

Noble Energy

Weld County, CO (NAD 83)

Sec. 23-T6N-R65W (Reliance E23)

Reliance E23-62-1HN

05-123-38220

Original Wellbore

Design: Actual Surveys

Sperry Drilling Services

Final Survey Report

27 April, 2015

Surface UWI : 05-123-38220

Well Coordinates: 1,414,335.17 N, 3,244,354.43 E (40° 28' 02.75" N, 104° 37' 18.30" W)

Ground Level: 4,694.00 usft

Local Coordinate Origin:

Centered on Well Reliance E23-62-1HN

Viewing Datum:

KB @ 4724.00usft (HP 321)

TVDs to System:

N

North Reference:

Grid

Unit System:

Dec-Deg - API - US Survey Feet - Custom

Geodetic Scale Factor Applied

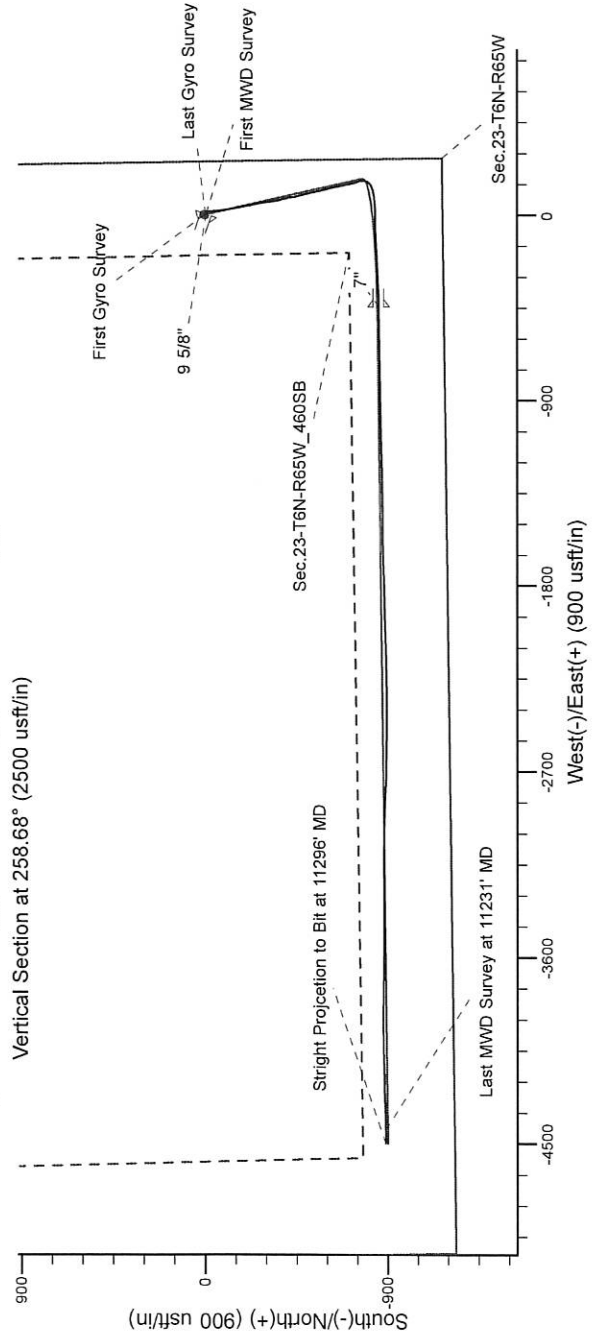
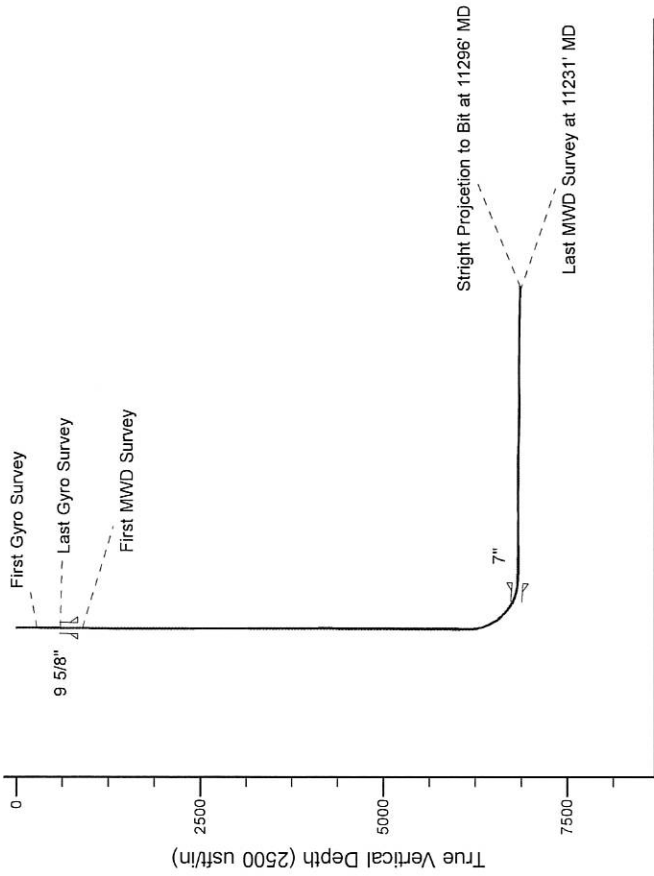
Version: 5000.1 Build: 73

