

D-C Pressure Case Directional
PCG-K Pressure Case Gamma

1 : 240

Company : APC									
Rig : HP 308									
Well : NRC 29N-32HZ									
Field : Wattenburg									
Country : USA									
API Number : 05-123-39293									
LOCATION					Other Services				
Latitude : 40° 4' 16.20" North Longitude : 104° 54' 59.90" West					Directional Drilling				
UTM Easting = 3,163,259,230 ft UTM Northing = 1,269,308,210 ft									
Country : USA									
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Company : APC									
Well : NRC 29N-3									

WELL INFORMATION

MWD Run Number	100	200	300	400	500
Date run completed	10-May-14	12-May-14	14-May-14	19-May-14	20-May-14
Rig Bit Number	0100	0200	300	0400	0500
Bit Size (in)	8.75	8.75	6.125	6.125	6.125
Tool Nominal OD (in)	6.750	6.750	4.750	4.750	4.750
Log Start Depth (MD, ft)	1,248.00	5,630.00	7,934.00	8,536.00	16,880.00
Log End Depth (MD, ft)	5,630.00	7,934.00	8,536.00	16,880.00	16,880.00
Drill or Wipe	Drill	Drill	Drill	Drill	Drill
Drill/Wipe Start Date and Time	09-May-14 06:00	10-May-14 20:37	13-May-14 19:30	14-May-14 08:30	19-May-14 09:00
Drill/Wipe End Date and Time	10-May-14 09:00	11-May-14 18:15	13-May-14 23:17	18-May-14 14:00	20-May-14 12:20
Min Inc (deg) @ Depth (MD, ft)	0.16 @ 1,299.00	0.25 @ 6,333.00	86.94 @ 8,111.00	87.26 @ 15,039.00	N/A @ N/A
Max Inc (deg) @ Depth (MD, ft)	13.38 @ 3,982.00	85.13 @ 7,887.00	90.06 @ 8,395.00	92.25 @ 12,880.00	N/A @ N/A
Bit TFA(in2) / Bit Type	0.97 / N/A	0.97 / N/A	1.36 / PDC	1.36 / PDC	1.36 / PDC
Flow Rate (gpm)	552.00	579.00	315.00	301.69	270.00
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A	N/A / N/A	N/A / N/A	N/A / N/A	N/A / N/A
Fluid Type	Native/Spud Mud	Native/Spud Mud	Polymer	Native/Spud Mud	Native/Spud Mud
Density (ppg) / Viscosity (spqt)	9.50 / 9.60	9.50 / 35.00	9.30 / 62.00	9.20 / 50.00	9.00 / 46.00
Filtrate CL (ppm)	1.20	1,900.00	69,000.00	1,500.00	1,500.00
pH / Fluid Loss (mptm)	9.30 / 5	9.20 / 1	8.20 / N/A	9.30 / N/A	9.30 / N/A
PV (cP) / YP (Ihf2)	49 / 17.00	8 / 6.00	14 / 25.00	18 / 19.00	13 / 17.00
% Solids / % Sand	7 / 0.7	5 / .35	8.1 / N/A	5.7 / N/A	5.3 / N/A
% Oil / Oil:Water Ratio	N/A / N/A	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	N/A @ N/A
Rmf @ Measured Temp (degF)	N/A @ N/A	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	N/A @ N/A
Max Tool Temp (deg F) / S	118.11 / PDM	178.87 / PDM	187.51 / PDM	200.00 / PDM	200.00 / PDM

Max Tool Temp (degF) / Source	149.14 / PCM	170.37 / PCM	197.51 / PCM	230.30 / PCM	236.82 / PCM
Rm @ Max Tool Temp (degF)	N/A @ 149.14	N/A @ 170.37	N/A @ 197.51	N/A @ 230.30	N/A @ 236.82
Lead MWD Engineer	Patrick Lane	Patrick Lane	Patrick Lane	Patrick Lane	Patrick Lane
Customer Representative	Rick Oman	Rick Oman	Rick Oman	Rick Oman	Rick Oman

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM	PCM	PCM	PCM
Software Version	5.84	5.84	5.84	5.84	5.76
Sub Serial Number	11342275	11342275	11768602	11768602	11768602
Insert Serial Number	11680880	11620312	11680880	11620312	11400901
Date and Time Initialized	07-May-14 23:48	10-May-14 09:51	11-May-14 18:29	14-May-14 01:46	18-May-14 15:39
Date and Time Read	01-Jan-70 00:00	01-Jan-70 00:00	01-Jan-70 00:00	01-Jan-70 00:00	01-Jan-70 00:00
ECMB SW Version	N/A	N/A	N/A	N/A	N/A

Directional Sensor Information

Tool Type	PCDC	PCDC	PCDC	PCDC	PCDC
Distance From Bit (ft)	51.00	47.00	47.00	47.00	50.00
Software Version	6.21	6.21	6.21	6.21	6.21
Sub Serial Number	11342275	11342275	123	11768602	11768602
Sonde Serial Number	11638602	12177629	11478054	12177629	11833231
Sensor ID Number	N/A	N/A	N/A	N/A	N/A
Toolface Offset (deg)	160.00	339.23	293.01	293.01	63.53

Gamma Ray Sensor Information

Tool Type	PCG	PCG	PCG	PCG	PCG
Distance From Bit (ft)	54.12	49.59	49.64	49.64	53.29
Recorded Sample Period (sec)	10	10	10	10	10
Software Version	8.15	8.15	8.15	8.15	8.15
Sub Serial Number	11342275	11342275	11768602	11768602	11768602
Insert/Sonde Serial Number	11680942	12037422	11680942	12037422	12037424

WELL INFORMATION

MWD Run Number	600	700			
Date run completed	23-May-14	28-May-14			
Rig Bit Number	600	700			
Bit Size (in)	6.125	6.125			
Tool Nominal OD (in)	4.750	4.750			
Log Start Depth (MD, ft)	16,880.00	17,912.00			
Log End Depth (MD, ft)	17,912.00	18,522.00			
Drill or Wipe	Drill	Drill			
Drill/Wipe Start Date and Time	21-May-14 06:50	26-May-14 14:40			
Drill/Wipe End Date and Time	22-May-14 10:31	27-May-14 05:00			
Min Inc (deg) @ Depth (MD, ft)	89.35 @ 17,582.00	91.48 @ 17,958.00			
Max Inc (deg) @ Depth (MD, ft)	92.22 @ 17,298.00	93.21 @ 18,240.00			
Bit TFA(in2) / Bit Type	1.36 / PDC	1.36 / N/A			
Flow Rate (gpm)	270.00	250.00			
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A	N/A / N/A			
Fluid Type	Native/Spud Mud	Native/Spud Mud			
Density (ppg) / Viscosity (spqt)	9.30 / 44.00	10.00 / 44.00			
Filtrate CL (ppm)	1,400.00	1,400.00			
pH / Fluid Loss (mptm)	9.50 / N/A	9.50 / N/A			
PV (cP) / YP (lbf2)	13 / 29.00	13 / 29.00			
% Solids / % Sand	6.2 / 0.15	6.3 / 0.15			
% Oil / Oil:Water Ratio	N/A / N/A	N/A / N/A			

Rm @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
Rmf @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
Rmc @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
Max Tool Temp (degF) / Source	236.82 / PCM	239.54 / PCM			
Rm @ Max Tool Temp (degF)	N/A @ 236.82	N/A @ 239.54			
Lead MWD Engineer	Patrick Lane	Jonathan Parrish			
Customer Representative	Rick Oman	Rick Oman			

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.76	5.76			
Sub Serial Number	11768602	11768602			
Insert Serial Number	11400901	11620312			
Date and Time Initialized	01-Jan-70 00:00	23-May-14 15:49			
Date and Time Read	01-Jan-70 00:00	01-Jan-70 00:00			
ECMB SW Version	N/A	N/A			

Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	51.00	51.00			
Software Version	6.21	6.21			
Sub Serial Number	11768602	11768602			
Sonde Serial Number	11833231	12177629			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	306.56	237.98			

Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	53.57	53.72			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	11768602	11768602			
Insert/Sonde Serial Number	12037424	12037422			

REMARKS

1. All depths are measured depths referenced to the Driller's pipe tally and are measured from the Drill Floor, unless otherwise specified.

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

3. All data presented is recorded data unless otherwise specified

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

PGRC (Corrected Gamma Ray):

Interval Resolution: 0.5 ft

Interval Distance: 0.6 ft

Gap Fill: 3.0 ft

ROPA (Average Rate of Penetration):

Interval Resolution: 0.5 ft

Interval Distance: 1.2 ft

Gap Fill : 3.0 ft

5. INSITE version 2.0.20

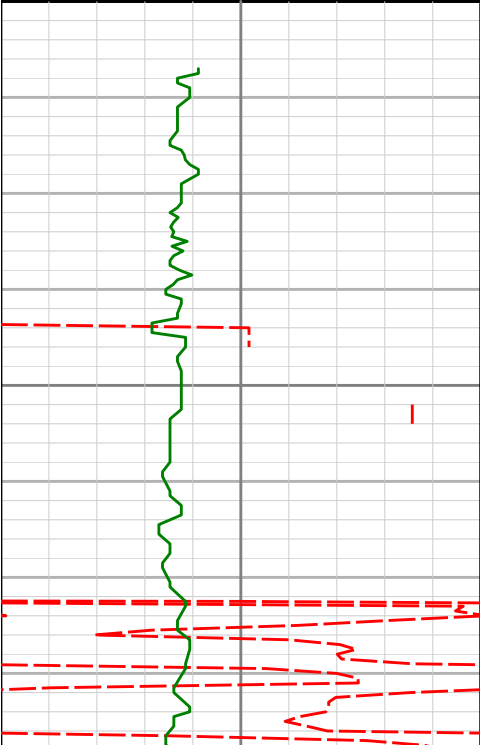
6. Run 500 - No footage was drilled, motor locked up while washing to bottom.

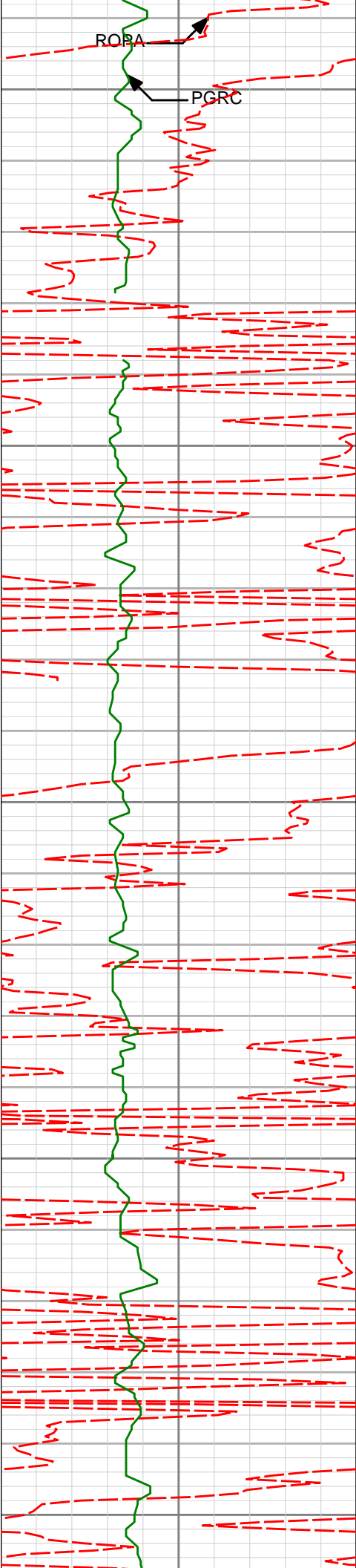
WARRANTY

HALLIBURTON WILL USE ITS BEST EFFORTS TO FURNISH CUSTOMERS WITH ACCURATE INFORMATION AND INTERPRETATIONS THAT ARE PART OF, AND INCIDENT TO, THE SERVICES PROVIDED. HOWEVER, HALLIBURTON CANNOT AND DOES NOT WARRANT THE ACCURACY OR CORRECTNESS OF SUCH INFORMATION AND INTERPRETATIONS. UNDER NO CIRCUMSTANCES SHOULD ANY SUCH INFORMATION OR INTERPRETATION BE RELIED UPON AS THE SOLE BASIS FOR ANY DRILLING, COMPLETION, PRODUCTION, OR FINANCIAL DECISION OR ANY PROCEDURE INVOLVING ANY RISK TO THE SAFETY OF ANY DRILLING VENTURE, DRILLING RIG OR ITS CREW OR ANY OTHER THIRD PARTY. THE CUSTOMER HAS FULL RESPONSIBILITY FOR ALL DRILLING, COMPLETION AND PRODUCTION OPERATION. HALLIBURTON MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WITH RESPECT TO THE SERVICES RENDERED. IN NO EVENT WILL HALLIBURTON BE LIABLE FOR FAILURE TO OBTAIN ANY PARTICULAR RESULTS OR FOR ANY DAMAGES, INCLUDING, BUT NOT LIMITED TO, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES, RESULTING FROM THE USE OF ANY INFORMATION OR INTERPRETATION PROVIDED BY HALLIBURTON.

HALLIBURTON

1:240 MD Detail Log

PCG GR XHi-Range RT BCor (PGRC) api					
0	300				
Avg Rate of Penetration (ROPA) feet per hr		MD ft			
500	0		Depth	Inc	Azi
			TVD	V/S	
		<Run 100>			
		1400	1394'	0.39°	263.11°
			1393.96'	5.69'	



1450

1491'

0.55°

226.75°

1490.95'

5.33'

1500

1550

1583'

0.55°

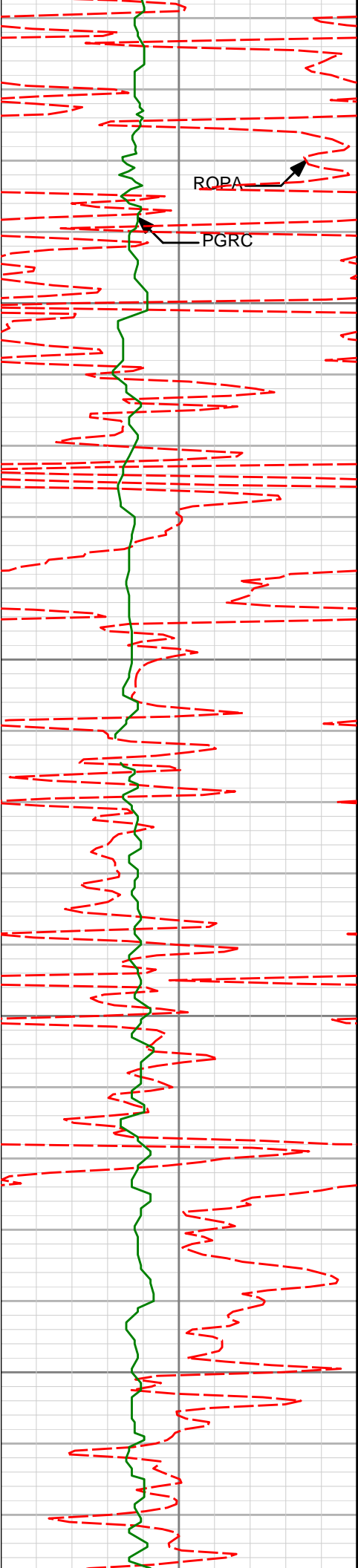
262.00°

1582.95'

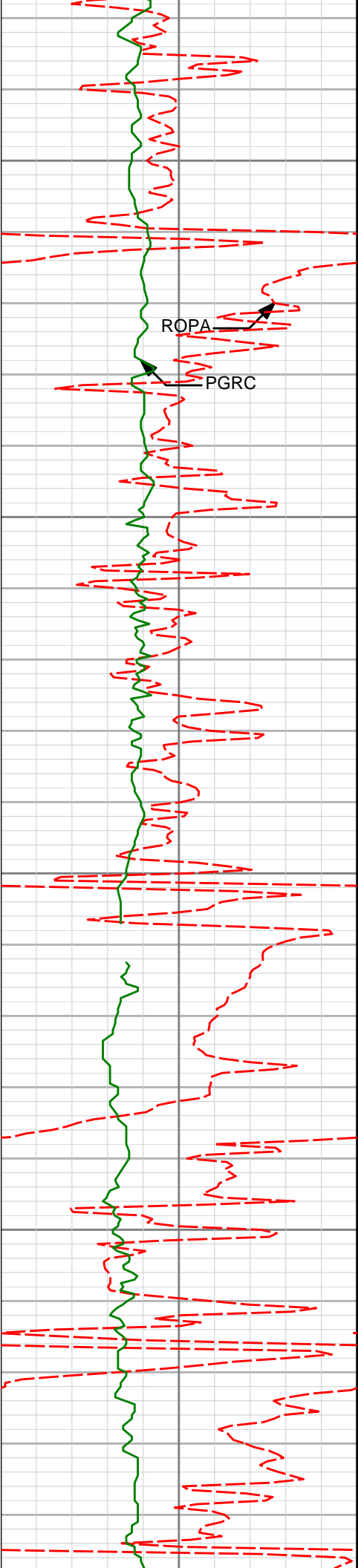
4.96'

1600

1650



1675'	0.33°	277.03°	1674.95'	4.92'
1700				
1750				
1768'	0.53°	243.99°	1767.94'	4.76'
1800				
1850				
1860'	0.48°	239.12°	1859.94'	4.38'



1900

1950

2000

2050

ROPa

PGRC

1952'

0.48°

268.80°

1951.94'

4.16'

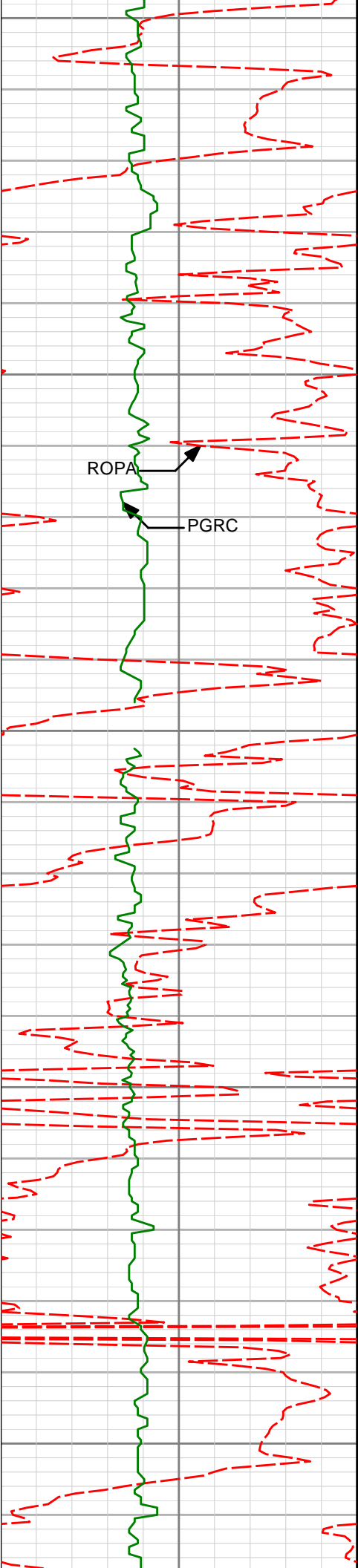
2046'

3.43°

281.32°

2045.87'

4.69'



2100

2139'

5.21°

276.99°

2138.60'

5.71'

2150

ROPA

PGRC

2200

2230'

4.48°

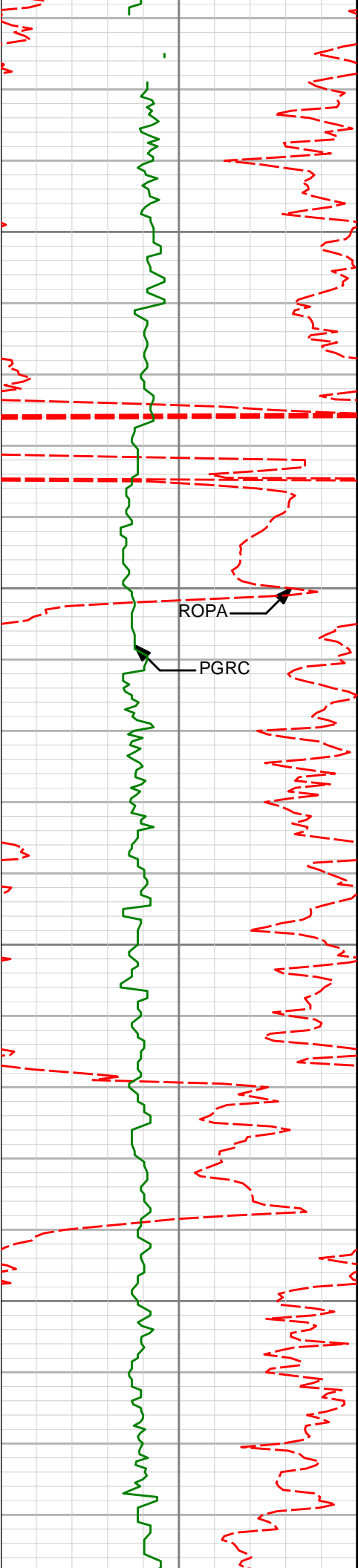
280.08°

2229.28'

6.79'

2250

2300



2350

2400

2450

2500

2321'

4.97°

271.12°

2319.97'

7.44'

2414'

7.41°

266.93°

2412.42'

7.14'

2507'

8.70°

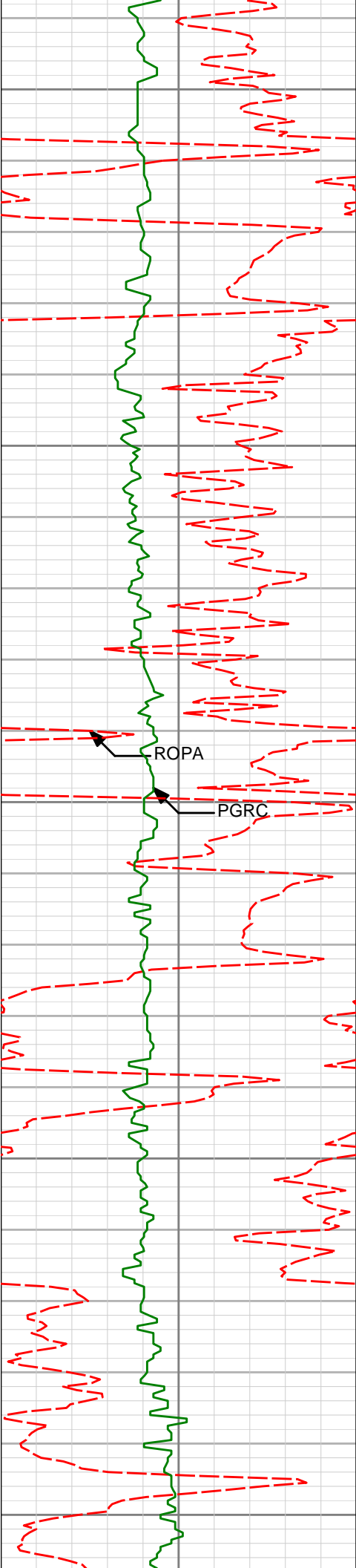
258.03°

2504.51'

5.29'

ROPa

PGRC



2550

2600

2650

2700

2750

2599'

9.59°

262.82°

2595.34'

2.80'

2690'

10.62°

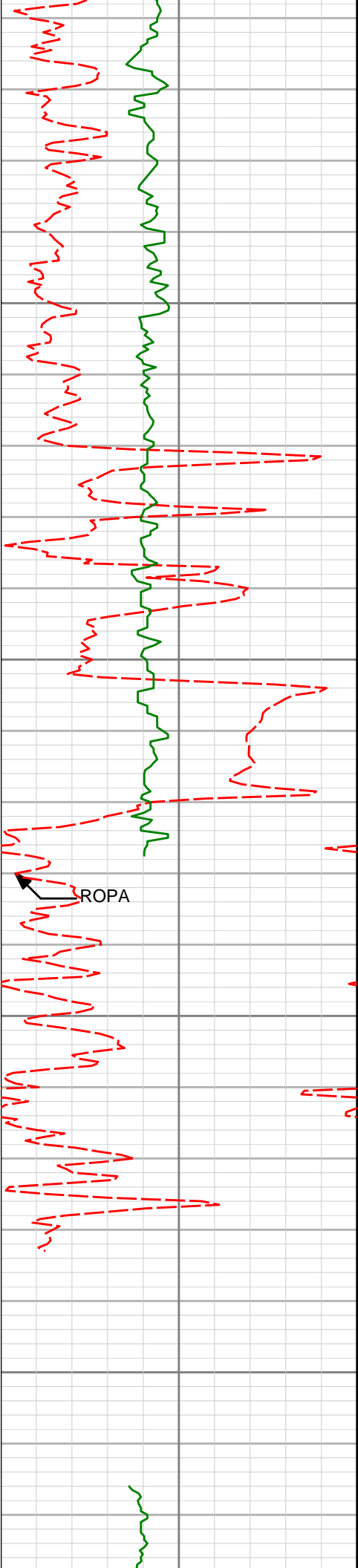
267.67°

2684.93'

1.42'

