HALLIBURTON | Sperry Drilling

PCGK: Pressure Case Gamma
PCDC: Pressure Case Directional

Country	: USA
Field	: Wattenberg
Location	: Lat: 40° 42' 54.07" North Long: 103° 58' 47.71" West
Well	: Brook LC28-74-1AHNC
Company	: Noble Energy
Rig	: H&P 273

Company : **Noble Energy**
Rig : **H&P 273**
Well : **Brook LC28-74-1AHNC**
Field : **Wattenberg**
Country : **USA**
API Number : **05-123-38844**

LOCATION
Latitude : **40° 42' 54.07" North**
Longitude : **103° 58' 47.71" West**
UTM Easting = **3,421,370.060 ft**
UTM Northing = **1,506,937.410 ft**

Other Services
Directional Drilling

Permanent Datum : **Ground Level** Elevation : **4843.00 ft**
Log Measured From : **Drill Floor** **24.00 ft** Above Permanent Datum
Drilling Measured From : **Drill Floor**

TVD LOG

Elev. KB **N/A**
DF **4867.00 ft**
GL **4843.00 ft**
WD **N/A**

Depth Logged : **631.99 ft** To **6,138.47 ft**
Date Logged : **28-Jul-14** To **31-Jul-14**
Total Depth MD : **6,496.00 ft** TVD : **6,138.47 ft**
Spud Date : **28-Jul-14**

Unit No. : **11703717** Job No. : **CA-XX-0901400364**
Plot Type : **Final**
Plot Date : **01-Aug-14**

Run No.	Borehole Record (TVD) Size	From	To
2	8.750 in	631.99 ft	5,446.73 ft
3	8.750 in	5,446.73 ft	6,138.47 ft

Run No.	Borehole Record (TVD) Size	From	To

Casing Record (TVD) Size	Weight	From	To
9.625 in	36.00 lbpf	SURFACE	621.99 ft
7.000 in	26.00 lbpf	SURFACE	6,138.40 ft

WELL INFORMATION

MWD Run Number	100	200			
Date run completed	30-Jul-14	31-Jul-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)	631.99	5,446.73			
Log End Depth (TVD, ft)	5,446.73	6,138.47			
Drill or Wipe	Drill	Drill			
Drill/Wipe Start Date and Time	29-Jul-14 06:10	30-Jul-14 20:00			
Drill/Wipe End Date and Time	29-Jul-14 21:30	31-Jul-14 07:40			
Min Inc (deg) @ Depth (TVD, ft)	0.03 @ 1,459.98	0.60 @ 5,418.73			
Max Inc (deg) @ Depth (TVD, ft)	7.67 @ 2,305.39	89.60 @ 6,138.47			
Bit TFA(in2) / Bit Type	0.75 / PDC	0.86 / PDC			
Flow Rate (gpm)	573.92	534.86			
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A	N/A / N/A			
Fluid Type	Fresh Water Gel	Fresh Water Gel			
Density (ppg) / Viscosity (spqt)	10.30 / 150.00	10.30 / 150.00			
Filtrate CL (ppm)	150.00	150.00			
pH / Fluid Loss (mptm)	9.50 / 43	9.50 / 43			
PV (cP) / YP (lhf2)	16 / 31.00	16 / 31.00			
% Solids / % Sand	9.5 / .25	9.5 / .25			
% 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	151.47 / PCM	158.10 / PCM			
Rm @ Max Tool Temp (degF)	N/A @ N/A	N/A @ N/A			
Lead MWD Engineer	Juan Pablo Centeno	Juan Pablo Centeno			
Customer Representative	Dave Nielsen	Dave Nielsen			

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.93	5.93			
Sub Serial Number	245494	245494			
Insert Serial Number	12001048	11620315			
Date and Time Initialized	27-Jul-14 01:49	30-Jul-14 00:52			
Date and Time Read	30-Jul-14 09:35	01-Aug-14 07:40			
ECMB SW Version	N/A	N/A			

Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	53.84	53.14			
Software Version	6.21	6.21			
Sub Serial Number	245494	245494			
Sonde Serial Number	11297623	11638628			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	118.62	228.43			

Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	48.74	48.04			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	245494	245494			
Insert/Sonde Serial Number	11293276	11579806			

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

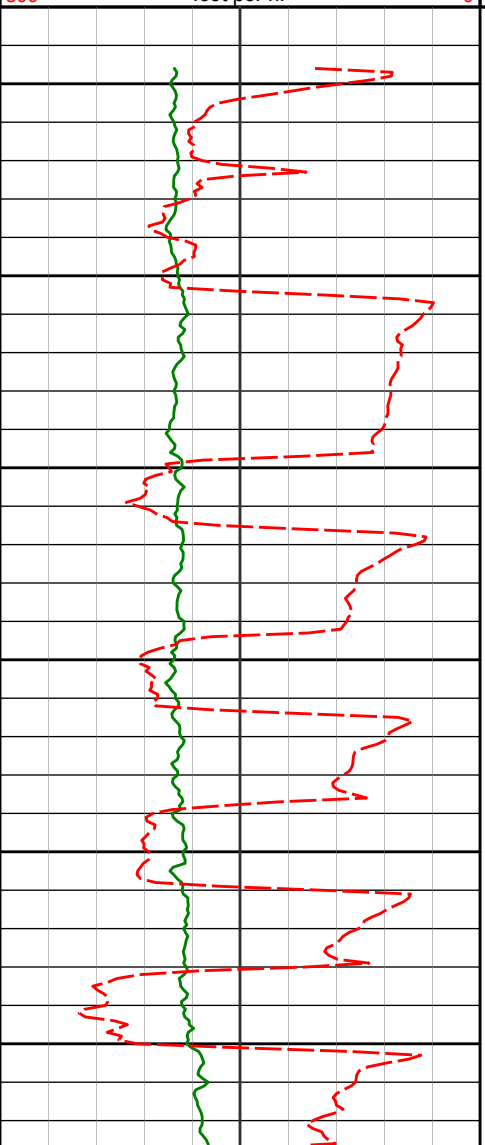
Sperry Drilling Services

TVD Detail Log 1:600

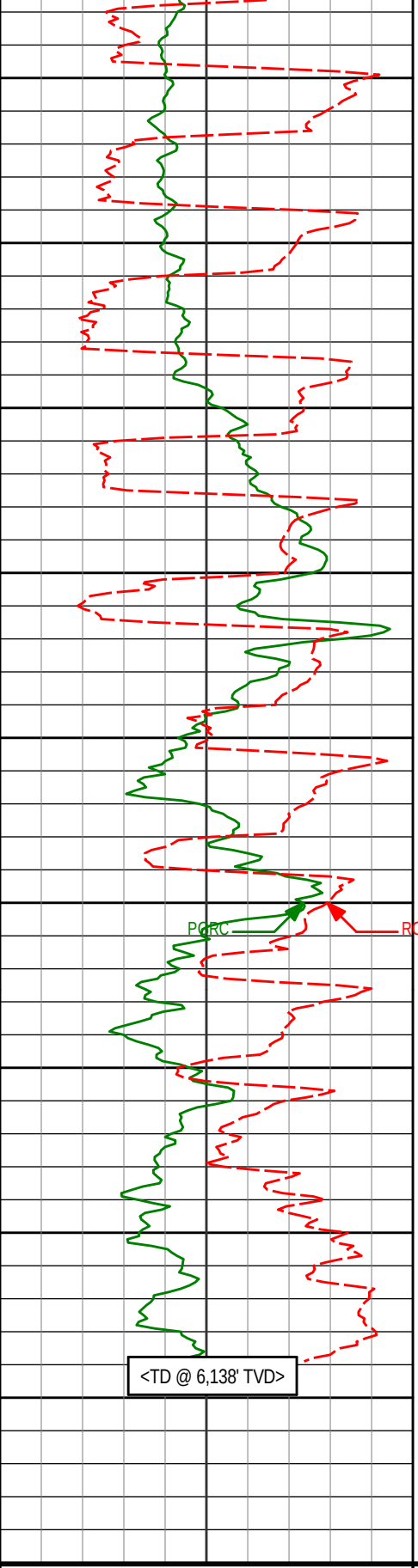
Noble Energy, Inc
Brook LC28-74-AHNC
H&P 273
T9N R59W

