

Project: Weld County, CO (NAD 83)
Site: Sec. 14-T05N-R64W (Holman Pad)
Well: HOLMAN B15-65HNM
Wellbore: Plan B
Design: Actual Surveys

Noble Energy



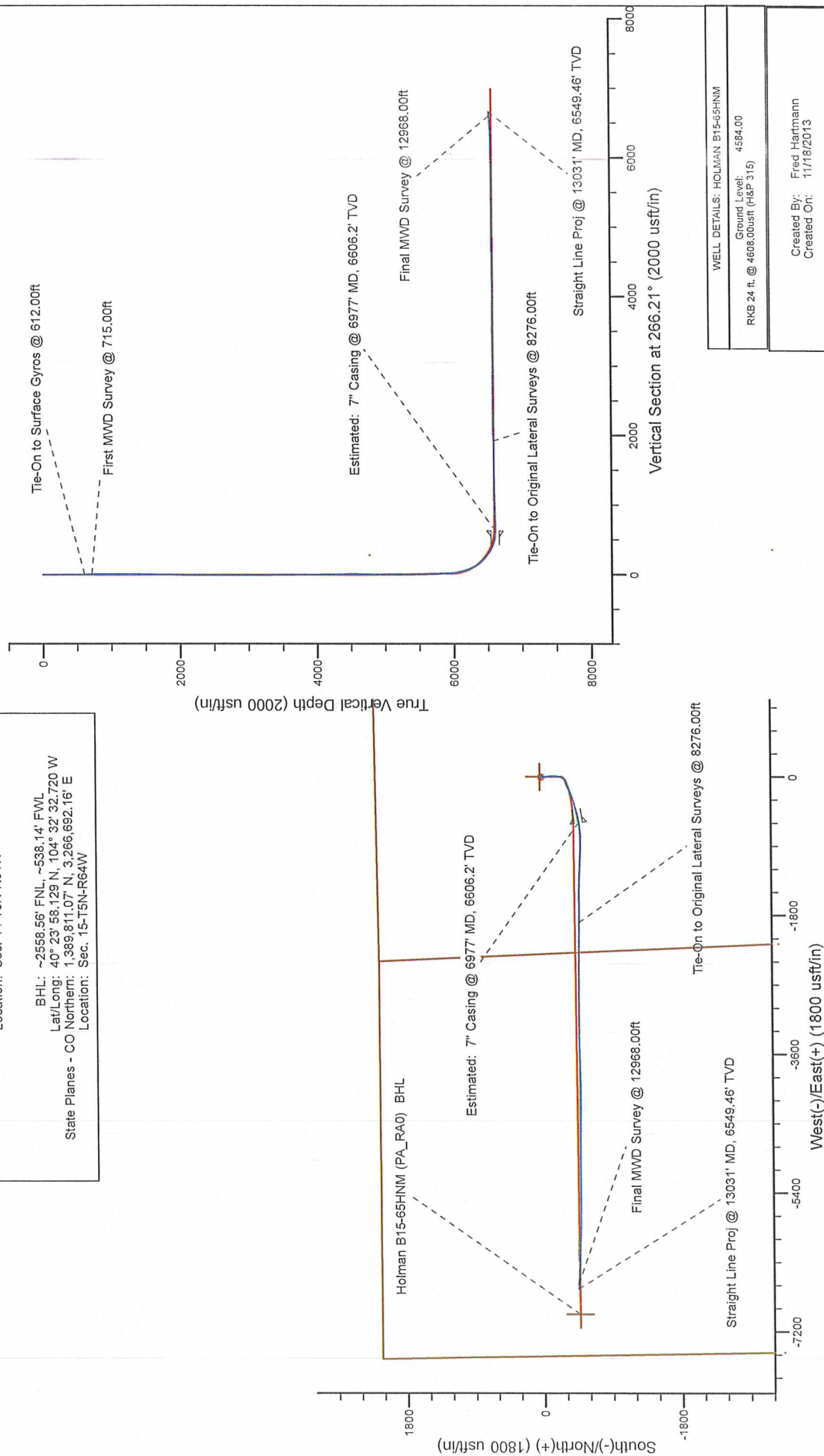
Platted SHL: 2186' FNL, 2297' FWL
Platted Lat/Long: 40.40050° N, 104.51854° W
Location: Sec. 14-T5N-R64W

