



1 : 240 / 1 : 600

WELL INFORMATION					
MWD Run Number	100	200			
Date run completed	17-Feb-13	18-Feb-13			
Rig Bit Number	2	3			
Bit Size (in)	8.750	8.750			
Tool Nominal OD (in)	6.750	6.750			
Log Start Depth (MD, ft)	648.00	6,220.00			
Log End Depth (MD, ft)	6,220.00	7,355.00			
Drill or Wipe	Drill	Drill			
Drill/Wipe Start Date and Time	16-Feb-13 06:50	17-Feb-13 15:27			
Drill/Wipe End Date and Time	17-Feb-13 08:20	18-Feb-13 09:39			
Min Inc (deg) @ Depth (MD, ft)	.28 @ 1,550.00	1.05 @ 6,225.00			
Max Inc (deg) @ Depth (MD, ft)	17.23 @ 3,826.00	83.05 @ 7,300.00			
Bit TFA(in2) / Bit Type	.75 / PDC	.86 / PDC			
Flow Rate (gpm)	567.29	556.77			
Max AV (fpm) / CV (fpm) @ MWD	NA / NA	NA / NA			
Fluid Type	Fresh Water Gel	Fresh Water Gel			
Density (ppg) / Viscosity (spqt)	8.60 / 29.00	9.40 / 36.00			
Filtrate CL (ppm)	2,400.00	2,850.00			
pH / Fluid Loss (mptm)	9.00 / 18	9.00 / 10			
PV (cP) / YP (Ihf2)	1 / 4.00	9 / 9.00			
% Solids / % Sand	1.70 / 0.30	7.00 / 0.30			
% Oil / Oil:Water Ratio	NA / NA	NA / NA			
Rm @ Measured Temp (degF)	NA @ NA	NA @ NA			
Rmf @ Measured Temp (degF)	@ NA	NA @ NA			
Rmc @ Measured Temp (degF)	NA @ NA	NA @ NA			
Max Tool Temp (deg F) / S	107.05 / PDM	100.00 / PDM			

Max Tool Temp (degF) / Source	167.97 / PCM	168.00 / PCM			
Rm @ Max Tool Temp (degF)	NA @ 167.97	NA @ 168.00			
Lead MWD Engineer	Christopher Befort	Christopher Befort			
Customer Representative	Jim Turner	Jim Turner			

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.76	5.76			
Sub Serial Number	11964411	113413322			
Insert Serial Number	11400838	11400838			
Date and Time Initialized	14-Feb-13 19:40	14-Feb-13 19:40			
Date and Time Read	18-Feb-13 15:14	18-Feb-13 15:14			
ECMB SW Version	N/A	N/A			

Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	58.00	55.00			
Software Version	6.21	6.21			
Sub Serial Number	11964411	11341332			
Sonde Serial Number	11833225	11833225			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	60.35	132.32			

Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	50.75	48.31			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	11964411	11341332			
Insert/Sonde Serial Number	11293307	11293307			

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:
PGRC (Gamma CG):
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
6. Insite Version 7.4.1

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.

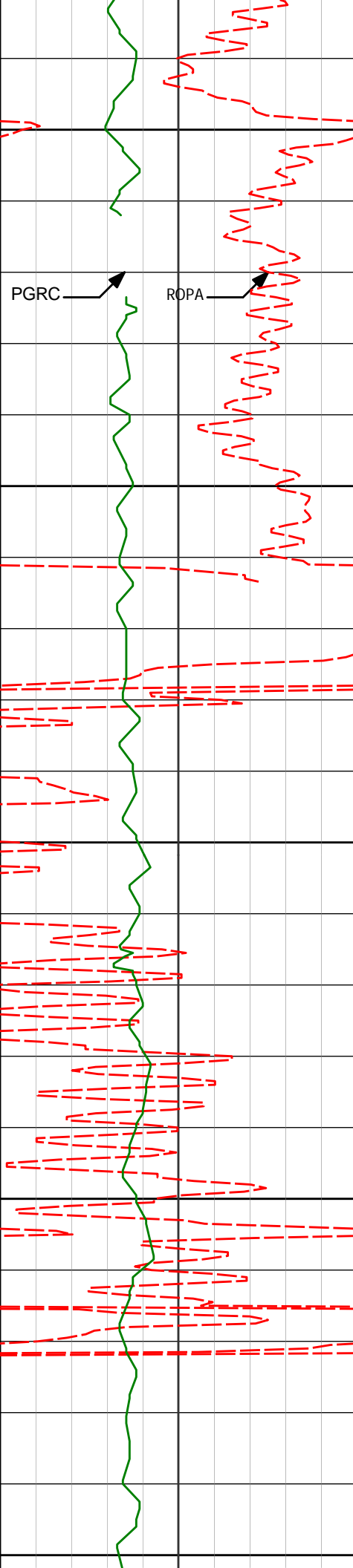
HALLIBURTON

Sperry Drilling Services

TVD Detail Log 1:240
Noble Energy

Noble Energy
Knaub PC G04-66-A2
HP 321
T4N R65W

[illegible]



700

730'

0.37°

283.93°

7.06'

729.95'

750

800

830'

0.47°

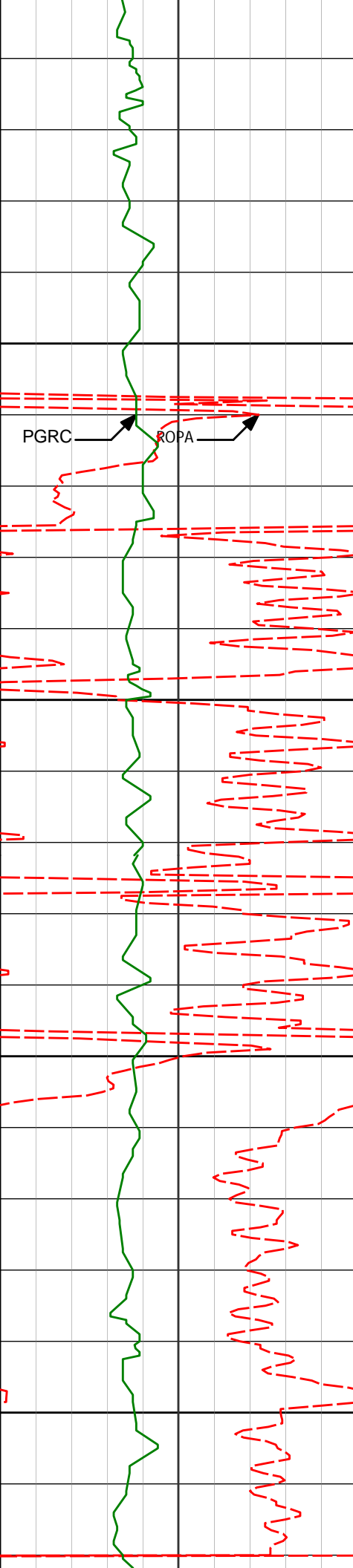
280.00°

6.37'

829.94'

