



WELL INFORMATION					
MWD Run Number	100	200			
Date run completed	12-Jan-13	13-Jan-13			
Rig Bit Number	2	3			
Bit Size (in)	8.750	8.750			
Tool Nominal OD (in)	6.750	6.750			
Log Start Depth (TVD, ft)	665.00	5,944.75			
Log End Depth (TVD, ft)	5,944.75	6,710.60			
Drill or Wipe	Drill	Drill			
Drill/Wipe Start Date and Time	11-Jan-13 06:20	12-Jan-13 10:15			
Drill/Wipe End Date and Time	11-Jan-13 23:30	13-Jan-13 04:00			
Min Inc (deg) @ Depth (TVD, ft)	.20 @ 5,665.80	.87 @ 5,947.75			
Max Inc (deg) @ Depth (TVD, ft)	17.19 @ 2,012.13	84.26 @ 6,706.96			
Bit TFA(in2) / Bit Type	.75 / PDC	.86 / PDC			
Flow Rate (gpm)	590.19	546.62			
Max AV (fpm) / CV (fpm) @ MWD	417.4 / NA	392.5 / NA			
Fluid Type	Fresh Water Gel	Fresh Water Gel			
Density (ppg) / Viscosity (spqt)	9.00 / 29.00	9.90 / 37.00			
Filtrate CL (ppm)	2,800.00	2,800.00			
pH / Fluid Loss (mptm)	9.20 / NA	9.20 / NA			
PV (cP) / YP (Ihf2)	4 / 4.00	12 / 8.00			
% Solids / % Sand	4.70 / 0.25	6.2 / 0.40			
% Oil / Oil:Water Ratio	0 / 0:95	0 / 0:88			
Rm @ Measured Temp (degF)	NA @ NA	NA @ NA			
Rmf @ Measured Temp (degF)	NA @ NA	NA @ NA			
Rmc @ Measured Temp (degF)	NA @ NA	NA @ NA			
Max Tool Temp (deg F) / S	144.75 / PDM	129.22 / PDM			

Max Tool Temp (degF) / Source	141.70 / PCM	160.83 / PCM			
Rm @ Max Tool Temp (degF)	NA @ 141.70	NA @ 160.83			
Lead MWD Engineer	Ryan Brunkhorst	Ryan Brunkhorst			
Customer Representative	Matt Settles	Matt Settles			

## SENSOR INFORMATION

### Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.76	5.76			
Sub Serial Number	245494	245494			
Insert Serial Number	11400826	11400826			
Date and Time Initialized	06-Jan-13 01:30	06-Jan-13 01:30			
Date and Time Read	13-Jan-13 10:29	13-Jan-13 10:35			
ECMB SW Version	N/A	N/A			

### Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	57.00	55.00			
Software Version	6.21	6.21			
Sub Serial Number	245494	245494			
Sonde Serial Number	10859920	10859920			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	181.06	108.75			

### Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	50.06	48.18			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	11909583	11909583			
Insert/Sonde Serial Number	11680972	11680972			

## REMARKS

1. All depths are true vertical bit 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. Critical annual velocities are calculated using the "Power Law" model for water based fluids and the "Bingham 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 (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
6. The Surveys presented on the log are Sperry surveys that were recorded while drilling. The Surveys in the Survey Report are gyro surveys that were recorded by Vaughn Energy Services after drilling to 11,187' MD.
7. INSITE version 7.4.01

WARRANTY

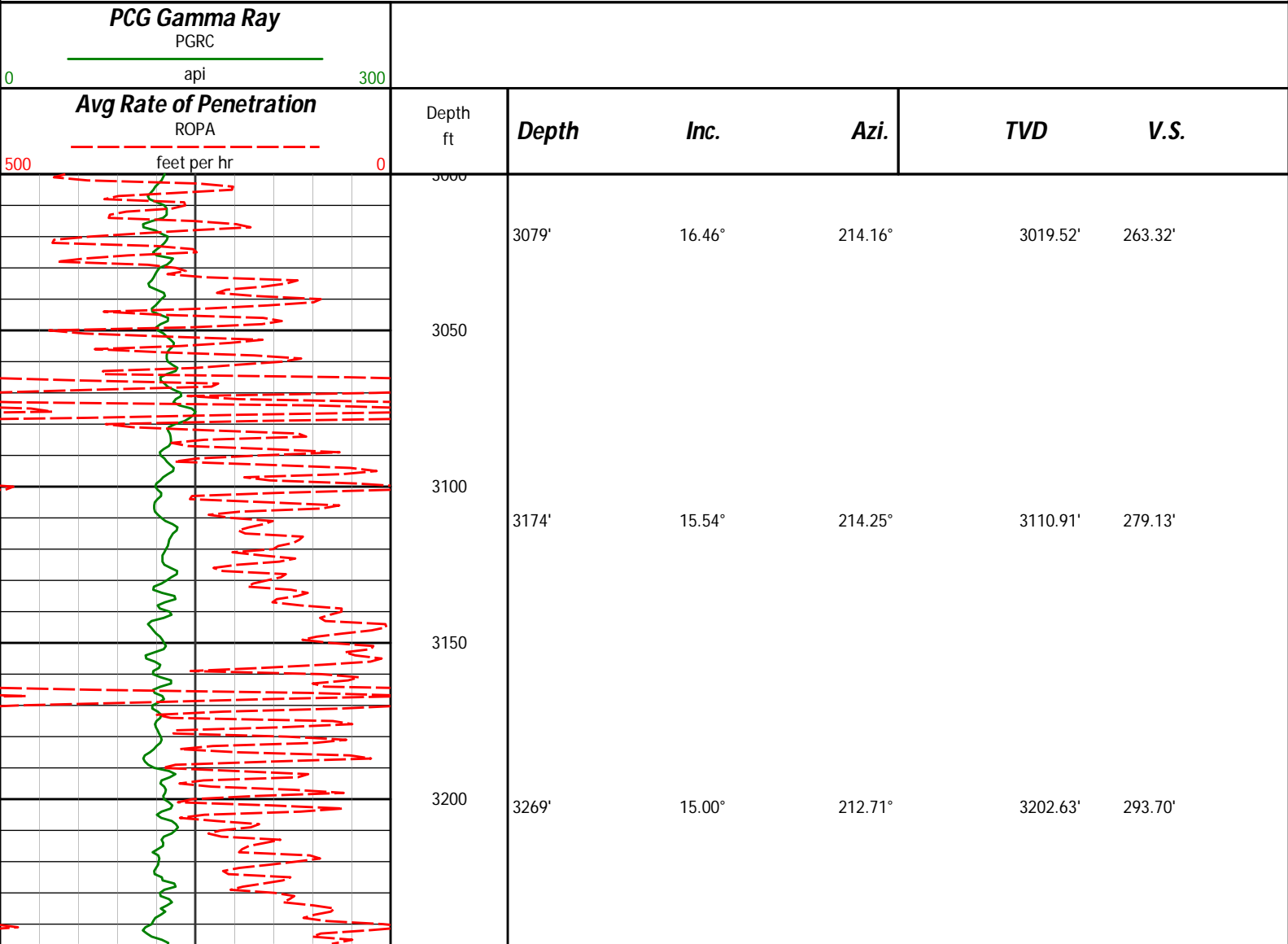
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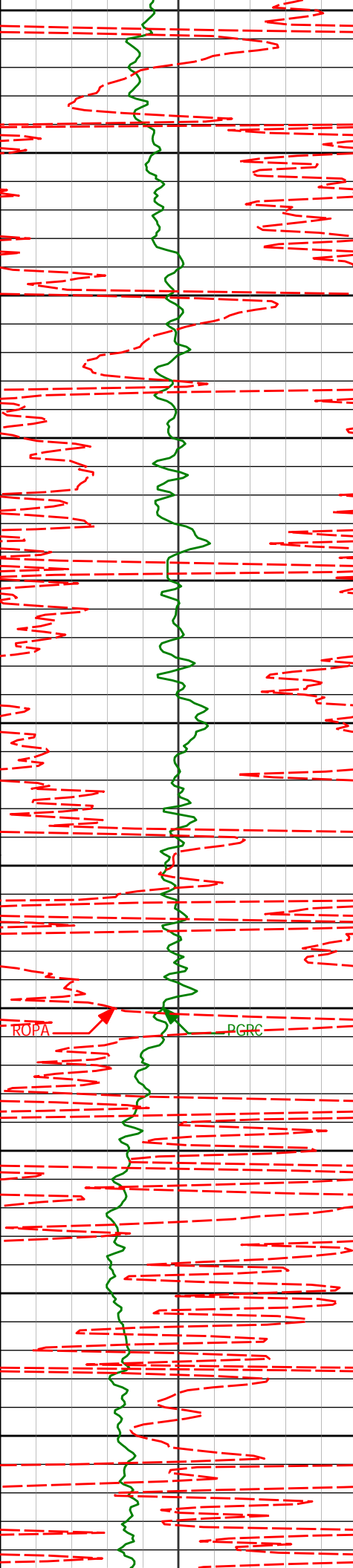
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Sperry Drilling Services