ROPA

PGRC



2783'

9.17°

266.70°

2776.54'

0.55'

2800

2850

2875'

10.54°

271.87°

2867.18'

0.31'

2900

2950

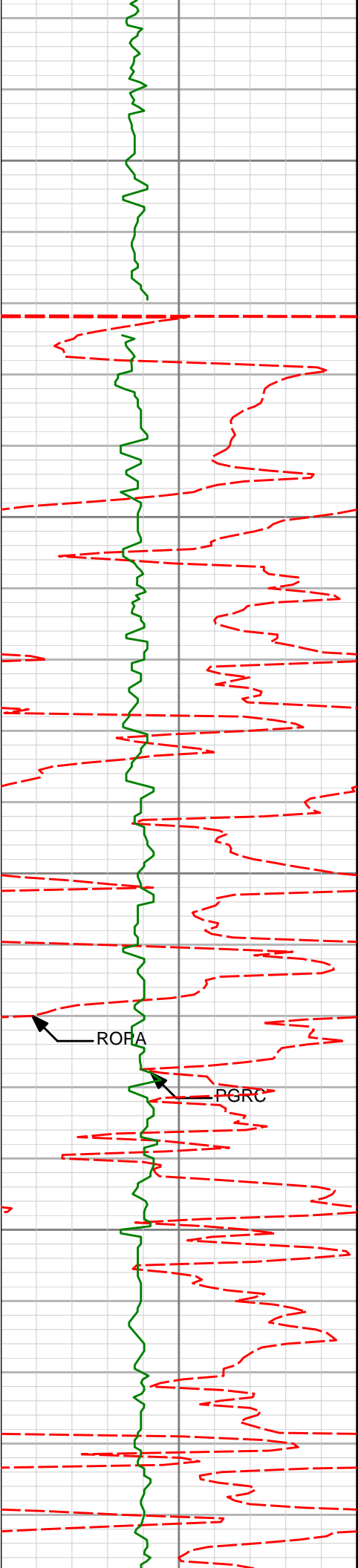
2967'

9.69°

268.60°

2957.75'

0.30'



3000

3050

3100

3150

3060'

3153'

10.99°

10.09°

273.30°

271.10°

3049.24'

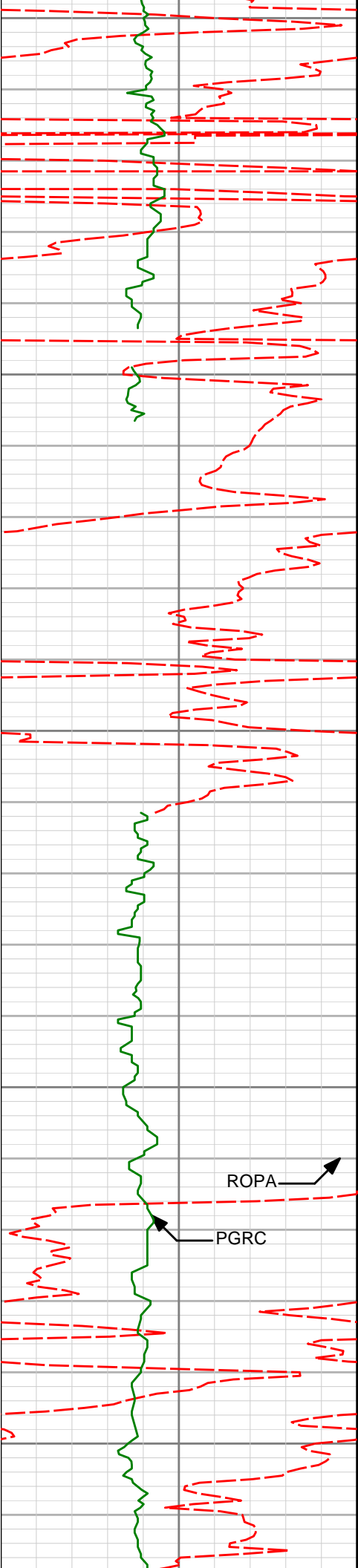
3140.67'

0.52'

1.08'

ROFA

PGRC



3200

3246'

8.40°

269.74°

3232.46'

1.12'

3250

3300

3339'

9.87°

273.69°

3324.28'

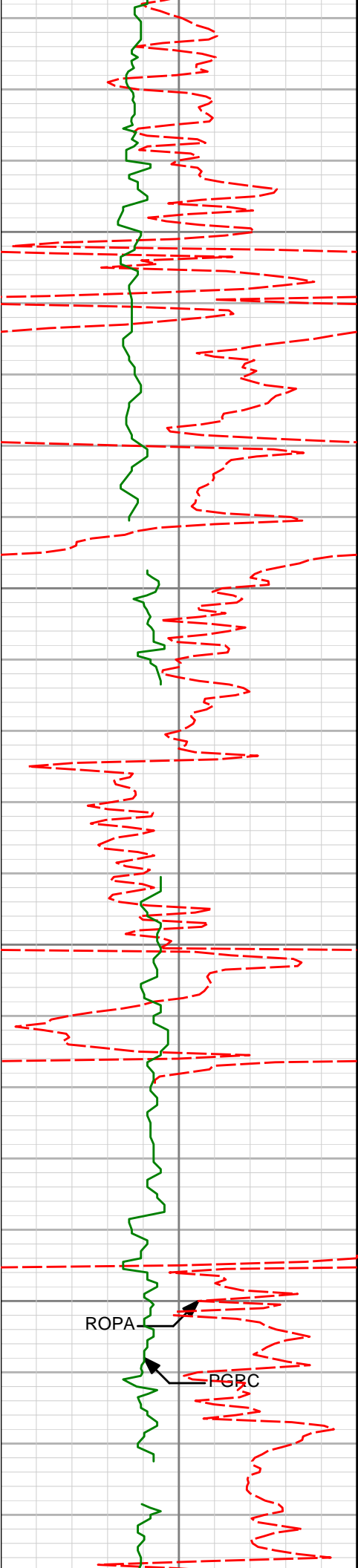
1.51'

3350

ROPA

PGRC

3400



3431'

9.18°

272.65°

3415.01'

2.27'

3450

3500

3523'

10.98°

281.12°

3505.59'

4.20'

3550

3600

ROPA

PGRC

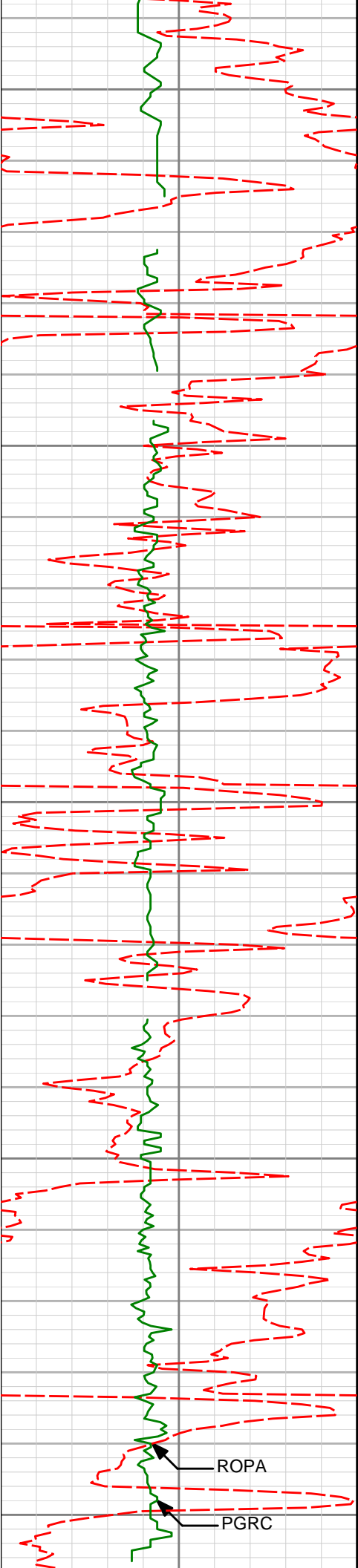
3615'

9.53°

278.70°

3596.12'

6.95'



3650

3700

3750

3800

3850

3706'

8.89°

278.36°

3685.95'

9.03'

3798'

8.61°

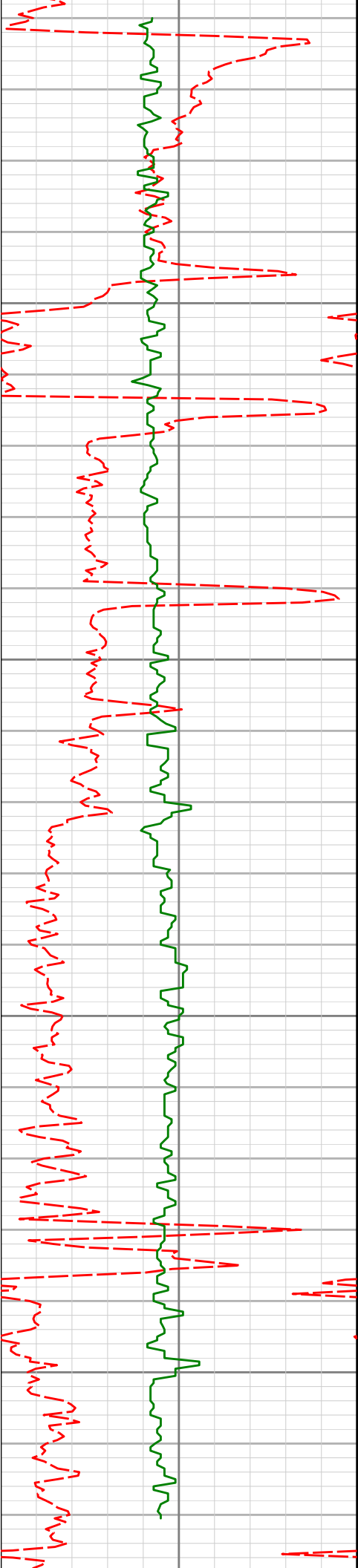
285.10°

3776.88'

11.77'

ROPA

PGRC



3900

3950

4000

4050

3890'

13.06°

297.19°

3867.23'

18.23'

3982'

13.38°

292.94°

3956.79'

27.01'

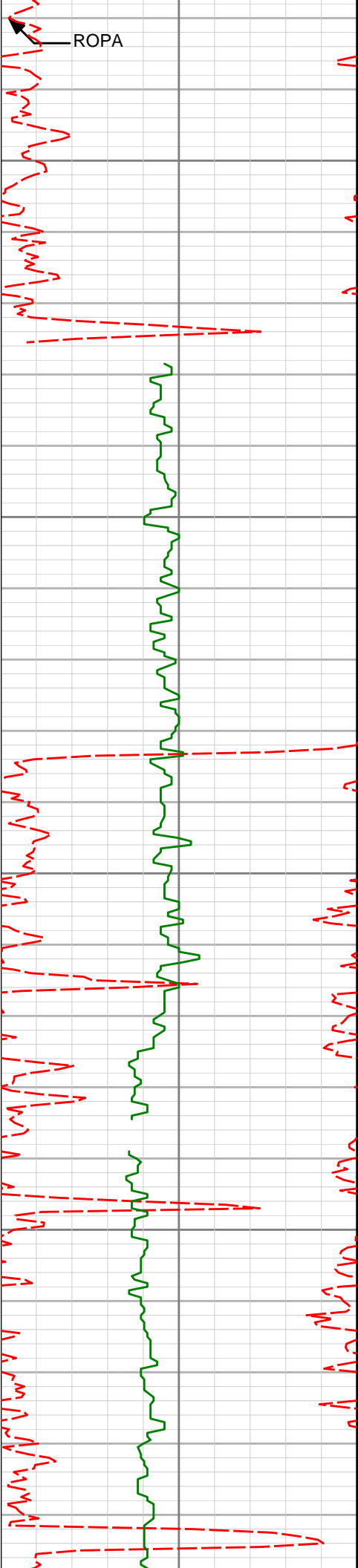
4073'

11.59°

289.75°

4045.64'

34.10'



4100

4150

4200

4250

4165'

10.73°

285.47°

4135.90'

39.40'

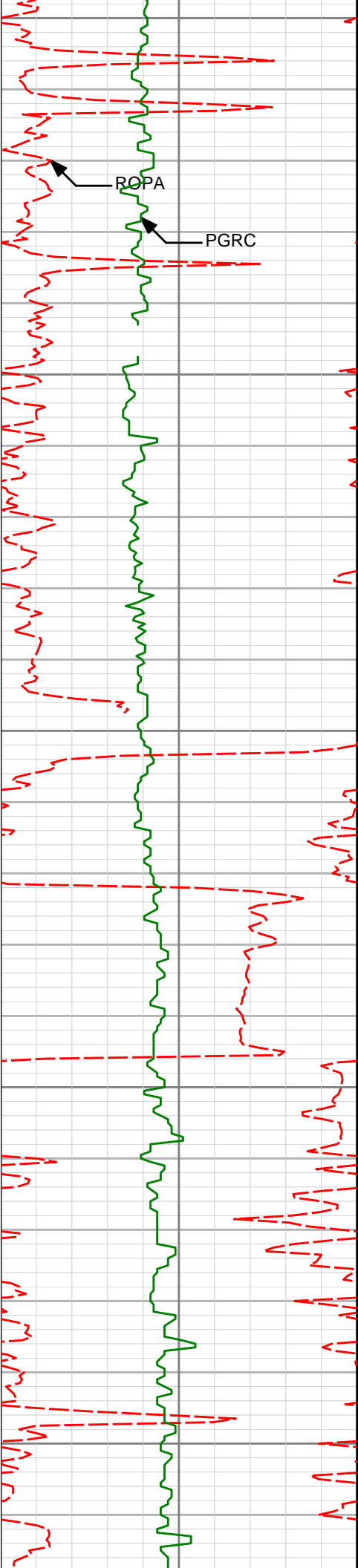
4257'

10.02°

284.11°

4226.39'

43.54'



4300

ROPA

PGRC

4350

4352'

9.28°

281.83°

4320.05'

47.04'

4400

4450

4446'

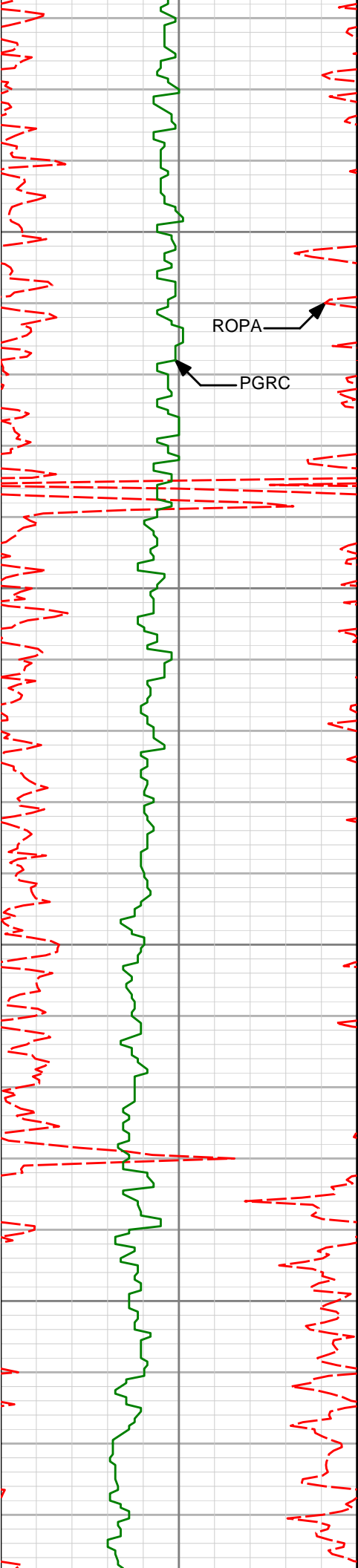
10.18°

271.17°

4412.70'

48.67'

4500



4540'

9.97°

269.56°

4505.25'

48.68'

4550

ROPA

PGRC

4600

4635'

8.24°

269.53°

4599.05'

48.47'

4650

4700

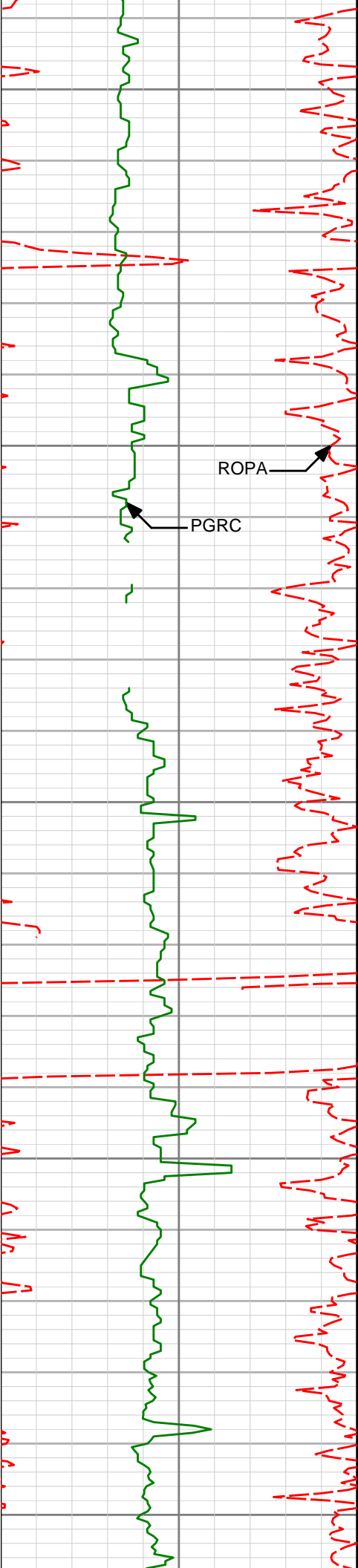
4729'

7.28°

265.40°

4692.19'

47.86'



4750

4800

4850

4900

4950

ROPA

PGRC

4824'

6.83°

266.16°

4786.47'

46.93'

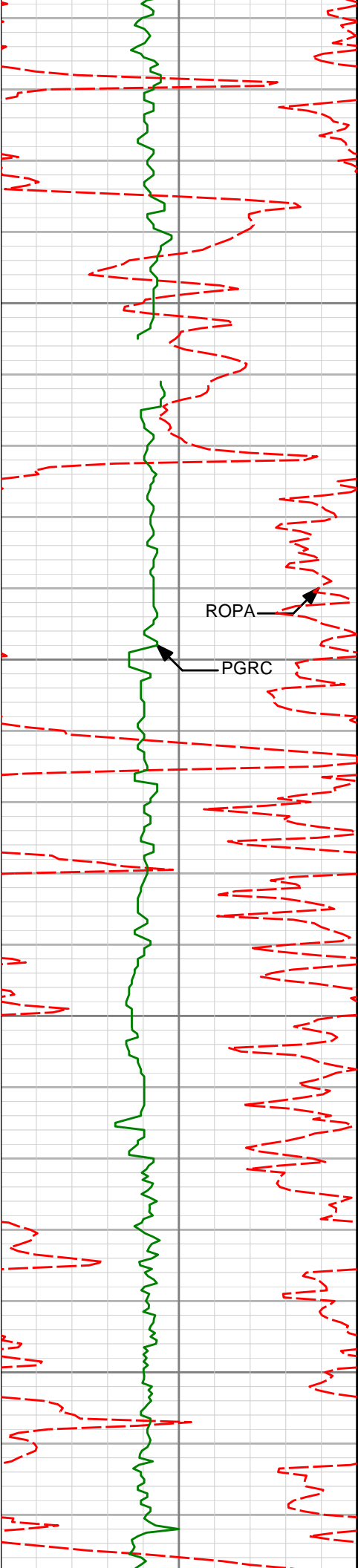
4918'

6.64°

263.82°

4879.82'

45.91'



5000

5012'

6.19°

269.20°

4973.24'

45.19'

5050

ROPA

PGRC

5100

5107'

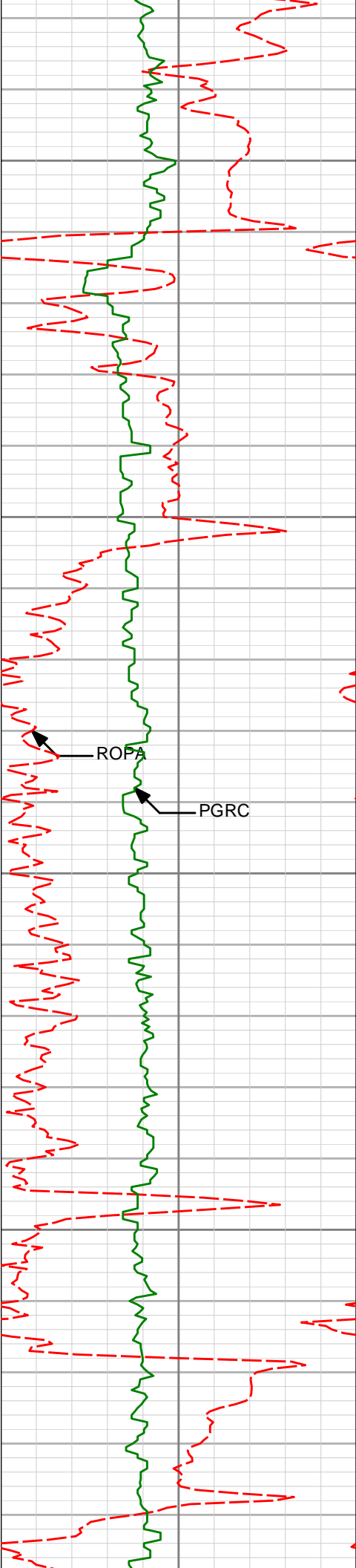
5.61°

261.56°

5067.73'

44.38'

5150



5200

5201'

4.32°

258.96°

5161.38'

42.98'

5250

5300

5350

5296'

4.40°

253.37°

5256.10'

41.21'

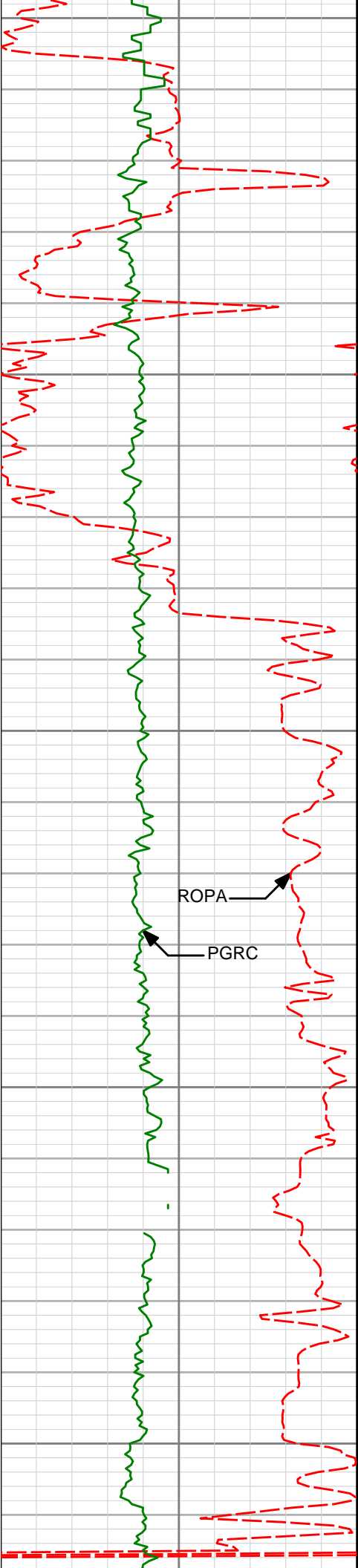
5390'

4.17°

230.79°

5349.85'

37.98'



5400

5450

5500

5550

5600

5484'

3.59°

228.01°

5443.63'

33.82'

ROPA

PGRC

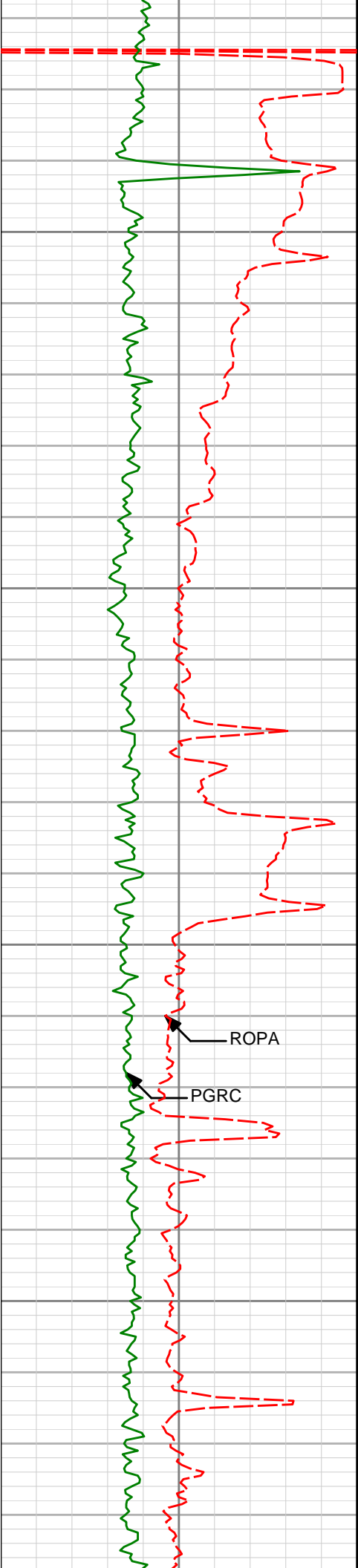
5579'