850

900



930'	0.60°	241.51°	5.50'	929.94'
------	-------	---------	-------	---------

950

PGRC →

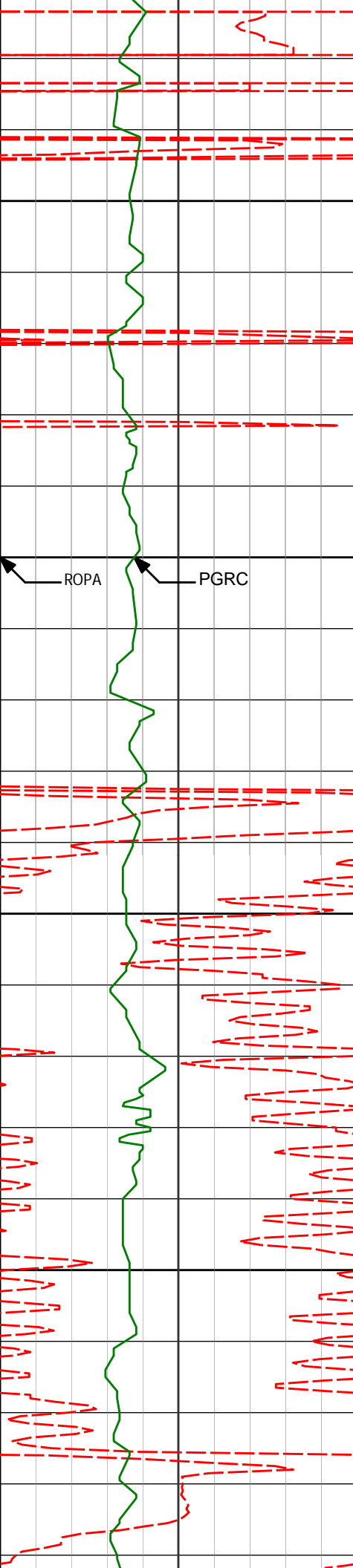
→ ROPA

1000

1030'	0.78°	220.85°	4.51'	1029.93'
-------	-------	---------	-------	----------

1050

1100



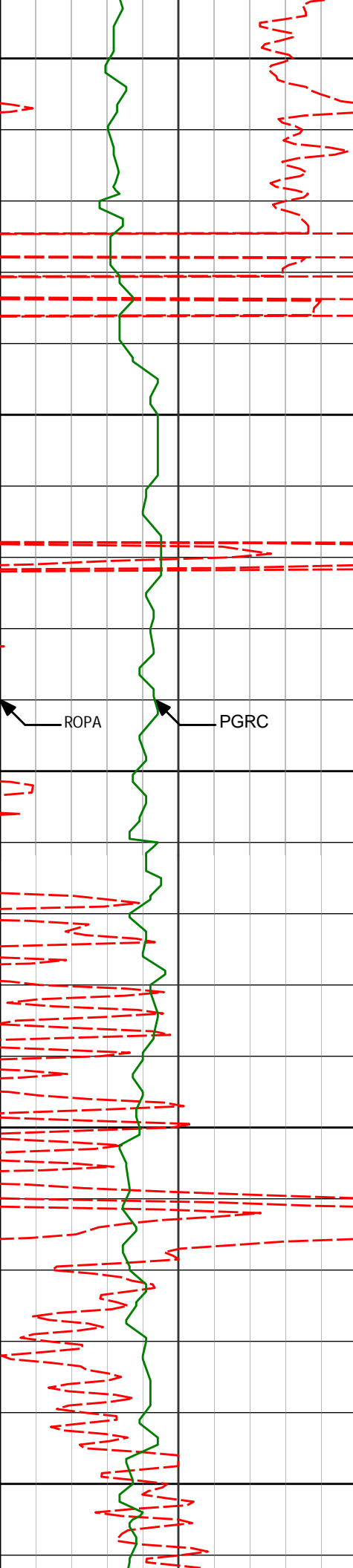
1150

1200

1250

1300

1130'	0.60°	201.50°	3.76'	1129.93'
1230'	0.66°	204.91°	3.21'	1229.92'
1280'	0.66°	196.80°	2.94'	1279.92'
1330'	0.64°	194.49°	2.72'	1329.91'



1350

1380'

0.71°

195.71°

2.50'

1379.91'

1400

1430'

0.60°

215.11°

2.21'

1429.91'

1450

1480'

0.33°

240.65°

1.90'

1479.90'

1500

1530'

0.34°

242.62°

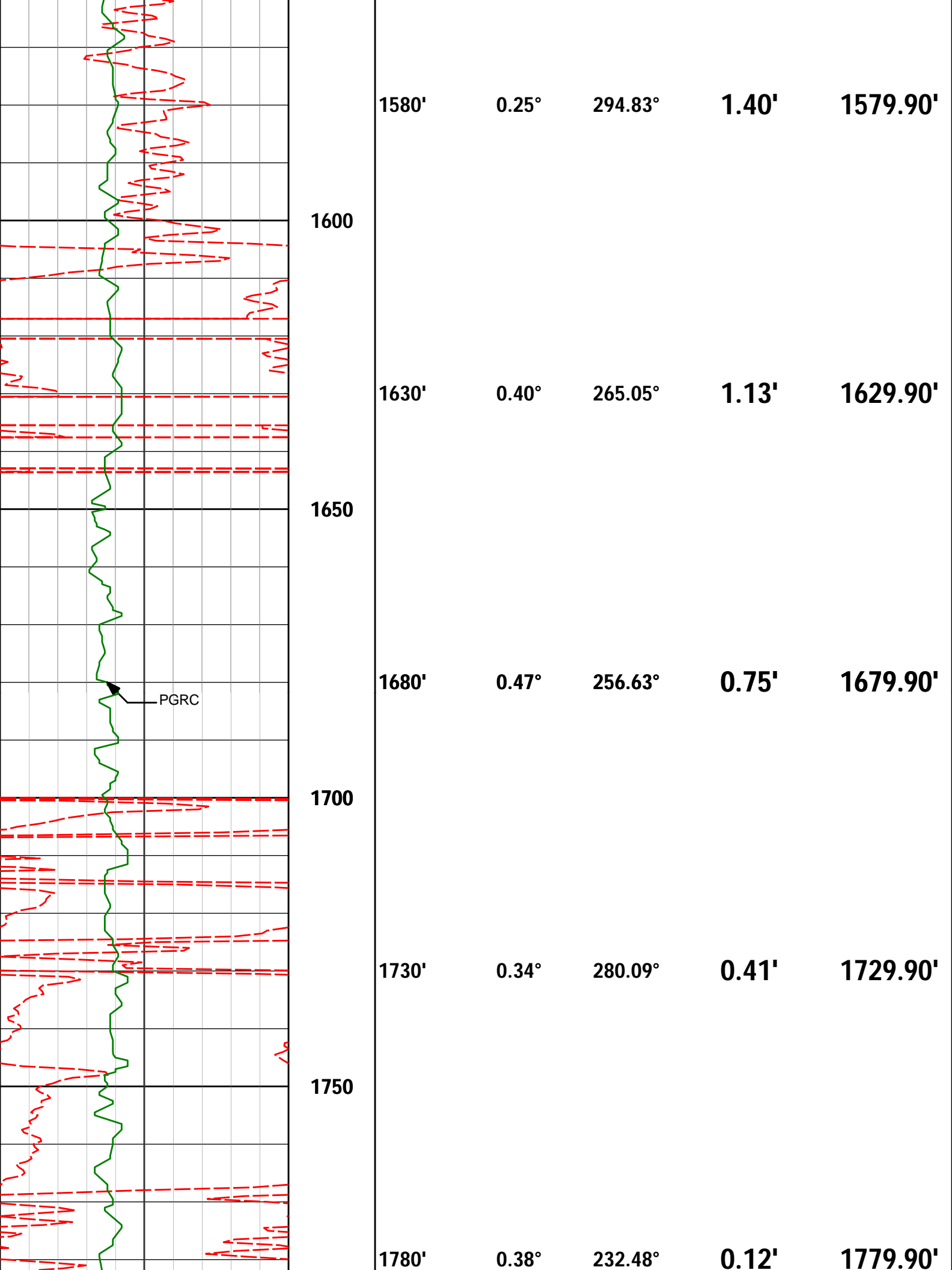
1.63'

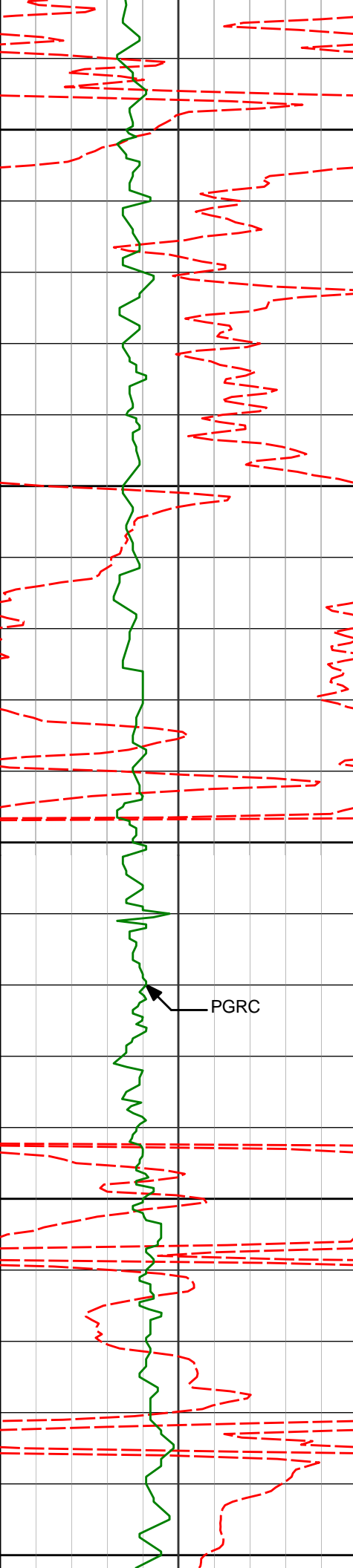
1529.90'

1550

ROPA

PGRC





1800

1830'

0.52°

205.72°

-0.15'

1829.90'

1850

1880'

0.69°

204.40°

-0.42'

1879.89'

1900

1930'

0.78°

204.44°

-0.76'

1929.89'

1950

1980'

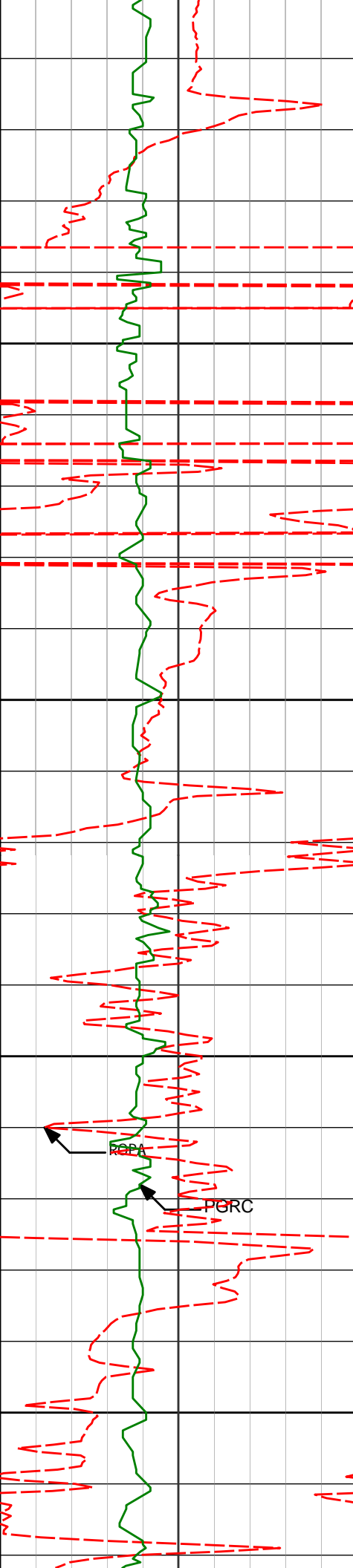
0.84°

218.56°

-1.20'

