

PCGK: Pressure Case Gamma
PCDC: Pressure Case Directional



1 : 600 / 1 : 240

[illegible]

WELL INFORMATION

MWD Run Number	100				
Date run completed	13-Dec-14				
Rig Bit Number	2				
Bit Size (in)	8.750				
Tool Nominal OD (in)	6.750				
Log Start Depth (TVD, ft)	1,238.96				
Log End Depth (TVD, ft)	5,508.69				
Drill or Wipe	Drill				
Drill/Wipe Start Date and Time	12-Dec-14 09:00				
Drill/Wipe End Date and Time	13-Dec-14 02:10				
Min Inc (deg) @ Depth (TVD, ft)	0.49 @ 1,566.94				
Max Inc (deg) @ Depth (TVD, ft)	86.86 @ 5,505.47				
Bit TFA(in2) / Bit Type	0.91 / PDC				
Flow Rate (gpm)	581.83				
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A				
Fluid Type	Fresh Water Gel				
Density (ppg) / Viscosity (spqt)	10.30 / 27.00				
Filtrate CL (ppm)	150.00				
pH / Fluid Loss (mptm)	8.00 / 0				
PV (cP) / YP (lbf2)	17 / 9.00				
% Solids / % Sand	5 / .15				
% Oil / Oil:Water Ratio	N/A / N/A				
Rm @ Measured Temp (degF)	N/A @ N/A				
Rmf @ Measured Temp (degF)	N/A @ N/A				
Rmc @ Measured Temp (degF)	N/A @ N/A				
Min Temp (degF) / Max Temp (degF)	122.00 / 123.00				

Max Tool Temp (degF) / Source	162.80 / PCM				
Rm @ Max Tool Temp (degF)	N/A @ N/A				
Lead MWD Engineer	Paul Kock				
Customer Representative	Dave Nielsen				

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM				
Software Version	5.93				
Sub Serial Number	11342275				
Insert Serial Number	11055866				
Date and Time Initialized	12-Dec-14 04:07				
Date and Time Read	13-Dec-14 06:46				
ECMB SW Version	N/A				

Directional Sensor Information

Tool Type	PCDC				
Distance From Bit (ft)	51.94				
Software Version	6.21				
Sub Serial Number	11342275				
Sonde Serial Number	12177554				
Sensor ID Number	N/A				
Toolface Offset (deg)	318.36				

Gamma Ray Sensor Information

Tool Type	PCG				
Distance From Bit (ft)	46.84				
Recorded Sample Period (sec)	10				
Software Version	8.15				
Sub Serial Number	11342275				
Insert/Sonde Serial Number	11293319				

