HALLIBURTON | **Sperry Drilling**

PCDC - Pressure Case Directional
PCGK - Pressure Case Gamma

1 : 240

Country	: **USA**
Field	: **Wattenberg**
Location	: **Lat: 40° 28' 2.53" North** **Long: 104° 26' 2.90" West**
Well	: **Wells Ranch State AA28-69HN**
Company	: **Noble Energy**
Rig	: **H&P 322**

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Well	: **Wells Ranch State AA28-69HN**
Field	: **Wattenberg**
Country	: **USA**
API Number	: **05-123-38140**

LOCATION

Latitude : **40° 28' 2.53" North**
Longitude : **104° 26' 2.90" West**

UTM Easting = 3296551.217 ft
UTM Northing = 1414885.332 ft

Other Services
Directional Drilling

Permanent Datum : **Ground Level** Elevation : **4731.00 ft**
Log Measured From : **Drill Floor** **24.00 ft** Above Permanent Datum
Drilling Measured From : **Drill Floor**

TVD LOG

Elev. KB **N/A**
DF **4755.00 ft**
GL **4731.00 ft**
WD **N/A**

Depth Logged : **941.98 ft** To **6,605.80 ft**
Date Logged : **30-Dec-13** To **30-Dec-13**
Total Depth MD : **7,016.00 ft** TVD : **6,605.80 ft**
Spud Date : **30-Dec-13**

Unit No. : **11210425** Job No. :**CA-XX-0900918620**
Plot Type : **Final**
Plot Date : **02-Jan-14**

Run No.	Borehole Record (TVD) Size	From	To
2	8.750 in	941.98 ft	5,903.27 ft
3	8.750 in	5,903.27 ft	6,605.80 ft

Run No.	Borehole Record (TVD) Size	From	To

Casing Record (TVD) Size	Weight	From	To
9.625 in	36.00 lbpf	SURFACE	931.98 ft

WELL INFORMATION

MWD Run Number	100	200			
Date run completed	01-Jan-14	02-Jan-14			
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)	941.98	5,903.27			
Log End Depth (TVD, ft)	5,903.27	6,605.80			
Drill or Wipe	Drill	Drill			
Drill/Wipe Start Date and Time	31-Dec-13 10:20	01-Jan-14 13:15			
Drill/Wipe End Date and Time	01-Jan-14 03:30	02-Jan-14 04:15			
Min Inc (deg) @ Depth (TVD, ft)	0.19 @ 5,843.27	0.25 @ 5,917.27			
Max Inc (deg) @ Depth (TVD, ft)	15.99 @ 3,697.62	79.13 @ 6,597.23			
Bit TFA(in2) / Bit Type	0.75 / PDC	0.98 / PDC			
Flow Rate (gpm)	563.20	538.00			
Max AV (fpm) / CV (fpm) @ MWD	427.3 / 427.3	427.3 / 427.3			
Fluid Type	Fresh Water Gel	Fresh Water Gel			
Density (ppg) / Viscosity (spqt)	9.00 / 28.00	9.35 / 34.00			
Filtrate CL (ppm)	2,100.00	1,700.00			
pH / Fluid Loss (mptm)	8.30 / N/A	9.50 / N/A			
PV (cP) / YP (lhf2)	2 / 4.00	6 / 6.00			
% Solids / % Sand	4.50 / 0.25	5.70 / 0.35			
% 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	150.10 / PCM	162.80 / PCM			
Rm @ Max Tool Temp (degF)	N/A @ N/A	N/A @ N/A			
Lead MWD Engineer	Robret Ley	Robret Ley			
Customer Representative	Charles Collver	Jeremy Stolz			

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.84	5.84			
Sub Serial Number	12187587	12187587			
Insert Serial Number	12001055	12001055			
Date and Time Initialized	30-Dec-13 15:14	30-Dec-13 15:14			
Date and Time Read	02-Jan-14 10:30	02-Jan-14 10:08			
ECMB SW Version	N/A	N/A			

Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	60.00	57.00			
Software Version	6.21	6.21			
Sub Serial Number	12187587	12187587			
Sonde Serial Number	11833221	11833221			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	319.37	115.77			

Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	52.32	50.76			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	12187587	12187587			
Insert/Sonde Serial Number	12071301	12071301			

REMARKS

1. All depths are true vertical depths and are calibrated to the driller' pipe tally and are measured from the 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.

