**HALLIBURTON** | Sperry Drilling

**PCGK: Pressure Case Gamma**
**PCDC: Pressure Case Directional**

Powered by INSITE™

**1 : 600 / 1 : 240**

Country : **USA**
Field : **Wattenberg**
Location : **Lat: 40° 28' 55.74" North**
**Long: 104° 28' 7.68" West**
Well : **Colt A13-628**
Company : **Noble Energy**
Rig : **H&P 273**

Company : **Noble Energy**
Rig : **H&P 273**
Well : **Colt A13-628**
Field : **Wattenberg**
Country : **USA**
API Number : **05-123-40905**

LOCATION
Latitude : **40° 28' 55.74" North**
Longitude : **104° 28' 7.68" West**
UTM Easting = **3,286,845.390 ft**
UTM Northing = **1,420,155.540 ft**

Other Services
**Directional Drilling**

Permanent Datum : **Ground Level** Elevation : **4665.00 ft**
Log Measured From : **Drill Floor** **24.00 ft** Above Permanent Datum
Drilling Measured From : **Drill Floor**

TVD LOG

Elev. KB **N/A**
DF **4689.00 ft**
GL **4665.00 ft**
WD **N/A**

Depth Logged : **924.99 ft** To **6,685.20 ft**
Date Logged : **15-Mar-15** To **16-Mar-15**
Total Depth MD : **7,041.00 ft** TVD : **6,685.20 ft**
Spud Date : **14-Mar-15**

Unit No. : **11703717** Job No. : **CA-XX-0902118376**
Plot Type : **Final**
Plot Date : **17-Mar-15**

| Run No. | Borehole Record (TVD) | | | Size | Casing Record (TVD) | | |
|---|---|---|---|---|---|---|---|
| | Size | From | To | | Weight | From | To |
| 2 | 8.750 in | 924.99 ft | 6,685.20 ft | 7.000 in | 26.00 lbpf | SURFACE | 6,684.98 ft |

**WELL INFORMATION**

| MWD Run Number | 100 | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date run completed | 16-Mar-15 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rig Bit Number | 2 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bit Size (in) | 8.750 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tool Nominal OD (in) | 4.750 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Log Start Depth (TVD, ft) | 924.99 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Log End Depth (TVD, ft) | 6,685.20 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Drill or Wipe | Drill | | | | | | | | | | | | | | | | | | | | | | | | | |
| Drill/Wipe Start Date and Time | 15-Mar-15 00:10 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Drill/Wipe End Date and Time | 16-Mar-15 00:00 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Min Inc (deg) @ Depth (TVD, ft) | 0.18 @ 5,292.77 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Max Inc (deg) @ Depth (TVD, ft) | 77.20 @ 6,676.90 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bit TFA(in2) / Bit Type | 1.21 / PDC | | | | | | | | | | | | | | | | | | | | | | | | | |
| Flow Rate (gpm) | 586.43 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Max AV (fpm) / CV (fpm) @ MWD | N/A / N/A | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fluid Type | Fresh Water Gel | | | | | | | | | | | | | | | | | | | | | | | | | |
| Density (ppg) / Viscosity (spqt) | 8.40 / 28.00 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Filtrate CL (ppm) | 1,200.00 | | | | | | | | | | | | | | | | | | | | | | | | | |
| pH / Fluid Loss (mptm) | 10.90 / 0 | | | | | | | | | | | | | | | | | | | | | | | | | |
| PV (cP) / YP (lhf2) | 1 / 1.00 | | | | | | | | | | | | | | | | | | | | | | | | | |
| % Solids / % Sand | 0.40 / 0.10 | | | | | | | | | | | | | | | | | | | | | | | | | |
| % 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 | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Max Tool Temp (degF) / Source** | 175.40 / PCM | | | | |
| **Rm @ Max Tool Temp (degF)** | N/A @ N/A | | | | |
| **Lead MWD Engineer** | Paul Kock | | | | |
| **Customer Representative** | Justin Fields | | | | |

