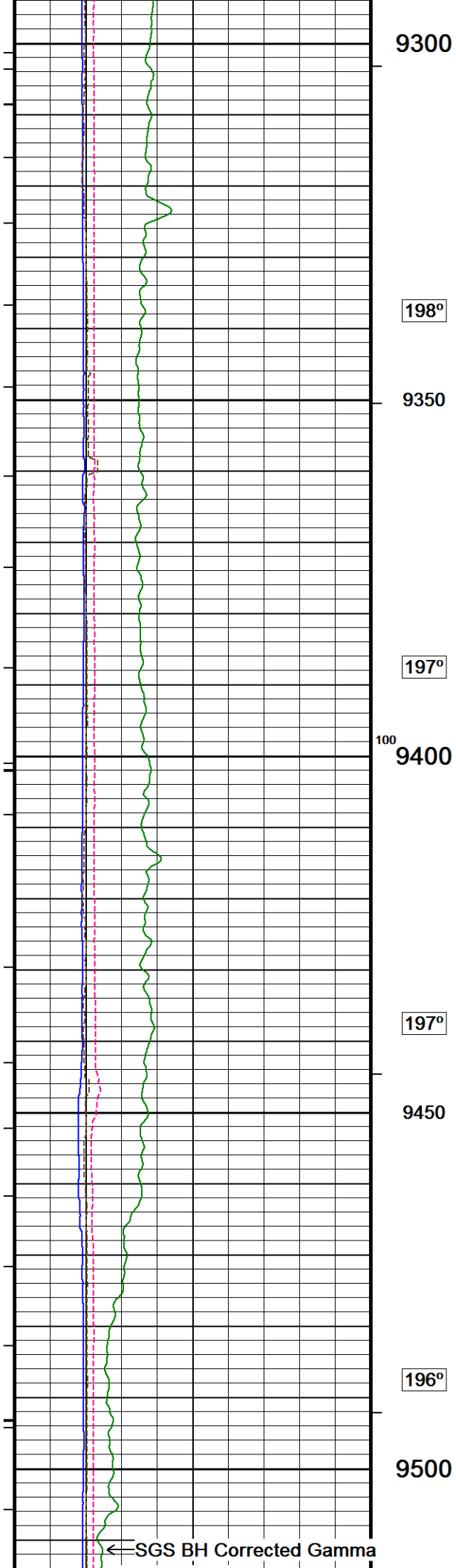


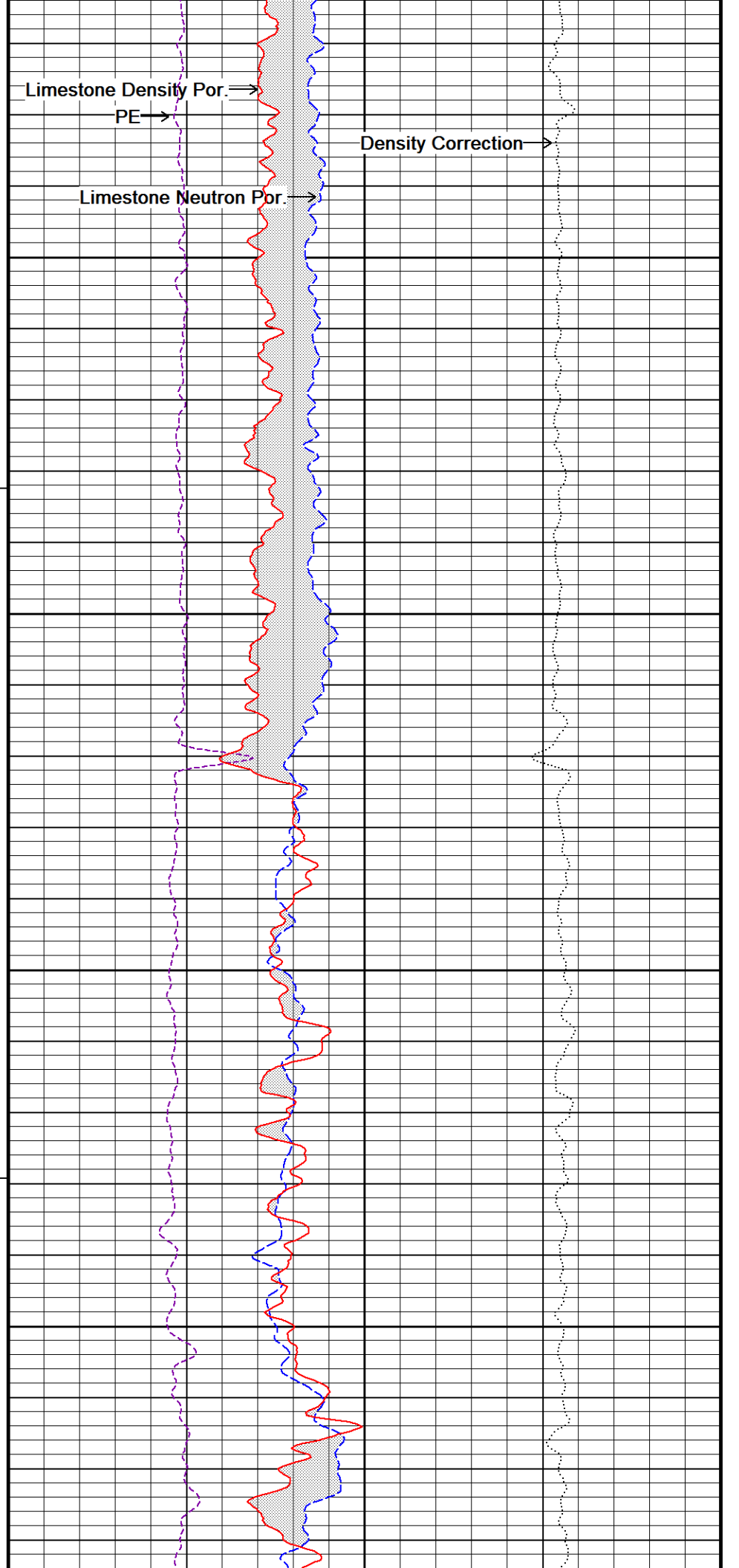
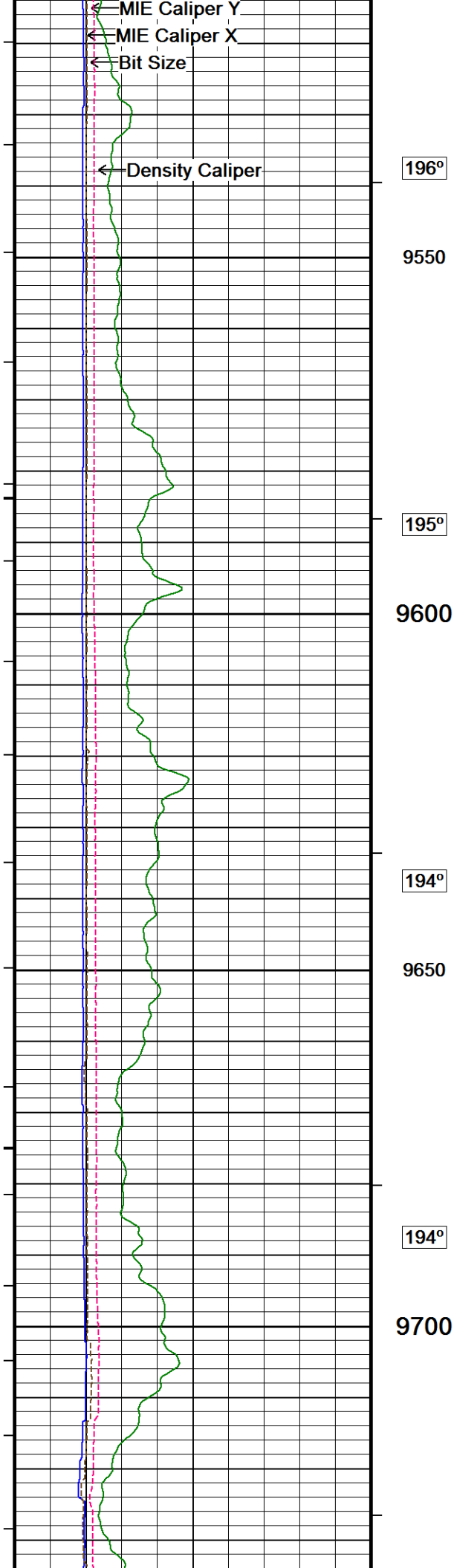


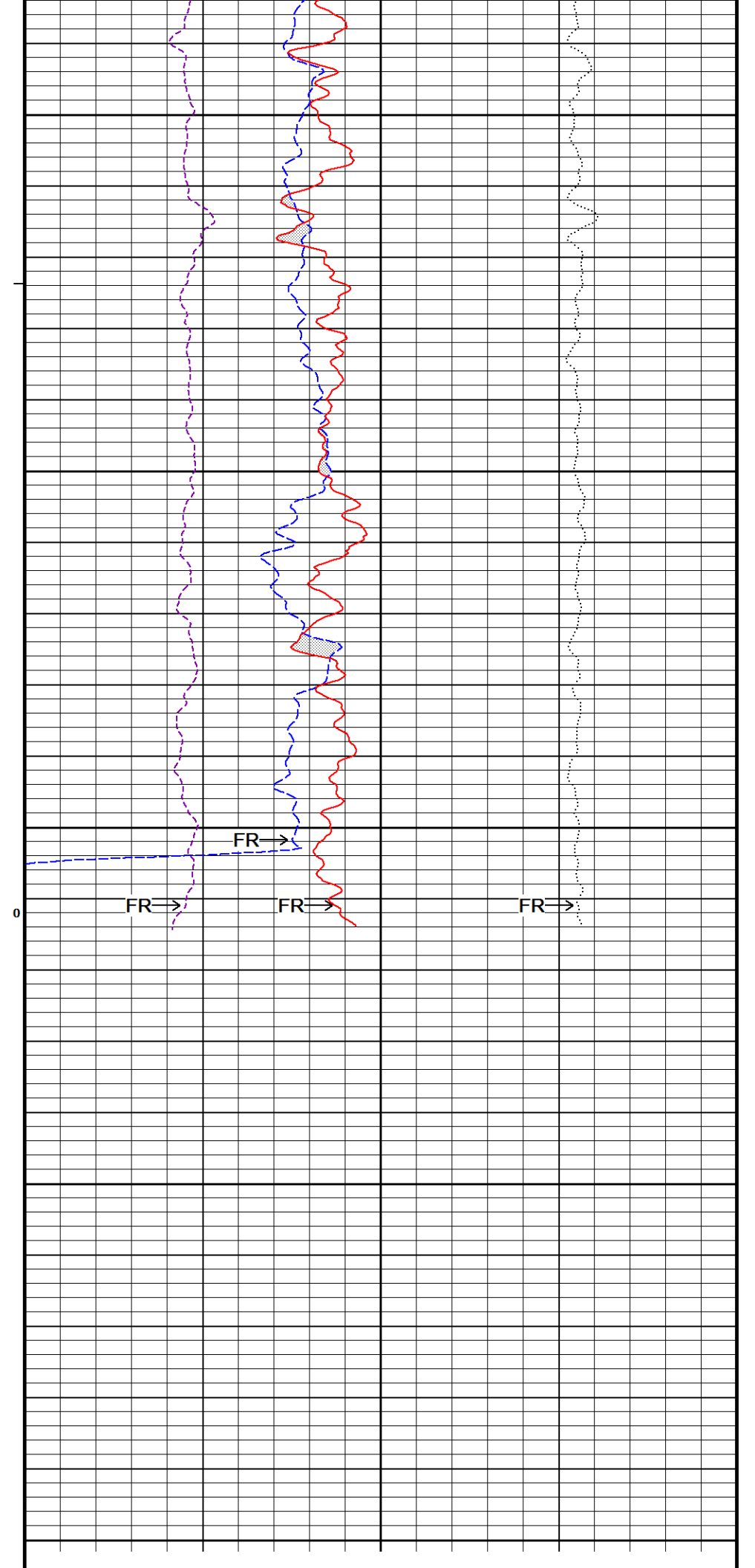
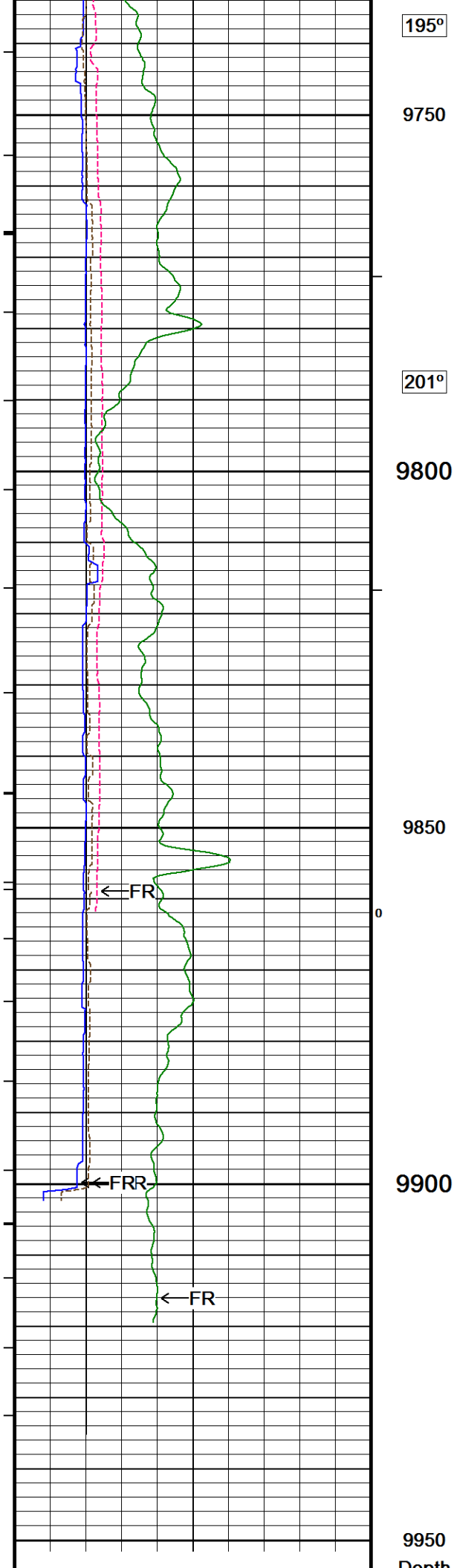


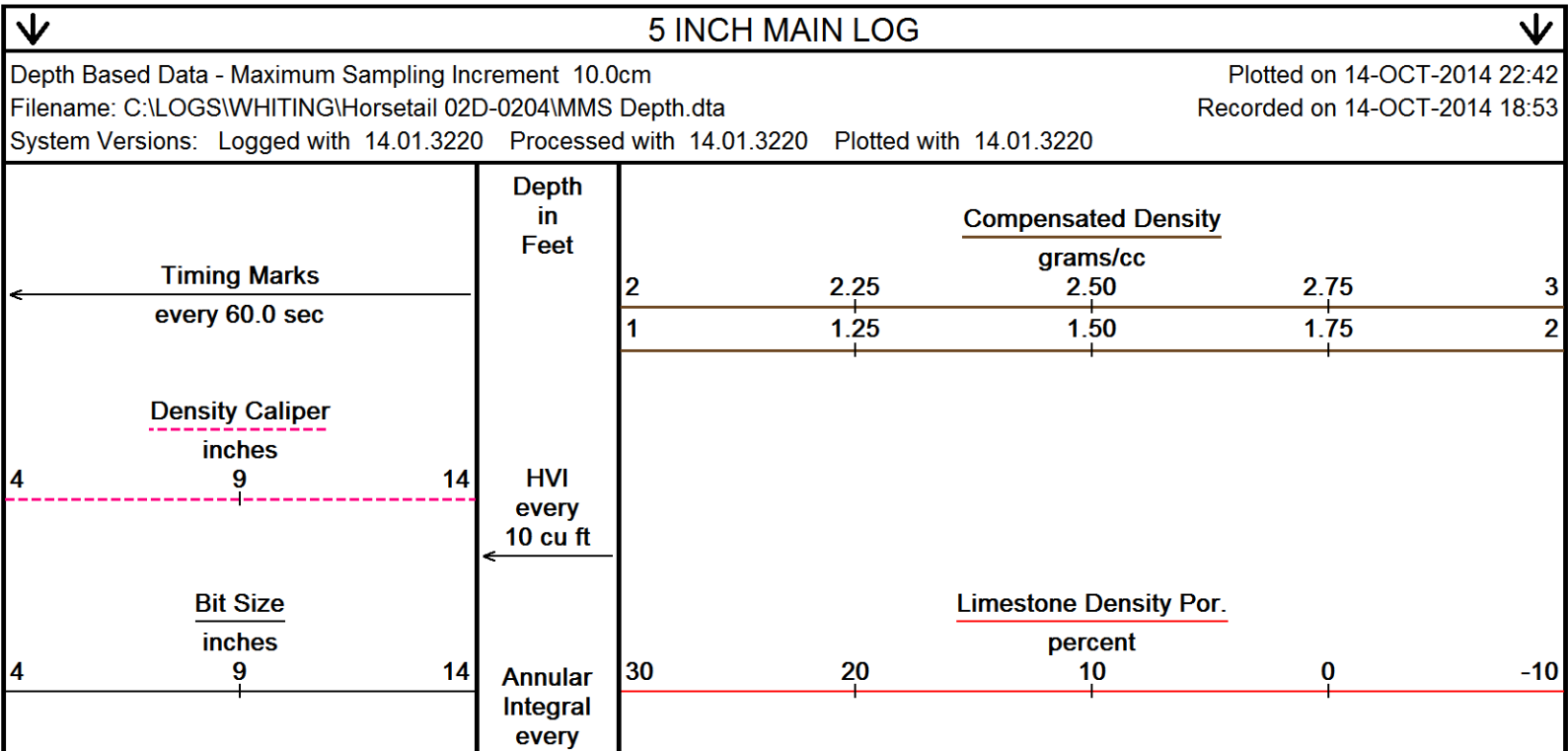
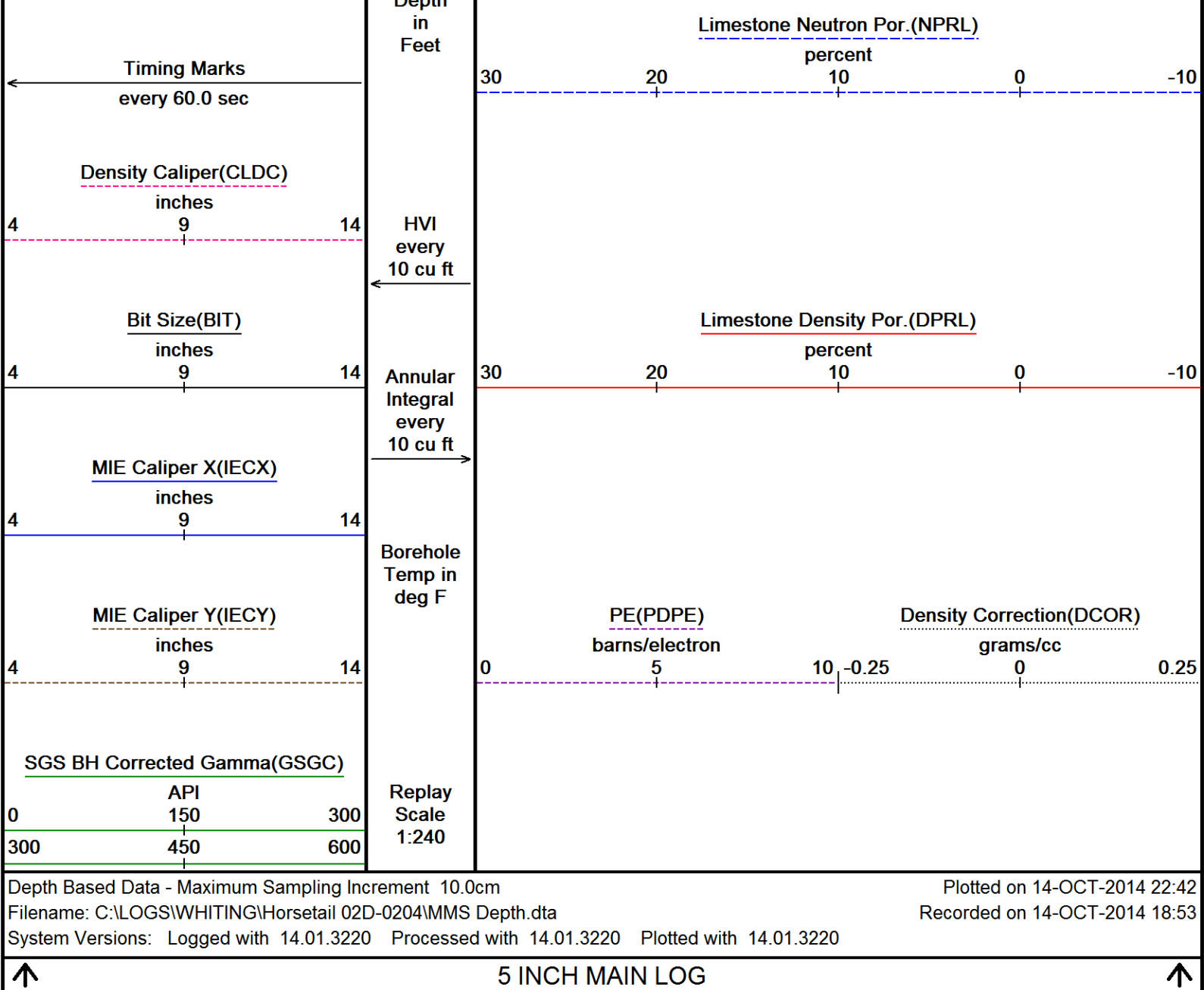