4. The Following smoothing parameters have been applied to the data"

PGXR (Gamma Ray CG):
Interval Resolution: 0.5 feet
Coercion Distance: 0.6 feet
Gap Fill: 3.0 feet

ROPA (Rate of Penetration):
Interval Resolution: 0.5 feet
Coercion Distance: 1.2 feet

WARRANTY

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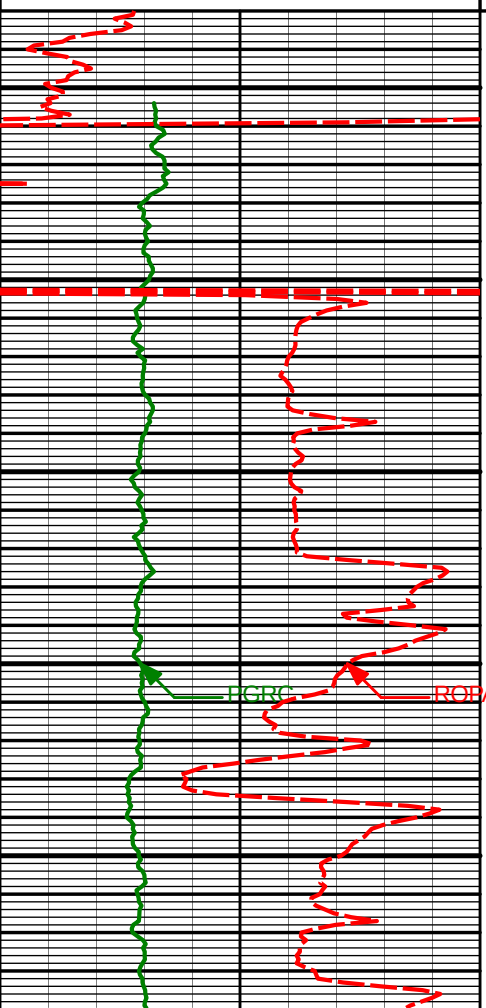
TVD Detail Log 1:600

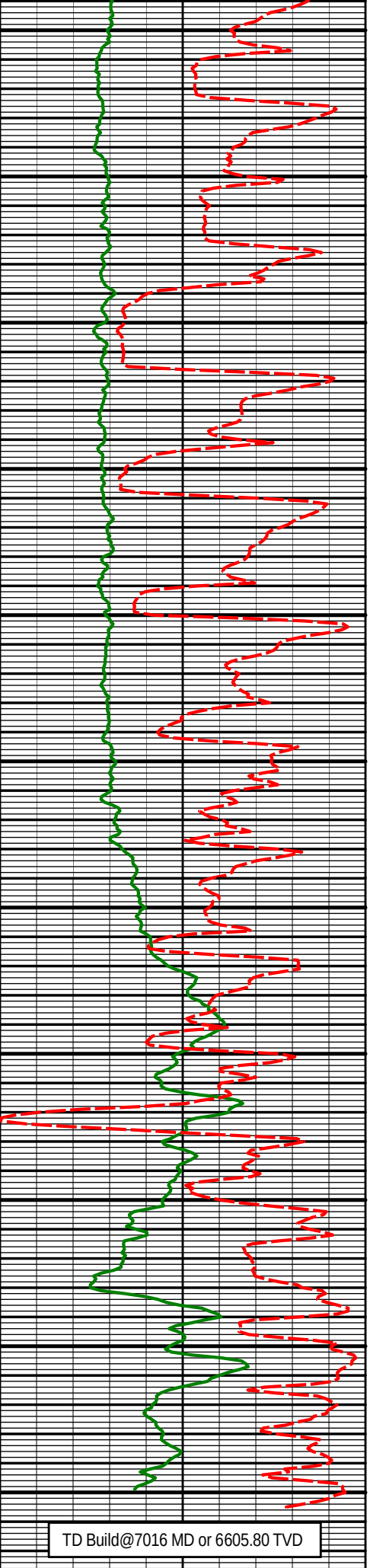
Gamma Ray
(PGXC)
(Api)
0 300

Avg Rate of Penetration
feet per hr
600 0



Feet

Depth	Inc	Azm	TVD	Vsec
5940'	0.19°	239.96°	5843.27'	-259.39'
5850'				
Run 200				
6014'	0.25°	141.15°	5917.27'	-259.34'
6029'	0.31°	216.36°	5932.27'	-259.32'
5950'				
KOP				
6076'	1.82°	273.83°	5979.26'	-258.51'
6000'				
6123'	7.25°	279.35°	6026.10'	-255.06'
6050'				
6170'	11.94°	279.51°	6072.43'	-247.84'