TVD Main Log 1:600

Noble Energy  
Wells Ranch State USX AA16-68-1HNL  
H&P 343  
T6N-R63W





3250

3300

3350

3400

3450

3500

3550

3600

3650

3700

3750

3364'

12.02°

209.02°

3294.82'

306.48'

3459'

7.51°

210.78°

3388.19'

316.30'

3554'

7.27°

211.77°

3482.39'

323.40'

3649'

3.96°

201.53°

3576.82'

329.23'

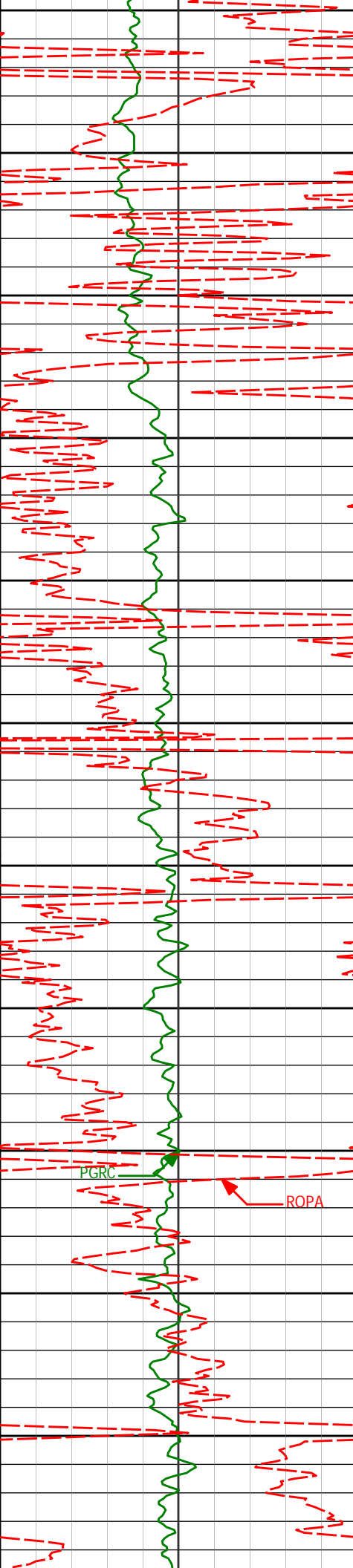
3839'

3.28°

202.92°

3766.36'

335.50'



3800

3850

3900

3950

4000

4050

4100

4150

4200

4250

4300

3934'

1.92°

211.97°

3861.27'

337.63'

4029'

1.75°

195.72°

3956.22'

339.19'

4124'

1.58°

186.84°

4051.18'

340.55'

4219'

0.95°

159.10°

4146.15'

341.01'

4314'

1.65°

115.59°

4241.13'

339.72'

4409'

2.84°

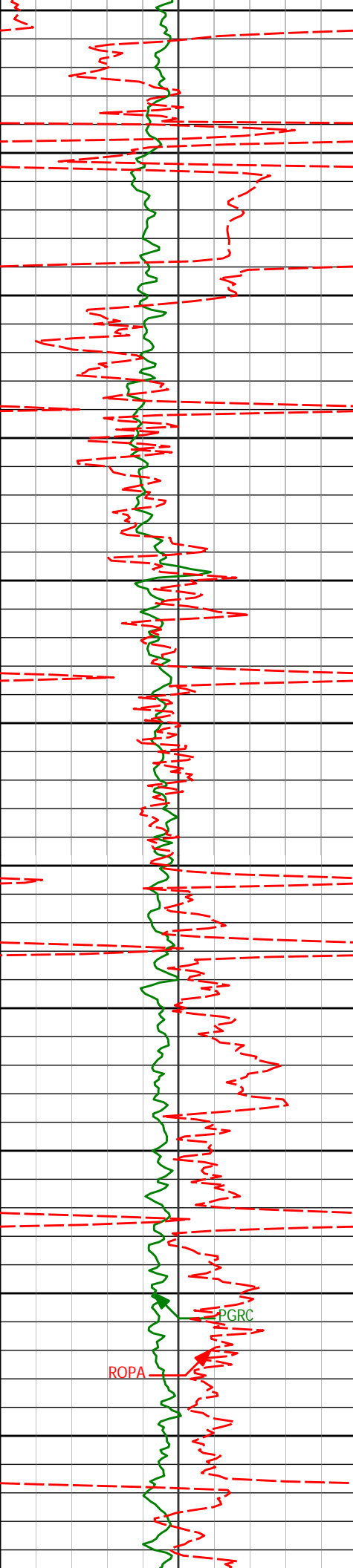
117.70°

4336.07'

336.75'

PGRC

ROPA



4350

4400

4450

4500

4550

4600

4650

4700

4750

4800

4850

4504'

1.81°

72.85°

4431.00'

333.46'

4599'

0.71°

64.79°

4525.97'

331.00'

4789'

0.83°

141.27°

4715.94'

327.67'

4884'

1.41°

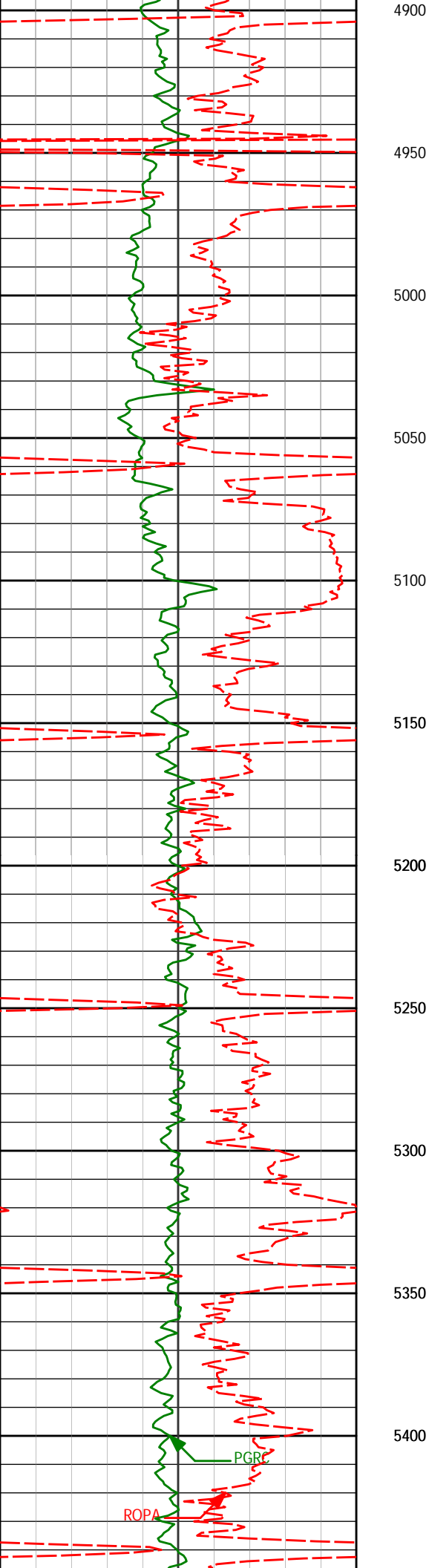
138.27°

4810.91'

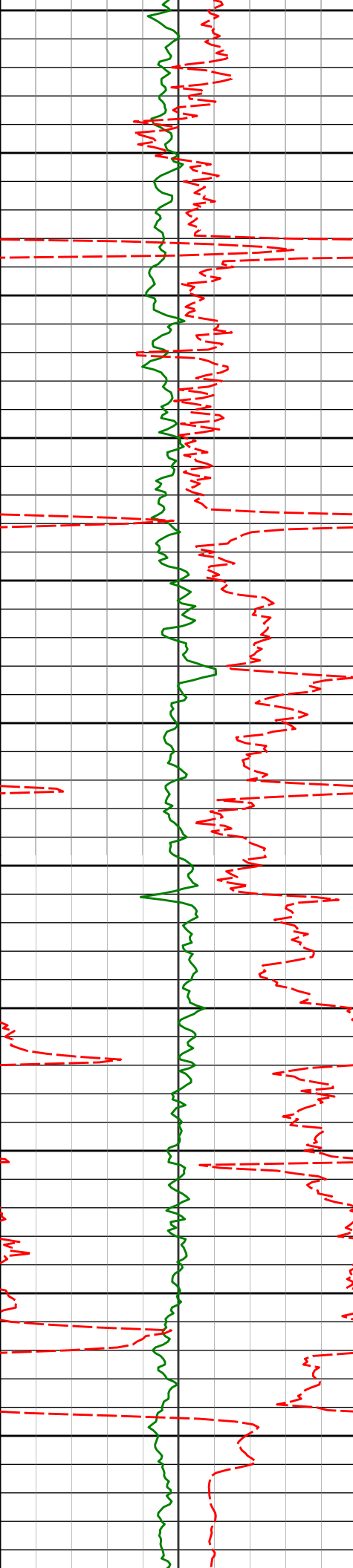
326.32'