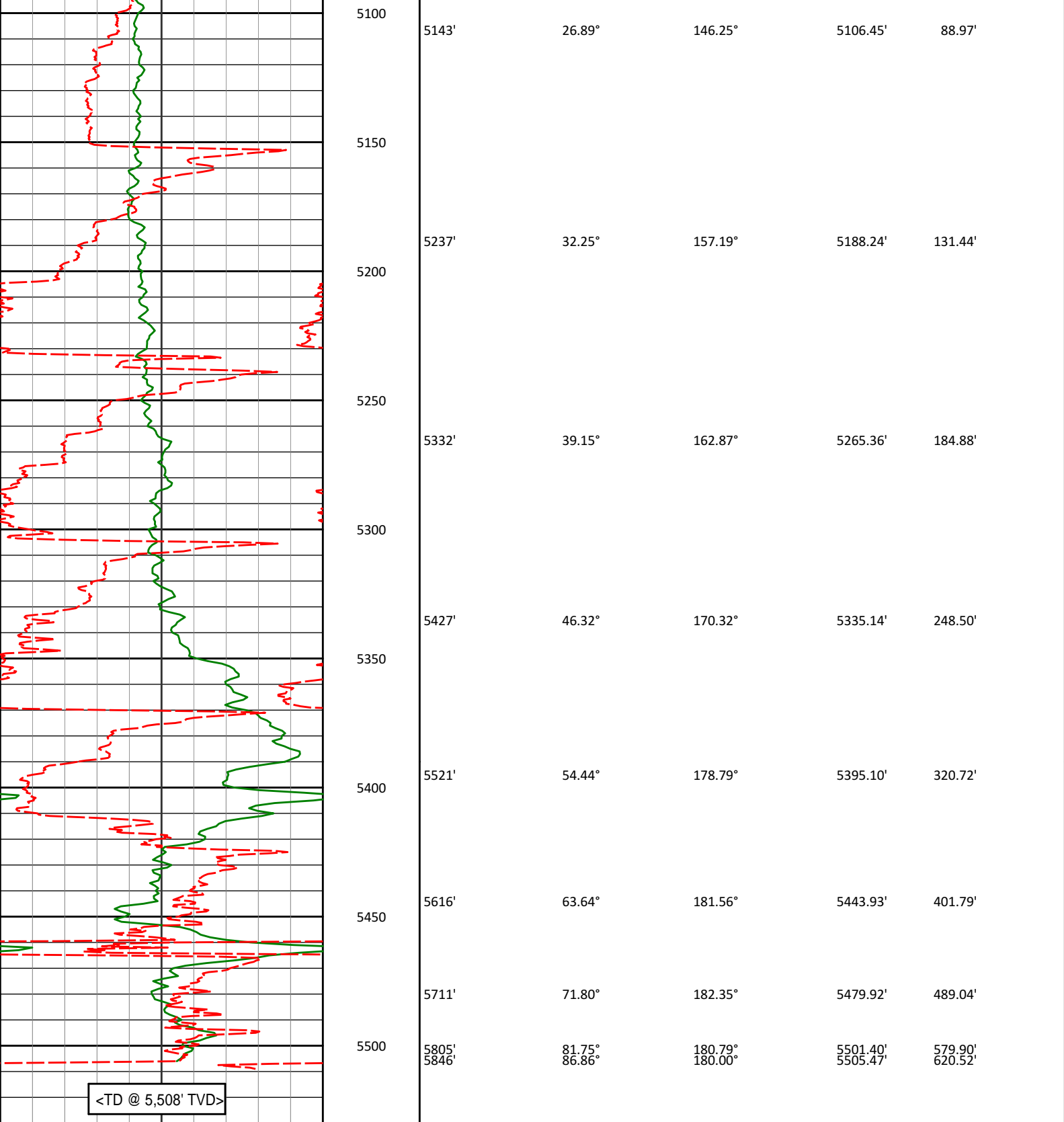
REMARKS

1. All depths are calibrated to the driller's pipe tally and are measured from the Rig drill floor.
2. No depth corrections have been made for pipe stretch or compression.
3. All data presented is recorded (memory data) unless otherwise stated.
 - ROPA: Average Rate of Penetration is real time data.
 - PGRC: Smooth Pressure Case Gamma Ray Borehole corrected is recorded data.
4. The following smoothing parameters have been applied to the data:
 - 2" (1:600) log - 1 ft. interval, 3 ft. coercion distance, 5 ft. gap fill.
 - 5" (1:240) log for ROP - 0.5 ft. interval, 1.2 ft. coercion distance, 3 ft. gap fill.
 - 5" (1:240) log for Gamma Ray - 0.5 ft. interval, 0.6 ft. coercion distance, 3 ft. gap fill.
5. INSITE version 8.0.20

WARRANTY

HALLIBURTON
Sperry Drilling Services
TVD Detail Log 1:600

PCG Gamma Ray PGRC 0 300 api							
Avg Rate of Penetration ROP Avg 500 0 feet per hr		Depth ft	Depth	Inc.	Azi.	TVD	V.S.
		4800 <KOP>	4811'	9.50°	106.63°	4794.48'	17.90'
		4850	4858'	12.43°	115.39°	4840.62'	21.84'
		4900	4906'	15.30°	118.28°	4887.21'	27.87'
		4950	4953'	18.68°	120.54°	4932.16'	35.57'
		5000					
			5048'	24.15°	126.92°	5020.58'	57.25'
		5050					