PCG Gamma Ray
PGRC
0 api 300

Avg Rate of Penetration
ROP Avg
500 feet per hr 0



Depth ft	Depth	Inc.	Azi.	TVD	V.S.
<RUN 200>					
5450					
5500					
<KOP>	5527'	2.96°	24.58°	5513.68'	-235.70'
5550	5574'	7.63°	15.80°	5560.47'	-231.62'
5600	5621'	11.45°	22.14°	5606.81'	-224.35'
5650	5668'	14.53°	27.26°	5652.60'	-214.87'
5700	5716'	18.45°	26.41°	5698.62'	-202.84'



Depth	Inc.	Azi.	TVD	V.S.
5763'	22.50°	24.63°	5742.64'	-188.15'
5811'	25.07°	19.74°	5786.56'	-170.37'
5858'	26.13°	11.62°	5828.96'	-150.97'
5906'	29.29°	4.39°	5871.47'	-128.97'
5953'	33.54°	359.49°	5911.57'	-104.53'
6001'	37.34°	352.27°	5950.69'	-76.78'
6048'	41.81°	349.89°	5986.91'	-47.13'
6096'	47.08°	349.81°	6021.16'	-13.94'
6143'	51.91°	351.76°	6051.69'	21.43'
6190'	58.55°	356.40°	6078.48'	59.88'
6237'	64.79°	359.67°	6100.78'	101.22'
6285'	72.40°	2.24°	6118.29'	145.83'
6332'	79.44°	2.87°	6129.71'	191.30'
6380'	86.05°	3.52°	6135.77'	238.75'
6441'	89.60°	2.25°	6138.09'	299.54'

