HALLIBURTON | Sperry Drilling

# Natural Gamma Ray
# Rate Of Penetration

**1 : 240**

| | |
|---|---|
| County | : **Harper** |
| Field | : **Wildcat** |
| Location | : **Lat: 37° 10' 2.82" North**<br>**Long: 98° 3' 21.10" West** |
| Well | : **Lockwood Farms 3307 14-1H** |
| Company | : **Shell Exploration Production Co** |
| Rig | : **Nabors 102** |

LOCATION

Company : **Shell Exploration Production Co**
Rig : **Nabors 102**
Well : **Lockwood Farms 3307 14-1H**
Field : **Wildcat**
County : **Harper**
API Number : **15-077-21772**

Latitude : **37° 10' 2.82" North**
Longitude : **98° 3' 21.10" West**
UTM Easting = **2,129,423.39 ft**
UTM Northing = **182,652.64 ft**

Other Services
**Directional**

Elev. KB **N/A**
DF **1382.10 ft**
GL **1350.40 ft**
WD **N/A**

Permanent Datum : **Ground Level** Elevation : **1350.40 ft**
Log Measured From : **Drill Floor** **31.70 ft** Above Permanent Datum
Drilling Measured From : **Drill Floor**

MD LOG

Depth Logged : **90.00 ft** To **9,450.00 ft**
Date Logged : **01-Feb-12** To **20-Mar-12**
Total Depth MD : **9,450.00 ft** TVD : **4,725.55 ft**
Spud Date : **01-Feb-12**

Unit No. : **PP46**
Plot Type : **Final**
Plot Date : **11-Apr-12**

Job No. :**OK-XX-0009199477**

Borehole Record (MD)

| Run No. | Size | From | To |
|---|---|---|---|
| 1 | 12.250 in | 90.00 ft | 721.00 ft |
| 2 | 8.750 in | 721.00 ft | 4,364.00 ft |
| 3 | 8.750 in | 4,364.00 ft | 5,250.00 ft |
| 4 | 6.125 in | 5,250.00 ft | 6,893.00 ft |
| 5 | 6.125 in | 6,893.00 ft | 9,450.00 ft |

Casing Record (MD)

| Run No. | Size | Weight | From | To |
|---|---|---|---|---|
| | 9.625 in | 36.00 lbpf | 90.00 ft | 721.00 ft |
| | 9.625 in | 36.00 lbpf | 721.00 ft | 5,238.00 ft |

Borehole Record (MD)

| Run No. | Size | From | To |
|---|---|---|---|

## WELL INFORMATION

| | | | | | |
|---|---|---|---|---|---|
| **MWD Run Number** | 200 | 300 | 400 | 500 | |
| **Date run completed** | 09-Mar-12 | 12-Mar-12 | 17-Mar-12 | 20-Mar-12 | |
| **Rig Bit Number** | 2 | 3 | 4 | 5 | |
| **Bit Size (in)** | 8.750 | 8.750 | 6.125 | 6.125 | |
| **Tool Nominal OD (in)** | 6.750 | 6.750 | 4.750 | 4.750 | |
| **Log Start Depth (MD, ft)** | 721.00 | 4,364.00 | 5,250.00 | 6,893.00 | |
| **Log End Depth (MD, ft)** | 4,364.00 | 5,250.00 | 6,893.00 | 9,450.00 | |
| **Drill or Wipe** | Drill | Drill | Drill | Drill | |
| **Drill/Wipe Start Date and Time** | 06-Mar-12 17:30 | 10-Mar-12 06:00 | 15-Mar-12 23:00 | 18-Mar-12 03:20 | |
| **Drill/Wipe End Date and Time** | 09-Mar-12 15:00 | 11-Mar-12 19:30 | 17-Mar-12 14:00 | 20-Mar-12 10:30 | |
| **Min Inc (deg) @ Depth (MD, ft)** | .03 @ 3,588.00 | 46.70 @ 4,390.00 | 86.79 @ 6,432.00 | 86.02 @ 7,392.00 | |
| **Max Inc (deg) @ Depth (MD, ft)** | 38.54 @ 4,302.00 | 90.49 @ 5,193.00 | 91.11 @ 6,815.00 | 88.28 @ 6,911.00 | |
| **Bit TFA(in2) / Bit Type** | .56 / PDC | .46 / PDC | .38 / PDC | 0 / PDC | |
| **Flow Rate (gpm)** | 500.00 | 550.00 | 250.00 | 250.00 | |
| **Max AV (fpm) / CV (fpm) @ MWD** | 35.0 / 57.0 | 59.0 / 120.0 | 123.0 / 132.0 | 90.0 / 220.0 | |
| **Fluid Type** | Fresh Water Gel | Fresh Water Gel | Fresh Water Gel | Fresh Water Gel | |
| **Density (ppg) / Viscosity (spqt)** | 8.85 / 32.00 | 9.10 / 47.00 | 8.60 / 32.00 | 8.50 / 52.00 | |
| **Filtrate CL (ppm)** | 600.00 | 1,300.00 | 600.00 | 440.00 | |
| **pH / Fluid Loss (mptm)** | 8.50 / 1 | 10.00 / 68 | 8.60 / 1 | 8.50 / 1 | |
| **PV (cP) / YP (lhf2)** | 3 / 1.00 | 16 / 15.00 | 3 / 1.00 | 6 / 6.00 | |
| **% Solids / % Sand** | 1.20 / 0.50 | 4.80 / 0.50 | 1.20 / 0.50 | 1.20 / 0.50 | |
| **% Oil / Oil:Water Ratio** | N/A / N/A | N/A / N/A | N/A / N/A | N/A / N/A | |
| **Rm @ Measured Temp (degF)** | N/A @ N/A | N/A @ N/A | N/A @ N/A | N/A @ N/A | |
| **Rmf @ Measured Temp (degF)** | N/A @ N/A | N/A @ N/A | N/A @ N/A | N/A @ N/A | |
| **Rmc @ Measured Temp (degF)** | N/A @ N/A | N/A @ N/A | N/A @ N/A | N/A @ N/A | |
| **Max Tool Temp (degF) / Source** | 107.00 / PCM | 150.00 / PCM | 137.50 / PCM | 139.96 / PCM | |
| **Rm @ Max Tool Temp (degF)** | N/A @ N/A | N/A @ N/A | N/A @ N/A | N/A @ N/A | |
| **Lead MWD Engineer** | RJ Pike | RJ Pike | RJ Pike | RJ Pike | |
| **Customer Representative** | Josh Kirk | Josh Kirk | Josh Kirk | Josh Kirk | |

# SENSOR INFORMATION

## Directional Sensor Information

| | | | | | |
|---|---|---|---|---|---|
| **Tool Type** | PCDC | PCDC | PCDC | PCDC | |
| **Distance From Bit (ft)** | 57.96 | 51.26 | 59.17 | 59.17 | |
| **Software Version** | 6.21 | 6.21 | 6.21 | 6.21 | |
| **Sub Serial Number** | 11254964 | 11254964 | 11595279 | 11595279 | |
| **Sonde Serial Number** | 400830 | 11638596 | 400880 | 400880 | |
| **Sensor ID Number** | N/A | N/A | N/A | N/A | |
| **Toolface Offset (deg)** | 277.45 | 192.28 | 234.94 | 144.89 | |

## Gamma Ray Sensor Information

| | | | | | |
|---|---|---|---|---|---|
| **Tool Type** | PCG | PCG | PCG | PCG | |
| **Distance From Bit (ft)** | 63.46 | 57.48 | 52.95 | 52.95 | |
| **Recorded Sample Period (sec)** | 25 | 25 | 25 | 25 | |
| **Software Version** | 8.15 | 8.15 | 8.15 | 8.15 | |
| **Sub Serial Number** | 11254964 | 11254964 | 11595279 | 11595279 | |
| **Insert/Sonde Serial Number** | 11293350 | 11293350 | 11680935 | 11680935 | |

## REMARKS

1. **All depths are calibrated to the driller's pipe tally and are measured from the rotary table.**

2. **No depth corrections have been made for pipe stretch or compression.**

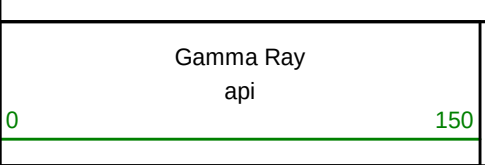
3. **All data presented is recorded (memory data) unless otherwise stated.**

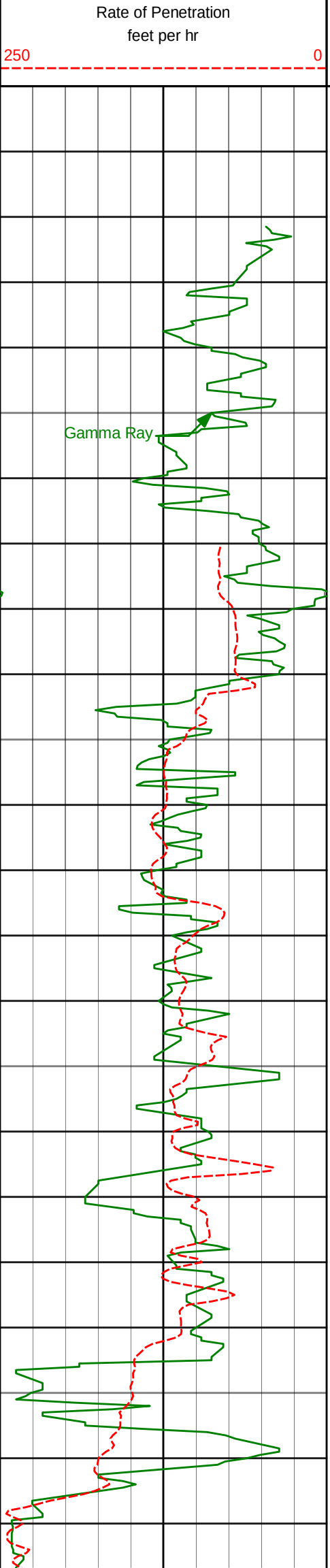
4. **The following smoothing parameters have been applied to the data:**