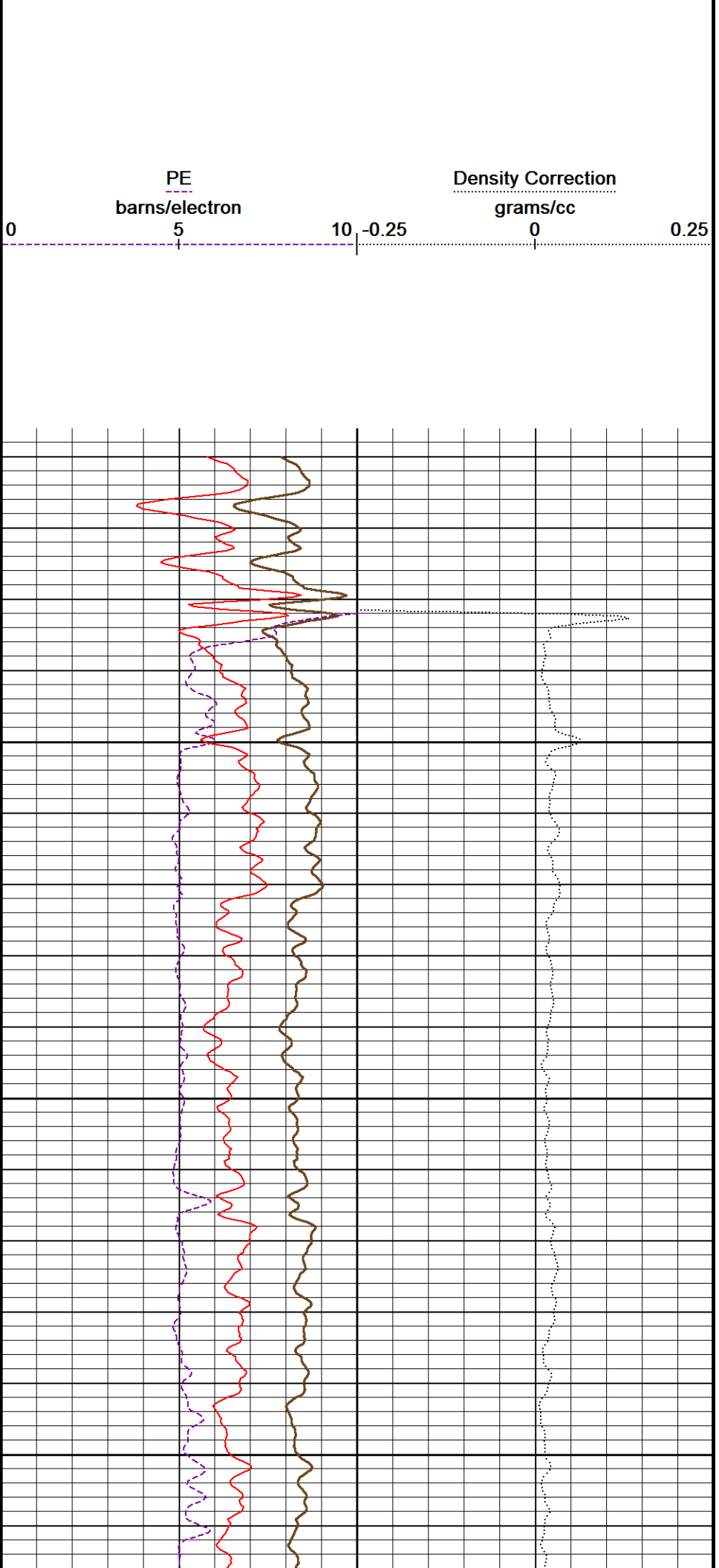
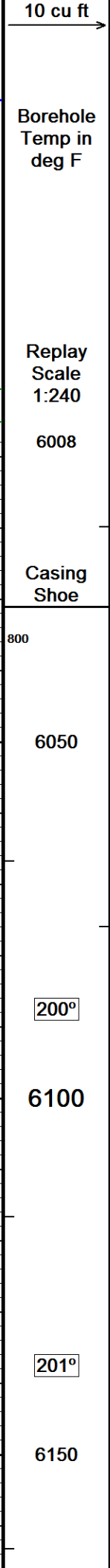
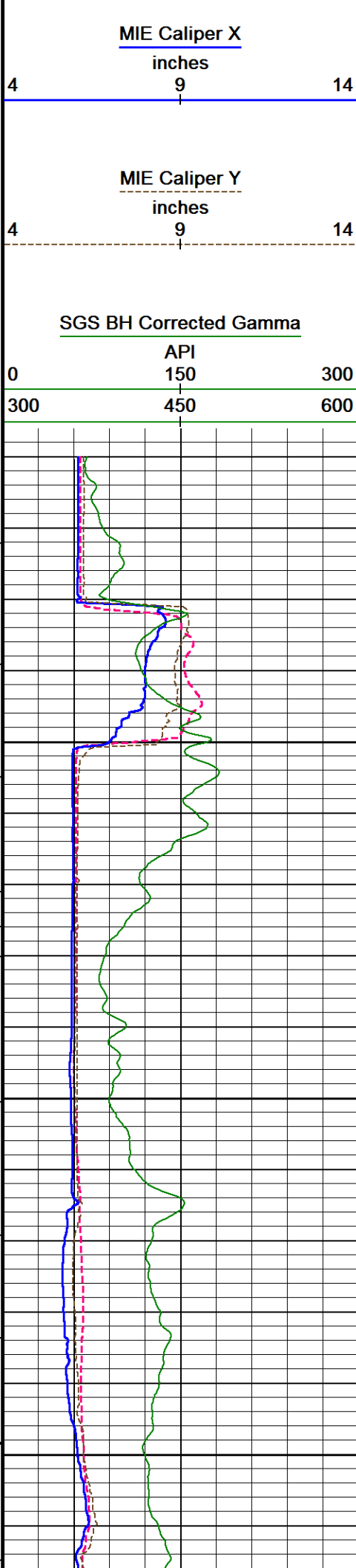




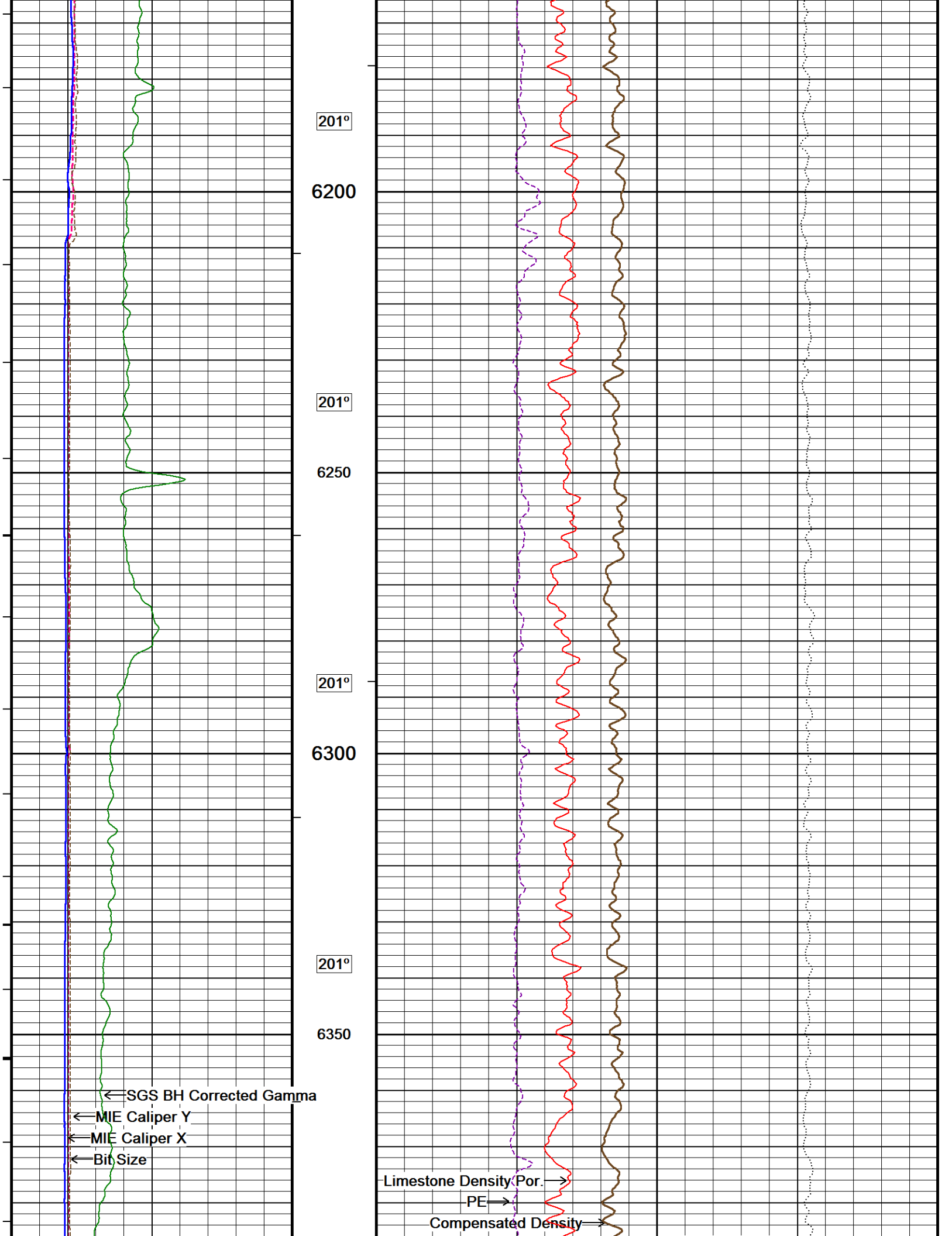


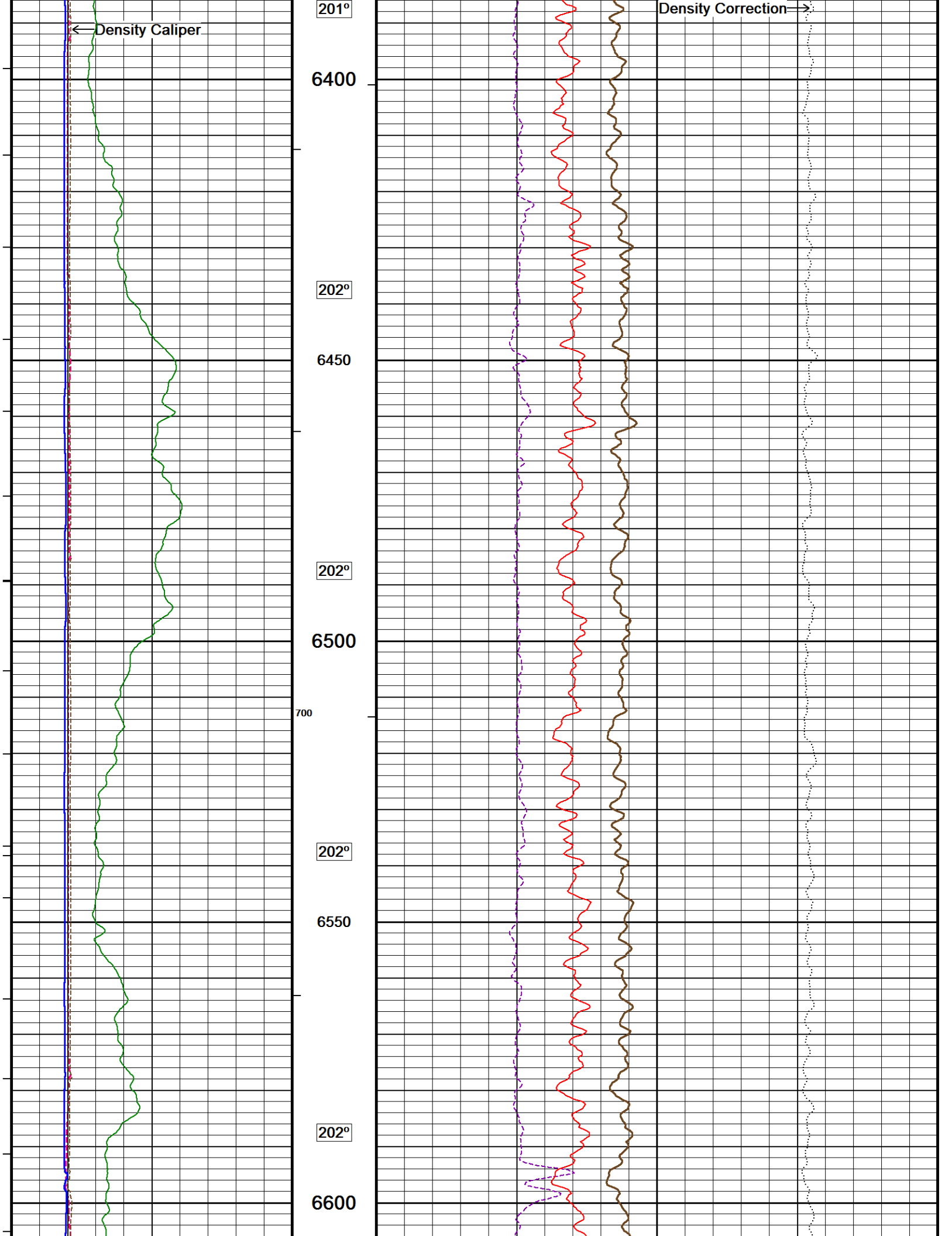


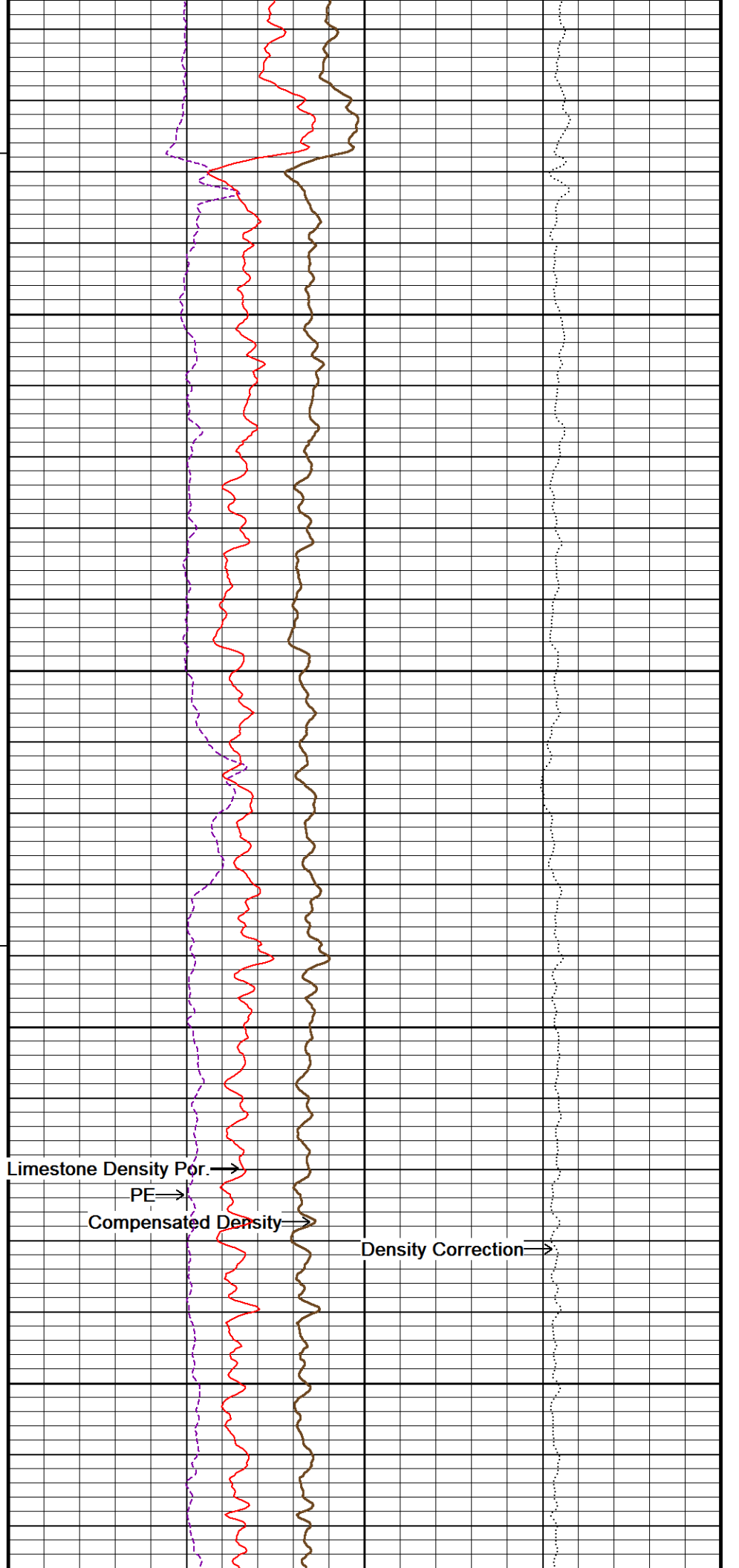
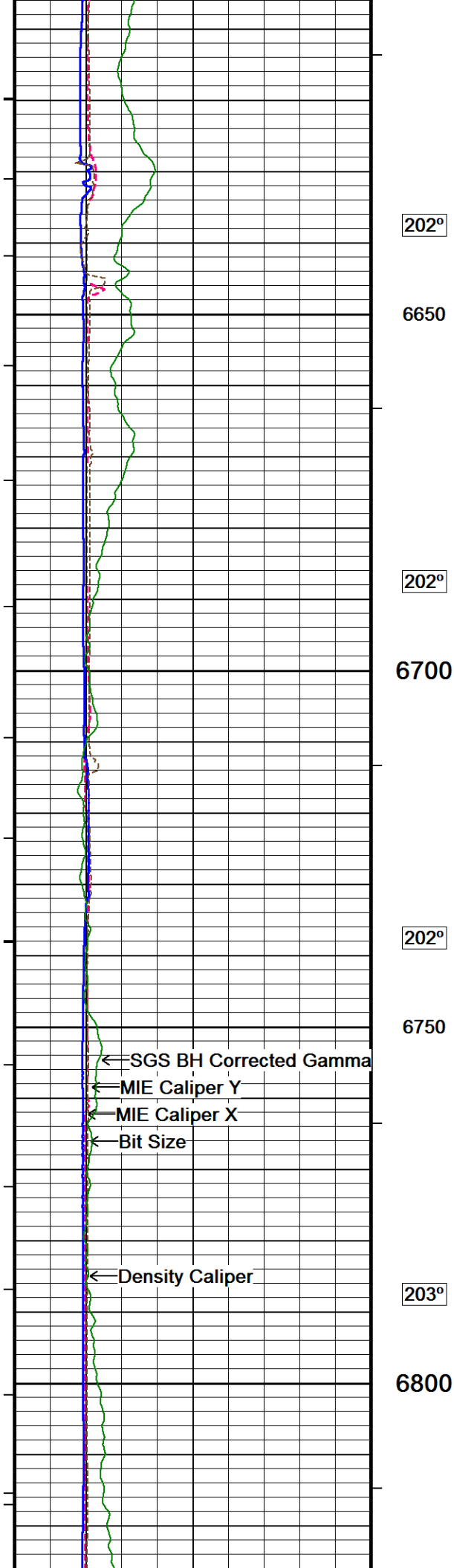