Avg Rate of Penetration
ROP Avg
500 feet per hr 0

PCG Gamma Ray
PGRC
0 api 300

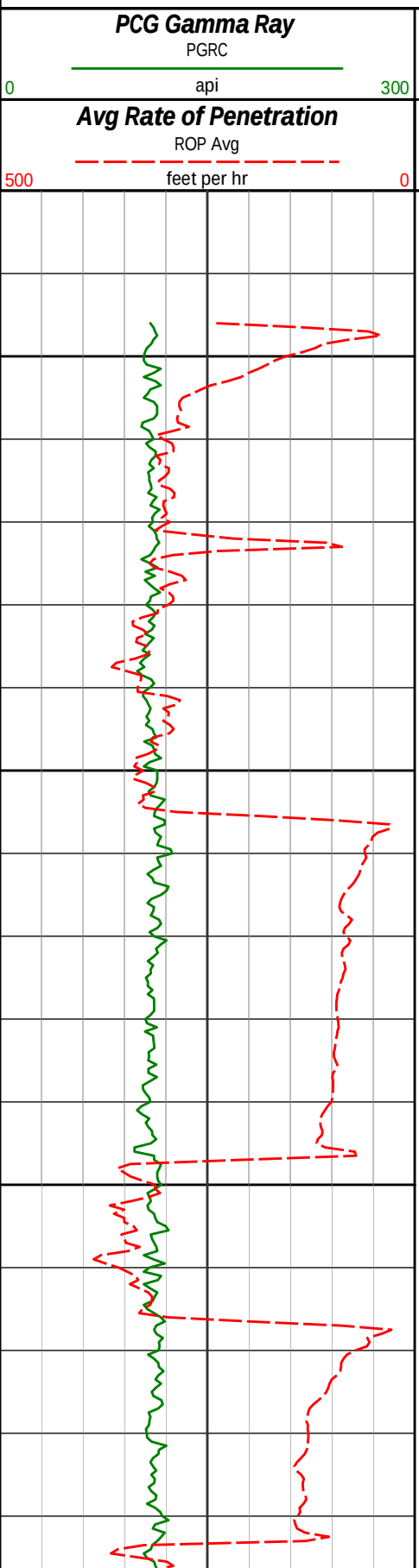
Depth
ft

HALLIBURTON

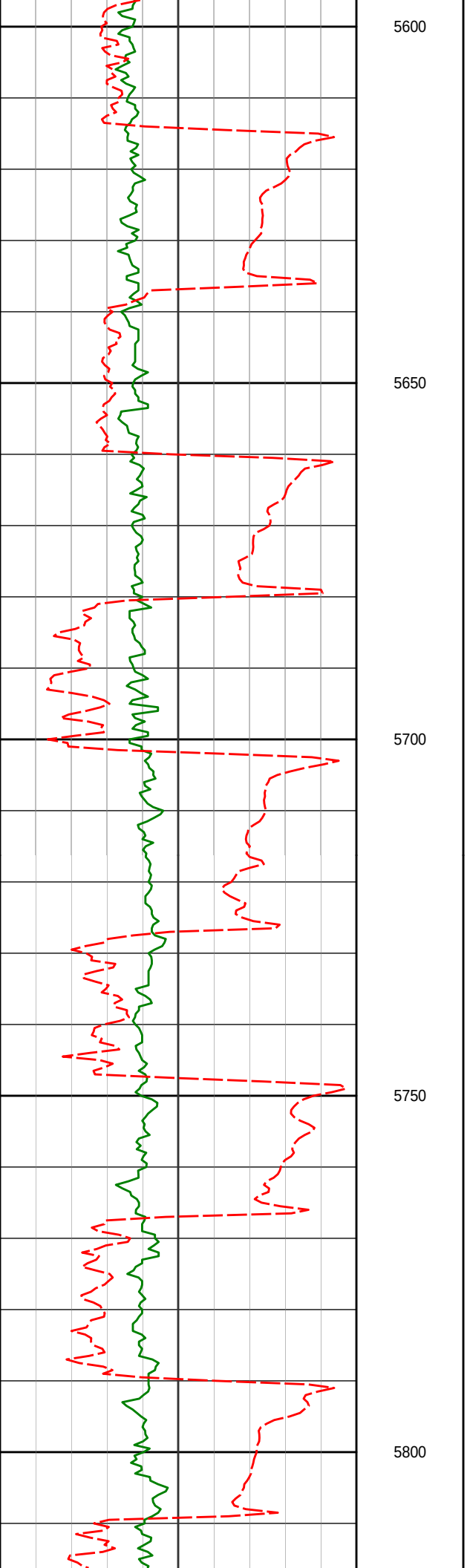
Sperry Drilling Services

TVD Detail Log 1:240

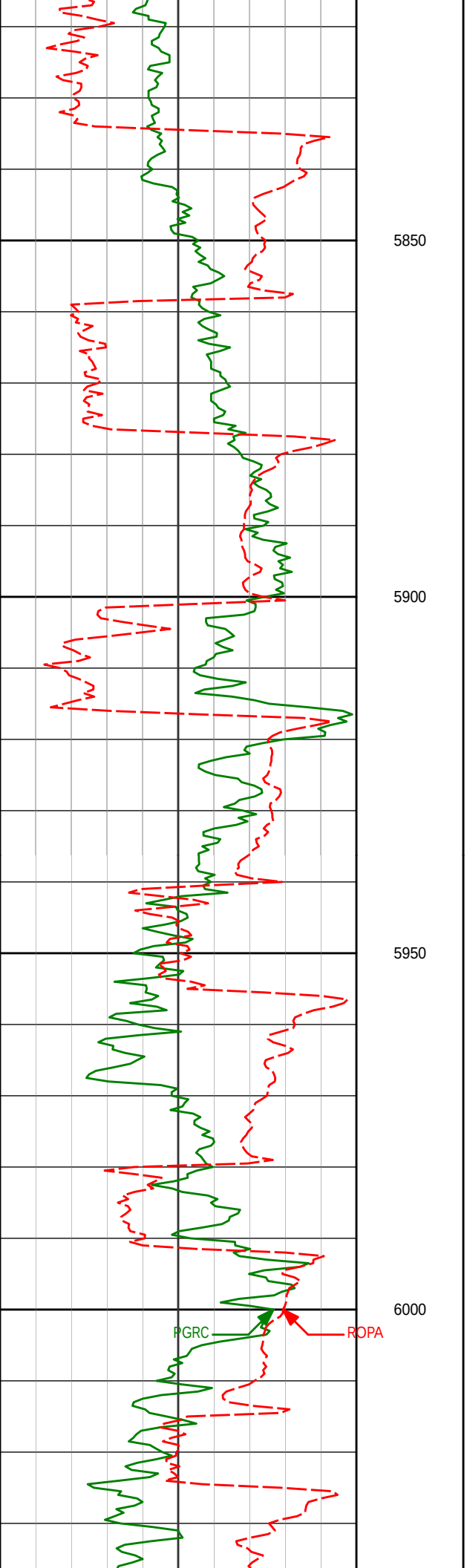
Noble Energy, Inc
Brook LC28-74-AHNC
H&P 273
T9N R59W