1979.89'

2000



2030'

1.63°

314.17°

-1.91'

2029.88'

2050

2100

2130'

3.43°

317.91°

-4.53'

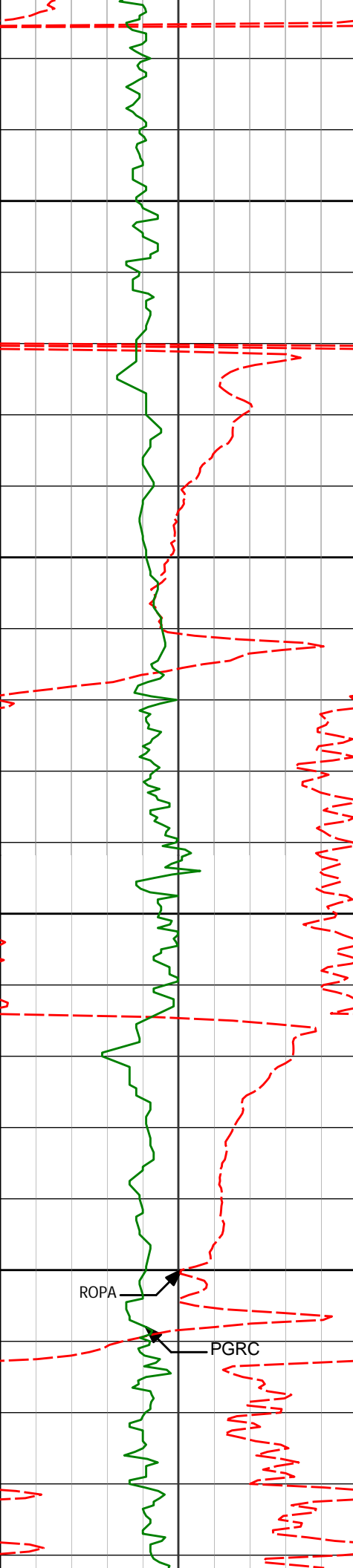
2129.78'

2150

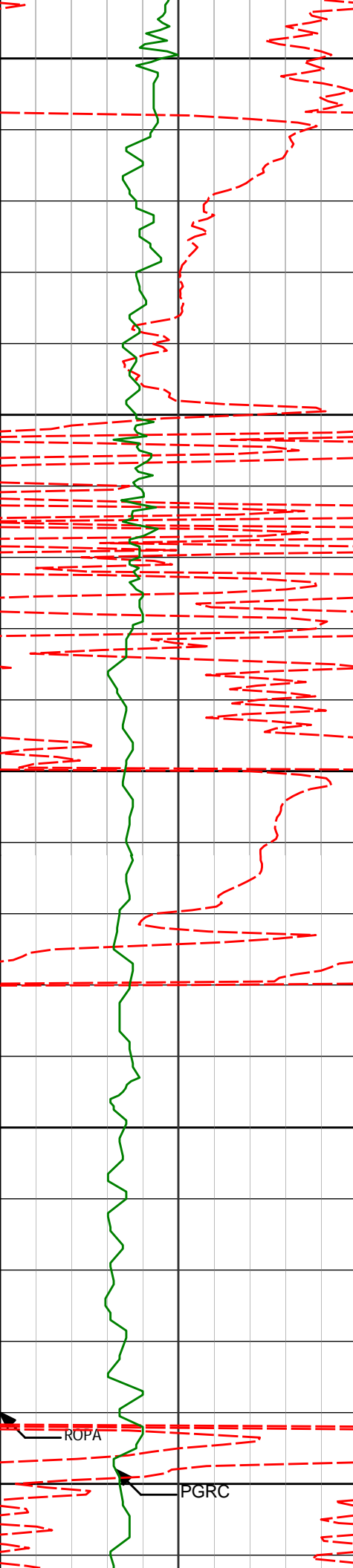
2200

RPA

PGRC



2230'	6.07°	335.35°	-7.87'	2229.43'
2250				
2300				
2330'	8.72°	342.77°	-10.85'	2328.59'
2350				
2400				
2430'	11.27°	338.35°	-14.71'	2427.07'



2450

2500

2550

2600

2650

2530'

14.08°

336.43°

-20.70'

2524.62'

2630'

16.21°

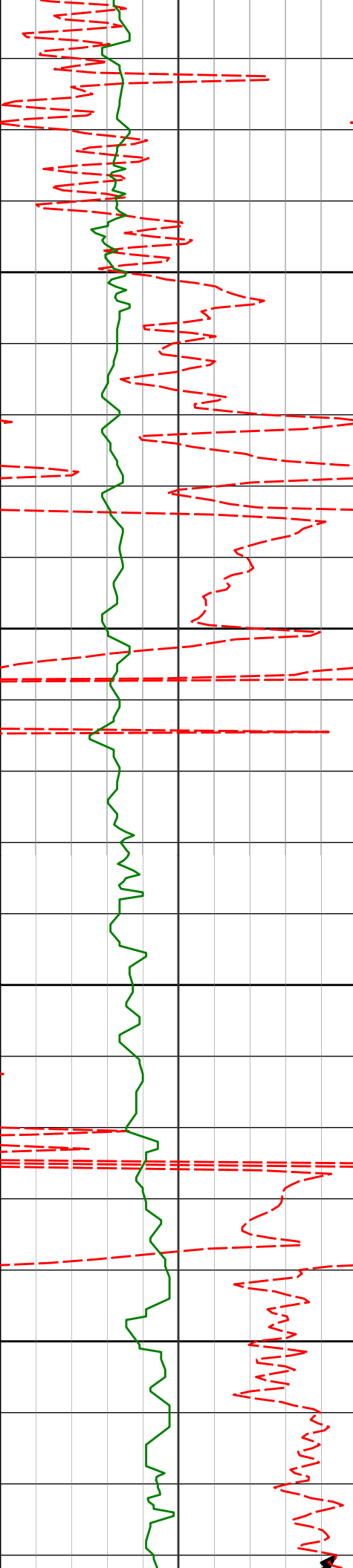
338.87°

-27.64'

2621.14'

ROPA

PGRC



2700

2730'

16.81°

338.93°

-34.63'

2717.02'

2750

2800

2830'

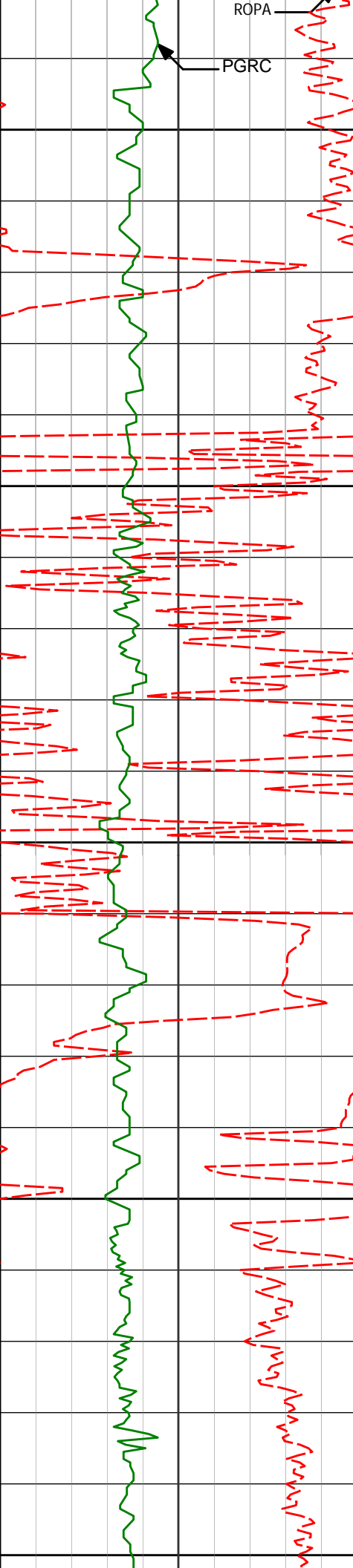
16.56°

333.75°

-42.92'

2812.81'

2850



2900

2930'

13.26°

333.49°

-51.50'

2909.43'

2950

3000

3030'

12.61°

332.68°

-59.18'

3006.90'

3050

3068'

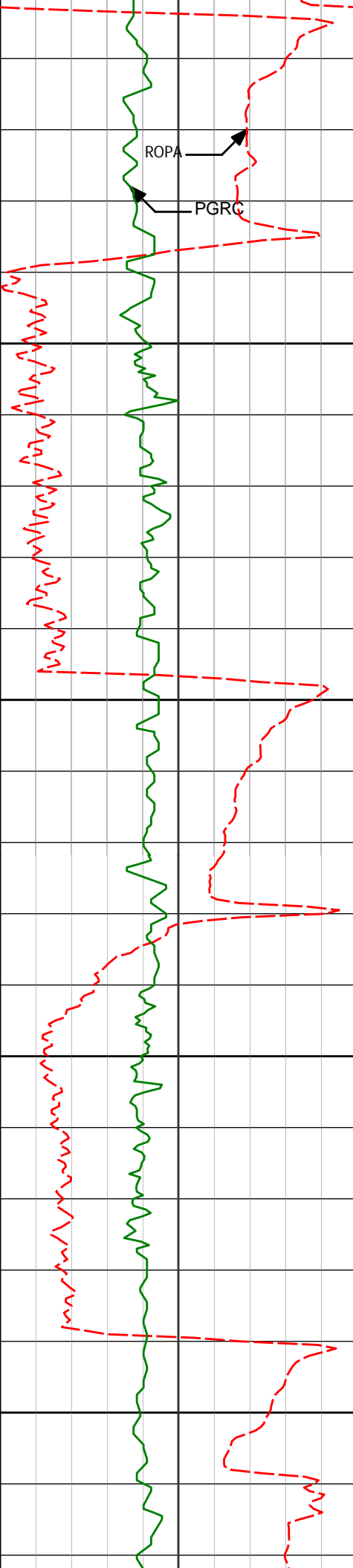
12.79°

335.39°

-61.91'