PGRC

ROPA

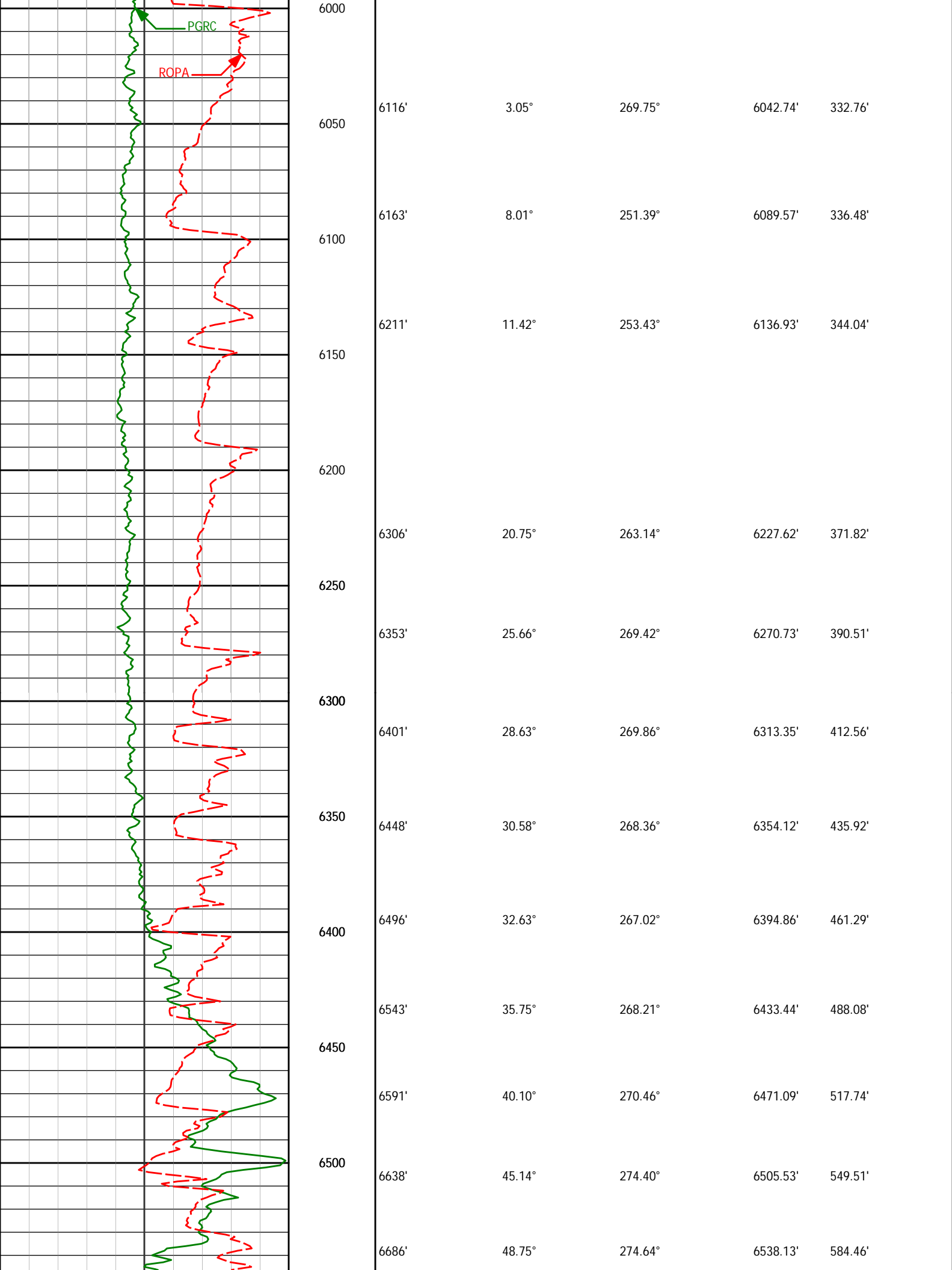


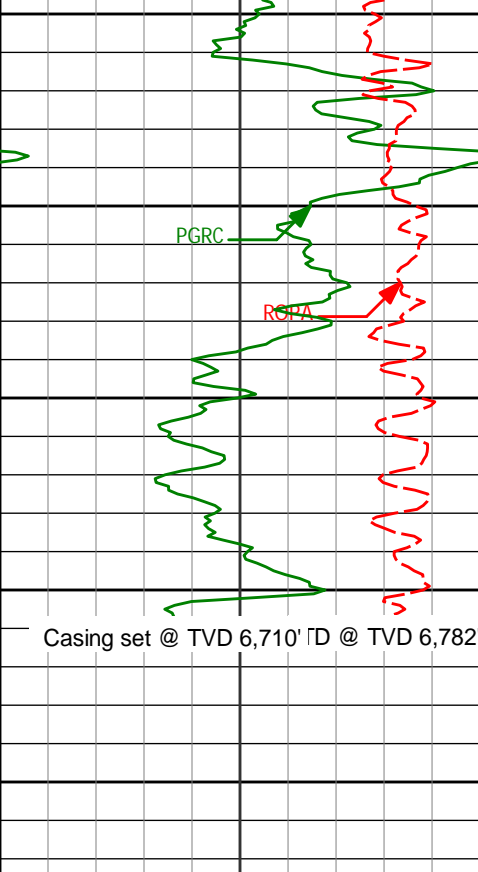
5074'	1.14°	325.52°	5000.88'	326.23'
5169'	0.81°	1.44°	5095.87'	326.76'
5264'	1.26°	338.25°	5190.85'	327.02'
5359'	0.88°	311.01°	5285.83'	328.01'
5454'	1.02°	318.66°	5380.81'	329.14'



5450					
	5549'	0.67°	312.66°	5475.80'	330.24'
5500					
5550					
	5644'	0.25°	285.30°	5570.80'	330.80'
5600					
5650					
	5739'	0.20°	129.87°	5665.80'	331.17'
5700					
5750					
	5834'	0.88°	13.95°	5760.80'	330.99'
5800					
5850					
	5929'	1.97°	338.70°	5855.77'	331.11'
	5961'	1.83°	333.63°	5887.77'	331.29'
5900					
<Run 200> 5950	6021'	0.87°	338.67°	5947.75'	331.78'







6550					
	6733'	51.69°	272.66°	6568.11'	620.41'
6600	6781'	56.08°	269.93°	6596.24'	659.19'
	6828'	61.62°	269.69°	6620.66'	699.26'
6650	6876'	66.87°	269.29°	6641.65'	742.32'
	6923'	70.62°	269.26°	6658.38'	786.18'
	6971'	74.09°	268.93°	6672.57'	831.95'
	7018'	76.59°	268.79°	6684.11'	877.44'
6700	7066'	78.50°	268.89°	6694.29'	924.25'
	7113'	82.12°	270.33°	6702.47'	970.38'
	7148'	84.26°	270.10°	6706.96'	1004.97'
6750					

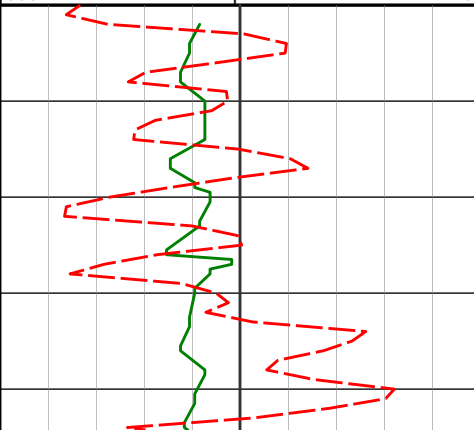
<b>Avg Rate of Penetration</b> ROPA <div> <div></div> <div>feet per hr</div> </div>		Depth ft	<b>Depth</b>	<b>Inc.</b>	<b>Azi.</b>	<b>TVD</b>	<b>V.S.</b>
500	0						
<b>PCG Gamma Ray</b> PGRC <div> <div></div> <div>api</div> </div>							
0	300						