6218'	16.71°	275.52°	6118.92'	-236.73'
6265'	19.98°	271.91°	6163.53'	-222.59'
6313'	21.50°	270.07°	6208.42'	-206.13'
6360'	24.06°	263.21°	6251.76'	-188.23'
6408'	28.45°	259.58°	6294.80'	-167.08'
6455'	33.03°	261.48°	6335.18'	-143.13'
6503'	38.11°	264.20°	6374.21'	-115.39'
6550'	44.25°	267.81°	6409.58'	-84.90'
6598'	49.45°	269.85°	6442.39'	-50.70'
6645'	54.02°	269.84°	6471.49'	-14.79'
6693'	58.41°	268.45°	6498.18'	24.14'
6740'	60.64°	268.23°	6522.02'	63.79'
6788'	63.81°	267.14°	6544.38'	105.46'
6835'	68.59°	266.67°	6563.34'	147.75'
6883'	73.19°	266.87°	6579.06'	192.37'
6959'	79.13°	266.88°	6597.23'	264.94'

Avg Rate of Penetration
feet per hr
600 0

Feet

Depth Inc Azm TVD Vsec

Gamma Ray
(PGXC)
(Api)
0 300

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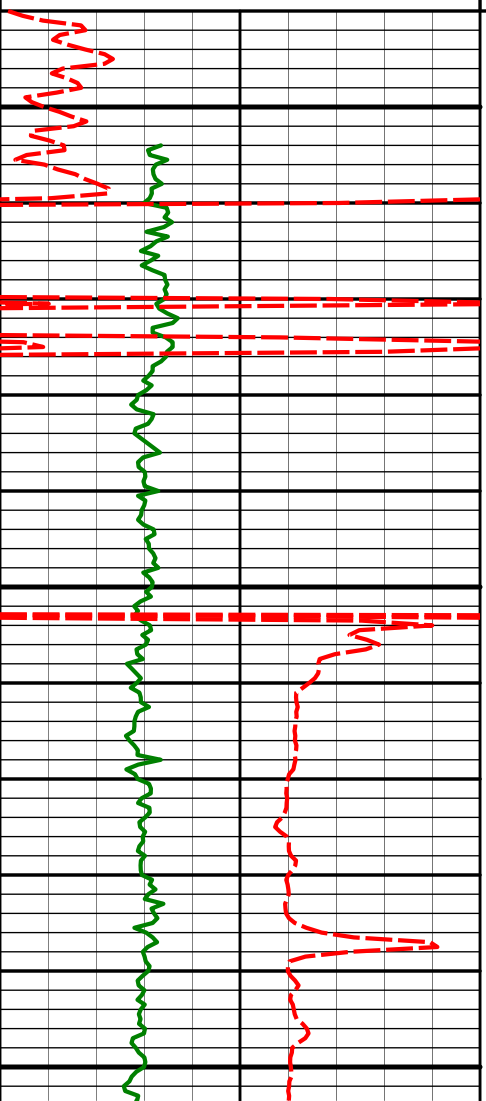
TVD Detail Log 1:240