   **ROP: 1.0 ft interval, 3.0 ft coercion distance.**
   **GAMMA: 0.5 ft interval, 0.6 ft coercion distance.**

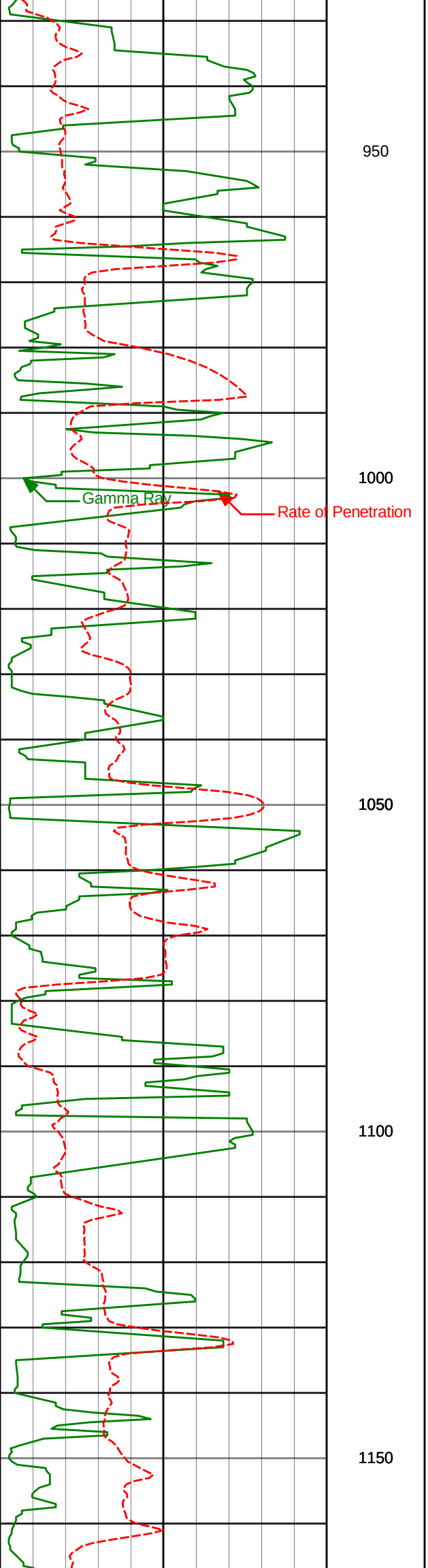
## WARRANTY



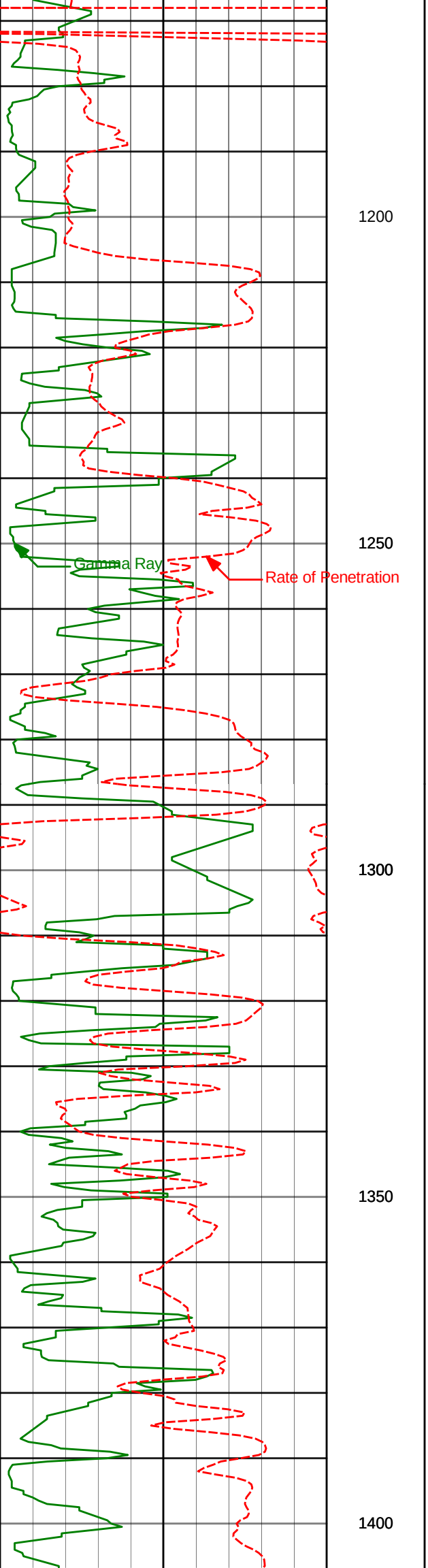




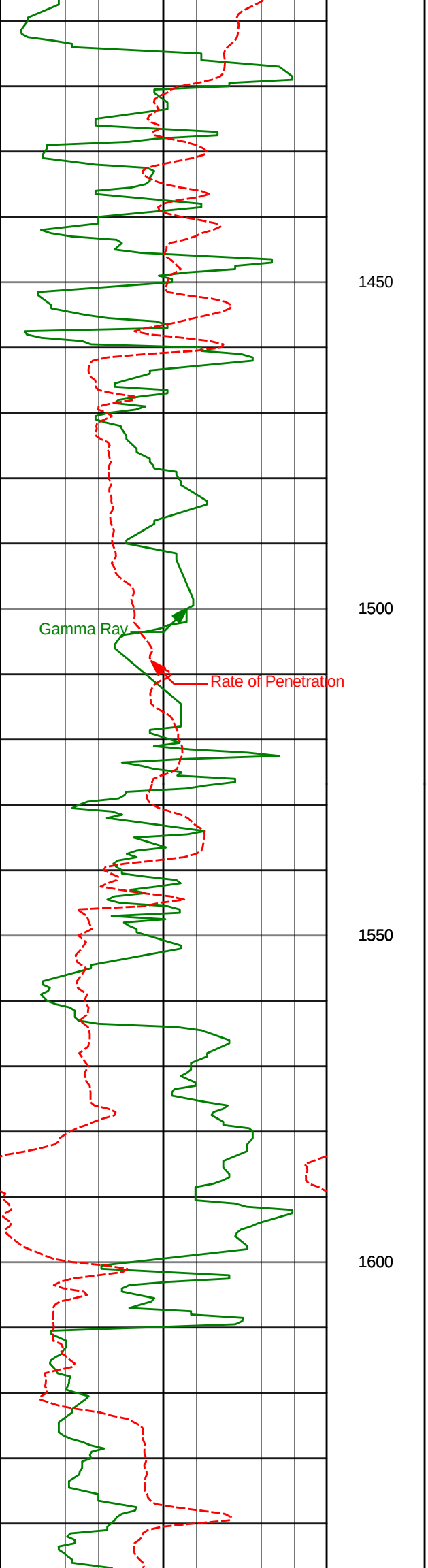

| MD ft 1 : 240 | Surveys Depth | Surveys Inclination | Surveys Azimuth | Surveys TVD | Surveys Vertical Sec | Surveys Dogleg Sev |
|---|---|---|---|---|---|---|
| Run 200 | | | | | | |
| 9 5/8" Casing @ 721 ft | | | | | | |
| 750 | | | | | | |
| | 761 | 0.20 | 301.16 | 760.99 | 0.89 | 0.21 |
| 800 | | | | | | |
| 850 | | | | | | |
| 900 | | | | | | |
| | 915 | 0.23 | 85.38 | 914.99 | 0.73 | 0.27 |



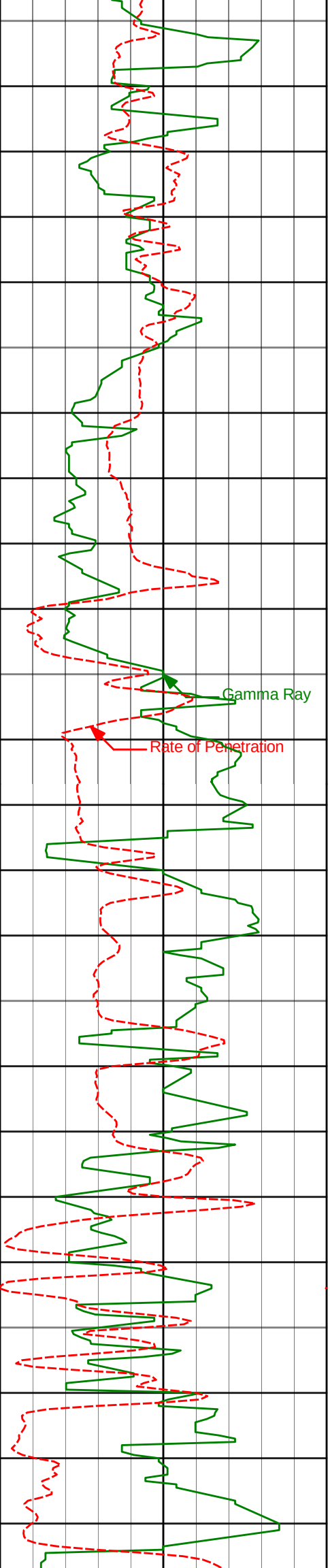

| | | | | | |
|---|---|---|---|---|---|
| 1098 | 0.40 | 42.96 | 1097.98 | 0.23 | 0.15 |



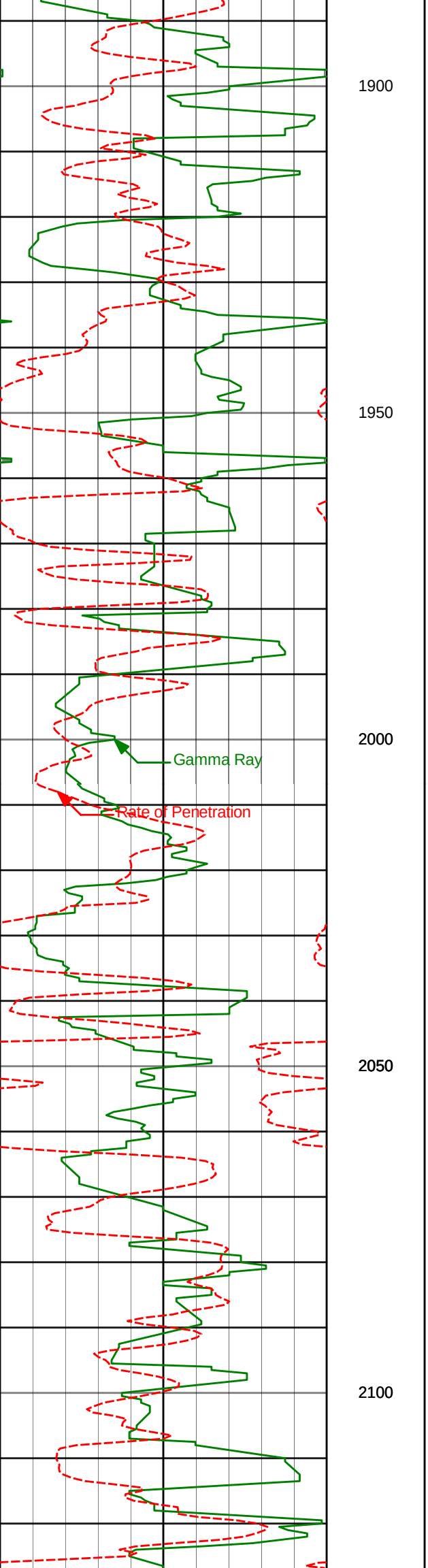

| | | | | | |
|---|---|---|---|---|---|
| 1289 | 0.19 | 262.03 | 1288.98 | -0.21 | 0.29 |



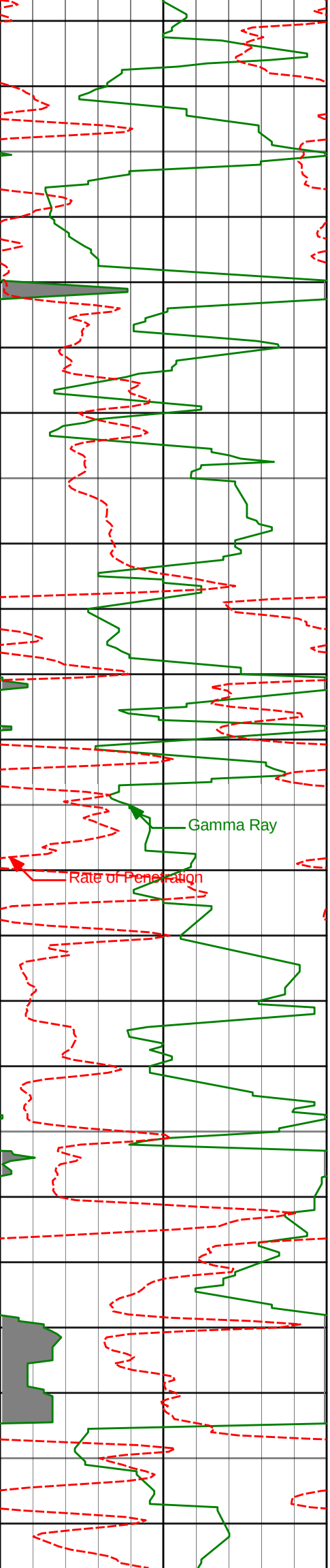

| | | | | | |
|---|---|---|---|---|---|
| 1481 | 0.09 | 63.97 | 1480.98 | -0.24 | 0.14 |



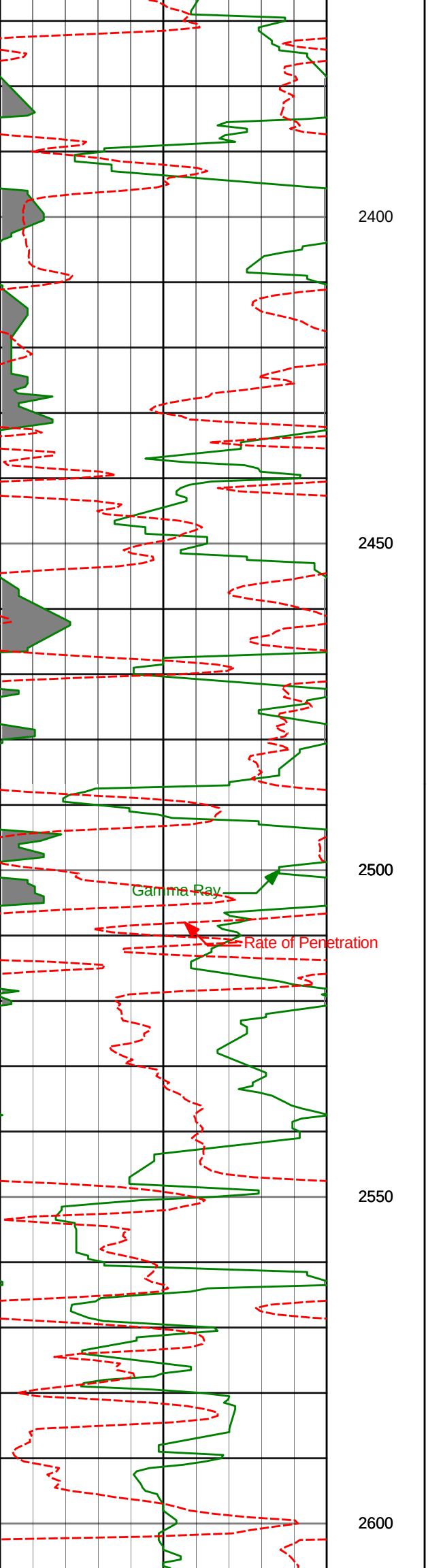

| | | | | | | |
|---|---|---|---|---|---|---|
| 1650 | | | | | | |
| | 1673 | 0.44 | 83.55 | 1672.98 | -0.38 | 0.19 |
| 1700 | | | | | | |
| 1750 | | | | | | |
| 1800 | | | | | | |
| 1850 | | | | | | |
| | 1865 | 0.57 | 142.75 | 1864.97 | 0.30 | 0.27 |