3.52°

221.10°

5538.45'

29.61'



<Run 200>

5650

5673'

1.37°

216.18°

5632.36'

26.51'

5700

5750

ROPA

PGRC

5767'

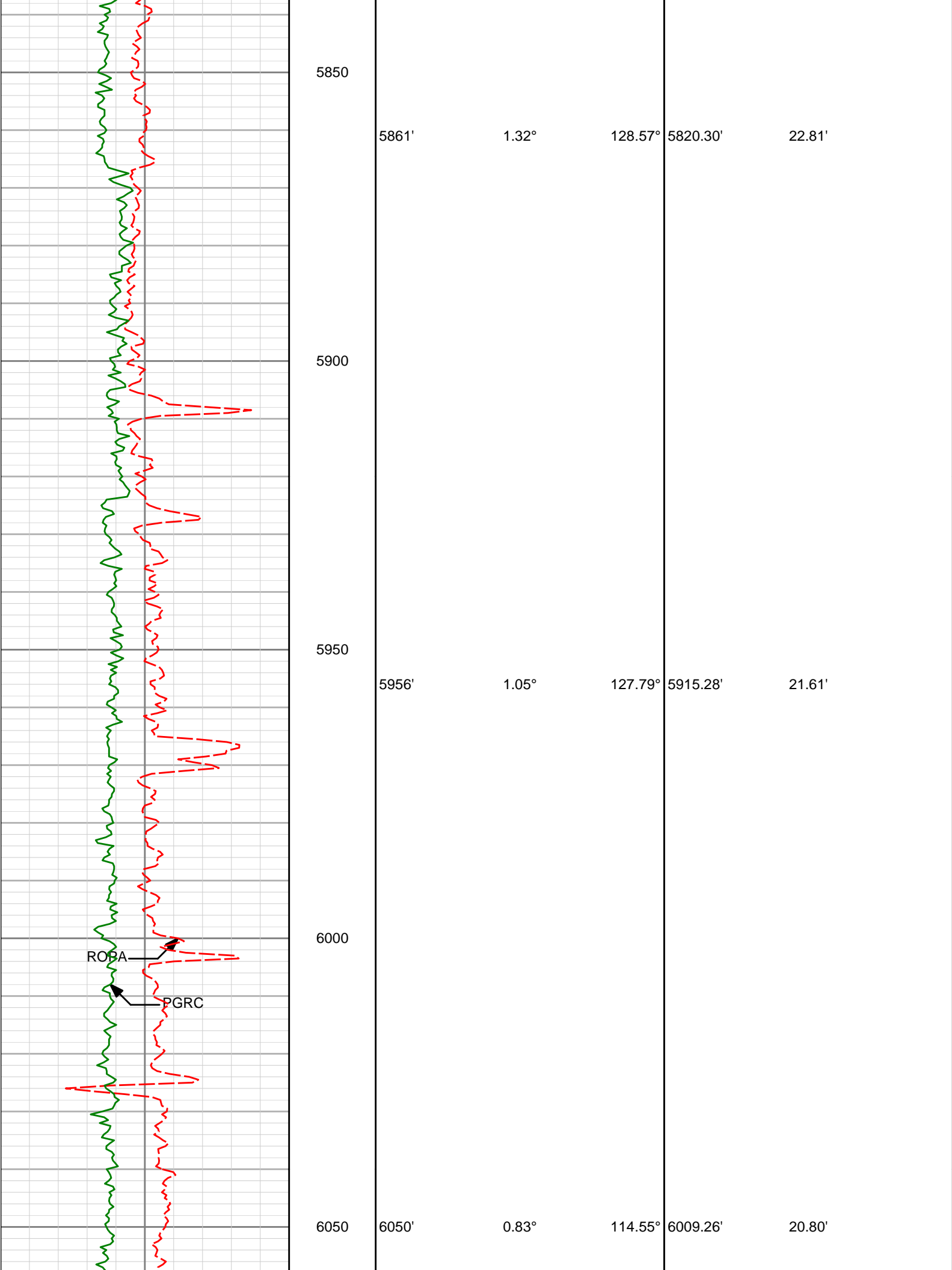
1.85°

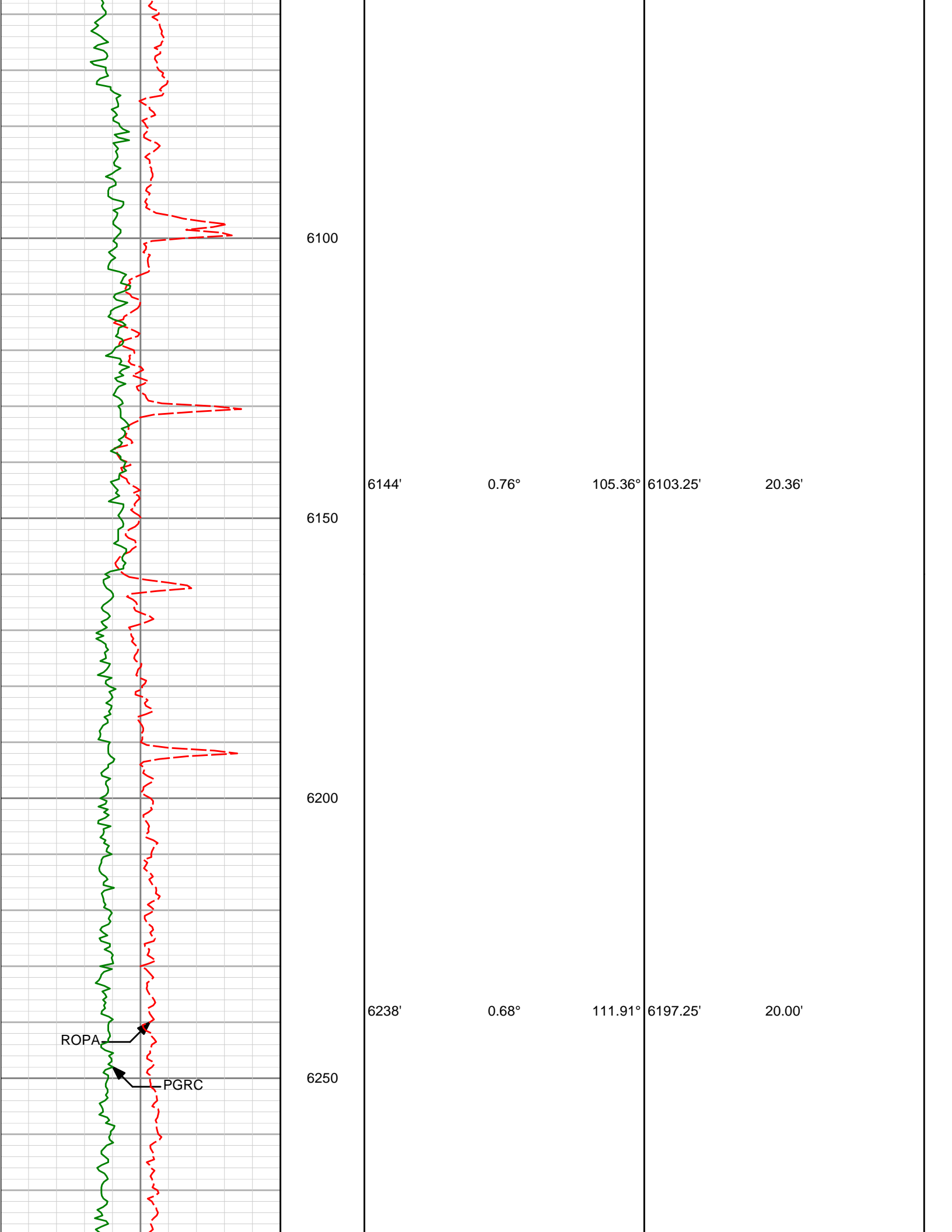
134.57°

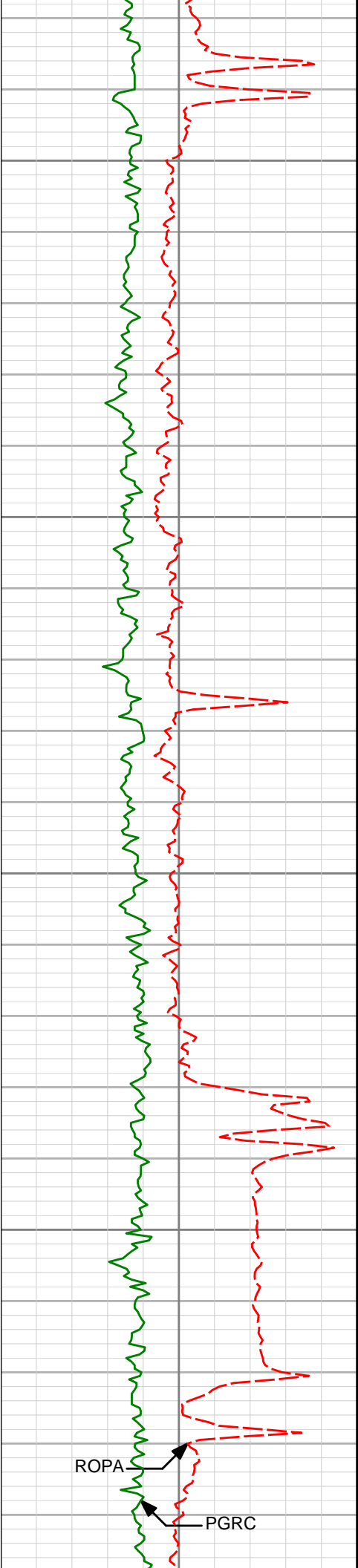
5726.33'

24.54'

5800







6300

6350

6400

6450

6333'

0.25°

75.75°

6292.24'

19.84'

6427'

0.74°

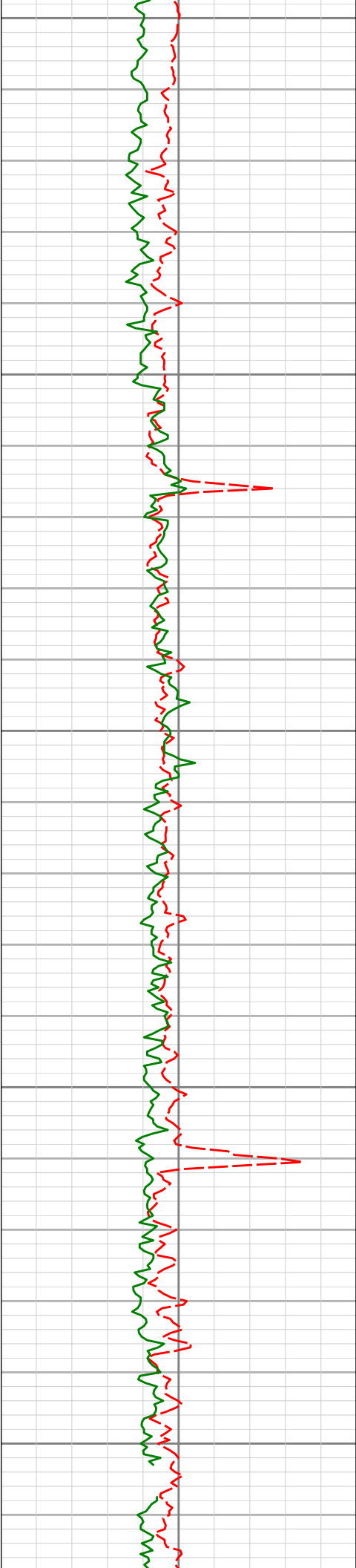
6.54°

6386.24'

20.50'

ROPA

PGRC



6500

6522'

0.75°

355.53°

6481.23'

21.73'

6550

6600

6616'

0.63°

307.75°

6575.23'

22.65'

6650

6700

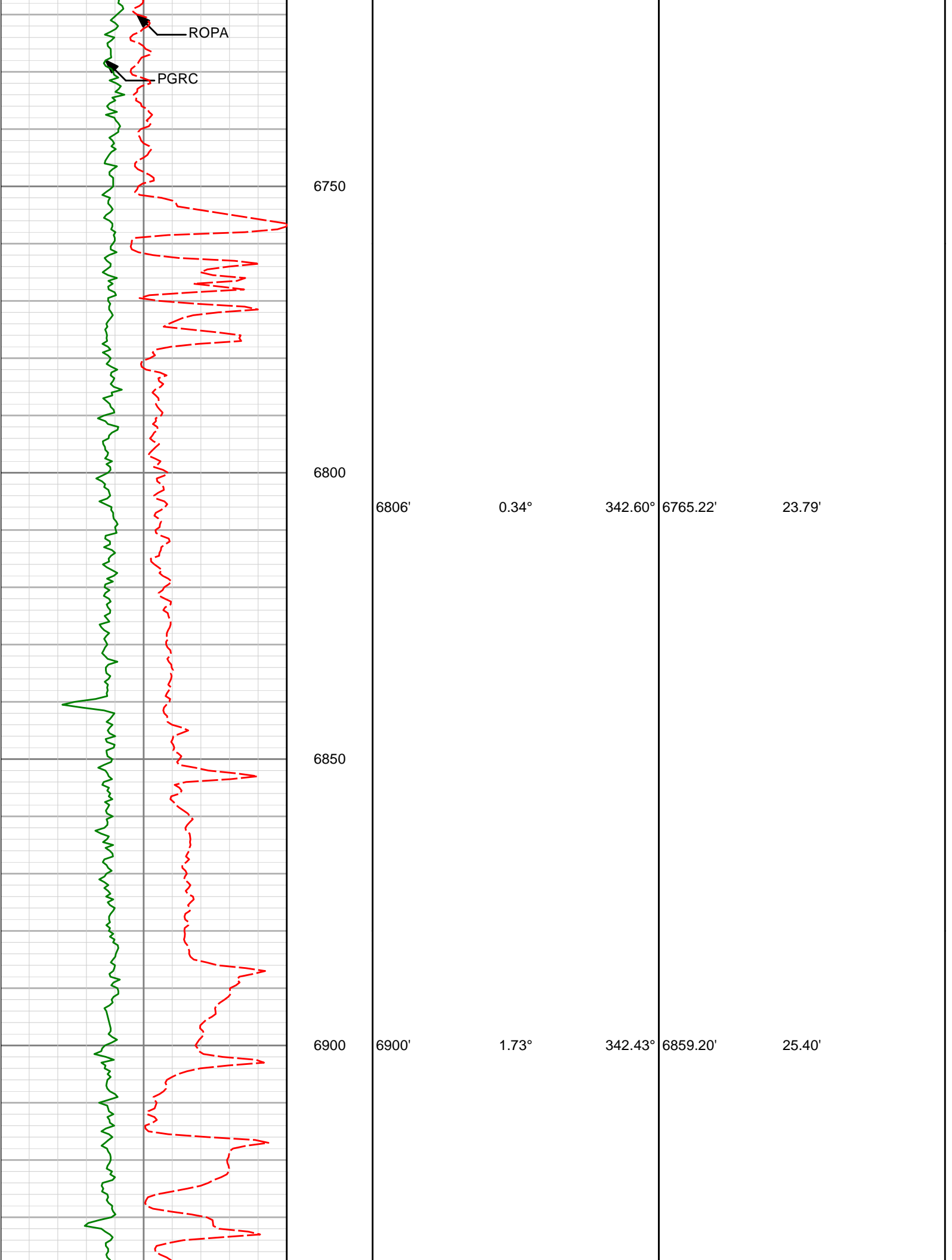
6711'

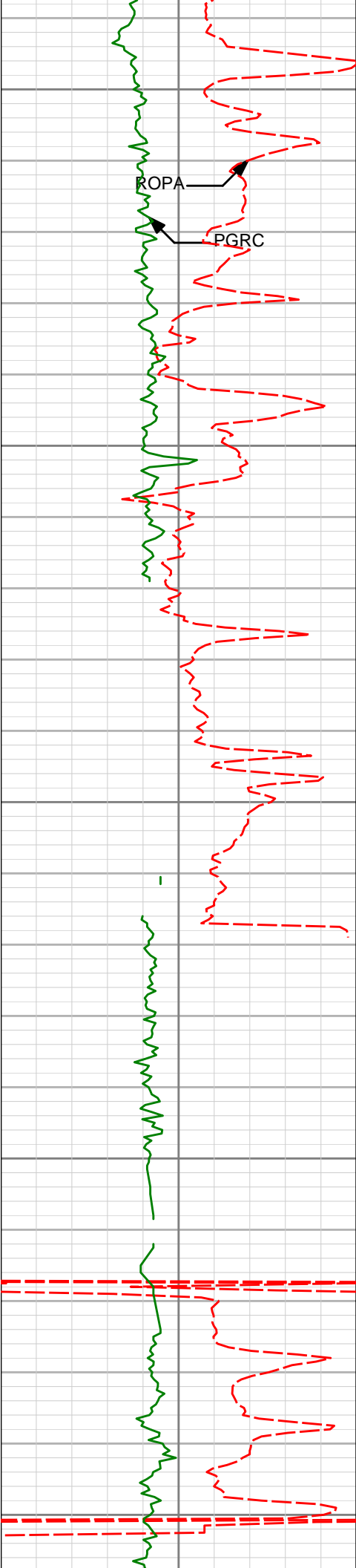
0.51°

310.62°

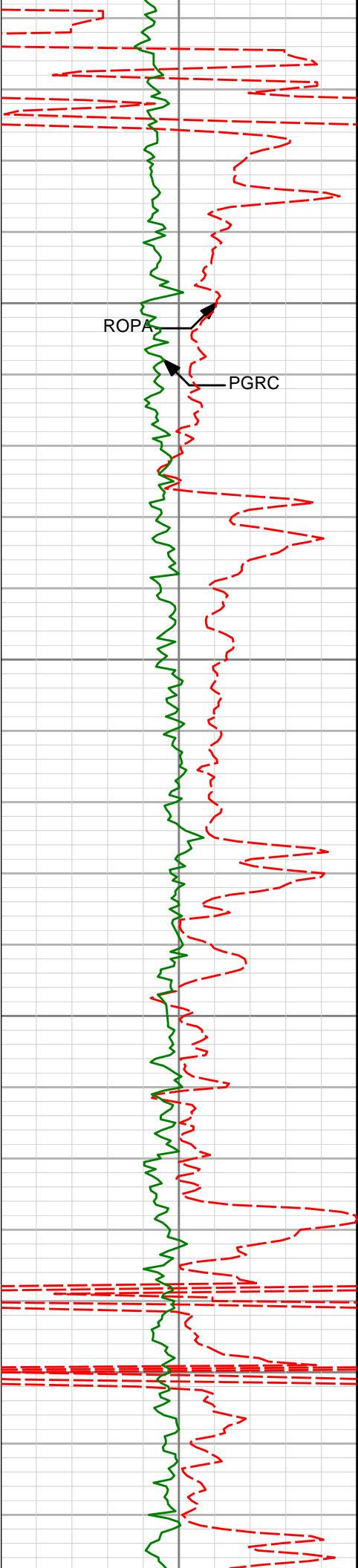
6670.22'

23.24'