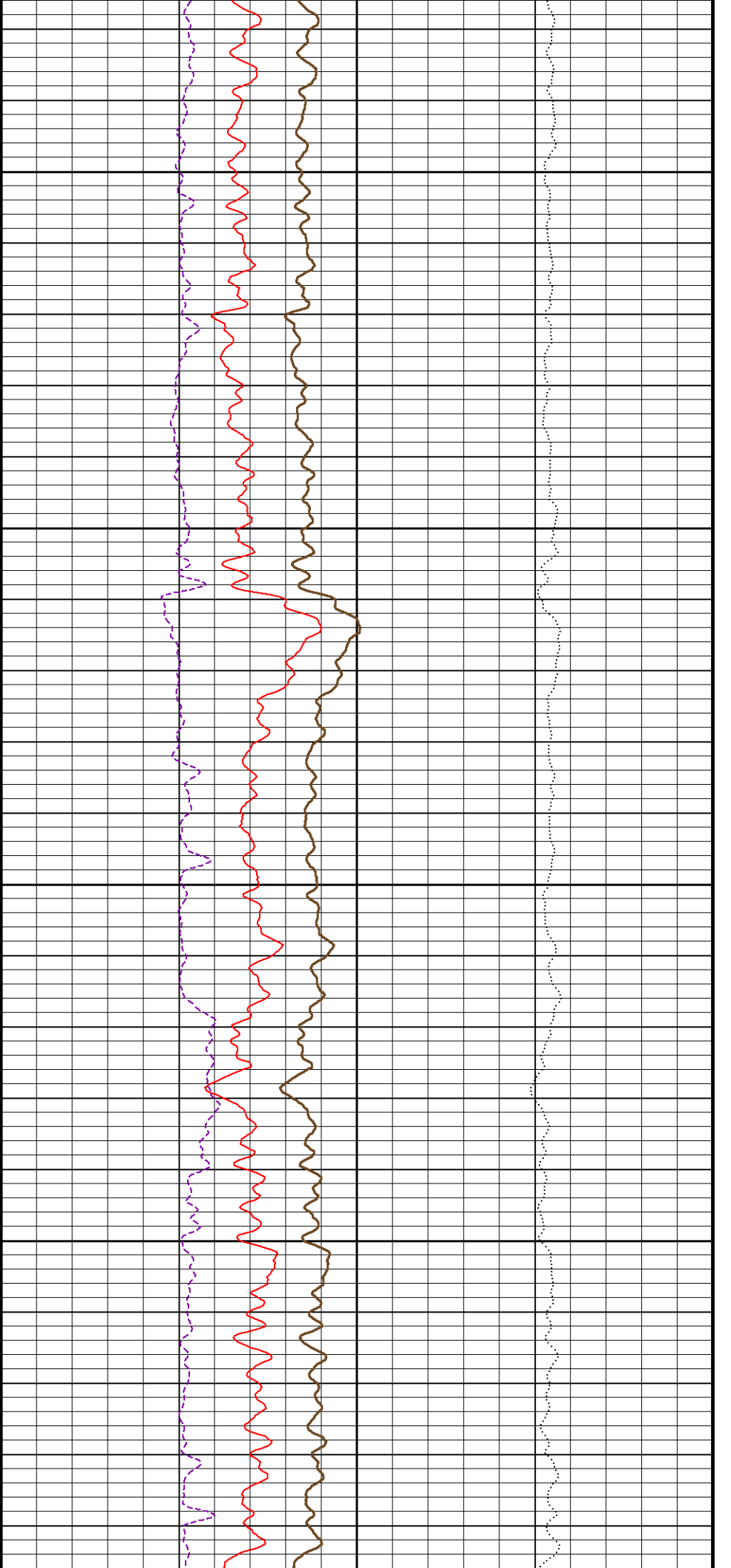
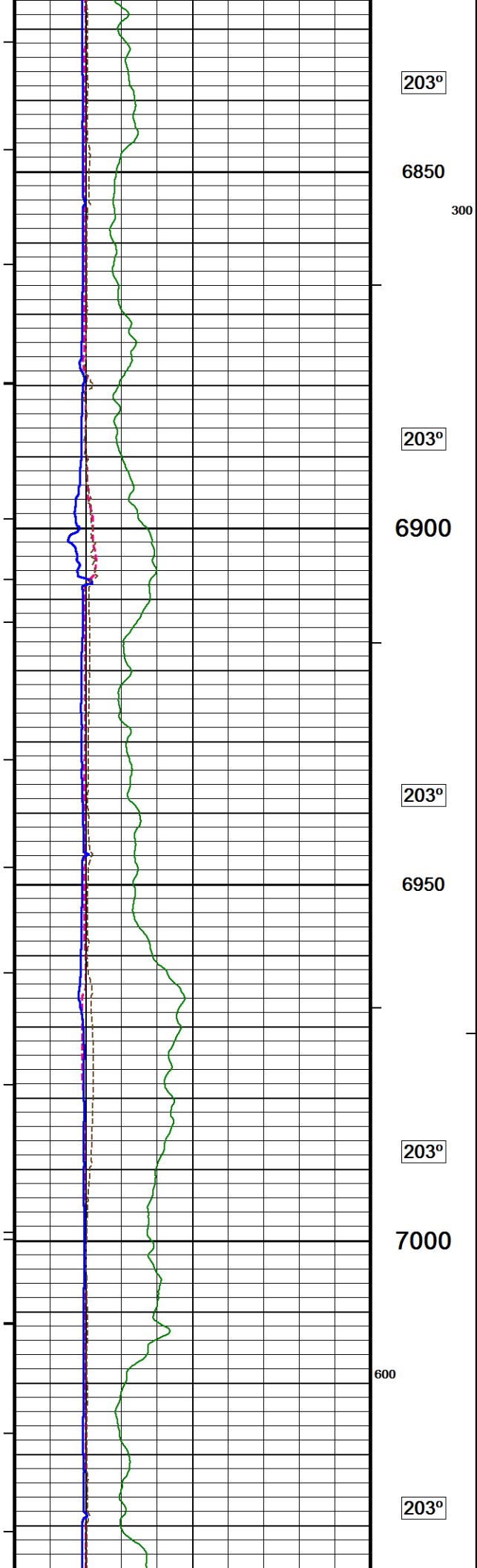


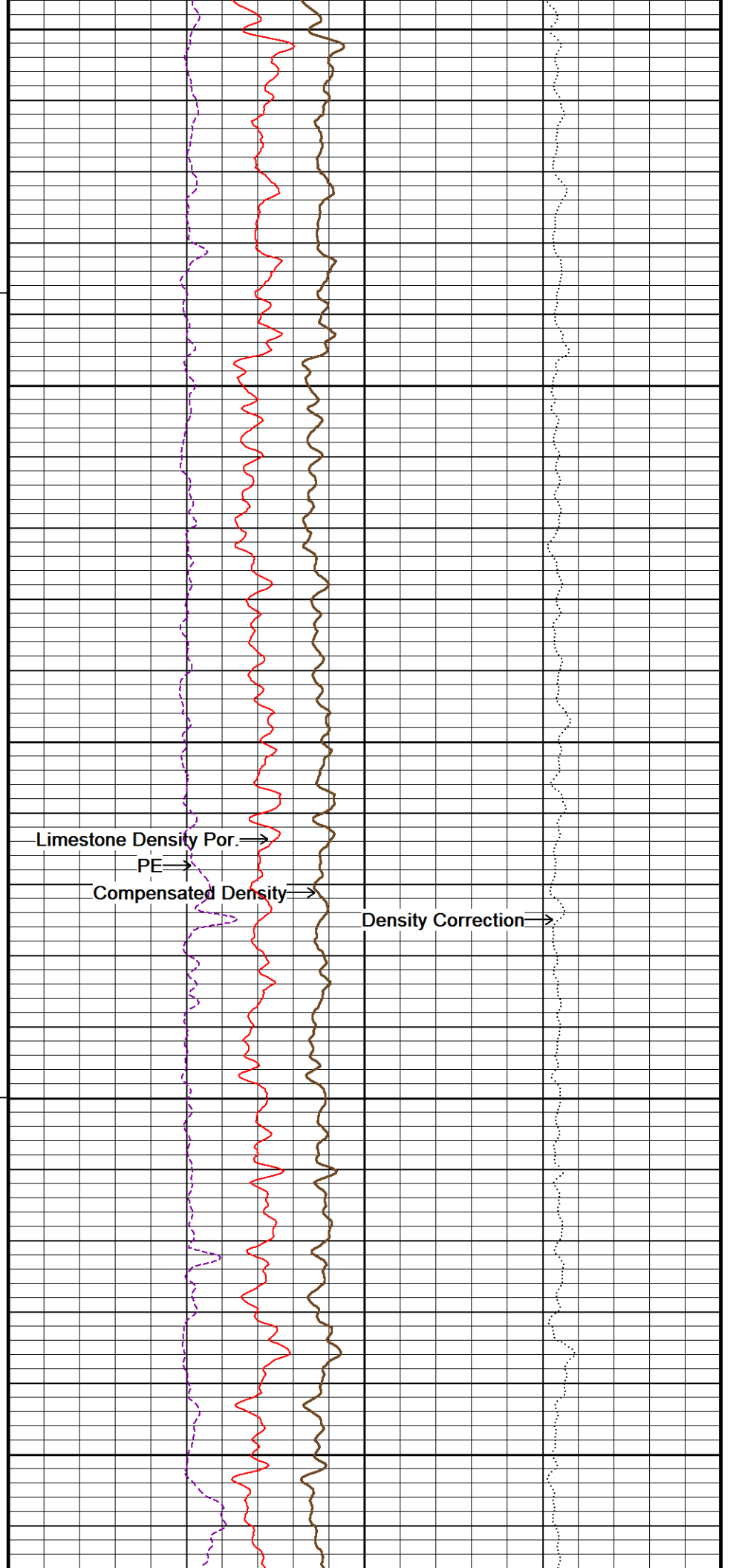
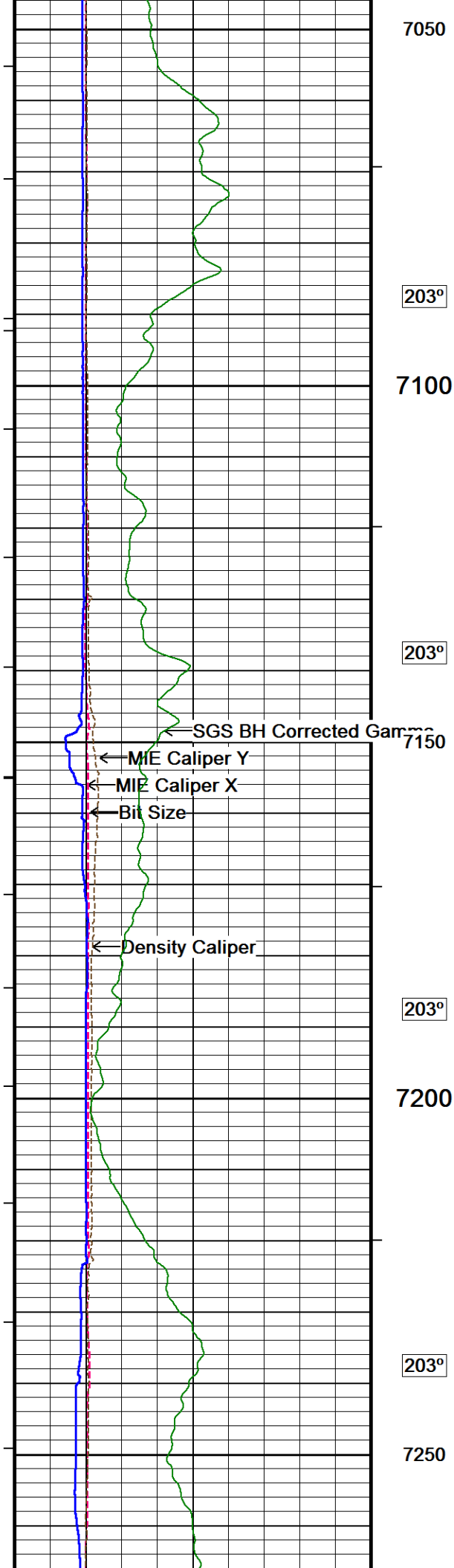