Gamma Ray
(PGXC)
(Api)
0 300

Avg Rate of Penetration
feet per hr
600 0

Feet

Depth Inc Azm TVD Vsec



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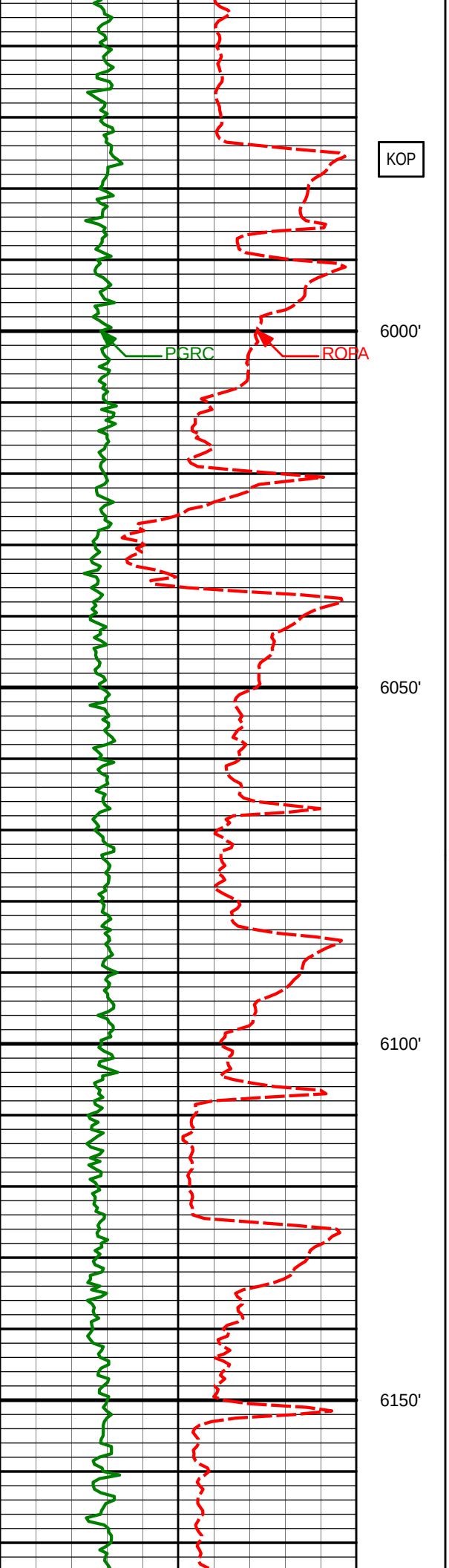
6029'	0.31°	216.36°	5932.27'	-259.32'

5850'

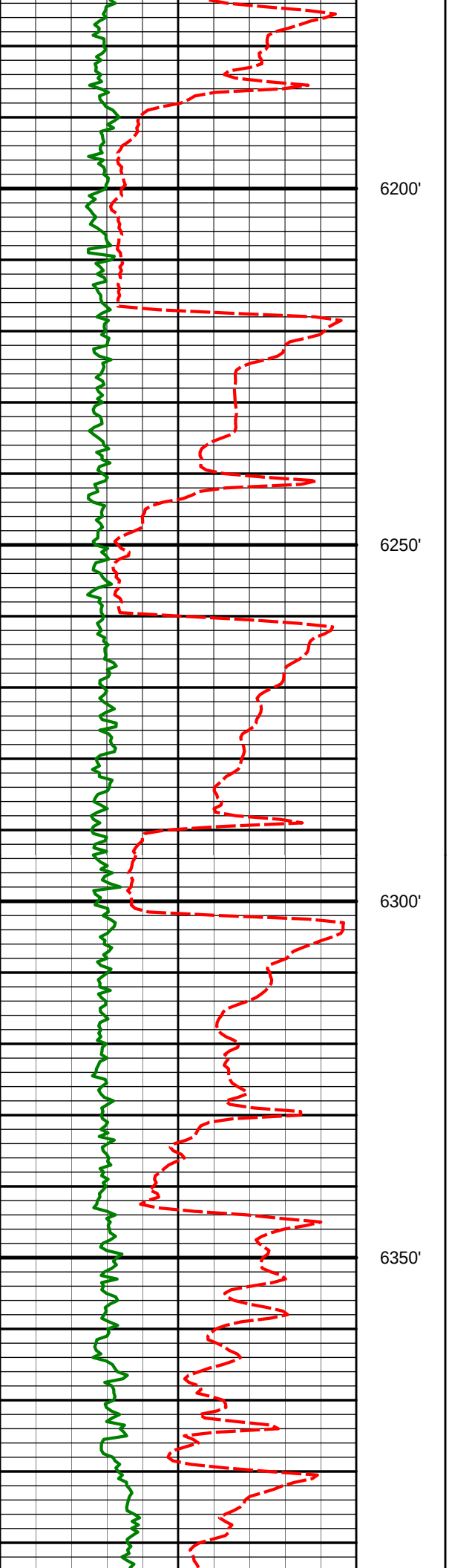
5900'

Run 200

5950'