## SENSOR INFORMATION

### Downhole Processor Information

| | | | | | |
|---|---|---|---|---|---|
| **Tool Type** | PCM | | | | |
| **Software Version** | 5.93 | | | | |
| **Sub Serial Number** | 246473 | | | | |
| **Insert Serial Number** | 11620280 | | | | |
| **Date and Time Initialized** | 14-Mar-15 21:45 | | | | |
| **Date and Time Read** | 16-Mar-15 06:26 | | | | |
| **ECMB SW Version** | N/A | | | | |

### Directional Sensor Information

| | | | | | |
|---|---|---|---|---|---|
| **Tool Type** | PCDC | | | | |
| **Distance From Bit (ft)** | 49.46 | | | | |
| **Software Version** | 6.21 | | | | |
| **Sub Serial Number** | 246473 | | | | |
| **Sonde Serial Number** | 11638576 | | | | |
| **Sensor ID Number** | N/A | | | | |
| **Toolface Offset (deg)** | 90.93 | | | | |

### Gamma Ray Sensor Information

| | | | | | |
|---|---|---|---|---|---|
| **Tool Type** | PCG | | | | |
| **Distance From Bit (ft)** | 39.34 | | | | |
| **Recorded Sample Period (sec)** | 10 | | | | |
| **Software Version** | 8.15 | | | | |
| **Sub Serial Number** | 246473 | | | | |
| **Insert/Sonde Serial Number** | 11681014 | | | | |

## 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:**
**- All ROP in logs - 0.5 ft interval, 1.2 ft coercion distance.**
**- Gamma in 2" (1:600) logs - 1 ft interval, 3 ft coercion distance.**
**- Gamma in 5" (1:240) logs - 0.5 ft interval, 0.6 ft coercion distance.**