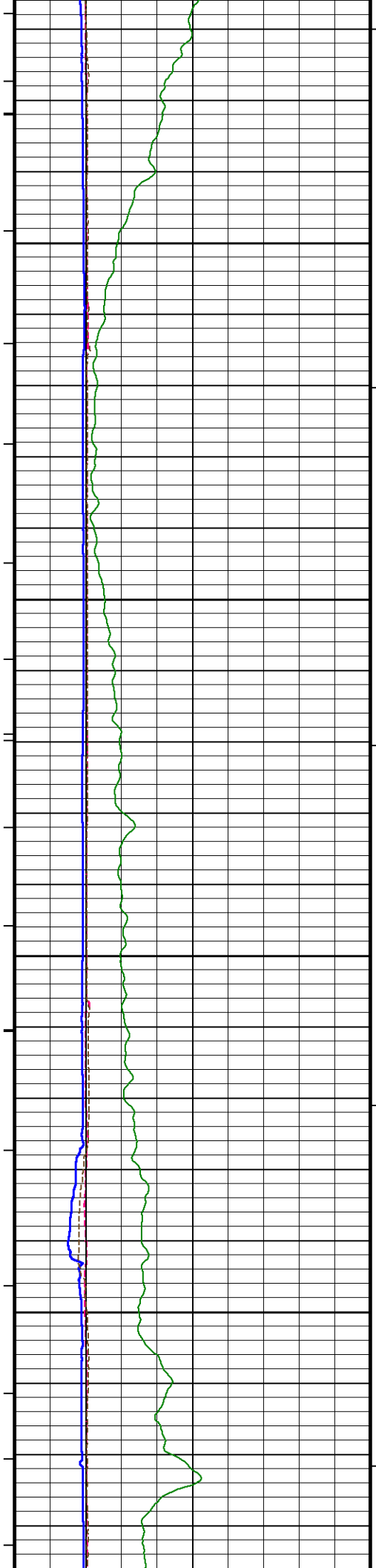












203°

7300

203°

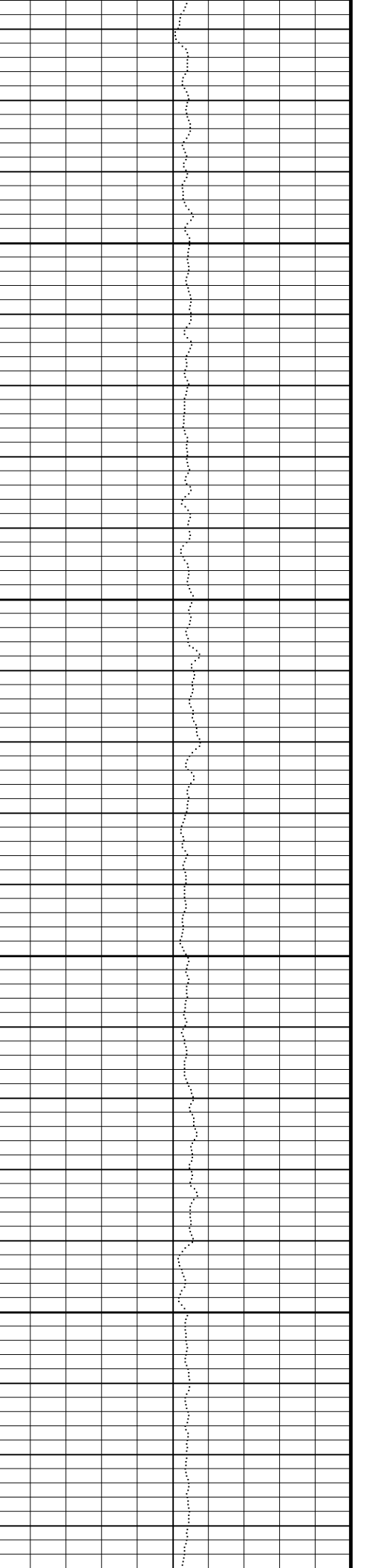
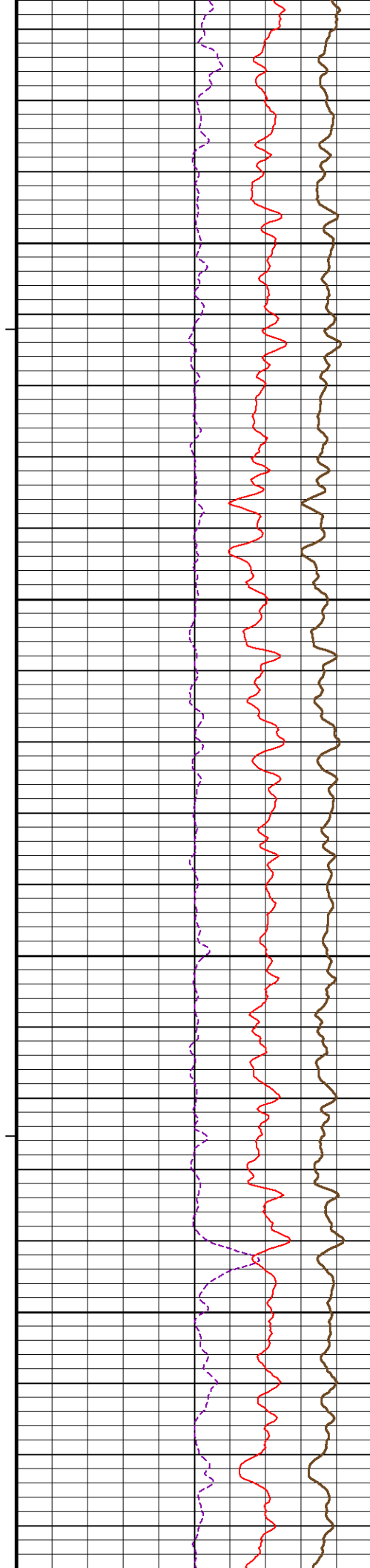
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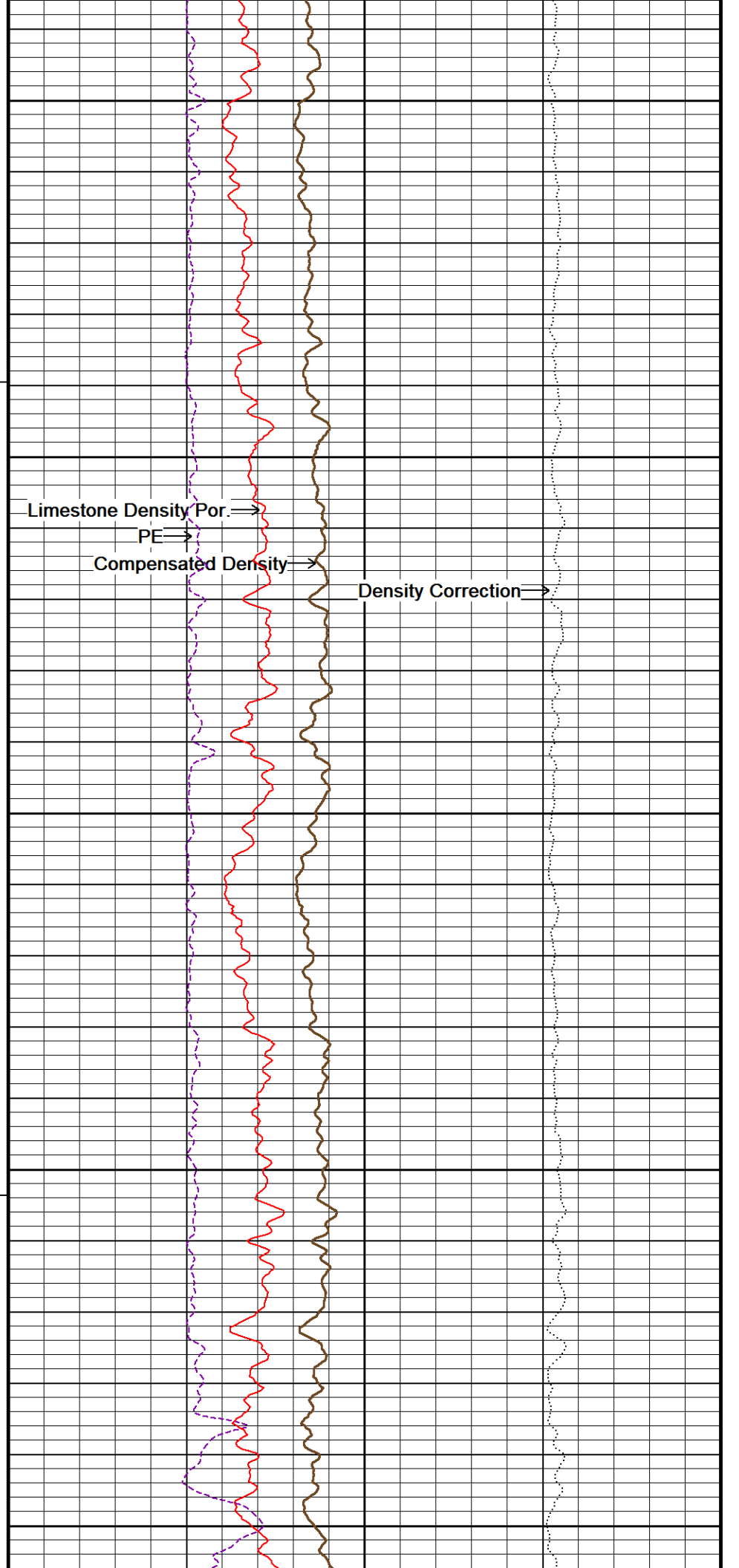
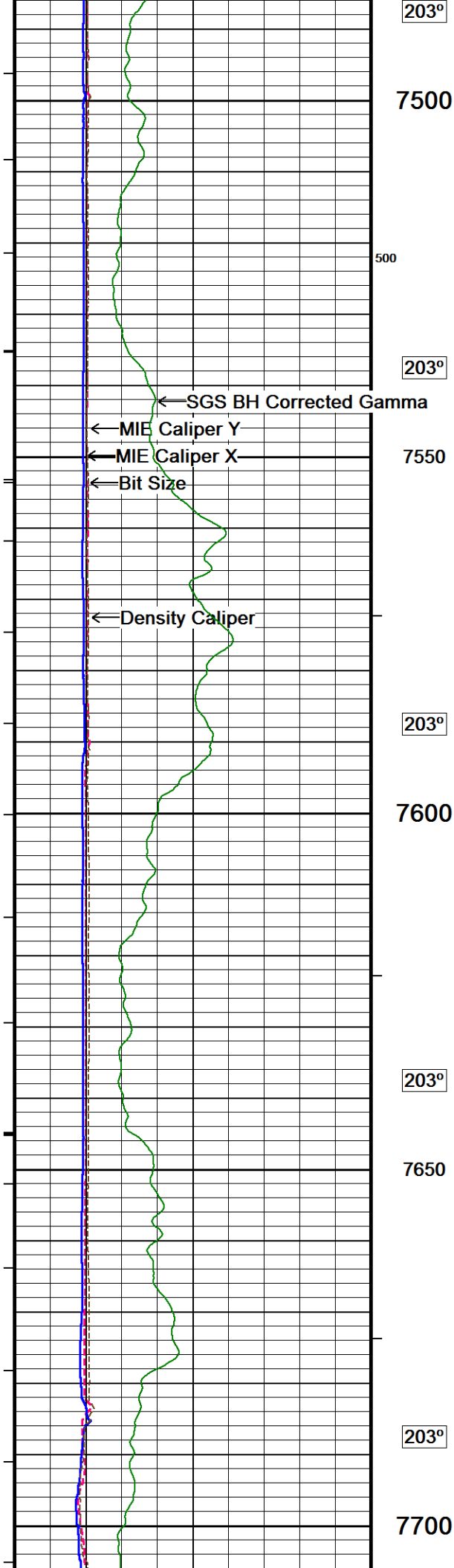
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7400