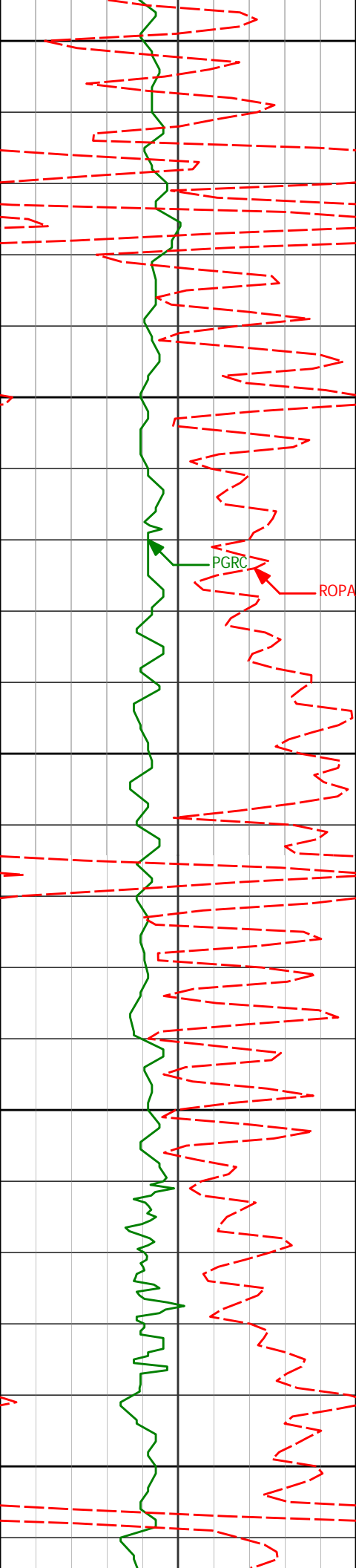
# HALLIBURTON

## Sperry Drilling Services

# TVD Detail Log 1:240

40 Noble Energy  
Wells Ranch State USX AA16-68-1HNL  
H&P 343  
T6N-R63W

PCG Gamma Ray PGRC 0 300 api							
Avg Rate of Penetration ROPA 500 0 feet per hr		Depth ft	Depth	Inc.	Azi.	TVD	V.S.
		3079'	16.46°	214.16°	3019.52'	263.32'	



3050

3100

3150

3200

3250

3174'

15.54°

214.25°

3110.91'

279.13'

PGR

ROPA

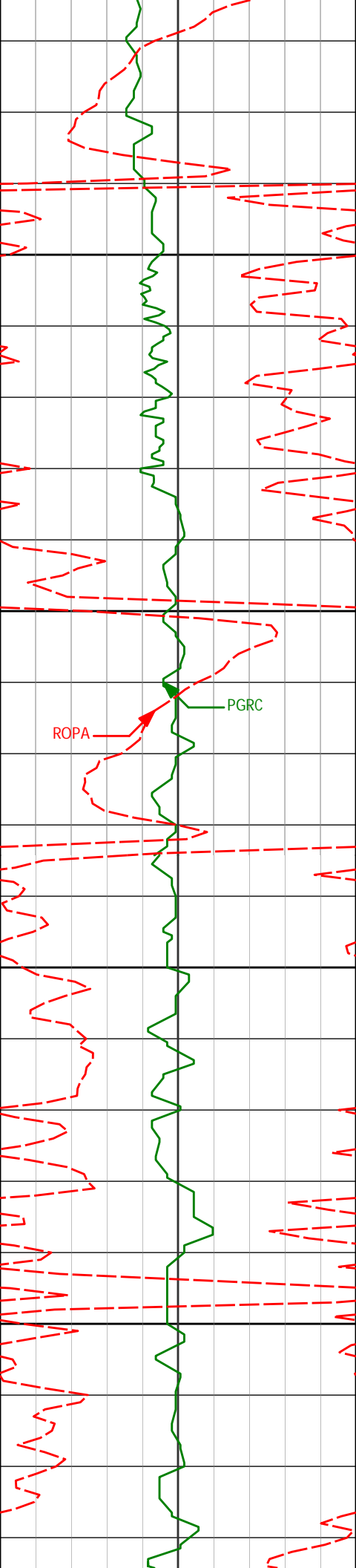
3269'

15.00°

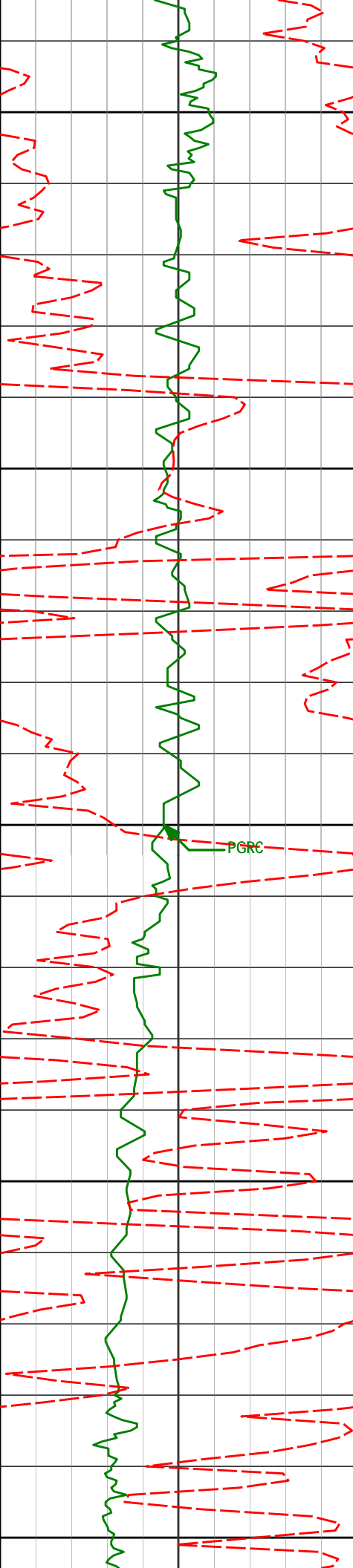
212.71°

3202.63'

293.70'



3364'	12.02°	209.02°	3294.82'	306.48'
3300				
3350				
3459'	7.51°	210.78°	3388.19'	316.30'
3400				
3450				
3554'	7.27°	211.77°	3482.39'	323.40'



3500

3550

3649'

3.96°

201.53°

3576.82'

329.23'

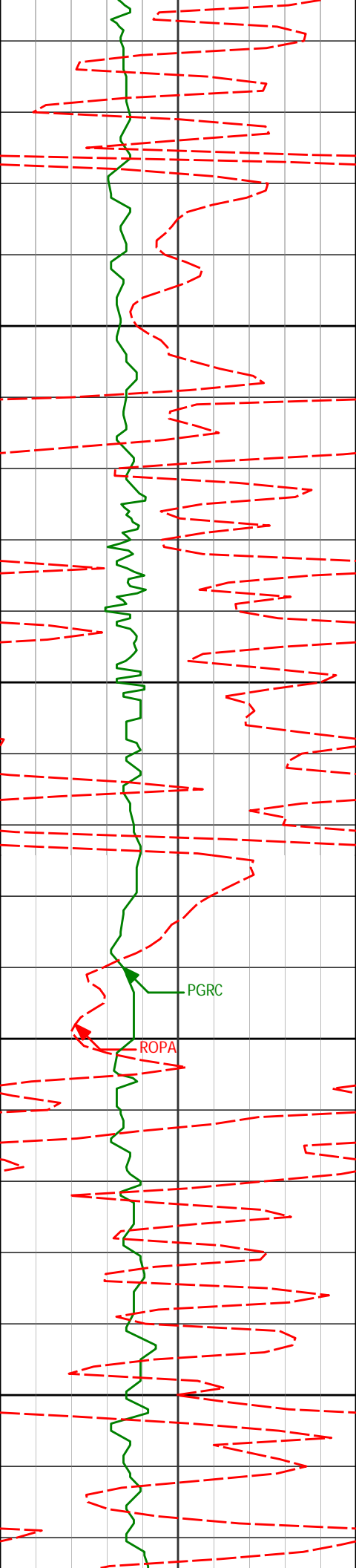
3600

PGRC

ROPA

3650

3700



3750

3839'

3.28°

202.92°

3766.36'

335.50'

3800

3850

3934'

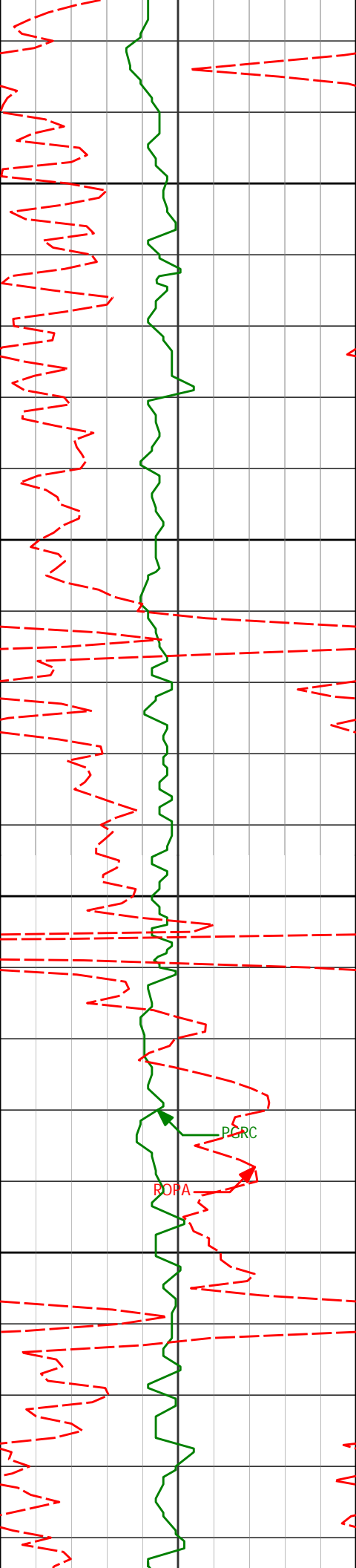
1.92°

211.97°

3861.27'