HALLIBURTON

Project: Weld County, CO (NAD 83)
 Site: Sec. 23-T6N-R65W (Reliance E23)
 Well: Reliance E23-62-1HN
 Wellbore: Original Wellbore
 Design: Actual Surveys

Noble Energy

HALLIBURTON
 Sperry Drilling



Platted SHL: 1117' FSL, 256 FEL
 Platted Lat/Long: 40.467430 N, 104.621750 W
 Location: Sec. 23-T6N-R65W

~7" Casing: 331' FSL, 727' FEL
 Lat/Long: 40.465088 N, 104.623385 W
 State Planes - CO Northern: 1413477.62 N, 3243908.02 E
 Location: Sec. 23-T6N-R65W

Platted BHL: 330' FSL, 535' FWL
 Lat/Long: 40.465080 N, 104.637950 W
 State Planes - CO Northern: 1413485.11 N, 3243891.75 E
 Location: Sec. 23-T6N-R65W

LEGEND

— Reliance E23-62-1HN, Original Wellbore, Rev B0 V0

— Actual Surveys

WELL DETAILS: Reliance E23-62-1HN	
Ground Level:	4694.00
KB @ 4724.00ast (HP 321)	
Created By:	Amanda Marchand
Created On:	4/27/2015

Design Report for Reliance E23-62-1HN - 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
285.00	0.60	164.84	284.99	-1.44	0.39	-0.10	0.21
First Gyro Survey							
600.00	0.80	173.64	599.97	-5.22	1.07	-0.02	0.07
Last Gyro Survey							
900.00	0.83	95.81	899.95	-7.52	3.46	-1.92	0.34
First MWD Survey							
992.00	0.73	94.79	991.94	-7.64	4.71	-3.12	0.11
1,086.00	0.91	111.11	1,085.93	-7.95	6.00	-4.32	0.31
1,177.00	0.96	105.31	1,176.92	-8.42	7.41	-5.61	0.12
1,269.00	0.80	123.55	1,268.91	-8.97	8.69	-6.76	0.35
1,361.00	0.86	131.93	1,360.90	-9.79	9.74	-7.63	0.15
1,453.00	0.80	136.86	1,452.89	-10.72	10.69	-8.38	0.10
1,545.00	0.67	123.03	1,544.88	-11.48	11.58	-9.10	0.24
1,731.00	0.76	92.07	1,730.87	-12.12	13.72	-11.08	0.21
1,826.00	1.94	160.71	1,825.84	-13.66	14.88	-11.91	1.90
1,920.00	3.43	180.00	1,919.74	-17.97	15.41	-11.58	1.83
2,015.00	5.03	175.18	2,014.48	-24.97	15.76	-10.55	1.72