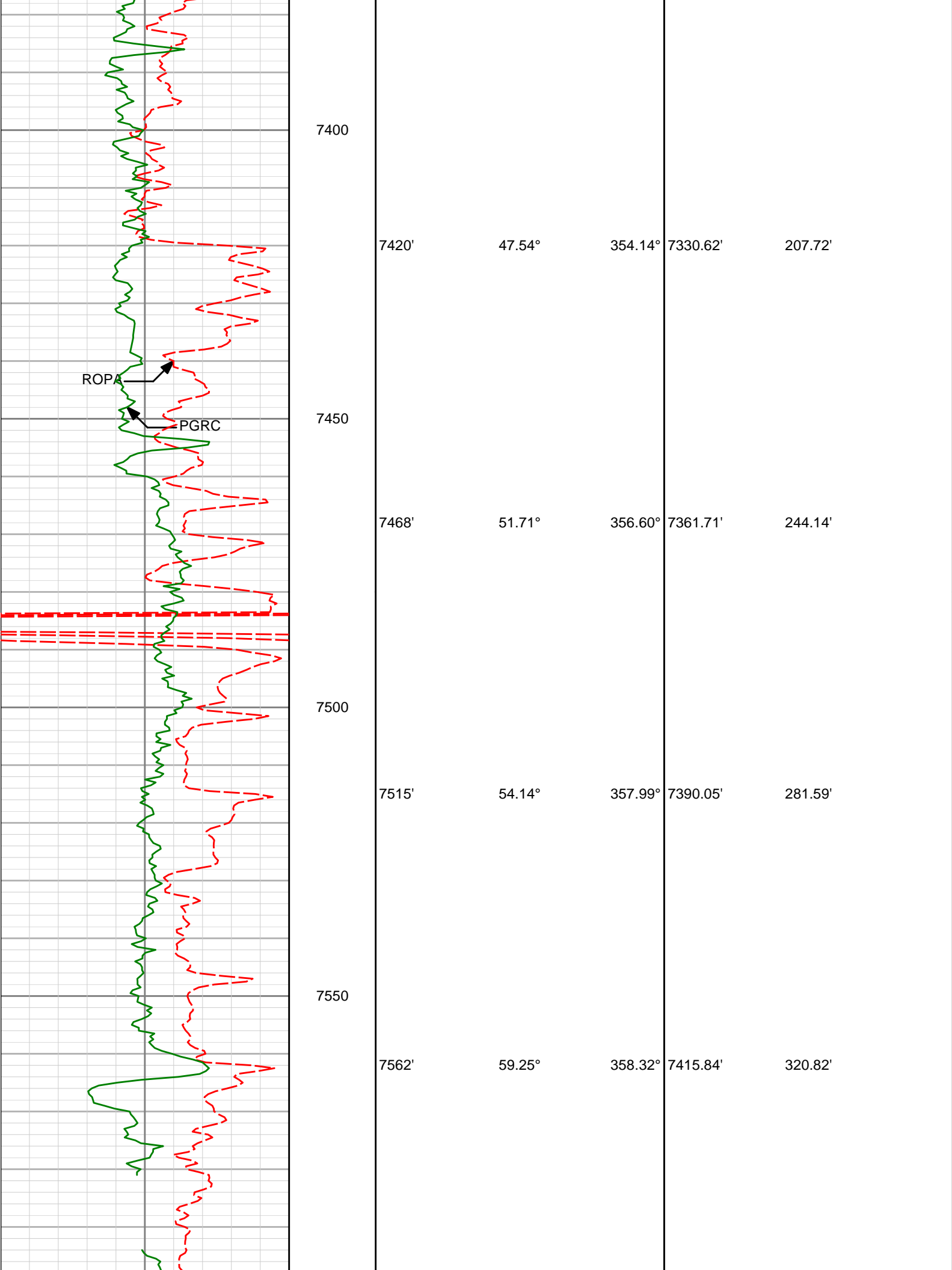


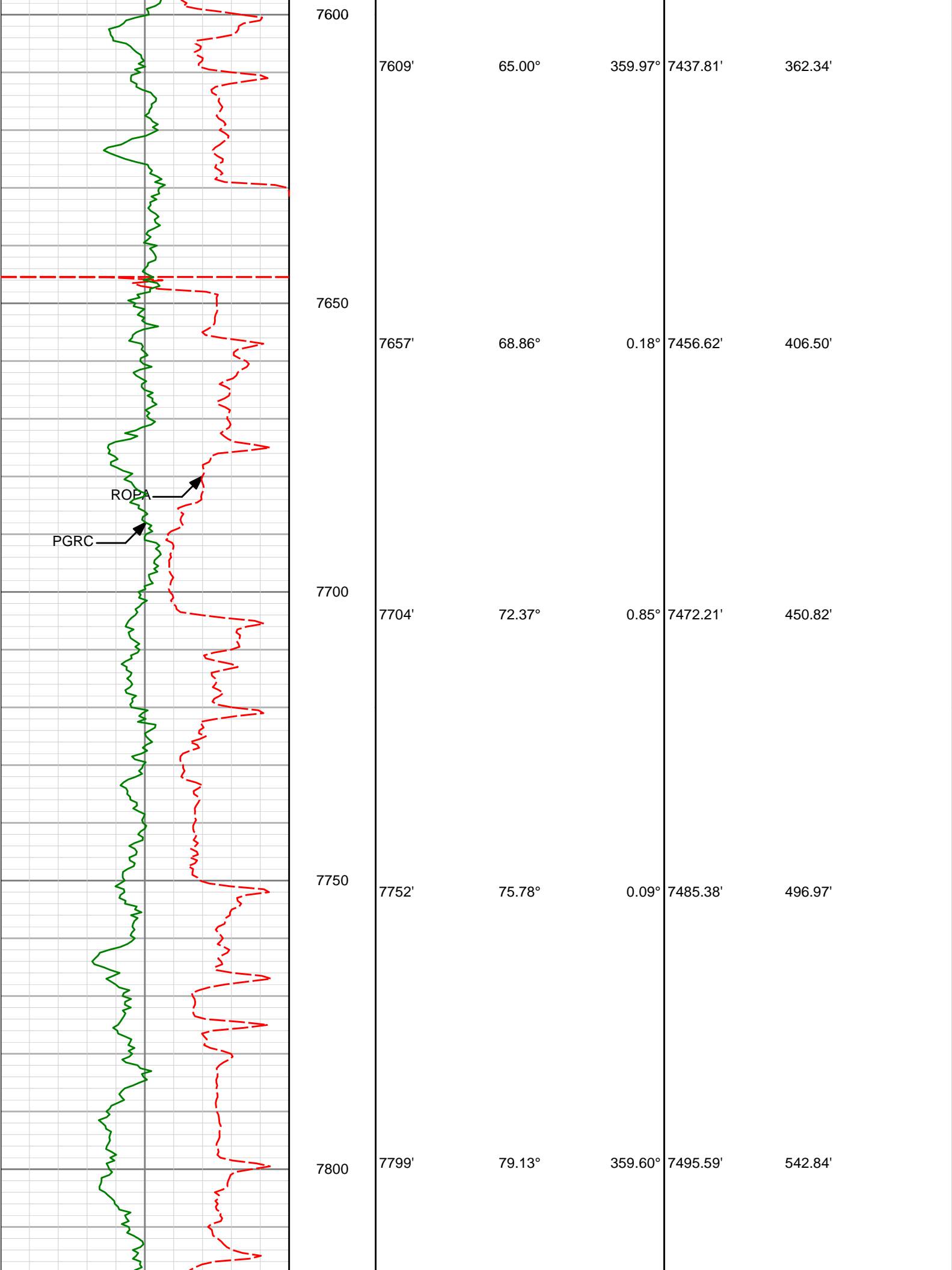


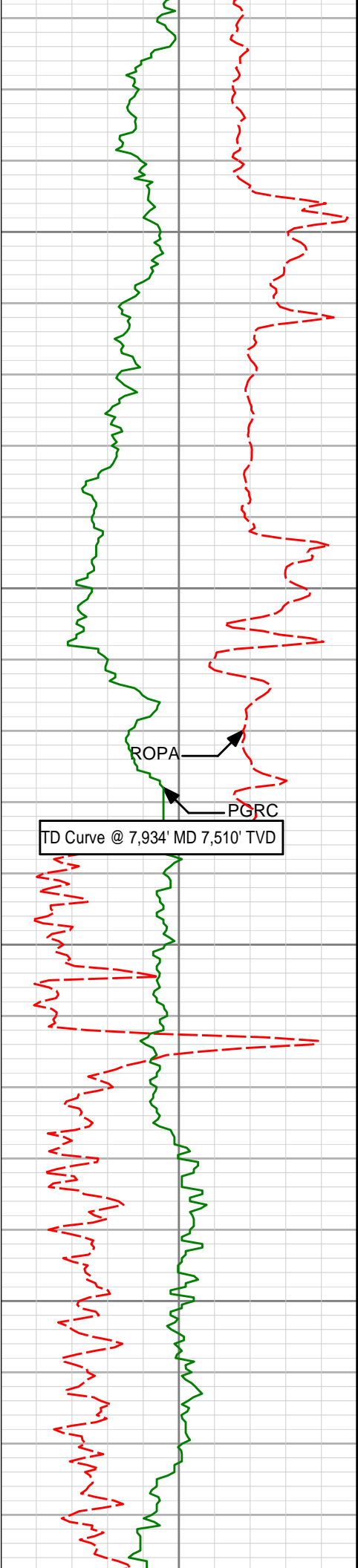
6950	6947'	3.81°	347.62°	6906.14'	27.60'
7000	6995'	6.53°	355.29°	6953.94'	31.88'
7050	7042'	9.28°	356.04°	7000.49'	38.32'
7100	7089'	14.08°	354.85°	7046.51'	47.79'
7150	7136'	18.16°	358.51°	7091.65'	60.81'



7184'	21.92°	357.39°	7136.74'	77.24'
7200				
7231'	26.25°	1.70°	7179.64'	96.40'
7250				
7279'	31.05°	0.01°	7221.75'	119.41'
7300				
7326'	36.47°	356.08°	7260.81'	145.48'
7350				
7373'	41.90°	351.57°	7297.24'	174.95'







7846'	82.49°	359.69°	7503.10'	589.23'
7850				

7887'	85.13°	357.61°	7507.52'	629.97'
7900				

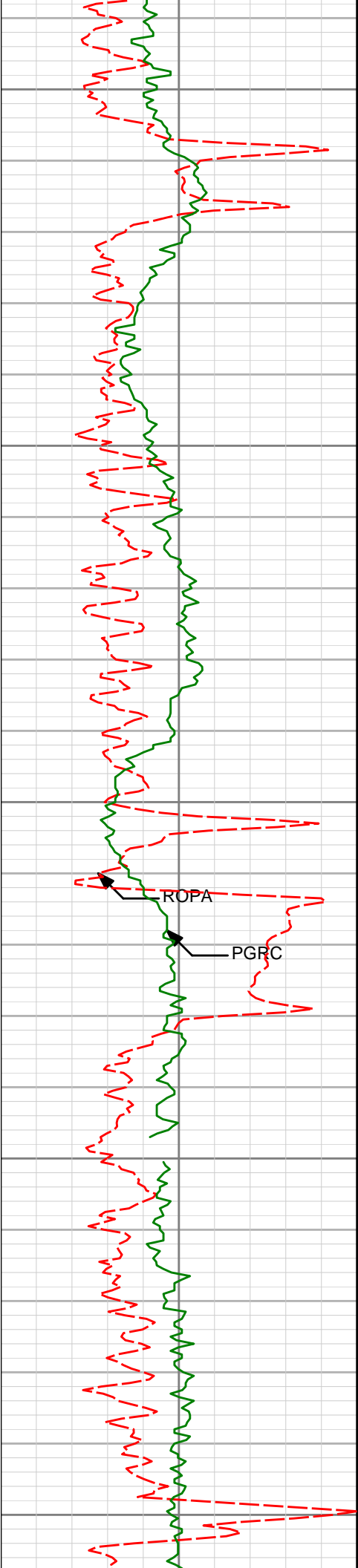
ROP
PGRC

Casing Set @
7,924' MD

<Run 300>

7950

8000



8050

8100

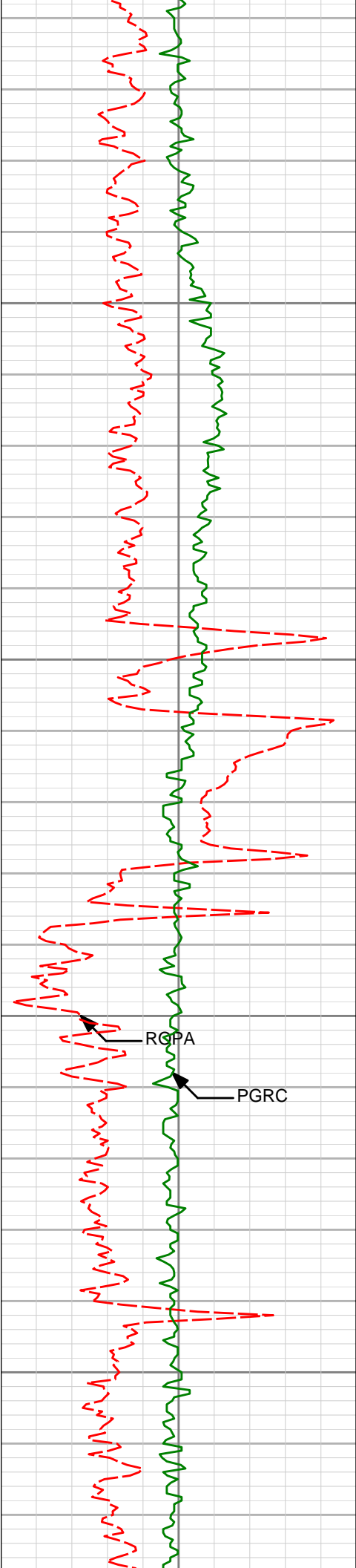
8150

8200

8250

ROPA

PGRC



8300

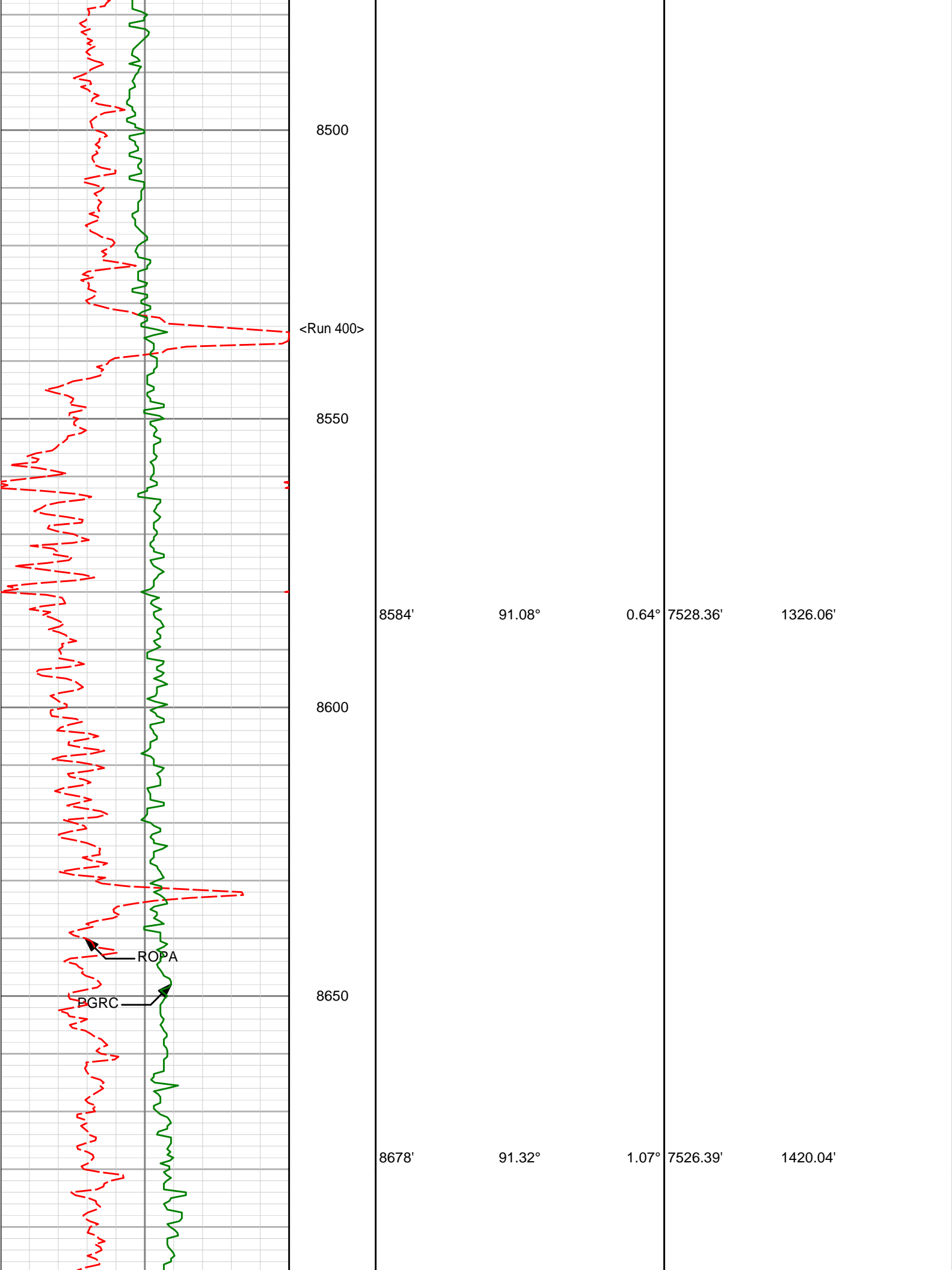
8350

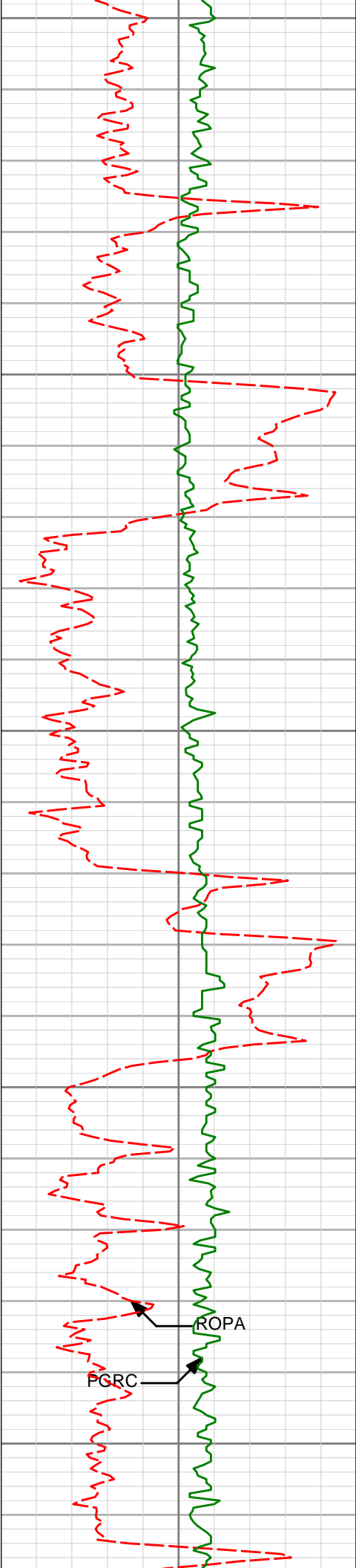
8400

8450

RGPA

PGRC





8700

8750

8800

8850

8900

8773'

90.15°

0.07°

7525.18'

1515.02'

8867'

89.67°

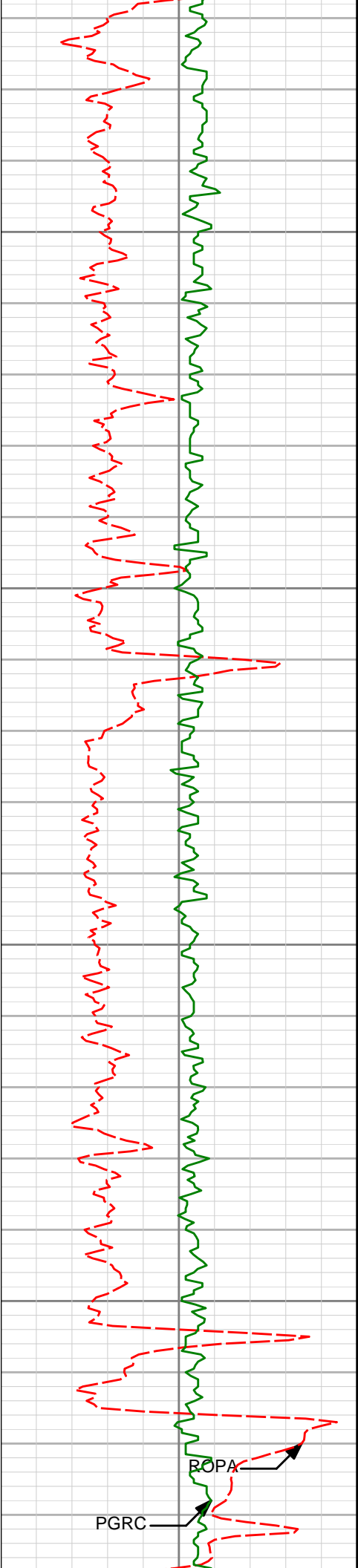
358.08°

7525.32'

1609.00'

ROPA

PGRC



8950

8962'

89.85°

358.45°

7525.72'

1703.93'

9000

9050

9057'

90.25°

359.07°

7525.64'

1798.90'

9100

PGRC

ROPA



9150

9152'

90.68°

358.33°

7524.87'

1893.85'

9200

9250

9247'

90.25°

357.10°

7524.10'

1988.75'

9300

9350

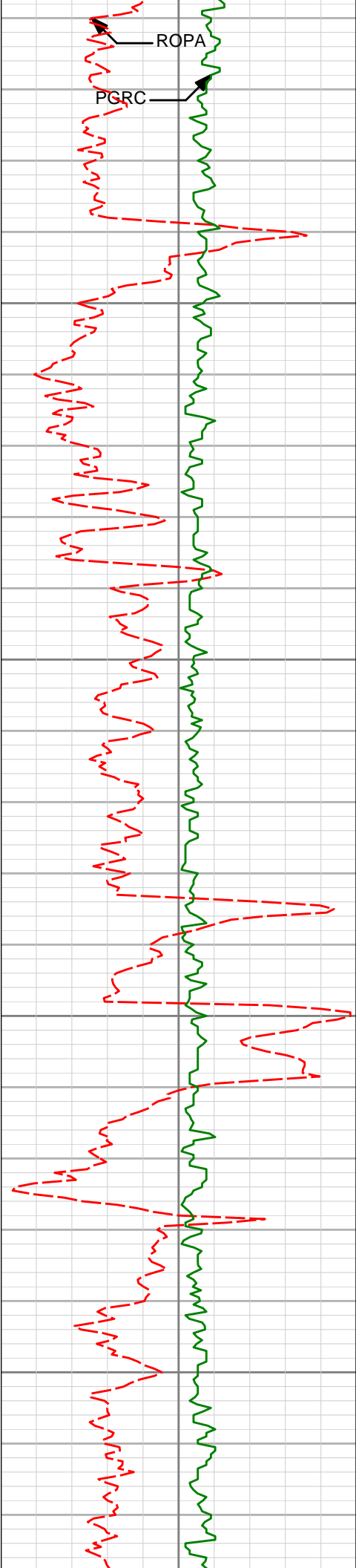
9341'

89.75°

356.86°

7524.10'

2082.59'



9400

9450

9500

9550

9436'

89.88°

357.13°

7524.40'

2177.42'

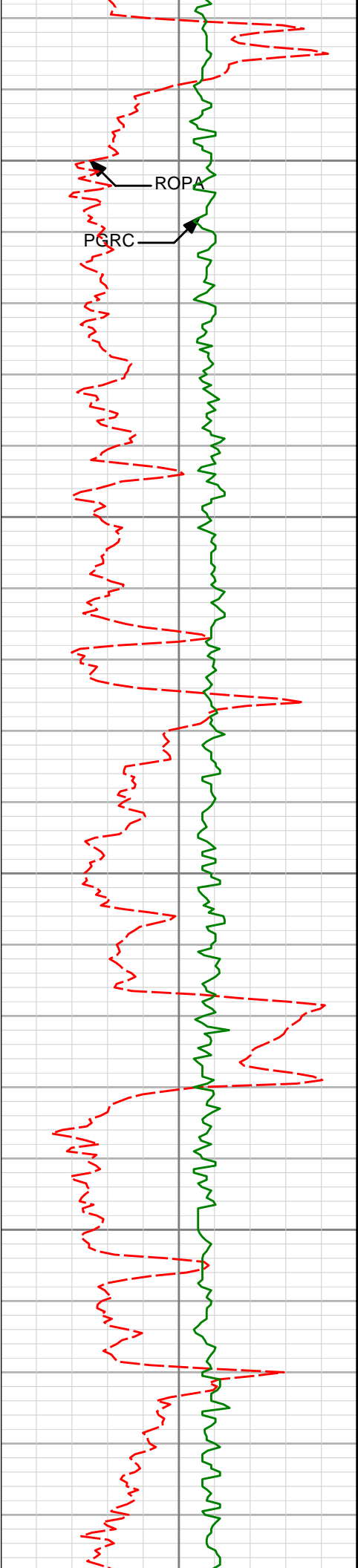
9531'

90.40°

356.93°

7524.17'

2272.26'



9600

9626'

90.46°

357.19°

7523.46'

2367.11'

9650

9700

9721'

90.52°

356.74°

7522.65'

2461.94'

9750



9800

9815'

90.12°

356.37°

7522.12'

2555.73'

9850

PGRC

ROPA

9900

9910'

91.27°

356.25°

7520.97'

2650.49'

9950

10000

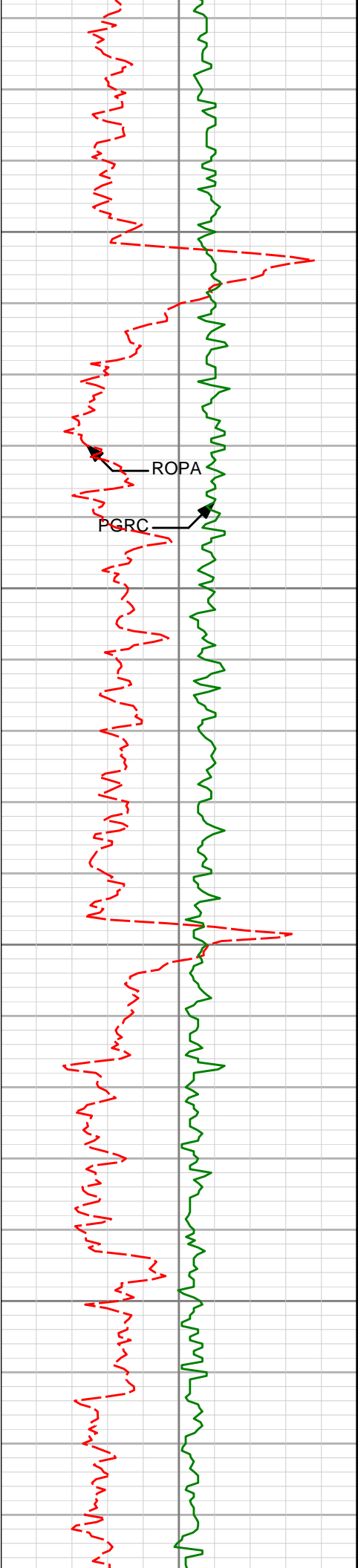
10005'

90.68°

355.96°

7519.35'

2745.21'



10050

10100

10150

10200

10100'

10194'

90.03°

90.15°

355.68°

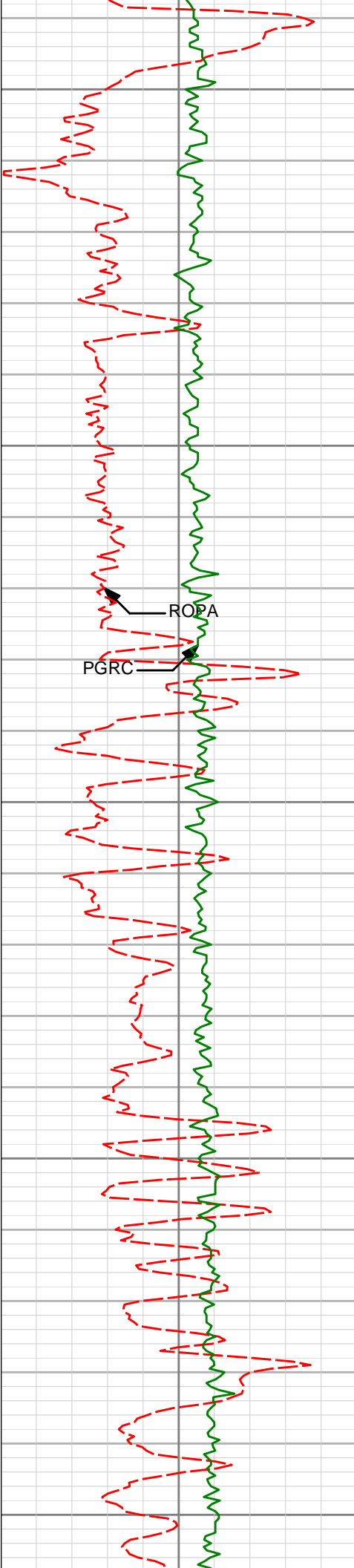
355.98°

7518.76'

7518.62'

2839.92'

2933.62'



10250

10289'

90.62°

356.73°

7517.98'

3028.39'

10300

ROPA

PGRC

10350

10383'

90.68°

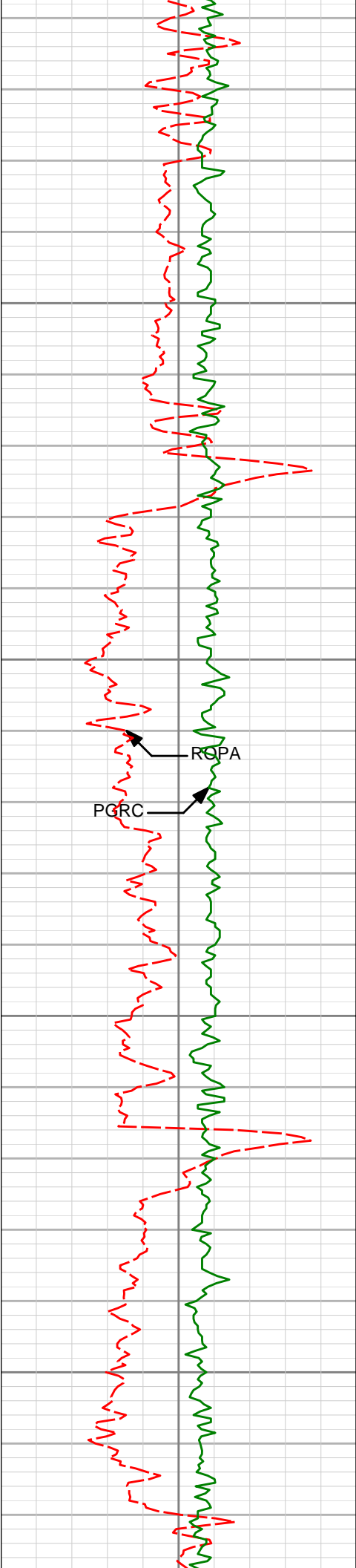
357.17°

7516.91'