337.63'

3900



3950

4029'

1.75°

195.72°

3956.22'

339.19'

4000

4050

4124'

1.58°

186.84°

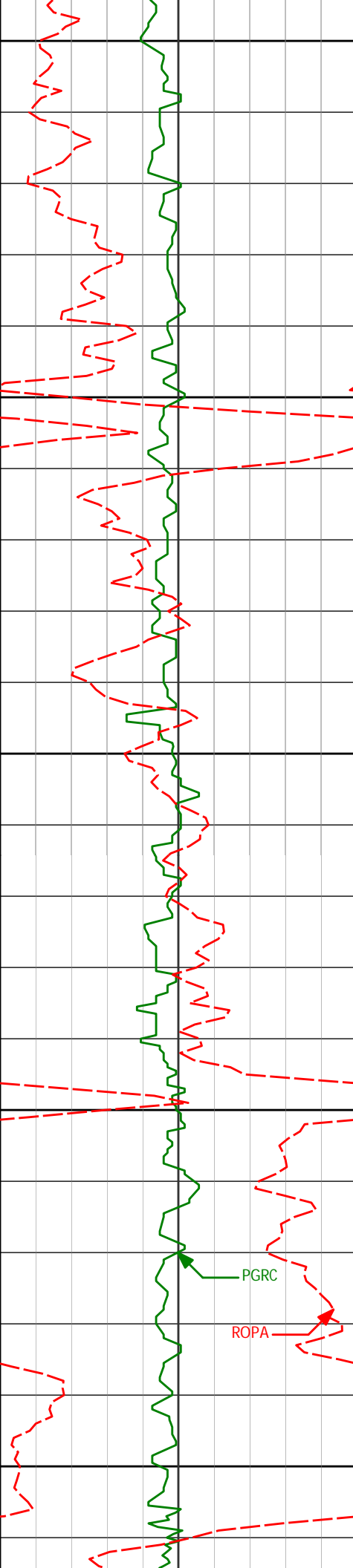
4051.18'

340.55'

4100

PERC

ROPA



4150

4200

4250

4300

4350

PGRC

ROPA

4219'

0.95°

159.10°

4146.15'

341.01'

4314'

1.65°

115.59°

4241.13'

339.72'

4409'

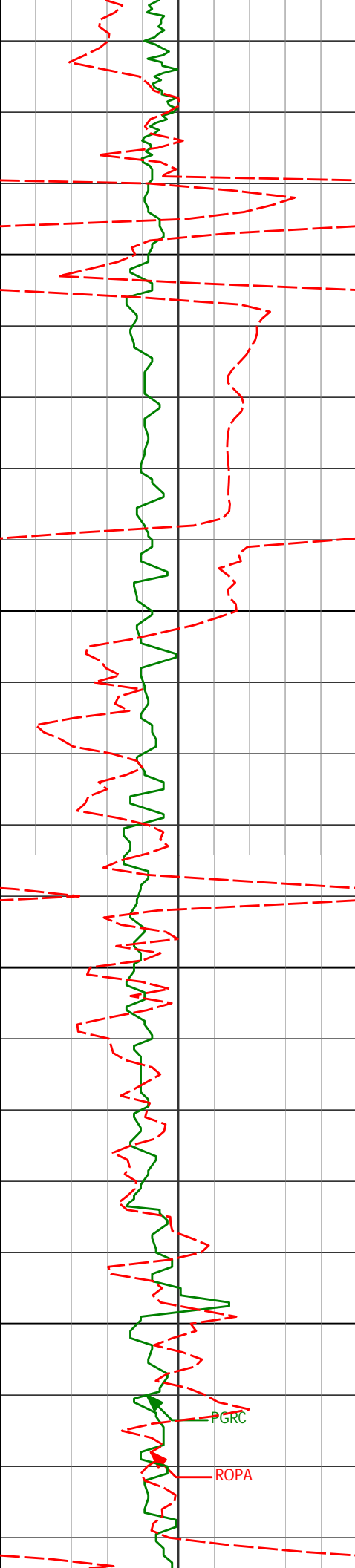
2.84°

117.70°

4336.07'

336.75'





4400

4450

4500

4550

PGRC

ROPA

4504'

1.81°

72.85°

4431.00'

333.46'

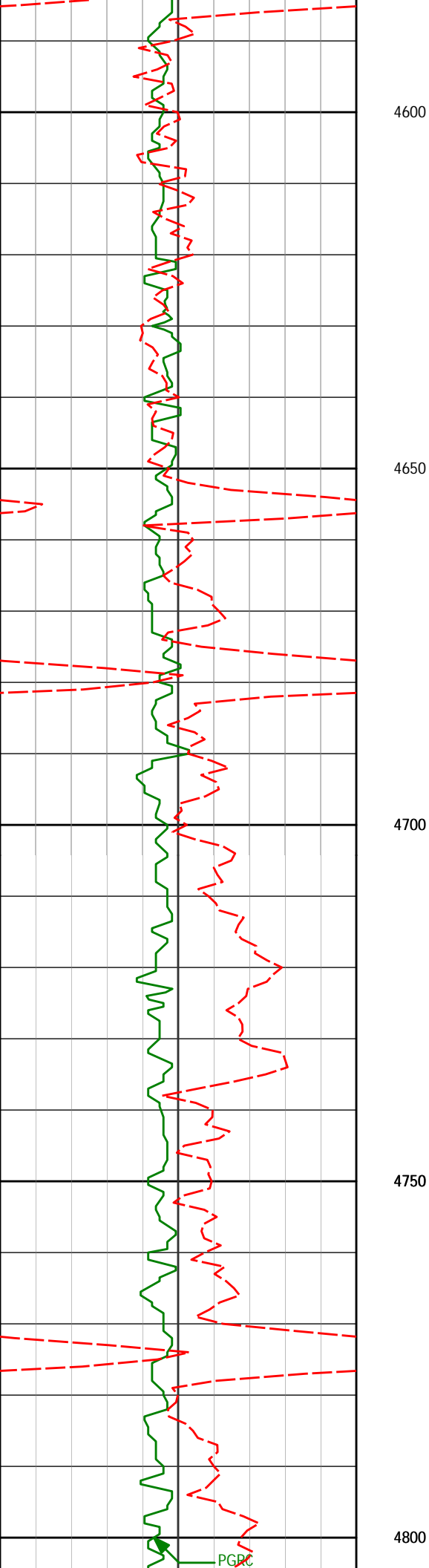
4599'

0.71°

64.79°

4525.97'

331.00'



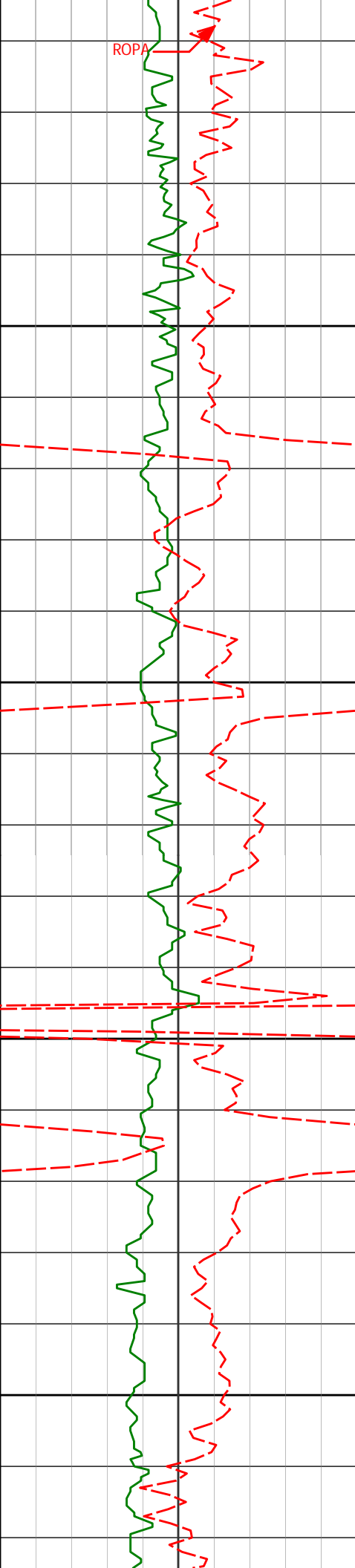
4789'

0.83°

141.27°

4715.94'