7" Casing: ~2592.42' FSL, ~1677.49' FWL
Lat/Long: 40° 23' 57.016" N, 104° 31' 14.537" W
State Planes - CO Northern: 1,389,764.50' N, 3,272,741.69' E
Location: Sec. 14-T5N-R64W

BHL: ~2558.56' FNL, ~538.14' FWL
Lat/Long: 40° 23' 58.129" N, 104° 32' 32.720" W
State Planes - CO Northern: 1,389,811.07' N, 3,266,692.16' E
Location: Sec. 15-T5N-R64W

LEGEND

- HOLMAN B15-65HNM, Plan B, Rev B0 - PROPOSAL V0
- HOLMAN B15-65HNM, Plan A, Rev A0 Proposal V0
- Actual Surveys



Noble Energy

Weld County, CO (NAD 83)

Sec. 14-T05N-R64W (Holman Pad)

HOLMAN B15-65HNM

Design: Actual Surveys

Sperry Drilling Services

Final Survey Report

18 November, 2013

Surface UWI : 900697468

Well Coordinates: 1,390,255.22 N, 3,273,339.18 E (40° 24' 01.80" N, 104° 31' 06.74" W)

Ground Level: 4,584.00 usft

Local Coordinate Origin:

Viewing Datum:

TVDs to System:

North Reference:

Unit System:

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

Centered on Well HOLMAN B15-65HNM

RKB 24 ft. @ 4608.00usft (H&P 315)

N

Grid

API - US Survey Feet - Custom

HALLIBURTON

Design Report for HOLMAN B15-65HNM - 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
304.00	0.50	222.23	304.00	-0.98	-0.89	0.95	0.16
612.00	0.50	268.53	611.99	-2.01	-3.14	3.26	0.13
Tie-On to Surface Gyros @ 612.00ft							
715.00	0.54	308.98	714.98	-1.72	-3.96	4.07	0.35
First MWD Survey @ 715.00ft							
900.00	0.74	271.88	899.97	-1.13	-5.84	5.90	0.24
993.00	0.58	255.72	992.96	-1.23	-6.89	6.96	0.26
1,086.00	0.16	131.80	1,085.96	-1.43	-7.25	7.33	0.73
1,178.00	0.48	22.33	1,177.96	-1.16	-7.01	7.07	0.60
1,271.00	0.94	310.80	1,270.96	-0.30	-7.44	7.44	0.98
1,363.00	0.35	81.95	1,362.95	0.23	-7.73	7.70	1.30
1,456.00	0.44	273.14	1,455.95	0.29	-7.81	7.77	0.85
1,551.00	1.70	138.01	1,550.94	-0.74	-7.23	7.26	2.14
1,646.00	1.44	138.65	1,645.90	-2.68	-5.50	5.66	0.27