3043.97'

3100



ROPA

PGRG

3163'	12.78°	333.58°	-68.63'	3136.61'
-------	--------	---------	---------	----------

3150

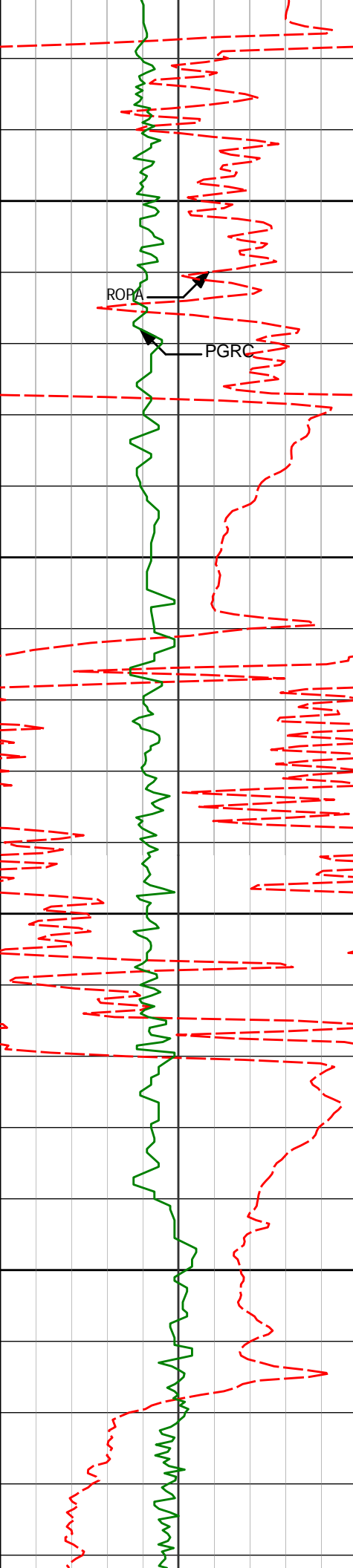
3200

3258'	12.75°	334.82°	-75.44'	3229.27'
-------	--------	---------	---------	----------

3250

3300

3252'	12.71°	227.04°	81.86'	2221.74'
-------	--------	---------	--------	----------



3350

ROPA

PGRC

3400

3447'

13.73°

336.02°

-88.24'

3413.06'

3450

3500

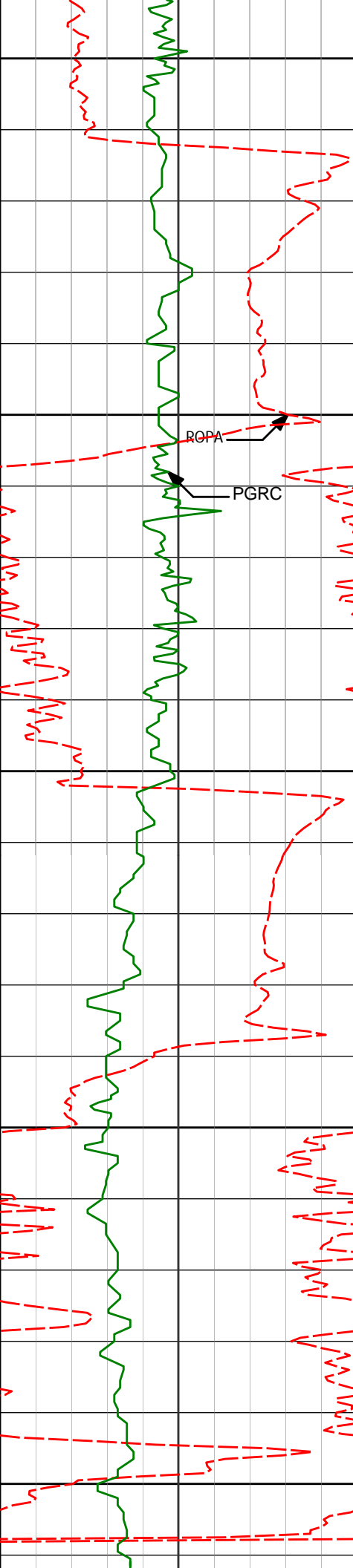
3542'

14.39°

334.26°

-95.38'

3505.21'



3550

3600

3650

3700

3750

ROPA

PGRC

3637'

15.13°

335.69°

-102.92'

3597.08'

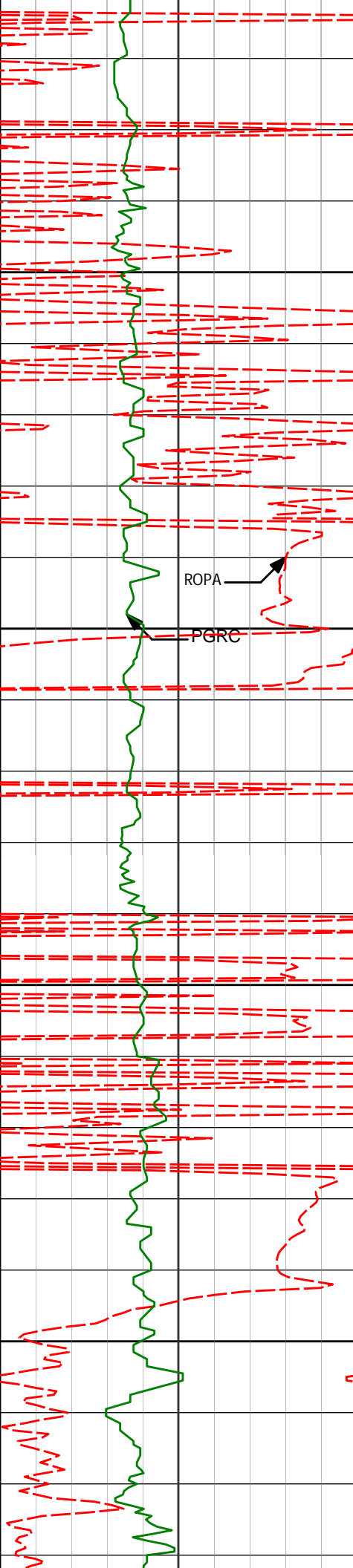
3732'

16.14°

339.85°

-109.67'

3688.56'



3826'

17.23°

340.29°

-115.77'

3778.60'

3800

ROPA —

~~PGRC~~

3850

3921'

16.14°

337.33°

-122.50'

3869.60'

3900

3950

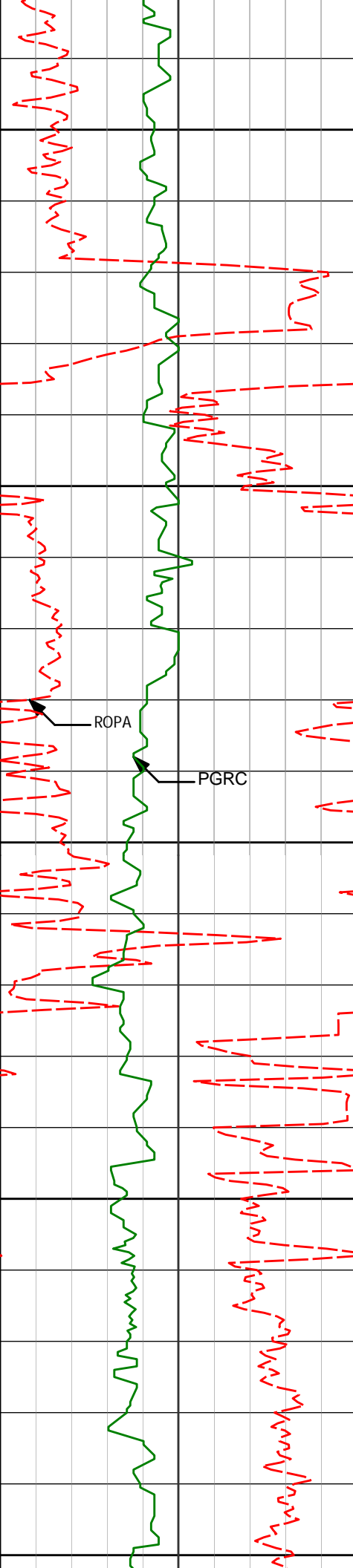
4016'

13.09°

337.50°

-129.00'

3961.52'



4000

4050

4100

4150

4200

4111'

9.79°

338.26°

-133.97'

4054.62'

4206'