327.67'



ROPA

4850

4900

4950

5000

4884'

1.41°

138.27°

4810.91'

326.32'

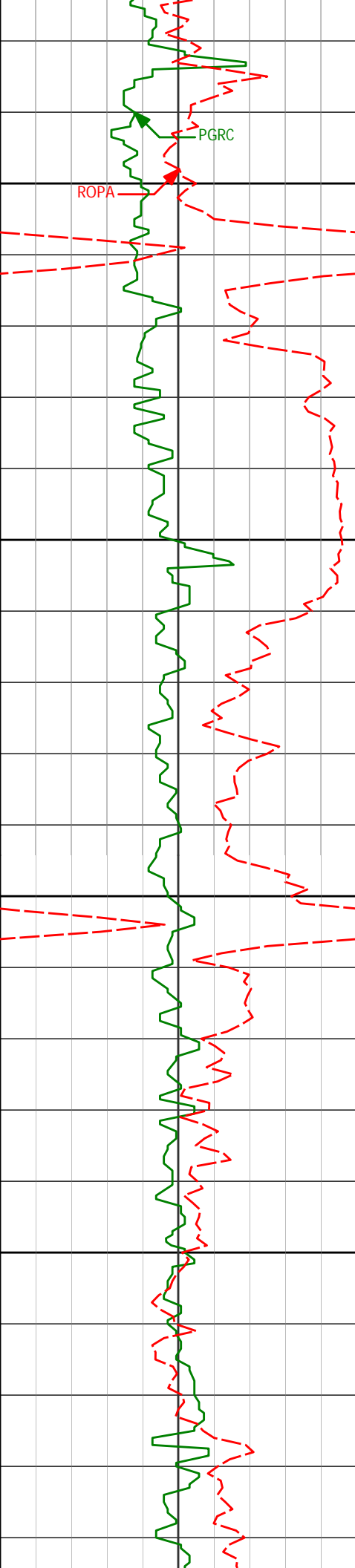
5074'

1.14°

325.52°

5000.88'

326.23'



5050

5100

5150

5200

5169'

0.81°

1.44°

5095.87'

326.76'

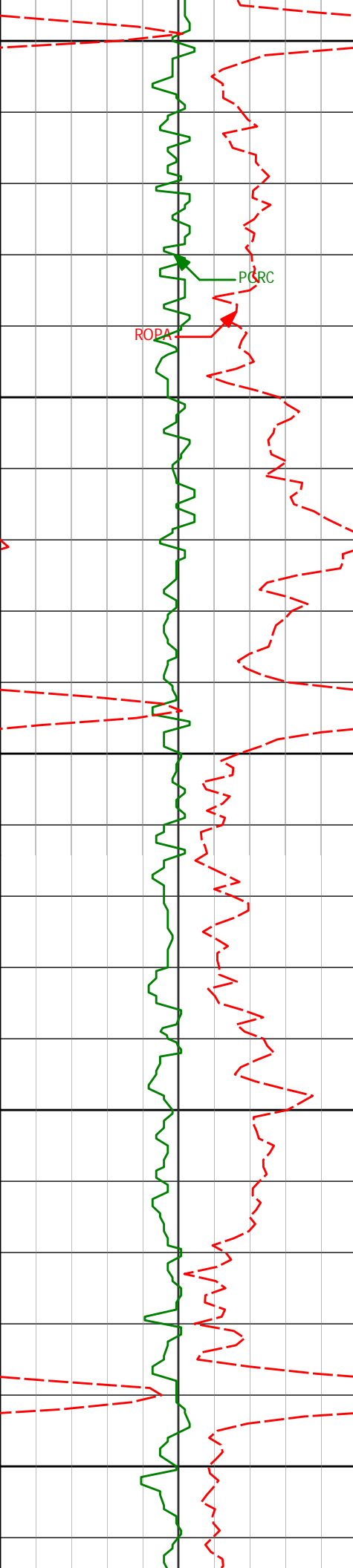
5264'

1.26°

338.25°

5190.85'

327.02'



5250

5359'

0.88°

311.01°

5285.83'

328.01'

5300

5350

5454'

1.02°

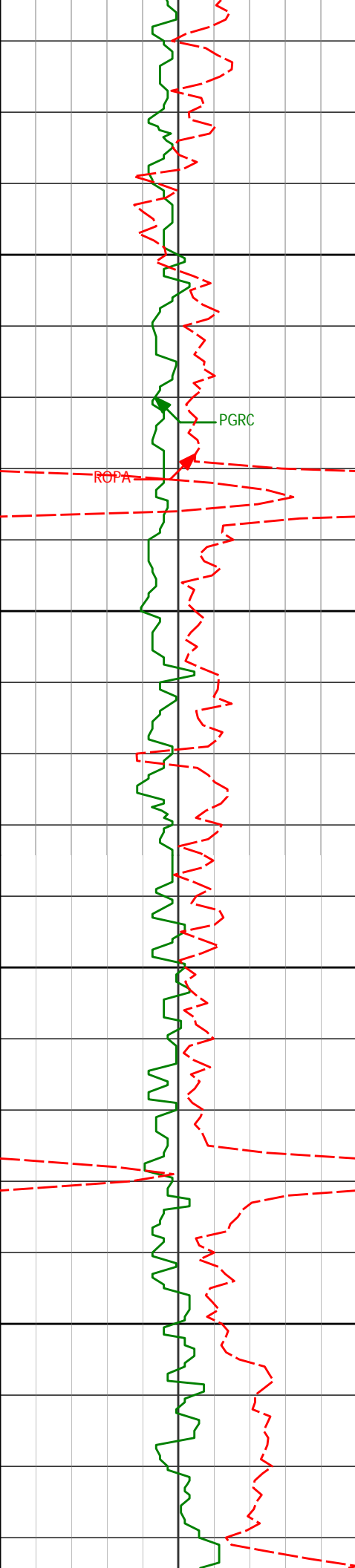
318.66°

5380.81'

329.14'

5400

5450



5549'

0.67°

312.66°

5475.80'

330.24'

5500

5550

5644'

0.25°

285.30°

5570.80'

330.80'

5600

5650

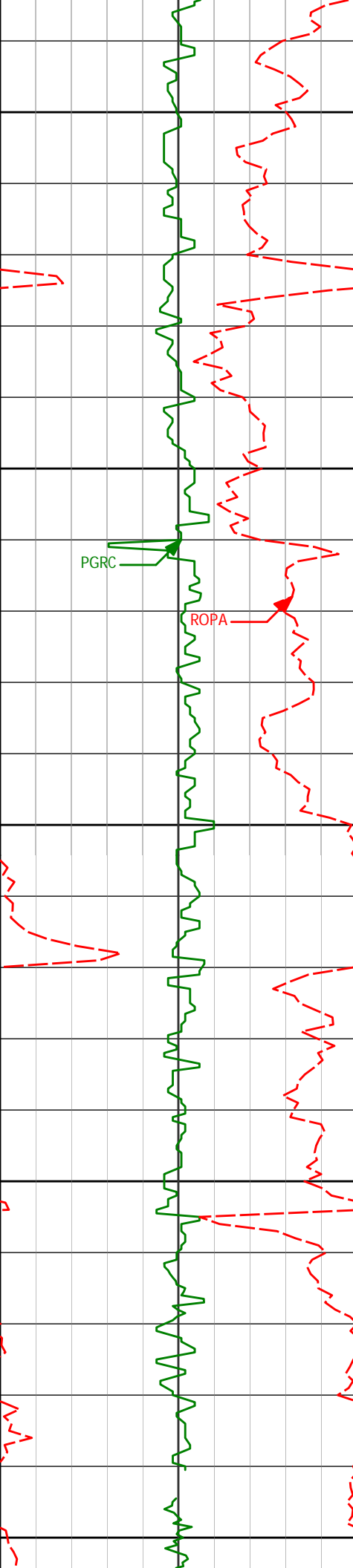
5739'

0.20°

129.87°

5665.80'

331.17'



5700

5750

5800

5850

5900

PGRC

ROPA

5834'

0.88°

13.95°

5760.80'

330.99'

5929'

1.97°

338.70°

5855.77'

331.11'