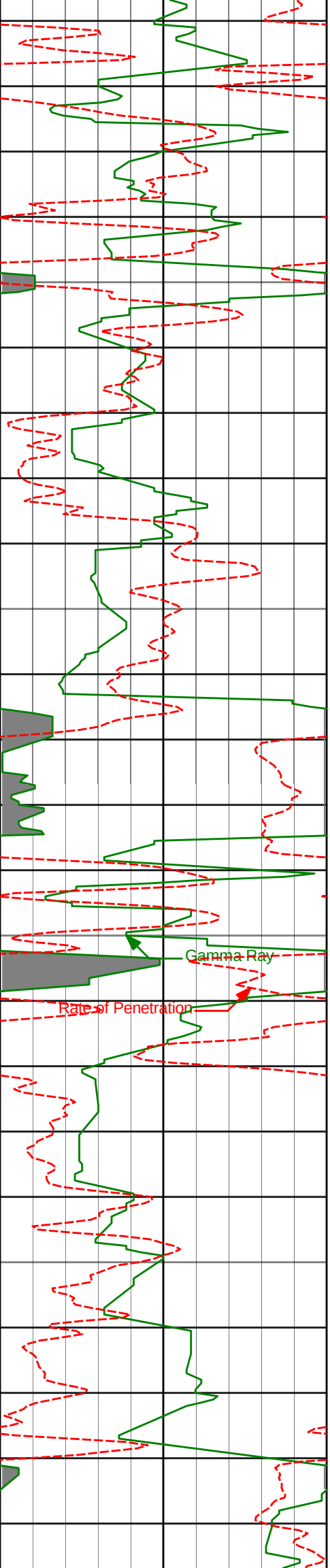

| | | | | | |
|---|---|---|---|---|---|
| 2057 | 0.53 | 158.06 | 2056.96 | 1.88 | 0.08 |



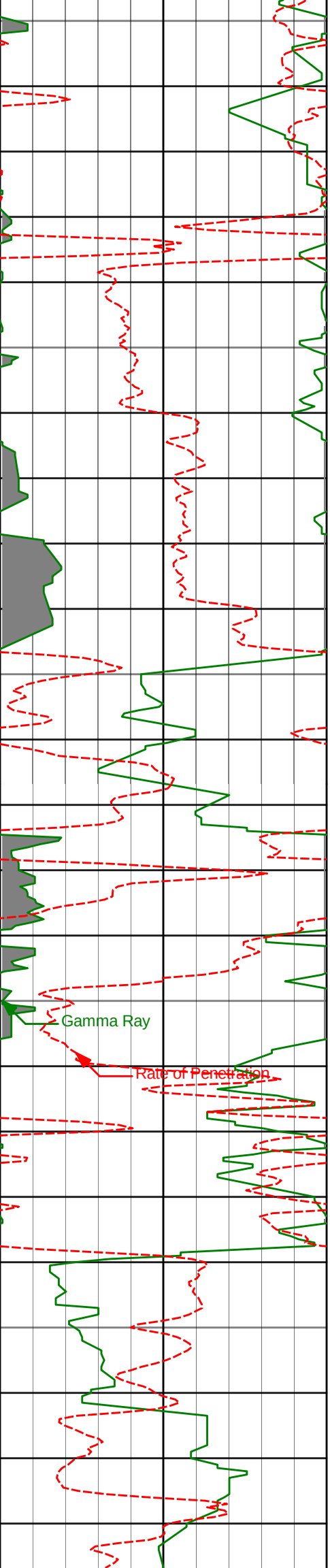

| | | | | | | |
|---|---|---|---|---|---|---|
| 2150 | | | | | | |
| 2200 | | | | | | |
| 2250 | 2248 | 0.18 | 131.23 | 2247.96 | 2.90 | 0.20 |
| 2300 | | | | | | |
| 2350 | | | | | | |



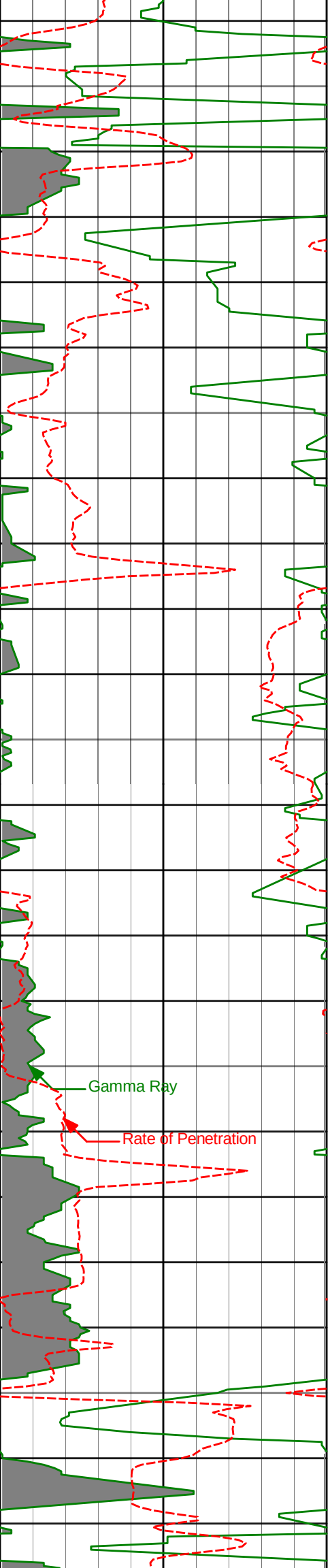

| | | | | | |
|---|---|---|---|---|---|
| 2439 | 0.30 | 90.58 | 2438.96 | 3.11 | 0.11 |



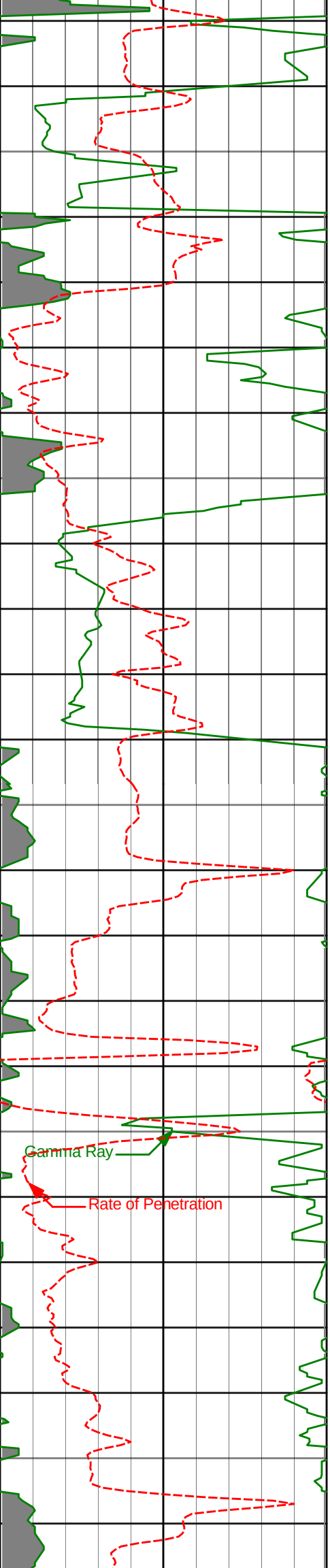

| | | | | | |
|---|---|---|---|---|---|
| 2630 | 0.69 | 131.75 | 2629.95 | 3.89 | 0.26 |
| 2821 | 0.63 | 186.83 | 2820.94 | 5.70 | 0.32 |



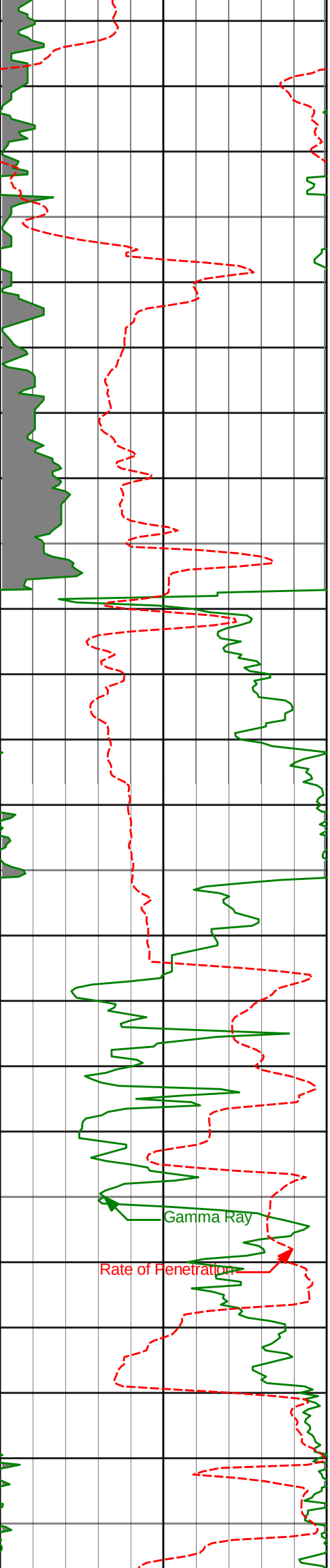

| | | | | | |
|---|---|---|---|---|---|
| 3013 | 0.51 | 187.78 | 3012.93 | 7.59 | 0.06 |



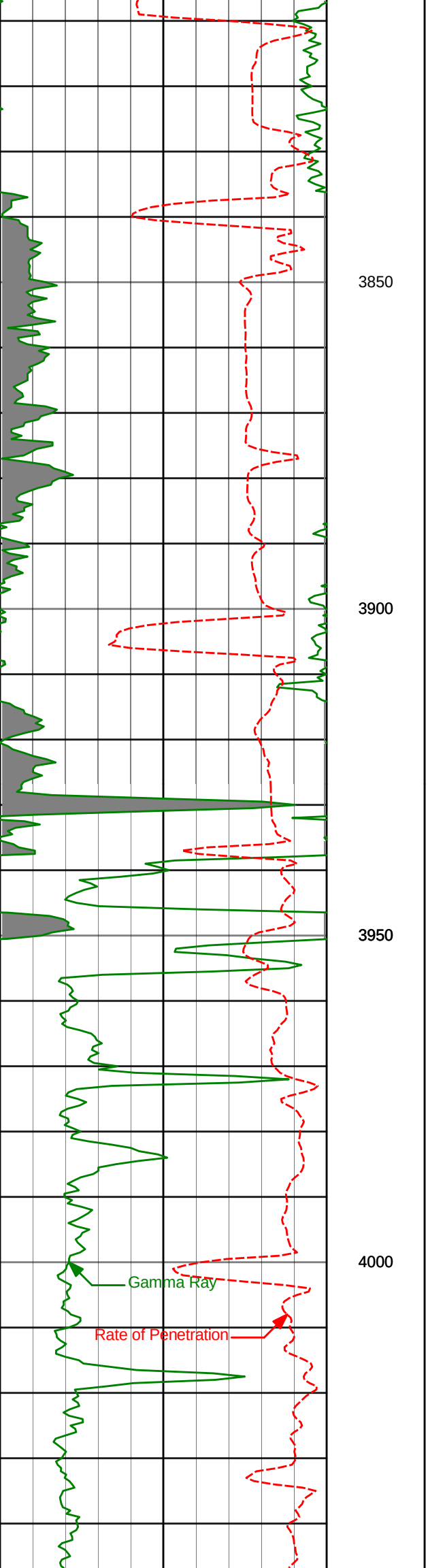

| | | | | | |
|---|---|---|---|---|---|
| 3205 | 0.37 | 162.60 | 3204.93 | 9.04 | 0.12 |



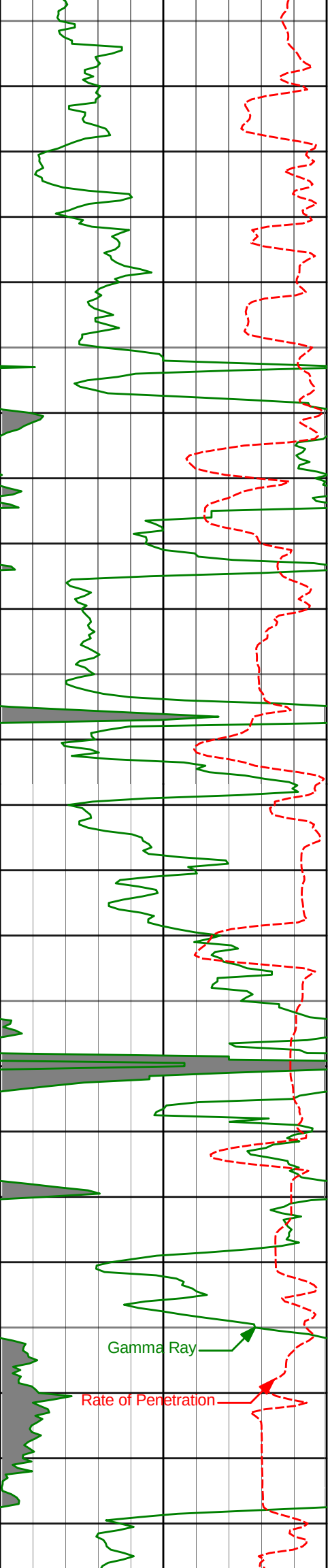

| | | | | | |
|---|---|---|---|---|---|
| 3396 | 0.07 | 74.26 | 3395.92 | 9.60 | 0.20 |