3122.22'

10400

10450



10478'	90.25°	356.87°	7516.14'	3217.06'
--------	--------	---------	----------	----------

10500

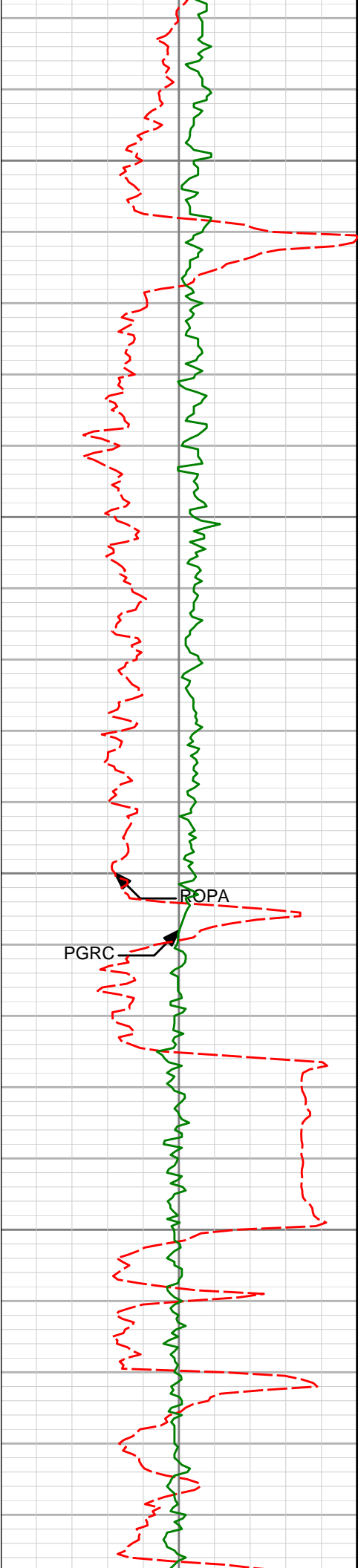
10550

10572'	89.60°	356.41°	7516.26'	3310.86'
--------	--------	---------	----------	----------

10600

10650

10665'	89.57°	356.57°	7516.94'	3403.65'
--------	--------	---------	----------	----------



10700

10750

10800

10850

10757'

89.75°

356.80°

7517.48'

3495.46'

PGRC

ROPA

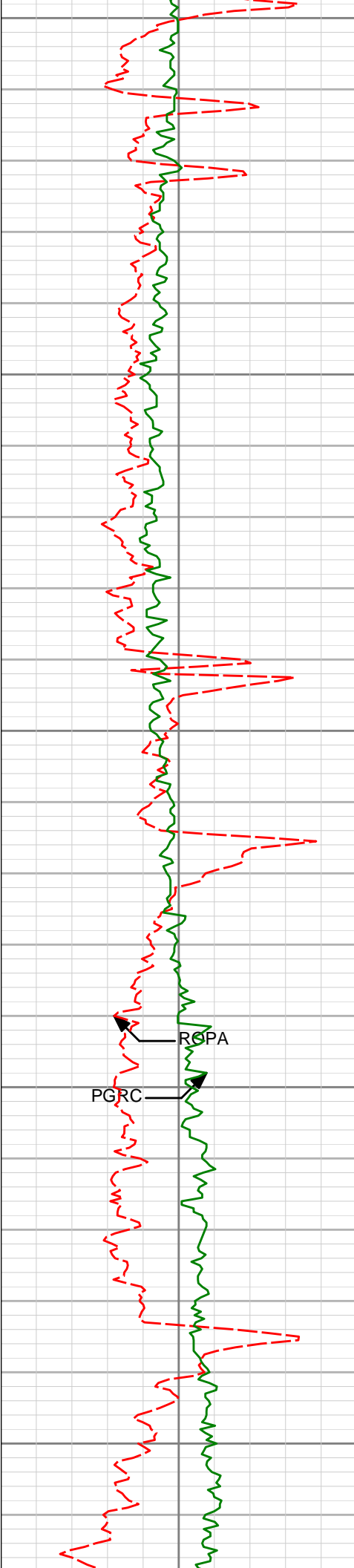
10850'

90.92°

358.05°

7516.94'

3588.33'



10900

10942'

91.14°

358.31°

7515.28'

3680.25'

10950

11000

11034'

91.23°

358.41°

7513.38'

3772.18'

11050

11100

RCPA

PGRC



11150

11200

11250

11300

11127'

91.08°

358.19°

7511.51'

3865.10'

11220'

91.51°

357.51°

7509.41'

3957.99'

ROPA

PGRC

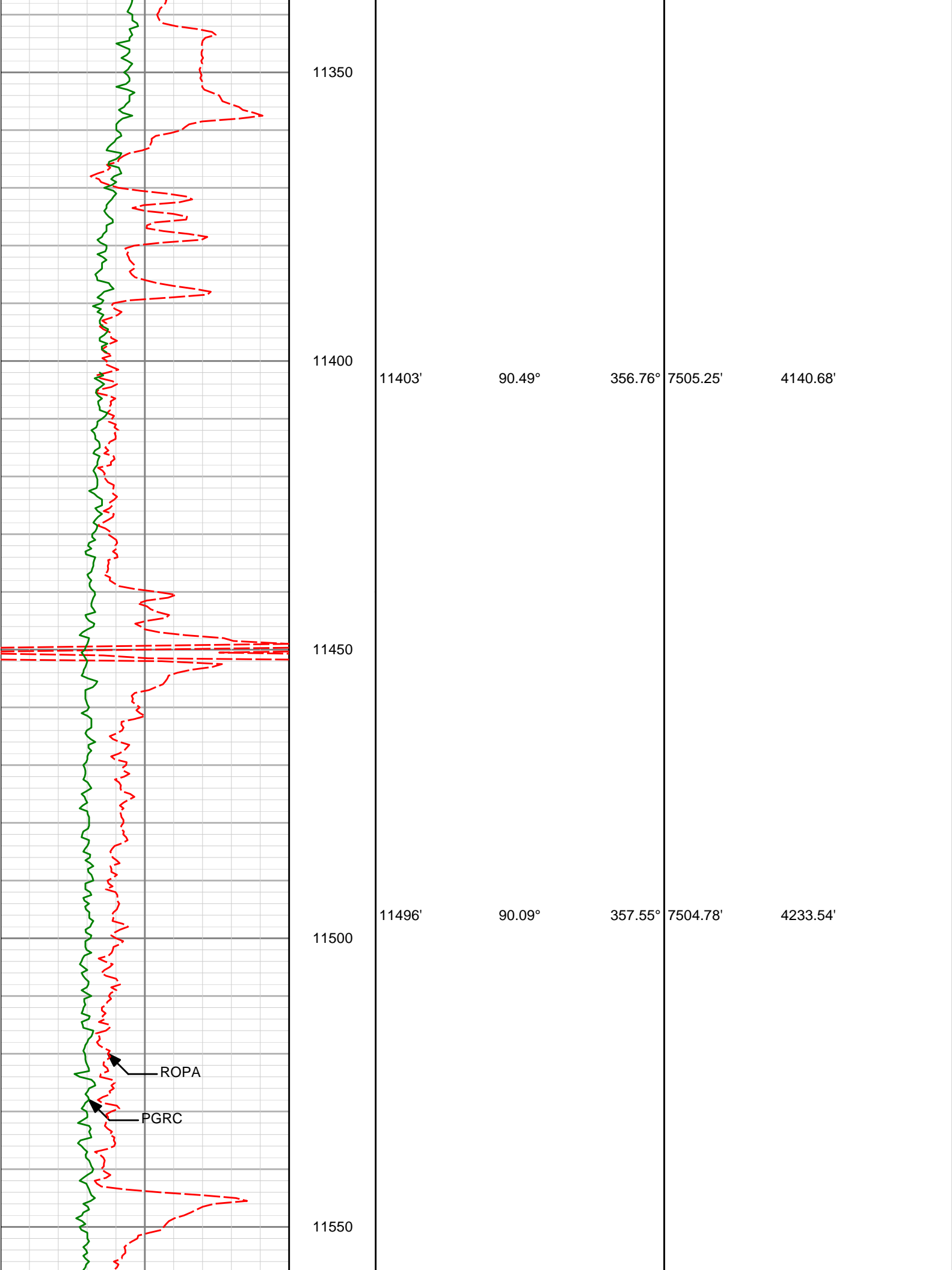
11312'

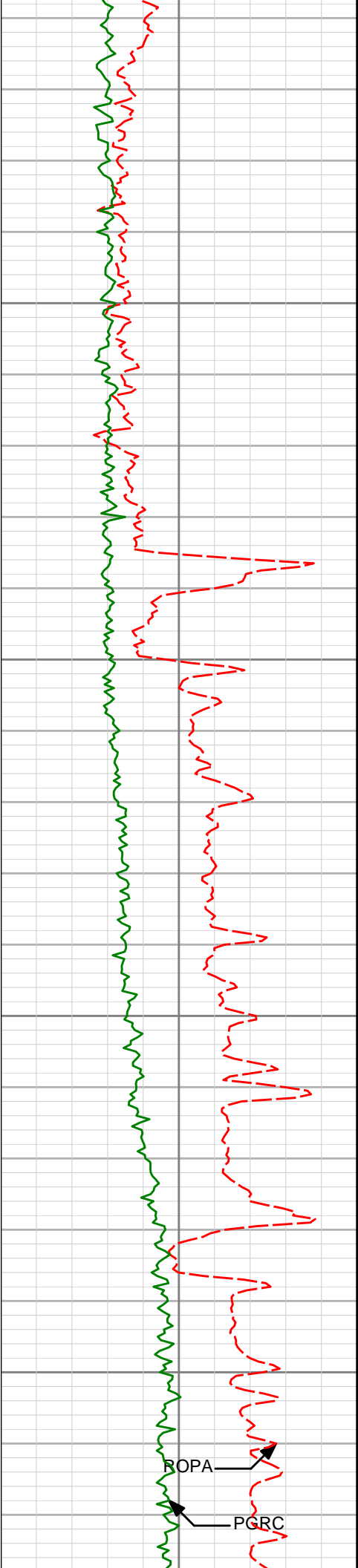
91.60°

357.51°

7506.91'

4049.84'





11589'	89.82°	357.67°	7504.85'	4326.43'
--------	--------	---------	----------	----------

11600

11650

11681'	89.41°	357.53°	7505.47'	4418.33'
--------	--------	---------	----------	----------

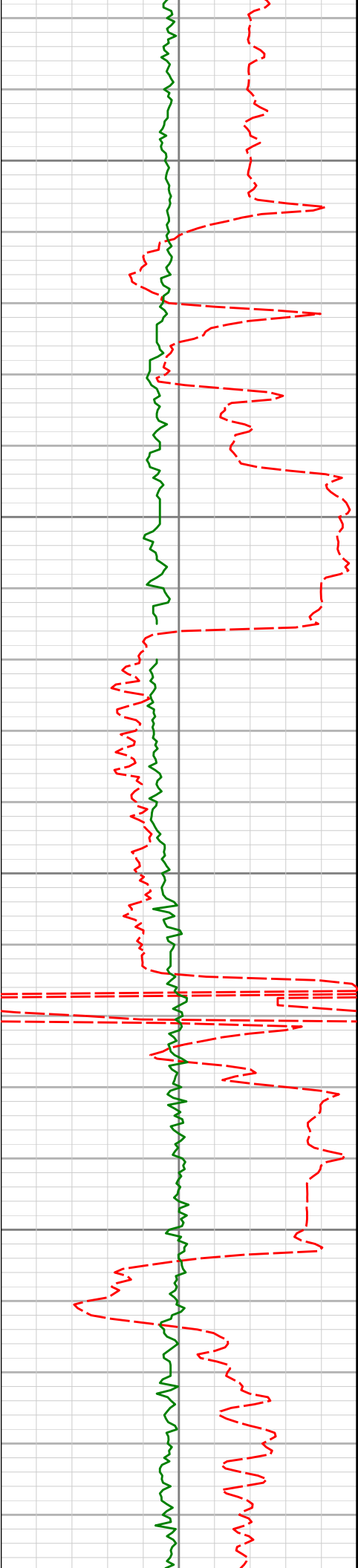
11700

11750

POPA

PGRC

11772'	89.23°	357.42°	7506.55'	4509.21'
--------	--------	---------	----------	----------



11800

11850

11900

11950

11864'

89.48°

358.18°

7507.59'

4601.11'

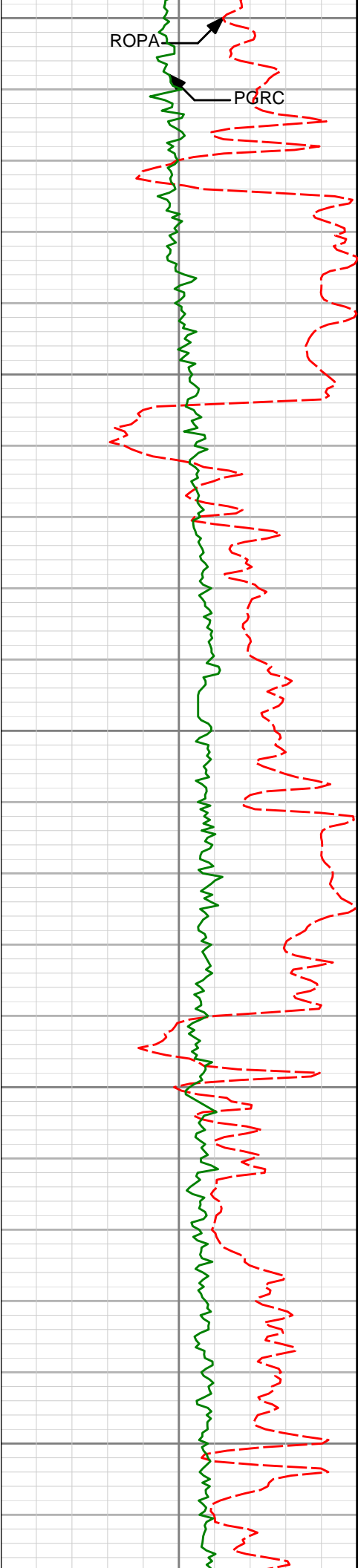
11956'

88.92°

359.62°

7508.87'

4693.07'



12000

12050

12100

12150

12200

12049'

12141'

89.26°

90.00°

0.98°

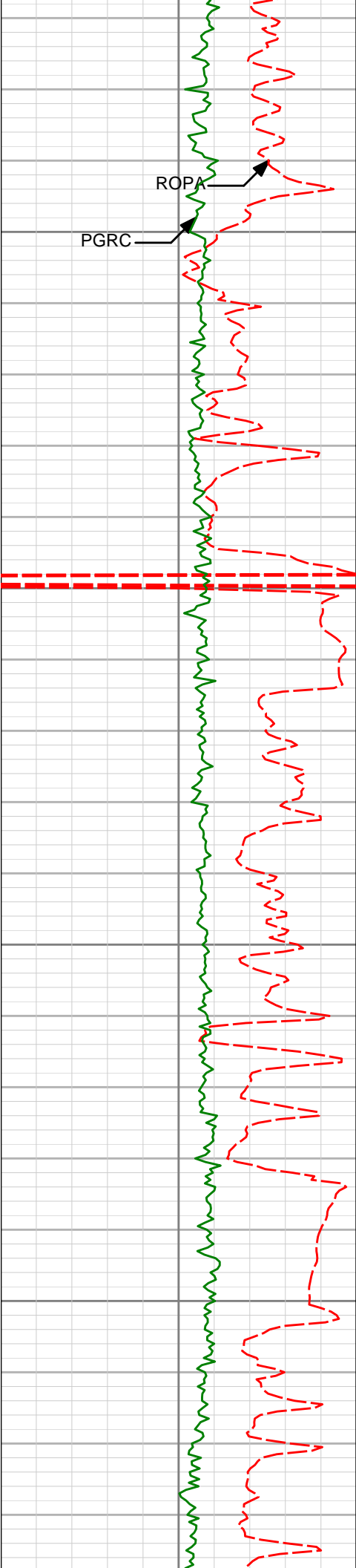
1.16°

7510.35'

7510.94'

4786.05'

4878.04'



12250

12300

12350

12400

12235'

89.75°

1.11°

7511.15'

4972.03'

12328'

89.91°

1.87°

7511.42'

5065.01'

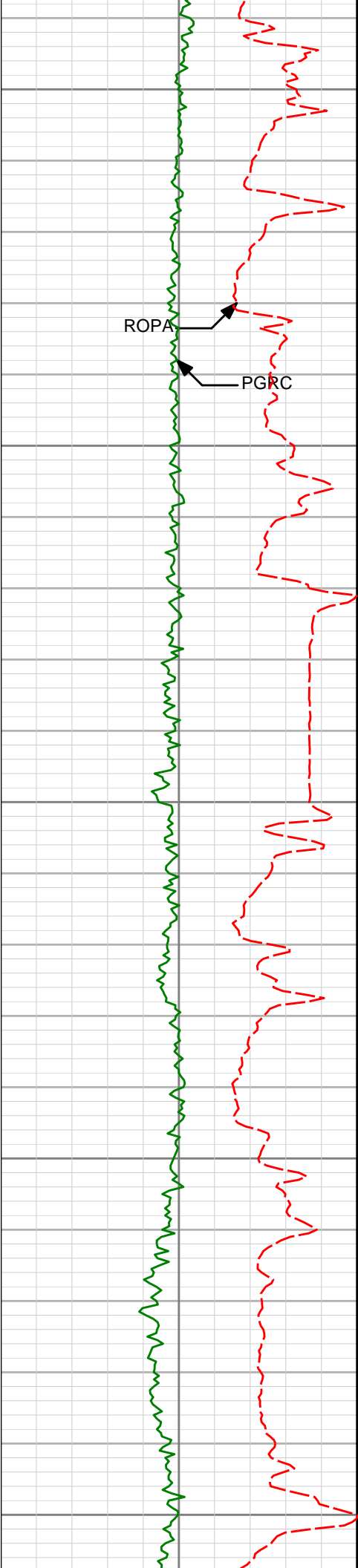
12421'

90.68°

1.66°

7510.94'

5157.98'



12450

12500

12550

12600

12650

12513'

90.28°

1.44°

7510.17'

5249.96'

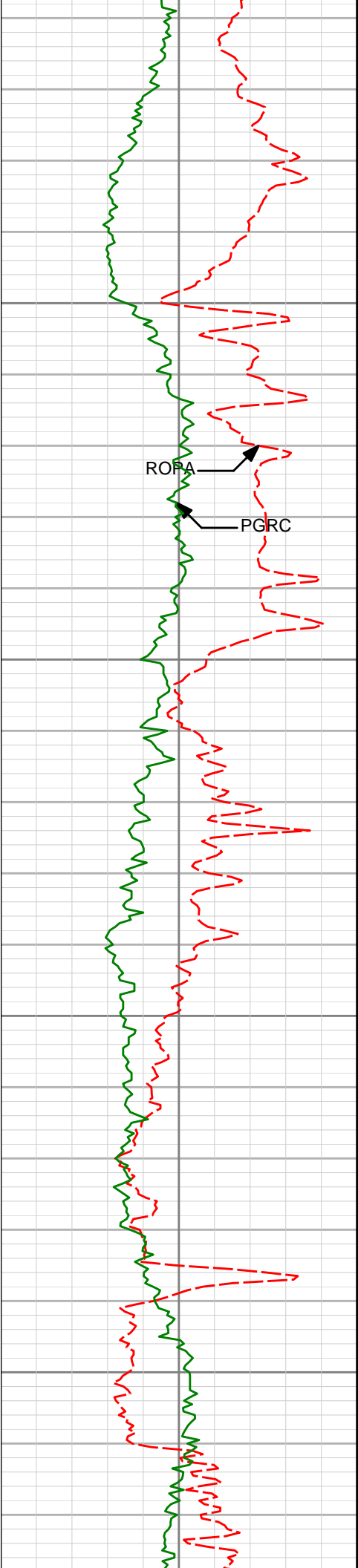
12605'

91.66°

1.39°

7508.62'

5341.93'



12700

12750

12800

12850

12696'

91.88°

1.76°

7505.81'

5432.86'

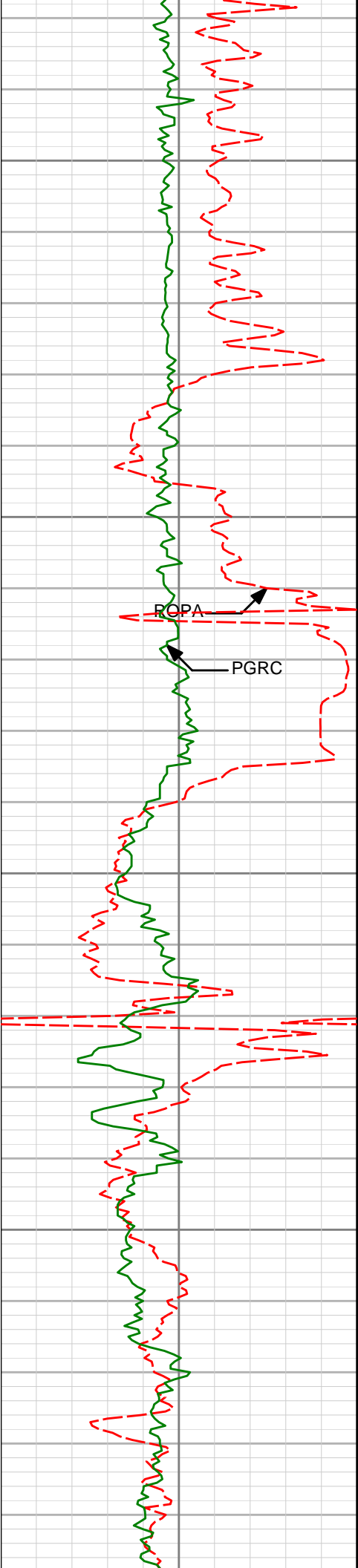
12788'

91.97°

1.88°

7502.71'

5524.78'



12900

12950

13000

13050

12880'

92.25°

1.66°

7499.33'

5616.69'

12972'

89.97°

1.84°

7497.55'

5708.64'

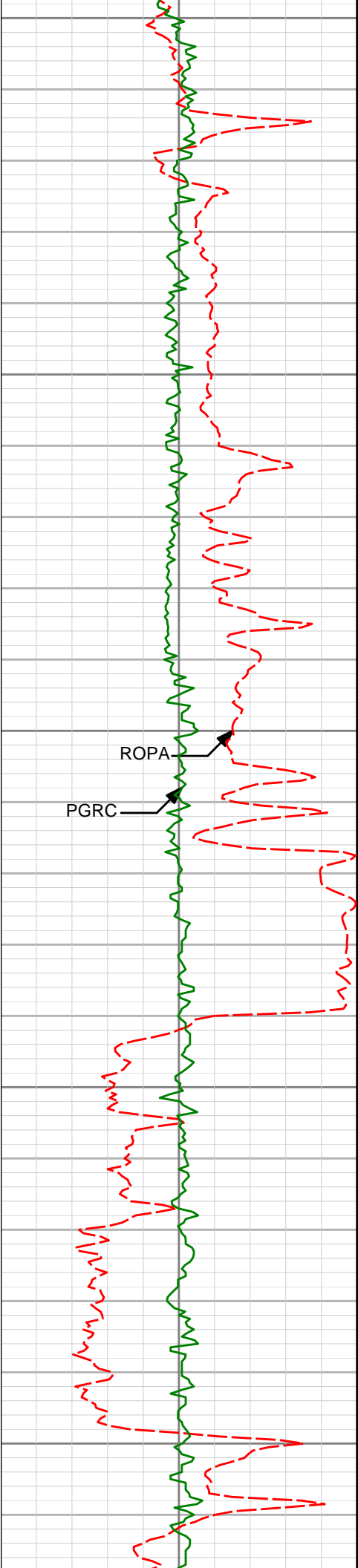
13063'

90.12°

2.06°

7497.47'

5799.60'



13100

13150

13200

13250

13300

13155'

89.78°

1.87°

7497.55'

5891.56'

13247'