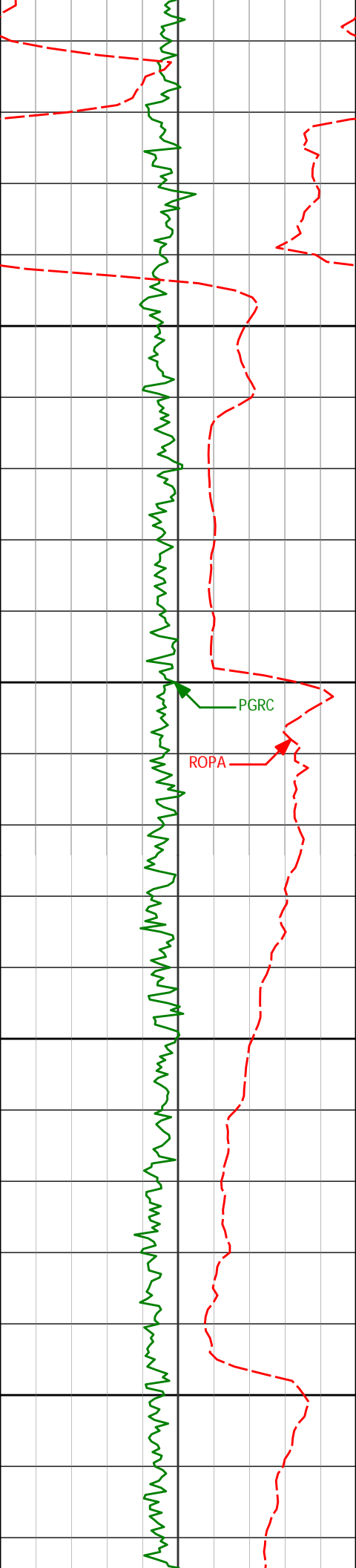
5961'

1.83°

333.63°

5887.77'

331.29'



<Run 200>  
5950

6021'

0.87°

338.67°

5947.75'

331.78'

6000

PGRC

ROPA

6050

6116'

3.05°

269.75°

6042.74'

332.76'

6100

6163'

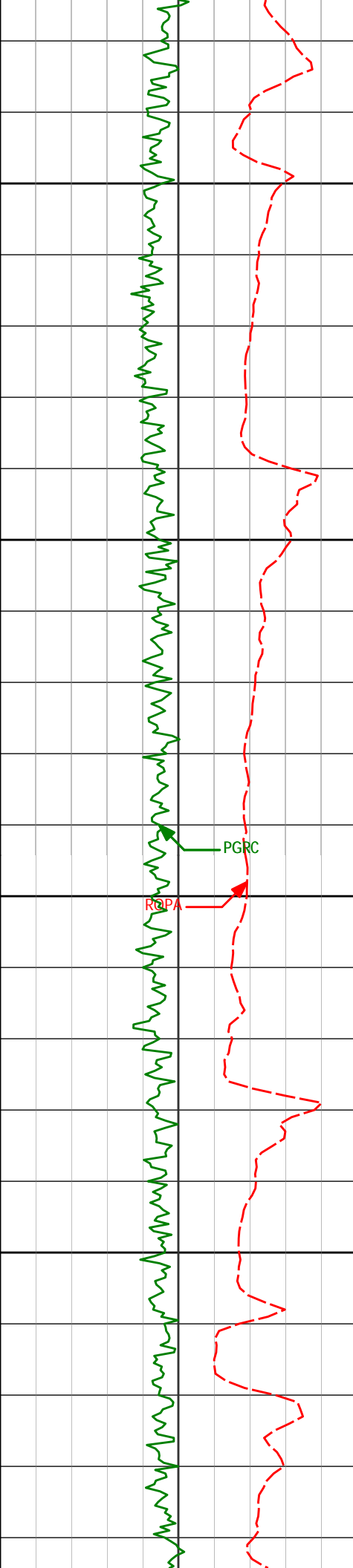
8.01°

251.39°

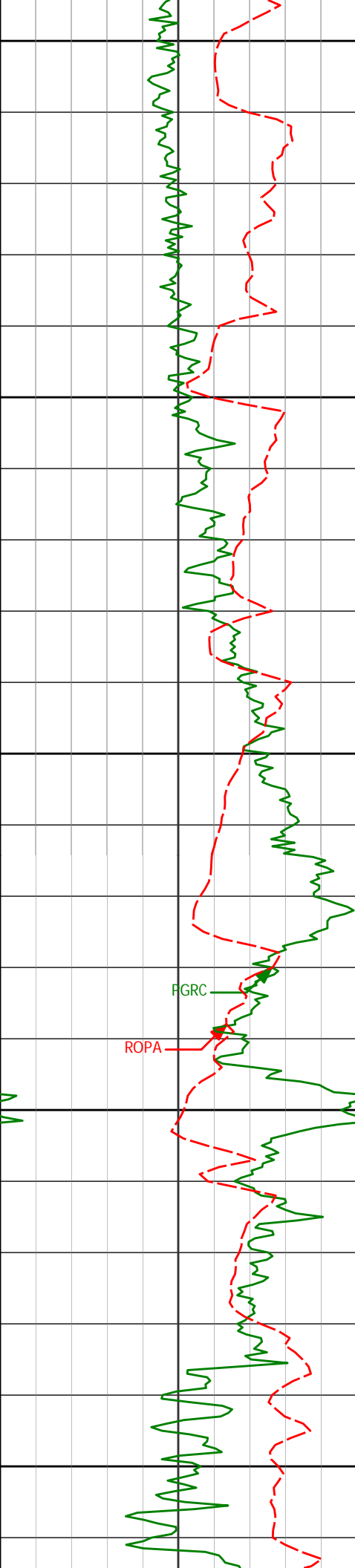
6089.57'

336.48'





6211'	11.42°	253.43°	6136.93'	344.04'
6150				
6200				
6306'	20.75°	263.14°	6227.62'	371.82'
6250				
6353'	25.66°	269.42°	6270.73'	390.51'
6300				
6401'	28.63°	269.86°	6313.35'	412.56'



6350

6448'

30.58°

268.36°

6354.12'

435.92'

6400

6496'

32.63°

267.02°

6394.86'

461.29'

6450

6543'

35.75°

268.21°

6433.44'

488.08'

6500

6591'

40.10°

270.46°

6471.09'

517.74'

6550

6638'

45.14°

274.40°

6505.53'

549.51'

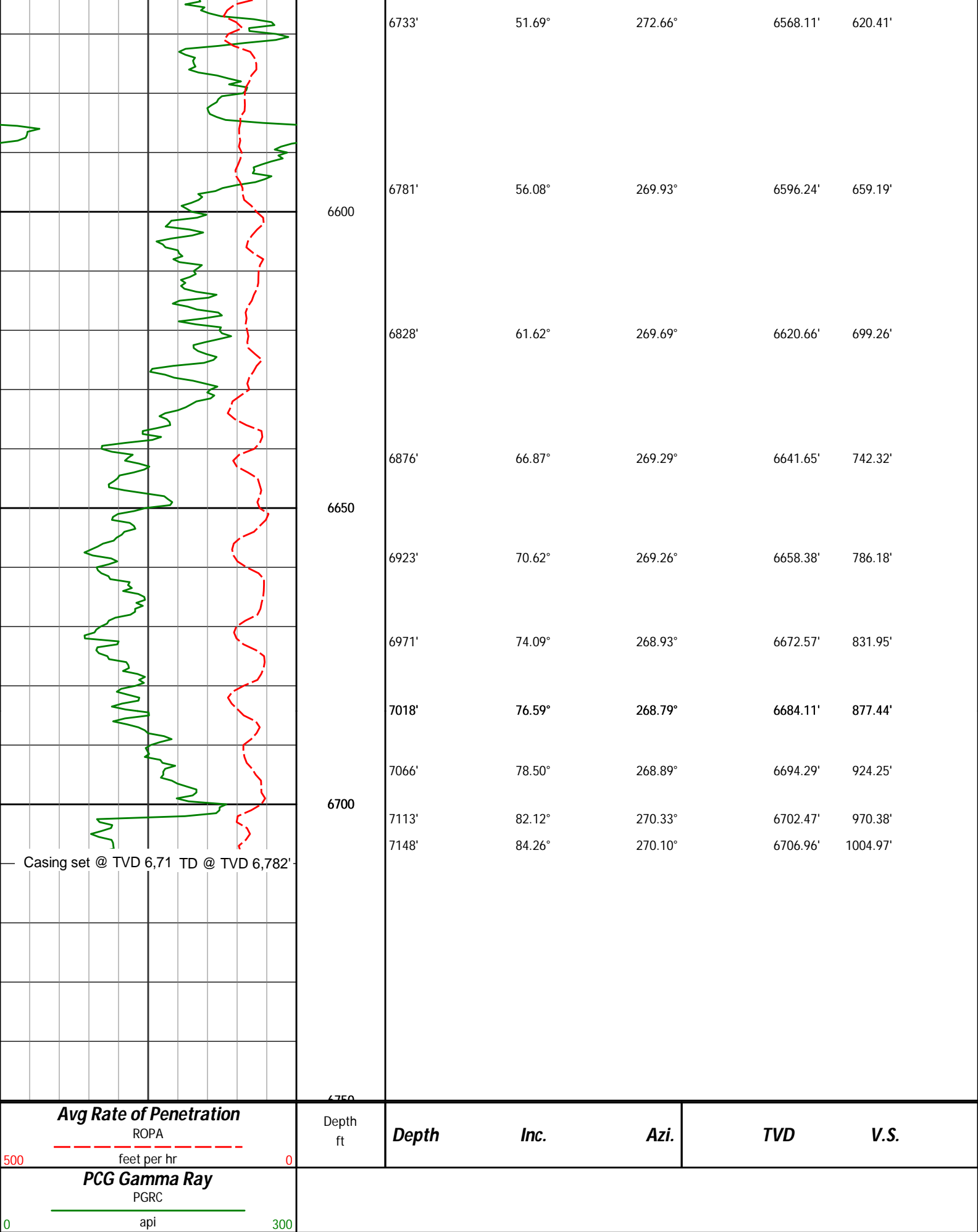
6686'