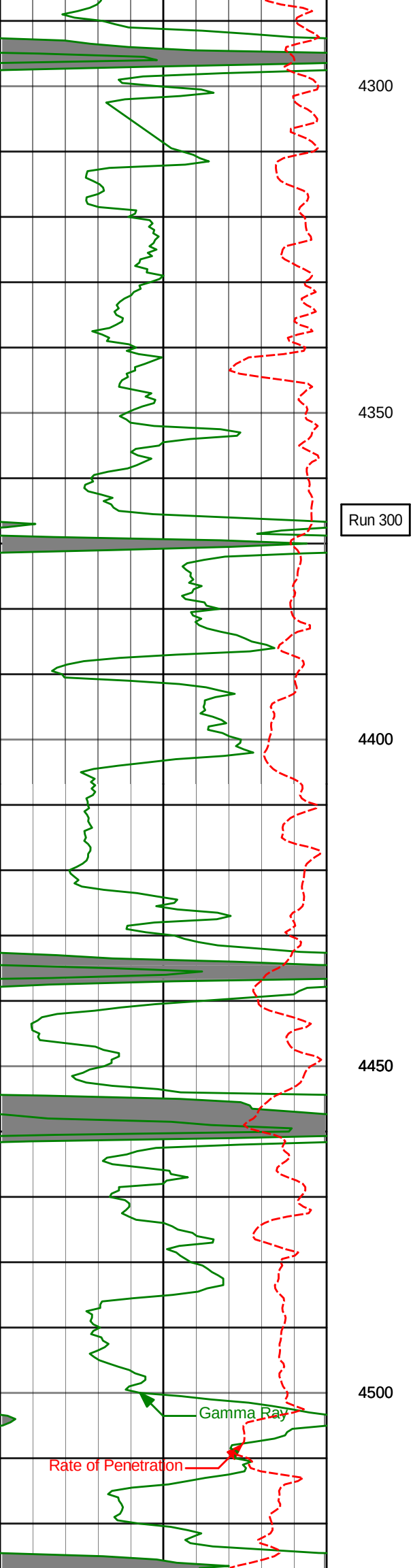

| | | | | | |
|---|---|---|---|---|---|
| 3588 | 0.03 | 259.13 | 3587.92 | 9.58 | 0.05 |
| 3652 | 0.39 | 247.98 | 3651.92 | 9.66 | 0.57 |
| 3684 | 0.19 | 304.52 | 3683.92 | 9.67 | 1.03 |
| 3716 | 1.25 | 202.31 | 3715.92 | 9.96 | 4.09 |
| 3748 | 2.98 | 182.79 | 3747.90 | 11.12 | 5.76 |
| 3780 | 4.33 | 185.58 | 3779.83 | 13.15 | 4.28 |



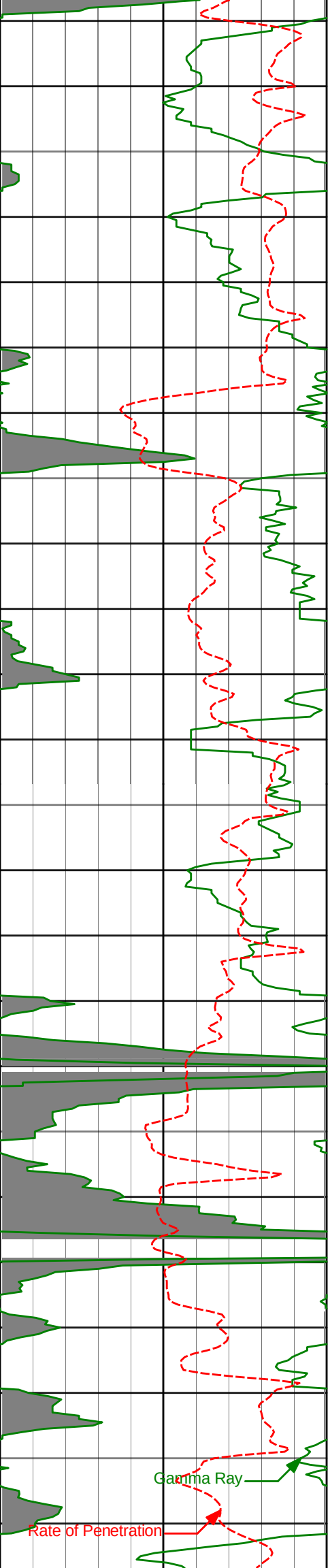

| | | | | | |
|---|---|---|---|---|---|
| 3812 | 6.00 | 186.02 | 3811.70 | 16.02 | 5.22 |
| 3845 | 8.24 | 187.91 | 3844.44 | 20.07 | 6.82 |
| 3877 | 10.90 | 186.36 | 3876.00 | 25.35 | 8.34 |
| 3909 | 13.06 | 186.00 | 3907.30 | 31.94 | 6.76 |
| 3941 | 15.55 | 186.35 | 3938.30 | 39.80 | 7.77 |
| 3973 | 18.62 | 187.36 | 3968.89 | 49.12 | 9.65 |
| 4005 | 21.79 | 186.78 | 3998.91 | 60.07 | 9.94 |
| 4037 | 25.12 | 185.97 | 4028.27 | 72.72 | 10.44 |



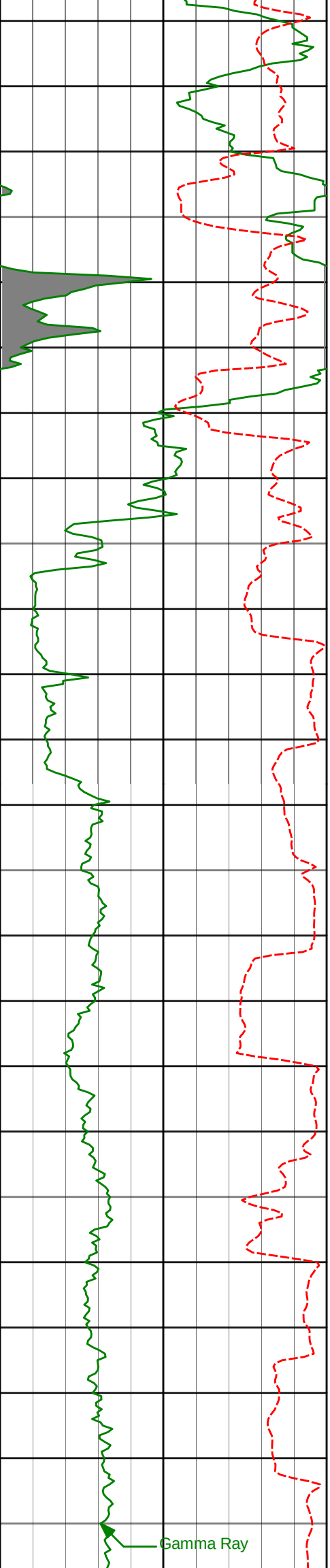

| | | | | | | |
|---|---|---|---|---|---|---|
| 4050 | | | | | | |
| | 4069 | 28.03 | 185.76 | 4056.88 | 86.94 | 9.09 |
| 4100 | 4100 | 28.56 | 187.13 | 4084.18 | 101.53 | 2.72 |
| | 4133 | 29.18 | 186.87 | 4113.08 | 117.32 | 1.91 |
| 4150 | | | | | | |
| | 4164 | 30.16 | 185.81 | 4140.01 | 132.56 | 3.61 |
| | 4196 | 31.73 | 185.04 | 4167.46 | 148.93 | 5.06 |
| 4200 | | | | | | |
| | 4228 | 34.10 | 184.25 | 4194.32 | 166.25 | 7.51 |
| 4250 | | | | | | |
| | 4260 | 36.14 | 182.19 | 4220.49 | 184.61 | 7.38 |



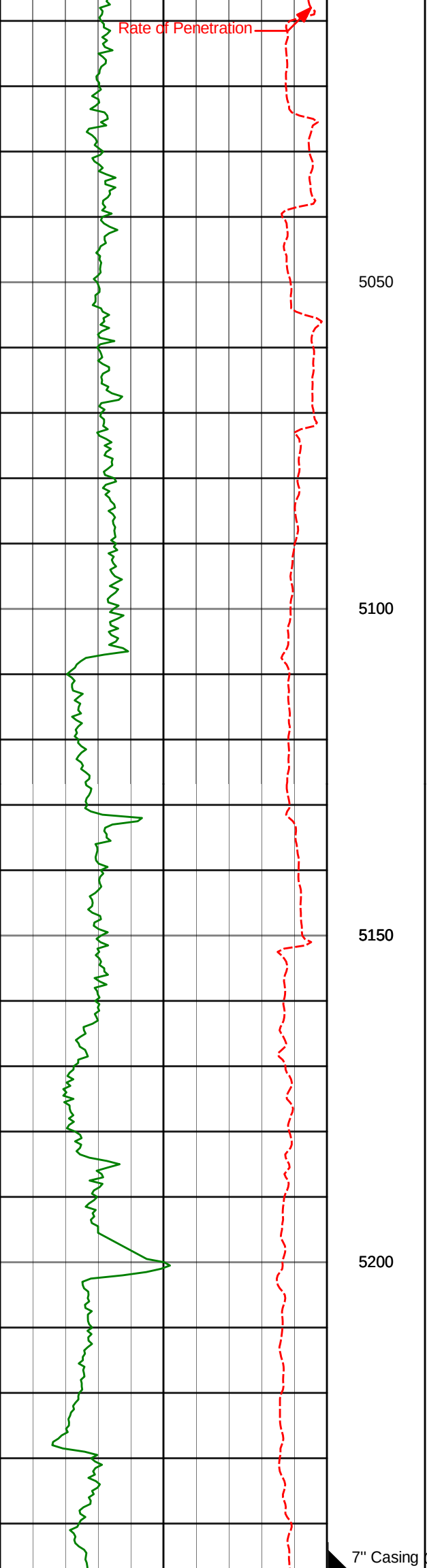

| | | | | | |
|---|---|---|---|---|---|
| 4292 | 38.13 | 180.31 | 4246.00 | 203.92 | 7.17 |
| 4326 | 40.37 | 179.83 | 4272.33 | 225.43 | 6.63 |
| 4358 | 43.44 | 180.61 | 4296.15 | 246.80 | 9.72 |
| 4390 | 46.70 | 181.91 | 4318.74 | 269.44 | 10.61 |
| 4422 | 50.38 | 181.10 | 4339.93 | 293.40 | 11.64 |
| 4454 | 53.62 | 181.26 | 4359.63 | 318.60 | 10.13 |
| 4486 | 56.63 | 181.20 | 4377.92 | 344.84 | 9.41 |
| 4518 | 59.15 | 180.74 | 4394.93 | 371.93 | 7.98 |



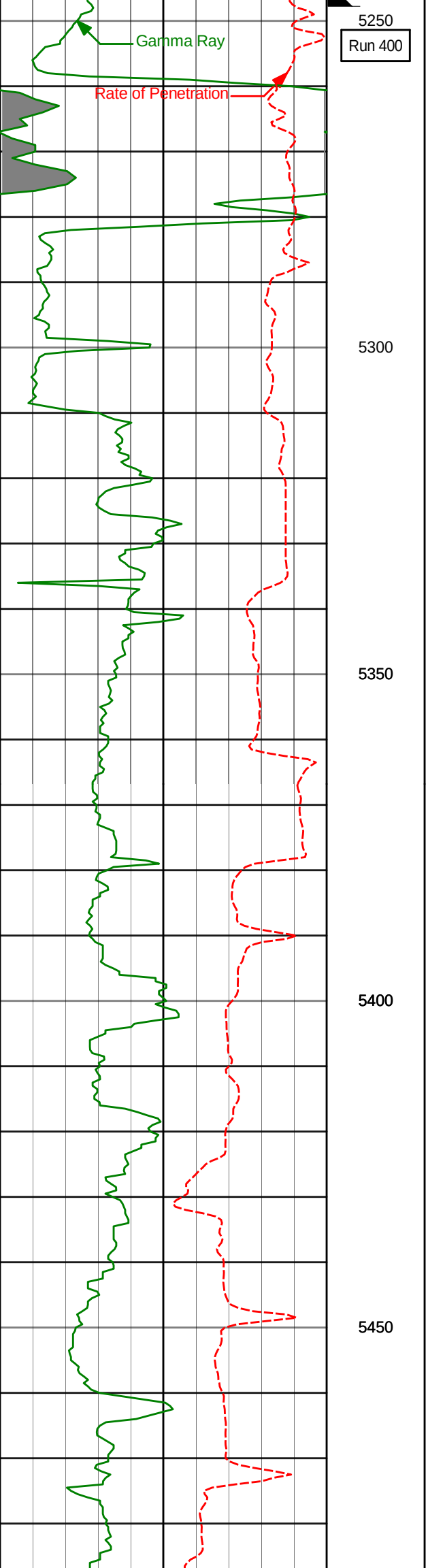

| | | | | | |
|---|---|---|---|---|---|
| 4582 | 64.60 | 178.39 | 4425.09 | 428.35 | 9.11 |
| 4646 | 66.27 | 178.74 | 4451.69 | 486.55 | 2.65 |
| 4678 | 66.46 | 178.80 | 4464.52 | 515.86 | 0.60 |
| 4710 | 66.56 | 178.56 | 4477.28 | 545.21 | 0.76 |
| 4742 | 67.27 | 179.20 | 4489.82 | 574.64 | 2.89 |



