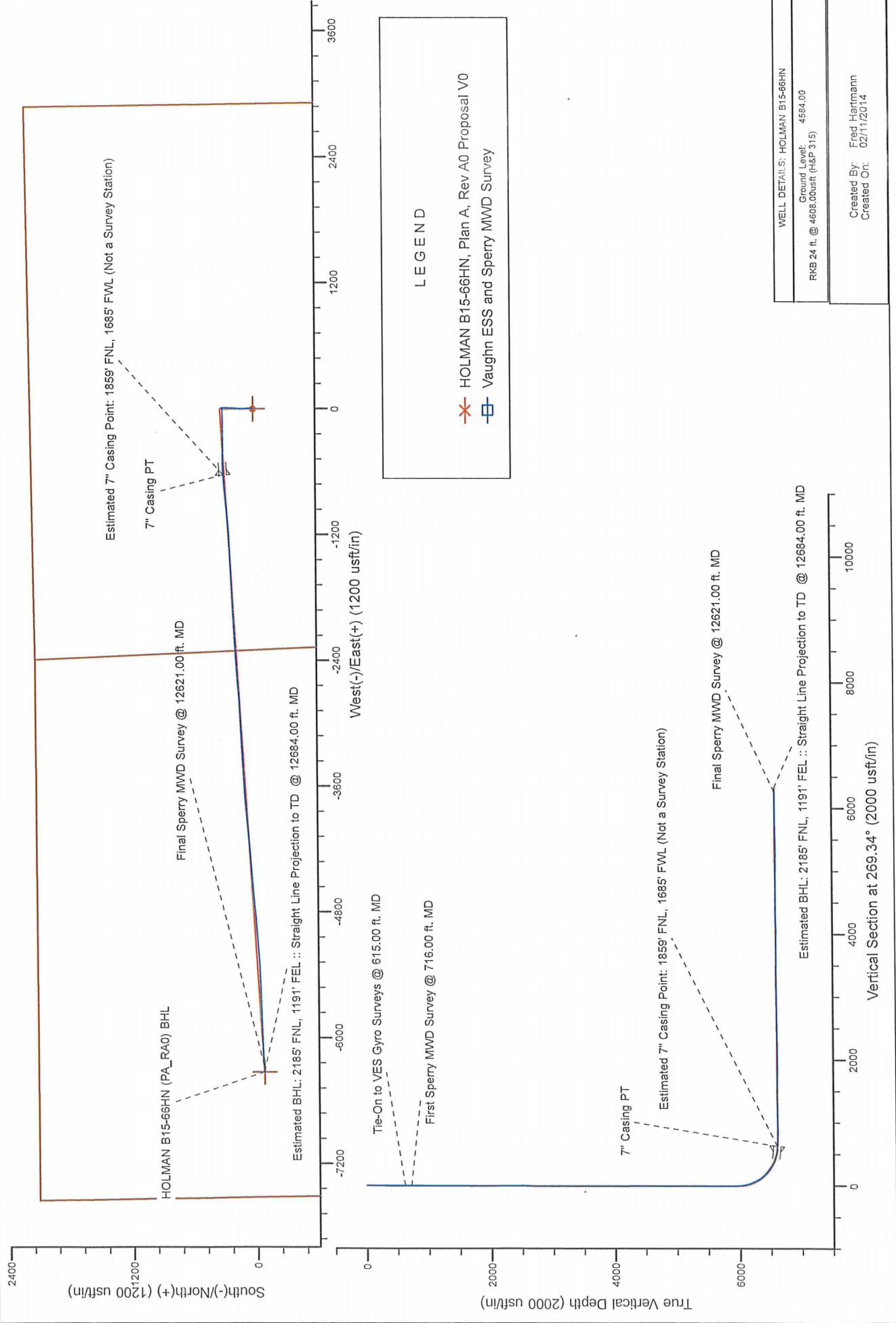


Project: Weld County, CO (NAD 83)
 Site: Sec. 14-T05N-R64W (Holman Pad)
 Well: HOLMAN B15-66HN
 Wellbore: Plan A
 Design: Vaughn ESS and Sperry MWD Survey

Noble Energy



Noble Energy

Weld County, CO (NAD 83)

Sec. 14-T05N-R64W (Holman Pad)

