

**PCDC - Pressure Case Directional**  
**PCGK - Pressure Case Gamma**

**1 : 600 / 1 : 240**

Country : <b>USA</b>			
Field : <b>Wattenburg</b>			
Location : <b>Lat: 40° 27' 20.66" North</b> <b>Long: 104° 21' 22.21" West</b>			
Well : <b>Wells Ranch AE30-65-1BHNB</b>			
Company : <b>Noble Energy</b>			
Rig : <b>H&amp;P 321</b>			
LOCATION			
Latitude : <b>40° 27' 20.66" North</b> Longitude : <b>104° 21' 22.21" West</b>		Other Services <b>Directional Drilling</b>	
UTM Easting = <b>3,318,297.740 ft</b> UTM Northing = <b>1,410,919.330 ft</b>			
Company : <b>Noble Energy</b>		: <b>Noble Energy</b>	
Rig : <b>H&amp;P 321</b>		: <b>H&amp;P 321</b>	
Well : <b>Wells Ranch AE30-65-1BHNB</b>		: <b>Wells Ranch AE30-65-1BHNB</b>	
Field : <b>Wattenburg</b>		: <b>Wattenburg</b>	
Country : <b>USA</b>		: <b>USA</b>	
API Number : <b>05-123-38645</b>			
Permanent Datum : <b>Ground Level</b>		Elevation : <b>4757.00 ft</b>	
Log Measured From : <b>Drill Floor</b>		30.00 ft Above Permanent Datum	
Drilling Measured From : <b>Drill Floor</b>		<b>TVD LOG</b>	
Depth Logged : <b>644.98 ft</b> To <b>6,492.10 ft</b>		Unit No. : <b>11210424</b>	
Date Logged : <b>02-Apr-14</b> To <b>04-Apr-14</b>		Job No. : <b>CA-XX-0901176445</b>	
Total Depth MD : <b>6,889.00 ft</b> TVD : <b>6,492.10 ft</b>		Plot Type : <b>Final</b>	
Spud Date : <b>02-Apr-14</b>		Plot Date : <b>05-Apr-14</b>	
Run No.		Run No.	
Size		Size	
From		From	
To		To	
0100		0100	
8.750 in		8.750 in	
635.98 ft		635.98 ft	
5,809.86 ft		5,809.86 ft	
0200		0200	
8.750 in		8.750 in	
5,809.86 ft		5,809.86 ft	
6,492.10 ft		6,492.10 ft	
Casing Record (TVD)		Casing Record (TVD)	
Size		Size	
Weight		Weight	
From		From	
To		To	
9.625 in		9.625 in	
34.90 lbp/		34.90 lbp/	
SURFACE		SURFACE	
625.98 ft		625.98 ft	

**WELL INFORMATION**

MWD Run Number	100	200		
Date run completed	04-Apr-14	05-Apr-14		
Rig Bit Number	2	3		
Bit Size (in)	8.750	8.750		
Tool Nominal OD (in)	6.800	6.800		
Log Start Depth (MD, ft)	636.00	5,828.00		
Log End Depth (MD, ft)	5,828.00	6,889.00		
Drill or Wipe	Drill	Drill		
Drill/Wipe Start Date and Time	03-Apr-14 12:02	04-Jan-14 17:40		
Drill/Wipe End Date and Time	04-Apr-14 11:07	05-Jan-14 05:03		
Min Inc (deg) @ Depth (MD, ft)	0.21 @ 2,966.00	0.59 @ 5,834.00		
Max Inc (deg) @ Depth (MD, ft)	12.05 @ 3,817.00	85.10 @ 6,835.00		
Bit TFA(in2) / Bit Type	0.75 / PDC	0.75 / PDC		
Flow Rate (gpm)	584.02	590.21		
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A	N/A / N/A		
Fluid Type	Native/Spud Mud	Fresh Water Gel		
Density (ppg) / Viscosity (spqt)	8.65 / 31.00	10.02 / 40.00		
Filtrate CL (ppm)	1,600.00	2,000.00		
pH / Fluid Loss (mptm)	10.70 / 32	9.00 / 9		
PV (cP) / YP (lbf2)	4 / 4.00	12 / 11.00		
% Solids / % Sand	2.40 / 0.75	10.60 / 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	145.90 / PCM	162.80 / PCM			
Rm @ Max Tool Temp (degF)	N/A @ 145.90	N/A @ 162.80			
Lead MWD Engineer	Kyle Wass	Kyle Wass			
Customer Representative	Stetson Nielsen	Stetson Nielsen			

## SENSOR INFORMATION

### Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.84	5.84			
Sub Serial Number	245494	245494			
Insert Serial Number	11400842	11400842			
Date and Time Initialized	02-Apr-14 22:06	01-Jan-70 00:00			
Date and Time Read	05-Apr-14 10:33	05-Apr-14 10:31			
ECMB SW Version	N/A	N/A			

### Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	57.00	54.00			
Software Version	6.21	6.21			
Sub Serial Number	245494	245494			
Sonde Serial Number	11478014	11478014			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	70.35	50.59			

### Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	49.60	46.94			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	245494	245494			
Insert/Sonde Serial Number	11681051	11681051			

## REMARKS

1. All depths are calibrated to driller's pipe tally and are true vertical depth from the Drill Floor.
2. No depth corrections have been made for pipe stretch or compression.
3. Critical annular velocities are calculated using the "Power Law" model for water based fluids and the "Brigham Plastic" model for oil and synthetic based fluids.
4. All data presented is recorded data unless otherwise specified.
5. The following smoothing parameters have been applied to the data:  
1:600 Log  
PGRC (Gamma CG) and ROPA (Average Rate of Penetration)  
Interval Resolution: 1.0 ft  
Interval Distance: 3.0 ft  
  
1:240 Log  
PGRC (Gamma CG):  
Interval Resolution: 0.5 ft  
Interval Distance: 0.6 ft  
  
ROPA (Average Rate Of Penetration):  
Interval Resolution: 0.5 ft

Interval Resolution: 1.2 ft

6. Insite Version v8.0.10

## WARRANTY

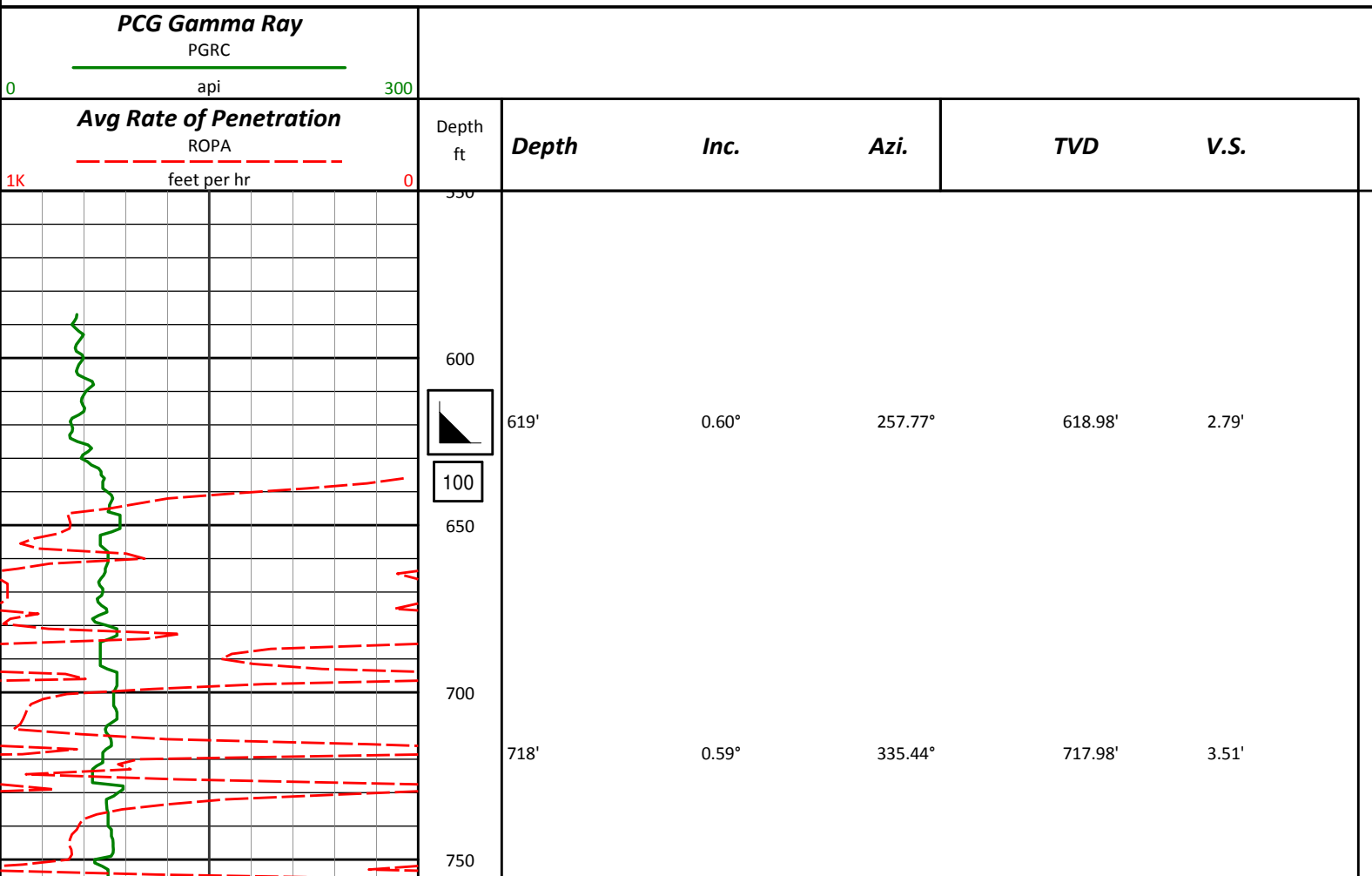
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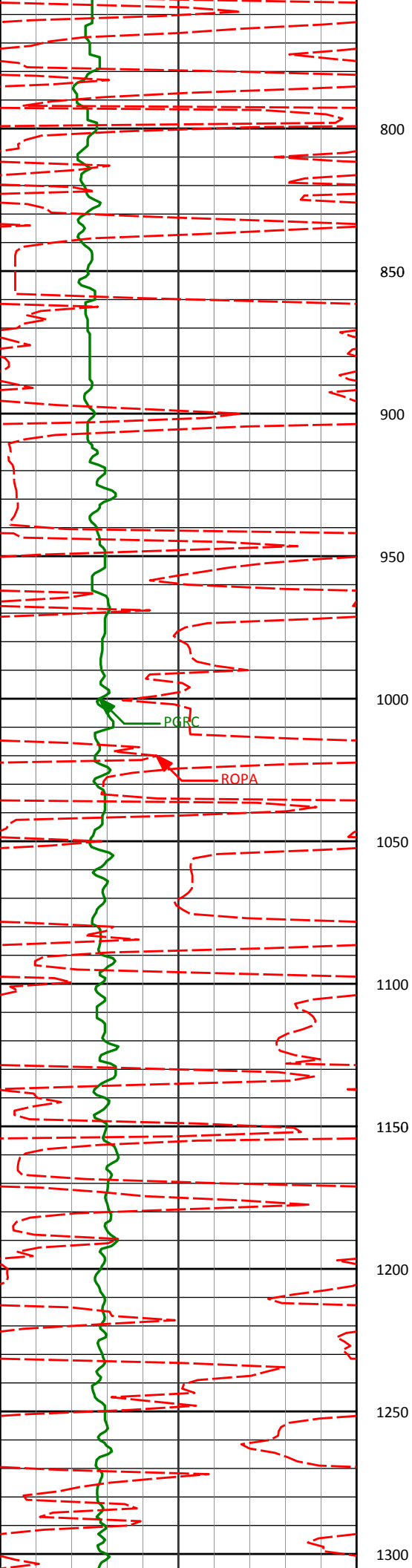
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## Sperry Drilling Services