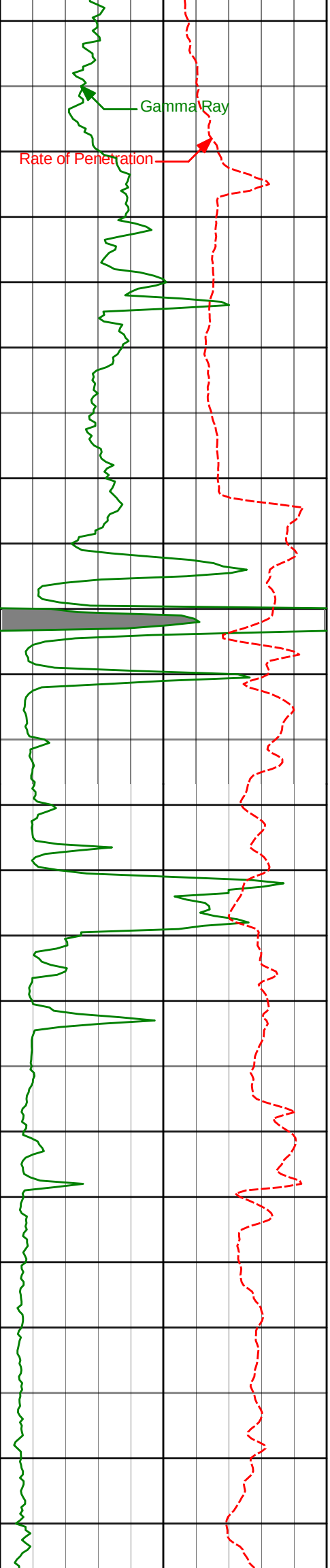

| | | | | | |
|---|---|---|---|---|---|
| 4774 | 69.10 | 179.23 | 4501.71 | 604.35 | 5.70 |
| 4806 | 71.52 | 179.29 | 4512.49 | 634.48 | 7.57 |
| 4838 | 73.99 | 179.47 | 4521.98 | 665.04 | 7.74 |
| 4869 | 76.57 | 180.11 | 4529.85 | 695.02 | 8.56 |
| 4901 | 78.36 | 179.86 | 4536.80 | 726.25 | 5.63 |
| 4933 | 80.24 | 179.28 | 4542.74 | 757.69 | 6.14 |
| 4965 | 82.25 | 178.97 | 4547.61 | 789.32 | 6.37 |
| 4997 | 84.14 | 179.20 | 4551.40 | 821.09 | 5.95 |



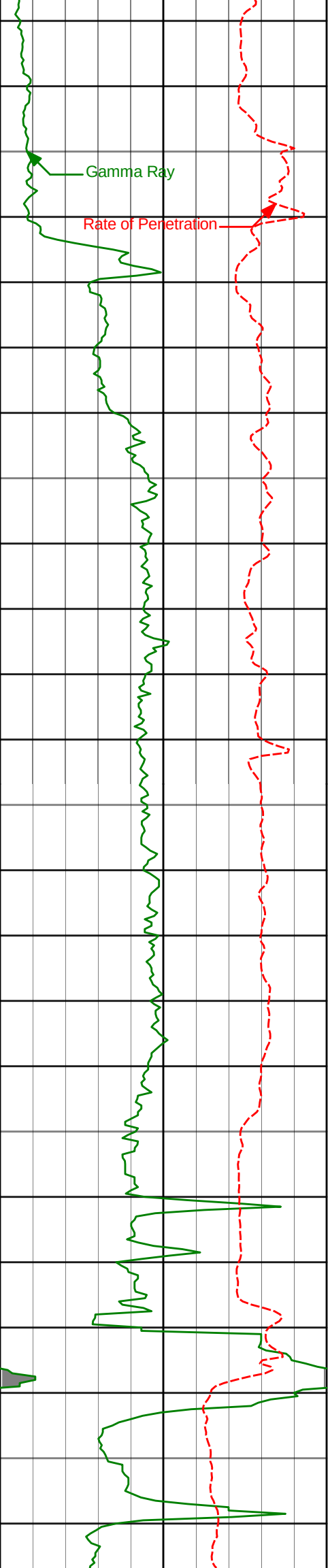

| | | | | | |
|---|---|---|---|---|---|
| 5093 | 88.89 | 178.84 | 4557.23 | 916.88 | 4.96 |
| 5193 | 90.49 | 178.54 | 4557.77 | 1016.87 | 1.63 |



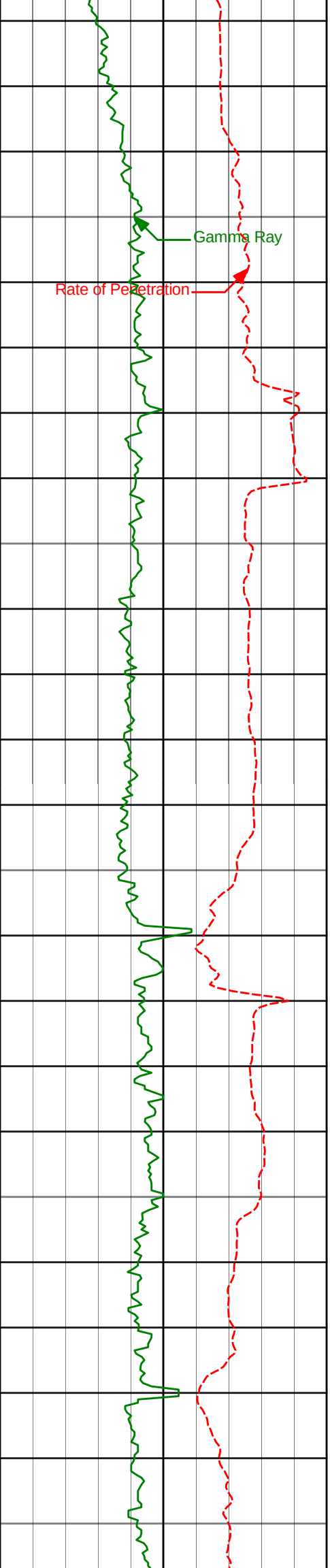

| | | | | | |
|---|---|---|---|---|---|
| 5287 | 90.55 | 177.81 | 4556.91 | 1110.84 | 0.78 |
| 5379 | 88.74 | 178.59 | 4557.48 | 1202.81 | 2.15 |



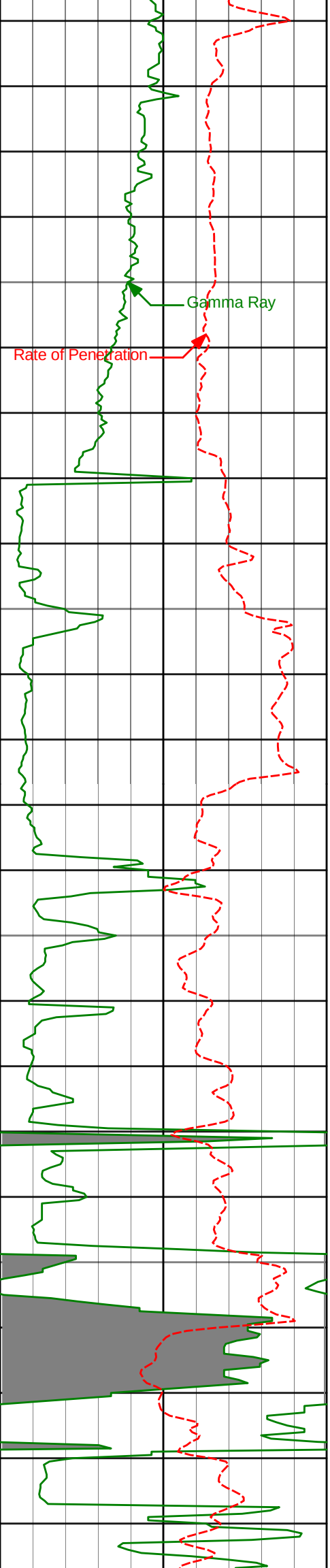

| | | | | | | |
|---|---|---|---|---|---|---|
| 5500 | 5502 | 90.52 | 179.12 | 4558.28 | 1325.79 | 1.52 |
| 5550 | | | | | | |
| 5600 | 5594 | 89.08 | 178.64 | 4558.60 | 1417.78 | 1.66 |
| 5650 | | | | | | |
| 5700 | 5686 | 88.31 | 179.37 | 4560.70 | 1509.75 | 1.16 |




| | | | | | | |
|---|---|---|---|---|---|---|
| 5750 | | | | | | |
| | 5779 | 86.88 | 178.76 | 4564.60 | 1602.66 | 1.67 |
| 5800 | | | | | | |
| 5850 | | | | | | |
| | 5871 | 87.91 | 178.63 | 4568.79 | 1694.56 | 1.12 |
| 5900 | | | | | | |
| 5950 | | | | | | |
| | 5963 | 89.35 | 178.64 | 4570.99 | 1786.52 | 1.57 |

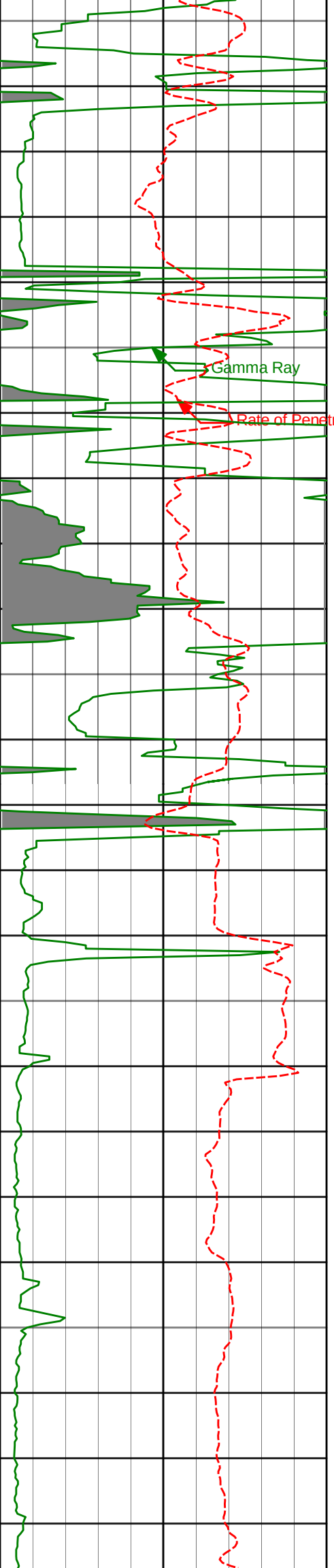



| | | | | | |
|---|---|---|---|---|---|
| 6055 | 88.31 | 179.05 | 4572.87 | 1878.49 | 1.22 |
| 6147 | 89.54 | 179.39 | 4574.60 | 1970.47 | 1.39 |

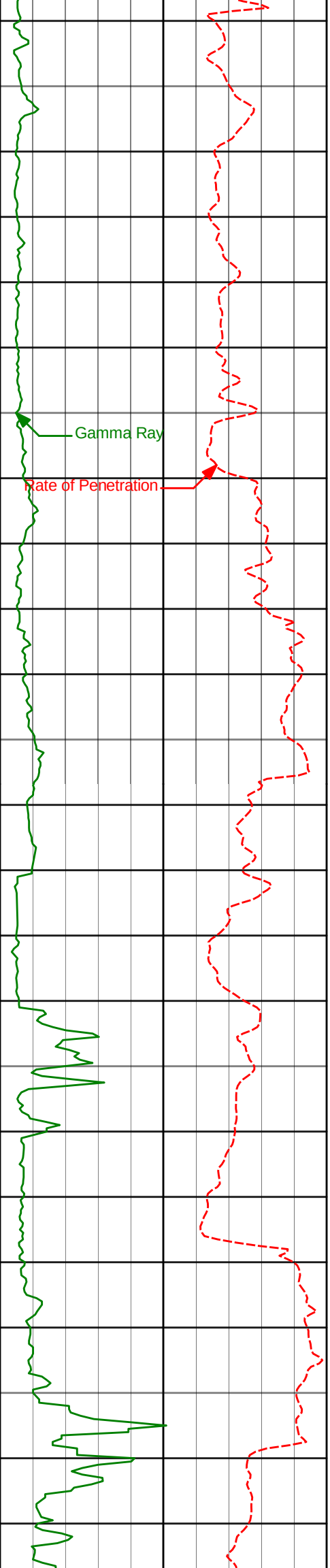



| | | | | | |
|---|---|---|---|---|---|
| 6240 | 90.68 | 179.30 | 4574.42 | 2063.47 | 1.23 |
| 6336 | 88.40 | 178.32 | 4575.19 | 2159.45 | 2.59 |
| 6432 | 86.79 | 178.74 | 4579.22 | 2255.35 | 1.73 |

