

Noble Energy

Weld County, CO (NAD 83)

Sec. 2-T9N-R58W (Sharpe State 2 /Davis State (PAD)

Gradishar State LD11-72-1BHN

Original Wellbore

Design: Actual Surveys

Sperry Drilling Services

Final Survey Report

21 January, 2015

Well Coordinates: 1,529,271.63 N, 3,464,461.68 E (40° 46' 27.05" N, 103° 49' 22.73" W)

Ground Level: 4,661.00 usft

Local Coordinate Origin:

Centered on Well Gradishar State LD11-72-1BHN

Viewing Datum:

KB @ 4685.00usft (HP 343)

TVDs to System:

N

North Reference:

Grid

Unit System:

Dec-Deg - API - US Survey Feet - Custom

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

HALLIBURTON

Project: Weld County, CO (NAD 83)
Site: Sec. 2-T9N-R58W (Sharpe State 2 /Davis State (PAD))
Well: Gradishar State LD11-72-1BHN
Wellbore: Original Wellbore
Design: Actual Surveys

Noble Energy

WALLBURN

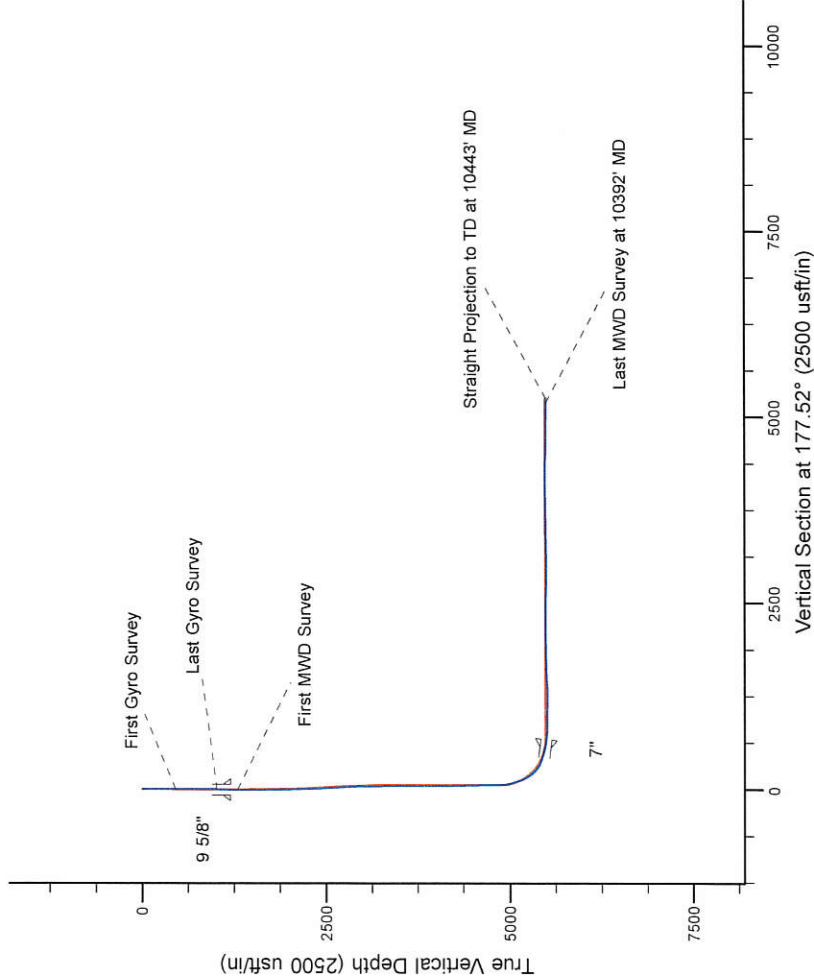
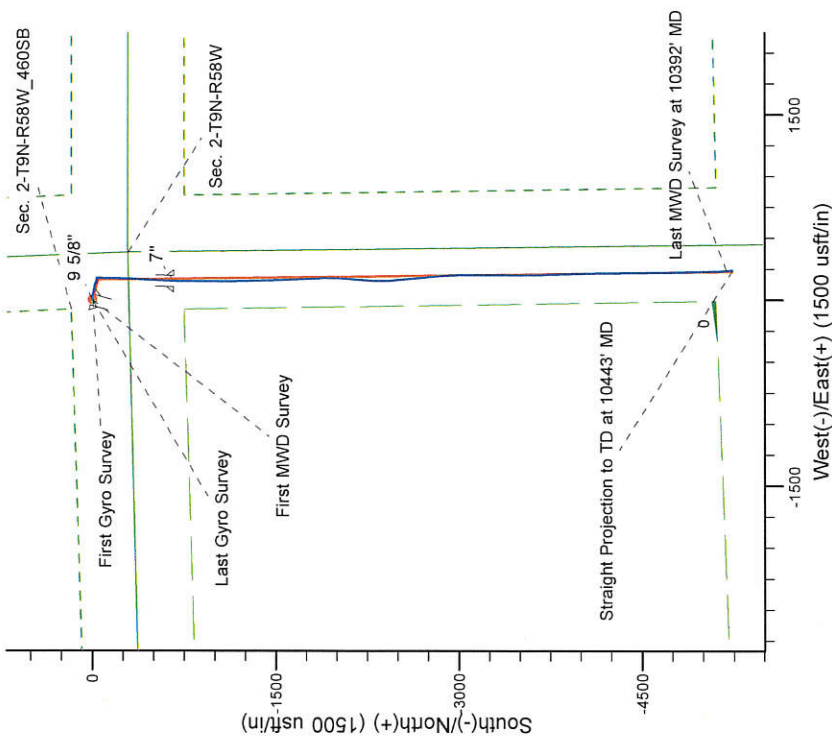
Platted SHL: 300' FSL, 371' FEL
Platted Lat/Long: 40.77418 N, 103.82298 W
Location: Sec. 2-T9N-R58W