1,741.00	2.14	141.40	1,740.86	-4.96	-3.60	3.92	0.74
1,836.00	2.44	145.35	1,835.78	-8.01	-1.35	1.87	0.36
1,931.00	1.81	109.92	1,930.72	-10.19	1.21	-0.54	1.50
2,026.00	1.45	43.77	2,025.69	-9.83	3.46	-2.80	1.90
2,310.00	0.77	350.16	2,309.64	-5.35	5.62	-5.25	0.41
2,595.00	1.16	39.82	2,594.60	-1.25	7.14	-7.04	0.31
2,880.00	1.38	314.99	2,879.55	3.39	6.56	-6.77	0.60
3,164.00	1.28	212.56	3,163.51	3.14	2.43	-2.63	0.73
3,449.00	1.51	159.63	3,448.43	-3.07	2.02	-1.82	0.44
3,734.00	2.20	179.46	3,733.29	-12.06	3.38	-2.58	0.33
4,019.00	2.87	201.36	4,018.01	-24.17	0.84	0.77	0.41
4,304.00	1.87	210.46	4,302.77	-34.83	-4.12	6.42	0.37
4,399.00	1.33	210.20	4,397.73	-37.12	-5.46	7.90	0.57
4,494.00	2.82	176.96	4,492.67	-40.40	-5.89	8.55	1.95
4,589.00	3.93	169.72	4,587.50	-45.94	-5.19	8.21	1.25
4,684.00	5.27	169.66	4,682.19	-53.44	-3.82	7.35	1.41
4,779.00	6.49	164.48	4,776.69	-62.90	-1.60	5.76	1.40
4,874.00	7.61	171.83	4,870.97	-74.30	0.73	4.19	1.51
4,969.00	8.71	171.35	4,965.01	-87.64	2.70	3.10	1.16
5,063.00	8.33	171.68	5,057.97	-101.41	4.76	1.96	0.41
5,158.00	8.91	170.91	5,151.90	-115.49	6.92	0.74	0.62
5,253.00	9.46	179.33	5,245.69	-130.56	8.17	0.48	1.53
5,348.00	9.11	175.14	5,339.44	-145.86	8.90	0.77	0.80
5,443.00	9.44	178.69	5,433.20	-161.14	9.71	0.97	0.70
5,538.00	10.74	189.81	5,526.74	-177.66	8.38	3.39	2.46
5,633.00	11.08	191.55	5,620.02	-195.32	5.05	7.88	0.50
5,728.00	12.11	190.87	5,713.08	-214.05	1.34	12.82	1.09
5,822.00	12.43	186.21	5,804.94	-233.79	-1.61	17.07	1.11
5,916.00	12.58	187.39	5,896.71	-254.00	-4.02	20.82	0.32
5,942.00	12.38	189.22	5,922.09	-259.56	-4.83	21.99	1.70
6,057.00	14.04	215.62	6,034.15	-283.09	-14.94	33.64	5.39
6,104.00	17.33	217.02	6,079.39	-293.32	-22.48	41.83	7.05
6,152.00	17.37	230.97	6,125.23	-303.54	-32.36	52.36	8.65
6,199.00	18.71	246.37	6,169.94	-310.99	-44.72	65.19	10.51
6,247.00	22.30	253.03	6,214.90	-316.73	-60.49	81.31	8.91