90.34°

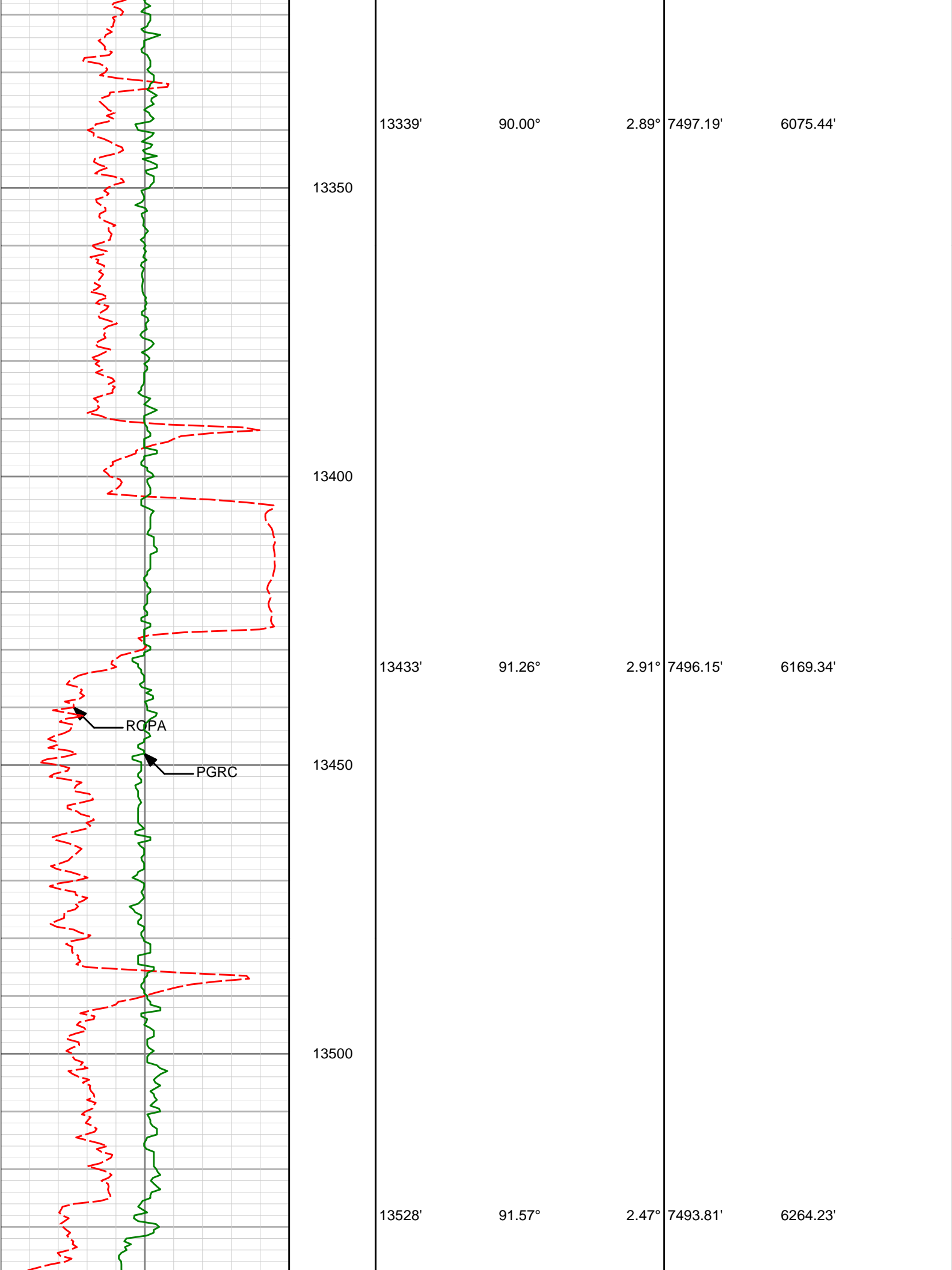
2.43°

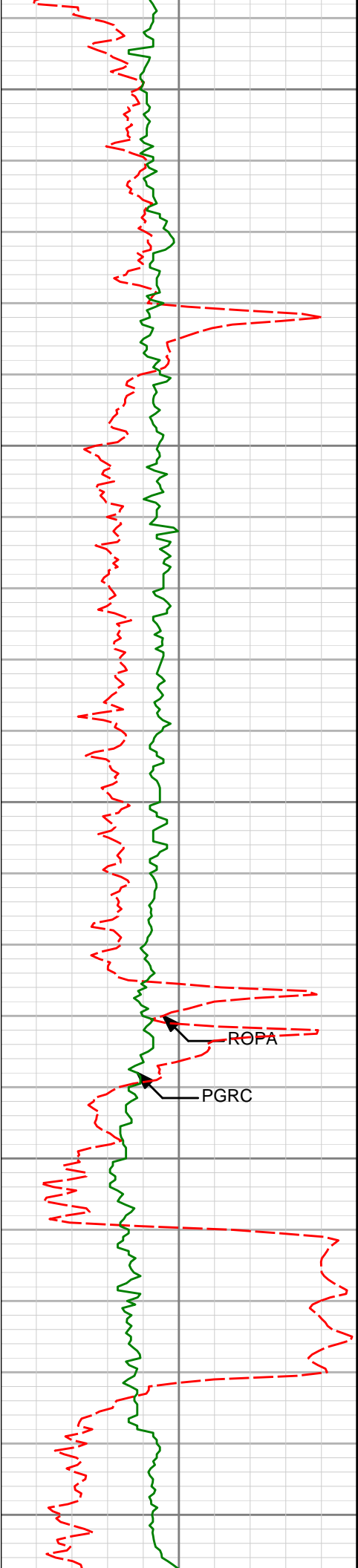
7497.46'

5983.52'

ROPA

PGRC





13550

13600

13650

13700

13750

13622'

91.73°

2.60°

7491.10'

6358.12'

ROPA

PGRC

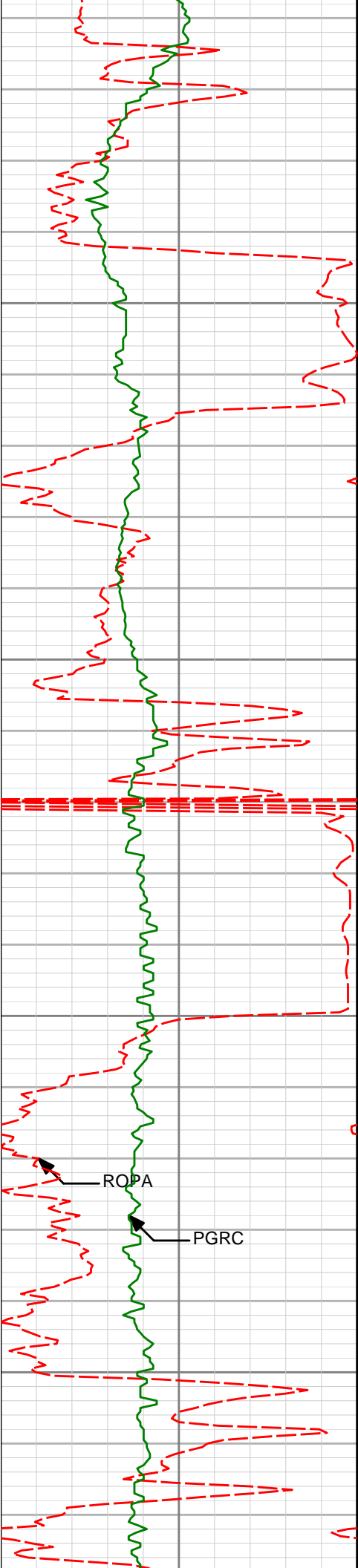
13717'

91.51°

2.07°

7488.41'

6453.03'



13800

13811'

91.48°

2.36°

7485.96'

6546.94'

13850

13900

13905'

89.26°

1.28°

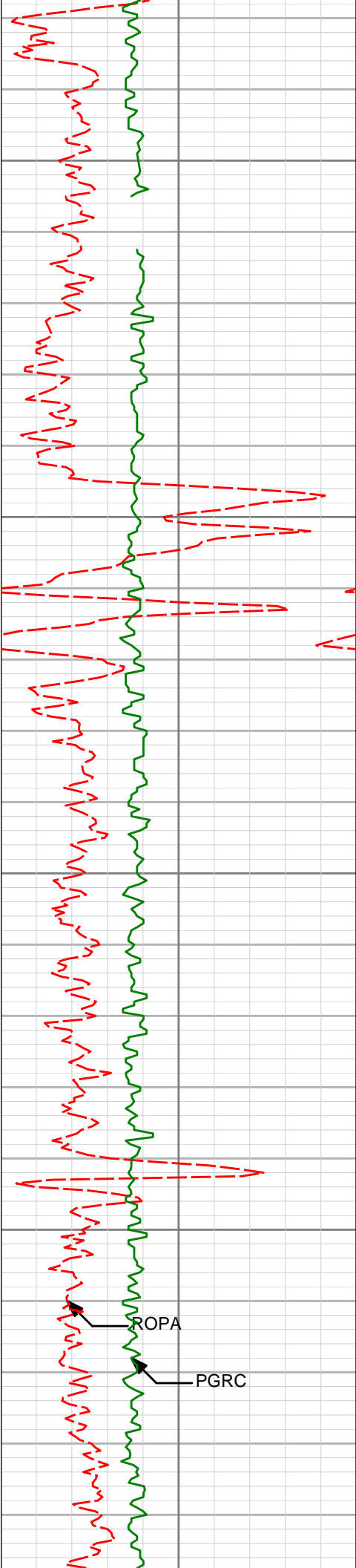
7485.35'

6640.90'

13950

ROPA

PGRC



14000

14000'

89.97°

1.70°

7485.99'

6735.88'

14050

14100

14094'

89.41°

2.04°

7486.50'

6829.85'

14150

ROPA

PGRC

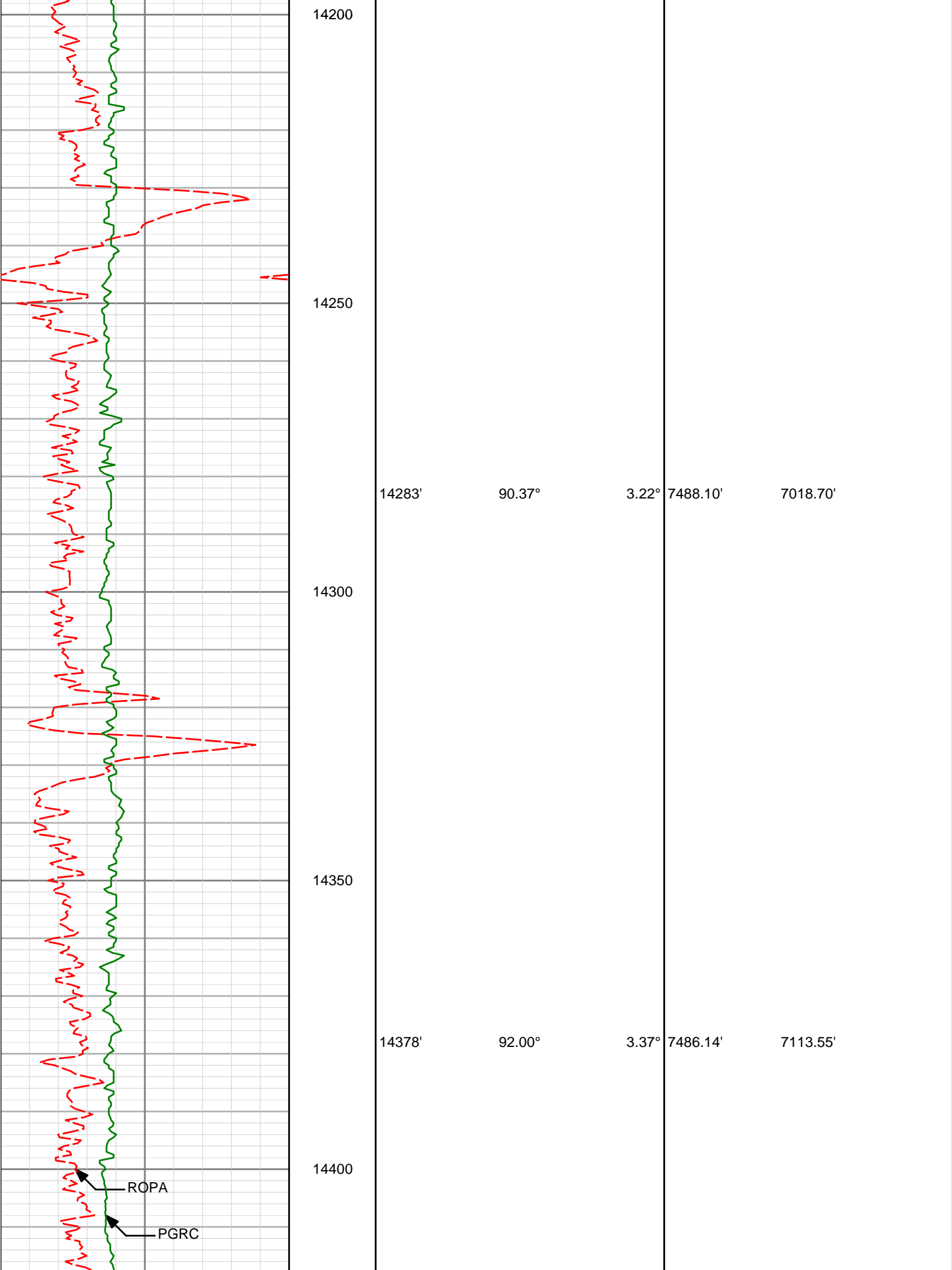
14189'

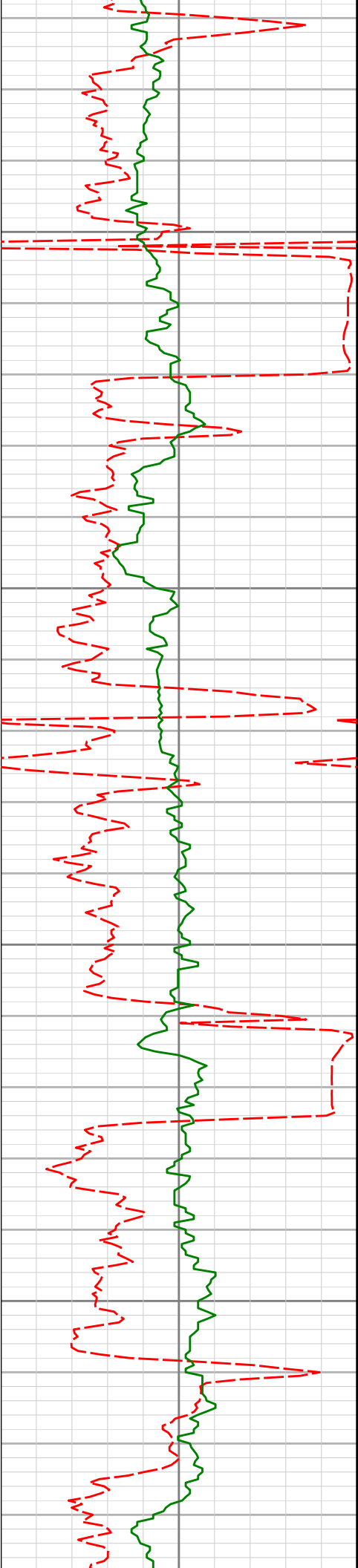
89.14°

2.37°

7487.70'

6924.79'





14450

14472'

91.63°

2.57°

7483.16'

7207.40'

14500

14550

14567'

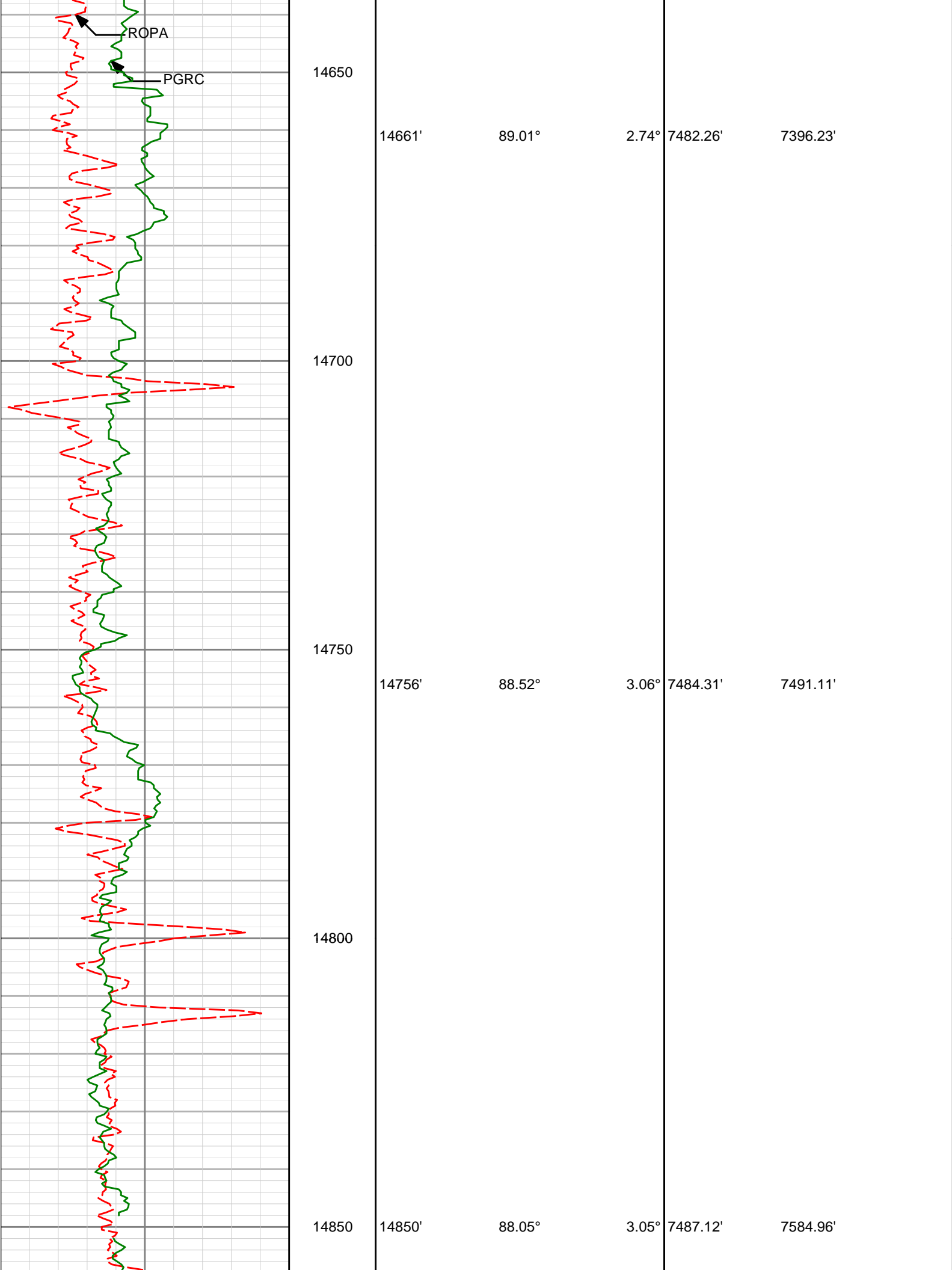
90.22°

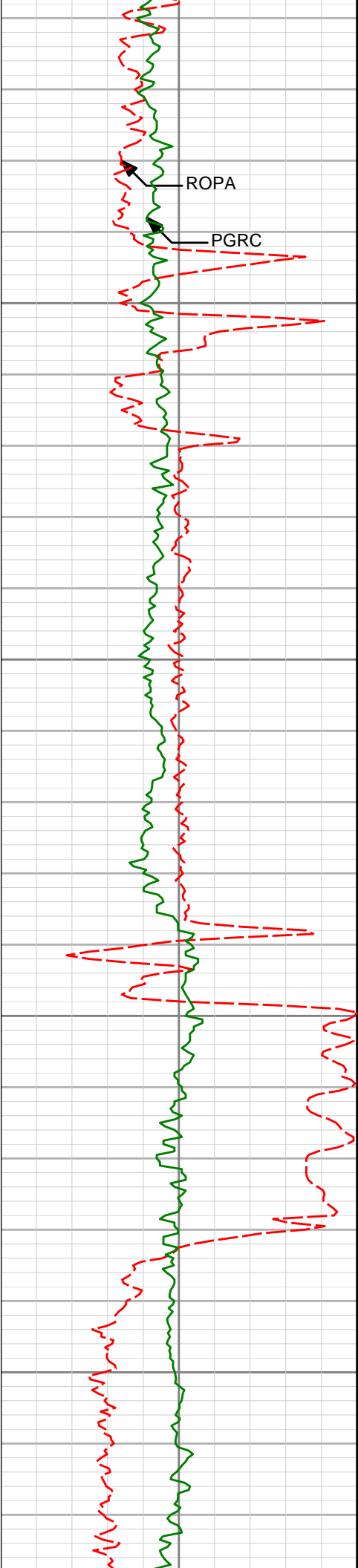
2.71°

7481.63'

7302.31'

14600





14900

14950

15000

15050

14945'

87.50°

3.28°

7490.81'

7679.77'

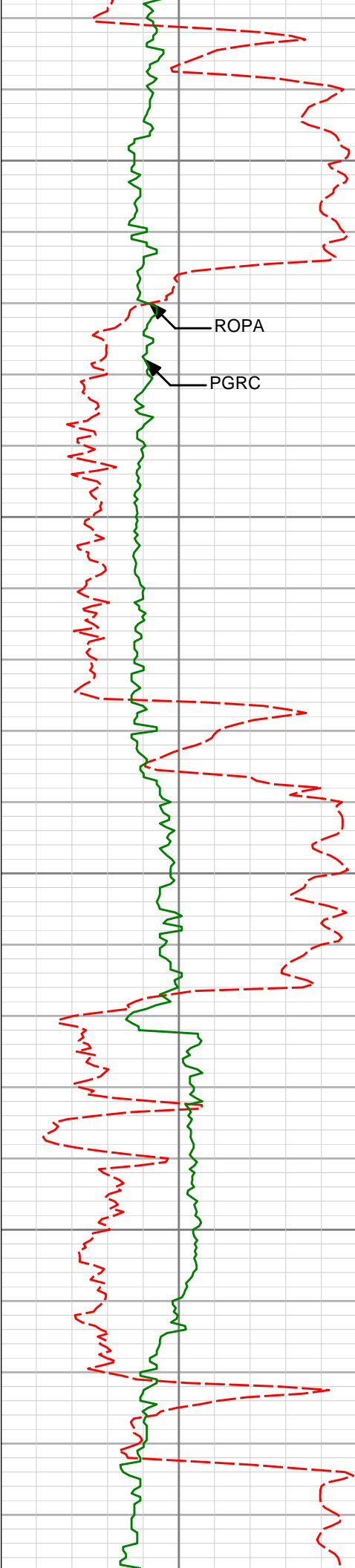
15039'

87.26°

2.10°

7495.11'

7773.59'



15100

15150

15200

15250

15133'

88.21°

1.93°

7498.82'

7867.48'

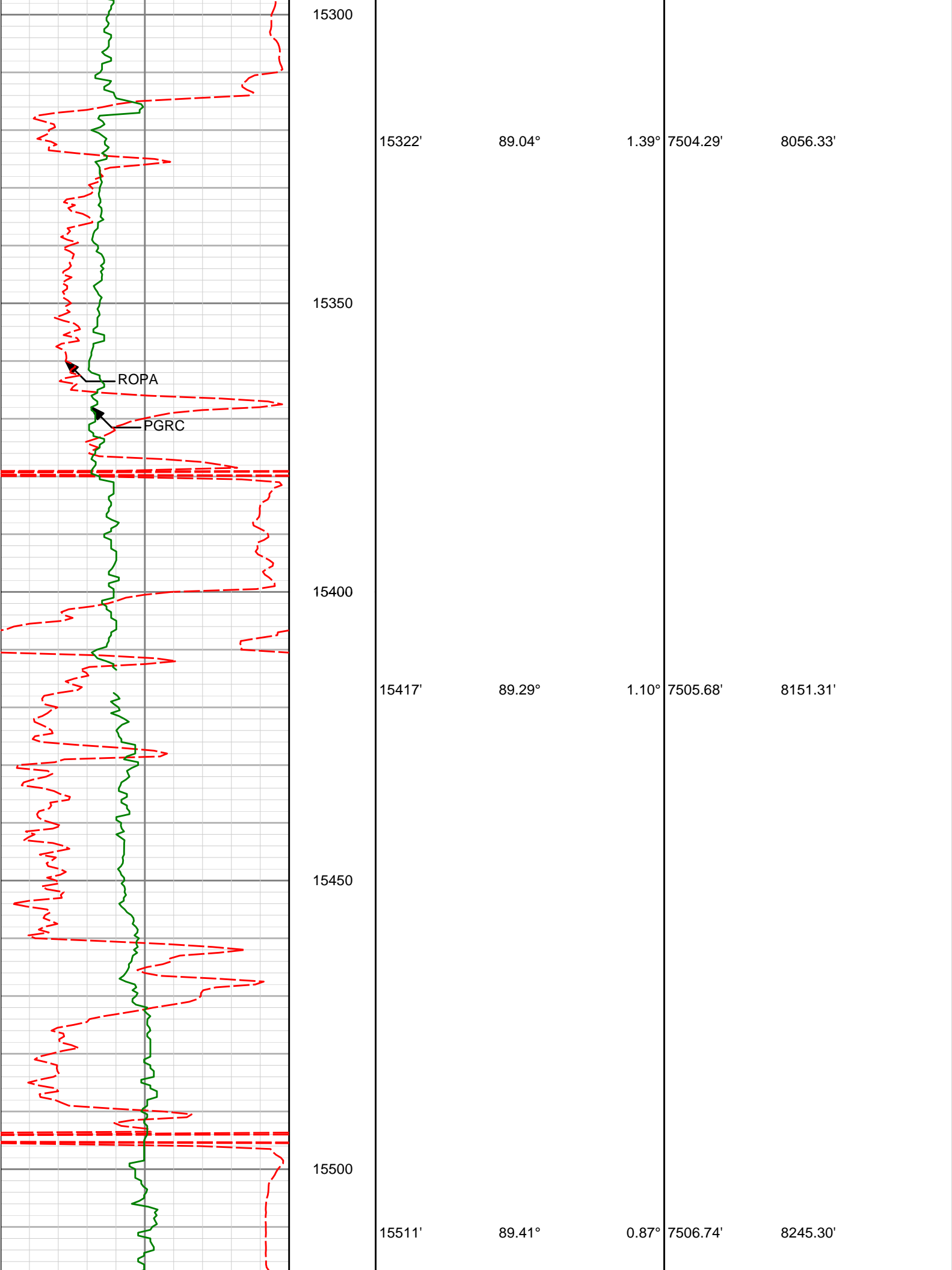
15228'