**5. INSITE version 8.1.10.**

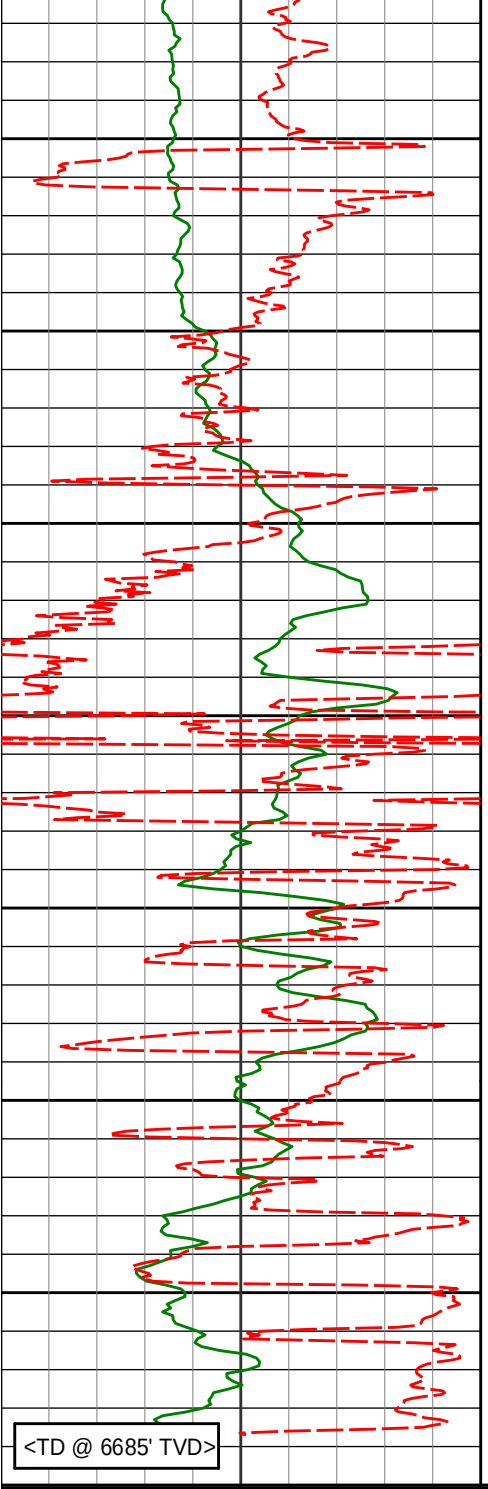
## WARRANTY

# TVD Detail 1:600 Scale

Gamma CG Cor
PGRC
0 api 300

Avg Rate of Penetration
ROP Avg
500 feet per hr 0

| Depth TVD ft | Depth | Inc | Azi | TVD | V.S. | Temp |
|---|---|---|---|---|---|---|
| 6000 <KOP> | | | | | | |
| 6050 | 6084' | 7.02° | 287.39° | 6049.40' | 491.68' | 154.34°F |
| 6100 | | | | | | |
| 6150 | 6179' | 16.43° | 279.32° | 6142.32' | 510.48' | 158.56°F |
| 6200 | | | | | | |
| 6250 | 6273' | 20.88° | 274.00° | 6231.36' | 540.29' | 162.78°F |
| 6300 | | | | | | 162.78°F |




| Depth | Inc | Azi | TVD | V.S. | Temp |
|---|---|---|---|---|---|
| 6368' | 25.84° | 271.11° | 6318.55' | 577.88' | |
| 6463' | 33.92° | 270.88° | 6400.85' | 625.15' | 162.78°F |
| 6558' | 45.68° | 271.38° | 6473.71' | 685.83' | 167.00°F |
| 6652' | 52.78° | 271.38° | 6535.06' | 756.93' | 162.78°F |
| 6747' | 60.60° | 267.82° | 6587.20' | 836.24' | 167.00°F |
| 6842' | 66.61° | 266.04° | 6629.42' | 921.21' | 167.00°F |
| 6936' | 72.05° | 267.89° | 6662.59' | 1009.04' | 171.22°F |
| 6990' | 77.20° | 269.18° | 6676.90' | 1061.09' | 175.44°F |

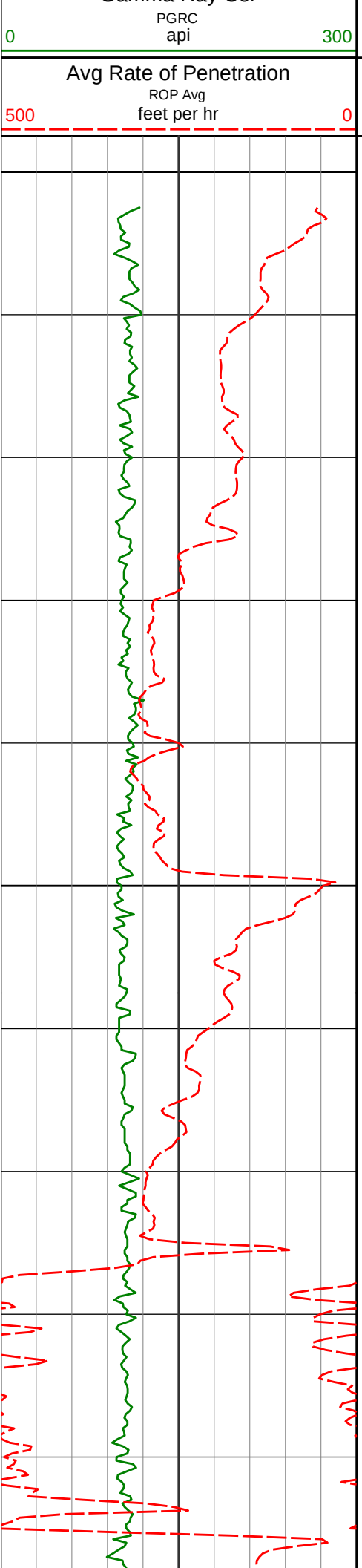
Avg Rate of Penetration
ROP Avg
500 feet per hr 0