6076'	1.82°	273.83°	5979.26'	-258.51'
6123'	7.25°	279.35°	6026.10'	-255.06'
6170'	11.94°	279.51°	6072.43'	-247.84'
6218'	16.71°	275.52°	6118.92'	-236.73'
6265'	19.98°	271.91°	6163.53'	-222.59'



6313'	21.50°	270.07°	6208.42'	-206.13'
6360'	24.06°	263.21°	6251.76'	-188.23'
6408'	28.45°	259.58°	6294.80'	-167.08'
6455'	33.03°	261.48°	6335.18'	-143.13'
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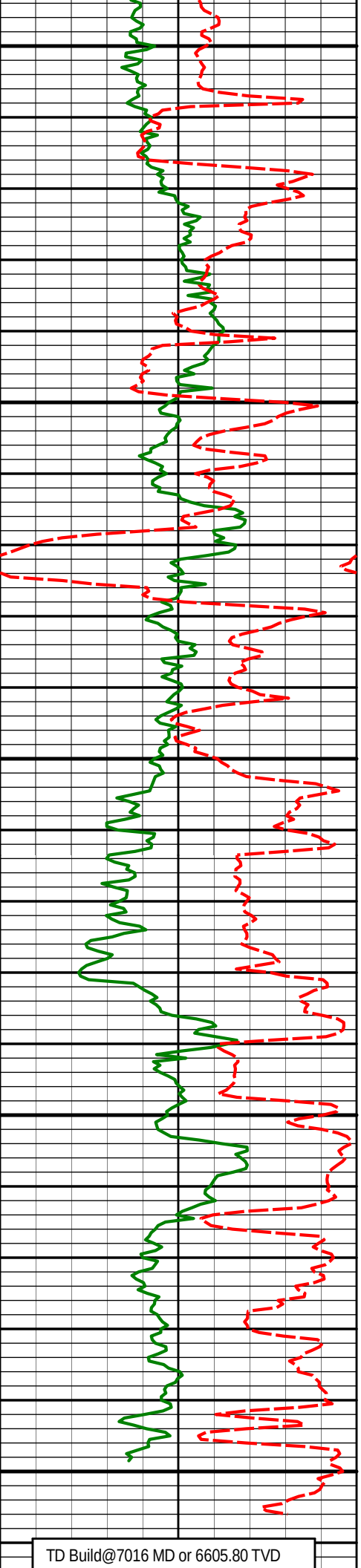
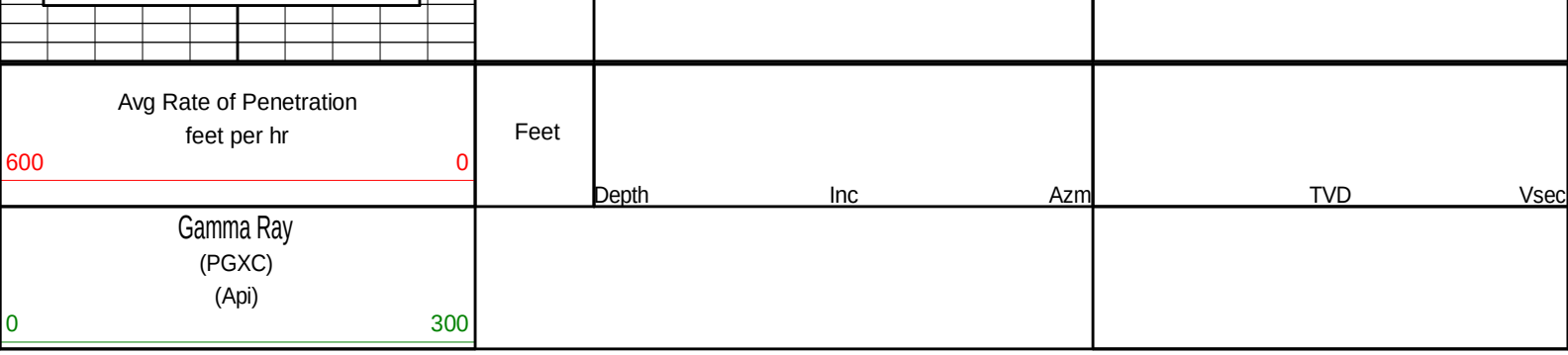