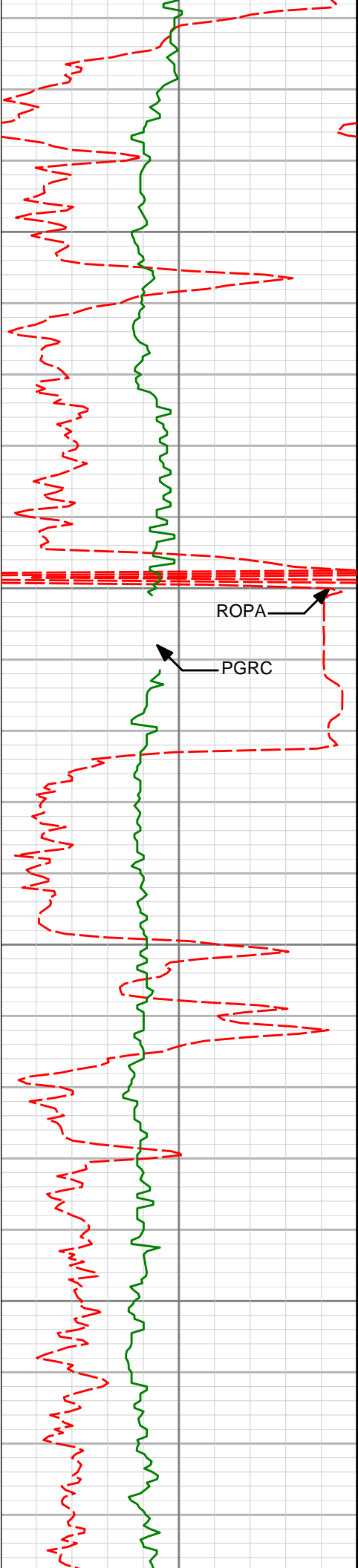
88.06°

2.01°

7501.91'

7962.39'





15550

15600

15650

15700

ROPA

PGRC

15606'

90.74°

1.54°

7506.62'

8340.28'

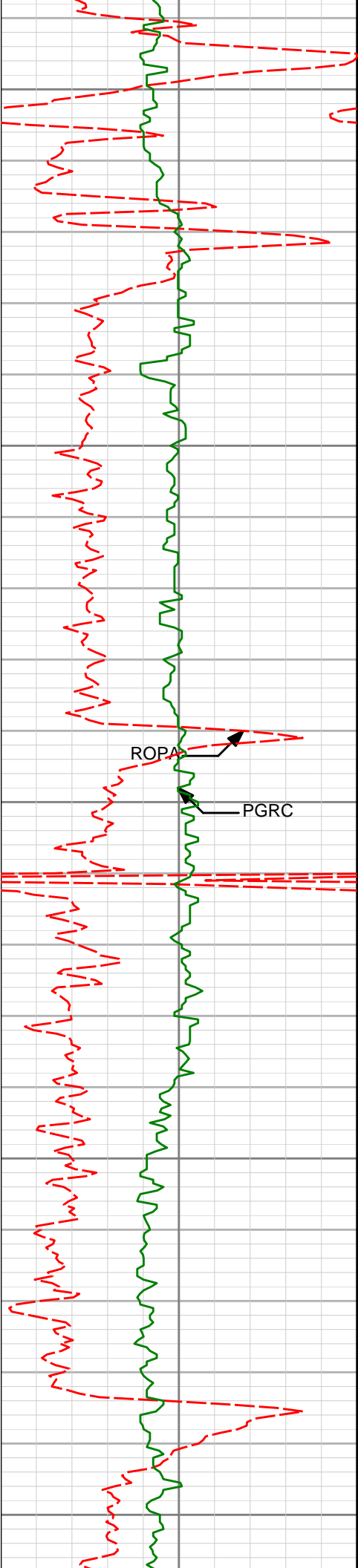
15700'

91.17°

1.90°

7505.05'

8434.24'



15750

15794'

90.56°

1.70°

7503.63'

8528.20'

15800

ROPV

PGRC

15850

15889'

90.62°

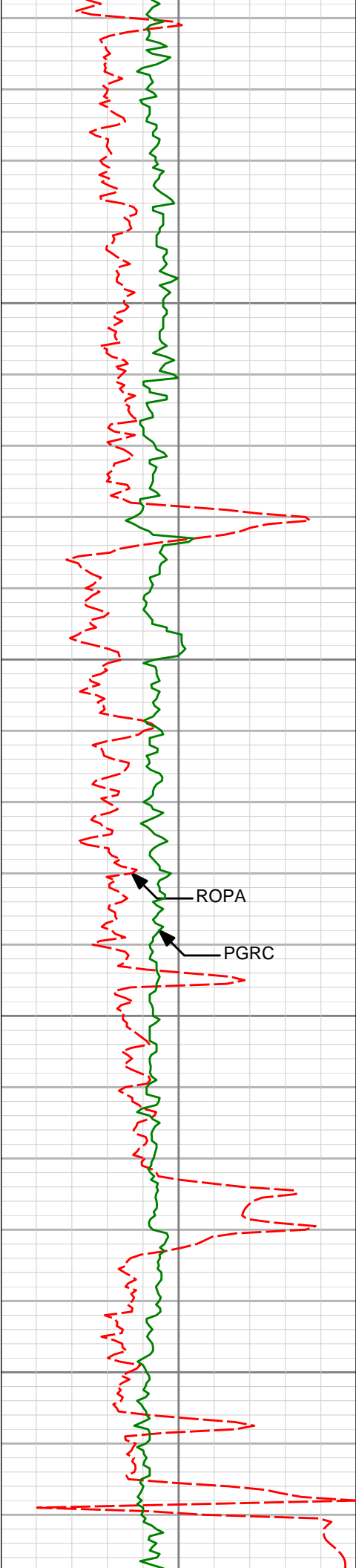
1.53°

7502.66'

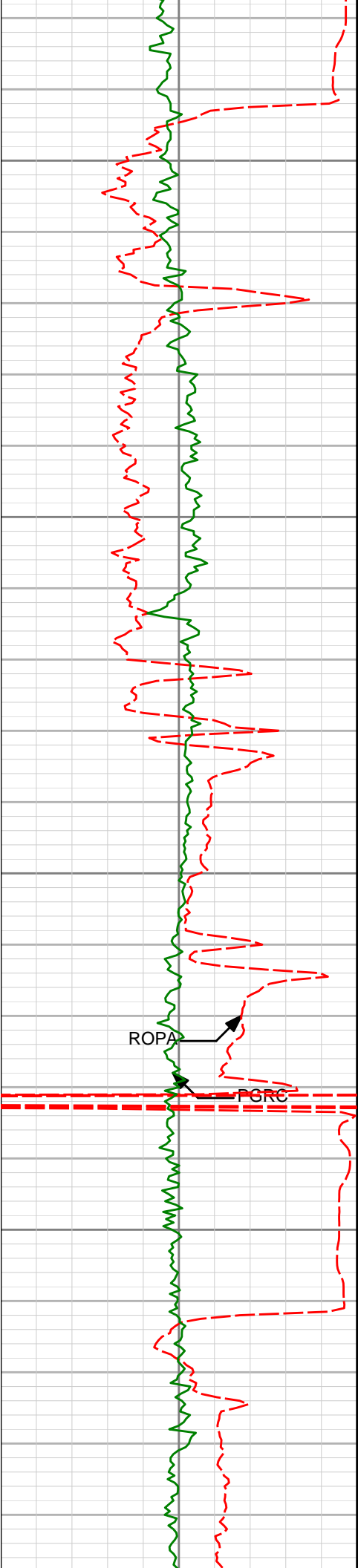
8623.17'

15900

15950



15983'	90.46°	1.51°	7501.77'	8717.15'
16000				
16050				
16078'	89.66°	1.13°	7501.67'	8812.13'
16100				
16150				
16172'	89.54°	1.23°	7502.33'	8906.12'



16200

16250

16300

16350

16267'

89.23°

1.05°

7503.35'

9001.11'

ROPA

PGRC

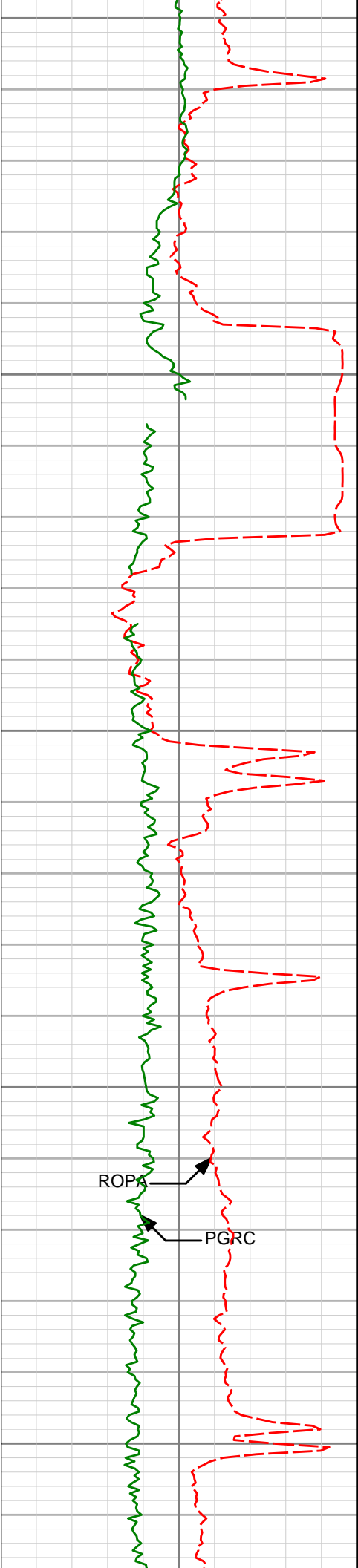
16361'

89.94°

1.25°

7504.03'

9095.09'



16400

16450

16500

16550

16600

16455'

90.28°

0.70°

7503.85'

9189.09'

16550'

90.65°

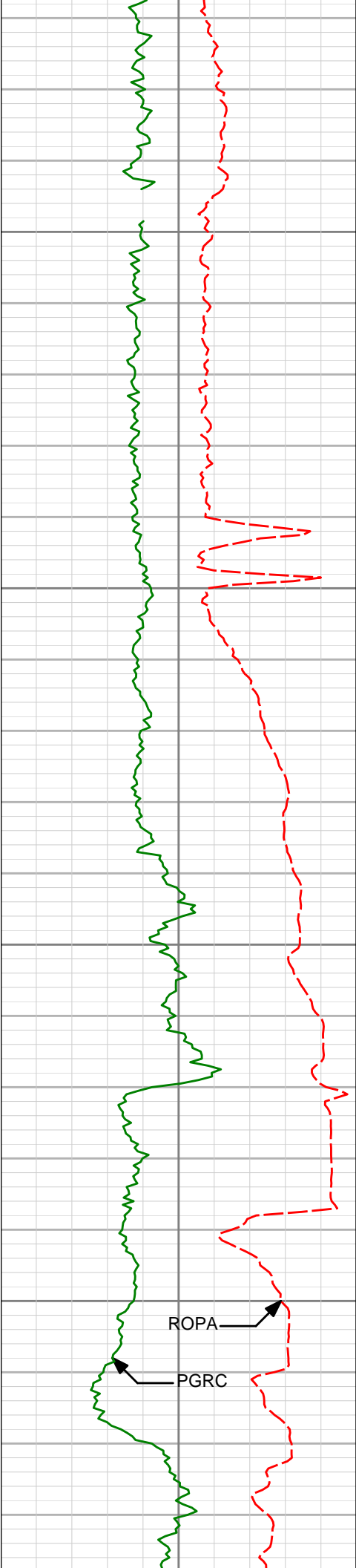
0.63°

7503.08'

9284.08'

ROPA

PGRC



	16644'	90.99°	1.10°	7501.73'	9378.07'
16650					
<Run 600>					
16700					
	16739'	90.37°	1.14°	7500.60'	9473.05'
16750					
16800					
	16831'	89.60°	1.03°	7500.63'	9565.04'



16850

16900

16950

17000

17050

16921'

90.37°

0.83°

7500.65'

9655.04'

17015'

91.88°

1.21°

7498.80'

9749.01'

ROPA

PGRC



17100

17110'

92.16°

0.82°

7495.46'

9843.95'

17150

17200

17204'

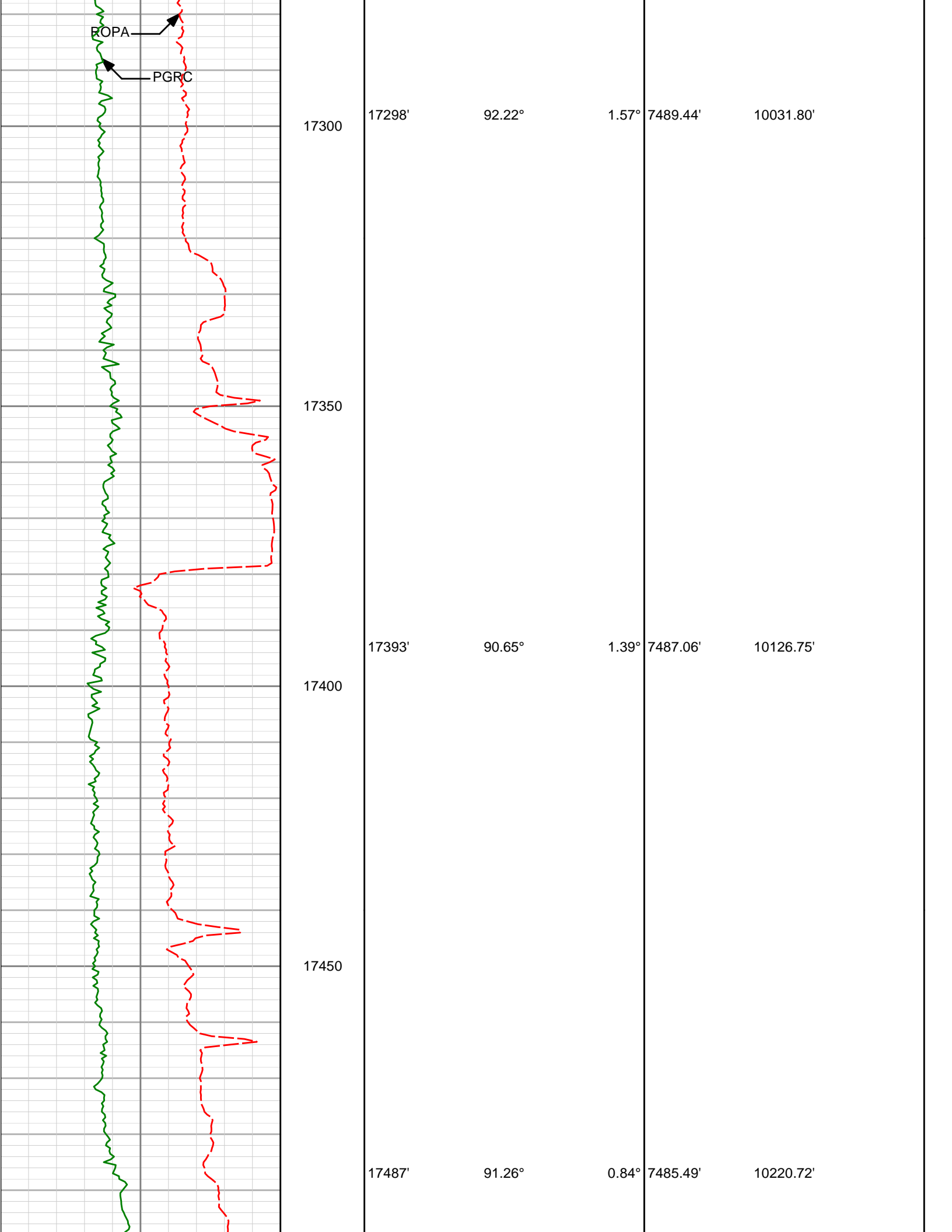
91.48°

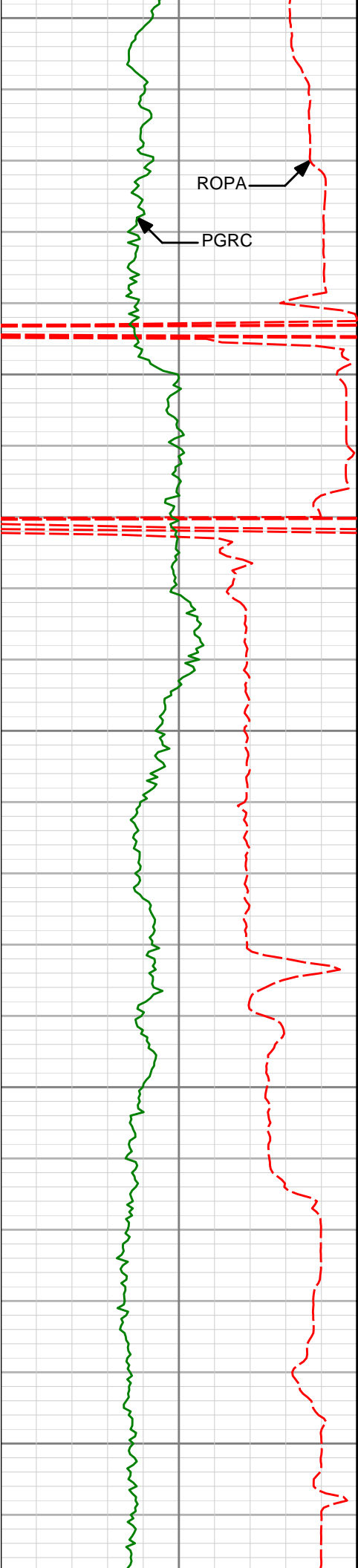
2.06°

7492.47'

9937.88'

17250





17500

ROPA

PGRC

17550

17582'

89.35°

1.33°

7484.98'

10315.71'

17600

17650

17676'

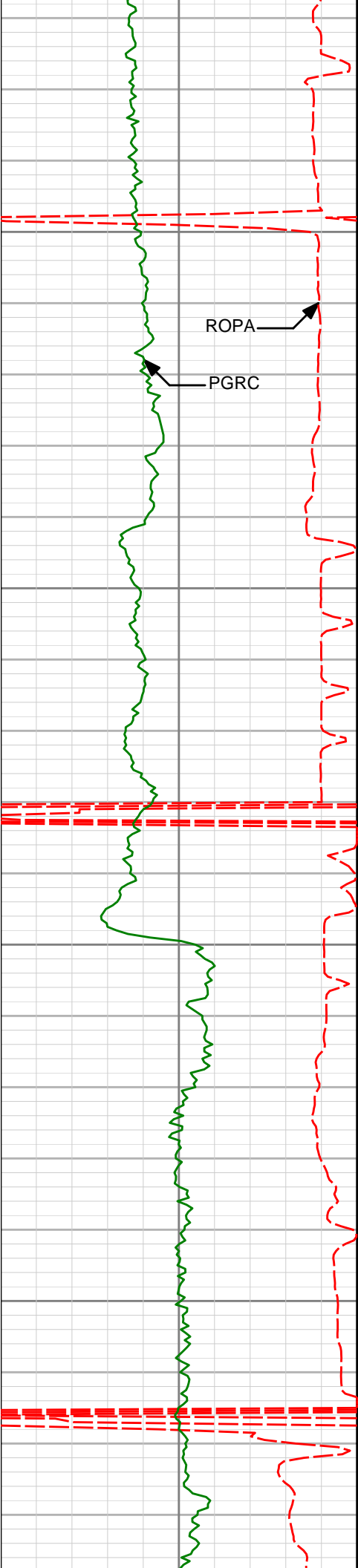
89.38°

1.01°

7486.03'

10409.69'

17700



17750

ROPAC

PGRC

17800

17850

17900

<Run 700>

17770'

90.74°

0.83°

7485.93'

10503.69'

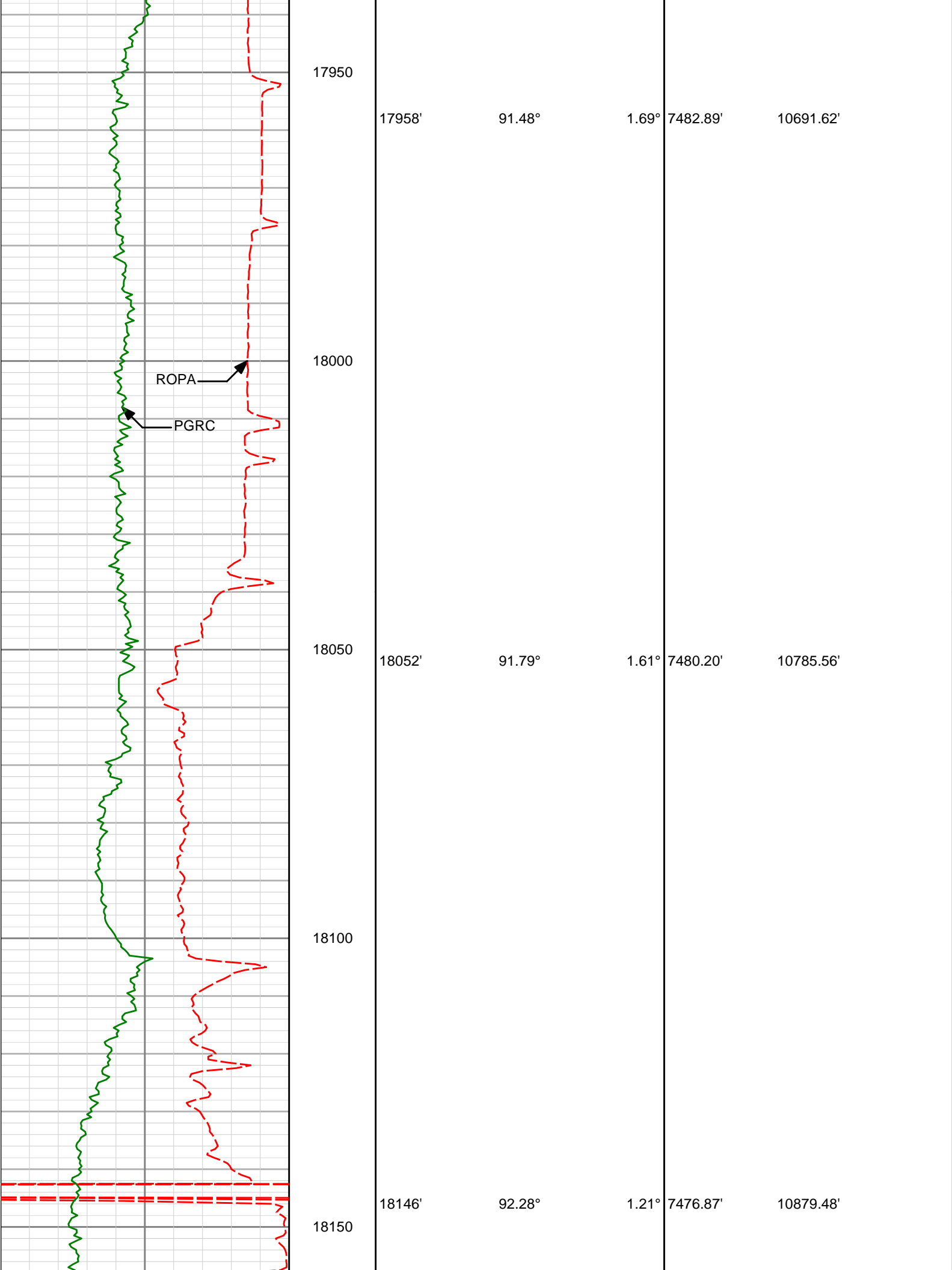
17863'