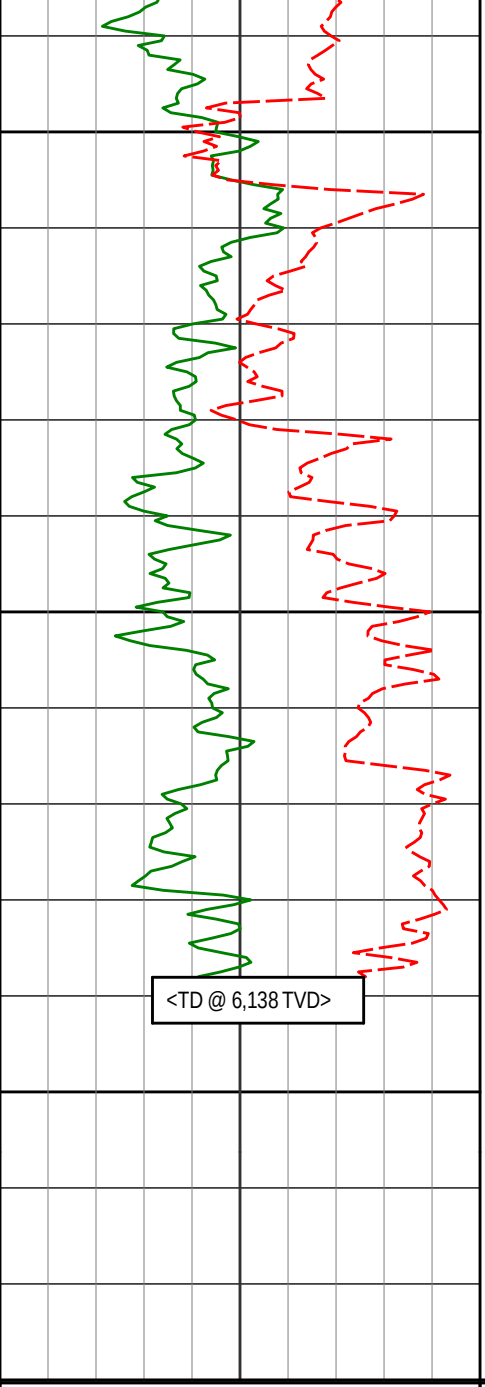
Depth ft	Depth	Inc.	Azi.	TVD	V.S.
	5527'	2.96°	24.58°	5513.68'	-235.70'
	5574'	7.63°	15.80°	5560.47'	-231.62'



5621'	11.45°	22.14°	5606.81'	-224.35'
5668'	14.53°	27.26°	5652.60'	-214.87'
5716'	18.45°	26.41°	5698.62'	-202.84'
5763'	22.50°	24.63°	5742.64'	-188.15'
5811'	25.07°	19.74°	5786.56'	-170.37'



5858'	26.13°	11.62°	5828.96'	-150.97'
5906'	29.29°	4.39°	5871.47'	-128.97'
5953'	33.54°	359.49°	5911.57'	-104.53'
6001'	37.34°	352.27°	5950.69'	-76.78'
6048'	41.81°	349.89°	5986.91'	-47.13'
6096'	47.08°	349.81°	6021.16'	-13.94'