~7" Casing: 401' FNL, 219' FEL
State Planes - CO Northern: 1528608.61 N, 3464611.28 E
Location: Sec. 11-T9N-R58W

Platted BHL: 330' FSL, 220' FEL
Lat/Long: 40.75979 N, 103.82252 W
State Planes - CO Northern: 1524032.22 N, 3464688.24 E
Location: Sec. 11-T9N-R58W

LEGEND

Gradishar State LD11-72-1BHN, Original Wellbore, Rev B0 V0
Actual Surveys



WELL DETAILS: Gradishar State LD11-72-1BHN

Ground Level: 4661.00
KB @ 4685.00usft (HP 343)

Created By: Amanda Marchand
Created On: 1/21/2015

Design Report for Gradishar State LD11-72-1BHN - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
460.00	0.80	260.71	459.99	-0.52	-3.17	0.38	0.17
First Gyro Survey							
742.00	0.70	55.11	741.98	0.15	-3.70	-0.31	0.52
1,020.00	1.20	16.51	1,019.94	3.91	-1.48	-3.97	0.28
Last Gyro Survey							
1,296.00	0.10	17.50	1,295.92	6.91	-0.59	-6.93	0.40
First MWD Survey							
1,388.00	0.15	134.64	1,387.92	6.90	-0.48	-6.92	0.23
1,482.00	0.13	204.08	1,481.92	6.72	-0.43	-6.73	0.17
1,575.00	0.31	168.54	1,574.92	6.38	-0.42	-6.39	0.23
1,668.00	0.24	163.92	1,667.92	5.94	-0.32	-5.95	0.08
1,759.00	0.13	121.47	1,758.92	5.71	-0.18	-5.71	0.19
1,852.00	1.57	80.29	1,851.90	5.87	1.17	-5.81	1.59
1,945.00	3.82	95.80	1,944.79	5.77	5.50	-5.53	2.52
2,038.00	5.25	97.86	2,037.50	4.87	12.80	-4.32	1.55
2,129.00	6.97	103.58	2,127.98	3.01	22.29	-2.04	2.00
2,222.00	8.71	101.24	2,220.11	0.31	34.69	1.19	1.90
2,315.00	10.50	106.45	2,311.80	-3.46	49.72	5.61	2.14
2,408.00	10.55	103.55	2,403.24	-7.86	66.13	10.71	0.57
2,503.00	10.82	102.95	2,496.59	-11.89	83.27	15.48	0.31
2,599.00	10.68	100.88	2,590.91	-15.59	100.79	19.93	0.43
2,694.00	10.62	107.93	2,684.28	-19.95	117.76	25.02	1.37
2,788.00	8.54	107.72	2,776.96	-24.74	132.65	30.45	2.21
2,883.00	6.76	110.66	2,871.11	-28.86	144.61	35.08	1.92
2,979.00	4.03	112.04	2,966.68	-32.12	153.02	38.70	2.85
3,074.00	2.82	95.41	3,061.51	-33.59	158.44	40.41	1.64
3,169.00	2.84	96.42	3,156.39	-34.08	163.11	41.09	0.06
3,264.00	1.94	64.40	3,251.31	-33.64	166.90	40.82	1.66
3,359.00	1.17	67.96	3,346.28	-32.59	169.25	39.87	0.82
3,454.00	0.93	74.85	3,441.26	-32.02	170.89	39.37	0.29
3,549.00	0.74	92.43	3,536.25	-31.84	172.25	39.26	0.33
3,644.00	0.52	144.09	3,631.24	-32.22	173.11	39.67	0.61
3,739.00	0.69	199.46	3,726.24	-33.11	173.17	40.56	0.61
3,835.00	0.56	221.37	3,822.23	-34.01	172.67	41.43	0.28
3,930.00	0.73	233.59	3,917.23	-34.71	171.88	42.11	0.23
4,025.00	0.56	228.01	4,012.22	-35.38	171.04	42.74	0.19
4,120.00	0.75	220.26	4,107.22	-36.17	170.30	43.49	0.22
4,215.00	0.93	240.09	4,202.21	-37.03	169.23	44.30	0.36
4,310.00	1.62	178.94	4,297.19	-38.75	168.58	46.00	1.50
4,405.00	2.75	165.40	4,392.12	-42.30	169.18	49.57	1.30
4,500.00	2.37	151.48	4,487.02	-46.23	170.70	53.56	0.76
4,595.00	0.22	15.40	4,582.00	-47.78	171.68	55.16	2.67
4,690.00	0.40	56.33	4,677.00	-47.42	172.01	54.81	0.29
4,786.00	0.28	98.43	4,772.99	-47.27	172.52	54.68	0.28
4,881.00	1.52	157.10	4,867.98	-48.47	173.24	55.91	1.47
4,976.00	11.68	181.79	4,962.24	-59.27	173.43	66.71	10.86
5,071.00	16.73	183.69	5,054.30	-82.54	172.25	89.90	5.34
5,166.00	21.25	180.87	5,144.11	-113.42	171.11	120.70	4.85
5,261.00	28.84	176.83	5,230.12	-153.57	172.11	160.86	8.19