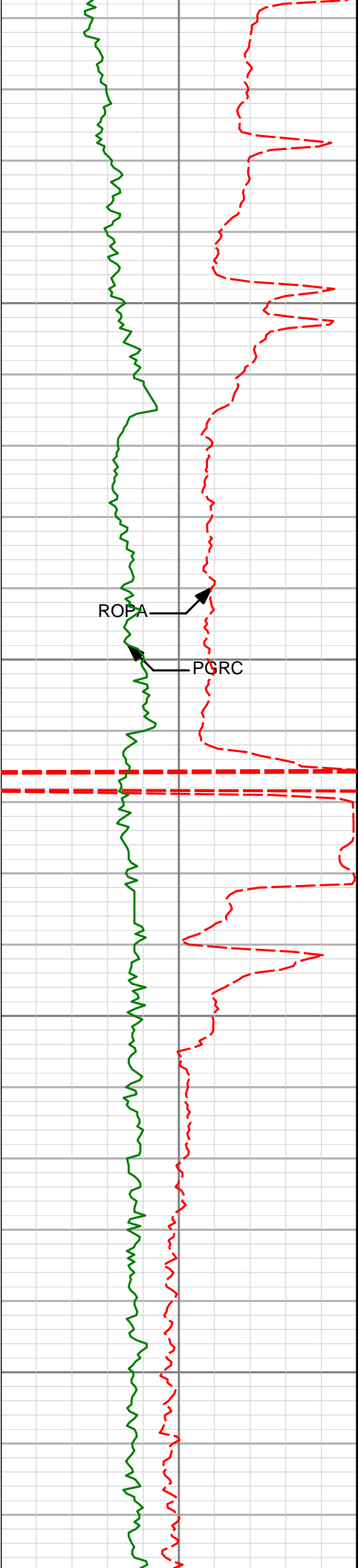
90.74°

1.64°

7484.73'

10596.67'





18200

18250

18300

18350

18240'

93.21°

0.90°

7472.37'

10973.37'

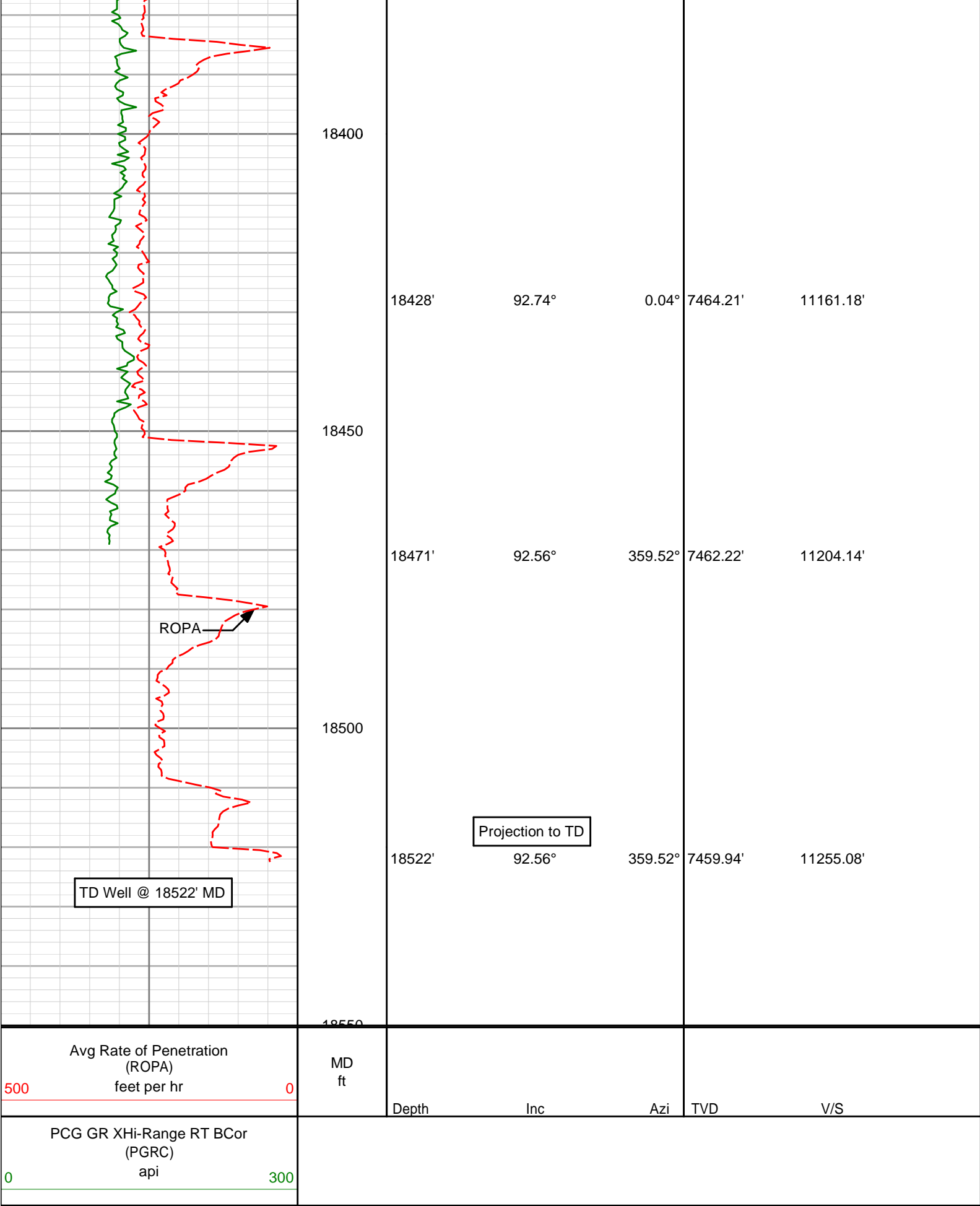
18334'

92.00°

0.56°

7468.09'

11067.27'



DIRECTIONAL SURVEY REPORT

APC
NRC 29N-32HZ
Wattenburg
Weld Colorado
USA
CA-XX-0901323759
The last survey is a projection to TD

<i>Measured Depth (feet)</i>	<i>Inclination (degrees)</i>	<i>Direction (degrees)</i>	<i>Vertical Depth (feet)</i>	<i>Latitude (feet)</i>	<i>Departure (feet)</i>	<i>Vertical Section (feet)</i>	<i>Dogleg (deg/100ft)</i>
1187.00	0.68	283.52	1186.96	5.88 N	2.98 W	5.86	TIE-IN
1299.00	0.16	189.40	1298.96	5.88 N	3.65 W	5.86	0.63
1394.00	0.39	263.11	1393.96	5.71 N	3.99 W	5.69	0.40
1491.00	0.55	226.75	1490.95	5.35 N	4.66 W	5.33	0.34
1583.00	0.55	262.00	1582.95	4.99 N	5.42 W	4.96	0.36
1675.00	0.33	277.03	1674.95	4.96 N	6.12 W	4.92	0.27
1768.00	0.53	243.99	1767.94	4.80 N	6.77 W	4.76	0.33
1860.00	0.48	239.12	1859.94	4.42 N	7.49 W	4.38	0.07
1952.00	0.48	268.80	1951.94	4.21 N	8.20 W	4.16	0.27
2046.00	3.43	281.32	2045.87	4.76 N	11.35 W	4.69	3.15
2139.00	5.21	276.99	2138.60	5.82 N	18.27 W	5.71	1.94
2230.00	4.48	280.08	2229.28	6.94 N	25.87 W	6.79	0.85
2321.00	4.97	271.12	2319.97	7.64 N	33.31 W	7.44	0.97
2414.00	7.41	266.93	2412.42	7.40 N	43.33 W	7.14	2.67
2507.00	8.70	258.03	2504.51	5.62 N	56.20 W	5.29	1.93
2599.00	9.59	262.82	2595.34	3.22 N	70.61 W	2.80	1.27
2690.00	10.62	267.67	2684.93	1.93 N	86.51 W	1.42	1.47
2783.00	9.17	266.70	2776.54	1.15 N	102.47 W	0.55	1.57
2875.00	10.54	271.87	2867.18	1.01 N	118.20 W	0.31	1.77
2967.00	9.69	268.60	2957.75	1.09 N	134.35 W	0.30	1.11
3060.00	10.99	273.30	3049.24	1.41 N	151.03 W	0.52	1.67
3153.00	10.09	271.10	3140.67	2.08 N	168.02 W	1.08	1.06
3246.00	8.40	269.74	3232.46	2.20 N	182.96 W	1.12	1.83
3339.00	9.87	273.69	3324.28	2.69 N	197.71 W	1.51	1.72
3431.00	9.18	272.65	3415.01	3.53 N	212.91 W	2.27	0.77
3523.00	10.98	281.12	3505.59	5.56 N	228.84 W	4.20	2.53
3615.00	9.53	278.70	3596.12	8.40 N	244.97 W	6.95	1.64
3706.00	8.89	278.36	3685.95	10.57 N	259.37 W	9.03	0.71
3798.00	8.61	285.10	3776.88	13.39 N	273.05 W	11.77	1.15
3890.00	13.06	297.19	3867.23	19.94 N	288.96 W	18.23	5.41
3982.00	13.38	292.94	3956.79	28.84 N	308.01 W	27.01	1.11
4073.00	11.59	289.75	4045.64	36.03 N	326.31 W	34.10	2.11
4165.00	10.73	285.47	4135.90	41.44 N	343.26 W	39.40	1.30
4257.00	10.02	284.11	4226.39	45.68 N	359.28 W	43.54	0.82
4352.00	9.28	281.83	4320.05	49.26 N	374.79 W	47.04	0.88
4446.00	10.18	271.17	4412.70	50.99 N	390.52 W	48.67	2.14
4540.00	9.97	269.56	4505.25	51.09 N	406.96 W	48.68	0.37
4635.00	8.24	269.53	4599.05	50.97 N	421.99 W	48.47	1.82
4729.00	7.28	265.40	4692.19	50.44 N	434.66 W	47.86	1.18
4824.00	6.83	266.16	4786.47	49.58 N	446.30 W	46.93	0.48
4918.00	6.64	263.82	4879.82	48.62 N	457.28 W	45.91	0.36
5012.00	6.19	269.20	4973.24	47.96 N	467.75 W	45.19	0.80
5107.00	5.61	261.56	5067.73	47.21 N	477.46 W	44.38	1.03
5201.00	4.32	258.96	5161.38	45.86 N	485.48 W	42.98	1.39
5296.00	4.40	253.37	5256.10	44.13 N	492.49 W	41.21	0.46
5390.00	4.17	230.79	5349.85	40.94 N	498.59 W	37.98	1.80
5484.00	3.59	228.01	5443.63	36.81 N	503.43 W	33.82	0.65
5579.00	3.52	221.10	5538.45	32.62 N	507.55 W	29.61	0.46
5673.00	1.37	216.18	5632.36	29.54 N	510.12 W	26.51	2.30
5767.00	1.85	134.57	5726.33	27.57 N	509.70 W	24.54	2.27
5861.00	1.32	128.57	5820.30	25.83 N	507.77 W	22.81	0.59
5956.00	1.05	127.79	5915.28	24.61 N	506.23 W	21.61	0.28
6050.00	0.83	114.55	6009.26	23.80 N	504.93 W	20.80	0.33
6144.00	0.76	105.36	6103.25	23.35 N	503.71 W	20.36	0.15
6238.00	0.68	111.91	6197.25	22.98 N	502.59 W	20.00	0.12
6333.00	0.25	75.75	6292.24	22.82 N	501.86 W	19.84	0.53
6427.00	0.74	6.54	6386.24	23.47 N	501.60 W	20.50	0.74
6522.00	0.75	355.53	6481.23	24.70 N	501.57 W	21.73	0.15
6616.00	0.63	283.75	6575.23	25.63 N	502.23 W	22.65	0.24

6616.00	0.63	307.75	6575.23	25.63 N	502.03 W	22.65	0.61
6711.00	0.51	310.62	6670.22	26.23 N	502.77 W	23.24	0.13
6806.00	0.34	342.60	6765.22	26.77 N	503.17 W	23.79	0.30
6900.00	1.73	342.43	6859.20	28.39 N	503.68 W	25.40	1.48
6947.00	3.81	347.62	6906.14	30.59 N	504.23 W	27.60	4.45
6995.00	6.53	355.29	6953.94	34.87 N	504.80 W	31.88	5.83
7042.00	9.28	356.04	7000.49	41.32 N	505.28 W	38.32	5.86
7089.00	14.08	354.85	7046.51	50.80 N	506.05 W	47.79	10.23
7136.00	18.16	358.51	7091.65	63.82 N	506.76 W	60.81	8.94
7184.00	21.92	357.39	7136.74	80.25 N	507.36 W	77.24	7.87
7231.00	26.25	1.70	7179.64	99.42 N	507.45 W	96.40	9.94
7279.00	31.05	0.01	7221.75	122.42 N	507.13 W	119.41	10.14
7326.00	36.47	356.08	7260.81	148.50 N	508.09 W	145.48	12.43
7373.00	41.90	351.57	7297.24	177.99 N	511.35 W	174.95	13.04
7420.00	47.54	354.14	7330.62	210.79 N	515.42 W	207.72	12.60
7468.00	51.71	356.60	7361.71	247.22 N	518.35 W	244.14	9.52
7515.00	54.14	357.99	7390.05	284.68 N	520.11 W	281.59	5.68
7562.00	59.25	358.32	7415.84	323.92 N	521.37 W	320.82	10.89
7609.00	65.00	359.97	7437.81	365.45 N	521.97 W	362.34	12.62
7657.00	68.86	0.18	7456.62	409.60 N	521.92 W	406.50	8.05
7704.00	72.37	0.85	7472.21	453.93 N	521.51 W	450.82	7.59
7752.00	75.78	0.09	7485.38	500.08 N	521.14 W	496.97	7.27
7799.00	79.13	359.60	7495.59	545.95 N	521.26 W	542.84	7.20
7846.00	82.49	359.69	7503.10	592.34 N	521.55 W	589.23	7.15
7887.00	85.13	357.61	7507.52	633.08 N	522.51 W	629.97	8.18
8017.00	86.98	357.96	7516.46	762.67 N	527.53 W	759.52	1.45
8111.00	86.70	358.39	7521.64	856.48 N	530.51 W	853.31	0.55
8206.00	88.24	359.00	7525.84	951.36 N	532.68 W	948.18	1.74
8300.00	88.06	359.16	7528.87	1045.30 N	534.18 W	1042.11	0.26
8395.00	89.88	359.94	7530.58	1140.27 N	534.93 W	1137.08	2.08
8489.00	90.86	0.36	7529.97	1234.27 N	534.68 W	1231.07	1.13
8584.00	91.08	0.64	7528.36	1329.25 N	533.86 W	1326.06	0.37
8678.00	91.32	1.07	7526.39	1423.22 N	532.45 W	1420.04	0.52
8773.00	90.15	0.07	7525.18	1518.21 N	531.51 W	1515.02	1.62
8867.00	89.67	358.08	7525.32	1612.19 N	533.03 W	1609.00	2.18
8962.00	89.85	358.45	7525.72	1707.14 N	535.90 W	1703.93	0.43
9057.00	90.25	359.07	7525.64	1802.12 N	537.96 W	1798.90	0.78
9152.00	90.68	358.33	7524.87	1897.09 N	540.11 W	1893.85	0.90
9247.00	90.25	357.10	7524.10	1992.01 N	543.90 W	1988.75	1.37
9341.00	89.75	356.86	7524.10	2085.88 N	548.85 W	2082.59	0.59
9436.00	89.88	357.13	7524.40	2180.75 N	553.83 W	2177.42	0.32
9531.00	90.40	356.93	7524.17	2275.62 N	558.76 W	2272.26	0.59
9626.00	90.46	357.19	7523.46	2370.49 N	563.63 W	2367.11	0.28
9721.00	90.52	356.74	7522.65	2465.36 N	568.66 W	2461.94	0.48
9815.00	90.12	356.37	7522.12	2559.18 N	574.31 W	2555.73	0.58
9910.00	91.27	356.25	7520.97	2653.98 N	580.42 W	2650.49	1.22
10005.00	90.68	355.96	7519.35	2748.74 N	586.87 W	2745.21	0.69
10100.00	90.03	355.68	7518.76	2843.49 N	593.80 W	2839.92	0.74
10194.00	90.15	355.98	7518.62	2937.24 N	600.63 W	2933.62	0.34
10289.00	90.62	356.73	7517.98	3032.05 N	606.67 W	3028.39	0.93
10383.00	90.68	357.17	7516.91	3125.91 N	611.67 W	3122.22	0.47
10478.00	90.25	356.87	7516.14	3220.77 N	616.61 W	3217.06	0.55
10572.00	89.60	356.41	7516.26	3314.61 N	622.12 W	3310.86	0.85
10665.00	89.57	356.57	7516.94	3407.43 N	627.81 W	3403.65	0.18
10757.00	89.75	356.80	7517.48	3499.28 N	633.13 W	3495.46	0.32
10850.00	90.92	358.05	7516.94	3592.18 N	637.31 W	3588.33	1.84
10942.00	91.14	358.31	7515.28	3684.12 N	640.23 W	3680.25	0.37
11034.00	91.23	358.41	7513.38	3776.06 N	642.87 W	3772.18	0.15
11127.00	91.08	358.19	7511.51	3869.00 N	645.63 W	3865.10	0.29
11220.00	91.51	357.51	7509.41	3961.91 N	649.11 W	3957.99	0.86
11312.00	91.60	357.51	7506.91	4053.79 N	653.11 W	4049.84	0.10
11403.00	90.49	356.76	7505.25	4144.66 N	657.66 W	4140.68	1.47
11496.00	90.09	357.55	7504.78	4237.54 N	662.27 W	4233.54	0.95
11589.00	89.82	357.67	7504.85	4330.46 N	666.15 W	4326.43	0.32
11681.00	89.41	357.53	7505.47	4422.38 N	670.00 W	4418.33	0.47
11772.00	89.23	357.42	7506.55	4513.28 N	674.01 W	4509.21	0.23
11864.00	89.48	358.18	7507.59	4605.21 N	677.54 W	4601.11	0.87
11956.00	88.92	359.62	7508.87	4697.18 N	679.31 W	4693.07	1.68
12049.00	89.26	0.98	7510.35	4790.17 N	678.82 W	4786.05	1.51
12141.00	90.00	1.16	7510.94	4882.15 N	677.10 W	4878.04	0.83
12235.00	89.75	1.11	7511.15	4976.13 N	675.24 W	4972.03	0.27
12328.00	89.91	1.87	7511.42	5069.10 N	672.82 W	5065.01	0.84

12020.00	88.81	1.07	7511.42	5355.15 N	672.52 W	5555.94	0.54
12421.00	90.68	1.66	7510.94	5162.05 N	669.96 W	5157.98	0.86
12513.00	90.28	1.44	7510.17	5254.01 N	667.47 W	5249.96	0.50
12605.00	91.66	1.39	7508.62	5345.97 N	665.20 W	5341.93	1.50
12696.00	91.88	1.76	7505.81	5436.89 N	662.70 W	5432.86	0.47
12788.00	91.97	1.88	7502.71	5528.79 N	659.78 W	5524.78	0.16
12880.00	92.25	1.66	7499.33	5620.69 N	656.94 W	5616.69	0.39
12972.00	89.97	1.84	7497.55	5712.62 N	654.13 W	5708.64	2.49
13063.00	90.12	2.06	7497.47	5803.57 N	651.04 W	5799.60	0.29
13155.00	89.78	1.87	7497.55	5895.51 N	647.88 W	5891.56	0.42
13247.00	90.34	2.43	7497.46	5987.45 N	644.43 W	5983.52	0.86
13339.00	90.00	2.89	7497.19	6079.35 N	640.16 W	6075.44	0.62
13433.00	91.26	2.91	7496.15	6173.22 N	635.40 W	6169.34	1.34
13528.00	91.57	2.47	7493.81	6268.09 N	630.95 W	6264.23	0.57
13622.00	91.73	2.60	7491.10	6361.95 N	626.79 W	6358.12	0.22
13717.00	91.51	2.07	7488.41	6456.84 N	622.92 W	6453.03	0.60
13811.00	91.48	2.36	7485.96	6550.74 N	619.29 W	6546.94	0.31
13905.00	89.26	1.28	7485.35	6644.68 N	616.31 W	6640.90	2.63
14000.00	89.97	1.70	7485.99	6739.64 N	613.84 W	6735.88	0.87
14094.00	89.41	2.04	7486.50	6833.59 N	610.77 W	6829.85	0.70
14189.00	89.14	2.37	7487.70	6928.51 N	607.11 W	6924.79	0.45
14283.00	90.37	3.22	7488.10	7022.40 N	602.53 W	7018.70	1.59
14378.00	92.00	3.37	7486.14	7117.22 N	597.07 W	7113.55	1.72
14472.00	91.63	2.57	7483.16	7211.04 N	592.20 W	7207.40	0.94
14567.00	90.22	2.71	7481.63	7305.93 N	587.83 W	7302.31	1.49
14661.00	89.01	2.74	7482.26	7399.82 N	583.36 W	7396.23	1.29
14756.00	88.52	3.06	7484.31	7494.67 N	578.55 W	7491.11	0.62
14850.00	88.05	3.05	7487.12	7588.50 N	573.55 W	7584.96	0.50
14945.00	87.50	3.28	7490.81	7683.28 N	568.31 W	7679.77	0.63
15039.00	87.26	2.10	7495.11	7777.08 N	563.90 W	7773.59	1.28
15133.00	88.21	1.93	7498.82	7870.94 N	560.60 W	7867.48	1.03
15228.00	88.06	2.01	7501.91	7965.84 N	557.33 W	7962.39	0.18
15322.00	89.04	1.39	7504.29	8059.76 N	554.54 W	8056.33	1.23
15417.00	89.29	1.10	7505.68	8154.73 N	552.48 W	8151.31	0.40
15511.00	89.41	0.87	7506.74	8248.71 N	550.86 W	8245.30	0.28
15606.00	90.74	1.54	7506.62	8343.69 N	548.87 W	8340.28	1.57
15700.00	91.17	1.90	7505.05	8437.63 N	546.05 W	8434.24	0.60
15794.00	90.56	1.70	7503.63	8531.58 N	543.09 W	8528.20	0.68
15889.00	90.62	1.53	7502.66	8626.53 N	540.42 W	8623.17	0.19
15983.00	90.46	1.51	7501.77	8720.50 N	537.92 W	8717.15	0.17
16078.00	89.66	1.13	7501.67	8815.47 N	535.73 W	8812.13	0.93
16172.00	89.54	1.23	7502.33	8909.45 N	533.80 W	8906.12	0.17
16267.00	89.23	1.05	7503.35	9004.42 N	531.91 W	9001.11	0.38
16361.00	89.94	1.25	7504.03	9098.40 N	530.02 W	9095.09	0.78
16455.00	90.28	0.70	7503.85	9192.39 N	528.42 W	9189.09	0.69
16550.00	90.65	0.63	7503.08	9287.38 N	527.32 W	9284.08	0.40
16644.00	90.99	1.10	7501.73	9381.36 N	525.90 W	9378.07	0.62
16739.00	90.37	1.14	7500.60	9476.33 N	524.04 W	9473.05	0.65
16831.00	89.60	1.03	7500.63	9568.31 N	522.30 W	9565.04	0.85
16921.00	90.37	0.83	7500.65	9658.30 N	520.84 W	9655.04	0.88
17015.00	91.88	1.21	7498.80	9752.26 N	519.17 W	9749.01	1.66
17110.00	92.16	0.82	7495.46	9847.19 N	517.49 W	9843.95	0.51
17204.00	91.48	2.06	7492.47	9941.11 N	515.13 W	9937.88	1.50
17298.00	92.22	1.57	7489.44	10035.01 N	512.15 W	10031.80	0.94
17393.00	90.65	1.39	7487.06	10129.95 N	509.70 W	10126.75	1.66
17487.00	91.26	0.84	7485.49	10223.92 N	507.87 W	10220.72	0.87
17582.00	89.35	1.33	7484.98	10318.89 N	506.07 W	10315.71	2.08
17676.00	89.38	1.01	7486.03	10412.87 N	504.15 W	10409.69	0.34
17770.00	90.74	0.83	7485.93	10506.85 N	502.64 W	10503.69	1.46
17863.00	90.74	1.64	7484.73	10599.82 N	500.64 W	10596.67	0.87
17958.00	91.48	1.69	7482.89	10694.77 N	497.88 W	10691.62	0.78
18052.00	91.79	1.61	7480.20	10788.69 N	495.17 W	10785.56	0.34
18146.00	92.28	1.21	7476.87	10882.60 N	492.86 W	10879.48	0.67
18240.00	93.21	0.90	7472.37	10976.48 N	491.13 W	10973.37	1.04
18334.00	92.00	0.56	7468.09	11070.37 N	489.93 W	11067.27	1.34
18428.00	92.74	0.04	7464.21	11164.29 N	489.44 W	11161.18	0.96
18471.00	92.56	359.52	7462.22	11207.24 N	489.61 W	11204.14	1.28
18522.00	92.56	359.52	7459.94	11258.19 N	490.03 W	11255.08	0.00

**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 0.34 DEGREES (TRUE)
A TOTAL CORRECTION OF 8.59 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 18522.00 FEET
IS 11268.85 FEET ALONG 357.51 DEGREES (TRUE)**

Survey Data is tied on to Gyro Data.

Surveys have been IFR Corrected

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