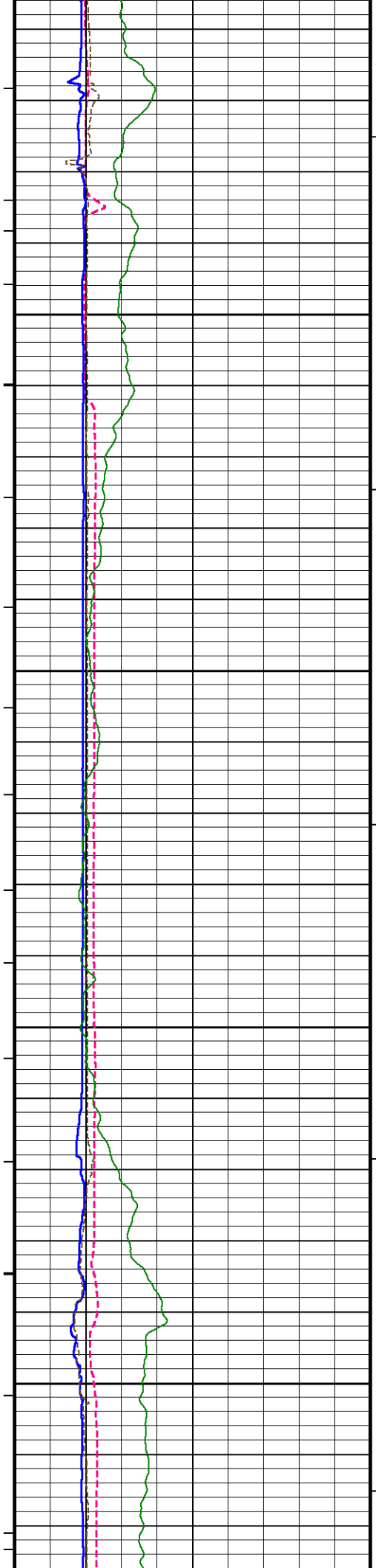
203°

7450









203°

7750

203°

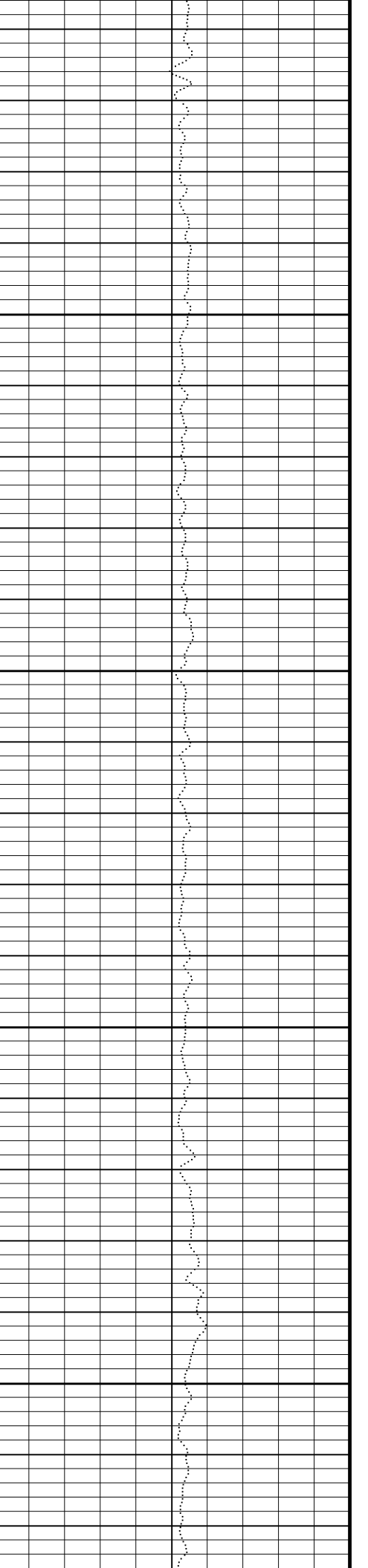
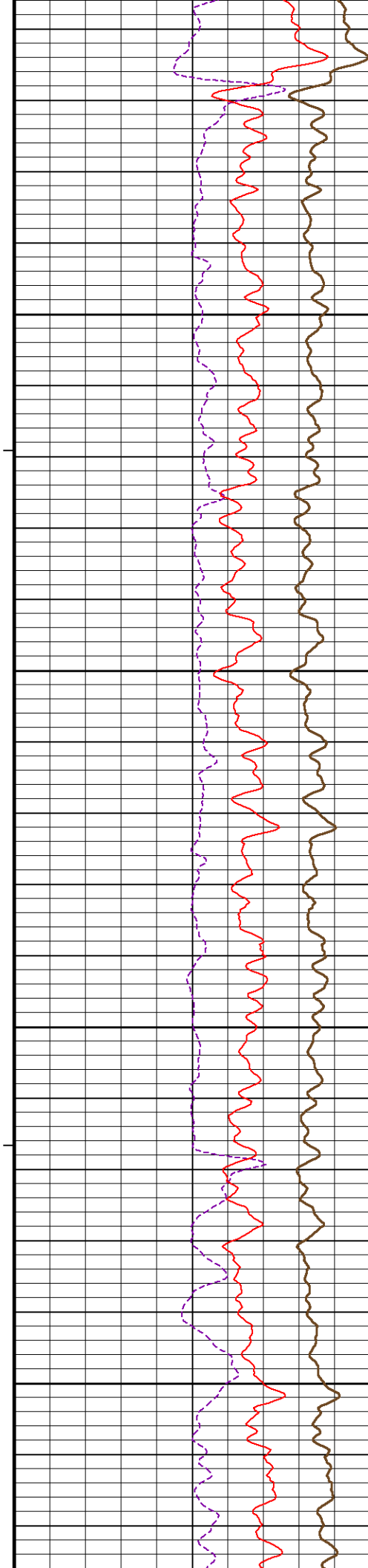
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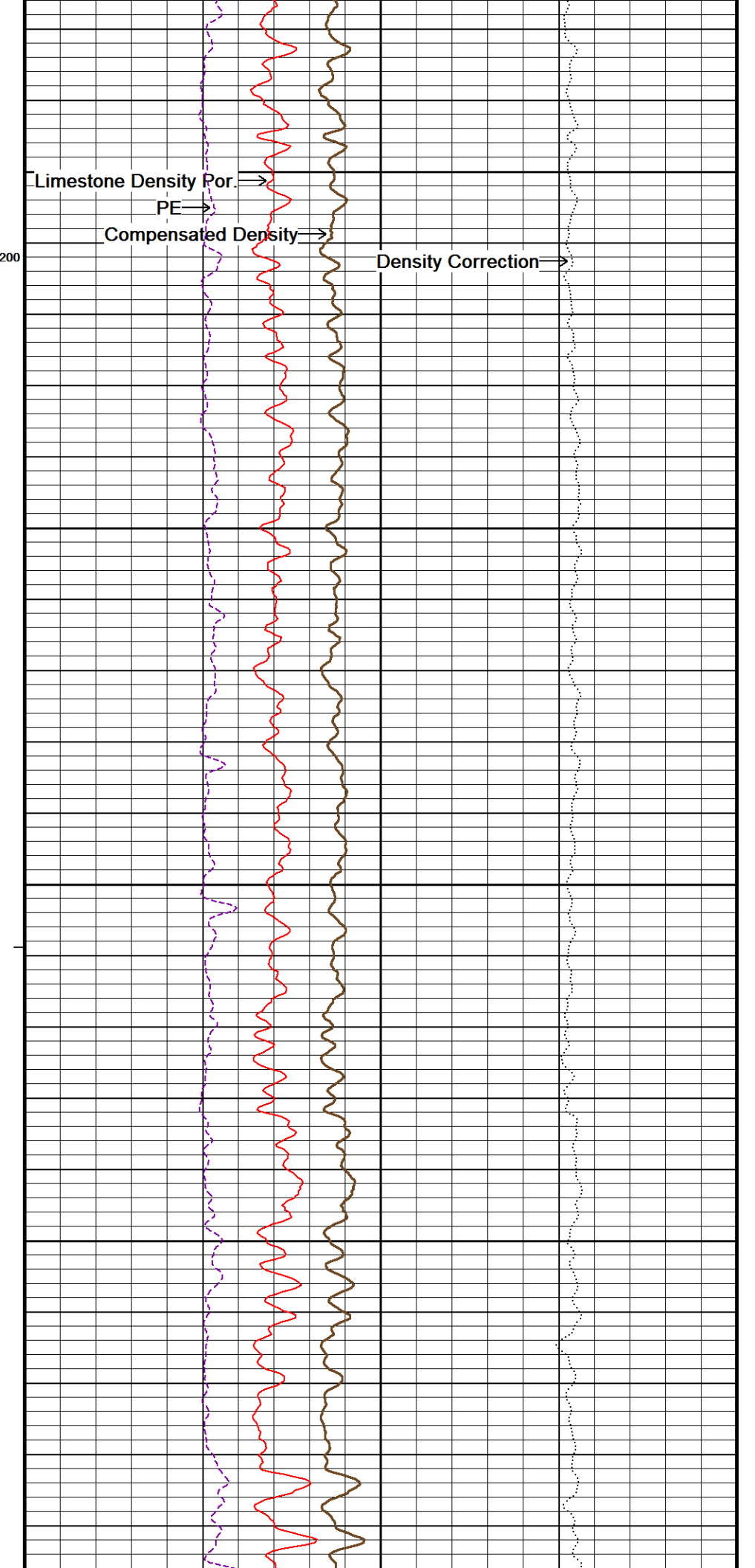
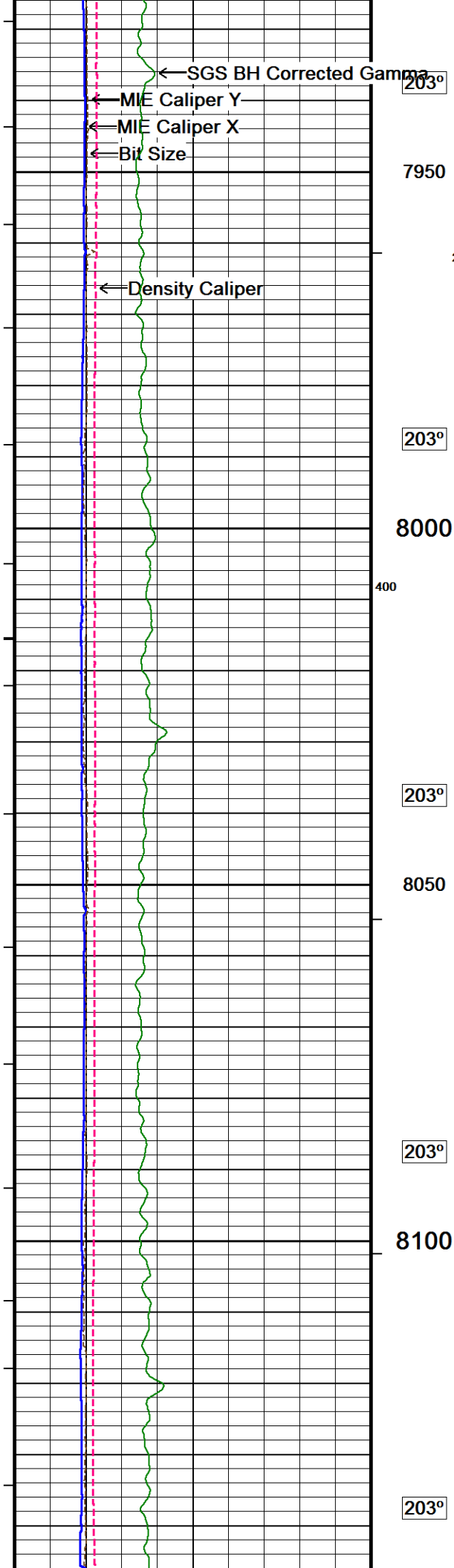
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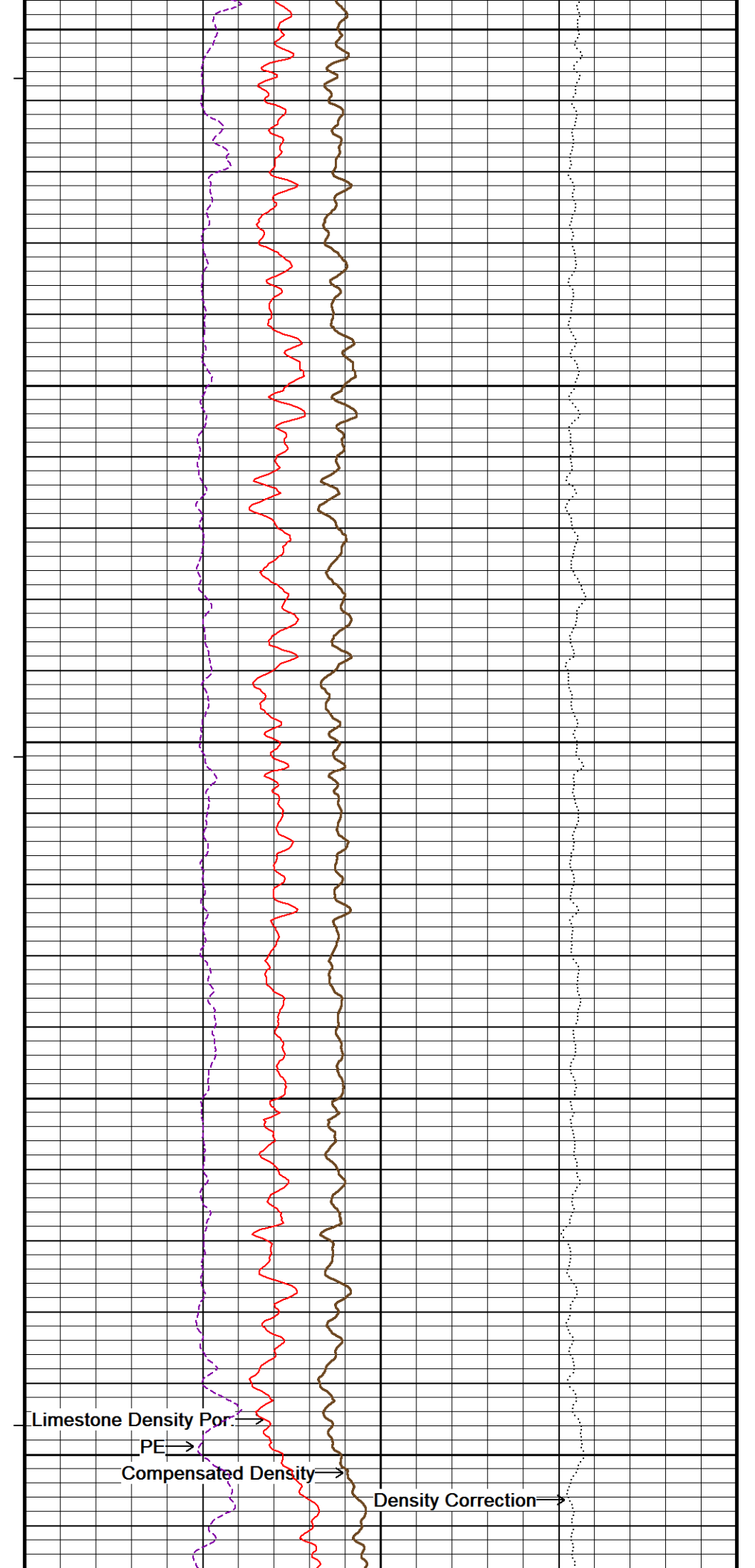
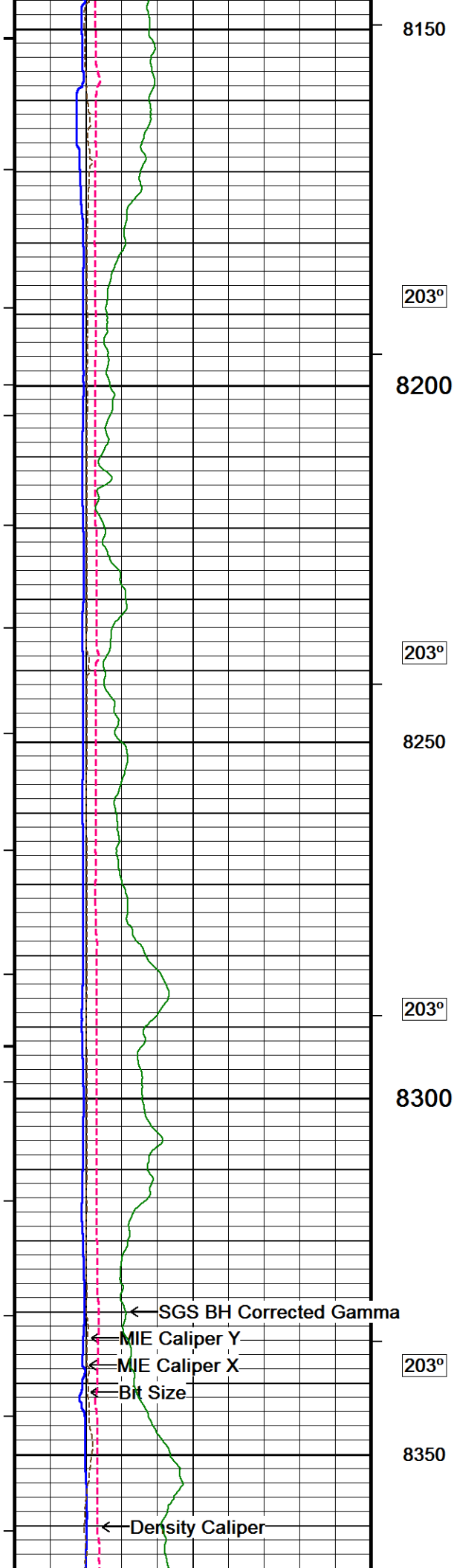
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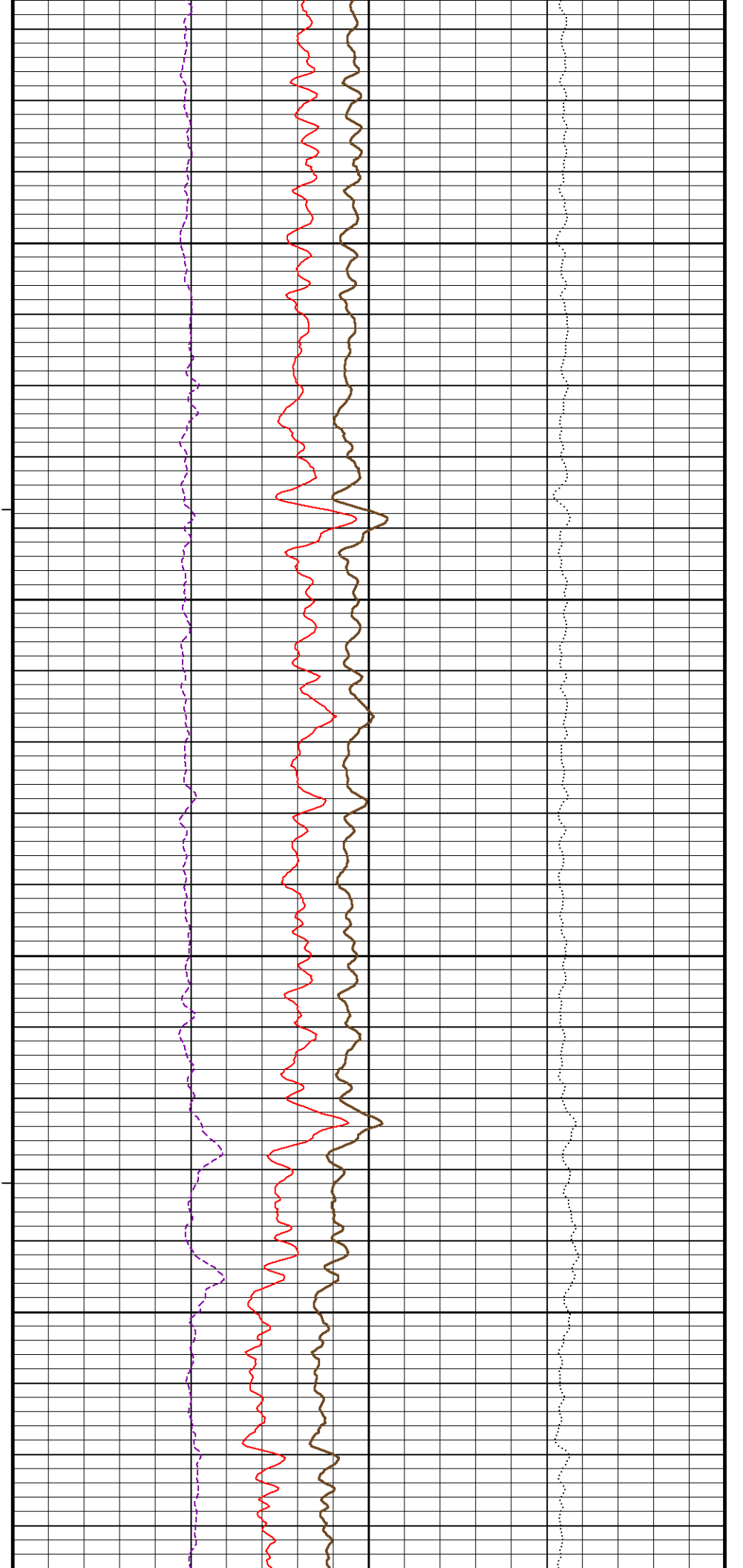
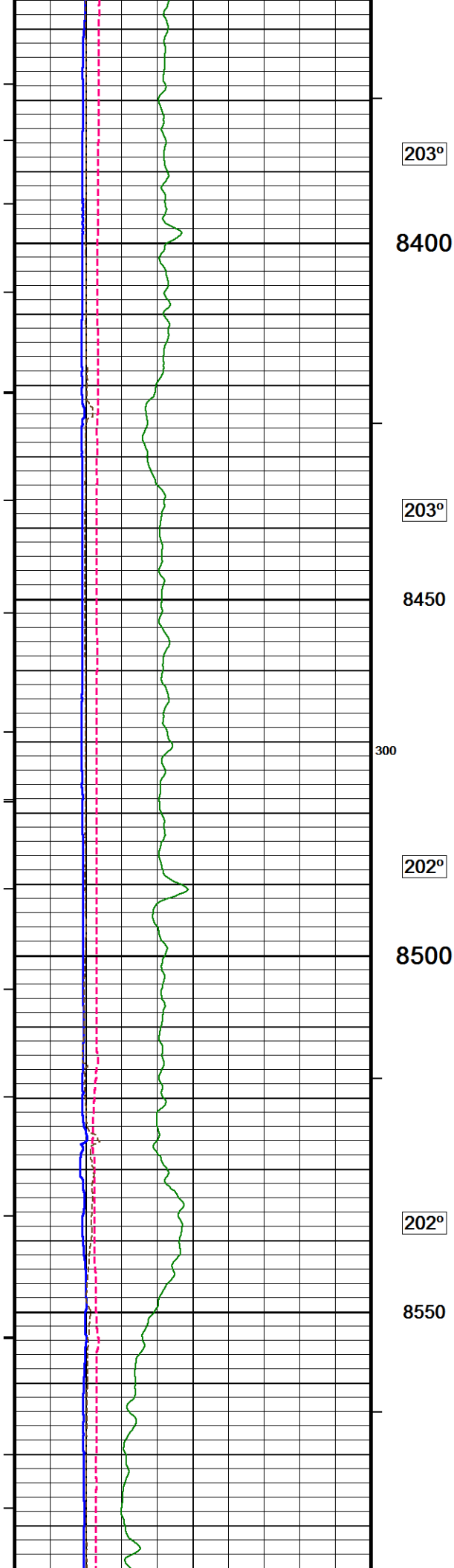
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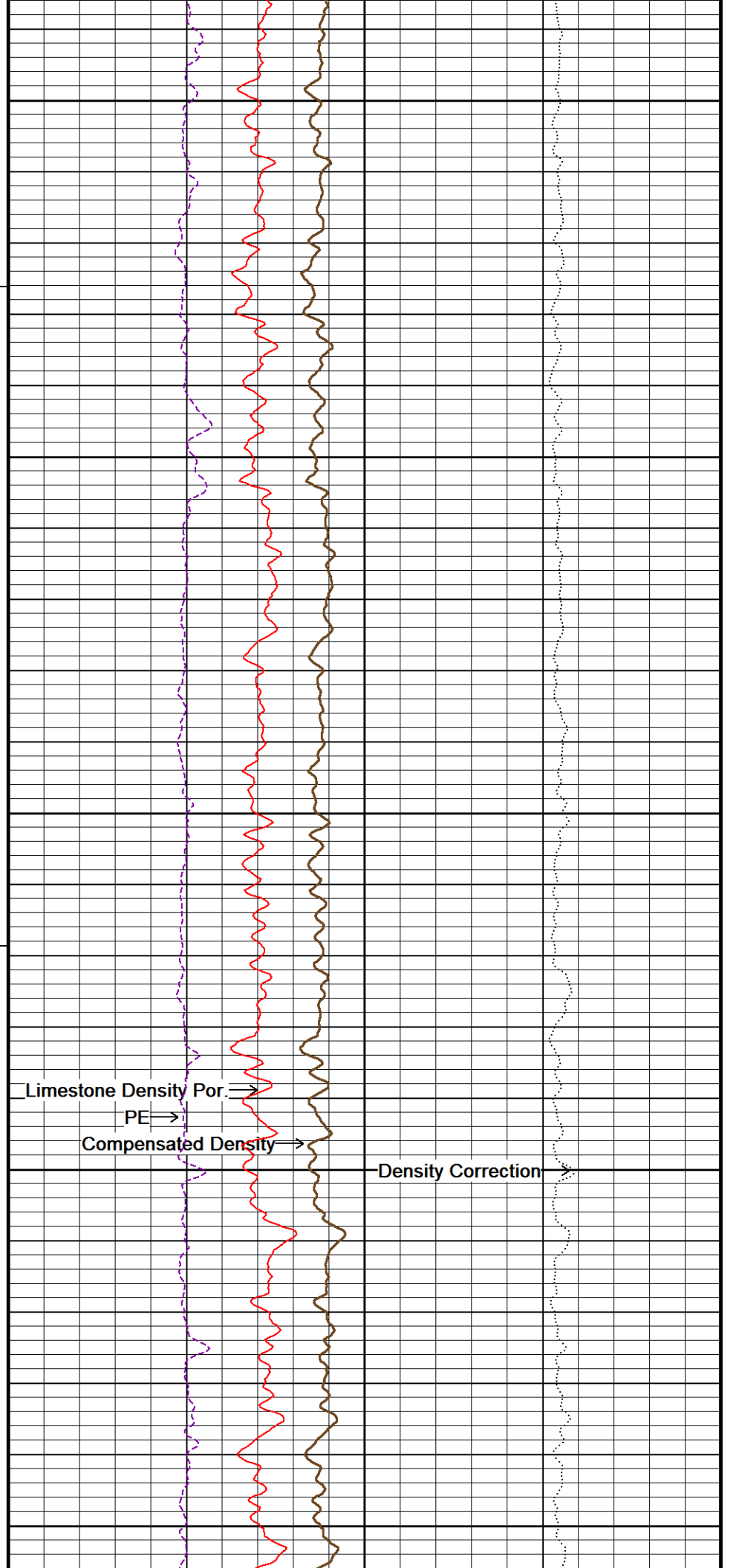
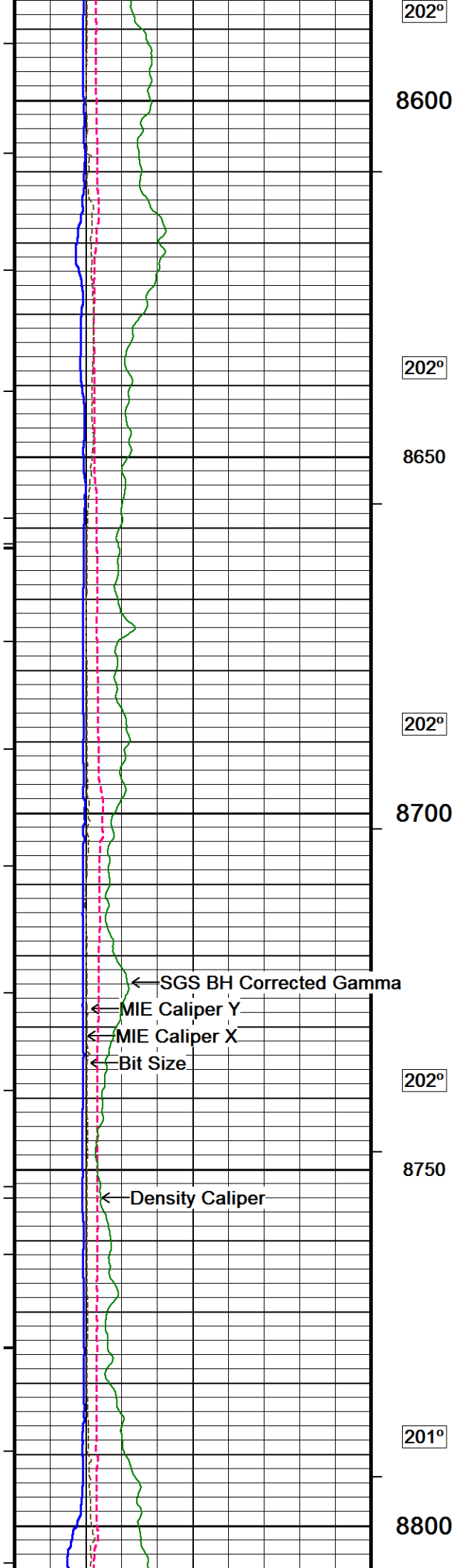
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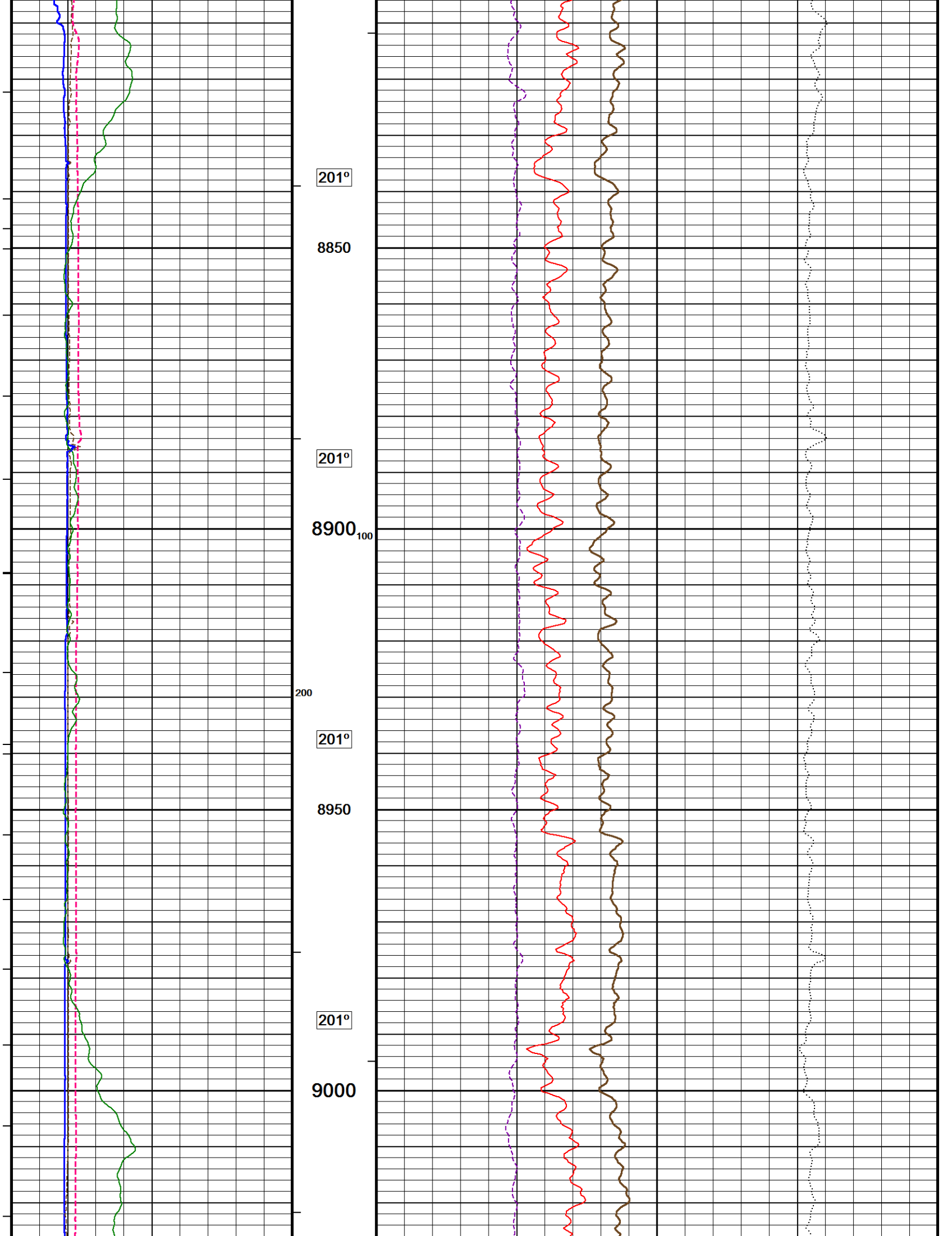