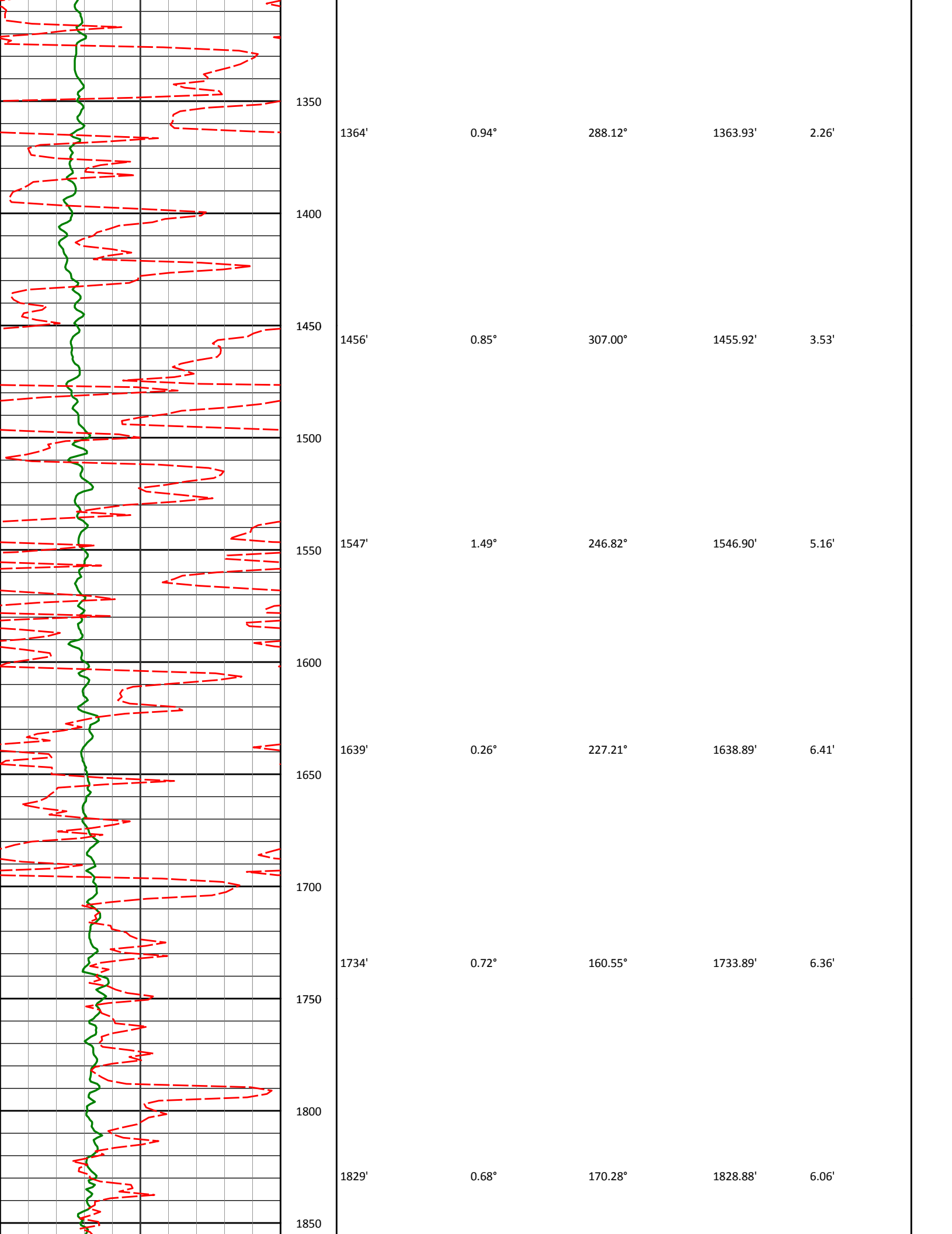
### TVD Correlation Log 1:600

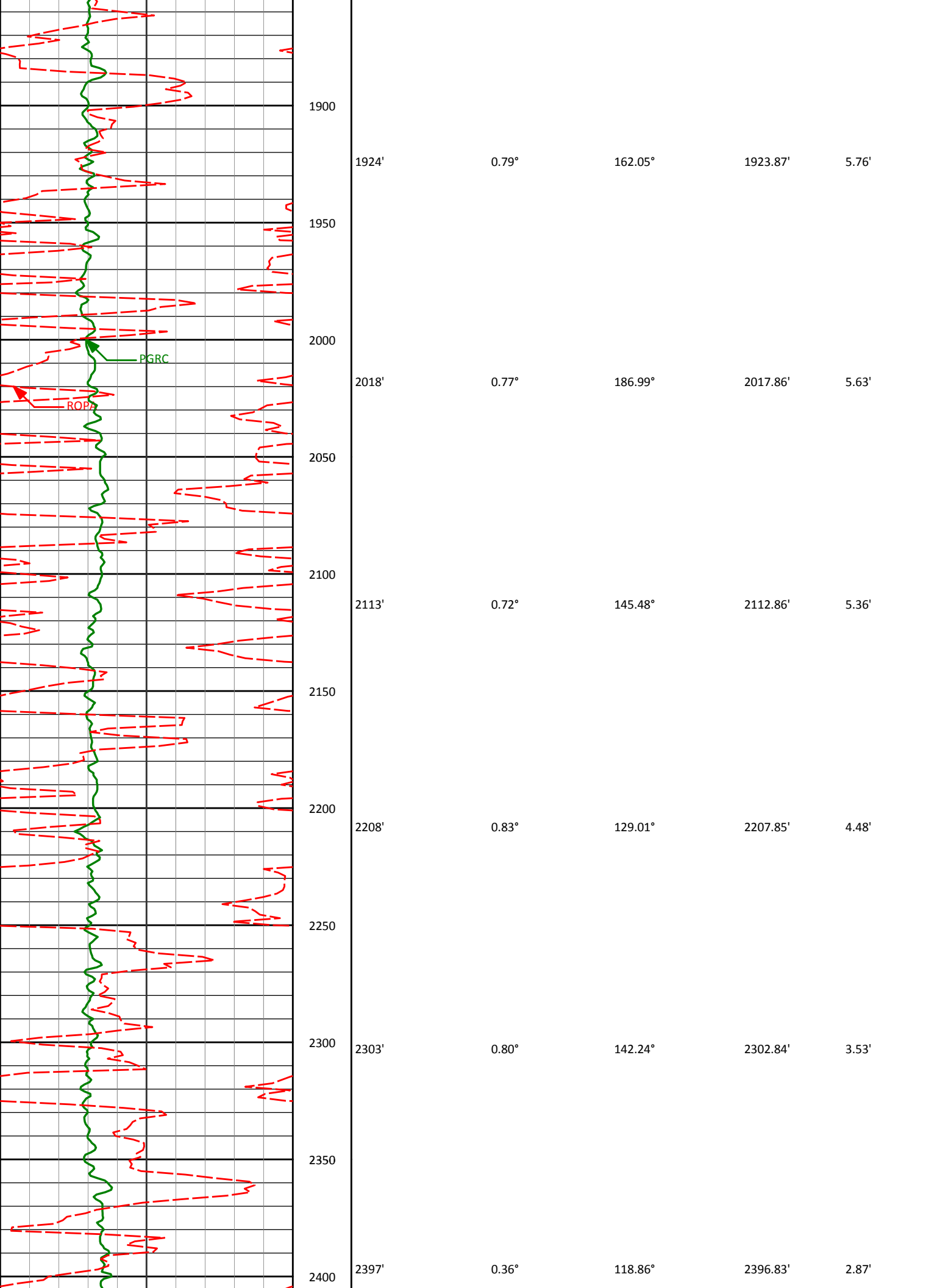
Noble Energy  
Wells Ranch AE30-65-1BHNB  
H&P 321  
Sec. 29-T6N-R62W

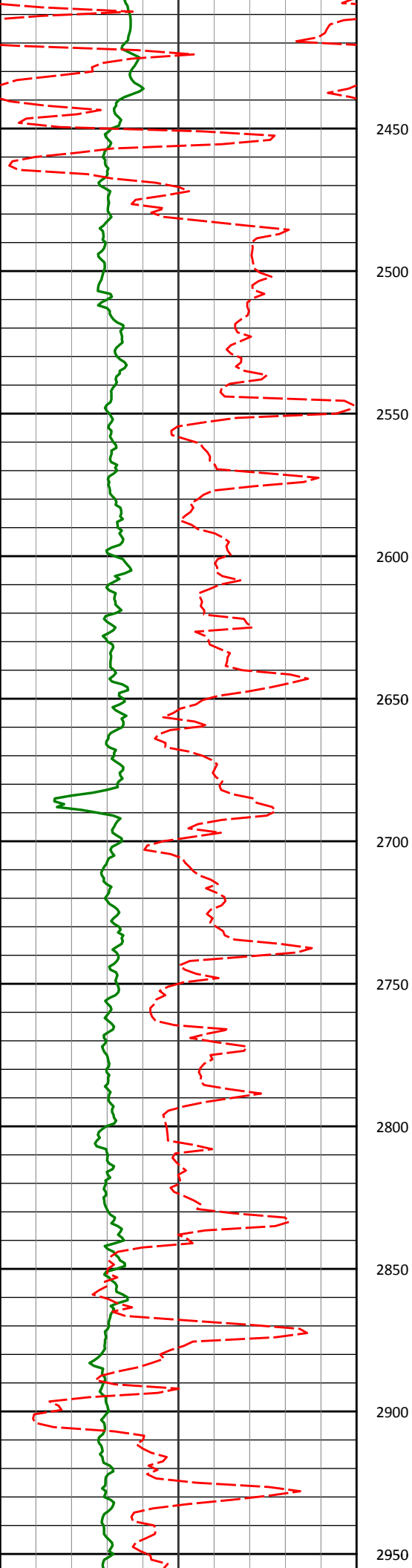




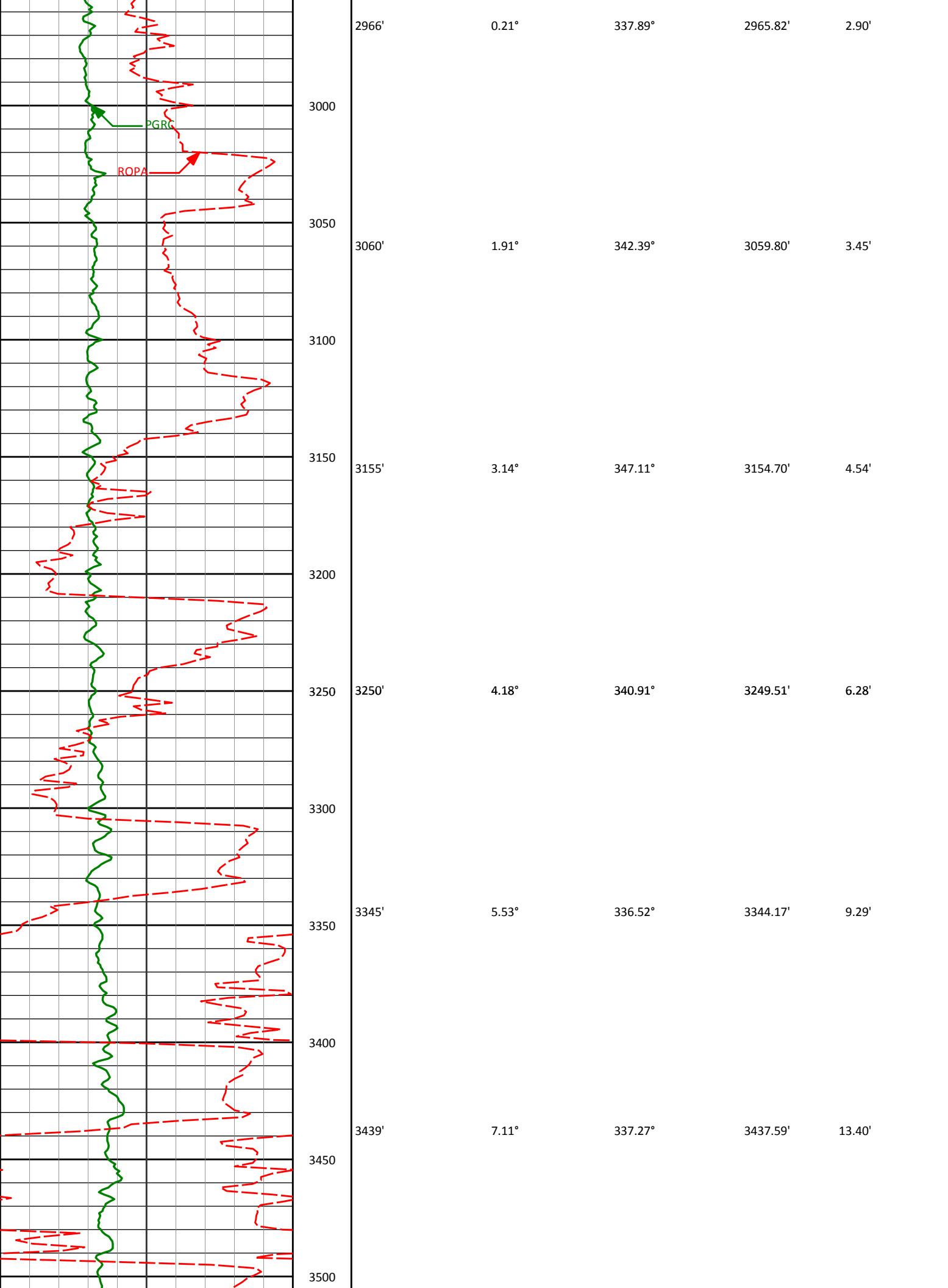
810'	0.47°	337.32°	809.97'	3.86'
994'	0.43°	10.12°	993.97'	4.03'
1085'	0.80°	35.96°	1084.96'	3.61'
1178'	0.94°	31.76°	1177.95'	2.83'
1271'	0.99°	34.17°	1270.94'	1.99'