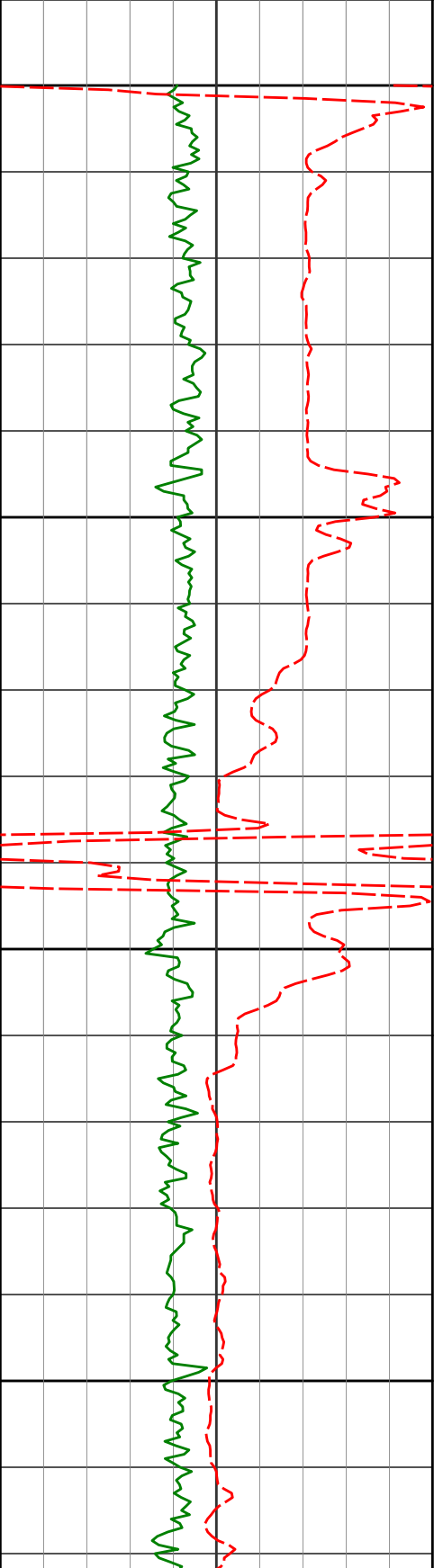


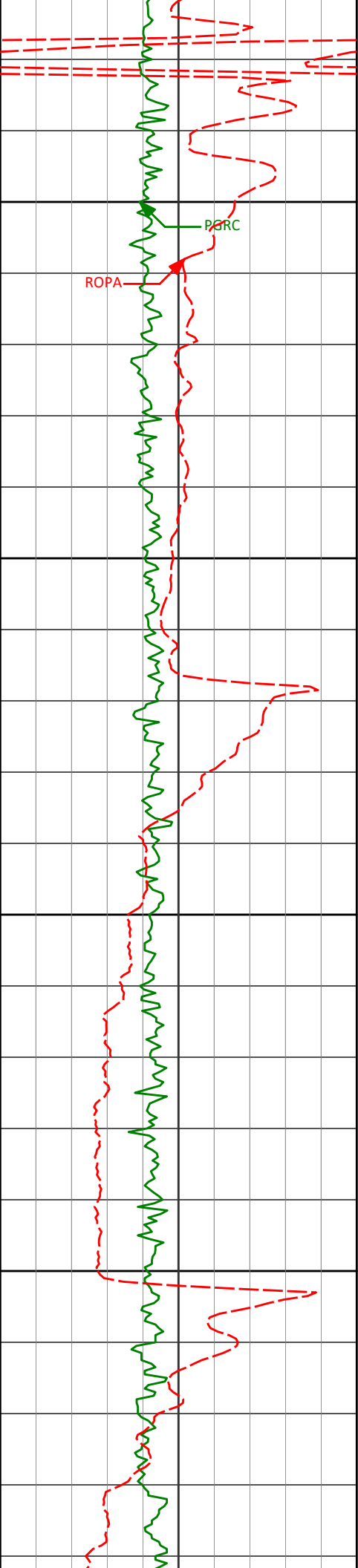
<div><div>Avg Rate of Penetration</div><div>ROP Avg</div><div>feet per hr</div></div>	Depth ft	Depth	Inc.	Azi.	TVD	V.S.
<div><div>PCG Gamma Ray</div><div>PGRC</div><div>api</div></div>						

HALLIBURTON
Sperry Drilling Services

TVD Detail Log 1:240

Noble Energy, Inc.