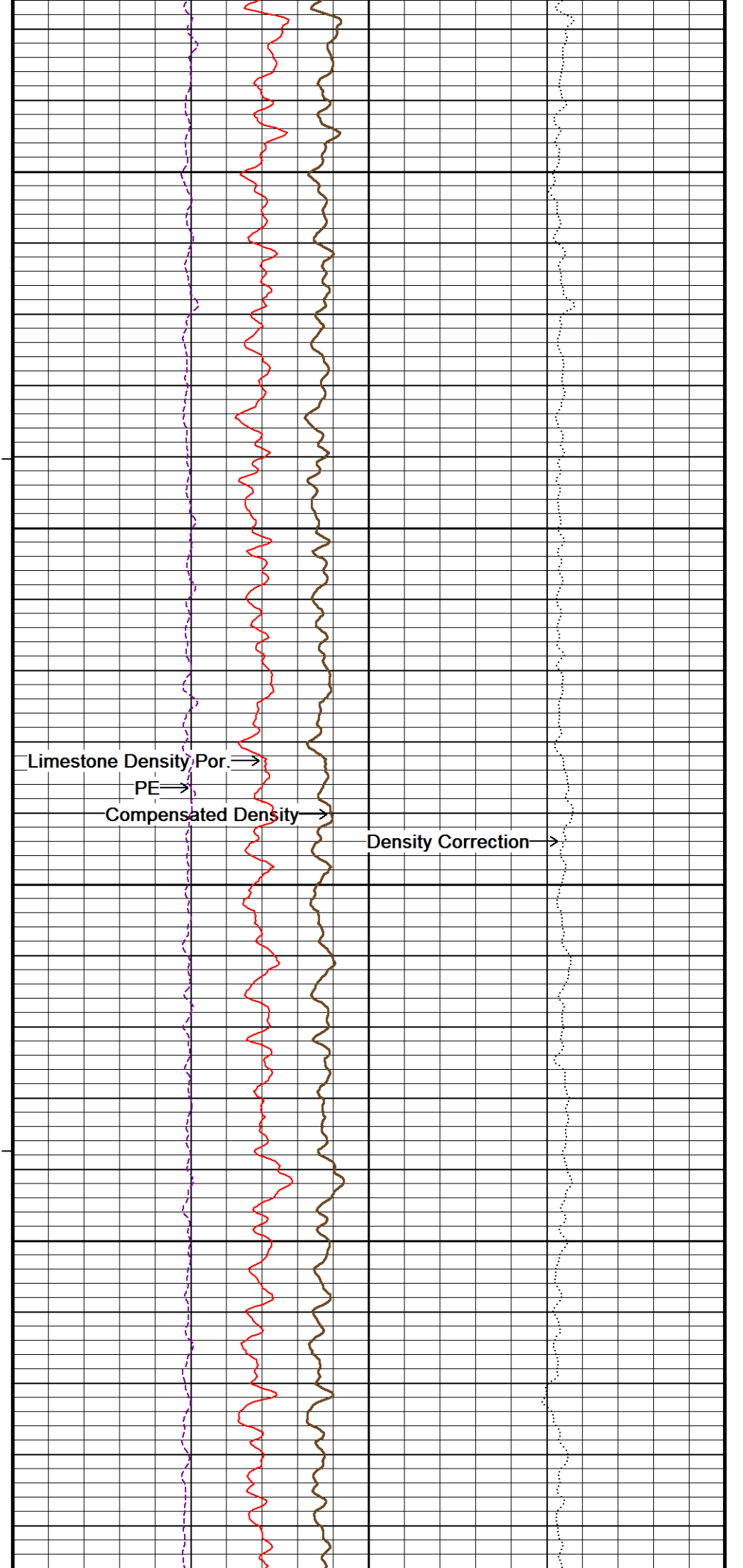
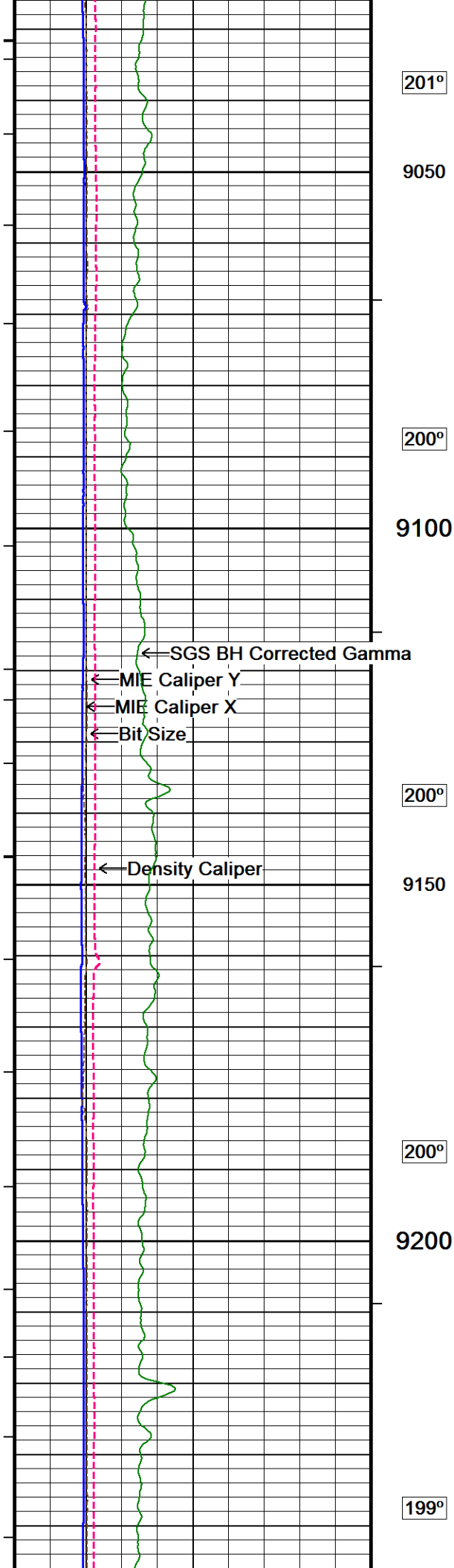




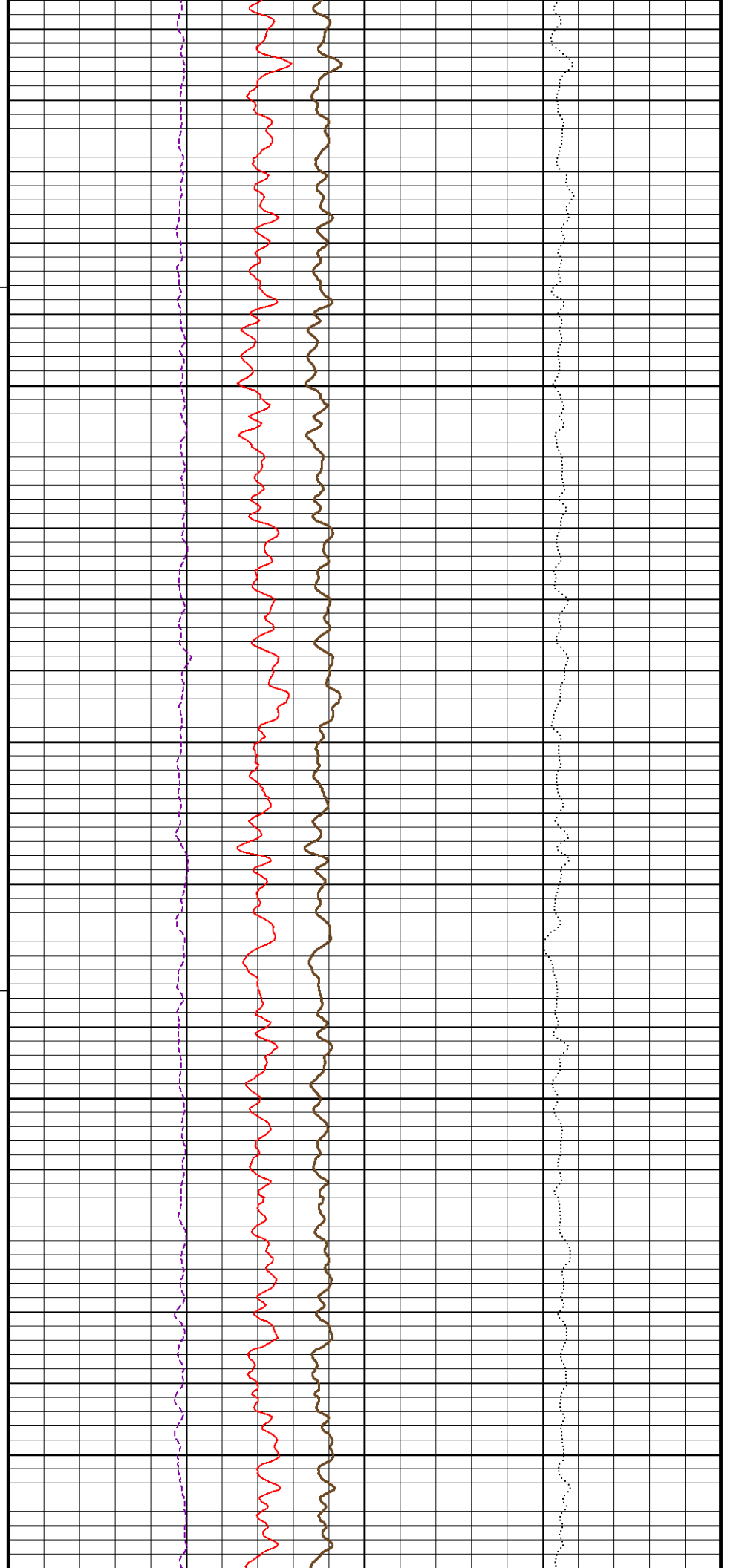
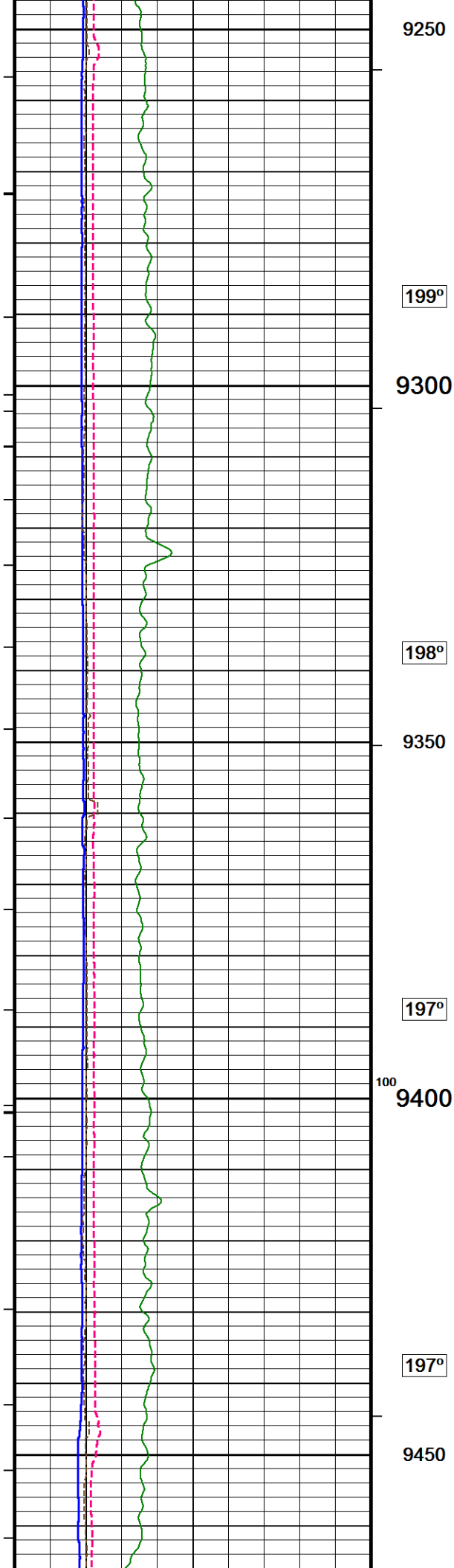


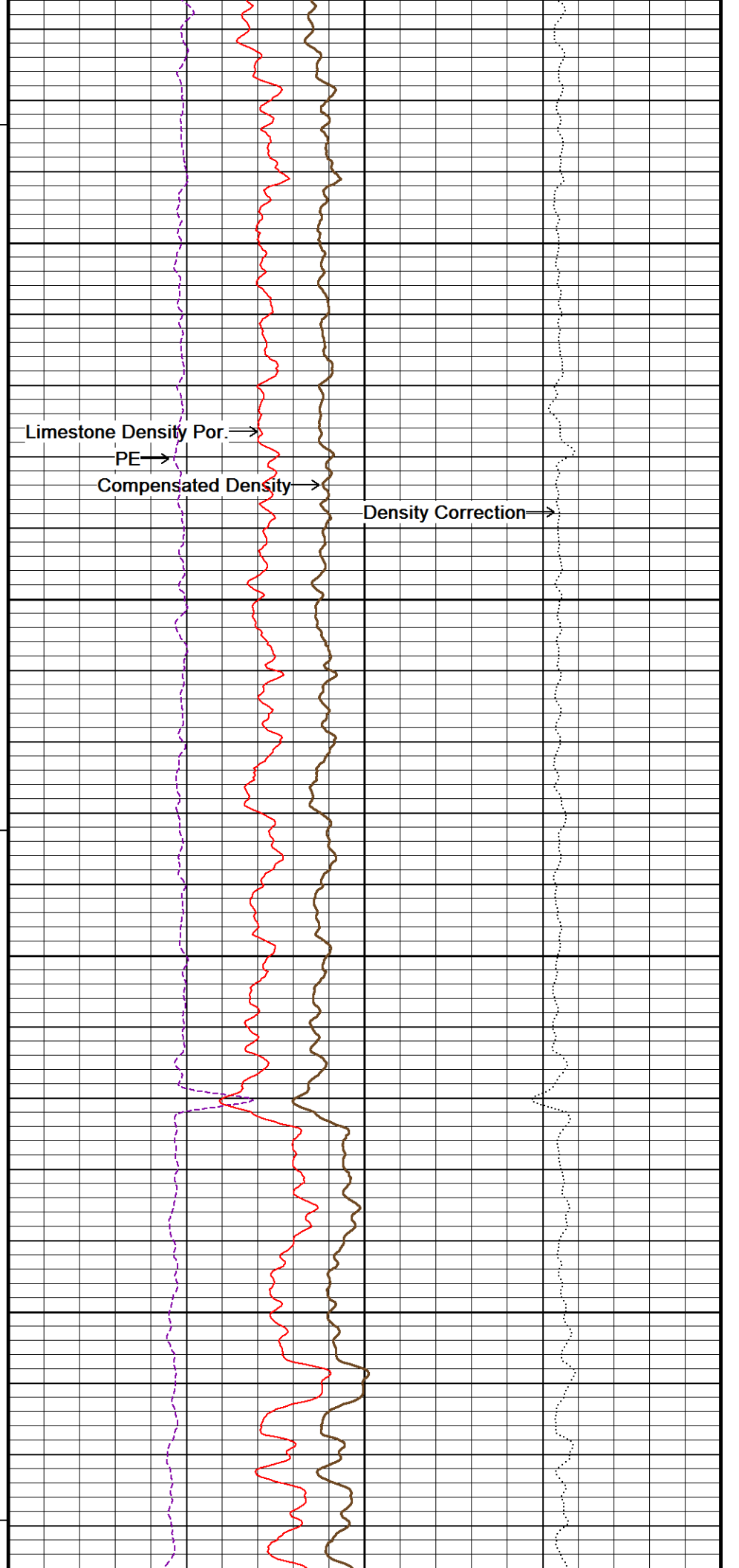
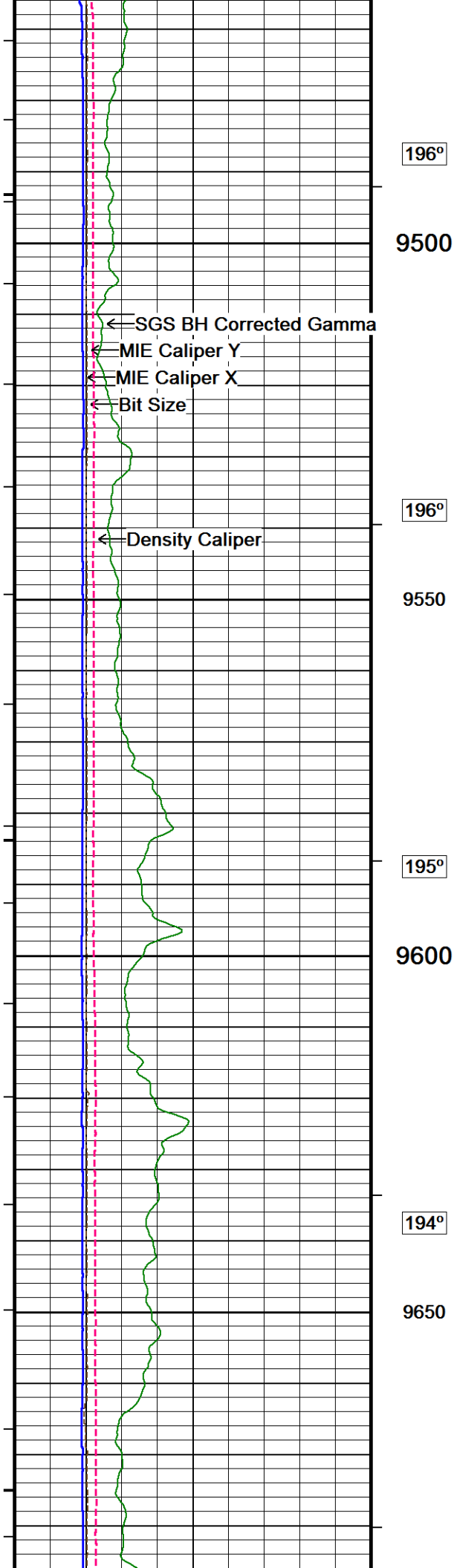