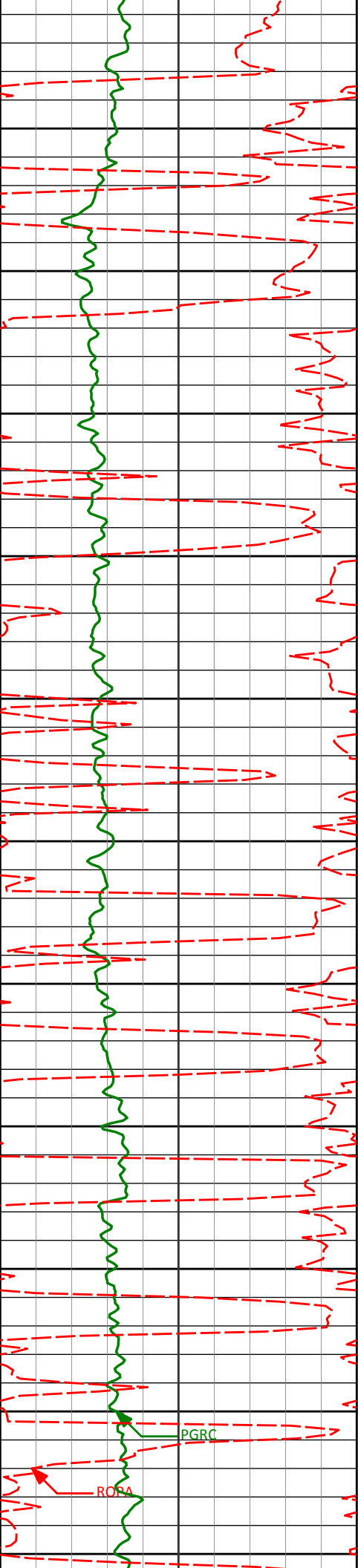




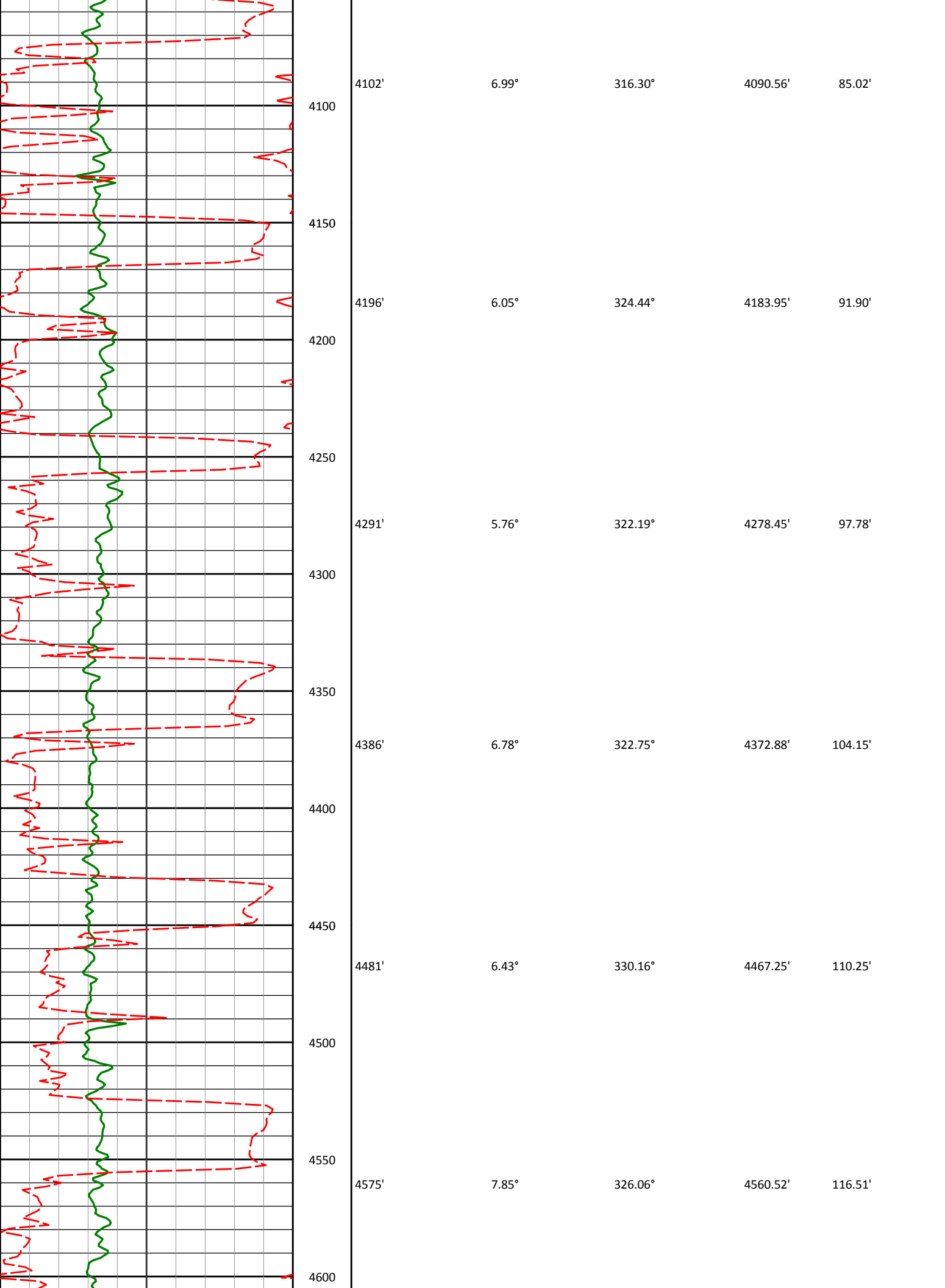
2450				
2492'	0.61°	151.69°	2491.83'	2.36'
2500				
2550				
2587'	0.49°	167.90°	2586.83'	2.03'
2600				
2650				
2681'	0.53°	171.20°	2680.82'	1.88'
2700				
2750				
2776'	0.36°	228.71°	2775.82'	2.03'
2800				
2850				
2871'	0.38°	292.82°	2870.82'	2.55'
2900				
2950				