8.19°

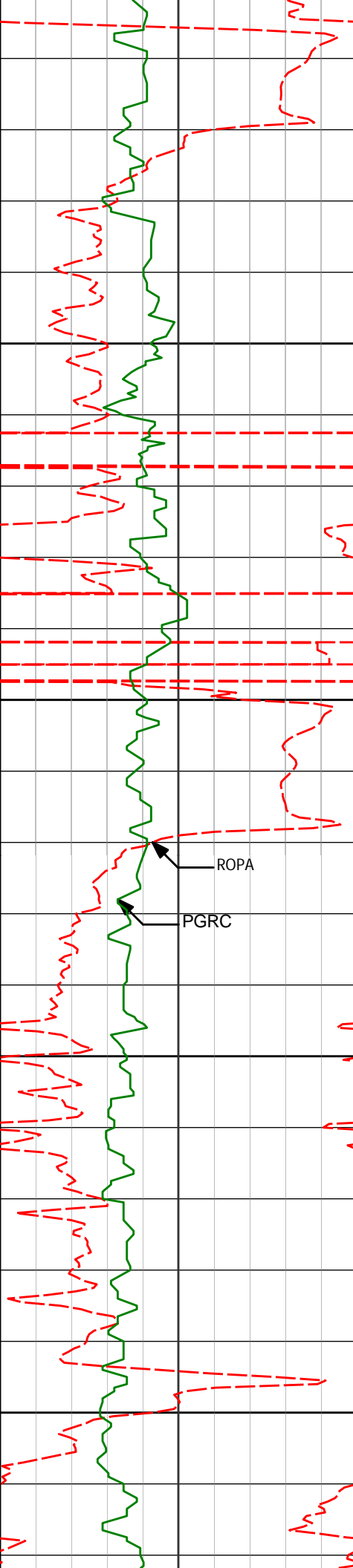
338.26°

-137.78'

4148.45'

ROPA

PGRC



4300' 7.91° 340.32° -140.94' 4241.52'

4250

4300

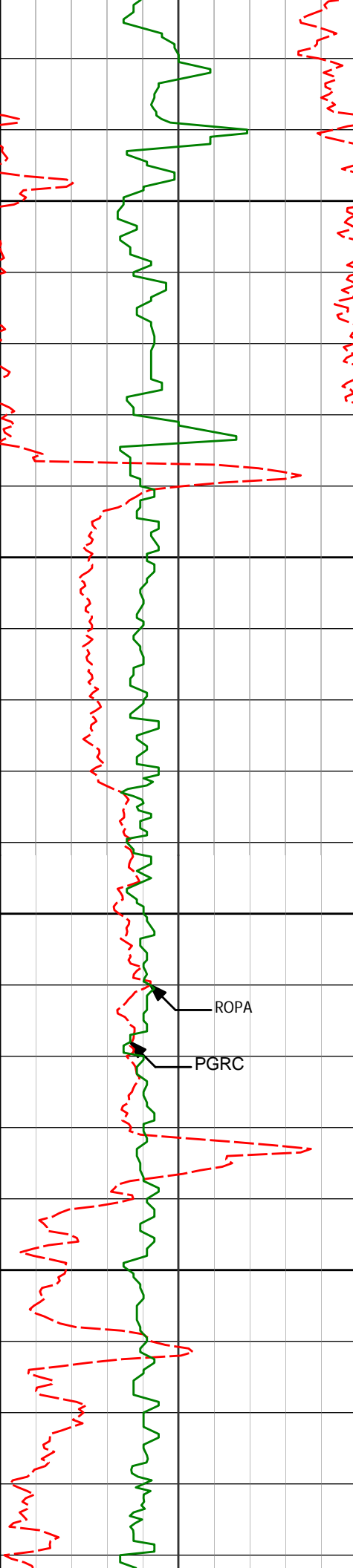
ROPA

PGRC

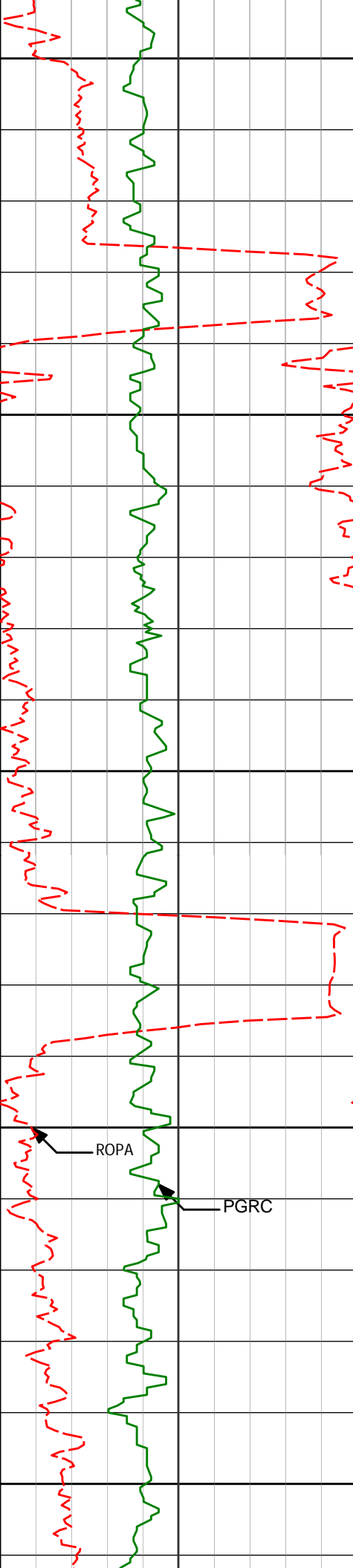
4395' 8.57° 337.42° -144.31' 4335.54'

4350

4400



4490'	7.69°	337.69°	-147.92'	4429.59'
4450				
4500				
4585'	6.43°	341.96°	-150.64'	4523.86'
4550				
4600				
4680'	4.74°	343.67°	-152.32'	4618.41'



4650

4700

4750

4800

4850

4774'

3.80°

342.10°

-153.56'

4712.15'

4869'

3.58°

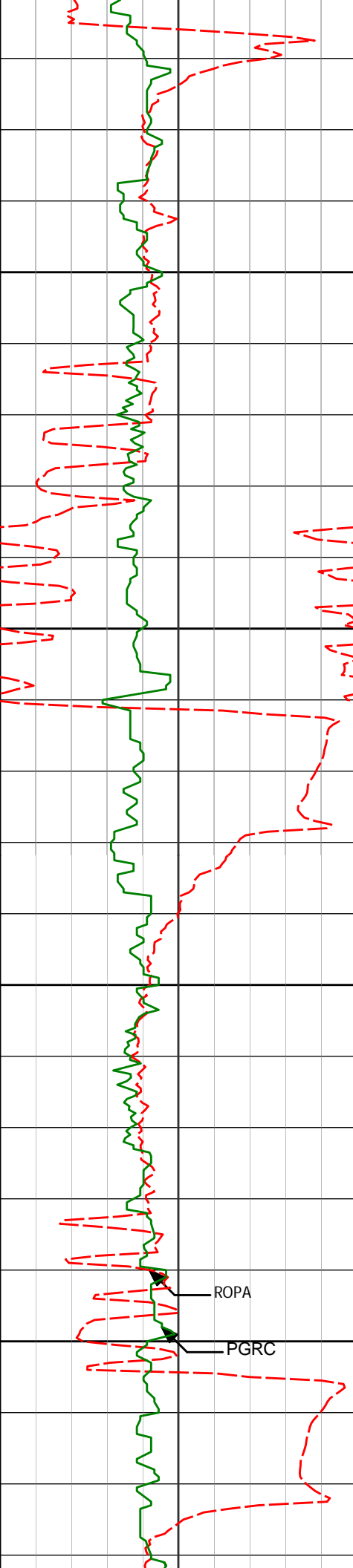
334.53°

-155.11'

4806.95'

ROPA

PGRC



4900

4964'

3.14°

336.59°

-156.80'

4901.79'

4950

5000

5059'

2.01°

310.83°

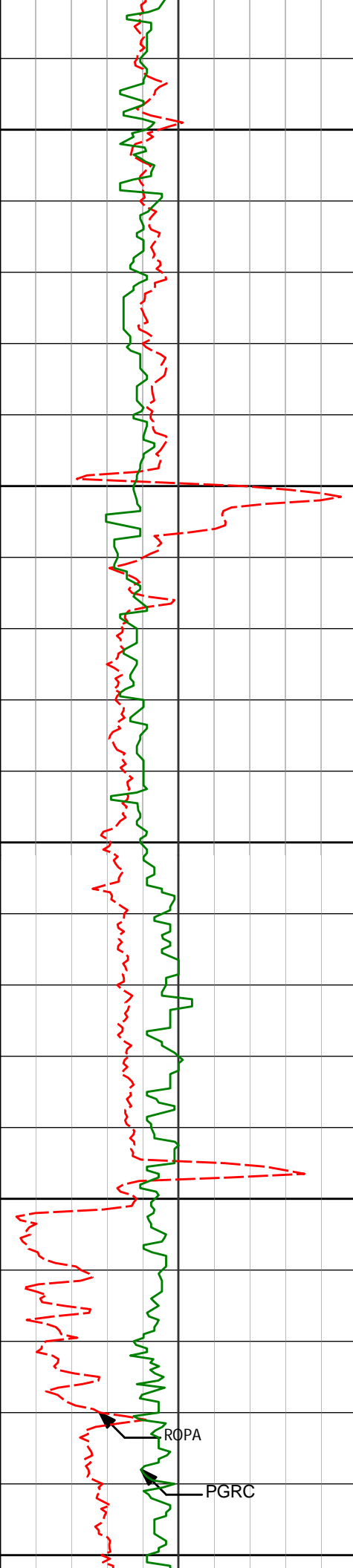
-158.66'

4996.69'

5050

ROPA

PGRC



5154'

0.63°

253.65°

-160.30'

5091.67'