PCG Gamma Ray PGRC							
0 300 api							
Avg Rate of Penetration ROP Avg 500 0 feet per hr		Depth ft	Depth	Inc.	Azi.	TVD	V.S.
		4800 <KOP>	4811'	9.50°	106.63°	4794.48'	17.90'
		4850	4858'	12.43°	115.39°	4840.62'	21.84'
		4900	4906'	15.30°	118.28°	4887.21'	27.87'
		4950	4953'	18.68°	120.54°	4932.16'	35.57'



5000

5048'

24.15°

126.92°

5020.58'

57.25'

5050

5100

5143'

26.89°

146.25°

5106.45'

88.97'

5150

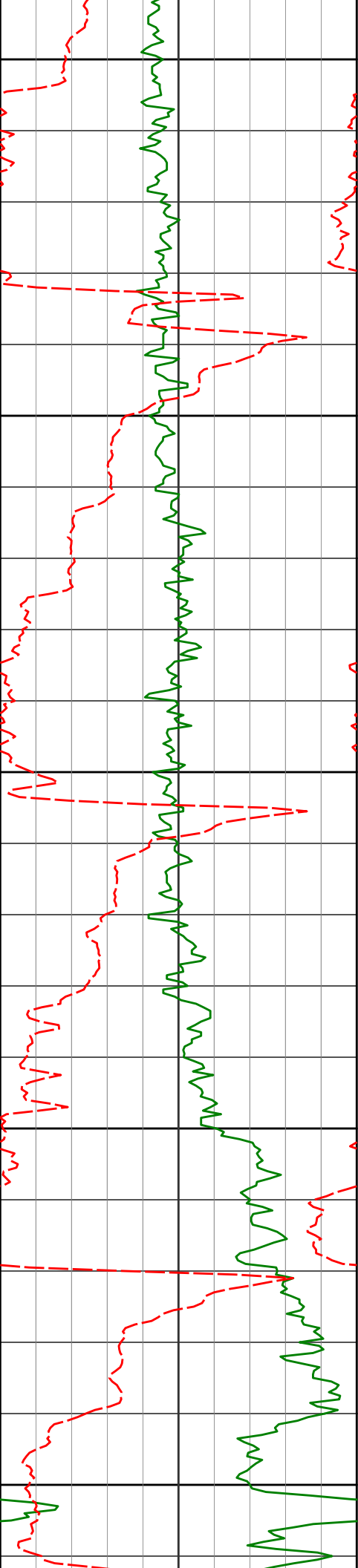
5237'

32.25°

157.19°

5188.24'

131.44'



5200

5250

5300

5350

5400

5332'

39.15°

162.87°

5265.36'

184.88'

5427'

46.32°

170.32°

5335.14'

248.50'