6550'	44.25°	267.81°	6409.58'	-84.90'
6598'	49.45°	269.85°	6442.39'	-50.70'
6645'	54.02°	269.84°	6471.49'	-14.79'
6693'	58.41°	268.45°	6498.18'	24.14'
6740'	60.64°	268.23°	6522.02'	63.79'
6788'	63.81°	267.14°	6544.38'	105.46'
6835'	68.59°	266.67°	6563.34'	147.75'
6883'	73.19°	266.87°	6579.06'	192.37'
6959'	79.13°	266.88°	6597.23'	264.94'



DIRECTIONAL SURVEY REPORT

Noble Energy
Wells Ranch State AA28-69HN
Wattenberg
Weld Colorado
USA
CA-XX-0900918620

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
242.00	0.50	251.29	242.00	0.34 S	1.00 W	1.05	0.21
487.00	0.40	294.39	486.99	0.33 S	2.79 W	2.79	0.14
756.00	0.20	274.49	755.99	0.10 N	4.11 W	3.98	0.08
922.00	0.50	68.59	921.98	0.38 N	3.73 W	3.54	0.41
1015.00	0.48	274.03	1014.98	0.56 N	3.74 W	3.51	1.03
1108.00	0.38	281.99	1107.98	0.65 N	4.43 W	4.16	0.12
1201.00	2.25	171.86	1200.96	1.09 S	4.47 W	4.60	2.59
1295.00	4.62	150.27	1294.79	6.20 S	2.33 W	3.71	2.83
1387.00	7.37	148.41	1386.27	14.45 S	2.60 E	0.83	2.99
1480.00	9.02	145.60	1478.32	25.54 S	9.84 E	-3.64	1.82
1575.00	11.55	146.49	1571.79	39.61 S	19.29 E	-9.56	2.67
1670.00	13.07	149.11	1664.60	56.76 S	30.06 E	-16.05	1.71
1765.00	12.95	146.97	1757.17	74.90 S	41.37 E	-22.84	0.52
1860.00	13.49	148.73	1849.65	93.30 S	52.92 E	-29.81	0.71
1955.00	13.62	150.57	1942.00	112.51 S	64.17 E	-36.28	0.47
2050.00	11.59	148.39	2034.71	130.38 S	74.67 E	-42.34	2.19
2144.00	12.82	146.55	2126.58	147.12 S	85.37 E	-48.86	1.37
2239.00	13.30	147.50	2219.13	165.13 S	97.05 E	-56.04	0.55
2334.00	12.91	150.67	2311.65	183.60 S	108.12 E	-62.52	0.86
2429.00	12.21	153.68	2404.38	201.85 S	117.77 E	-67.66	1.01
2524.00	13.32	154.59	2497.03	220.75 S	126.92 E	-72.18	1.19
2619.00	13.49	150.33	2589.45	240.26 S	137.10 E	-77.55	1.05
2714.00	13.80	154.31	2681.77	260.09 S	147.49 E	-83.05	1.04
2809.00	13.51	150.60	2774.08	279.97 S	157.85 E	-88.51	0.97
2904.00	14.65	151.31	2866.23	300.18 S	169.07 E	-94.73	1.22
2999.00	13.79	150.41	2958.32	320.56 S	180.43 E	-101.04	0.94
3093.00	12.38	148.91	3049.88	338.93 S	191.16 E	-107.22	1.54
3189.00	13.21	149.08	3143.49	357.15 S	202.11 E	-113.63	0.87
3283.00	11.61	148.34	3235.29	374.42 S	212.59 E	-119.82	1.72
3378.00	11.41	150.77	3328.38	390.75 S	222.20 E	-125.37	0.55
3473.00	11.43	150.87	3421.50	407.18 S	231.37 E	-130.48	0.03
3568.00	12.11	147.33	3514.50	423.79 S	241.34 E	-136.31	1.04
3663.00	14.54	146.46	3606.94	442.12 S	253.31 E	-143.69	2.56
3757.00	15.99	145.86	3697.62	462.67 S	267.09 E	-152.33	1.55
3852.00	15.76	149.21	3789.00	484.58 S	281.04 E	-160.80	1.00
3947.00	15.32	147.74	3880.53	506.27 S	294.34 E	-168.70	0.62
4041.00	12.92	153.60	3971.69	526.19 S	305.64 E	-175.07	2.96
4136.00	12.76	153.35	4064.31	545.08 S	315.07 E	-179.86	0.18
4231.00	12.23	153.72	4157.06	563.48 S	324.23 E	-184.49	0.56
4326.00	12.18	160.16	4249.92	581.93 S	332.09 E	-187.85	1.43
4421.00	11.95	157.83	4342.82	600.46 S	339.20 E	-190.46	0.57
4516.00	13.30	152.80	4435.53	619.28 S	347.90 E	-194.55	1.83
4611.00	12.66	154.78	4528.10	638.41 S	357.33 E	-199.28	0.82
4706.00	12.91	151.40	4620.75	657.15 S	366.85 E	-204.19	0.83
4801.00	12.00	146.53	4713.51	674.71 S	377.38 E	-210.35	1.46
4895.00	11.26	141.51	4805.58	690.05 S	388.48 E	-217.58	1.34