2,110.00	6.50	175.88	2,109.00	-34.48	16.50	-9.41	1.55
2,204.00	7.65	173.75	2,202.28	-46.01	17.56	-8.19	1.25
2,299.00	8.52	174.95	2,296.33	-59.30	18.87	-6.86	0.93
2,394.00	10.19	175.72	2,390.07	-74.69	20.11	-5.07	1.76
2,489.00	11.43	169.52	2,483.38	-92.33	22.45	-3.90	1.79
2,583.00	10.61	169.31	2,575.65	-109.99	25.75	-3.67	0.87
2,678.00	11.14	169.78	2,668.94	-127.62	29.00	-3.40	0.57
2,773.00	11.16	170.36	2,762.15	-145.72	32.17	-2.95	0.12
2,868.00	11.46	169.55	2,855.30	-164.06	35.42	-2.54	0.36
2,963.00	9.85	171.90	2,948.66	-181.39	38.28	-1.94	1.76
3,057.00	11.66	168.59	3,041.01	-198.66	41.29	-1.51	2.03
3,152.00	10.70	170.44	3,134.20	-216.77	44.66	-1.25	1.08
3,246.00	10.08	167.41	3,226.66	-233.40	47.90	-1.17	0.88
3,341.00	9.96	163.97	3,320.22	-249.41	51.98	-2.03	0.64
3,436.00	10.22	170.32	3,413.75	-265.62	55.67	-2.46	1.20
3,531.00	10.04	172.89	3,507.27	-282.14	58.11	-1.61	0.51
3,626.00	11.41	172.01	3,600.61	-299.66	60.44	-0.46	1.45
3,721.00	11.77	172.63	3,693.67	-318.58	62.99	0.75	0.40
3,816.00	12.98	173.21	3,786.46	-338.78	65.49	2.26	1.28
3,911.00	11.21	167.00	3,879.35	-358.38	68.83	2.83	2.31
4,005.00	11.43	166.04	3,971.52	-376.32	73.13	2.13	0.31
4,100.00	9.96	165.92	4,064.87	-393.42	77.40	1.30	1.55
4,195.00	9.32	164.78	4,158.53	-408.82	81.42	0.38	0.70
4,290.00	10.31	177.12	4,252.15	-424.73	83.87	1.10	2.44
4,385.00	10.00	168.50	4,345.66	-441.31	85.94	2.33	1.63
4,479.00	9.49	161.85	4,438.31	-456.67	89.98	1.38	1.31
4,574.00	10.02	163.27	4,531.94	-472.02	94.80	-0.33	0.61
4,669.00	10.87	166.59	4,625.36	-488.65	99.26	-1.44	1.10
4,764.00	11.08	171.13	4,718.63	-506.39	102.74	-1.38	0.94
4,858.00	11.03	170.35	4,810.88	-524.18	105.64	-0.73	0.17
4,953.00	10.61	165.85	4,904.20	-541.62	109.30	-0.90	0.99
5,047.00	12.78	164.86	4,996.24	-560.05	114.13	-2.02	2.32