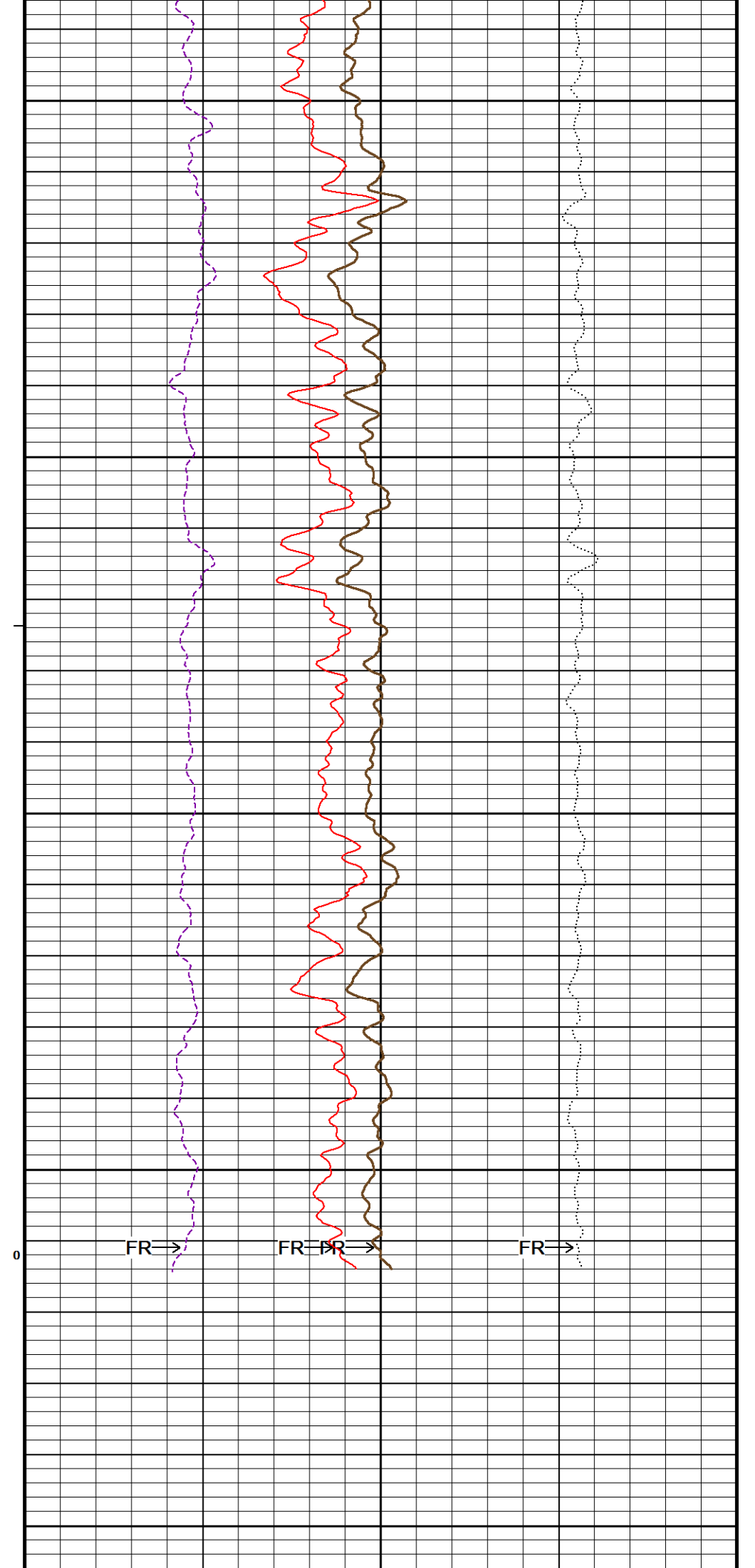
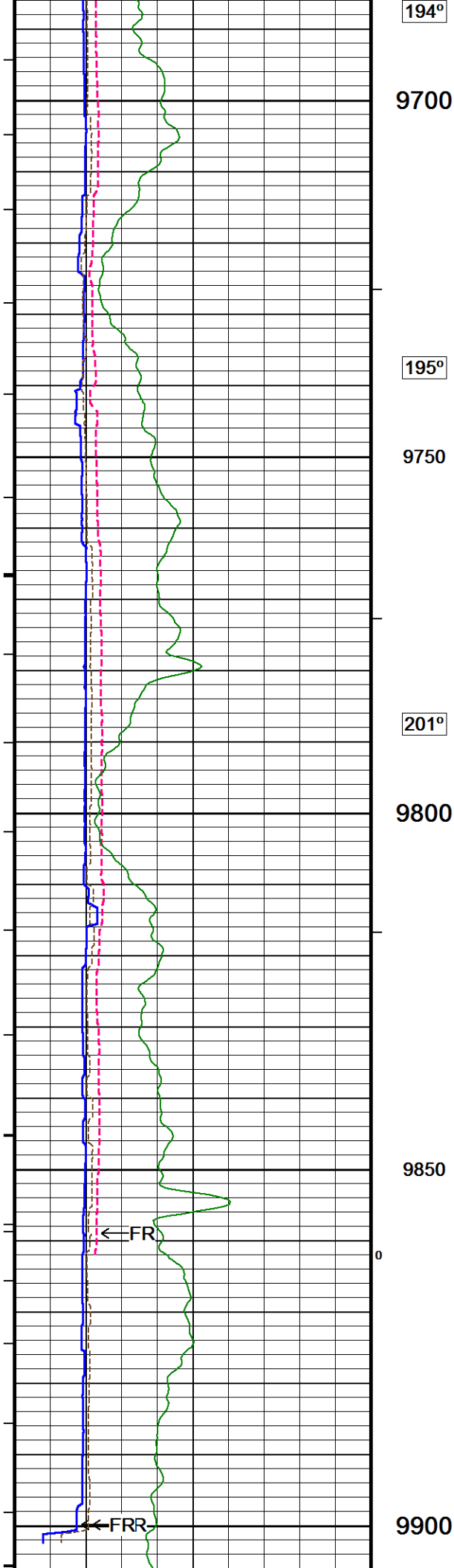












← FR

9950  
Depth  
in  
Feet

Timing Marks  
every 60.0 sec

Density Caliper  
inches

4 9 14

HVI  
every  
10 cu ft

Bit Size  
inches

4 9 14

Annular  
Integral  
every  
10 cu ft

MIE Caliper X  
inches

4 9 14

Borehole  
Temp in  
deg F

MIE Caliper Y  
inches

4 9 14

SGS BH Corrected Gamma

0 150 300  
300 450 600

Replay  
Scale  
1:240

Compensated Density

grams/cc

2 2.25 2.50 2.75 3  
1 1.25 1.50 1.75 2

Limestone Density Por.

percent

30 20 10 0 -10

PE

barns/electron

Density Correction

grams/cc

0 5 10 -0.25 0 0.25

Depth Based Data - Maximum Sampling Increment 10.0cm

Filename: C:\LOGS\WHITING\Horsetail 02D-0204\MMS Depth.dta

Plotted on 14-OCT-2014 22:42

Recorded on 14-OCT-2014 18:53

System Versions: Logged with 14.01.3220 Processed with 14.01.3220 Plotted with 14.01.3220



5 INCH MAIN LOG



## BEFORE SURVEY CALIBRATION

C:\LOGS\WHITING\Horsetail 02D-0204\MMS Depth.dta

General Constants All 000

Last Edited on 14-OCT-2014,17:48

### General Parameters

Mud Resistivity 1.370 ohm-metres  
Mud Resistivity Temperature 78.200 degrees F  
Water Level 0.000 feet

## Hole/Annular Volume and Differential Caliper Parameters

|                                  |                 |        |
|----------------------------------|-----------------|--------|
| HVOL Method                      | Single Caliper  |        |
| HVOL Caliper 1                   | Density Caliper |        |
| HVOL Caliper 2                   | N/A             |        |
| Annular Volume Diameter          | 4.500           | inches |
| Caliper for Differential Caliper | Density Caliper |        |

## Rwa Parameters

|                     |                        |  |
|---------------------|------------------------|--|
| Porosity used       | Base Density Porosity  |  |
| Resistivity used    | Array Ind. Four Res Rt |  |
| RWA Constant A      | 0.610                  |  |
| RWA Constant M      | 2.150                  |  |
| SW/APOR Tool Source | 0.000                  |  |

## Strain Gauge Constants MMS-F.A 246

Last Edited on

|                                      |       |              |       |       |       |       |       |           |
|--------------------------------------|-------|--------------|-------|-------|-------|-------|-------|-----------|
| Atmospheric Pressure                 |       | 14.70        |       | psi   |       |       |       |           |
| Serial Number                        |       | 0            |       |       |       |       |       |           |
| Calibration Date                     |       | 000000000000 |       |       |       |       |       |           |
| Base Check Date                      |       |              |       |       |       |       |       |           |
| Dead Weight Serial Number            |       | 0            |       |       |       |       |       |           |
| Dead Weight Gravitational Correction |       | 1.0          |       |       |       |       |       |           |
| Temperature                          | 75.0  | 150.0        |       | 250.0 |       | 350.0 |       | degrees F |
| Pressure psia                        | Inc.  | Dec.         | Inc.  | Dec.  | Inc.  | Dec.  | Inc.  | Dec.      |
| 0.0                                  | 0.000 | 0.000        | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000     |
| 2000.0                               | 0.000 | 0.000        | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000     |
| 4000.0                               | 0.000 | 0.000        | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000     |
| 6000.0                               | 0.000 | 0.000        | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000     |
| 8000.0                               | 0.000 | 0.000        | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000     |
| 10000.0                              | 0.000 |              | 0.000 |       | 0.000 |       | 0.000 |           |

## Gamma Calibration MGS-D.A 220

Field Calibration on 13-OCT-2014 18:03

|                    |          |                  |
|--------------------|----------|------------------|
|                    | Measured | Calibrated (API) |
| Background         | 142      | 101              |
| Calibrator (Gross) | 991      | 703              |
| Calibrator (Net)   | 848      | 602              |

## Gamma Constants MGS-D.A 220

Last Edited on 13-OCT-2014,17:45

|                               |                 |       |
|-------------------------------|-----------------|-------|
| Gamma Calibrator Number       | GRC-224         |       |
| Mud Density                   | 1.09            | gm/cc |
| Caliper Source for Processing | Density Caliper |       |
| Tool Position                 | Eccentred       |       |
| Concentration of KCl          |                 | kppm  |
| K Mud Type                    | Chloride        |       |
| K Mud Concentration           | 0.09            | %     |

## SP Calibration MGS-D.A 220

Field Calibration on 13-OCT-2014,17:44

|             |          |                 |
|-------------|----------|-----------------|
|             | Measured | Calibrated (mV) |
| Reference 1 | 100.0    | 101.0           |
| Reference 2 | -100.0   | -101.0          |

## High Resolution Temperature Calibration MGS-D.A 220

Field Calibration on 13-OCT-2014,17:44

|       |          |                   |
|-------|----------|-------------------|
|       | Measured | Calibrated(Deg F) |
| Lower | 20.00    | 21.00             |
| Upper | 200.00   | 201.00            |

## High Resolution Temperature Constants MGS-D.A 220

Last Edited on 13-OCT-2014,17:44

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

## Neutron Calibration MDN-B.J 372

Base Calibration on 01-OCT-2014 13:06

Field Check on 13-OCT-2014 17:44

## Base Calibration

| Base Calibration |                  |
|------------------|------------------|
|                  | Measured         |
|                  | Near             |
|                  | 2881             |
|                  | Far              |
|                  | 87               |
| Ratio            | 33.018           |
|                  | Calibrated (cps) |
|                  | Near             |
|                  | 3714             |
|                  | Far              |
|                  | 110              |
|                  | 33.764           |

|                          |                    |
|--------------------------|--------------------|
| Field Calibrator at Base | Calibrated (cps)   |
| Ratio                    | 2377 3500<br>0.679 |
| Field Check              | Calibrated (cps)   |
| Ratio                    | 2392 3557<br>0.672 |

|                                 |                 |           |                                  |
|---------------------------------|-----------------|-----------|----------------------------------|
| Neutron Constants MDN-B.J 372   |                 |           | Last Edited on 13-OCT-2014,17:40 |
| Neutron Source Id               | P44385B         |           |                                  |
| Neutron Jig Number              | NJ5236          |           |                                  |
| 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       | None            |           |                                  |
| Formation Pressure              | N/A             | kpsi      |                                  |
| Temperature Source              | None            |           |                                  |
| Temperature                     | N/A             | 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     |           |                                  |

|  |                  |                 |                 |  |
|--|------------------|-----------------|-----------------|--|
| Accelerometer Parameters MIE-A.J 241   |                  |                 |                 |  |
| Date Of Last Accelerometer Calibration | 8-APR-2012,12:35 |                 |                 |  |
|  | X Accelerometer  | Y Accelerometer | Z Accelerometer |  |
| Slope                                  | -1.108980        | -1.107773       | -1.091611       |  |
| Offset                                 | -0.003545        | 0.008582        | -0.004936       |  |

|  |              |               |                                  |              |
|--|--------------|---------------|----------------------------------|--------------|
| Accelerometer Constants MIE-A.J 241        |              |               | Last Edited on 24-SEP-2014,15:24 |              |
| Accelerometer Calibrator Number            |              | 000           |                                  |              |
| Accelerometer Temperature Characterisation |              |               |                                  |              |
| X Accelerometer                            |              |               |                                  |              |
| Serial Number                              | 922          |               |                                  |              |
| Calibration Date                           | 14-Nov-2010  |               |                                  |              |
|  | B0           | B1            | B2                               | B3           |
| Bias(g)                                    | 0.00000e+000 | 1.98626e-005  | -2.34772e-009                    | 1.61466e-010 |
|  | SF0          | SF1           | SF2                              | SF3          |
| Scale Factor(mA/g)                         | 3.00000e+000 | 2.59314e-004  | 4.64734e-007                     | 5.67183e-010 |
| Y Accelerometer                            |              |               |                                  |              |
| Serial Number                              | 970          |               |                                  |              |
| Calibration Date                           | 19-Jan-2011  |               |                                  |              |
|  | B0           | B1            | B2                               | B3           |
| Bias(g)                                    | 0.00000e+000 | -4.23329e-006 | -2.08894e-008                    | 1.84400e-010 |
|  | SF0          | SF1           | SF2                              | SF3          |
| Scale Factor(mA/g)                         | 3.00000e+000 | 2.61643e-004  | 3.45088e-007                     | 8.15526e-010 |
| Z Accelerometer                            |              |               |                                  |              |
| Serial Number                              | 1076         |               |                                  |              |
| Calibration Date                           | 05-May-2011  |               |                                  |              |
|  | B0           | B1            | B2                               | B3           |
| Bias(g)                                    | 0.00000e+000 | -5.18602e-006 | 1.72429e-008                     | 7.30746e-011 |
|  | SF0          | SF1           | SF2                              | SF3          |
| Scale Factor(mA/g)                         | 3.00000e+000 | 2.93462e-004  | 2.41183e-007                     | 1.26400e-009 |

|                                       |                  |                |                |  |
|---------------------------------------|------------------|----------------|----------------|--|
| Magnetometer Parameters MIE-A.J 241   |                  |                |                |  |
| Date Of Last Magnetometer Calibration | 9-AUG-2014,14:48 |                |                |  |
|                                       | X Magnetometer   | Y Magnetometer | Z Magnetometer |  |
| Slope                                 | -1.000000        | -1.010059      | -0.993063      |  |
| Offset                                | 0.000064         | -0.018611      | 0.005101       |  |

Magnetometer Calibrator Number 000

## Caliper Calibration MIE-A.J 241

Base Calibration on 24-SEP-2014 15:35

Field Calibration on 24-SEP-2014 15:36

## Base Calibration

| Reading No | Pads 1-5 Meas. | Pads 3-7 Meas. | Calibrator Size (in) |
|------------|----------------|----------------|----------------------|
| 1          | 25791          | 29402          | 5.97                 |
| 2          | 35739          | 39625          | 7.96                 |
| 3          | 45187          | 49544          | 9.86                 |
| 4          | 56655          | 60899          | 11.92                |
| 5          | 0              | 0              | 0.00                 |

| Reading No | Pad 2 Meas. | Pad 4 Meas. | Pad 6 Meas. | Pad 8 Meas. | Calibrator Size (in) |
|------------|-------------|-------------|-------------|-------------|----------------------|
| 1          | 25282       | 25027       | 24801       | 25969       | 5.97                 |
| 2          | 34223       | 33459       | 33093       | 34195       | 7.96                 |
| 3          | 42933       | 41405       | 40947       | 42789       | 9.86                 |
| 4          | 53039       | 50642       | 50663       | 53201       | 11.92                |
| 5          | 0           | 0           | 0           | 0           | 0.00                 |

## Field Calibration

| Measured<br>Pads 1-5 Caliper(in) | Measured<br>Pads 3-7 Caliper(in) | Actual<br>Caliper(in) |
|----------------------------------|----------------------------------|-----------------------|
| 5.94                             | 6.00                             | 5.97                  |

| Measured<br>Pad 2 Caliper(in) | Measured<br>Pad 4 Caliper(in) | Measured<br>Pad 6 Caliper(in) | Measured<br>Pad 8 Caliper(in) | Actual<br>Caliper(in) |
|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-----------------------|
| 2.99                          | 2.98                          | 2.96                          | 2.97                          | 5.97                  |

## Caliper Constants MIE-A.J 241

Last Edited on 24-SEP-2014,15:26

Caliper Difference for BRKT 0.120 inches

## Navigation Constants MIE-A.J 241

Last Edited on 14-OCT-2014,17:29

Magnetic Declination 7.88 degrees East

## Imager Pad Check MIE-A.J 241

Field Check on

|       |                |       |                |
|-------|----------------|-------|----------------|
| Pad 1 | Pad Not Tested | Pad 5 | Pad Not Tested |
| Pad 2 | Pad Not Tested | Pad 6 | Pad Not Tested |
| Pad 3 | Pad Not Tested | Pad 7 | Pad Not Tested |
| Pad 4 | Pad Not Tested | Pad 8 | Pad Not Tested |