Depth
TVD
ft

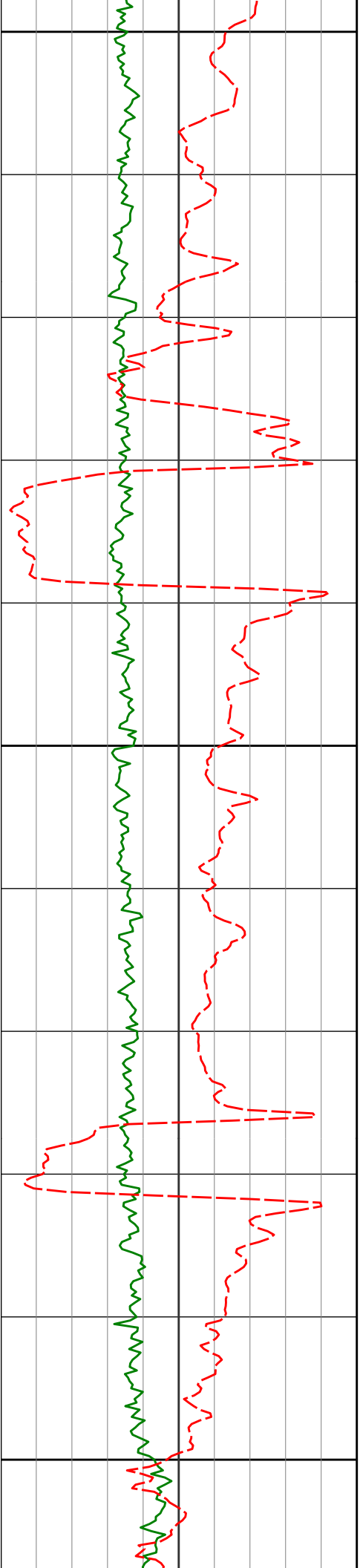
Gamma CG Cor
PGRC
0 api 300

# TVD Detail 1:240 Scale

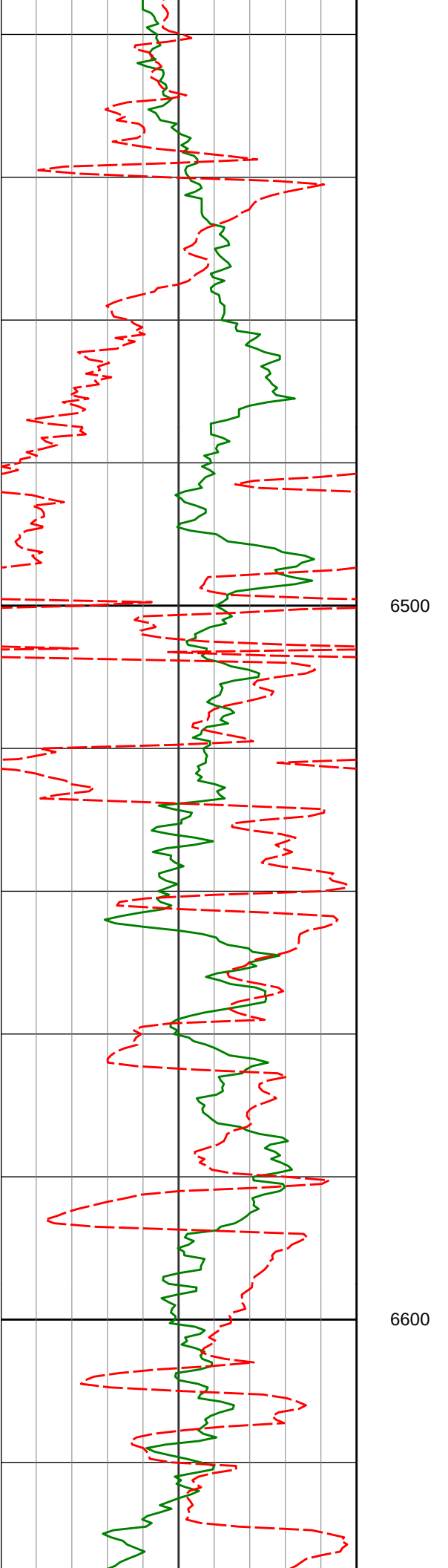
Gamma Ray Cor



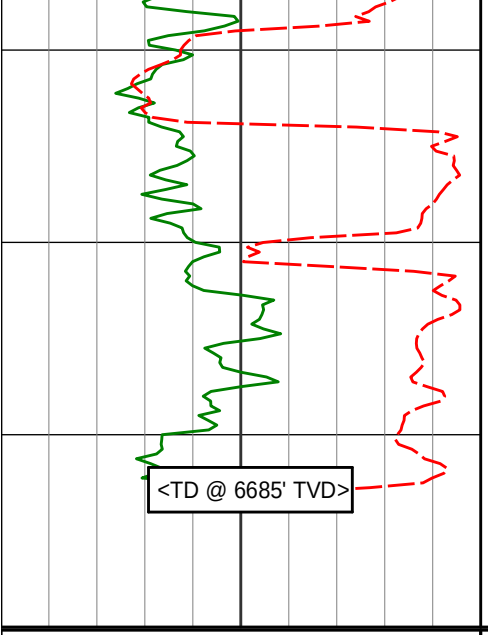

| Depth TVD ft | Depth | Inc | Azi | TVD | V.S. | Temp |
|---|---|---|---|---|---|---|
| 6000 | | | | | | |
| <KOP> | | | | | | |
| | 6084' | 7.02° | 287.39° | 6049.40' | 491.68' | 154.34°F |
| 6100 | | | | | | |
| | 6179' | 16.43° | 279.32° | 6142.32' | 510.48' | 158.56°F |




| | | | | | |
|---|---|---|---|---|---|
| | | | | | 162.78°F |
| 6273' | 20.88° | 274.00° | 6231.36' | 540.29' | |
| | | | | | 162.78°F |
| 6368' | 25.84° | 271.11° | 6318.55' | 577.88' | |
| | | | | | 162.78°F |
| 6463' | 33.92° | 270.88° | 6400.85' | 625.15' | |




| | | | | | |
|---|---|---|---|---|---|
| 6558' | 45.68° | 271.38° | 6473.71' | 685.83' | 167.00°F |
| 6652' | 52.78° | 271.38° | 6535.06' | 756.93' | 162.78°F |
| 6747' | 60.60° | 267.82° | 6587.20' | 836.24' | 167.00°F |
| | | | | | 167.00°F |
| | | | | | 167.00°F |
| | | | | | 167.00°F |
| 6842' | 66.61° | 266.04° | 6629.42' | 921.21' | 167.00°F |




| | | | | | | |
|---|---|---|---|---|---|---|
| 6936' | 72.05° | 267.89° | 6662.59' | 1009.04' | | 171.22°F |
| 6990' | 77.20° | 269.18° | 6676.90' | 1061.09' | | 175.44°F |