Design Report for HOLMAN B15-65HNM - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
6,294.00	25.75	250.01	6,257.82	-322.83	-78.62	99.80	7.79
6,342.00	29.58	248.14	6,300.33	-330.81	-99.42	121.09	8.18
6,389.00	34.61	247.74	6,340.13	-340.19	-122.56	144.79	10.71
6,437.00	39.99	246.51	6,378.30	-351.51	-149.34	172.26	11.31
6,484.00	45.05	243.79	6,412.93	-364.88	-178.13	201.88	11.45
6,532.00	49.60	244.79	6,445.46	-380.18	-209.92	234.61	9.60
6,579.00	52.90	248.65	6,474.88	-394.63	-243.59	269.16	9.50
6,627.00	55.47	252.02	6,502.97	-407.71	-280.24	306.59	7.81
6,673.00	59.17	253.88	6,527.81	-419.05	-317.25	344.27	8.73
6,721.00	63.76	254.47	6,550.73	-430.54	-357.81	385.50	9.62
6,768.00	67.83	253.99	6,570.00	-442.19	-399.05	427.43	8.71
6,816.00	73.58	254.80	6,585.85	-454.36	-442.67	471.76	12.08
6,863.00	79.32	255.15	6,596.86	-466.20	-486.78	516.55	12.23
6,923.00	86.46	257.31	6,604.28	-480.36	-544.57	575.15	12.42
6,977.00	89.46	260.49	6,606.20	-490.74	-597.51	628.67	8.09
Estimated: 7" Casing @ 6977' MD, 6606.2' TVD							
7,006.00	91.08	262.19	6,606.06	-495.11	-626.18	657.56	8.09
7,069.00	92.00	263.72	6,604.37	-502.84	-688.68	720.43	2.83
7,164.00	91.82	269.36	6,601.20	-508.56	-783.42	815.34	5.94
7,259.00	90.86	270.86	6,598.98	-508.38	-878.39	910.09	1.87
7,354.00	89.97	272.40	6,598.29	-505.68	-973.34	1,004.66	1.87
7,446.00	90.83	273.13	6,597.65	-501.24	-1,065.23	1,096.05	1.23
7,539.00	91.72	273.04	6,595.58	-496.24	-1,158.07	1,188.36	0.96
7,632.00	91.42	272.04	6,593.03	-492.12	-1,250.94	1,280.76	1.12
7,725.00	90.65	271.84	6,591.35	-488.97	-1,343.87	1,373.28	0.86
7,817.00	90.34	271.46	6,590.56	-486.32	-1,435.83	1,464.86	0.53
7,909.00	90.59	271.05	6,589.81	-484.31	-1,527.81	1,556.50	0.52
8,001.00	90.18	269.67	6,589.19	-483.73	-1,619.80	1,648.25	1.56
8,094.00	90.46	268.98	6,588.67	-484.82	-1,712.79	1,741.11	0.80
8,186.00	90.71	270.44	6,587.73	-485.29	-1,804.78	1,832.93	1.61
8,276.00	92.22	271.06	6,585.43	-484.11	-1,894.74	1,922.62	1.81
Tie-On to Original Lateral Surveys @ 8276.00ft							
8,337.00	93.80	272.62	6,582.23	-482.16	-1,955.62	1,983.24	3.64
8,429.00	92.90	271.65	6,576.85	-478.73	-2,047.40	2,074.58	1.44
8,521.00	89.51	271.10	6,574.92	-476.53	-2,139.34	2,166.18	3.73
8,613.00	89.48	271.04	6,575.73	-474.81	-2,231.32	2,257.84	0.07
8,706.00	89.14	270.84	6,576.85	-473.28	-2,324.30	2,350.52	0.42
8,798.00	89.11	271.05	6,578.26	-471.77	-2,416.28	2,442.19	0.23
8,891.00	89.29	271.03	6,579.55	-470.08	-2,509.25	2,534.85	0.19
8,983.00	89.60	269.99	6,580.45	-469.26	-2,601.24	2,626.59	1.18
9,078.00	89.60	269.63	6,581.11	-469.58	-2,696.24	2,721.40	0.38
9,173.00	89.75	269.74	6,581.65	-470.10	-2,791.24	2,816.22	0.20
9,268.00	90.28	270.42	6,581.62	-469.97	-2,886.24	2,911.00	0.91
9,363.00	90.28	270.55	6,581.16	-469.16	-2,981.23	3,005.74	0.14
9,458.00	90.22	269.32	6,580.74	-469.27	-3,076.23	3,100.53	1.30
9,553.00	90.37	269.25	6,580.25	-470.45	-3,171.22	3,195.40	0.17
9,648.00	90.89	269.45	6,579.21	-471.53	-3,266.21	3,290.25	0.59
9,743.00	91.51	269.54	6,577.22	-472.37	-3,361.18	3,385.07	0.66
9,838.00	89.60	268.46	6,576.30	-474.03	-3,456.16	3,479.95	2.31
9,932.00	90.06	268.50	6,576.58	-476.52	-3,550.13	3,573.87	0.49
10,027.00	90.43	268.60	6,576.17	-478.92	-3,645.09	3,668.79	0.40