Design Report for Reliance E23-62-1HN - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,143.00	11.38	166.68	5,090.11	-579.51	119.09	-3.06	1.51
5,238.00	10.21	164.17	5,183.43	-596.73	123.55	-4.05	1.33
5,333.00	11.09	165.07	5,276.79	-613.66	128.20	-5.29	0.94
5,427.00	9.70	165.35	5,369.25	-630.06	132.53	-6.32	1.48
5,522.00	10.97	170.56	5,462.71	-646.72	136.04	-6.49	1.66
5,617.00	11.97	167.85	5,555.81	-665.27	139.59	-6.34	1.20
5,711.00	9.98	166.14	5,648.08	-682.71	143.60	-6.84	2.14
5,806.00	10.34	168.68	5,741.59	-699.06	147.24	-7.21	0.60
5,901.00	9.52	170.52	5,835.17	-715.17	150.21	-6.96	0.93
5,995.00	10.76	166.38	5,927.70	-731.37	153.56	-7.06	1.53
6,085.00	10.01	160.57	6,016.23	-746.91	158.14	-8.50	1.43
6,184.00	8.29	156.16	6,113.97	-761.55	163.88	-11.26	1.87
6,232.00	10.81	180.31	6,161.32	-769.22	165.26	-11.11	9.75
6,279.00	13.12	180.89	6,207.29	-778.96	165.15	-9.09	4.92
6,327.00	14.11	189.85	6,253.95	-790.18	164.07	-5.83	4.85
6,374.00	16.10	205.97	6,299.34	-801.69	160.23	0.19	9.85
6,422.00	18.22	226.88	6,345.25	-812.81	151.83	10.61	13.51
6,468.00	20.63	242.93	6,388.66	-821.42	139.35	24.54	12.68
6,516.00	23.64	255.78	6,433.14	-827.64	122.48	42.30	11.84
6,563.00	28.16	260.72	6,475.41	-831.75	102.39	62.81	10.65
6,657.00	37.56	265.53	6,554.30	-837.57	51.81	113.55	10.37
6,752.00	45.88	269.54	6,625.16	-840.10	-11.28	175.90	9.19
6,847.00	51.82	268.70	6,687.64	-841.23	-82.77	246.23	6.29
6,895.00	54.47	266.80	6,716.43	-842.75	-121.14	284.15	6.36
6,941.00	59.50	266.89	6,741.49	-844.87	-159.64	322.32	10.94
6,989.00	65.09	267.10	6,763.79	-847.09	-202.06	364.35	11.65
7,036.00	69.08	267.19	6,782.09	-849.25	-245.29	407.16	8.49
7,084.00	75.01	266.79	6,796.88	-851.65	-290.87	452.33	12.38
7,131.00	78.65	267.37	6,807.59	-853.98	-336.57	497.59	7.84
7,179.00	81.44	267.76	6,815.89	-855.98	-383.80	544.30	5.87
7,198.00	83.61	268.07	6,818.36	-856.67	-402.62	562.89	11.54
7,266.00	87.26	270.35	6,823.77	-857.60	-470.38	629.52	6.32
7,361.00	86.92	268.87	6,828.59	-858.24	-565.26	722.67	1.60
7,455.00	88.52	268.77	6,832.33	-860.18	-659.16	815.13	1.71
7,549.00	90.34	269.34	6,833.27	-861.73	-753.14	907.59	2.03
7,644.00	91.51	269.26	6,831.73	-862.89	-848.11	1,000.95	1.23
7,738.00	91.29	268.93	6,829.44	-864.37	-942.07	1,093.37	0.42
7,833.00	90.71	269.09	6,827.78	-866.01	-1,037.05	1,186.82	0.63
7,927.00	90.28	268.30	6,826.97	-868.16	-1,131.02	1,279.38	0.96
8,022.00	91.08	267.44	6,825.84	-871.69	-1,225.94	1,373.15	1.24
8,117.00	90.06	269.05	6,824.89	-874.60	-1,320.89	1,466.83	2.01
8,211.00	90.34	268.95	6,824.57	-876.24	-1,414.87	1,559.31	0.32
8,306.00	89.20	269.65	6,824.95	-877.40	-1,509.86	1,652.68	1.41
8,401.00	90.15	269.43	6,825.49	-878.16	-1,604.86	1,745.97	1.03
8,496.00	90.52	268.51	6,824.93	-879.87	-1,699.84	1,839.44	1.04
8,590.00	92.47	268.17	6,822.48	-882.59	-1,793.76	1,932.08	2.11
8,685.00	89.72	269.40	6,820.66	-884.60	-1,888.71	2,025.58	3.17
8,779.00	88.77	267.55	6,821.90	-887.10	-1,982.67	2,118.19	2.21
8,874.00	89.72	267.96	6,823.15	-890.82	-2,077.59	2,212.00	1.09
8,969.00	88.86	268.61	6,824.33	-893.67	-2,172.53	2,305.66	1.13
9,064.00	87.19	269.89	6,827.60	-894.91	-2,267.46	2,398.99	2.21