Design Report for Gradishar State LD11-72-1BHN - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,356.00	38.93	181.10	5,308.90	-206.43	172.81	213.71	10.91
5,451.00	54.15	182.21	5,374.05	-275.15	170.74	282.27	16.04
5,546.00	70.50	184.12	5,418.03	-358.86	166.00	365.70	17.30
5,641.00	73.12	184.25	5,447.68	-448.86	159.42	455.33	2.76
5,736.00	75.52	182.92	5,473.35	-540.14	153.71	546.28	2.86
5,811.00	81.06	181.54	5,488.57	-613.49	150.86	619.44	7.60
6,004.00	89.82	180.92	5,503.90	-805.65	146.74	811.24	4.55
6,097.00	88.00	180.14	5,505.67	-898.63	145.88	904.09	2.13
6,190.00	89.91	179.67	5,507.37	-991.61	146.03	996.99	2.12
6,281.00	89.54	179.39	5,507.80	-1,082.60	146.78	1,087.93	0.51
6,374.00	89.48	178.80	5,508.60	-1,175.59	148.25	1,180.89	0.64
6,467.00	90.99	178.41	5,508.22	-1,268.55	150.51	1,273.87	1.68
6,560.00	92.84	178.45	5,505.11	-1,361.46	153.06	1,366.80	1.99
6,651.00	92.47	178.40	5,500.89	-1,452.33	155.56	1,457.70	0.41
6,744.00	91.82	178.10	5,497.41	-1,545.22	158.39	1,550.62	0.77
6,837.00	91.42	177.72	5,494.78	-1,638.12	161.79	1,643.58	0.59
7,025.00	91.85	176.67	5,489.42	-1,825.82	170.98	1,831.50	0.60
7,119.00	91.51	179.10	5,486.66	-1,919.71	174.45	1,925.45	2.61
7,214.00	89.85	180.98	5,485.54	-2,014.69	174.38	2,020.34	2.64
7,309.00	92.87	187.20	5,483.28	-2,109.37	167.62	2,114.64	7.28
7,404.00	92.25	185.44	5,479.04	-2,203.69	157.17	2,208.42	1.96
7,499.00	88.33	181.02	5,478.55	-2,298.50	151.82	2,302.91	6.22
7,594.00	88.86	178.55	5,480.88	-2,393.46	152.18	2,397.80	2.66
7,689.00	87.10	175.41	5,484.23	-2,488.25	157.18	2,492.72	3.79
7,784.00	87.41	174.68	5,488.78	-2,582.79	165.37	2,587.52	0.83
7,879.00	90.55	174.62	5,490.47	-2,677.35	174.23	2,682.38	3.31
7,974.00	89.29	173.87	5,490.61	-2,771.87	183.75	2,777.22	1.54
8,070.00	90.09	176.90	5,491.13	-2,867.54	191.48	2,873.14	3.26
8,165.00	88.89	176.51	5,491.97	-2,962.38	196.94	2,968.12	1.33
8,260.00	91.51	181.09	5,491.64	-3,057.32	198.92	3,063.06	5.55
8,355.00	89.41	178.58	5,490.88	-3,152.31	199.20	3,157.97	3.44
8,450.00	93.30	181.16	5,488.63	-3,247.26	199.42	3,252.84	4.91
8,545.00	90.99	180.65	5,485.08	-3,342.17	197.92	3,347.60	2.49
8,640.00	89.82	179.94	5,484.40	-3,437.16	197.43	3,442.48	1.44
8,736.00	89.94	178.61	5,484.60	-3,533.15	198.64	3,538.44	1.39
8,830.00	92.34	179.76	5,482.73	-3,627.12	199.98	3,632.37	2.83
8,925.00	90.12	177.94	5,480.70	-3,722.07	201.89	3,727.31	3.02
9,020.00	89.72	177.50	5,480.83	-3,816.99	205.67	3,822.31	0.63
9,115.00	91.70	179.21	5,479.65	-3,911.94	208.39	3,917.29	2.75
9,210.00	89.72	178.04	5,478.47	-4,006.89	210.67	4,012.26	2.42
9,305.00	91.54	179.19	5,477.43	-4,101.86	212.97	4,107.23	2.27
9,400.00	91.23	179.97	5,475.13	-4,196.82	213.66	4,202.14	0.88
9,495.00	88.52	179.25	5,475.34	-4,291.81	214.31	4,297.06	2.95
9,590.00	87.16	178.54	5,478.92	-4,386.72	216.14	4,391.97	1.61
9,685.00	88.64	179.64	5,482.40	-4,481.64	217.65	4,486.86	1.94
9,781.00	87.66	179.12	5,485.50	-4,577.59	218.69	4,582.76	1.16
9,875.00	90.37	179.94	5,487.12	-4,671.56	219.46	4,676.68	3.01
9,970.00	90.77	179.23	5,486.17	-4,766.55	220.14	4,771.61	0.86
10,065.00	90.31	178.76	5,485.28	-4,861.53	221.81	4,866.58	0.69
10,160.00	89.60	178.18	5,485.35	-4,956.50	224.35	4,961.56	0.97
10,255.00	88.33	177.14	5,487.07	-5,051.40	228.23	5,056.54	1.73