5100

5150

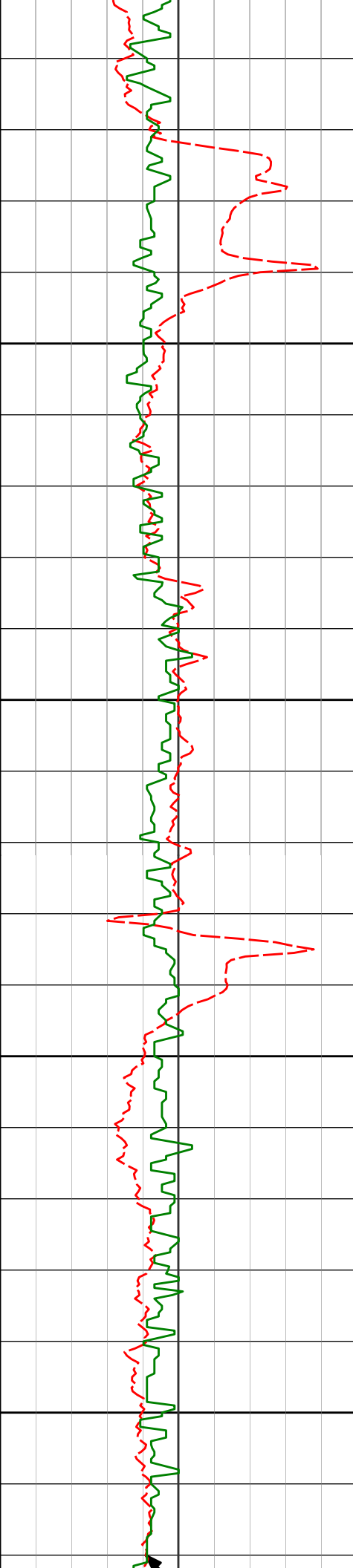
5200

5250

5300

ROPA

PGRC



5350

5400

5450

5500

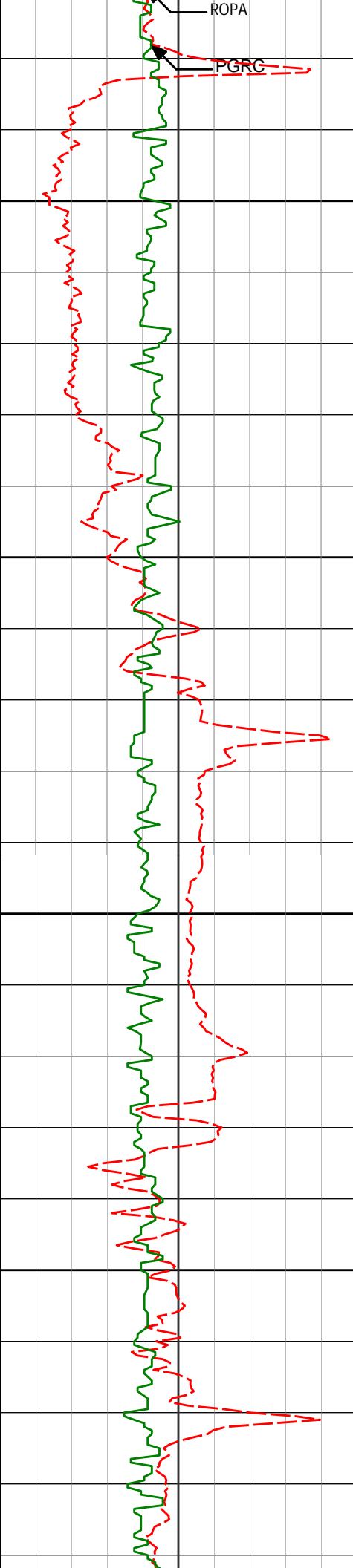
5438'

0.85°

303.27°

-163.47'

5375.65'



ROPA

PGRC

5550

5600

5650

5700

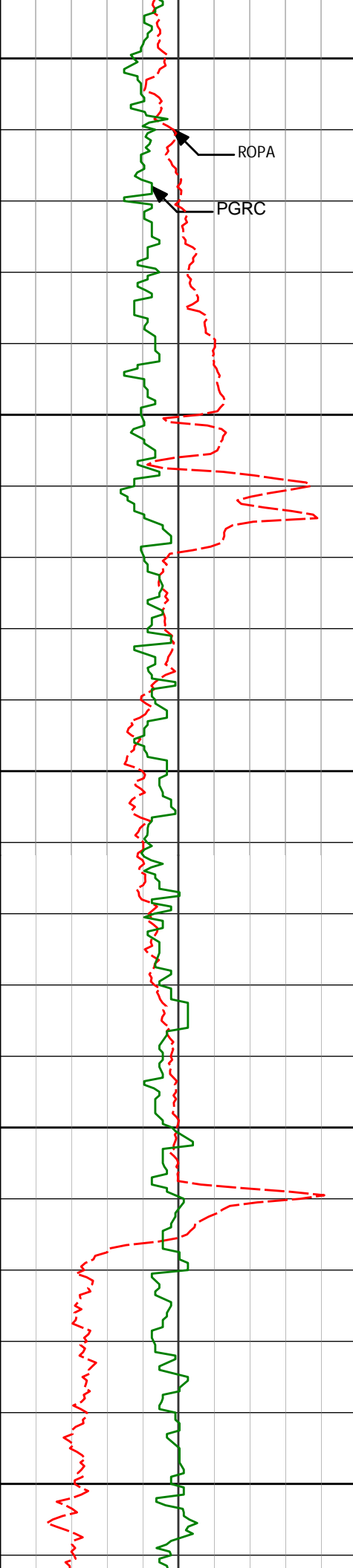
5722'

0.40°

351.98°

-165.10'

5659.63'



5750

ROPA

PGRC

5800

5850

5900

5950

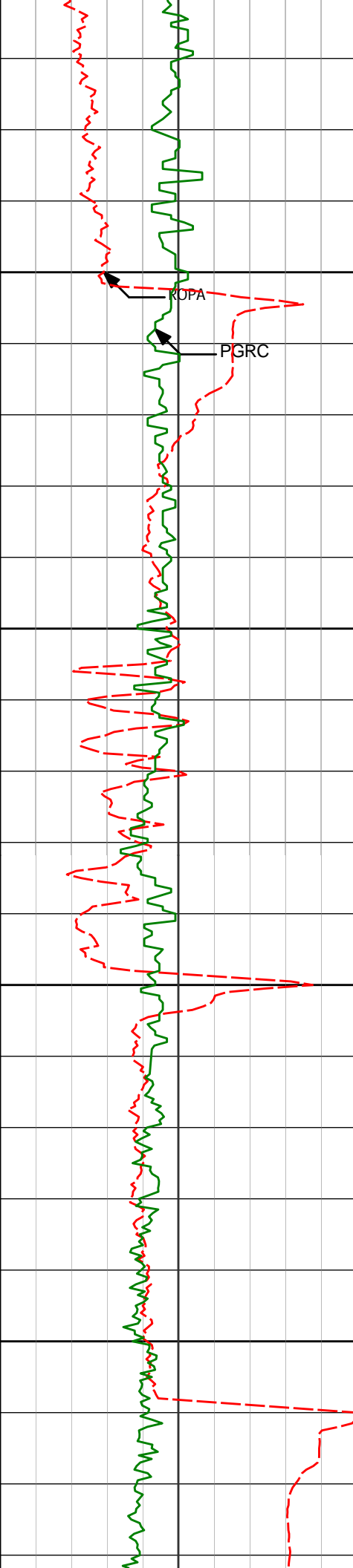
6007'

0.73°

122.46°

-163.72'

5944.62'



6000

KOPA

PGRC

6050

6100

6150

6162'

1.13°

125.56°

-161.83'

6099.60'

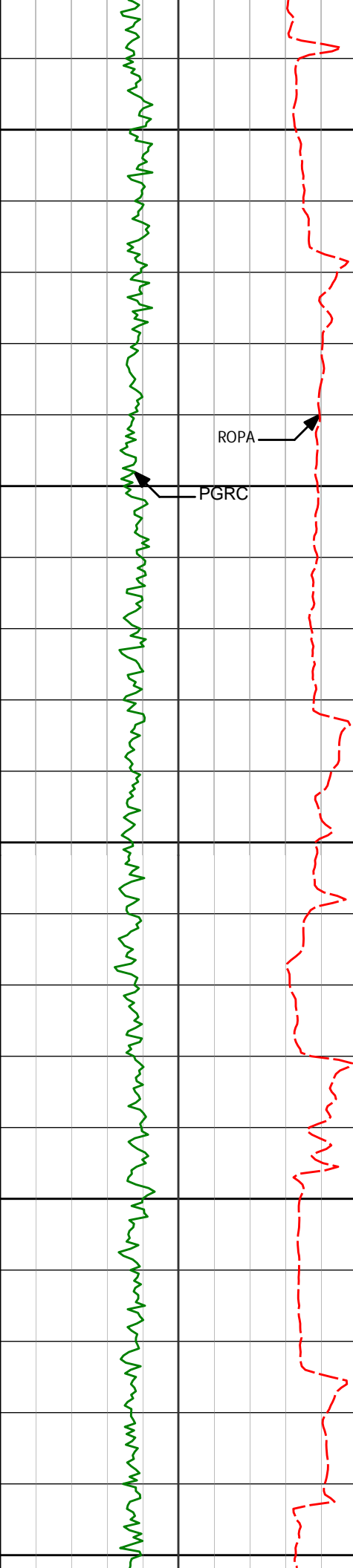
6225'

1.05°

120.11°

-160.91'