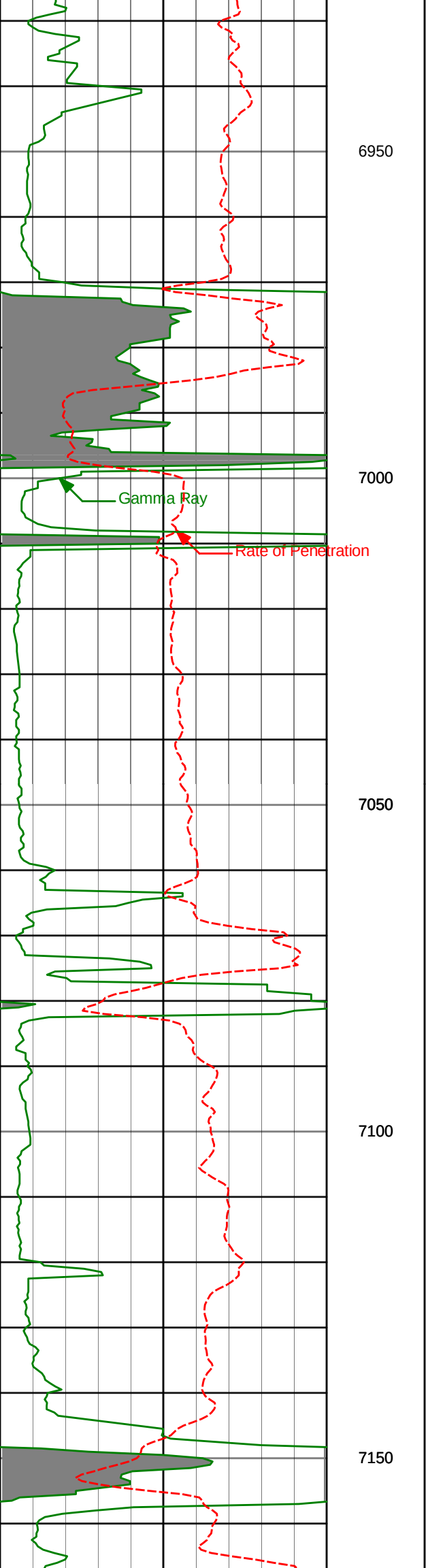
6250
6300
6350
6400



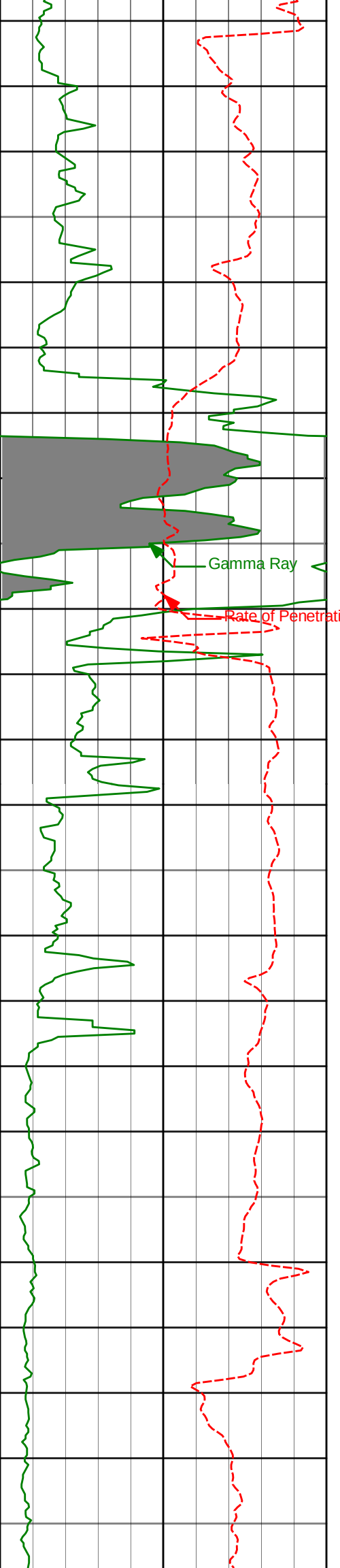

| | | | | | |
|---|---|---|---|---|---|
| 6528 | 88.27 | 177.92 | 4583.36 | 2351.24 | 1.76 |
| 6623 | 87.07 | 178.83 | 4587.22 | 2446.14 | 1.58 |



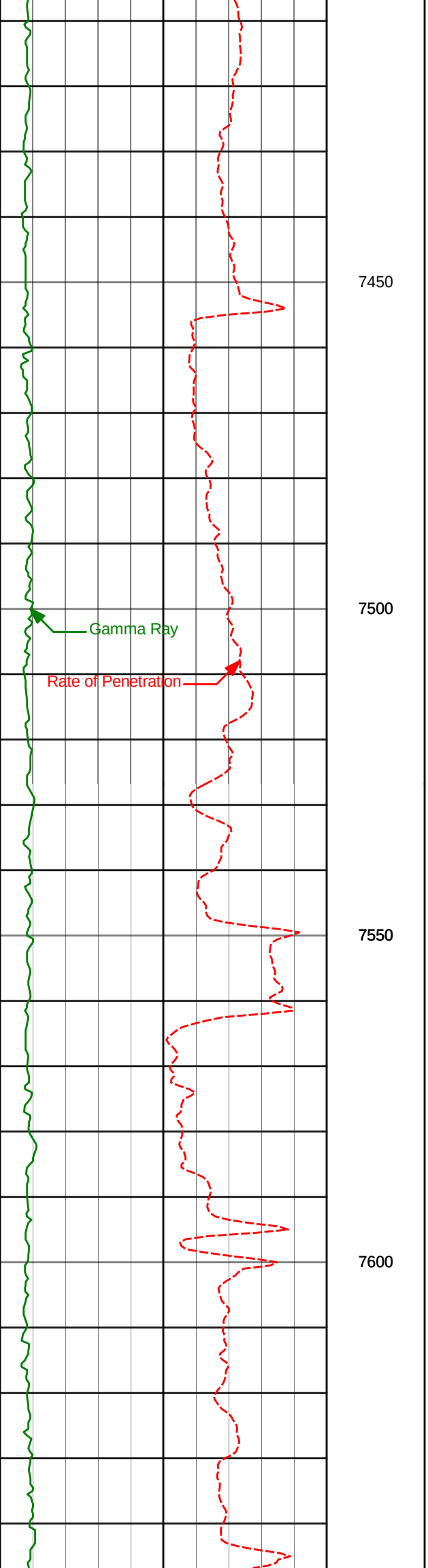

| | | | | | |
|---|---|---|---|---|---|
| 6700 | | | | | |
| 6719 | 88.43 | 178.72 | 4590.98 | 2542.05 | 1.42 |
| 6750 | | | | | |
| 6800 | | | | | |
| 6815 | 91.11 | 181.15 | 4591.37 | 2638.03 | 3.77 |
| 6850 | | | | | |
| Run 500 | | | | | |
| 6900 | | | | | |
| 6911 | 88.28 | 180.64 | 4591.88 | 2733.99 | 3.00 |



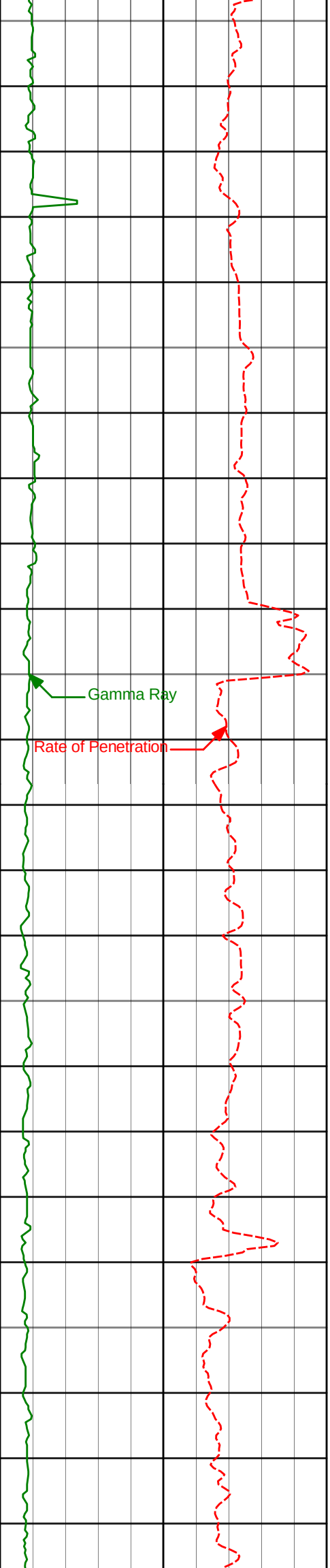

| | | | | | |
|---|---|---|---|---|---|
| 7007 | 86.86 | 180.50 | 4595.96 | 2829.89 | 1.48 |
| 7103 | 86.55 | 180.10 | 4601.47 | 2925.72 | 0.53 |



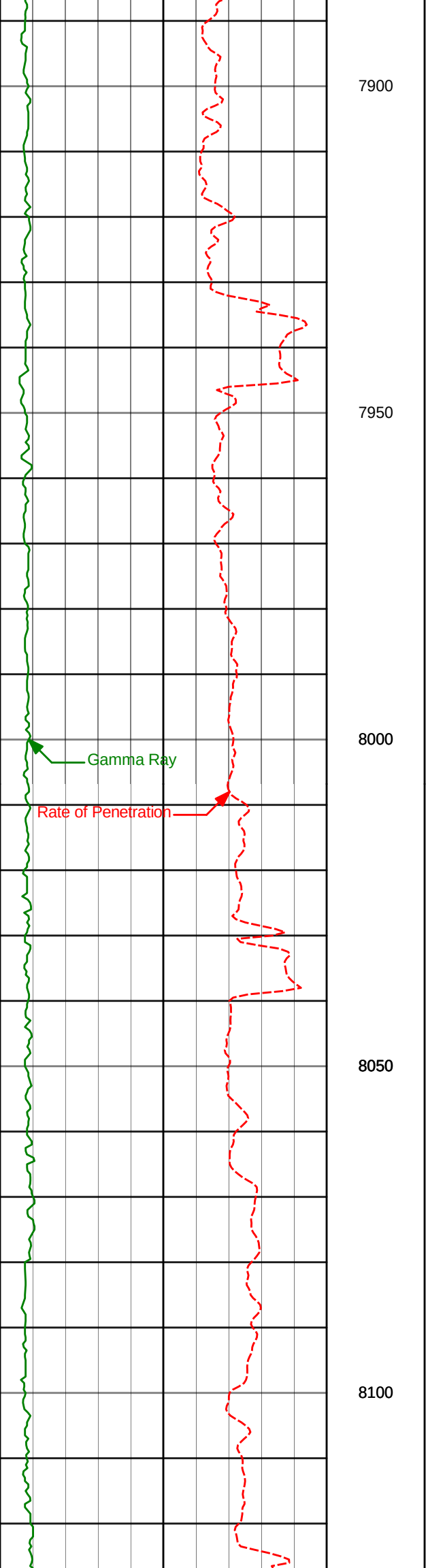

| | | | | | | |
|---|---|---|---|---|---|---|
| 7200 | 7199 | 86.23 | 179.45 | 4607.52 | 3021.53 | 0.75 |
| 7250 | | | | | | |
| 7300 | 7295 | 86.34 | 178.58 | 4613.74 | 3117.32 | 0.91 |
| 7350 | | | | | | |
| 7400 | 7392 | 86.02 | 180.44 | 4620.20 | 3214.10 | 1.94 |



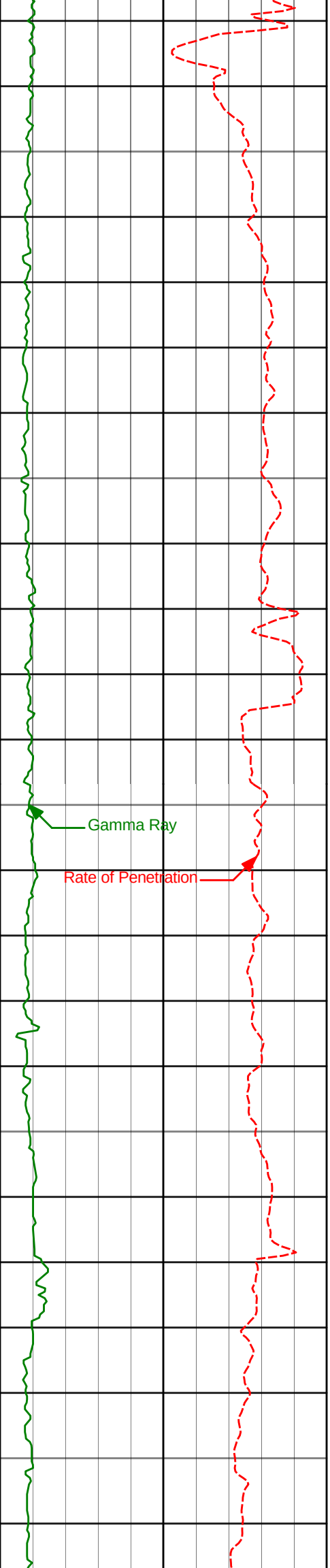

| | | | | | |
|---|---|---|---|---|---|
| 7488 | 87.22 | 180.49 | 4625.85 | 3309.92 | 1.25 |
| 7584 | 86.30 | 178.64 | 4631.28 | 3405.76 | 2.15 |



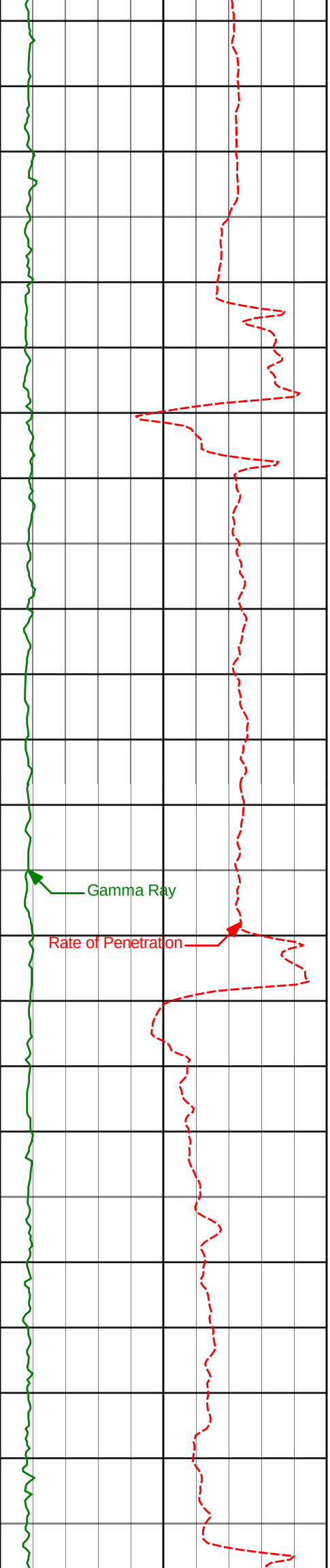

| | | | | | |
|---|---|---|---|---|---|
| 7680 | 87.10 | 178.81 | 4636.80 | 3501.59 | 0.85 |
| 7776 | 86.94 | 179.27 | 4641.79 | 3597.46 | 0.51 |
| 7872 | 88.24 | 179.46 | 4645.83 | 3693.37 | 1.37 |