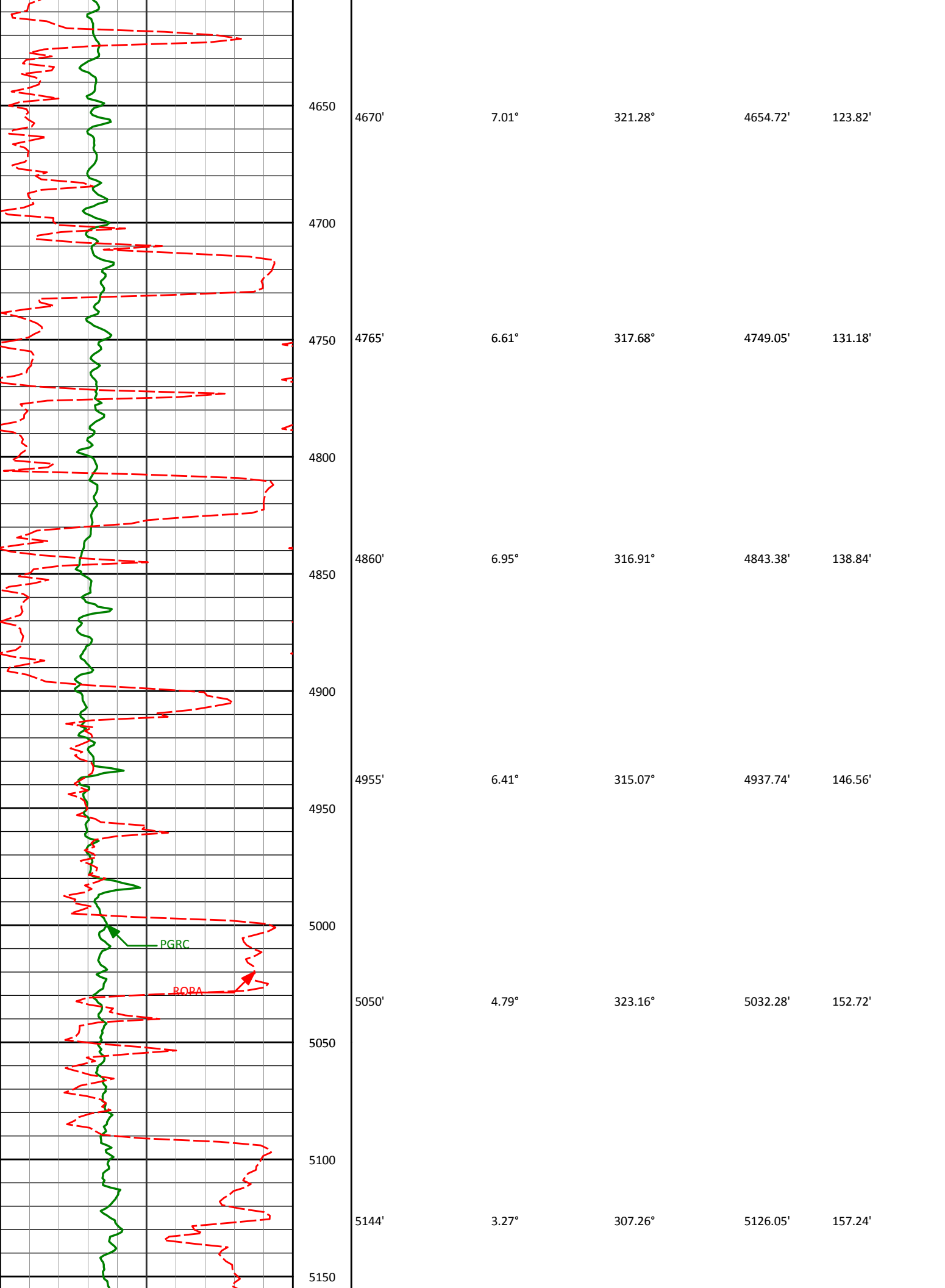


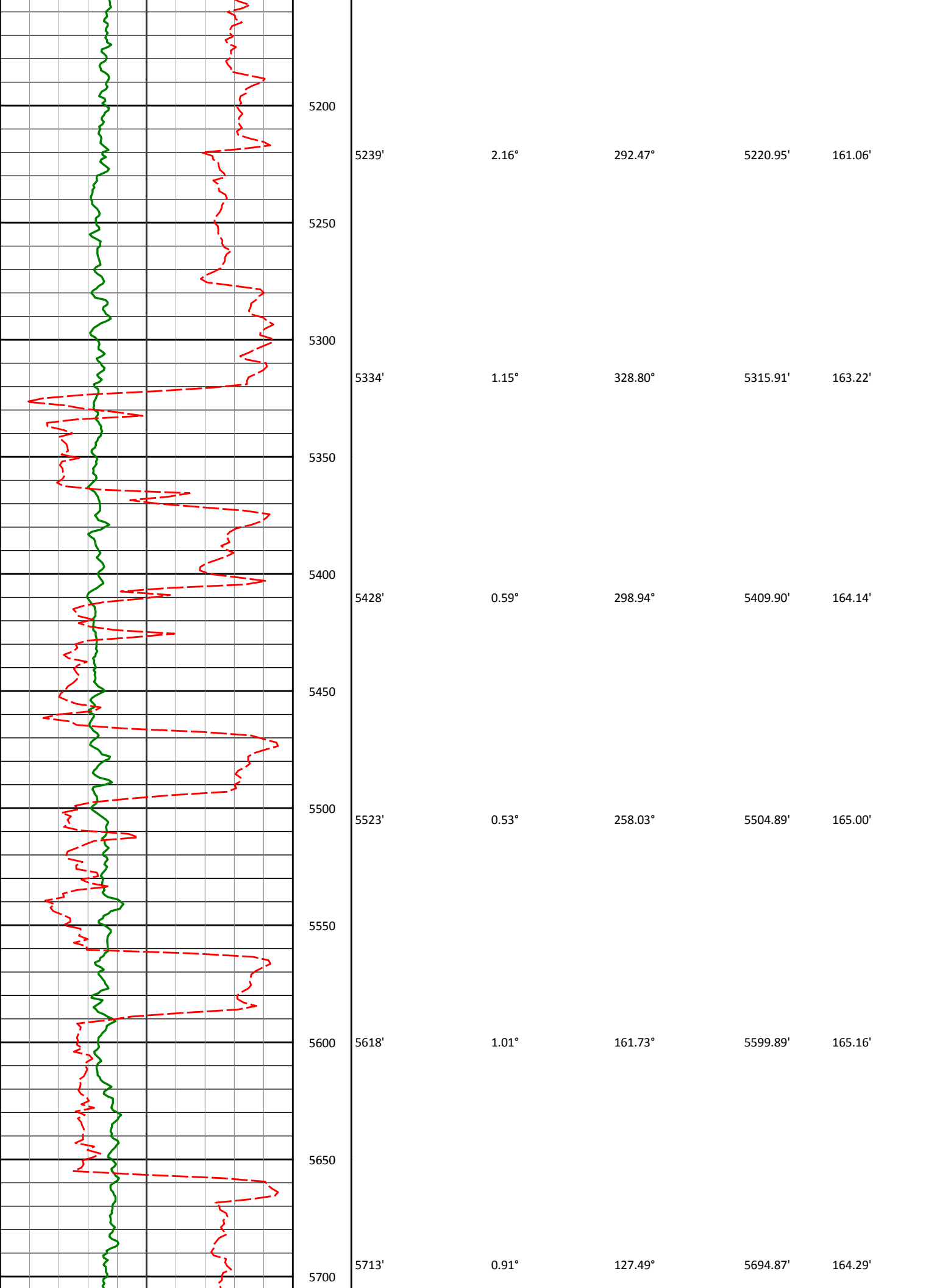


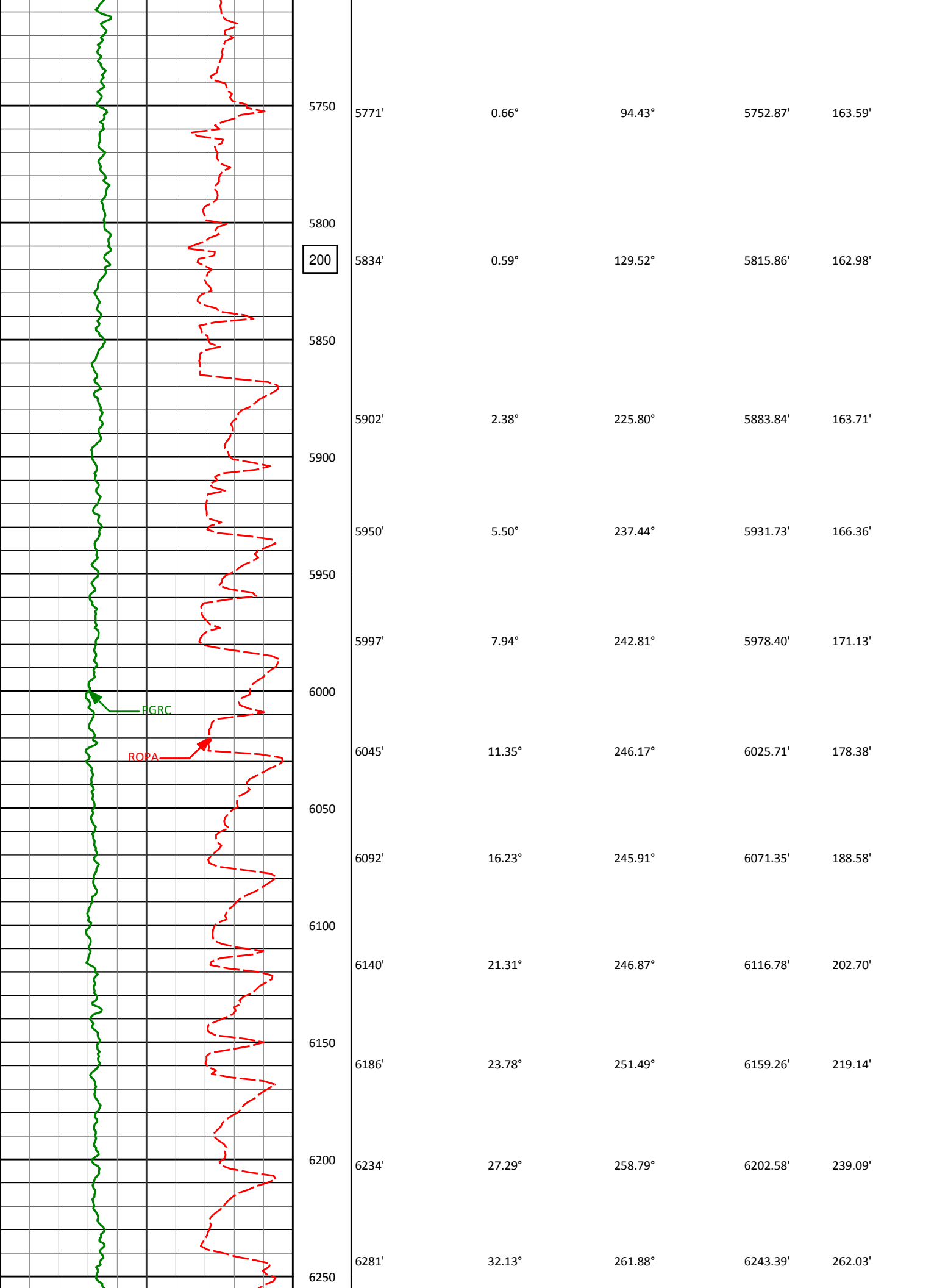


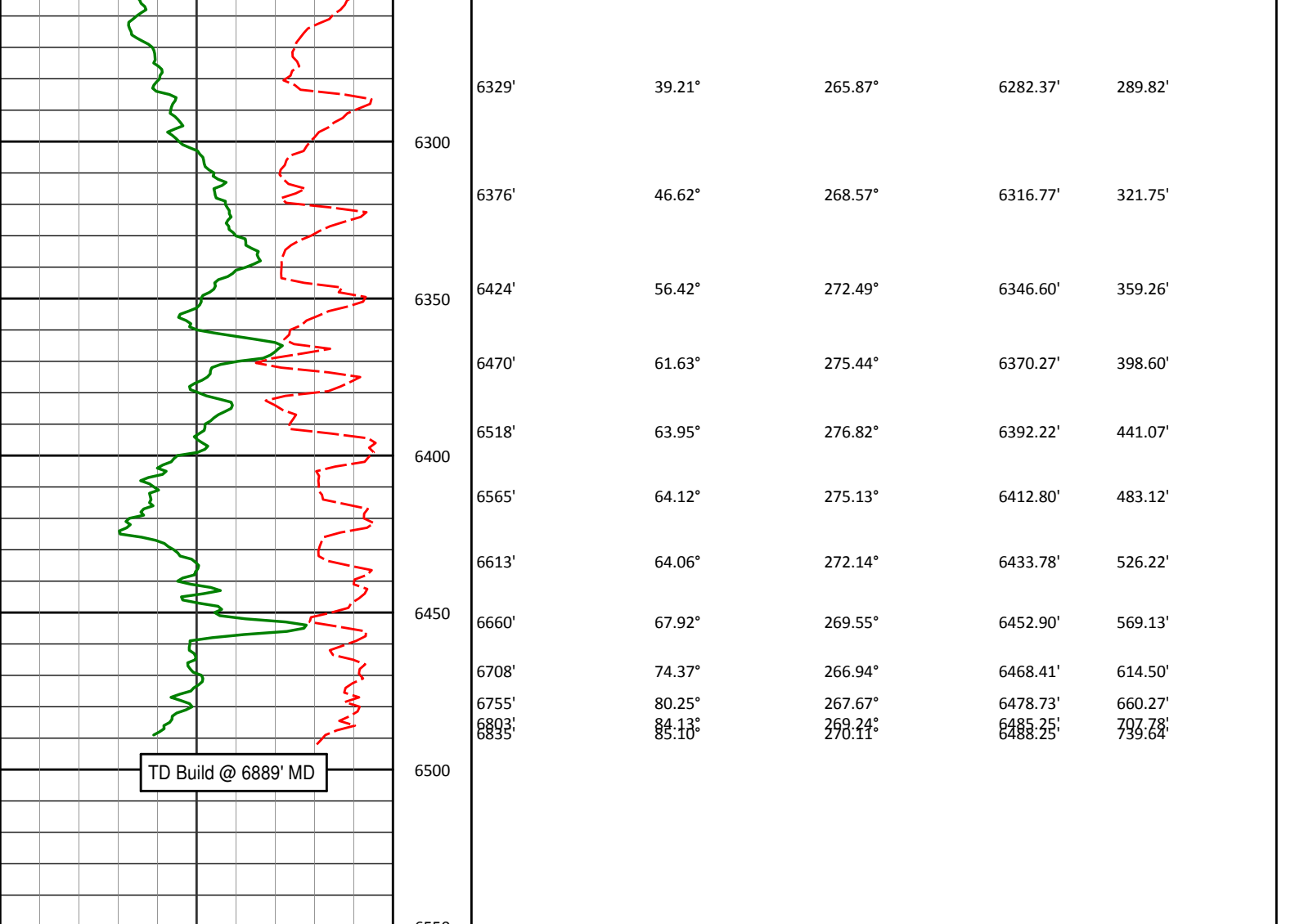
3534'	9.35°	329.31°	3531.61'	19.68'
3550				
3600				
3629'	10.85°	322.24°	3625.14'	29.18'
3650				
3700				
3724'	11.51°	316.29°	3718.34'	41.29'
3750				
3800				
3817'	12.05°	316.14°	3809.38'	54.51'
3850				
3900				
3912'	9.74°	317.54°	3902.66'	66.89'
3950				
4000	8.65°	323.10°	3996.44'	76.67'
4050				



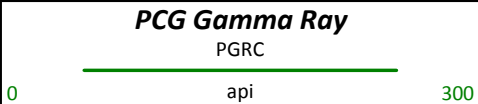








<b>Avg Rate of Penetration</b> ROPA feet per hr		Depth ft	<b>Depth</b>	<b>Inc.</b>	<b>Azi.</b>	<b>TVD</b>	<b>V.S.</b>
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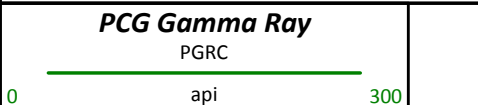


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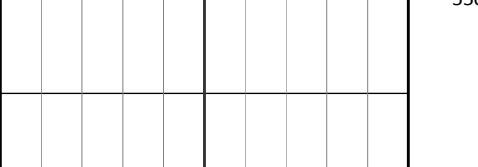
## Sperry Drilling Services

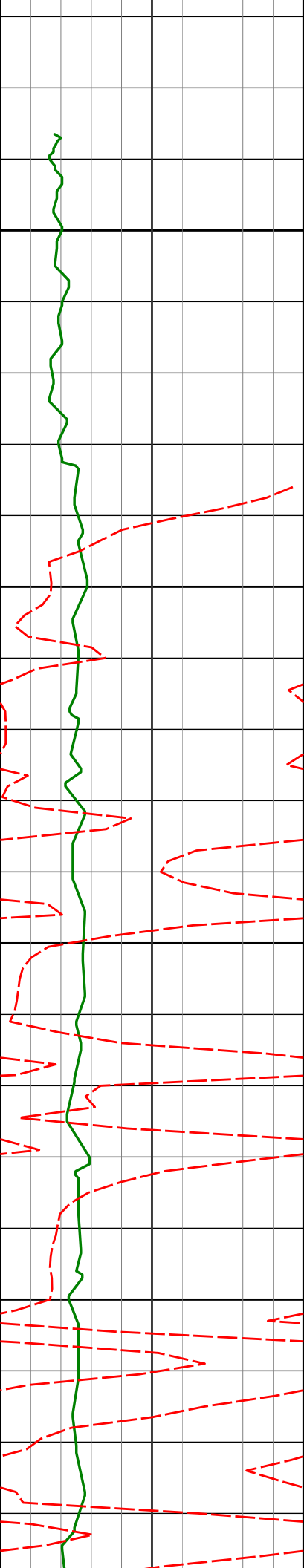
### TVD Detail Log 1:240

Noble Energy  
Wells Ranch AE30--65-1BHNB  
H&P 321  
Sec. 29-T6N-R62W



<b>Avg Rate of Penetration</b> ROPA feet per hr		Depth ft	<b>Depth</b>	<b>Inc.</b>	<b>Azi.</b>	<b>TVD</b>	<b>V.S.</b>
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600



Run 100

650

700

750

619'

718'

750

0.60°

0.59°

257.77°

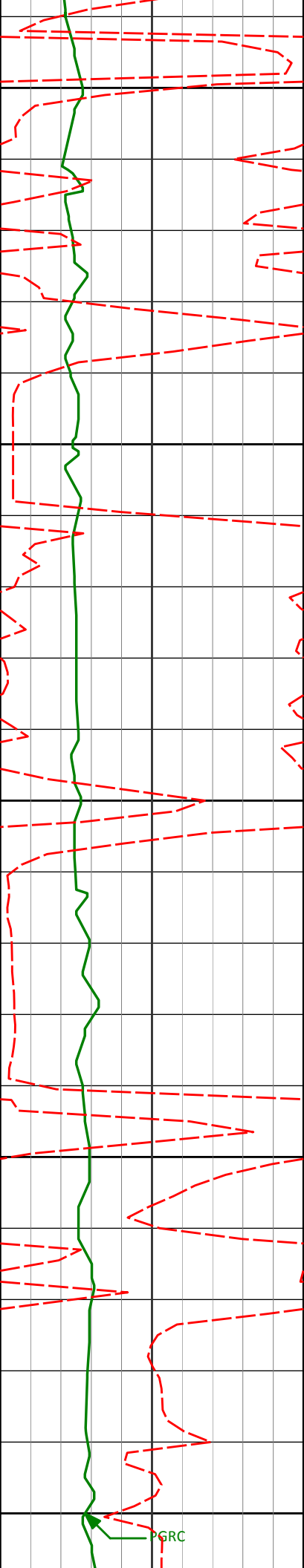
335.44°

618.98'

717.98'

2.79'

3.51'



800

810'

0.47°

337.32°

809.97'

3.86'

850

900

950

994'

0.43°

10.12°

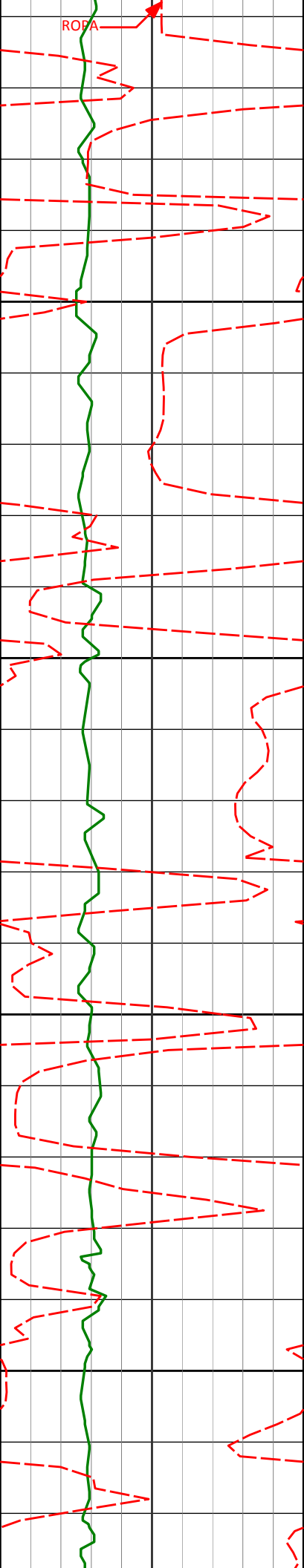
993.97'

4.03'

1000

PGRC





1050

1085'

0.80°

35.96°

1084.96'

3.61'

1100

1150

1178'