6700

Avg Rate of Penetration
ROP Avg
500 feet per hr 0

Gamma Ray Cor
PGRC
0 api 300

Depth
TVD
ft

| Depth | Inc | Azi | TVD | V.S. | Temp |
|---|---|---|---|---|---|

HALLIBURTON

# DIRECTIONAL SURVEY REPORT

**Noble Energy**
**Colt A13-628**
**Wattenberg**
**Weld Colorado**
**USA**
**CA-XX-0902118376**

| *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 |
| 380.00 | 0.40 | 288.93 | 380.00 | 0.43 N | 1.25 W | 1.25 | 0.11 |
| 650.00 | 0.20 | 202.53 | 649.99 | 0.30 N | 2.33 W | 2.32 | 0.16 |
| 925.00 | 0.60 | 236.83 | 924.99 | 0.93 S | 3.72 W | 3.73 | 0.16 |
| 1202.00 | 0.44 | 29.43 | 1201.98 | 0.80 S | 4.41 W | 4.42 | 0.37 |
| 1295.00 | 3.47 | 294.49 | 1294.93 | 0.68 N | 6.79 W | 6.79 | 3.80 |
| 1387.00 | 5.28 | 282.73 | 1386.66 | 2.77 N | 13.46 W | 13.43 | 2.19 |
| 1572.00 | 6.83 | 273.87 | 1570.62 | 5.39 N | 32.74 W | 32.68 | 0.98 |
| 1665.00 | 8.46 | 278.68 | 1662.79 | 6.79 N | 45.02 W | 44.95 | 1.88 |
| 1849.00 | 9.10 | 279.25 | 1844.64 | 11.17 N | 72.76 W | 72.65 | 0.35 |
| 1941.00 | 8.48 | 278.87 | 1935.55 | 13.39 N | 86.64 W | 86.51 | 0.68 |
| 2219.00 | 6.90 | 272.95 | 2211.05 | 17.41 N | 123.58 W | 123.40 | 0.64 |
| 2311.00 | 9.57 | 274.88 | 2302.09 | 18.34 N | 136.72 W | 136.53 | 2.92 |
| 2403.00 | 10.36 | 286.16 | 2392.71 | 21.30 N | 152.28 W | 152.06 | 2.28 |
| 2496.00 | 9.94 | 283.06 | 2484.26 | 25.44 N | 168.13 W | 167.87 | 0.74 |
| 2588.00 | 9.50 | 279.44 | 2574.94 | 28.48 N | 183.36 W | 183.07 | 0.82 |
| 2680.00 | 8.94 | 277.51 | 2665.75 | 30.66 N | 197.94 W | 197.62 | 0.70 |
| 2772.00 | 8.51 | 277.35 | 2756.69 | 32.46 N | 211.77 W | 211.44 | 0.47 |
| 2863.00 | 9.87 | 284.09 | 2846.52 | 35.22 N | 226.02 W | 225.66 | 1.90 |
| 2956.00 | 9.23 | 282.81 | 2938.23 | 38.82 N | 241.02 W | 240.62 | 0.73 |
| 3051.00 | 8.85 | 282.21 | 3032.05 | 42.05 N | 255.59 W | 255.16 | 0.41 |
| 3240.00 | 7.00 | 277.62 | 3219.24 | 46.65 N | 281.22 W | 280.74 | 1.03 |
| 3335.00 | 8.12 | 280.21 | 3313.41 | 48.61 N | 293.56 W | 293.06 | 1.23 |
| 3430.00 | 7.00 | 274.14 | 3407.58 | 50.22 N | 305.94 W | 305.42 | 1.45 |
| 3525.00 | 8.74 | 276.98 | 3501.69 | 51.51 N | 318.88 W | 318.35 | 1.88 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 3620.00 | 8.88 | 276.45 | 3595.57 | 53.22 N | 333.33 W | 332.78 | 0.17 |
| 3810.00 | 9.14 | 285.70 | 3783.23 | 58.95 N | 362.43 W | 361.82 | 0.77 |
| 3905.00 | 9.56 | 285.51 | 3876.97 | 63.10 N | 377.29 W | 376.65 | 0.44 |
| 3999.00 | 8.81 | 283.26 | 3969.76 | 66.84 N | 391.82 W | 391.14 | 0.88 |
| 4094.00 | 8.28 | 281.37 | 4063.71 | 69.85 N | 405.61 W | 404.90 | 0.63 |
| 4190.00 | 7.67 | 278.86 | 4158.78 | 72.20 N | 418.72 W | 417.98 | 0.73 |
| 4284.00 | 6.54 | 279.44 | 4252.06 | 74.05 N | 430.20 W | 429.44 | 1.20 |