6162.59'



Run 200

6200

6250

6300

6350

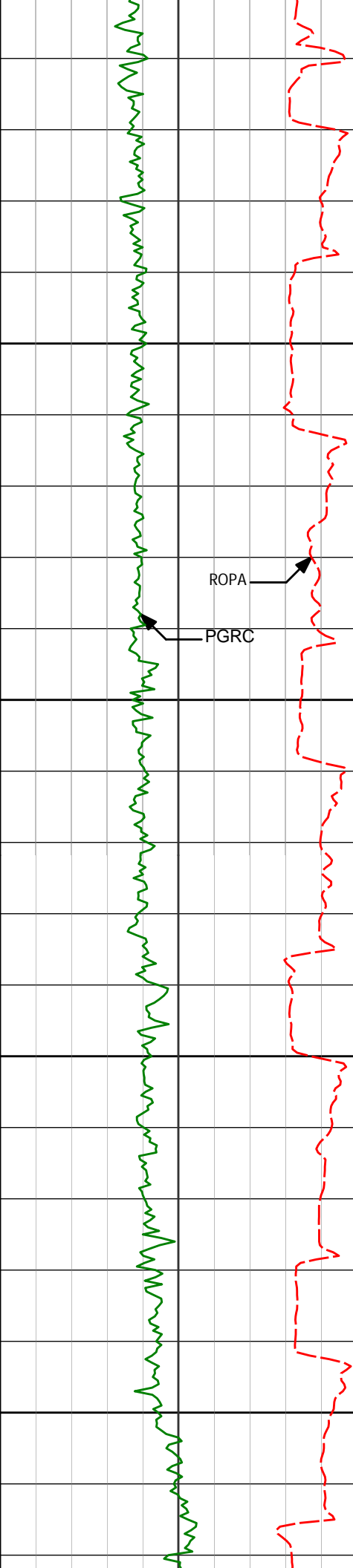
6400

6291'	3.06°	92.78°	-158.69'	6228.55'
-------	-------	--------	----------	----------

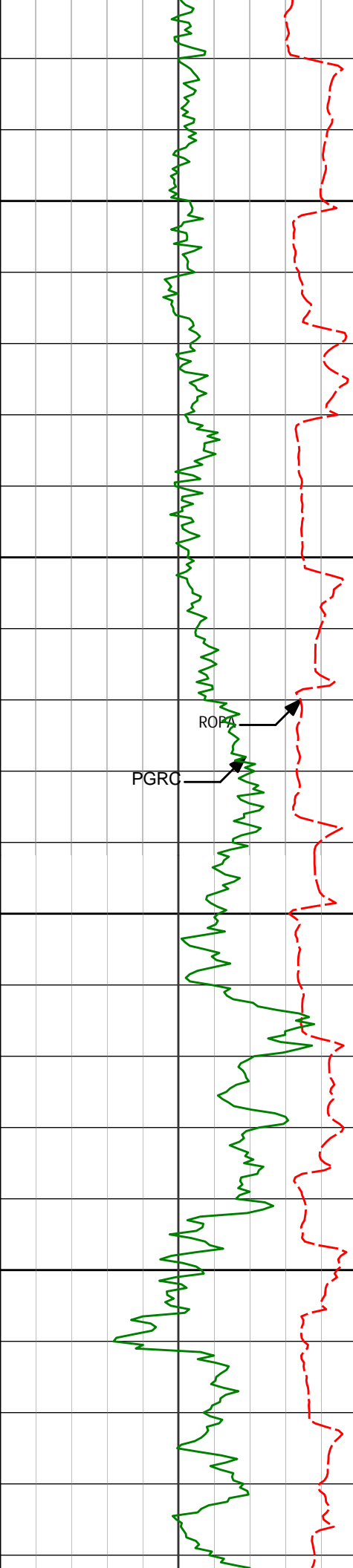
6339'	10.40°	91.05°	-153.12'	6276.18'
-------	--------	--------	----------	----------

6385'	14.75°	86.82°	-143.16'	6321.07'
-------	--------	--------	----------	----------

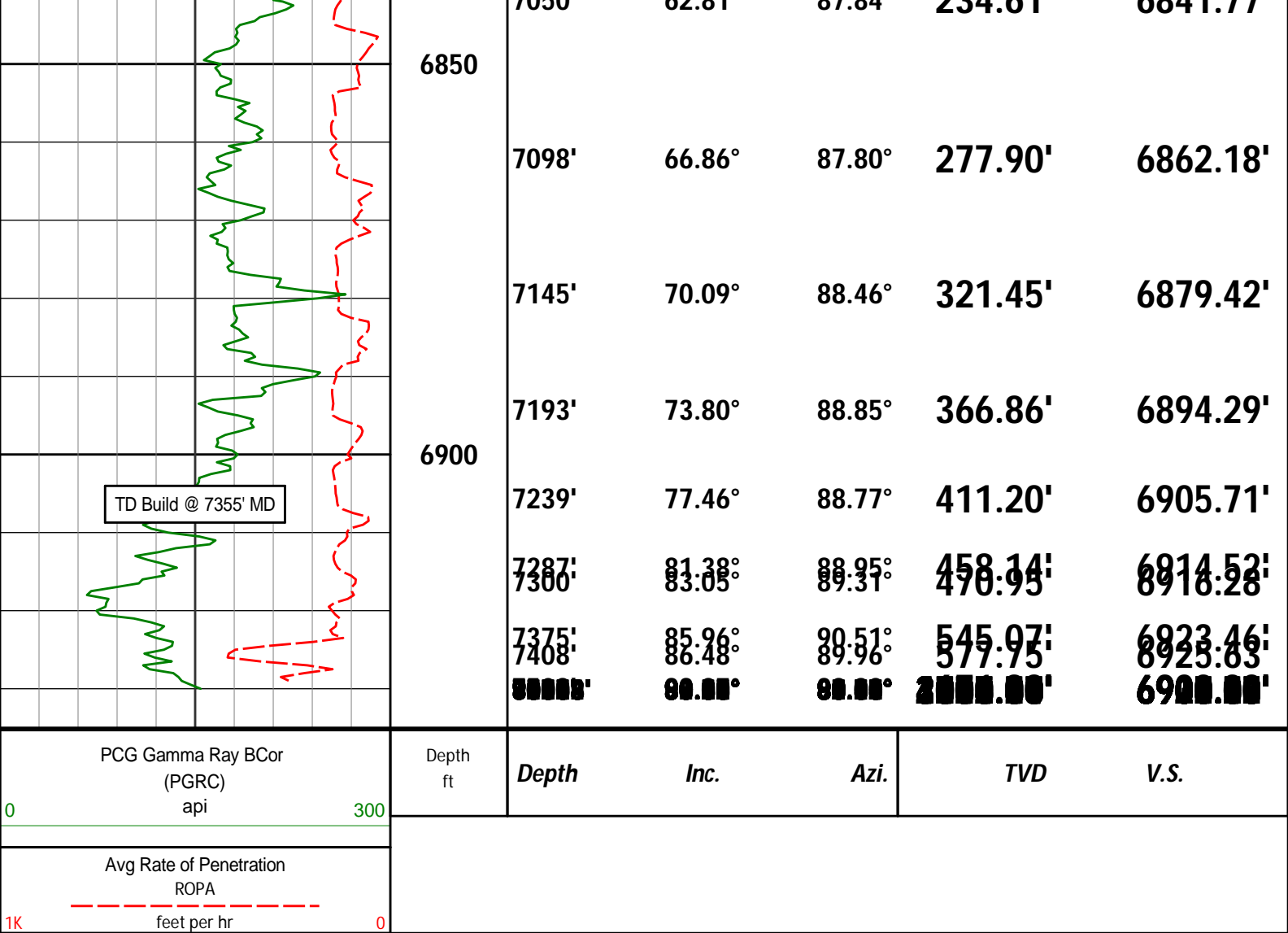
6433'	16.90°	85.70°	-130.10'	6367.25'
-------	--------	--------	----------	----------



	6480'	18.91°	89.79°	-115.71'	6411.97'
6450	6528'	21.06°	91.83°	-99.46'	6457.08'
6500	6575'	23.86°	86.95°	-81.62'	6500.51'
6550	6623'	27.85°	85.66°	-60.72'	6543.70'
6600	6670'	31.95°	87.76°	-37.35'	6584.44'



	6718'	36.27°	90.70°	-10.60'	6624.17'
6650					
	6765'	40.04°	92.49°	18.11'	6661.12'
6700	6813'	42.86°	91.84°	49.49'	6697.10'
	6860'	46.02°	90.23°	82.08'	6730.65'
6750					
	6908'	49.65°	87.90°	117.46'	6762.87'
	6955'	54.38°	89.57°	154.31'	6791.79'
6800					
	7003'	57.90°	88.92°	193.94'	6818.53'
	7050'	62.81°	87.84°	224.61'	6841.77'



HALLIBURTON

DIRECTIONAL SURVEY REPORT

Noble Energy
Knaub PC G04-66-1HN-A2
Wattenburg
Weld Colorado
USA
CA-XX-0900166420