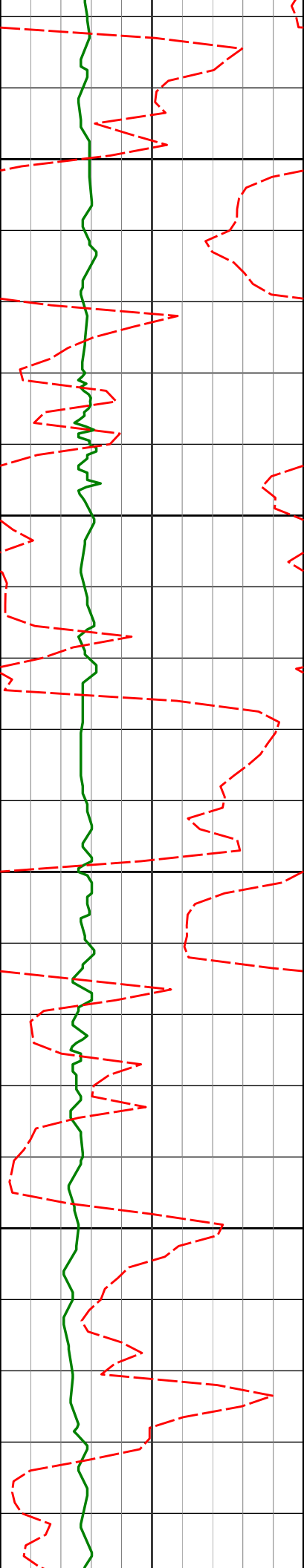
0.94°

31.76°

1177.95'

2.83'

1200



1250

1271'

0.99°

34.17°

1270.94'

1.99'

1300

1350

1364'

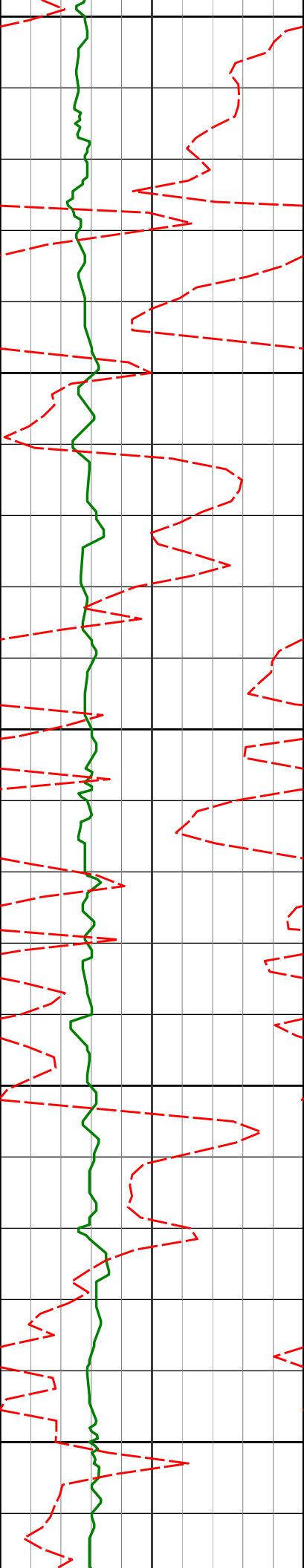
0.94°

288.12°

1363.93'

2.26'

1400



1450

1456'

0.85°

307.00°

1455.92'

3.53'

1500

1547'

1.49°

246.82°

1546.90'

5.16'

1550

1600

1639'

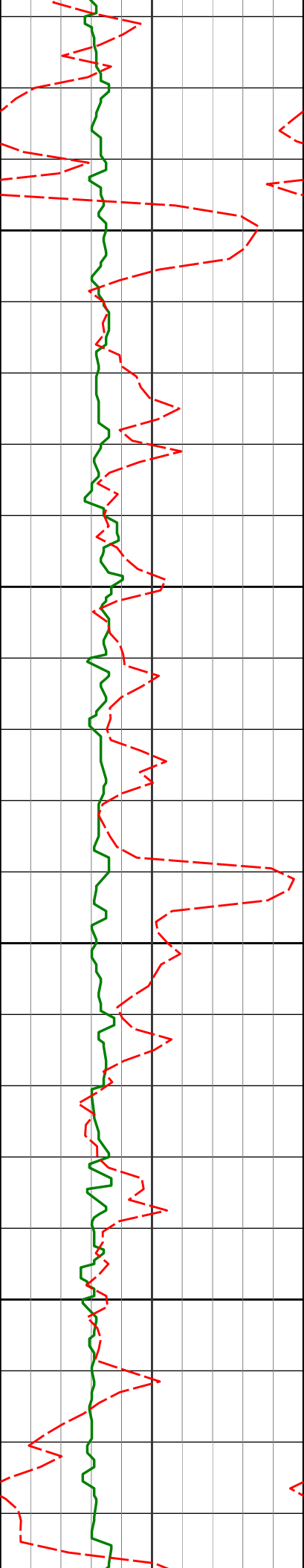
0.26°

227.21°

1638.89'

6.41'

1650



1700

1750

1800

1850

1734'

0.72°

160.55°

1733.89'

6.36'

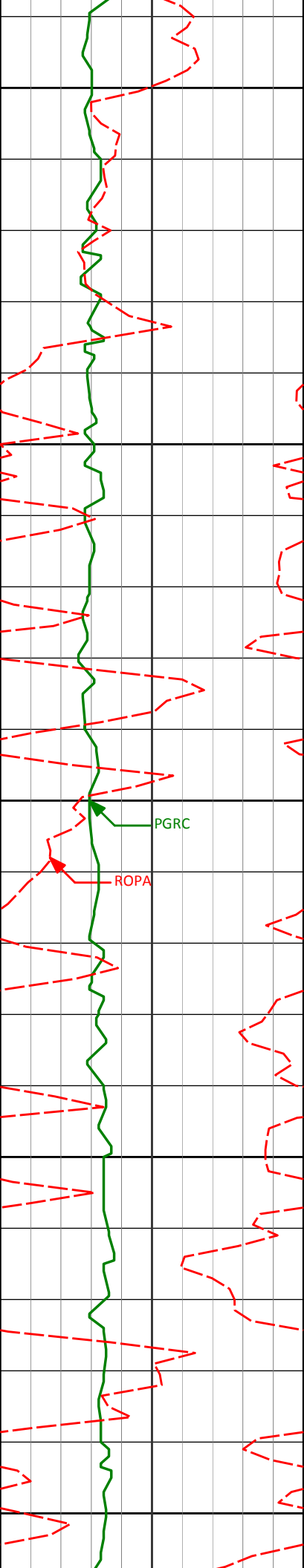
1829'

0.68°

170.28°

1828.88'

6.06'



1900

1924'

0.79°

162.05°

1923.87'

5.76'

1950

2000

PGRC

ROPA

2018'

0.77°

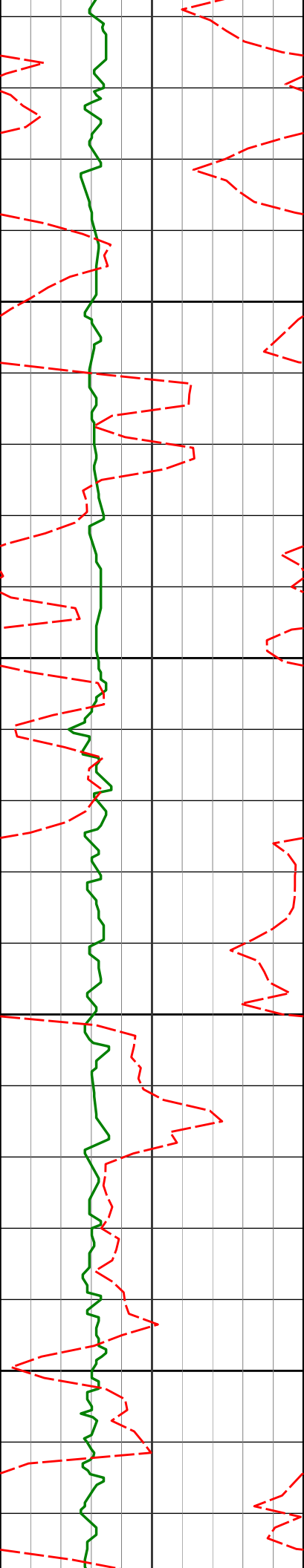
186.99°

2017.86'

5.63'

2050

2100



2113'

0.72°

145.48°

2112.86'

5.36'

2150

2200

2208'

0.83°

129.01°

2207.85'

4.48'

2250

2300

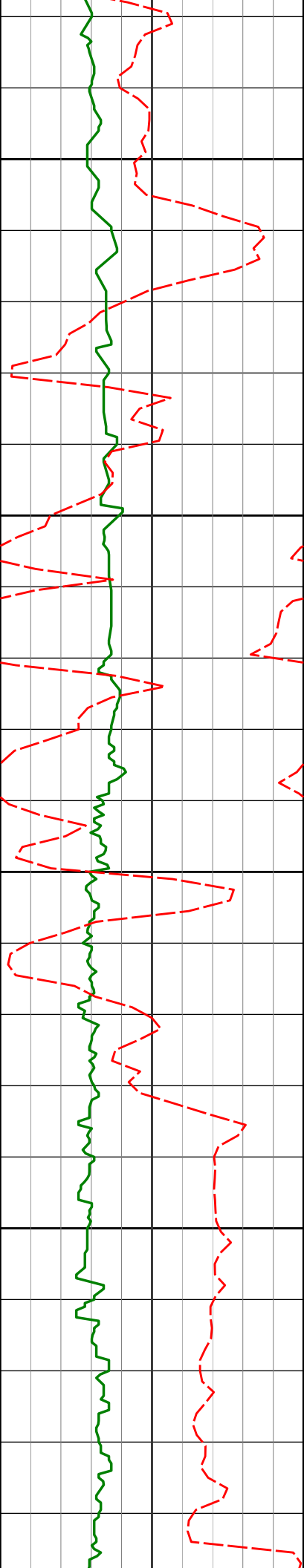
2303'

0.80°

142.24°

2302.84'

3.53'



2350

2400

2450

2500

2397'

0.36°

118.86°

2396.83'

2.87'

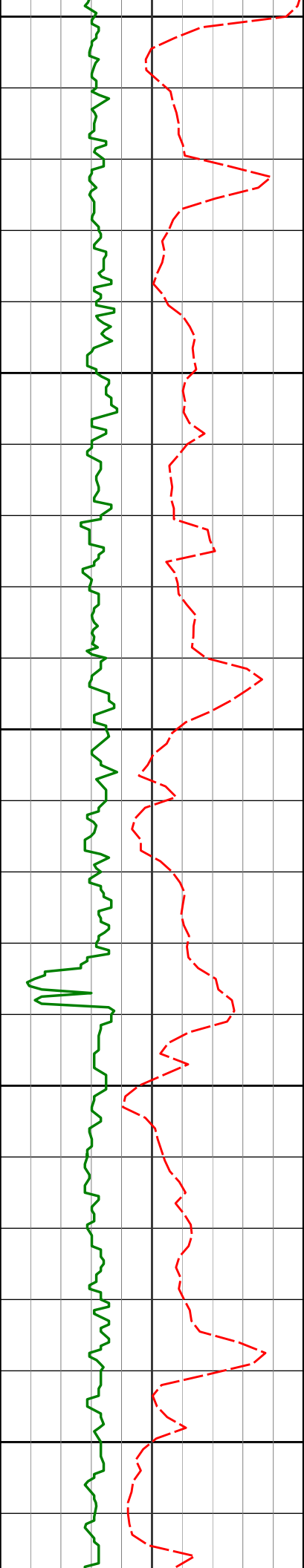
2492'

0.61°

151.69°

2491.83'

2.36'



2550

2587'

0.49°

167.90°

2586.83'

2.03'

2600

2650

2681'

0.53°

171.20°

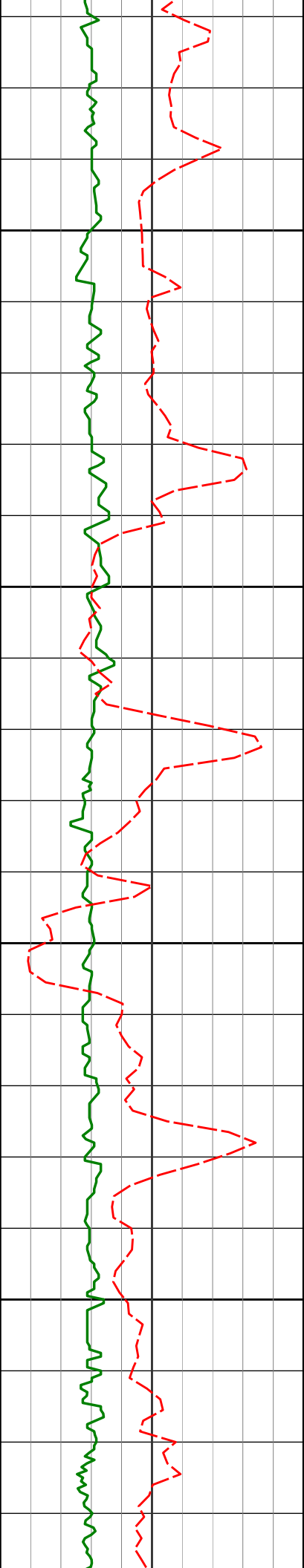
2680.82'

1.88'