Depth	Inc.	Azi.	TVD	V.S.
6143'	51.91°	351.76°	6051.69'	21.43'
6190'	58.55°	356.40°	6078.48'	59.88'
6237'	64.79°	359.67°	6100.78'	101.22'
6285'	72.40°	2.24°	6118.29'	145.83'
6332'	79.44°	2.87°	6129.71'	191.30'
6380'	86.05°	3.52°	6135.77'	238.75'
6441'	89.60°	2.25°	6138.09'	299.54'

Avg Rate of Penetration
ROP Avg
500 feet per hr 0

PCG Gamma Ray
PGRC
0 api 300

Depth ft

HALLIBURTON

DIRECTIONAL SURVEY REPORT

Noble Energy
Brook LC28-74-1AHNC
Wattenberg
Weld Colorado
USA
CA-XX-0901400364

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
340.00	0.60	216.94	339.99	1.42 S	1.07 W	-1.40	0.18
609.00	0.20	12.54	608.99	2.09 S	1.81 W	-2.05	0.29
716.00	0.30	170.36	715.99	2.19 S	1.73 W	-2.15	0.46
809.00	0.41	129.61	808.99	2.65 S	1.43 W	-2.62	0.29
902.00	0.15	193.30	901.99	2.98 S	1.20 W	-2.96	0.40
1088.00	0.11	166.56	1087.99	3.40 S	1.21 W	-3.38	0.04
1274.00	0.28	195.30	1273.99	4.01 S	1.29 W	-3.98	0.10
1460.00	0.03	183.08	1459.98	4.49 S	1.41 W	-4.46	0.13
1553.00	0.22	291.26	1552.98	4.45 S	1.58 W	-4.42	0.25
1645.00	0.29	253.19	1644.98	4.45 S	1.96 W	-4.41	0.20
1737.00	0.22	159.43	1736.98	4.69 S	2.12 W	-4.65	0.41
1832.00	0.04	197.45	1831.98	4.90 S	2.07 W	-4.85	0.20
1927.00	2.06	213.97	1926.96	6.35 S	3.03 W	-6.28	2.12
2022.00	3.84	205.85	2021.83	10.62 S	5.37 W	-10.51	1.92
2117.00	5.84	205.12	2116.49	17.86 S	8.81 W	-17.68	2.10
2212.00	5.53	204.06	2211.02	26.42 S	12.73 W	-26.15	0.34
2307.00	7.67	194.88	2305.39	36.73 S	16.22 W	-36.39	2.50
2401.00	7.17	192.47	2398.60	48.52 S	19.10 W	-48.12	0.62
2496.00	6.72	190.23	2492.90	59.79 S	21.37 W	-59.34	0.55
2591.00	6.69	189.80	2587.25	70.71 S	23.30 W	-70.22	0.06
2686.00	6.47	191.58	2681.63	81.41 S	25.32 W	-80.88	0.32
2781.00	6.36	190.41	2776.03	91.83 S	27.34 W	-91.25	0.18
2875.00	7.45	181.83	2869.35	103.04 S	28.48 W	-102.44	1.59
2970.00	6.92	182.39	2963.61	114.91 S	28.91 W	-114.30	0.56
3065.00	6.27	186.11	3057.98	125.79 S	29.70 W	-125.15	0.82
3160.00	5.25	181.06	3152.50	135.29 S	30.33 W	-134.64	1.19
3255.00	4.10	182.67	3247.18	143.03 S	30.57 W	-142.37	1.22
3350.00	5.22	187.31	3341.86	150.71 S	31.28 W	-150.04	1.24
3445.00	6.64	195.07	3436.35	160.30 S	33.26 W	-159.59	1.72
3540.00	6.55	194.59	3530.73	170.85 S	36.05 W	-170.08	0.12
3635.00	6.56	194.29	3625.11	181.35 S	38.76 W	-180.52	0.04
3730.00	6.93	185.73	3719.45	192.31 S	40.67 W	-191.44	1.12
3825.00	6.28	185.37	3813.82	203.17 S	41.72 W	-202.28	0.69
3920.00	5.68	186.55	3908.30	213.01 S	42.75 W	-212.09	0.64
4014.00	5.08	177.55	4001.89	221.79 S	43.10 W	-220.86	1.10