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
730.00	0.37	283.93	729.95	0.35 N	7.07 E	7.06	0.46
830.00	0.47	280.00	829.94	0.49 N	6.36 E	6.37	0.10
930.00	0.60	241.51	929.94	0.31 N	5.50 E	5.50	0.37
1030.00	0.78	220.85	1029.93	0.45 S	4.60 E	4.51	0.30
1130.00	0.60	201.50	1129.93	1.45 S	3.96 E	3.76	0.29
1230.00	0.66	204.91	1229.92	2.45 S	3.53 E	3.21	0.08
1280.00	0.66	196.80	1279.92	2.99 S	3.32 E	2.94	0.19
1330.00	0.64	194.49	1329.91	3.54 S	3.17 E	2.72	0.06
1380.00	0.71	195.71	1379.91	4.11 S	3.01 E	2.50	0.14
1430.00	0.60	215.11	1429.91	4.62 S	2.78 E	2.21	0.50
1480.00	0.33	240.65	1479.90	4.91 S	2.50 E	1.90	0.66
1530.00	0.34	242.62	1529.90	5.05 S	2.25 E	1.63	0.02
1580.00	0.25	294.83	1579.90	5.07 S	2.02 E	1.40	0.54
1630.00	0.40	265.05	1629.90	5.04 S	1.74 E	1.13	0.44

1680.00	0.47	256.63	1679.90	5.10 S	1.37 E	0.75	0.19
1730.00	0.34	280.09	1729.90	5.12 S	1.03 E	0.41	0.41
1780.00	0.38	232.48	1779.90	5.19 S	0.75 E	0.12	0.59
1830.00	0.52	205.72	1829.90	5.50 S	0.51 E	-0.15	0.49
1880.00	0.69	204.40	1879.89	5.98 S	0.29 E	-0.42	0.34
1930.00	0.78	204.44	1929.89	6.56 S	0.03 E	-0.76	0.19
1980.00	0.84	218.56	1979.89	7.16 S	0.34 W	-1.20	0.42
2030.00	1.63	314.17	2029.88	6.95 S	1.08 W	-1.91	3.82
2130.00	3.43	317.91	2129.78	3.74 S	4.11 W	-4.53	1.80
2230.00	6.07	335.35	2229.43	3.29 N	8.32 W	-7.87	2.98
2330.00	8.72	342.77	2328.59	15.34 N	12.77 W	-10.85	2.81
2430.00	11.27	338.35	2427.07	31.66 N	18.63 W	-14.71	2.66
2530.00	14.08	336.43	2524.62	51.90 N	27.10 W	-20.70	2.84
2630.00	16.21	338.87	2621.14	76.07 N	36.99 W	-27.64	2.22
2730.00	16.81	338.93	2717.02	102.58 N	47.22 W	-34.63	0.61
2830.00	16.56	333.75	2812.81	128.86 N	58.73 W	-42.92	1.51
2930.00	13.26	333.49	2909.43	151.90 N	70.15 W	-51.50	3.30
3030.00	12.61	332.68	3006.90	171.85 N	80.28 W	-59.18	0.67
3068.00	12.79	335.39	3043.97	179.36 N	83.93 W	-61.91	1.64
3163.00	12.78	333.58	3136.61	198.33 N	92.98 W	-68.63	0.42
3258.00	12.75	334.82	3229.27	217.23 N	102.12 W	-75.44	0.29
3353.00	13.71	337.04	3321.74	237.09 N	110.98 W	-81.86	1.14
3447.00	13.73	336.02	3413.06	257.54 N	119.86 W	-88.24	0.26
3542.00	14.39	334.26	3505.21	278.48 N	129.57 W	-95.38	0.83
3637.00	15.13	335.69	3597.08	300.41 N	139.80 W	-102.92	0.87
3732.00	16.14	339.85	3688.56	324.12 N	149.45 W	-109.67	1.59
3826.00	17.23	340.29	3778.60	349.49 N	158.65 W	-115.77	1.16
3921.00	16.14	337.33	3869.60	374.92 N	168.48 W	-122.50	1.45
4016.00	13.09	337.50	3961.52	397.05 N	177.69 W	-129.00	3.21
4111.00	9.79	338.26	4054.62	414.50 N	184.80 W	-133.97	3.48
4206.00	8.19	338.26	4148.45	428.29 N	190.30 W	-137.78	1.69
4300.00	7.91	340.32	4241.52	440.60 N	194.96 W	-140.94	0.43
4395.00	8.57	337.42	4335.54	453.29 N	199.88 W	-144.31	0.82
4490.00	7.69	337.69	4429.59	465.70 N	205.01 W	-147.92	0.93
4585.00	6.43	341.96	4523.86	476.64 N	209.07 W	-150.64	1.44
4680.00	4.74	343.67	4618.41	485.47 N	211.82 W	-152.32	1.79
4774.00	3.80	342.10	4712.15	492.16 N	213.87 W	-153.56	1.01
4869.00	3.58	334.53	4806.95	497.84 N	216.12 W	-155.11	0.56
4964.00	3.14	336.59	4901.79	502.91 N	218.43 W	-156.80	0.48
5059.00	2.01	310.83	4996.69	506.39 N	220.73 W	-158.66	1.68
5154.00	0.63	253.65	5091.67	507.34 N	222.49 W	-160.30	1.85
5438.00	0.85	303.27	5375.65	508.05 N	225.77 W	-163.47	0.23
5722.00	0.40	351.98	5659.63	510.19 N	227.67 W	-165.10	0.23
6007.00	0.73	122.46	5944.62	510.21 N	226.28 W	-163.72	0.36
6162.00	1.13	125.56	6099.60	508.79 N	224.20 W	-161.83	0.26
6225.00	1.05	120.11	6162.59	508.14 N	223.20 W	-160.91	0.21
6291.00	3.06	92.78	6228.55	507.75 N	220.91 W	-158.69	3.31
6339.00	10.40	91.05	6276.18	507.61 N	215.30 W	-153.12	15.29
6385.00	14.75	86.82	6321.07	507.85 N	205.29 W	-143.16	9.66
6433.00	16.90	85.70	6367.25	508.72 N	192.24 W	-130.10	4.52
6480.00	18.91	89.79	6411.97	509.26 N	177.81 W	-115.71	5.05
6528.00	21.06	91.83	6457.08	509.01 N	161.41 W	-99.46	4.71
6575.00	23.86	86.95	6500.51	509.25 N	143.47 W	-81.62	7.15
6623.00	27.85	85.66	6543.70	510.61 N	122.59 W	-60.72	8.39
6670.00	31.95	87.76	6584.44	511.93 N	99.21 W	-37.35	9.01
6718.00	36.27	90.70	6624.17	512.25 N	72.30 W	-10.60	9.64
6765.00	40.04	92.49	6661.12	511.42 N	43.29 W	18.11	8.36
6813.00	42.86	91.84	6697.10	510.23 N	11.54 W	49.49	5.93
6860.00	46.02	90.23	6730.65	509.65 N	21.36 E	82.08	7.15
6908.00	49.65	87.90	6762.87	510.25 N	56.92 E	117.46	8.37
6955.00	54.38	89.57	6791.79	511.05 N	93.94 E	154.31	10.45
7003.00	57.90	88.92	6818.53	511.58 N	133.79 E	193.94	7.41
7050.00	62.81	87.84	6841.77	512.74 N	174.61 E	234.61	10.64
7098.00	66.86	87.80	6862.18	514.39 N	218.02 E	277.90	8.44
7145.00	70.09	88.46	6879.42	515.82 N	261.71 E	321.45	7.00
7193.00	73.80	88.85	6894.29	516.88 N	307.32 E	366.86	7.77
7239.00	77.46	88.77	6905.71	517.81 N	351.87 E	411.20	7.96
7287.00	81.38	88.95	6914.52	518.75 N	399.03 E	458.14	8.17
7300.00	83.05	89.31	6916.28	518.94 N	411.91 E	470.95	13.14
7375.00	85.96	90.51	6923.46	519.06 N	486.56 E	545.07	4.20
7408.00	86.48	89.96	6925.63	518.93 N	519.49 E	577.75	2.29
7503.00	88.27	89.92	6929.98	519.03 N	614.38 E	671.98	1.88
7597.00	91.51	89.04	6930.16	519.88 N	708.36 E	765.39	3.57
7692.00	91.57	87.50	6927.60	522.74 N	803.28 E	859.97	1.62
7787.00	90.99	88.17	6925.48	526.33 N	898.19 E	954.63	0.93

7882.00	90.80	91.72	6924.00	526.42 N	993.16 E	1048.93	3.75
7977.00	90.34	89.72	6923.06	525.23 N	1088.15 E	1143.09	2.17
8072.00	88.83	89.58	6923.75	525.81 N	1183.14 E	1237.48	1.60
8167.00	89.04	92.44	6925.51	524.15 N	1278.10 E	1331.56	3.02
8262.00	91.23	94.84	6925.28	518.12 N	1372.89 E	1424.95	3.42
8356.00	90.12	89.16	6924.17	514.84 N	1466.79 E	1517.78	6.15
8451.00	90.49	86.56	6923.66	518.38 N	1561.72 E	1612.45	2.76
8546.00	90.37	85.02	6922.95	525.35 N	1656.45 E	1707.34	1.63
8641.00	89.91	85.04	6922.72	533.57 N	1751.10 E	1802.29	0.49
8736.00	90.25	86.19	6922.59	540.83 N	1845.82 E	1897.20	1.27
8831.00	89.11	88.11	6923.12	545.55 N	1940.69 E	1991.96	2.34
8926.00	89.51	92.75	6924.27	544.84 N	2035.66 E	2086.16	4.90

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 CLOSURE OF 75.02 DEGREES (GRID)
A TOTAL CORRECTION OF 8.11 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 8926.00 FEET
IS 2107.31 FEET ALONG 75.02 DEGREES (GRID)**

Tie In @ Surface Casing Shoe

Date Printed:12 March 2013