Design Report for Reliance E23-62-1HN - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
9,159.00	86.64	270.24	6,832.72	-894.80	-2,362.33	2,491.98	0.69
9,254.00	86.76	270.07	6,838.19	-894.55	-2,457.17	2,584.93	0.22
9,348.00	88.40	269.86	6,842.15	-894.60	-2,551.08	2,677.03	1.76
9,443.00	87.13	270.70	6,845.86	-894.14	-2,646.00	2,770.02	1.60
9,538.00	88.18	271.97	6,849.75	-891.93	-2,740.90	2,862.63	1.73
9,633.00	89.14	272.68	6,851.97	-888.08	-2,835.79	2,954.92	1.26
9,727.00	91.54	271.77	6,851.41	-884.43	-2,929.71	3,046.30	2.73
9,822.00	91.88	271.31	6,848.58	-881.87	-3,024.63	3,138.88	0.60
9,917.00	91.73	270.14	6,845.58	-880.67	-3,119.58	3,231.74	1.24
10,012.00	91.91	269.52	6,842.57	-880.95	-3,214.53	3,324.90	0.68
10,106.00	89.48	269.28	6,841.43	-881.94	-3,308.51	3,417.25	2.60
10,201.00	88.83	269.63	6,842.83	-882.84	-3,403.49	3,510.56	0.78
10,296.00	88.03	270.55	6,845.43	-882.69	-3,498.46	3,603.65	1.28
10,390.00	89.69	270.61	6,847.30	-881.74	-3,592.43	3,695.61	1.77
10,485.00	89.35	271.02	6,848.10	-880.39	-3,687.42	3,788.48	0.56
10,580.00	89.11	270.91	6,849.37	-878.79	-3,782.39	3,881.30	0.28
10,675.00	88.43	271.04	6,851.41	-877.17	-3,877.36	3,974.10	0.73
10,770.00	88.68	268.61	6,853.81	-877.46	-3,972.32	4,067.27	2.57
10,864.00	90.37	268.44	6,854.59	-879.88	-4,066.28	4,159.88	1.81
10,959.00	90.52	268.26	6,853.85	-882.62	-4,161.24	4,253.53	0.25
11,054.00	89.29	268.34	6,854.01	-885.44	-4,256.20	4,347.20	1.30
11,148.00	88.43	268.80	6,855.88	-887.78	-4,350.15	4,439.78	1.04
11,231.00	88.77	269.27	6,857.90	-889.18	-4,433.11	4,521.40	0.70
Last MWD Survey at 11231' MD							
11,296.00	88.77	269.27	6,859.30	-890.01	-4,498.09	4,585.28	0.00
Stright Projction to Bit at 11296' MD							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
285.00	284.99	-1.44	0.39	First Gyro Survey
600.00	599.97	-5.22	1.07	Last Gyro Survey
900.00	899.95	-7.52	3.46	First MWD Survey
11,231.00	6,857.90	-889.18	-4,433.11	Last MWD Survey at 11231' MD
11,296.00	6,859.30	-890.01	-4,498.09	Stright Projction to Bit at 11296' MD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	+N/-S (usft)	+E/-W (usft)	Start TVD (usft)
Target	Reliance E23-62-1HN_BHL	258.68	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
285.00	600.00	Gyro Surveys	Flexi-Shot
900.00	7,198.00	Intermediate Surveys	MWD
7,266.00	11,296.00	Production Surveys	MWD

Design Report for Reliance E23-62-1HN - Actual Surveys

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
838.00	837.95	9 5/8"	9-5/8	13-3/4
7,242.00	6,822.35	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
Reliance E23-62-1HN_	0.00	0.00	6,815.50	-850.09	-462.70	1,413,485.11	3,243,891.75	40.465109	-104.623443
- hit/miss target									
- actual wellpath misses target center by 10.90usft at 7257.58usft MD (6823.33 TVD, -857.63 N, -461.97 E)									
- Point									
Reliance E23-62-1HN_	0.00	0.00	6,853.04	-900.31	-4,499.00	1,413,434.89	3,239,855.59	40.465080	-104.637950
- actual wellpath misses target center by 12.09usft at 11296.00usft MD (6859.30 TVD, -890.01 N, -4498.09 E)									
- Point									

Directional Difficulty Index

Average Dogleg over Survey:	1.86 °/100usft	Maximum Dogleg over Survey:	13.51 °/100usft at 6,422.00 usft
Net Tortousity applicable to Plans:	0.94 °/100usft	Directional Difficulty Index:	6.279

Audit Info

North Reference Sheet for Sec. 23-T6N-R65W (Reliance E23) - Reliance E23-62-1HN - 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 @ 4724.00usft (HP 321). Northing and Easting are relative to Reliance E23-62-1HN

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: 0.99996398

Grid Coordinates of Well: 1,414,335.17 usft N, 3,244,354.43 usft E

Geographical Coordinates of Well: $40^\circ 28' 02.75''$ N, $104^\circ 37' 18.30''$ W

Grid Convergence at Surface is: 0.57°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,296.00usft the Bottom Hole Displacement is 4,585.29usft in the Direction of 258.81° (Grid).

Magnetic Convergence at surface is: -7.84° (14 January 2015, , BGGM2014)