Design Report for Gradishar State LD11-72-1BHN - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
10,350.00	88.98	177.16	5,489.30	-5,146.26	232.95	5,151.52	0.68
10,392.00	88.06	176.53	5,490.38	-5,188.18	235.26	5,193.50	2.65
Last MWD Survey at 10392' MD							
10,443.00	88.06	176.53	5,492.11	-5,239.06	238.34	5,244.46	0.00

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
460.00	459.99	-0.52	-3.17	First Gyro Survey
1,020.00	1,019.94	3.91	-1.48	Last Gyro Survey
1,296.00	1,295.92	6.91	-0.59	First MWD Survey
10,392.00	5,490.38	-5,188.18	235.26	Last MWD Survey at 10392' MD
10,443.00	5,492.11	-5,239.06	238.34	Straight Projection to TD at 10443' MD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/-S (usft)	+E/-W (usft)	
Target	Gradishar State LD11-72-1BHN_BHL	177.52	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
460.00	1,020.00	Gyro Surveys	Flexi-Shot
1,296.00	5,811.00	Intermediate Surveys	MWD
6,004.00	10,443.00	Production Surveys	MWD

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,203.00		9 5/8"	9-5/8	13-3/4
5,861.00	5,495.36	7"	7	8-3/4

Wellbore Targets

Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
- hit/miss target									
- Shape									
Gradishar State LD11-	0.00	0.00	5,474.85	-5,239.41	226.56	1,524,032.22	3,464,688.24	40.759790	-103.822520
- actual wellpath misses target center by 20.88usft at 10442.06usft MD (5492.08 TVD, -5238.11 N, 238.29 E)									
- Point									
Gradishar State LD11-	0.00	0.00	5,482.80	-698.70	168.40	1,528,572.93	3,464,630.08	40.772254	-103.822420
- actual wellpath misses target center by 25.39usft at 5895.16usft MD (5498.87 TVD, -696.99 N, 148.81 E)									
- Point									

Design Report for Gradishar State LD11-72-1BHN - Actual Surveys

Directional Difficulty Index

Average Dogleg over Survey:	2.15 °/100usft	Maximum Dogleg over Survey:	17.30 °/100usft at 5,546.00 usft
Net Tortosity applicable to Plans:	1.07 °/100usft	Directional Difficulty Index:	6.362

Audit Info

North Reference Sheet for Sec. 2-T9N-R58W (Sharpe State 2 /Davis State (PAD) - Gradishar State LD11-72-1BHN - Original Wellbore

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to Grid North Reference.

Vertical Depths are relative to KB @ 4685.00usft (HP 343). Northing and Easting are relative to Gradishar State LD 11-72-1BHN

Coordinate System is US State Plane 1983, Colorado Northern Zone using datum North American Datum 1983, ellipsoid GRS 1980

Projection method is Lambert Conformal Conic (2 parallel)

Central Meridian is -105.500000°, Longitude Origin:0.000000°, Latitude Origin:40.783333°

False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99999853

Grid Coordinates of Well: 1,529,271.63 usft N, 3,464,461.68 usft E

Geographical Coordinates of Well: 40° 46' 27.05" N, 103° 49' 22.73" W

Grid Convergence at Surface is: 1.08°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,443.00usft

the Bottom Hole Displacement is 5,244.47usft in the Direction of 177.40° (Grid).

Magnetic Convergence at surface is: -6.92° (10 December 2014, , BGGM2014)