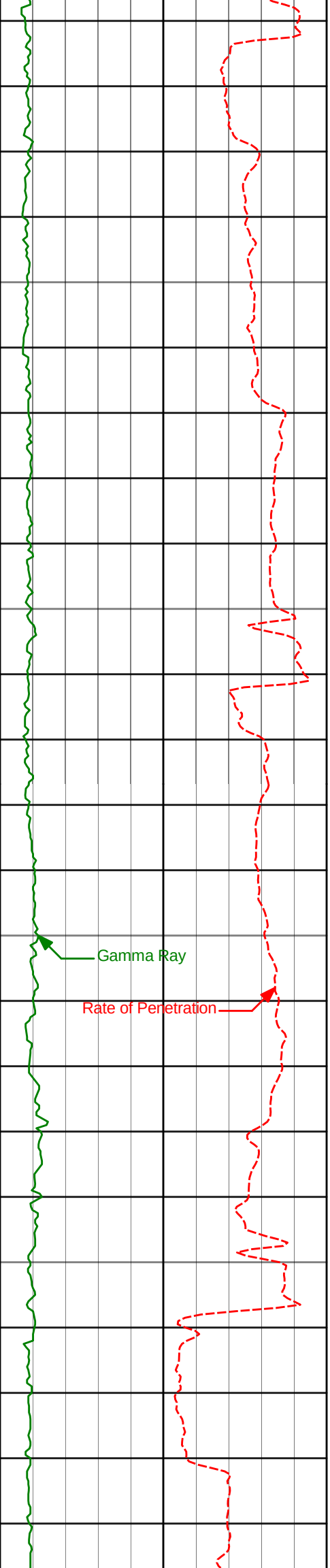

| | | | | | |
|---|---|---|---|---|---|
| 7968 | 87.52 | 179.90 | 4649.37 | 3789.30 | 0.87 |
| 8064 | 86.89 | 180.22 | 4654.05 | 3885.19 | 0.74 |



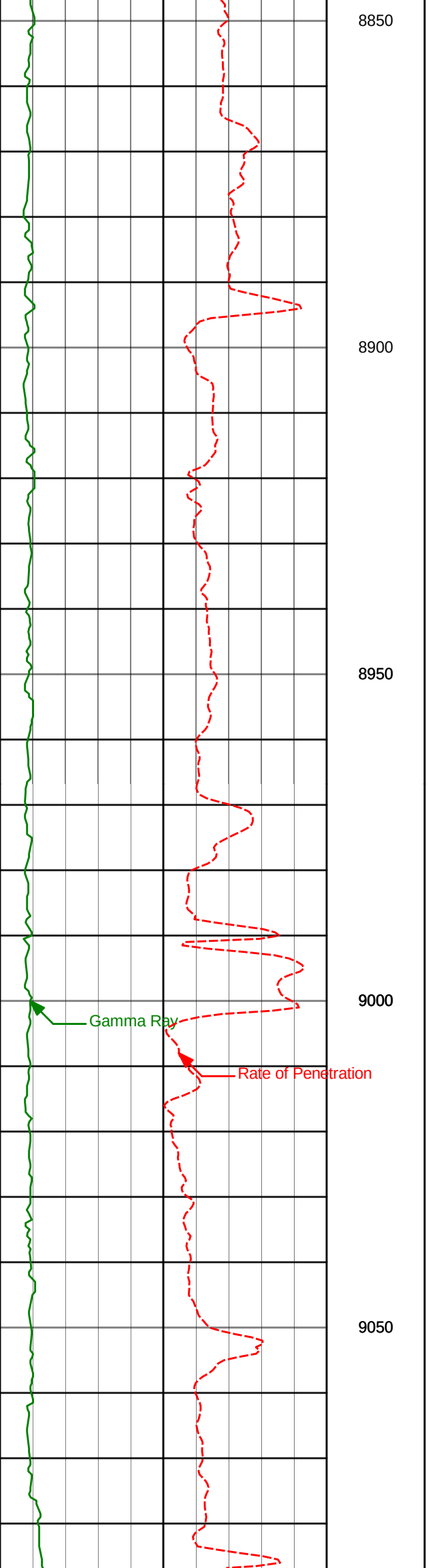

| | | | | | | |
|---|---|---|---|---|---|---|
| 8150 | | | | | | |
| | 8160 | 87.60 | 179.85 | 4658.67 | 3981.07 | 0.84 |
| 8200 | | | | | | |
| 8250 | | | | | | |
| | 8256 | 86.08 | 179.72 | 4663.95 | 4076.92 | 1.59 |
| 8300 | | | | | | |
| 8350 | | | | | | |
| | 8352 | 87.38 | 178.72 | 4669.43 | 4172.76 | 1.71 |



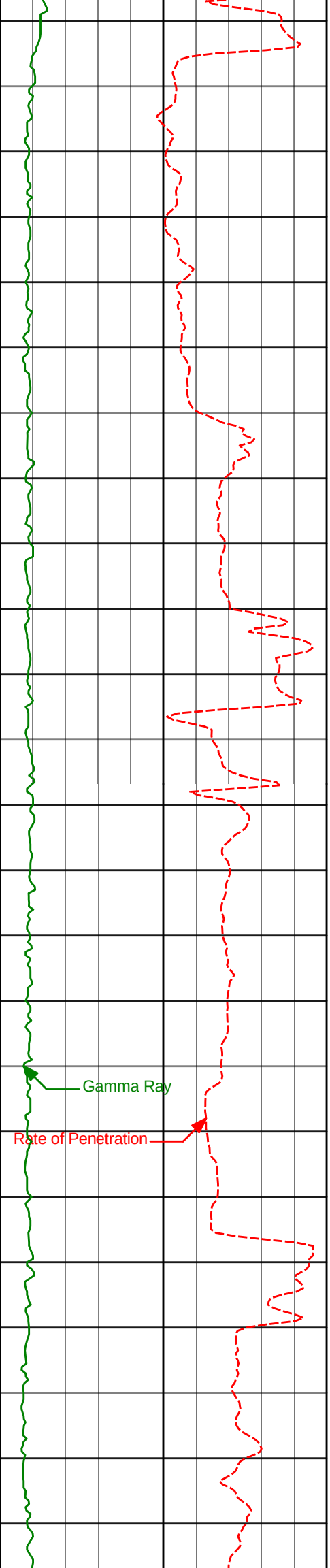

| | | | | | |
|---|---|---|---|---|---|
| 8448 | 86.92 | 180.10 | 4674.20 | 4268.64 | 1.52 |
| 8543 | 86.76 | 180.33 | 4679.44 | 4363.49 | 0.29 |



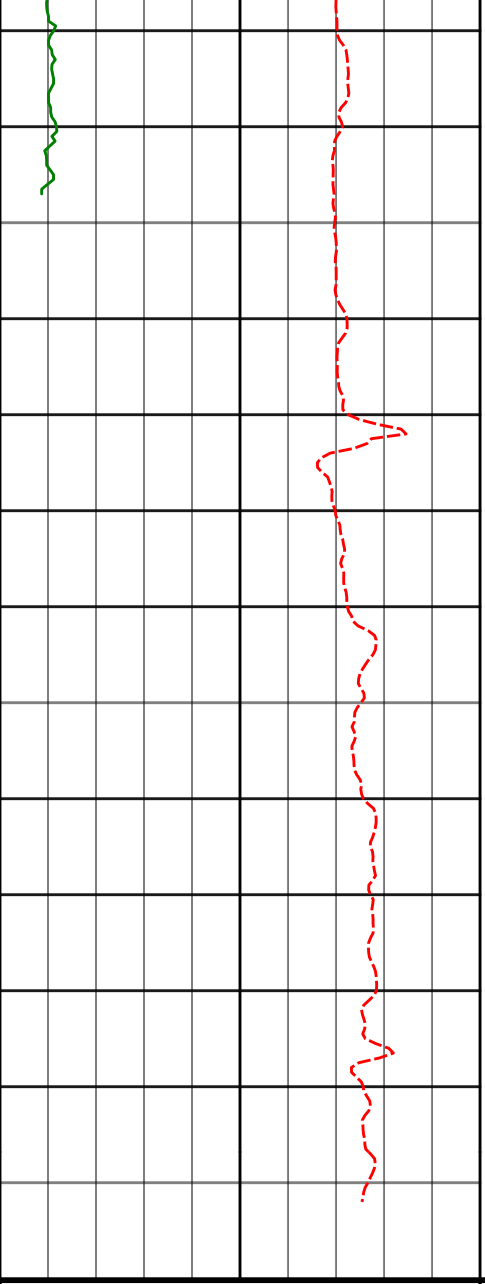

| | | | | | |
|---|---|---|---|---|---|
| 8639 | 87.50 | 178.82 | 4684.25 | 4459.36 | 1.75 |
| 8735 | 86.86 | 178.80 | 4688.97 | 4555.24 | 0.67 |
| 8831 | 85.69 | 178.60 | 4695.21 | 4651.02 | 1.24 |




| | | | | | |
|---|---|---|---|---|---|
| 8927 | 87.44 | 178.78 | 4700.96 | 4746.84 | 1.84 |
| 9022 | 86.83 | 179.03 | 4705.71 | 4841.71 | 0.70 |




| | | | | | |
|---|---|---|---|---|---|
| 9118 | 87.35 | 179.47 | 4710.58 | 4937.59 | 0.72 |
| 9214 | 87.72 | 180.32 | 4714.71 | 5033.50 | 0.96 |
| 9310 | 86.52 | 179.47 | 4719.54 | 5129.37 | 1.53 |




| | | | | | | |
|---|---|---|---|---|---|---|
| | 9388 | 87.94 | 179.14 | 4723.32 | 5207.27 | 1.87 |
| | 9450 | 87.94 | 179.14 | 4725.55 | 5269.23 | 0.01 |

Rate of Penetration
feet per hr
250 0

Gamma Ray
api
0 150

MD
ft
1 : 240

| Surveys | | | Surveys | | |
|---|---|---|---|---|---|
| Depth | Inclination | Azimuth | TVD | Vertical Sec | Dogleg Sev |

HALLIBURTON

INSITE

# DIRECTIONAL SURVEY REPORT

**Shell Exploration Production Co**
**Lockwood Farms 3307 14-1H**
**Wildcat**
**Harper Kansas**
**USA**
**OK-XX-0009199477**