4990.00	11.86	138.52	4898.66	704.62 S	400.71 E	-226.10	0.89
5085.00	11.25	138.66	4991.73	718.89 S	413.30 E	-235.03	0.65
5180.00	8.68	137.96	5085.29	731.17 S	424.22 E	-242.80	2.70
5275.00	6.79	139.98	5179.42	740.80 S	432.63 E	-248.75	2.01
5370.00	5.32	139.52	5273.89	748.45 S	439.11 E	-253.27	1.55
5464.00	4.02	139.12	5367.58	754.26 S	444.09 E	-256.77	1.39
5559.00	3.23	144.73	5462.39	758.96 S	447.82 E	-259.30	0.91
5654.00	1.43	143.27	5557.30	762.10 S	450.07 E	-260.76	1.90
5750.00	0.34	175.18	5653.29	763.34 S	450.81 E	-261.19	1.20
5845.00	1.17	222.26	5748.28	764.34 S	450.18 E	-260.35	1.03
5940.00	0.19	239.96	5843.27	765.14 S	449.39 E	-259.39	1.04
6014.00	0.25	141.15	5917.27	765.33 S	449.38 E	-259.34	0.46
6029.00	0.31	216.36	5932.27	765.39 S	449.38 E	-259.32	2.30
6076.00	1.82	273.83	5979.26	765.44 S	448.56 E	-258.51	3.57
6123.00	7.25	279.35	6026.10	764.91 S	444.88 E	-255.06	11.57
6170.00	11.94	279.51	6072.43	763.63 S	437.16 E	-247.84	9.98
6218.00	16.71	275.52	6118.92	762.14 S	425.38 E	-236.73	10.14
6265.00	19.98	271.91	6163.53	761.22 S	410.62 E	-222.59	7.36
6313.00	21.50	270.07	6208.42	760.94 S	393.63 E	-206.13	3.43
6360.00	24.06	263.21	6251.76	762.06 S	375.50 E	-188.23	7.85
6408.00	28.45	259.58	6294.80	765.29 S	354.52 E	-167.08	9.72
6455.00	33.03	261.48	6335.18	769.21 S	330.83 E	-143.13	9.97
6503.00	38.11	264.20	6374.21	772.65 S	303.14 E	-115.39	11.09
6550.00	44.25	267.81	6409.58	774.75 S	272.28 E	-84.90	13.99
6598.00	49.45	269.85	6442.39	775.43 S	237.29 E	-50.70	11.27
6645.00	54.02	269.84	6471.49	775.53 S	200.40 E	-14.79	9.72
6693.00	58.41	268.45	6498.18	776.14 S	160.52 E	24.14	9.46
6740.00	60.64	268.23	6522.02	777.31 S	120.03 E	63.79	4.75
6788.00	63.81	267.14	6544.38	779.03 S	77.60 E	105.46	6.92
6835.00	68.59	266.67	6563.34	781.36 S	34.68 E	147.75	10.21
6883.00	73.19	266.87	6579.06	783.91 S	10.59 W	192.37	9.58
6959.00	79.13	266.88	6597.23	787.93 S	84.24 W	264.94	7.82

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 256.57 DEGREES (GRID)
A TOTAL CORRECTION OF 7.69 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED

HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 6959.00 FEET
IS 792.42 FEET ALONG 186.10 DEGREES (GRID)

Tie-In @ Surface
Surveys at 242 ft, 487 ft, 742 ft, and 922 were taken and provided by HP 322 while they were drilling the surface hole

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