| 4379.00 | 5.84 | 278.10 | 4346.50 | 75.62 N | 440.32 W | 439.54 | 0.75 |
| 4474.00 | 5.54 | 293.78 | 4441.04 | 78.15 N | 449.30 W | 448.50 | 1.66 |
| 4569.00 | 4.94 | 292.70 | 4535.64 | 81.57 N | 457.27 W | 456.44 | 0.64 |
| 4664.00 | 4.00 | 300.98 | 4630.35 | 84.86 N | 463.88 W | 463.02 | 1.20 |
| 4759.00 | 3.93 | 300.48 | 4725.13 | 88.21 N | 469.53 W | 468.63 | 0.08 |
| 4854.00 | 4.04 | 298.24 | 4819.90 | 91.45 N | 475.28 W | 474.35 | 0.20 |
| 4949.00 | 1.55 | 231.76 | 4914.79 | 92.24 N | 479.24 W | 478.30 | 3.90 |
| 5044.00 | 0.22 | 227.00 | 5009.78 | 91.32 N | 480.39 W | 479.45 | 1.40 |
| 5233.00 | 0.65 | 243.29 | 5198.77 | 90.59 N | 481.61 W | 480.68 | 0.23 |
| 5327.00 | 0.18 | 253.15 | 5292.77 | 90.31 N | 482.23 W | 481.30 | 0.50 |
| 5516.00 | 0.81 | 319.94 | 5481.76 | 91.24 N | 483.37 W | 482.44 | 0.40 |
| 5610.00 | 0.82 | 339.01 | 5575.75 | 92.38 N | 484.04 W | 483.10 | 0.29 |
| 5705.00 | 0.83 | 324.66 | 5670.75 | 93.57 N | 484.68 W | 483.73 | 0.22 |
| 5800.00 | 0.87 | 343.00 | 5765.73 | 94.83 N | 485.29 W | 484.32 | 0.29 |
| 5894.00 | 0.93 | 334.31 | 5859.72 | 96.20 N | 485.83 W | 484.85 | 0.16 |
| 5989.00 | 1.94 | 341.83 | 5954.69 | 98.42 N | 486.66 W | 485.66 | 1.08 |
| 6084.00 | 7.02 | 287.39 | 6049.40 | 101.68 N | 492.71 W | 491.68 | 6.42 |
| 6179.00 | 16.43 | 279.32 | 6142.32 | 105.60 N | 511.55 W | 510.48 | 10.03 |
| 6273.00 | 20.88 | 274.00 | 6231.36 | 108.93 N | 541.40 W | 540.29 | 5.06 |
| 6368.00 | 25.84 | 271.11 | 6318.55 | 110.51 N | 579.01 W | 577.88 | 5.36 |
| 6463.00 | 33.92 | 270.88 | 6400.85 | 111.32 N | 626.29 W | 625.15 | 8.51 |
| 6558.00 | 45.68 | 271.38 | 6473.71 | 112.55 N | 686.98 W | 685.83 | 12.38 |
| 6652.00 | 52.78 | 271.38 | 6535.06 | 114.26 N | 758.11 W | 756.93 | 7.55 |
| 6747.00 | 60.60 | 267.82 | 6587.20 | 113.60 N | 837.41 W | 836.24 | 8.81 |
| 6842.00 | 66.61 | 266.04 | 6629.42 | 109.01 N | 922.34 W | 921.21 | 6.54 |
| 6936.00 | 72.05 | 267.89 | 6662.59 | 104.38 N | 1010.13 W | 1009.04 | 6.07 |
| 6990.00 | 77.20 | 269.18 | 6676.90 | 103.06 N | 1062.16 W | 1061.09 | 9.81 |
| 7041.00 | 84.06 | 267.95 | 6685.20 | 101.79 N | 1112.44 W | 1111.37 | 13.66 |

**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 269.43 DEGREES (GRID)**
**A TOTAL CORRECTION OF 7.43 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.**
**HORIZONTAL DISPLACEMENT(CLOSURE) AT 7041.00 FEET**
**IS 1117.08 FEET ALONG 275.23 DEGREES (GRID)**

**Surface surveys at 380 ft, 650 ft and 925 ft have had azimuths corrected to grid north, but were not taken by Halliburton.**

**Last survey is a projection from 6990 ft MD to TD at 7041 ft MD.**

**Date Printed:17 March 2015**