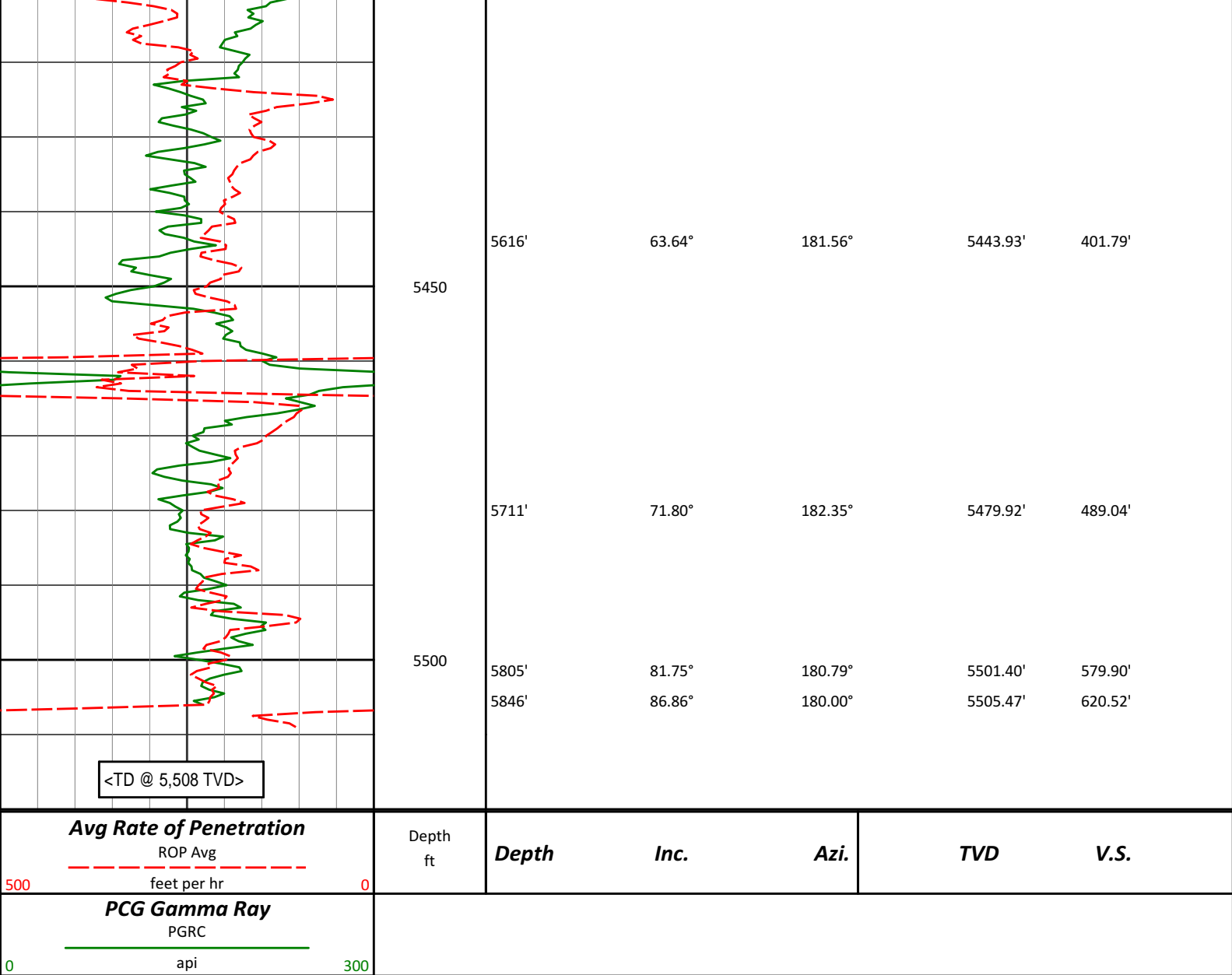
5521'

54.44°

178.79°

5395.10'

320.72'



HALLIBURTON

DIRECTIONAL SURVEY REPORT

**Noble Energy
Nalen State LD12-77-1BHN
Wattenberg
Weld Colorado
USA
CA-XX-0901834952**

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
450.00	0.20	213.31	450.00	0.66 S	0.43 W	0.62	0.04
825.00	0.80	184.31	824.98	3.81 S	0.99 W	3.72	0.17
1290.00	0.56	256.02	1289.96	7.60 S	3.43 W	7.30	0.18
1382.00	0.66	234.00	1381.95	8.02 S	4.29 W	7.64	0.27
1474.00	0.50	238.51	1473.95	8.54 S	5.06 W	8.10	0.18
1567.00	0.49	285.80	1566.94	8.64 S	5.78 W	8.14	0.42
1659.00	1.56	70.22	1658.94	8.11 S	4.98 W	7.68	2.15
1844.00	1.48	58.23	1843.87	6.00 S	0.58 W	5.93	0.18
2124.00	1.07	56.25	2123.80	2.64 S	4.68 E	3.01	0.15
2217.00	1.40	47.93	2216.78	1.39 S	6.25 E	1.89	0.40