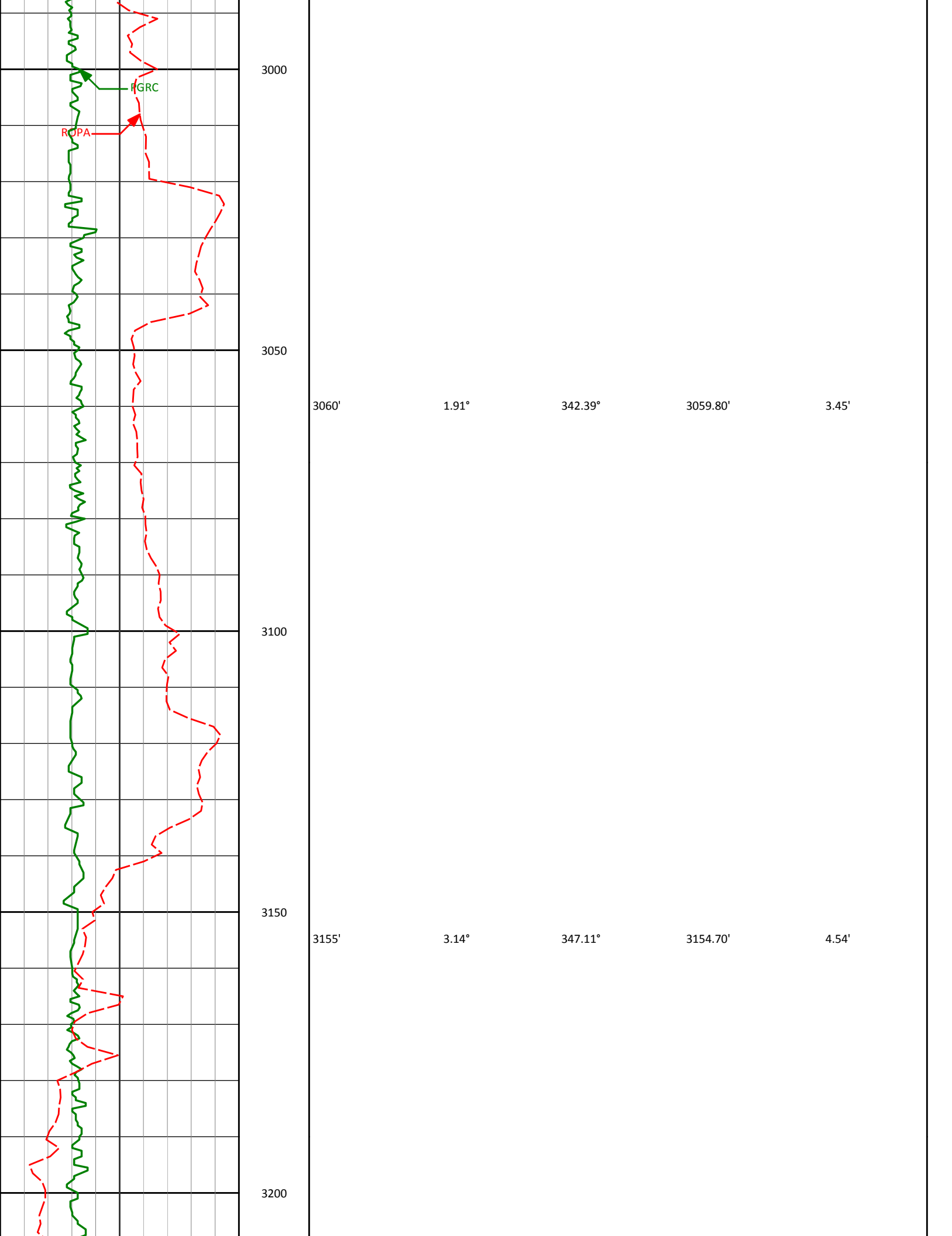
2700

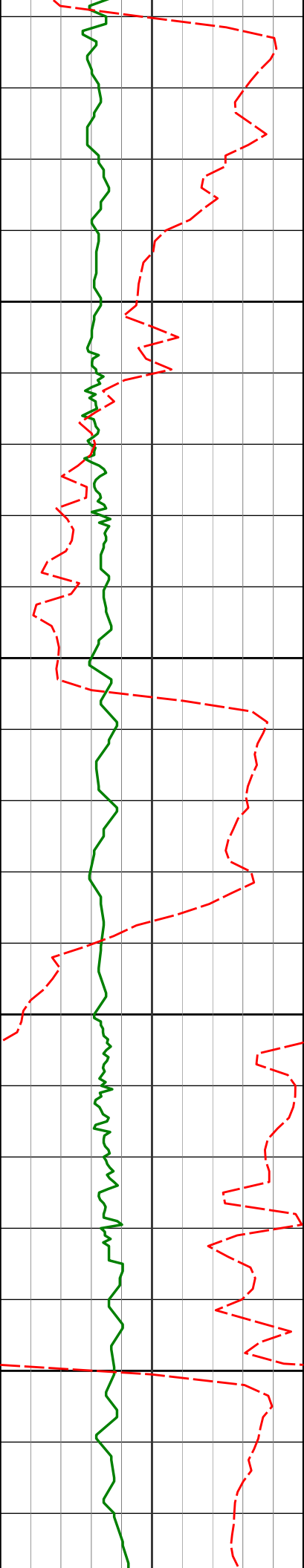
2750





2776'	0.36°	228.71°	2775.82'	2.03'
2800				
2850				
2871'	0.38°	292.82°	2870.82'	2.55'
2900				
2950				
2966'	0.21°	337.89°	2965.82'	2.90'





3250

3250'

4.18°

340.91°

3249.51'

6.28'

3300

3345'

5.53°

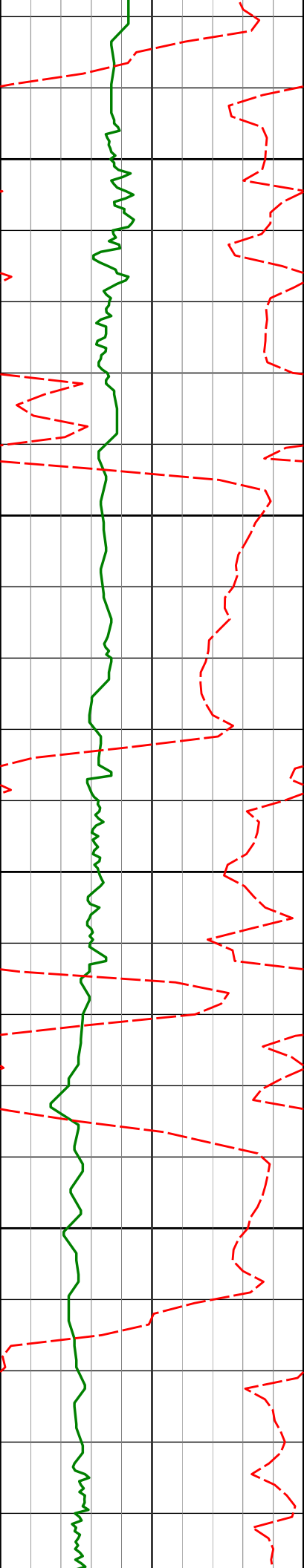
336.52°

3344.17'

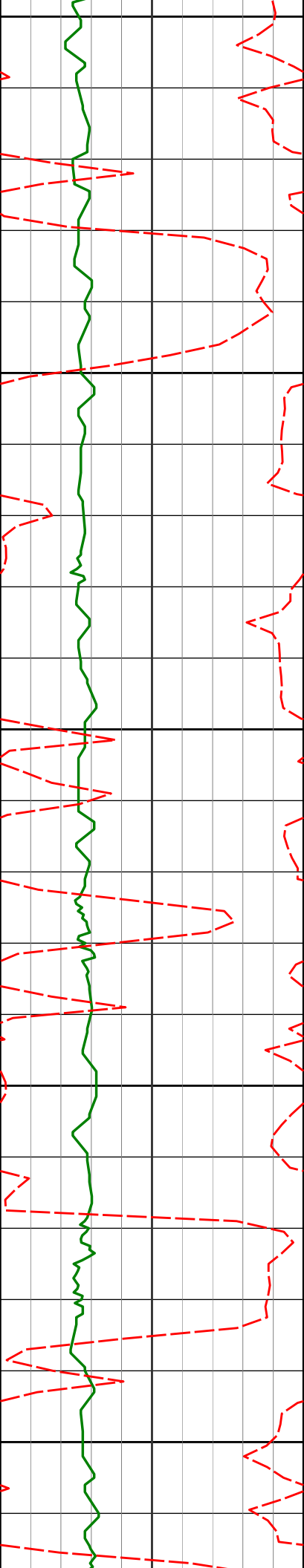
9.29'

3350

3400



3439'	7.11°	337.27°	3437.59'	13.40'
3450				
3500				
3534'	9.35°	329.31°	3531.61'	19.68'
3550				
3600				
3629'	10.85°	322.24°	3625.14'	29.18'



3650

3700

3750

3800

3850

3724'

11.51°

316.29°

3718.34'

41.29'

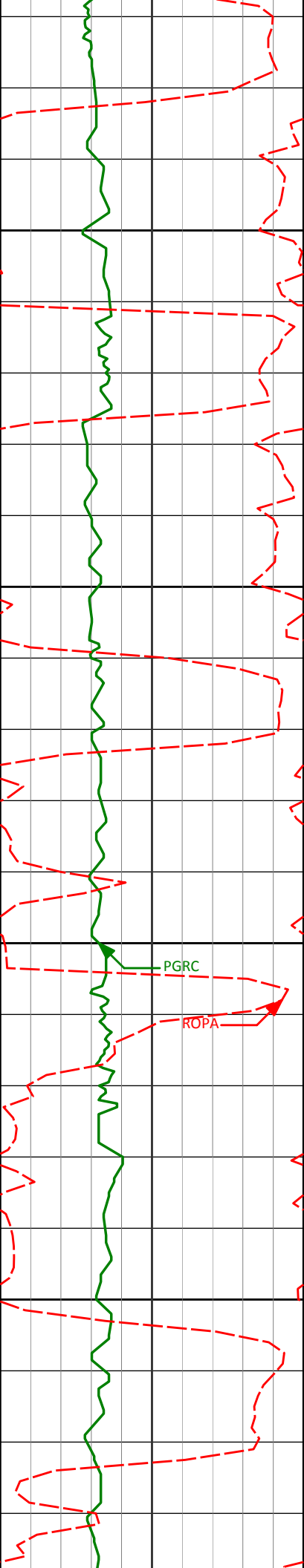
3817'

12.05°

316.14°

3809.38'

54.51'



3900

3912'

9.74°

317.54°

3902.66'

66.89'

3950

4000

PGRC

ROPA

4007'

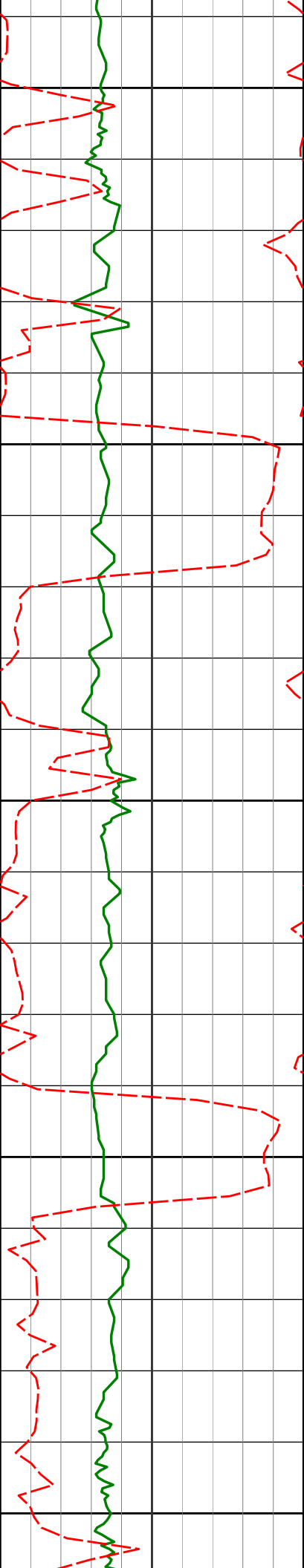
8.65°

323.10°

3996.44'

76.67'

4050



4102'

4100

4150

4196'

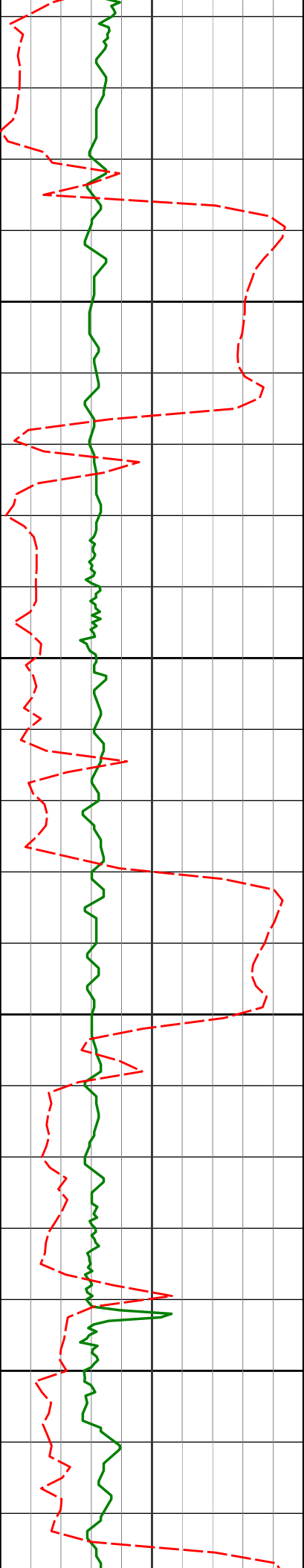
4200

4250

4291'