## Compact Micro Imager Constants MIE-A.J 241

Last Edited on 29-SEP-2014,05:04

|                                  |                        |
|----------------------------------|------------------------|
| Sonde Configuration              | Imager Mode            |
| Arm-Pad Kit                      | Normal Pads (12.25 in) |
| Arm-Pad Kit Serial Number        | N/A                    |
| Centre Pad 1 Rotational Offset   | 0.00 degrees           |
| Image/Borehole Ovality Reference | Azimuth of Pad 1       |
| Non Active Buttons               | Omit                   |
| Search Angle                     | 0.00 degrees           |
| Correlation Interval             | 3.28 feet              |
| Correlation Step                 | 1.64 feet              |
| Current Offset                   | 0.0000 mAmp            |
| Squasher Start                   | 0.0500 mAmp            |
| Image Processing                 | Enabled                |

## Induction Calibration MAI-B.A 289

Base Calibration on 09-OCT-2014,22:26

Field Check on 13-OCT-2014 17:31

## Base Calibration

| Test Loop Calibration<br>Channel | Measured |       | Calibrated (mmho/m) |       |
|----------------------------------|----------|-------|---------------------|-------|
|                                  | Low      | High  | Low                 | High  |
| 1                                | 16.7     | 472.3 | 9.3                 | 966.2 |
| 2                                | 5.8      | 381.9 | 7.6                 | 821.4 |
| 3                                | 3.2      | 261.2 | 5.2                 | 566.0 |
| 4                                | 1.9      | 138.0 | 2.6                 | 279.2 |

Array Temperature 76.1 Deg F

| Channel | Base Check (mmho/m) | Field Check (mmho/m) |
|---------|---------------------|----------------------|
|---------|---------------------|----------------------|

|                   |     |      |      |        |
|-------------------|-----|------|------|--------|
|                   | Low | High | Low  | High   |
| 1                 |     |      | 13.3 | 3834.5 |
| 2                 |     |      | 30.6 | 3519.7 |
| 3                 |     |      | 28.7 | 3019.5 |
| 4                 |     |      | 18.9 | 1996.6 |
| Deep              |     |      | 16.6 | 1912.5 |
| Medium            |     |      | 42.9 | 4037.7 |
| Shallow           |     |      | 47.0 | 5279.8 |
| Array Temperature |     |      | 61.2 | Deg F  |

|  |        |                          |                                  |            |
|--|--------|--------------------------|----------------------------------|------------|
| Induction Constants MAI-B.A 289                  |        |                          | Last Edited on 13-OCT-2014,20:17 |            |
| Induction Model                                  |        | RtAP-WBM                 |                                  |            |
| Caliper for Borehole Corr.                       |        | Density Caliper          |                                  |            |
| Hole Size for Borehole Correction                |        | N/A                      |                                  | inches     |
| Tool Centred                                     |        | No                       |                                  |            |
| Stand-off Type                                   |        | Pineapple                |                                  |            |
| Stand-off  |        | 0.49                     |                                  | inches     |
| Number of Fins on Stand-off                      |        | 5.0000                   |                                  |            |
| Stand-off Fin Angle                              |        | 72.00                    |                                  | degrees    |
| Stand-off Fin Width                              |        | 1.3878                   |                                  | inches     |
| Borehole Corr. Rm Source                         |        | Temperature Corr         |                                  |            |
| Temp. for Rm Corr.                               |        | MGS 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                      |            |
| 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.A 289 |          |                   | Field Calibration on 13-OCT-2014,17:32 |
|   | Measured | Calibrated(Deg F) |  |
| Lower   | 10.00    | 10.00             |  |
| Upper   | 100.00   | 101.00            |  |

|   |    |                                  |
|---|----|----------------------------------|
| High Resolution Temperature Constants MAI-B.A 289 |    | Last Edited on 13-OCT-2014,17:32 |
| Pre-filter Length                                 | 11 |                                  |

|                                       |        |          |   |       |
|---------------------------------------|--------|----------|---|-------|
| Photo Density Calibration MPD-C.J 378 |        |          | Base Calibration on 01-OCT-2014 11:53<br>Field Check on 13-OCT-2014 17:38 |       |
| Density Calibration                   |        |          |   |       |
| Base Calibration                      |        | Measured | Calibrated (sdu)  |       |
|                                       | Near   | Far      | Near  | Far   |
| Background                            | 1145   | 1223     |   |       |
| Reference 1                           | 56123  | 24901    | 59443   | 30683 |
| Reference 2                           | 22147  | 2322     | 25113   | 2508  |
| Field Check at Base                   |        |          |   |       |
|                                       | 1145.2 | 1222.9   |   |       |



## Field Check

1146.1 1229.0

## PE Calibration

## Base Calibration

## Measured

## Calibrated

WS

WH

Ratio

Ratio

Background

209

1030

Reference 1

24056

55936

0.434

0.372

Reference 2

6396

22017

0.295

0.268

## Field Check at Base

209.3

1029.7

## Field Check

210.5

1029.5

## Density Constants MPD-C.J 378

Last Edited on 13-OCT-2014,17:34

Density Source Id

P44264B

Nylon Calibrator Number

652

Aluminium Calibrator Number

659

Density Shoe Profile

4 inch

Caliper Source for Processing

Density Caliper

PE Correction to Density

Not Applied

Mud Density

1.09

gm/cc

Mud Density Z/A Multiplier

1.11

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

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

## Caliper Calibration MPD-C.J 378

Base Calibration on 14-OCT-2014 22:05

Field Calibration on 14-OCT-2014 22:06

## Base Calibration

Reading No

Measured

Calibrator Size (in)

1

13922

4.01

2

22072

5.97

3

30204

7.96

4

38079

9.86

5

47409

11.92

6

N/A

N/A

## Field Calibration

Measured Caliper (in)

Actual Caliper (in)

5.97

5.97

## Spectral Gamma Calibration SGS-E.J 128

Base Calibration on 25-SEP-2014 17:21

Field Calibration on 13-OCT-2014,17:33

## Base Calibration

Potassium Calibrator

Gate 1

Gate 2

Gate 3

Gate 4

Gate 5

Background

106.5

36.9

3.8

1.4

2.3

Calibrator (Gross)

234.7

121.4

29.0

1.5

2.4

Calibrator (Net)

128.2

84.5

25.2

0.1

0.1

Concentrations

K %

5.9

U ppm

0.0

Th ppm

0.0

Uranium Calibrator

Gate 1

Gate 2

Gate 3

Gate 4

Gate 5

|                    |                 |                |               |               |               |
|--------------------|-----------------|----------------|---------------|---------------|---------------|
| Background         | Gate 1<br>106.5 | Gate 2<br>36.9 | Gate 3<br>3.8 | Gate 4<br>1.4 | Gate 5<br>2.3 |
| Calibrator (Gross) | 561.8           | 196.8          | 17.3          | 11.1          | 5.9           |
| Calibrator (Net)   | 455.4           | 159.9          | 13.5          | 9.7           | 3.6           |

|                |     |       |        |
|----------------|-----|-------|--------|
|                | K % | U ppm | Th ppm |
| Concentrations | 0.0 | 16.6  | 0.0    |

#### Thorium Calibrator

|                    |        |        |        |        |        |
|--------------------|--------|--------|--------|--------|--------|
|                    | Gate 1 | Gate 2 | Gate 3 | Gate 4 | Gate 5 |
| Background         | 106.5  | 36.9   | 3.8    | 1.4    | 2.3    |
| Calibrator (Gross) | 424.1  | 156.4  | 12.6   | 6.6    | 17.3   |
| Calibrator (Net)   | 317.6  | 119.5  | 8.8    | 5.2    | 14.9   |

|                |     |       |        |
|----------------|-----|-------|--------|
|                | K % | U ppm | Th ppm |
| Concentrations | 0.0 | 0.0   | 44.7   |

#### Mixture Calibrator

|                    |        |        |        |        |        |
|--------------------|--------|--------|--------|--------|--------|
|                    | Gate 1 | Gate 2 | Gate 3 | Gate 4 | Gate 5 |
| Background         | 106.5  | 36.9   | 3.8    | 1.4    | 2.3    |
| Calibrator (Gross) | 906.0  | 369.5  | 48.4   | 14.6   | 19.8   |
| Calibrator (Net)   | 799.6  | 332.5  | 44.6   | 13.2   | 17.5   |

#### Field Calibration

##### Gamma Ray

|                    |          |                  |
|--------------------|----------|------------------|
|                    | Measured | Calibrated (API) |
| Background         | 157      | 31               |
| Calibrator (Gross) | 1356     | 271              |
| Calibrator (Net)   | 1199     | 240              |

#### Mixture Calibrator

|                    |        |        |        |        |        |
|--------------------|--------|--------|--------|--------|--------|
|                    | Gate 1 | Gate 2 | Gate 3 | Gate 4 | Gate 5 |
| Background         | 105.4  | 35.9   | 3.8    | 1.4    | 2.2    |
| Calibrator (Gross) | 900.9  | 365.2  | 48.3   | 14.3   | 19.5   |
| Calibrator (Net)   | 795.4  | 329.3  | 44.5   | 12.9   | 17.3   |

Spectral Gamma Constants SGS-E.J 128

Last Edited on 13-OCT-2014,17:33

|                               |                 |       |
|-------------------------------|-----------------|-------|
| Background Calibrator Number  | 440             |       |
| Mixture Calibrator Number     | 450             |       |
| Potassium Calibrator Number   | 500             |       |
| Uranium Calibrator Number     | 506             |       |
| Thorium Calibrator Number     | 503             |       |
| Mud Density                   | 1.09            | gm/cc |
| Caliper Source for Processing | Density Caliper |       |
| Tool Position                 | Eccentred       |       |
| Concentration of KCl          |                 | kppm  |
| K Mud Type                    | Chloride        |       |
| K Mud Concentration           | 0.09            | %     |

## DOWNHOLE EQUIPMENT

C:\LOGS\WHITING\Horsetail 02D-0204\MMS Depth.dta

Shuttle Running Tool 3.5"  
SRT-A.A 59 LG: 6.62 ft WT: 37.5 lb OD: 2.520 in

Compact Linker 400 EXT  
MLK-A 2 LG: 14.23 ft WT: 30.9 lb OD: 2.240 in

Compact Linker 200 STD  
MLK-A 1 LG: 8.52 ft WT: 30.9 lb OD: 2.240 in

SHA-J.A Compact Swivel Head Adaptor  
SHA-J.A 397 LG: 2.30 ft WT: 22.0 lb OD: 2.244 in

SKJ-E.B Compact Knuckle Joint  
SKJ-E.B 694 LG: 2.17 ft WT: 24.3 lb OD: 2.244 in



MIS-E.B Compact Inline Standoff sub  
MIS-E.B 695 LG: 2.14 ft WT: 15.4 lb OD: 2.244 in

MBS-F.A 200v Compact Battery Sub  
MBS-F.A 123 LG: 17.06 ft WT: 123.5 lb OD: 2.240 in

Compact Memory Sub F.A  
MMS-F.A 246 LG: 5.20 ft WT: 37.5 lb OD: 2.244 in

Compact Tool Isolator sub.  
MTI-C.A 146 LG: 1.54 ft WT: 13.2 lb OD: 2.244 in

Compact Short Gamma  
MGS-D.A 220 LG: 3.41 ft WT: 24.3 lb OD: 2.244 in

Compact Collar Locator  
MCL-C.A 129 LG: 3.17 ft WT: 26.5 lb OD: 2.244 in

SKJ-E.B Compact Knuckle Joint  
SKJ-E.B 610 LG: 2.17 ft WT: 24.3 lb OD: 2.244 in

SHA-J.A Compact Swivel Head Adaptor  
SHA-J.A 314 LG: 2.30 ft WT: 22.0 lb OD: 2.244 in

MIS-D.B Compact Inline Bowspring sub  
MIS-D.B 695 LG: 5.70 ft WT: 33.1 lb OD: 2.240 in

Compact Neutron  
MDN-B.J 372 LG: 5.04 ft WT: 50.7 lb OD: 2.244 in

Compact Density/Caliper  
MPD-C.J 378 LG: 9.59 ft WT: 90.4 lb OD: 2.244 in

MIS-D.B Compact Inline Bowspring sub  
MIS-D.B 734 LG: 5.70 ft WT: 33.1 lb OD: 2.240 in

SHA-J.B Compact Swivel Head Adaptor  
SHA-J.B 682 LG: 2.30 ft WT: 22.0 lb OD: 2.244 in

SKJ-E.B Compact Knuckle Joint  
SKJ-E.B 537 LG: 2.17 ft WT: 24.3 lb OD: 2.244 in

MIS-E.A Compact Inline Standoff sub  
MIS-E.A 363 LG: 2.14 ft WT: 15.4 lb OD: 2.244 in

SKJ-E.A Compact Knuckle Joint  
SKJ-E.A 410 LG: 2.17 ft WT: 24.3 lb OD: 2.244 in

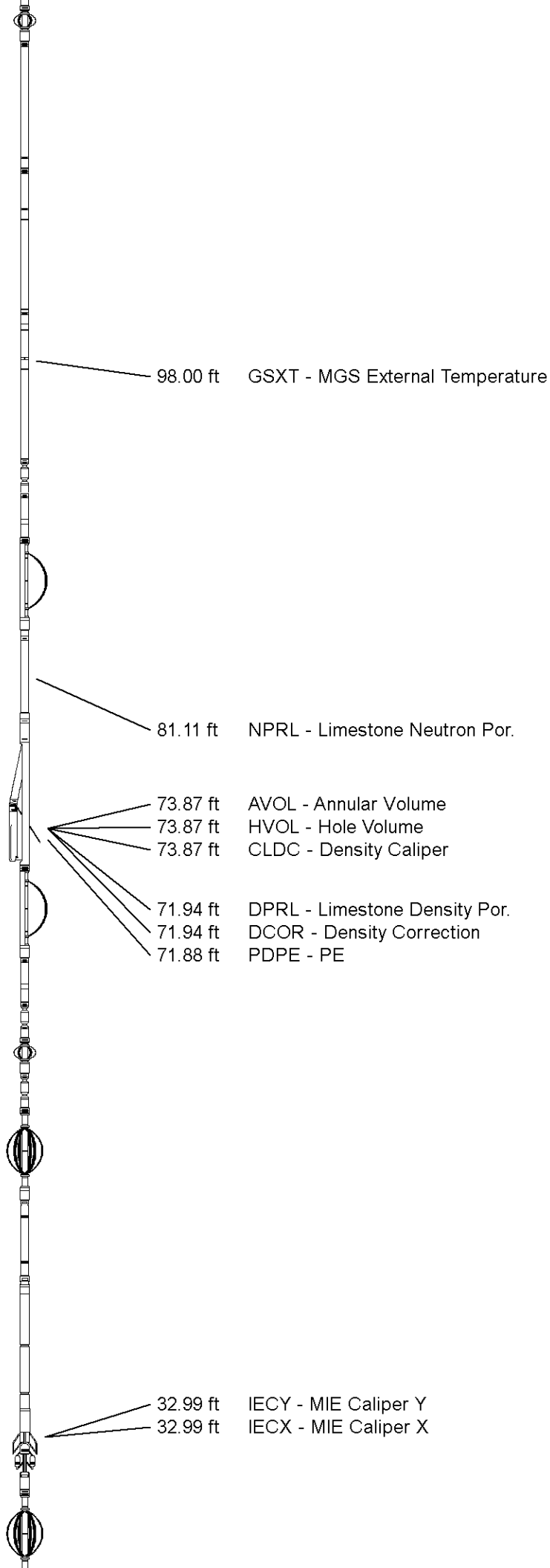
MIS-D.B Compact Inline Bowspring sub  
MIS-D.B 698 LG: 5.70 ft WT: 33.1 lb OD: 2.240 in

Compact MMI Memory Section  
MIM-A.J 244 LG: 4.65 ft WT: 26.5 lb OD: 2.244 in

Compact MMI Electrode Section  
MIE-A.J 241 LG: 13.96 ft WT: 99.2 lb OD: 4.094 in

MIS-D.B Compact Inline Bowspring sub  
MIS-D.B 810 LG: 5.70 ft WT: 33.1 lb OD: 2.240 in

SKJ-E.A Compact Knuckle Joint  
SKJ-E.A 203 LG: 2.17 ft WT: 24.3 lb OD: 2.244 in



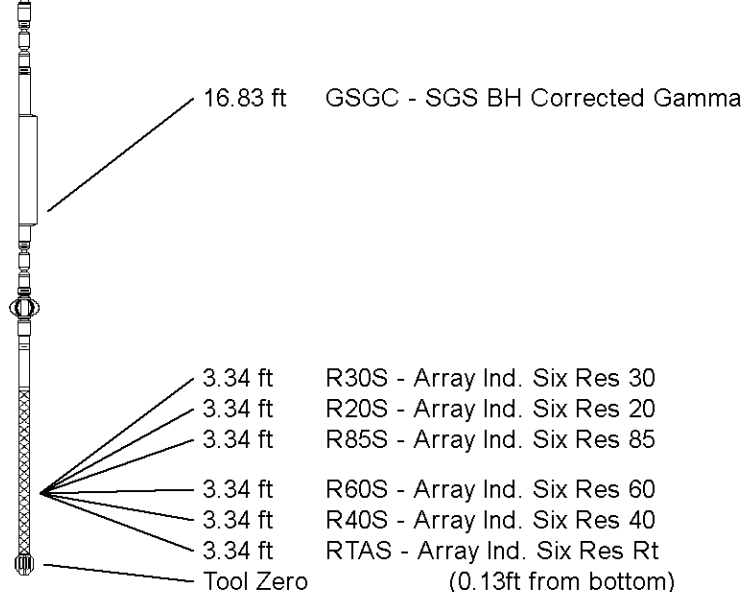
Spectral Gamma Ray Sub  
SGS-E.J 128 LG: 7.78 ft WT: 105.8 lb OD: 3.543 in

SKJ-E.A Compact Knuckle Joint  
SKJ-E.A 245 LG: 2.17 ft WT: 24.3 lb OD: 2.244 in

MIS-E.B Compact Inline Standoff sub  
MIS-E.B 662 LG: 2.14 ft WT: 15.4 lb OD: 2.244 in

Compact Induction  
MAI-B.A 289 LG: 10.81 ft WT: 48.5 lb OD: 2.244 in

Total Length: 160.68 ft Weight: 1135.4 lb



|                 |                                 |
|-----------------|---------------------------------|
| COMPANY         | WHITING OIL AND GAS CORPORATION |
| WELL            | HORSETAIL 02D-0204              |
| FIELD           | REDTAIL                         |
| PROVINCE/COUNTY | WELD                            |
| COUNTRY/STATE   | U.S.A. / COLORADO               |

|                         |         |      |               |         |      |
|-------------------------|---------|------|---------------|---------|------|
| Elevation Kelly Bushing | 4795.00 | feet | First Reading | 9859.00 | feet |
| Elevation Drill Floor   | 4795.00 | feet | Depth Driller | 9948.00 | feet |
| Elevation Ground Level  | 4778.00 | feet | Depth Logger  | 9948.00 | feet |



**Weatherford®**

MEASURED DEPTH  
COMPENSATED PHOTO DENSITY  
COMPENSATED DUAL NEUTRON