2495.00	1.55	45.54	2494.69	3.52 N	11.45 E	-2.58	0.06
2681.00	1.63	43.67	2680.61	7.19 N	15.07 E	-5.95	0.05
2773.00	1.52	46.03	2772.58	8.99 N	16.86 E	-7.60	0.14
2867.00	3.38	69.90	2866.49	10.81 N	20.36 E	-9.13	2.21
2962.00	4.72	83.52	2961.25	12.22 N	26.88 E	-10.00	1.73
3057.00	5.90	88.19	3055.84	12.81 N	35.65 E	-9.89	1.32
3152.00	6.14	87.46	3150.32	13.19 N	45.60 E	-9.46	0.26
3246.00	6.78	94.10	3243.73	13.02 N	56.16 E	-8.43	1.05
3341.00	8.10	95.82	3337.92	11.94 N	68.40 E	-6.37	1.41
3436.00	8.68	94.96	3431.91	10.64 N	82.20 E	-3.96	0.63
3531.00	8.53	95.37	3525.84	9.36 N	96.36 E	-1.54	0.17
3625.00	8.10	97.04	3618.85	7.90 N	109.88 E	1.02	0.52
3720.00	7.57	94.99	3712.96	6.53 N	122.76 E	3.42	0.63
3815.00	7.82	87.12	3807.11	6.31 N	135.45 E	4.66	1.14
3910.00	7.52	81.88	3901.26	7.52 N	148.07 E	4.49	0.80
4005.00	7.27	86.66	3995.47	8.75 N	160.23 E	4.24	0.70
4100.00	6.93	92.22	4089.74	8.87 N	171.96 E	5.06	0.81
4195.00	6.17	87.23	4184.12	8.90 N	182.78 E	5.92	1.00
4290.00	7.02	88.01	4278.49	9.35 N	193.68 E	6.35	0.90
4384.00	7.81	94.18	4371.71	9.08 N	205.79 E	7.60	1.19
4479.00	6.77	90.08	4465.94	8.60 N	217.83 E	9.04	1.22
4574.00	7.76	91.08	4560.17	8.48 N	229.84 E	10.14	1.05
4668.00	7.94	91.47	4653.29	8.19 N	242.67 E	11.47	0.20
4763.00	9.84	105.93	4747.16	5.79 N	257.04 E	15.02	3.08
4811.00	9.50	106.63	4794.48	3.53 N	264.78 E	17.90	0.76
4858.00	12.43	115.39	4840.62	0.25 N	273.07 E	21.84	7.15
4906.00	15.30	118.28	4887.21	4.96 S	283.31 E	27.87	6.16
4953.00	18.68	120.54	4932.16	11.73 S	295.26 E	35.57	7.33
5048.00	24.15	126.92	5020.58	31.15 S	323.93 E	57.25	6.24
5143.00	26.89	146.25	5106.45	60.74 S	351.45 E	88.97	9.18
5237.00	32.25	157.19	5188.24	101.60 S	373.01 E	131.44	8.07
5332.00	39.15	162.87	5265.36	153.69 S	391.70 E	184.88	8.05
5427.00	46.32	170.32	5335.14	216.34 S	406.33 E	248.50	9.23
5521.00	54.44	178.79	5395.10	288.27 S	412.87 E	320.72	11.07
5616.00	63.64	181.56	5443.93	369.63 S	412.53 E	401.79	9.99
5711.00	71.80	182.35	5479.92	457.41 S	409.52 E	489.04	8.63
5805.00	81.75	180.79	5501.40	548.77 S	407.04 E	579.90	10.71
5846.00	86.86	180.00	5505.47	589.55 S	406.76 E	620.52	12.61
5900.00	86.30	180.00	5508.69	643.45 S	406.76 E	674.25	1.03

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 175.36 DEGREES (GRID)
A TOTAL CORRECTION OF 6.91 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 5900.00 FEET
IS 761.24 FEET ALONG 147.70 DEGREES (GRID)**

Surface surveys at 450 ft and 825 ft have had azimuths corrected to grid north, but were not taken by Halliburton.

Last survey is a projection from 5846 ft MD to TD at 5900 ft MD.