4300

4102'	6.99°	316.30°	4090.56'	85.02'
4196'	6.05°	324.44°	4183.95'	91.90'
4291'	5.76°	322.19°	4278.45'	97.78'



4350

4386'

6.78°

322.75°

4372.88'

104.15'

4400

4450

4481'

6.43°

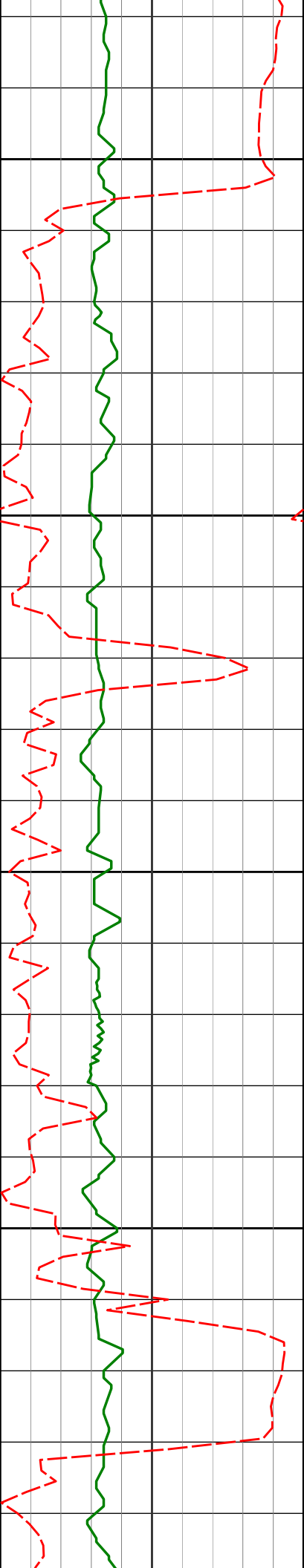
330.16°

4467.25'

110.25'

4500





4550

4575'

7.85°

326.06°

4560.52'

116.51'

4600

4650

4670'

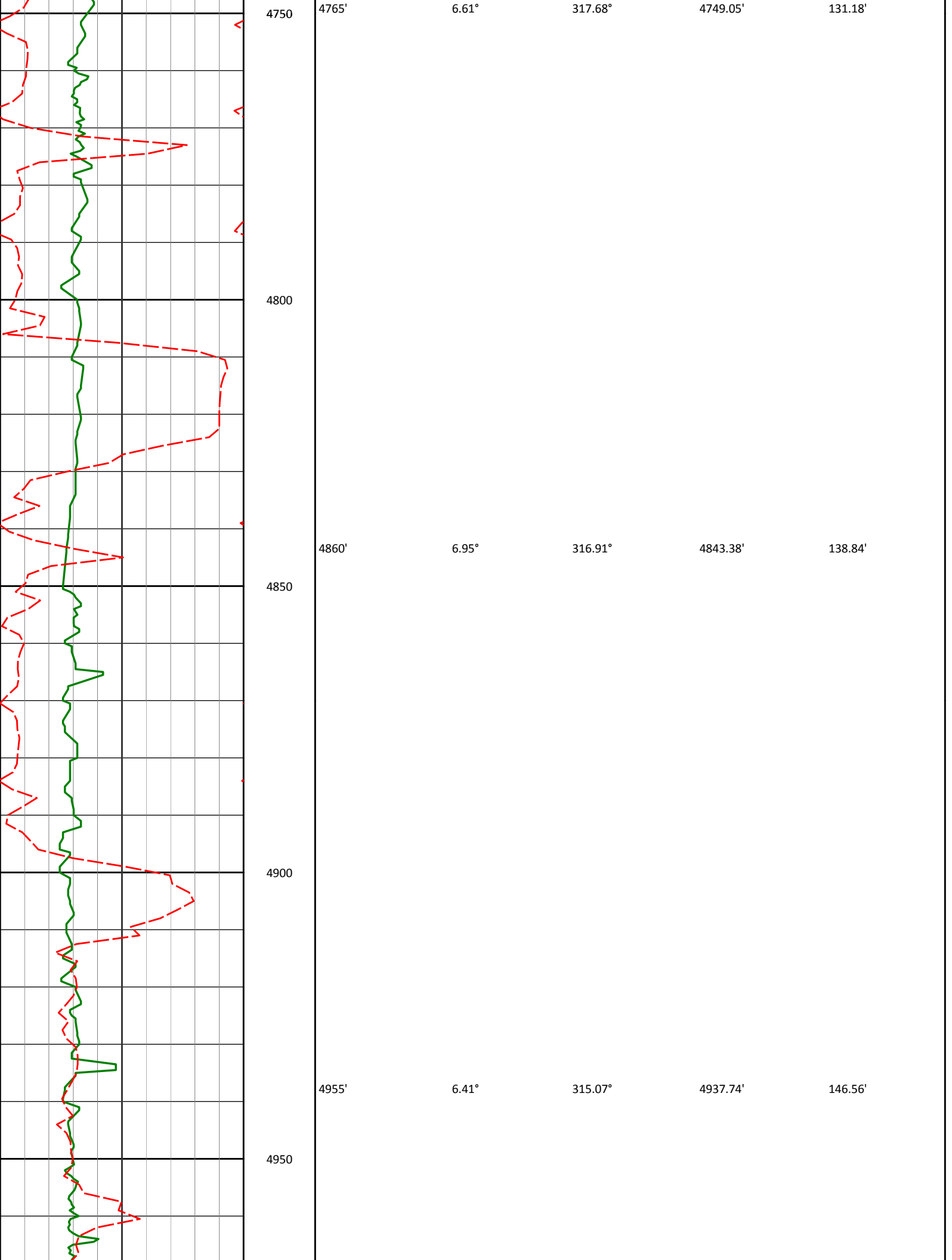
7.01°

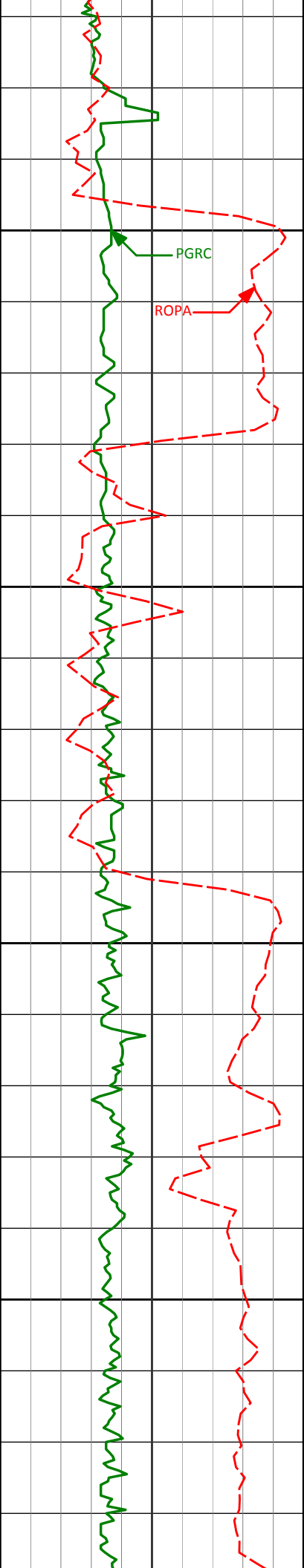
321.28°

4654.72'

123.82'

4700





PGRC

ROPA

5000

5050

5100

5150

5050'

4.79°

323.16°

5032.28'

152.72'

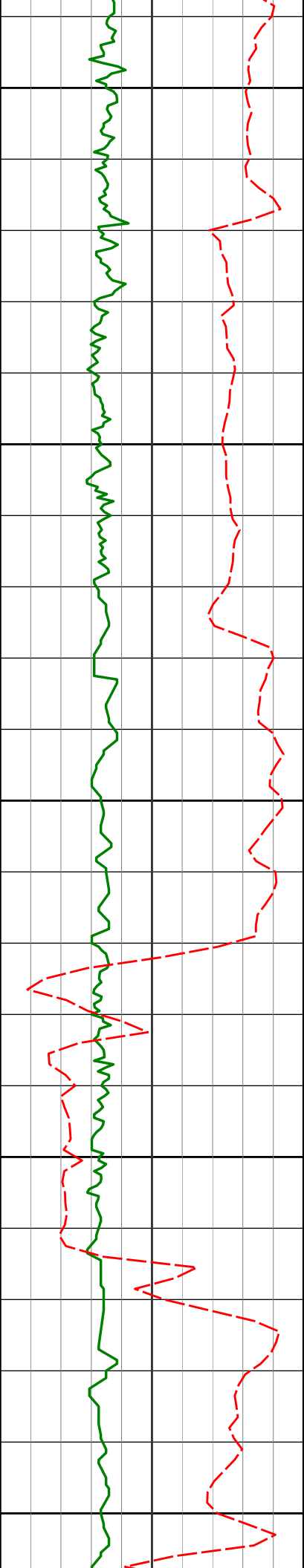
5144'

3.27°

307.26°

5126.05'

157.24'



5200

5239'

2.16°

292.47°

5220.95'

161.06'

5250

5300

5334'

1.15°

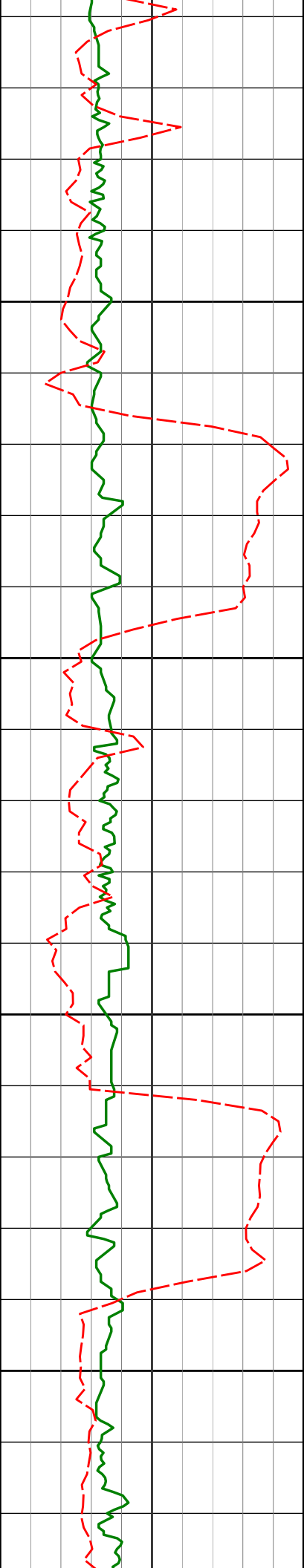
328.80°

5315.91'

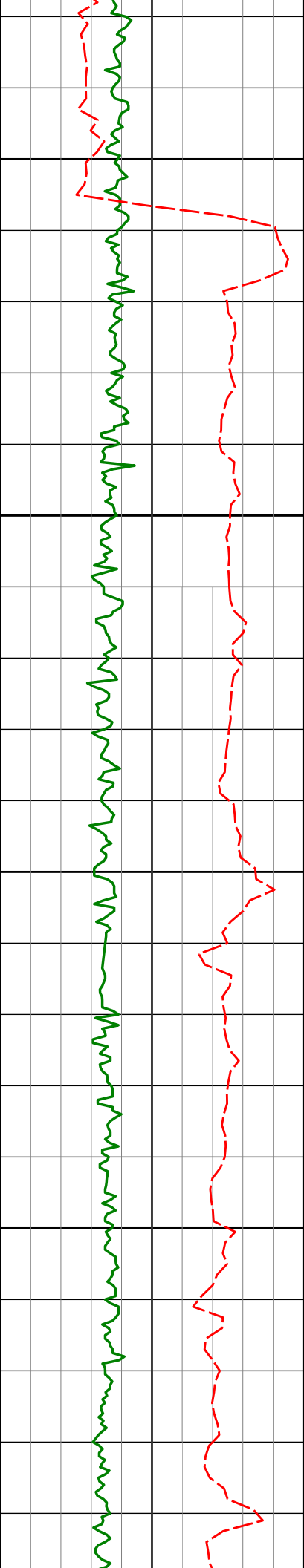
163.22'

5350

5400



	5428'	0.59°	298.94°	5409.90'	164.14'
5450					
5500	5523'	0.53°	258.03°	5504.89'	165.00'
5550					
5600	5618'	1.01°	161.73°	5599.89'	165.16'



5650

5700

5750

5800

200

5713'

5771'

5834'

0.91°

0.66°

0.59°

127.49°

94.43°

129.52°

5694.87'