48.75°

274.64°

6538.13'

584.46'





# HALLIBURTON

## DIRECTIONAL SURVEY REPORT

Noble Energy  
Wells Ranch State USX AA16-68-1  
Wattenberg  
Weld Colorado  
USA  
CA-XX-0900067301

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
100.00	0.10	0.00	100.00	0.09 N	0.00 E	-0.01	0.10
200.00	0.28	15.68	200.00	0.42 N	0.07 E	-0.09	0.18
300.00	0.12	30.50	300.00	0.74 N	0.18 E	-0.23	0.17
400.00	0.13	61.09	400.00	0.88 N	0.34 E	-0.40	0.07
500.00	0.29	30.60	500.00	1.16 N	0.57 E	-0.64	0.19
600.00	0.26	62.71	600.00	1.48 N	0.90 E	-1.00	0.16
700.00	0.20	333.41	700.00	1.74 N	1.02 E	-1.14	0.33
800.00	0.40	323.05	799.99	2.18 N	0.74 E	-0.88	0.20
900.00	0.62	345.52	899.99	2.98 N	0.39 E	-0.59	0.30
1000.00	0.64	31.29	999.99	3.98 N	0.55 E	-0.81	0.49
1100.00	0.84	233.07	1099.98	4.02 N	0.25 E	-0.52	1.46
1200.00	4.20	223.14	1199.87	0.91 N	2.84 W	2.77	3.38
1300.00	7.26	222.82	1299.36	6.40 S	9.64 W	10.04	3.06
1400.00	9.08	219.65	1398.34	17.11 S	18.97 W	20.07	1.87
1500.00	11.98	217.13	1496.65	31.46 S	30.26 W	32.31	2.93
1600.00	14.21	214.58	1594.04	49.84 S	43.49 W	46.74	2.30
1700.00	15.88	210.91	1690.62	71.68 S	57.49 W	62.17	1.92
1800.00	15.06	211.16	1786.99	94.53 S	71.23 W	77.42	0.82
1900.00	15.36	208.66	1883.49	117.26 S	84.31 W	91.99	0.72
2000.00	16.88	206.37	1979.56	141.90 S	97.11 W	106.42	1.65
2100.00	15.73	203.45	2075.54	167.34 S	108.96 W	119.95	1.42
2200.00	15.75	205.68	2171.79	192.01 S	120.24 W	132.86	0.60
2300.00	16.76	205.66	2267.79	217.24 S	132.36 W	146.65	1.01
2400.00	15.67	206.13	2363.81	242.36 S	144.55 W	160.50	1.09
2500.00	13.68	205.19	2460.54	265.19 S	155.54 W	172.99	2.00
2600.00	14.79	209.31	2557.47	287.02 S	166.82 W	185.72	1.50
2700.00	14.99	210.70	2654.11	309.27 S	179.67 W	200.03	0.41
2800.00	14.43	215.53	2750.84	330.54 S	193.52 W	215.28	1.35
2900.00	15.85	216.65	2847.36	351.64 S	208.91 W	232.05	1.45
3000.00	15.86	215.89	2943.56	373.67 S	225.08 W	249.66	0.21
3100.00	16.09	214.03	3039.70	396.22 S	240.84 W	266.91	0.56
3200.00	15.19	212.88	3135.99	418.72 S	255.72 W	283.25	0.95
3300.00	14.72	209.88	3232.60	440.74 S	269.16 W	298.14	0.91
3400.00	11.04	210.23	3330.07	460.03 S	280.31 W	310.56	3.68
3500.00	7.20	211.80	3428.79	473.63 S	288.43 W	319.58	3.85
3600.00	6.49	210.79	3528.08	483.81 S	294.63 W	326.45	0.72
3700.00	4.01	205.34	3627.65	491.82 S	299.01 W	331.36	2.52
3800.00	3.61	202.36	3727.43	497.90 S	301.71 W	334.46	0.45
3900.00	2.36	207.68	3827.29	502.64 S	303.87 W	336.93	1.28
4000.00	1.68	206.72	3927.23	505.78 S	305.49 W	338.76	0.68
4100.00	1.66	206.51	4027.19	508.39 S	306.79 W	340.24	0.02
4200.00	1.26	179.21	4127.16	510.79 S	307.42 W	341.03	0.79
4300.00	1.33	111.38	4227.14	512.31 S	306.33 W	340.03	1.45
4400.00	2.57	118.37	4327.08	513.80 S	303.27 W	337.09	1.25
4500.00	1.84	82.01	4427.01	514.64 S	299.71 W	333.59	1.54
4600.00	1.15	85.09	4526.97	514.34 S	297.12 W	330.98	0.69
4700.00	1.07	91.81	4626.95	514.28 S	295.18 W	329.05	0.15
4800.00	1.24	144.37	4726.93	515.19 S	293.61 W	327.54	1.04
4900.00	1.60	133.40	4826.90	517.03 S	291.97 W	326.02	0.45
5000.00	1.15	326.54	4926.89	517.16 S	291.50 W	325.57	2.74
5100.00	0.85	326.44	5026.88	515.70 S	292.47 W	326.43	0.30
5200.00	1.17	356.18	5126.86	514.06 S	292.94 W	326.80	0.61
5300.00	1.34	328.23	5226.84	512.05 S	293.63 W	327.35	0.63
5400.00	0.97	311.04	5326.82	510.50 S	294.88 W	328.49	0.50
5500.00	0.91	303.33	5426.81	509.51 S	296.17 W	329.72	0.14
5600.00	0.28	259.61	5526.80	509.12 S	297.07 W	330.59	0.73
5700.00	0.27	246.56	5626.80	509.26 S	297.53 W	331.06	0.06

5700.00	0.27	248.36	5826.80	509.26 S	297.53 W	331.06	0.06
5800.00	0.32	40.42	5726.80	509.14 S	297.57 W	331.09	0.57
5900.00	1.56	351.22	5826.78	507.59 S	297.60 W	331.01	1.37
6000.00	1.20	329.31	5926.76	505.34 S	298.34 W	331.60	0.64
6050.00	0.90	332.46	5976.75	504.55 S	298.79 W	331.99	0.59
6100.00	0.91	320.20	6026.74	503.89 S	299.22 W	332.38	0.39
6150.00	5.63	261.48	6076.65	503.95 S	301.91 W	335.06	10.44
6200.00	10.50	252.70	6126.14	505.67 S	308.69 W	341.94	10.01
6250.00	17.00	258.97	6174.69	508.43 S	320.23 W	353.64	13.33
6300.00	20.58	263.40	6222.02	510.84 S	336.14 W	369.68	7.69
6350.00	25.47	268.31	6268.02	512.17 S	355.62 W	389.21	10.50
6400.00	29.02	268.59	6312.47	512.78 S	378.50 W	412.08	7.11
6450.00	30.65	267.60	6355.84	513.61 S	403.36 W	436.94	3.40
6500.00	33.55	267.77	6398.20	514.69 S	429.90 W	463.49	5.82
6550.00	36.77	270.56	6439.07	515.08 S	458.69 W	492.24	7.19
6600.00	41.33	271.97	6477.89	514.37 S	490.17 W	523.60	9.29
6650.00	46.54	273.12	6513.88	512.81 S	524.81 W	558.06	10.54
6700.00	49.62	273.58	6547.28	510.63 S	561.95 W	594.97	6.18
6750.00	53.42	270.29	6578.40	509.34 S	601.05 W	633.89	9.19
6800.00	58.07	269.27	6606.54	509.51 S	642.36 W	675.12	9.46
6850.00	63.86	269.83	6630.79	509.85 S	686.06 W	718.74	11.61
6900.00	69.41	268.53	6650.62	510.52 S	731.93 W	764.56	11.36
6950.00	73.07	269.85	6666.69	511.18 S	779.26 W	811.83	7.74
7000.00	76.23	269.20	6679.92	511.58 S	827.47 W	859.96	6.44
7050.00	78.00	269.71	6691.07	512.05 S	876.21 W	908.61	3.67
7100.00	80.45	271.07	6700.42	511.71 S	925.32 W	957.59	5.58
7150.00	84.03	270.98	6707.17	510.83 S	974.85 W	1006.95	7.16

**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 242.35 DEGREES (GRID)  
A TOTAL CORRECTION OF 7.82 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 7150.00 FEET  
IS 1100.58 FEET ALONG 242.35 DEGREES (GRID)**