4109.00	4.66	181.39	4096.55	229.85 S	43.01 W	-228.92	0.56
4204.00	3.24	158.03	4191.33	236.20 S	42.10 W	-235.30	2.23
4394.00	3.25	148.36	4381.02	245.77 S	37.27 W	-244.96	0.29
4489.00	2.38	105.41	4475.92	248.58 S	33.96 W	-247.84	2.33
4583.00	1.45	46.78	4569.87	248.29 S	31.21 W	-247.60	2.17
4678.00	2.02	30.78	4664.83	246.03 S	29.47 W	-245.37	0.78
4773.00	2.30	311.54	4759.78	243.33 S	30.05 W	-242.66	2.91
4868.00	0.25	301.62	4854.75	241.95 S	31.65 W	-241.25	2.16
5058.00	0.44	28.61	5044.75	241.10 S	31.66 W	-240.40	0.26
5152.00	0.62	64.65	5138.74	240.56 S	31.03 W	-239.88	0.40
5247.00	0.50	49.14	5233.74	240.07 S	30.25 W	-239.41	0.21
5342.00	0.55	46.57	5328.73	239.49 S	29.61 W	-238.83	0.07
5432.00	0.60	48.14	5418.73	238.87 S	28.94 W	-238.23	0.06
5527.00	2.96	24.58	5513.68	236.31 S	27.54 W	-235.70	2.54
5574.00	7.63	15.80	5560.47	232.20 S	26.19 W	-231.62	10.06
5621.00	11.45	22.14	5606.81	224.87 S	23.58 W	-224.35	8.42
5668.00	14.53	27.26	5652.60	215.31 S	19.12 W	-214.87	7.00
5716.00	18.45	26.41	5698.62	203.15 S	12.98 W	-202.84	8.17
5763.00	22.50	24.63	5742.64	188.31 S	5.92 W	-188.15	8.72
5811.00	25.07	19.74	5786.56	170.38 S	1.34 E	-170.37	6.74
5858.00	26.13	11.62	5828.96	150.87 S	6.79 E	-150.97	7.79
5906.00	29.29	4.39	5871.47	128.79 S	9.82 E	-128.97	9.61
5953.00	33.54	359.49	5911.57	104.33 S	10.59 E	-104.53	10.55
6001.00	37.34	352.27	5950.69	76.62 S	8.51 E	-76.78	11.75
6048.00	41.81	349.89	5986.91	47.06 S	3.84 E	-47.13	10.05
6096.00	47.08	349.81	6021.16	13.98 S	2.08 W	-13.94	10.97
6143.00	51.91	351.76	6051.69	21.28 N	7.78 W	21.43	10.75
6190.00	58.55	356.40	6078.48	59.65 N	11.70 W	59.88	16.29
6237.00	64.79	359.67	6100.78	100.97 N	13.08 W	101.22	14.62
6285.00	72.40	2.24	6118.29	145.61 N	12.31 W	145.83	16.62
6332.00	79.44	2.87	6129.71	191.13 N	10.27 W	191.30	15.03
6380.00	86.05	3.52	6135.77	238.64 N	7.62 W	238.75	13.85
6441.00	89.60	2.25	6138.09	299.51 N	4.55 W	299.54	6.18
6496.00	89.60	2.25	6138.47	354.47 N	2.39 W	354.44	0.00

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 358.83 DEGREES (GRID)
A TOTAL CORRECTION OF 7.14 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED

HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 6496.00 FEET
IS 354.47 FEET ALONG 359.61 DEGREES (GRID)

Surface surveys at 340 ft and 609 ft have had azimuths corrected to grid north, but were not taken by Halliburton.

Last survey is a projection from 6441 ft MD to TD at 6496 ft MD.

Date Printed:01 August 2014