**Surveys from 200' to 9388' are MWD surveys. Final survey is a straight line projection to the bit @ 9450'.**

| *Measured Depth (feet)* | *Inclination (degrees)* | *Direction (degrees)* | *Vertical Depth (feet)* | *Latitude (feet)* | *Departure (feet)* | *Vertical Section (feet)* | *Dogleg (deg/100ft)* |
|---|---|---|---|---|---|---|---|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 N | 0.00 E | 0.00 | TIE-IN |
| 200.00 | 0.73 | 244.47 | 199.99 | 0.55 S | 1.15 W | 0.54 | 0.36 |
| 265.00 | 0.26 | 258.25 | 264.99 | 0.76 S | 1.67 W | 0.74 | 0.74 |
| 355.00 | 0.54 | 257.68 | 354.99 | 0.89 S | 2.28 W | 0.87 | 0.31 |
| 416.00 | 0.33 | 244.51 | 415.99 | 1.03 S | 2.72 W | 1.00 | 0.38 |
| 508.00 | 0.03 | 63.04 | 507.99 | 1.13 S | 2.94 W | 1.11 | 0.39 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 601.00 | 0.30 | 304.76 | 600.99 | 0.98 S | 3.12 W | 0.95 | 0.34 |
| 654.00 | 0.09 | 207.04 | 653.99 | 0.94 S | 3.25 W | 0.91 | 0.61 |
| 761.00 | 0.20 | 301.16 | 760.99 | 0.92 S | 3.45 W | 0.89 | 0.21 |
| 915.00 | 0.23 | 85.38 | 914.99 | 0.75 S | 3.36 W | 0.73 | 0.27 |
| 1098.00 | 0.40 | 42.96 | 1097.98 | 0.26 S | 2.55 W | 0.23 | 0.15 |
| 1289.00 | 0.19 | 262.03 | 1288.98 | 0.19 N | 2.40 W | -0.21 | 0.29 |
| 1481.00 | 0.09 | 63.97 | 1480.98 | 0.21 N | 2.58 W | -0.24 | 0.14 |
| 1673.00 | 0.44 | 83.55 | 1672.98 | 0.37 N | 1.70 W | -0.38 | 0.19 |
| 1865.00 | 0.57 | 142.75 | 1864.97 | 0.31 S | 0.38 W | 0.30 | 0.27 |
| 2057.00 | 0.53 | 158.06 | 2056.96 | 1.88 S | 0.52 E | 1.88 | 0.08 |
| 2248.00 | 0.18 | 131.23 | 2247.96 | 2.89 S | 1.07 E | 2.90 | 0.20 |
| 2439.00 | 0.30 | 90.58 | 2438.96 | 3.09 S | 1.81 E | 3.11 | 0.11 |
| 2630.00 | 0.69 | 131.75 | 2629.95 | 3.86 S | 3.16 E | 3.89 | 0.26 |
| 2821.00 | 0.63 | 186.83 | 2820.94 | 5.67 S | 3.89 E | 5.70 | 0.32 |
| 3013.00 | 0.51 | 187.78 | 3012.93 | 7.56 S | 3.65 E | 7.59 | 0.06 |
| 3205.00 | 0.37 | 162.60 | 3204.93 | 9.01 S | 3.72 E | 9.04 | 0.12 |
| 3396.00 | 0.07 | 74.26 | 3395.92 | 9.57 S | 4.02 E | 9.60 | 0.20 |
| 3588.00 | 0.03 | 259.13 | 3587.92 | 9.55 S | 4.08 E | 9.58 | 0.05 |
| 3652.00 | 0.39 | 247.98 | 3651.92 | 9.63 S | 3.85 E | 9.66 | 0.57 |
| 3684.00 | 0.19 | 304.52 | 3683.92 | 9.64 S | 3.71 E | 9.67 | 1.03 |
| 3716.00 | 1.25 | 202.31 | 3715.92 | 9.94 S | 3.53 E | 9.96 | 4.09 |
| 3748.00 | 2.98 | 182.79 | 3747.90 | 11.09 S | 3.36 E | 11.12 | 5.76 |
| 3780.00 | 4.33 | 185.58 | 3779.83 | 13.12 S | 3.20 E | 13.15 | 4.28 |
| 3812.00 | 6.00 | 186.02 | 3811.70 | 15.99 S | 2.91 E | 16.02 | 5.22 |
| 3845.00 | 8.24 | 187.91 | 3844.44 | 20.05 S | 2.40 E | 20.07 | 6.82 |
| 3877.00 | 10.90 | 186.36 | 3876.00 | 25.33 S | 1.75 E | 25.35 | 8.34 |
| 3909.00 | 13.06 | 186.00 | 3907.30 | 31.94 S | 1.03 E | 31.94 | 6.76 |
| 3941.00 | 15.55 | 186.35 | 3938.30 | 39.80 S | 0.18 E | 39.80 | 7.77 |
| 3973.00 | 18.62 | 187.36 | 3968.89 | 49.13 S | 0.95 W | 49.12 | 9.65 |
| 4005.00 | 21.79 | 186.78 | 3998.91 | 60.09 S | 2.30 W | 60.07 | 9.94 |
| 4037.00 | 25.12 | 185.97 | 4028.27 | 72.75 S | 3.71 W | 72.72 | 10.44 |
| 4069.00 | 28.03 | 185.76 | 4056.88 | 86.99 S | 5.17 W | 86.94 | 9.09 |
| 4100.00 | 28.56 | 187.13 | 4084.18 | 101.59 S | 6.82 W | 101.53 | 2.72 |
| 4133.00 | 29.18 | 186.87 | 4113.08 | 117.40 S | 8.76 W | 117.32 | 1.91 |
| 4164.00 | 30.16 | 185.81 | 4140.01 | 132.65 S | 10.46 W | 132.56 | 3.61 |
| 4196.00 | 31.73 | 185.04 | 4167.46 | 149.03 S | 12.01 W | 148.93 | 5.06 |
| 4228.00 | 34.10 | 184.25 | 4194.32 | 166.36 S | 13.41 W | 166.25 | 7.51 |
| 4260.00 | 36.14 | 182.19 | 4220.49 | 184.74 S | 14.44 W | 184.61 | 7.38 |
| 4292.00 | 38.13 | 180.31 | 4246.00 | 204.05 S | 14.85 W | 203.92 | 7.17 |
| 4326.00 | 40.37 | 179.83 | 4272.33 | 225.56 S | 14.88 W | 225.43 | 6.63 |
| 4358.00 | 43.44 | 180.61 | 4296.15 | 246.93 S | 14.97 W | 246.80 | 9.72 |
| 4390.00 | 46.70 | 181.91 | 4318.74 | 269.58 S | 15.47 W | 269.44 | 10.61 |
| 4422.00 | 50.38 | 181.10 | 4339.93 | 293.55 S | 16.10 W | 293.40 | 11.64 |
| 4454.00 | 53.62 | 181.26 | 4359.63 | 318.75 S | 16.62 W | 318.60 | 10.13 |
| 4486.00 | 56.63 | 181.20 | 4377.92 | 345.00 S | 17.18 W | 344.84 | 9.41 |
| 4518.00 | 59.15 | 180.74 | 4394.93 | 372.10 S | 17.64 W | 371.93 | 7.98 |
| 4582.00 | 64.60 | 178.39 | 4425.09 | 428.51 S | 17.18 W | 428.35 | 9.11 |
| 4646.00 | 66.27 | 178.74 | 4451.69 | 486.70 S | 15.72 W | 486.55 | 2.65 |
| 4678.00 | 66.46 | 178.80 | 4464.52 | 516.01 S | 15.09 W | 515.86 | 0.60 |
| 4710.00 | 66.56 | 178.56 | 4477.28 | 545.35 S | 14.41 W | 545.21 | 0.76 |
| 4742.00 | 67.27 | 179.20 | 4489.82 | 574.78 S | 13.83 W | 574.64 | 2.89 |
| 4774.00 | 69.10 | 179.23 | 4501.71 | 604.48 S | 13.42 W | 604.35 | 5.70 |
| 4806.00 | 71.52 | 179.29 | 4512.49 | 634.61 S | 13.03 W | 634.48 | 7.57 |
| 4838.00 | 73.99 | 179.47 | 4521.98 | 665.17 S | 12.70 W | 665.04 | 7.74 |
| 4869.00 | 76.57 | 180.11 | 4529.85 | 695.15 S | 12.59 W | 695.02 | 8.56 |
| 4901.00 | 78.36 | 179.86 | 4536.80 | 726.38 S | 12.58 W | 726.25 | 5.63 |
| 4933.00 | 80.24 | 179.28 | 4542.74 | 757.82 S | 12.35 W | 757.69 | 6.14 |
| 4965.00 | 82.25 | 178.97 | 4547.61 | 789.44 S | 11.86 W | 789.32 | 6.37 |
| 4997.00 | 84.14 | 179.20 | 4551.40 | 821.21 S | 11.36 W | 821.09 | 5.95 |
| 5093.00 | 88.89 | 178.84 | 4557.23 | 917.00 S | 9.71 W | 916.88 | 4.96 |
| 5193.00 | 90.49 | 178.54 | 4557.77 | 1016.96 S | 7.43 W | 1016.87 | 1.63 |
| 5287.00 | 90.55 | 177.81 | 4556.91 | 1110.91 S | 4.44 W | 1110.84 | 0.78 |
| 5379.00 | 88.74 | 178.59 | 4557.48 | 1202.86 S | 1.55 W | 1202.81 | 2.15 |
| 5502.00 | 90.52 | 179.12 | 4558.28 | 1325.83 S | 0.91 E | 1325.79 | 1.52 |
| 5594.00 | 89.08 | 178.64 | 4558.60 | 1417.81 S | 2.71 E | 1417.78 | 1.66 |
| 5686.00 | 88.31 | 179.37 | 4560.70 | 1509.77 S | 4.30 E | 1509.75 | 1.16 |
| 5779.00 | 86.88 | 178.76 | 4564.60 | 1602.67 S | 5.81 E | 1602.66 | 1.67 |
| 5871.00 | 87.91 | 178.63 | 4568.79 | 1694.55 S | 7.91 E | 1694.56 | 1.12 |
| 5963.00 | 89.35 | 178.64 | 4570.99 | 1786.50 S | 10.10 E | 1786.52 | 1.57 |
| 6055.00 | 88.31 | 179.05 | 4572.87 | 1878.46 S | 11.95 E | 1878.49 | 1.22 |
| 6147.00 | 89.54 | 179.39 | 4574.60 | 1970.43 S | 13.20 E | 1970.47 | 1.39 |
| 6240.00 | 90.68 | 179.30 | 4574.42 | 2063.42 S | 14.27 E | 2063.47 | 1.23 |
| 6336.00 | 88.40 | 178.32 | 4575.19 | 2159.39 S | 16.26 E | 2159.45 | 2.59 |
| 6432.00 | 86.79 | 178.74 | 4579.22 | 2255.27 S | 18.72 E | 2255.35 | 1.73 |
| 6528.00 | 88.27 | 177.92 | 4583.36 | 2351.14 S | 21.52 E | 2351.24 | 1.76 |
| 6623.00 | 87.07 | 178.83 | 4587.22 | 2446.02 S | 24.21 E | 2446.14 | 1.58 |
| 6719.00 | 88.43 | 178.72 | 4590.98 | 2541.92 S | 26.27 E | 2542.05 | 1.42 |
| 6815.00 | 91.11 | 181.15 | 4591.37 | 2637.90 S | 26.37 E | 2638.03 | 3.77 |
| 6911.00 | 88.28 | 180.64 | 4591.88 | 2733.88 S | 24.87 E | 2733.99 | 3.00 |
| 7007.00 | 86.86 | 180.50 | 4595.96 | 2829.79 S | 23.91 E | 2829.89 | 1.48 |
| 7103.00 | 86.55 | 180.10 | 4601.47 | 2925.63 S | 23.41 E | 2925.72 | 0.53 |
| 7199.00 | 86.23 | 179.45 | 4607.52 | 3021.43 S | 23.79 E | 3021.53 | 0.75 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7295.00 | 86.34 | 178.58 | 4613.74 | 3117.22 S | 25.43 E | 3117.32 | 0.91 |
| 7392.00 | 86.02 | 180.44 | 4620.20 | 3213.99 S | 26.26 E | 3214.10 | 1.94 |
| 7488.00 | 87.22 | 180.49 | 4625.85 | 3309.82 S | 25.49 E | 3309.92 | 1.25 |
| 7584.00 | 86.30 | 178.64 | 4631.28 | 3405.66 S | 26.22 E | 3405.76 | 2.15 |
| 7680.00 | 87.10 | 178.81 | 4636.80 | 3501.48 S | 28.35 E | 3501.59 | 0.85 |
| 7776.00 | 86.94 | 179.27 | 4641.79 | 3597.33 S | 29.96 E | 3597.46 | 0.51 |
| 7872.00 | 88.24 | 179.46 | 4645.83 | 3693.24 S | 31.02 E | 3693.37 | 1.37 |
| 7968.00 | 87.52 | 179.90 | 4649.37 | 3789.17 S | 31.56 E | 3789.30 | 0.87 |
| 8064.00 | 86.89 | 180.22 | 4654.05 | 3885.06 S | 31.46 E | 3885.19 | 0.74 |
| 8160.00 | 87.60 | 179.85 | 4658.67 | 3980.95 S | 31.40 E | 3981.07 | 0.84 |
| 8256.00 | 86.08 | 179.72 | 4663.95 | 4076.80 S | 31.77 E | 4076.92 | 1.59 |
| 8352.00 | 87.38 | 178.72 | 4669.43 | 4172.63 S | 33.08 E | 4172.76 | 1.71 |
| 8448.00 | 86.92 | 180.10 | 4674.20 | 4268.50 S | 34.07 E | 4268.64 | 1.52 |
| 8543.00 | 86.76 | 180.33 | 4679.44 | 4363.36 S | 33.72 E | 4363.49 | 0.29 |
| 8639.00 | 87.50 | 178.82 | 4684.25 | 4459.23 S | 34.43 E | 4459.36 | 1.75 |
| 8735.00 | 86.86 | 178.80 | 4688.97 | 4555.09 S | 36.41 E | 4555.24 | 0.67 |
| 8831.00 | 85.69 | 178.60 | 4695.21 | 4650.86 S | 38.58 E | 4651.02 | 1.24 |
| 8927.00 | 87.44 | 178.78 | 4700.96 | 4746.66 S | 40.77 E | 4746.84 | 1.84 |
| 9022.00 | 86.83 | 179.03 | 4705.71 | 4841.53 S | 42.59 E | 4841.71 | 0.70 |
| 9118.00 | 87.35 | 179.47 | 4710.58 | 4937.39 S | 43.84 E | 4937.59 | 0.72 |
| 9214.00 | 87.72 | 180.32 | 4714.71 | 5033.30 S | 44.01 E | 5033.50 | 0.96 |
| 9310.00 | 86.52 | 179.47 | 4719.54 | 5129.18 S | 44.19 E | 5129.37 | 1.53 |
| 9388.00 | 87.94 | 179.14 | 4723.32 | 5207.08 S | 45.13 E | 5207.27 | 1.87 |
| 9450.00 | 87.94 | 179.14 | 4725.55 | 5269.03 S | 46.06 E | 5269.23 | 0.01 |

**CALCULATION BASED ON MINIMUM CURVATURE METHOD**

**SURVEY COORDINATES RELATIVE TO WELL SYSTEM REFERENCE POINT**
**TVD VALUES GIVEN RELATIVE TO DRILLING MEASUREMENT POINT**

**VERTICAL SECTION RELATIVE TO WELL HEAD**
**VERTICAL SECTION IS COMPUTED ALONG A DIRECTION OF 179.52 DEGREES (TRUE)**
**A TOTAL CORRECTION OF 4.74 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.**
**HORIZONTAL DISPLACEMENT(CLOSURE) AT 9450.00 FEET**
**IS 5269.23 FEET ALONG 179.50 DEGREES (TRUE)**

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