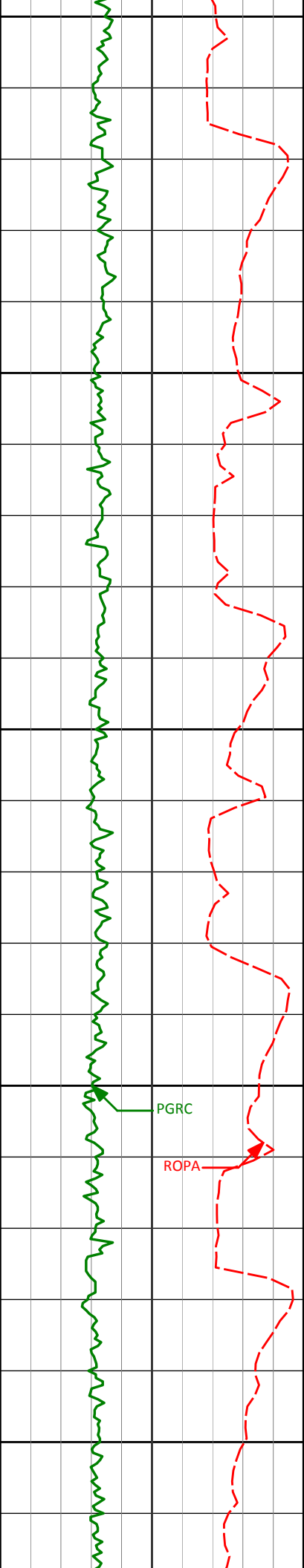
5752.87'

5815.86'

164.29'

163.59'

162.98'



5850

5900

5950

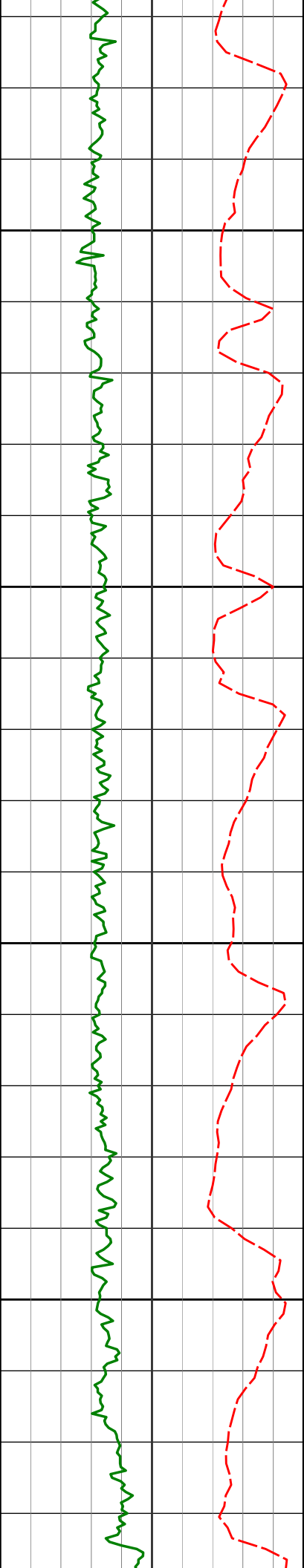
6000

6050

5902'	2.38°	225.80°	5883.84'	163.71'
5950'	5.50°	237.44°	5931.73'	166.36'
5997'	7.94°	242.81°	5978.40'	171.13'
6045'	11.35°	246.17°	6025.71'	178.38'

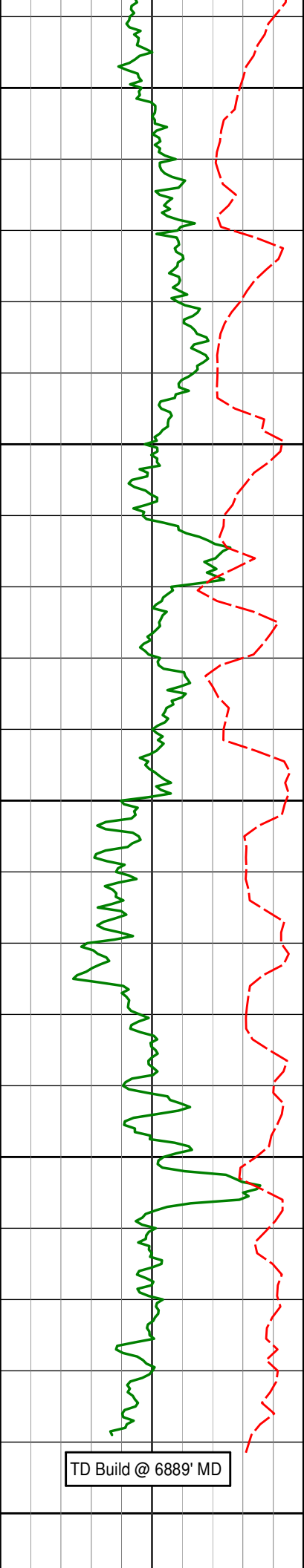
PGRC

ROPA



6092'	16.23°	245.91°	6071.35'	188.58'
6100				
6140'	21.31°	246.87°	6116.78'	202.70'
6150				
6186'	23.78°	251.49°	6159.26'	219.14'
6200				
6234'	27.29°	258.79°	6202.58'	239.09'
6250				
6281'	32.13°	261.88°	6243.39'	262.03'
6329'	39.21°	265.87°	6282.37'	289.82'





6300					
	6376'	46.62°	268.57°	6316.77'	321.75'
6350	6424'	56.42°	272.49°	6346.60'	359.26'
	6470'	61.63°	275.44°	6370.27'	398.60'
	6518'	63.95°	276.82°	6392.22'	441.07'
6400					
	6565'	64.12°	275.13°	6412.80'	483.12'
	6613'	64.06°	272.14°	6433.78'	526.22'
6450	6660'	67.92°	269.55°	6452.90'	569.13'
	6708'	74.37°	266.94°	6468.41'	614.50'
	6755'	80.25°	267.67°	6478.73'	660.27'
	6803'	84.13°	269.24°	6485.25'	707.78'
	6835'	85.10°	270.11°	6488.25'	739.64'
6500					

TD Build @ 6889' MD

[illegible]**HALLIBURTON**

## DIRECTIONAL SURVEY REPORT

**Noble Energy  
Wells Ranch AE30-65-1BHNB  
Wattenburg  
Weld Colorado  
USA  
CA-XX-0901176445**

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
235.00	0.10	38.77	235.00	0.16 N	0.13 E	-0.13	0.04
421.00	0.80	311.97	420.99	1.15 N	0.74 W	0.74	0.43
619.00	0.60	257.77	618.98	1.86 N	2.78 W	2.79	0.33
718.00	0.59	335.44	717.98	2.21 N	3.49 W	3.51	0.75
810.00	0.47	337.32	809.97	2.99 N	3.84 W	3.86	0.13
994.00	0.43	10.12	993.97	4.37 N	4.01 W	4.03	0.14
1085.00	0.80	35.96	1084.96	5.22 N	3.57 W	3.61	0.50
1178.00	0.94	31.76	1177.95	6.39 N	2.79 W	2.83	0.17
1271.00	0.99	34.17	1270.94	7.71 N	1.94 W	1.99	0.07
1364.00	0.94	288.12	1363.93	8.61 N	2.21 W	2.26	1.66
1456.00	0.85	307.00	1455.92	9.25 N	3.47 W	3.53	0.33
1547.00	1.49	246.82	1546.90	9.19 N	5.10 W	5.16	1.43
1639.00	0.26	227.21	1638.89	8.58 N	6.35 W	6.41	1.36
1734.00	0.72	160.55	1733.89	7.87 N	6.31 W	6.36	0.70
1829.00	0.68	170.28	1828.88	6.75 N	6.02 W	6.06	0.13
1924.00	0.79	162.05	1923.87	5.58 N	5.72 W	5.76	0.16
2018.00	0.77	186.99	2017.86	4.33 N	5.60 W	5.63	0.36
2113.00	0.72	145.48	2112.86	3.21 N	5.34 W	5.36	0.56
2208.00	0.83	129.01	2207.85	2.28 N	4.47 W	4.48	0.26
2303.00	0.80	142.24	2302.84	1.32 N	3.53 W	3.53	0.20
2397.00	0.36	118.86	2396.83	0.66 N	2.86 W	2.87	0.52
2492.00	0.61	151.69	2491.83	0.07 N	2.36 W	2.36	0.38
2587.00	0.49	167.90	2586.83	0.77 S	2.04 W	2.03	0.21
2681.00	0.53	171.20	2680.82	1.59 S	1.89 W	1.88	0.05
2776.00	0.36	228.71	2775.82	2.22 S	2.04 W	2.03	0.48
2871.00	0.38	292.82	2870.82	2.30 S	2.56 W	2.55	0.41
2966.00	0.21	337.89	2965.82	2.01 S	2.92 W	2.90	0.29
3060.00	1.91	342.39	3059.80	0.36 S	3.45 W	3.45	1.81
3155.00	3.14	347.11	3154.70	3.68 N	4.51 W	4.54	1.31
3250.00	4.18	340.91	3249.51	9.49 N	6.23 W	6.28	1.17
3345.00	5.53	336.52	3344.17	16.96 N	9.18 W	9.29	1.47
3439.00	7.11	337.27	3437.59	26.48 N	13.24 W	13.40	1.68

3534.00	9.35	329.31	3531.61	38.54 N	19.45 W	19.68	2.64
3629.00	10.85	322.24	3625.14	52.25 N	28.86 W	29.18	2.05
3724.00	11.51	316.29	3718.34	66.17 N	40.89 W	41.29	1.40
3817.00	12.05	316.14	3809.38	79.88 N	54.02 W	54.51	0.58
3912.00	9.74	317.54	3902.66	92.96 N	66.32 W	66.89	2.45
4007.00	8.65	323.10	3996.44	104.60 N	76.04 W	76.67	1.48
4102.00	6.99	316.30	4090.56	114.49 N	84.32 W	85.02	2.00
4196.00	6.05	324.44	4183.95	122.66 N	91.15 W	91.90	1.40
4291.00	5.76	322.19	4278.45	130.50 N	96.99 W	97.78	0.39
4386.00	6.78	322.75	4372.88	138.73 N	103.30 W	104.15	1.08
4481.00	6.43	330.16	4467.25	147.81 N	109.35 W	110.25	0.97
4575.00	7.85	326.06	4560.52	157.70 N	115.55 W	116.51	1.60
4670.00	7.01	321.28	4654.72	167.60 N	122.80 W	123.82	1.10
4765.00	6.61	317.68	4749.05	176.17 N	130.11 W	131.18	0.62
4860.00	6.95	316.91	4843.38	184.41 N	137.71 W	138.84	0.37
4955.00	6.41	315.07	4937.74	192.36 N	145.38 W	146.56	0.61
5050.00	4.79	323.16	5032.28	199.29 N	151.51 W	152.72	1.89
5144.00	3.27	307.26	5126.05	204.05 N	156.00 W	157.24	1.99
5239.00	2.16	292.47	5220.95	206.38 N	159.81 W	161.06	1.37
5334.00	1.15	328.80	5315.91	207.88 N	161.96 W	163.22	1.48
5428.00	0.59	298.94	5409.90	208.92 N	162.87 W	164.14	0.75
5523.00	0.53	258.03	5504.89	209.07 N	163.73 W	165.00	0.42
5618.00	1.01	161.73	5599.89	208.18 N	163.89 W	165.16	1.25
5713.00	0.91	127.49	5694.87	206.93 N	163.03 W	164.29	0.60
5771.00	0.66	94.43	5752.87	206.62 N	162.33 W	163.59	0.87
5834.00	0.59	129.52	5815.86	206.39 N	161.72 W	162.98	0.61
5902.00	2.38	225.80	5883.84	205.18 N	162.46 W	163.71	3.70
5950.00	5.50	237.44	5931.73	203.24 N	165.12 W	166.36	6.68
5997.00	7.94	242.81	5978.40	200.55 N	169.90 W	171.13	5.36
6045.00	11.35	246.17	6025.71	197.12 N	177.18 W	178.38	7.20
6092.00	16.23	245.91	6071.35	192.57 N	187.41 W	188.58	10.38
6140.00	21.31	246.87	6116.78	186.40 N	201.56 W	202.70	10.60
6186.00	23.78	251.49	6159.26	180.17 N	218.05 W	219.14	6.60
6234.00	27.29	258.79	6202.58	174.96 N	238.03 W	239.09	9.81
6281.00	32.13	261.88	6243.39	171.10 N	260.99 W	262.03	10.80
6329.00	39.21	265.87	6282.37	168.20 N	288.79 W	289.82	15.52
6376.00	46.62	268.57	6316.77	166.70 N	320.73 W	321.75	16.24
6424.00	56.42	272.49	6346.60	167.13 N	358.25 W	359.26	21.39
6470.00	61.63	275.44	6370.27	169.89 N	397.57 W	398.60	12.59
6518.00	63.95	276.82	6392.22	174.45 N	440.01 W	441.07	5.47
6565.00	64.12	275.13	6412.80	178.85 N	482.03 W	483.12	3.25
6613.00	64.06	272.14	6433.78	181.59 N	525.12 W	526.22	5.60
6660.00	67.92	269.55	6452.90	182.20 N	568.03 W	569.13	9.63
6708.00	74.37	266.94	6468.41	180.79 N	613.41 W	614.50	14.39
6755.00	80.25	267.67	6478.73	178.64 N	659.19 W	660.27	12.60
6803.00	84.13	269.24	6485.25	177.36 N	706.71 W	707.78	8.71
6835.00	85.10	270.11	6488.25	177.18 N	738.57 W	739.64	4.06

**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 270.35 DEGREES (GRID)  
A TOTAL CORRECTION OF 7.57 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 6835.00 FEET  
IS 759.53 FEET ALONG 283.49 DEGREES (GRID)**

First Three survey's from 3rd party source (Muilti Shot EMS) and provided by CO-man on location before drilling.

Survey Depth 235 Inc 0.10 Azi 38.77  
Survey Depth 421 Inc 0.80 Azi 311.97  
Survey Depth 619 Inc 0.60 Azi 257.77

Tied in @ Surface

Magnetic direction of 7.571 has been added to AZI for grid direction correction.