Design Report for HOLMAN B15-65HNM - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
10,122.00	89.01	268.24	6,576.64	-481.54	-3,740.05	3,763.72	1.54
10,217.00	89.54	268.10	6,577.84	-484.58	-3,835.00	3,858.65	0.58
10,312.00	89.38	268.51	6,578.73	-487.39	-3,929.95	3,953.58	0.46
10,407.00	89.41	269.38	6,579.74	-489.14	-4,024.93	4,048.47	0.92
10,502.00	89.91	270.74	6,580.30	-489.04	-4,119.93	4,143.25	1.53
10,597.00	90.25	270.57	6,580.17	-487.95	-4,214.92	4,237.96	0.40
10,692.00	91.36	270.82	6,578.83	-486.80	-4,309.90	4,332.66	1.20
10,787.00	90.65	270.65	6,577.17	-485.58	-4,404.88	4,427.35	0.77
10,882.00	89.48	270.52	6,577.06	-484.61	-4,499.87	4,522.07	1.24
10,977.00	90.40	270.53	6,577.16	-483.74	-4,594.87	4,616.80	0.97
11,072.00	89.29	270.08	6,577.42	-483.23	-4,689.86	4,711.56	1.26
11,167.00	90.34	270.70	6,577.72	-482.59	-4,784.86	4,806.30	1.28
11,262.00	91.02	270.53	6,576.60	-481.57	-4,879.85	4,901.01	0.74
11,357.00	89.91	269.94	6,575.82	-481.18	-4,974.84	4,995.77	1.32
11,452.00	89.88	270.58	6,576.00	-480.75	-5,069.84	5,090.54	0.67
11,547.00	89.78	269.21	6,576.28	-480.92	-5,164.84	5,185.34	1.45
11,642.00	89.94	268.49	6,576.51	-482.83	-5,259.82	5,280.23	0.78
11,736.00	90.71	269.75	6,575.98	-484.27	-5,353.80	5,374.11	1.57
11,831.00	91.20	270.96	6,574.40	-483.68	-5,448.78	5,468.84	1.37
11,926.00	90.12	270.51	6,573.30	-482.46	-5,543.77	5,563.54	1.23
12,021.00	90.25	271.21	6,573.00	-481.04	-5,638.76	5,658.23	0.75
12,116.00	89.75	270.58	6,573.00	-479.55	-5,733.74	5,752.91	0.85
12,211.00	89.04	271.07	6,574.00	-478.19	-5,828.73	5,847.59	0.91
12,306.00	90.22	271.79	6,574.61	-475.82	-5,923.69	5,942.19	1.46
12,401.00	89.48	272.21	6,574.86	-472.50	-6,018.63	6,036.71	0.90
12,495.00	90.86	272.83	6,574.58	-468.37	-6,112.54	6,130.13	1.61
12,590.00	91.02	271.88	6,573.02	-464.46	-6,207.45	6,224.57	1.01
12,685.00	92.10	272.59	6,570.44	-460.76	-6,302.34	6,319.01	1.36
12,780.00	93.05	272.53	6,566.17	-456.52	-6,397.14	6,413.33	1.00
12,875.00	93.98	272.86	6,560.34	-452.06	-6,491.86	6,507.54	1.04
12,968.00	94.01	272.93	6,553.87	-447.38	-6,584.52	6,599.69	0.08
Final MWD Survey @ 12968.00ft							
13,031.00	94.01	272.93	6,549.46	-444.17	-6,647.28	6,662.10	0.00
Straight Line Proj @ 13031' MD, 6549.46' TVD							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
612.00	611.99	-2.01	-3.14	Tie-On to Surface Gyros @ 612.00ft
715.00	714.98	-1.72	-3.96	First MWD Survey @ 715.00ft
8,276.00	6,585.43	-484.11	-1,894.74	Tie-On to Original Lateral Surveys @ 8276.00ft
12,968.00	6,553.87	-447.38	-6,584.52	Final MWD Survey @ 12968.00ft
13,031.00	6,549.46	-444.17	-6,647.28	Straight Line Proj @ 13031' MD, 6549.46' TVD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/-S (usft)	Origin +E/-W (usft)	Start TVD (usft)
Target	Holman B15-65HNM (PA_RA0) BHL	266.21	Slot	0.00	0.00	0.00

Design Report for HOLMAN B15-65HNM - Actual Surveys

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
304.00	612.00	Surface Gyros	Flexi-Shot
715.00	6,768.00	MWD Surveys - Vert/Build	MWD+IFR1+MS_WY
6,768.00	6,923.00	MWD Surveys - Build	MWD+IFR1
7,006.00	8,276.00	MWD Surveys - Lateral	MWD+IFR1+MS_WY
8,337.00	12,968.00	MWD Surveys - Lateral - re-entry	MWD+IFR1+MS_WY

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
6,977.00	6,606.20	Estimated: 7" Casing @ 6977' MD, 6606.2' TVD	7	8-3/4

Wellbore Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
Holman B15 (SEC 15 I	0.00	0.00	0.00	21.86	-0.24	1,390,277.08	3,273,338.94	40° 24' 2.016 N	104° 31' 6.744 W
- actual wellpath misses target center by 21.86usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				0.00	-2,700.13	-7,006.94	1,387,577.67	3,266,332.04	
Point 2				0.00	-2,657.01	-2,620.64	1,387,620.41	3,270,718.17	
Point 3				0.00	1,663.19	-2,853.64	1,391,940.45	3,270,485.55	
Point 4				0.00	1,650.82	-7,094.31	1,391,928.45	3,266,245.05	
Holman B15 (SEC 14 I	0.00	0.00	0.00	21.86	-0.24	1,390,277.08	3,273,338.94	40° 24' 2.016 N	104° 31' 6.744 W
- actual wellpath misses target center by 21.86usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				0.00	-2,657.01	-1,700.64	1,387,620.33	3,271,638.13	
Point 2				0.00	-2,618.57	2,490.72	1,387,658.40	3,275,829.33	
Point 3				0.00	1,739.78	2,414.96	1,392,016.58	3,275,753.95	
Point 4				0.00	1,663.19	-1,933.64	1,391,940.37	3,271,405.52	
Holman B15 (SEC 14 I	0.00	0.00	0.00	21.86	-0.24	1,390,277.08	3,273,338.94	40° 24' 2.016 N	104° 31' 6.744 W
- actual wellpath misses target center by 21.86usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				0.00	-3,117.01	-2,160.64	1,387,160.38	3,271,178.11	
Point 2				0.00	-3,078.57	2,950.72	1,387,198.38	3,276,289.27	
Point 3				0.00	2,199.78	2,874.96	1,392,476.52	3,276,213.97	
Point 4				0.00	2,123.19	-2,393.64	1,392,400.40	3,270,945.58	
Holman B15 (SEC 15 I	0.00	0.00	0.00	21.86	-0.24	1,390,277.08	3,273,338.94	40° 24' 2.016 N	104° 31' 6.744 W
- actual wellpath misses target center by 21.86usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				0.00	-3,160.13	-7,466.94	1,387,117.73	3,265,872.02	
Point 2				0.00	-3,117.01	-2,160.64	1,387,160.38	3,271,178.11	
Point 3				0.00	2,123.19	-2,393.64	1,392,400.40	3,270,945.58	
Point 4				0.00	2,110.82	-7,554.31	1,392,388.48	3,265,785.11	
Holman B15-65HNM (I	0.00	0.00	6,580.00	-462.41	-6,975.11	1,389,792.83	3,266,364.34	40° 23' 57.984 N	104° 32' 36.960 W
- actual wellpath misses target center by 329.76usft at 13031.00usft MD (6549.46 TVD, -444.17 N, -6647.28 E)									
- Point									

Directional Difficulty Index

Average Dogleg over Survey:	1.59 °/100usft	Maximum Dogleg over Survey:	12.42 °/100usft at 6,923.00 usft
Net Tortousity applicable to Plans:	0.35 °/100usft	Directional Difficulty Index:	6.457

Design Report for HOLMAN B15-65HNM - Actual Surveys

Audit Info

**North Reference Sheet for Sec. 14-T05N-R64W (Holman Pad) - HOLMAN
B15-65HNM**

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

Vertical Depths are relative to RKB 24 ft. @ 4608.00usft (H&P 315). Northing and Easting are relative to HOLMAN B15-65HNM

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° 30' 0.000 W°, Longitude Origin: 0° 0' 0.000 E°, Latitude Origin: 40° 47' 0.000 N°

False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99996025

Grid Coordinates of Well: 1,390,255.22 usft N, 3,273,339.18 usft E

Geographical Coordinates of Well: 40° 24' 01.80" N, 104° 31' 06.74" W

Grid Convergence at Surface is: 0.63°

Based upon Minimum Curvature type calculations, at a Measured Depth of 13,031.00usft
the Bottom Hole Displacement is 6,662.10usft in the Direction of 266.18° (Grid).

Magnetic Convergence at surface is: -7.81° (6 November 2013, , BGGM2013)