HOLMAN B15-66HN

Design: Vaughn ESS and Sperry MWD Survey

Sperry Drilling Services

Final Survey Report

11 February, 2014

Well Coordinates: 1,390,277.08 N, 3,273,338.94 E (40° 24' 02.02" 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 B15-66HN

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

N

Grid

Dec-Deg - API - US Survey Feet - Custom

HALLIBURTON

Design Report for HOLMAN B15-66HN - Vaughn ESS and Sperry MWD Survey

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
330.00	0.30	29.23	330.00	0.75	0.42	-0.43	0.09
615.00	0.30	276.53	615.00	1.49	0.04	-0.06	0.18
Tie-On to VES Gyro Surveys @ 615.00 ft. MD							
716.00	0.36	299.67	715.99	1.68	-0.49	0.47	0.14
First Sperry MWD Survey @ 716.00 ft. MD							
808.00	0.64	17.82	807.99	2.31	-0.59	0.56	0.72
900.00	0.50	351.30	899.99	3.20	-0.49	0.45	0.32
994.00	0.61	354.55	993.98	4.10	-0.60	0.55	0.12
1,087.00	0.53	49.19	1,086.98	4.87	-0.32	0.27	0.57
1,179.00	0.69	350.06	1,178.97	5.70	-0.10	0.03	0.67
1,273.00	0.47	43.37	1,272.97	6.53	0.07	-0.15	0.59
1,366.00	0.55	31.79	1,365.97	7.19	0.57	-0.65	0.14
1,460.00	0.42	9.73	1,459.96	7.91	0.86	-0.96	0.24
1,555.00	1.64	27.69	1,554.95	9.46	1.56	-1.66	1.31
1,650.00	3.40	23.10	1,649.85	13.26	3.29	-3.44	1.86
1,745.00	4.14	7.19	1,744.65	19.25	4.83	-5.05	1.34
1,840.00	6.05	357.57	1,839.27	27.65	5.04	-5.36	2.20
1,935.00	7.12	353.50	1,933.64	38.51	4.16	-4.61	1.23
2,030.00	9.10	356.82	2,027.69	51.86	3.08	-3.68	2.14
2,125.00	10.12	352.96	2,121.35	67.64	1.64	-2.42	1.27
2,219.00	9.89	356.17	2,213.93	83.89	0.09	-1.06	0.64
2,314.00	11.96	1.44	2,307.20	101.88	-0.21	-0.97	2.42
2,409.00	10.77	358.39	2,400.34	120.59	-0.21	-1.18	1.40
2,504.00	11.83	2.29	2,493.50	139.19	-0.07	-1.53	1.37
2,599.00	13.71	6.66	2,586.14	160.11	1.63	-3.47	2.22
2,694.00	13.86	6.17	2,678.41	182.60	4.15	-6.26	0.20
2,789.00	12.23	4.04	2,770.95	203.96	6.09	-8.43	1.79
2,884.00	11.48	1.84	2,863.93	223.44	7.10	-9.67	0.92
2,979.00	9.65	358.78	2,957.31	240.85	7.23	-10.01	2.01
3,074.00	8.52	358.41	3,051.12	255.85	6.87	-9.81	1.19
3,169.00	6.33	0.53	3,145.32	268.12	6.72	-9.81	2.32
3,264.00	4.79	358.84	3,239.87	277.32	6.69	-9.88	1.63
3,359.00	3.89	357.41	3,334.59	284.51	6.46	-9.74	0.95
3,454.00	3.69	357.59	3,429.39	290.78	6.19	-9.54	0.21
3,549.00	2.51	13.08	3,524.25	295.86	6.53	-9.94	1.51
3,644.00	1.50	346.40	3,619.19	299.10	6.71	-10.15	1.42
3,739.00	0.94	19.08	3,714.17	301.04	6.67	-10.14	0.92
4,023.00	0.44	294.28	3,998.15	303.69	6.44	-9.94	0.35
4,308.00	1.54	271.33	4,283.11	304.23	1.61	-5.12	0.40
4,593.00	0.37	147.66	4,568.08	303.54	-1.72	-1.77	0.62
4,878.00	0.97	161.16	4,853.05	300.48	-0.45	-3.01	0.22
5,163.00	0.22	14.95	5,138.04	298.73	0.47	-3.91	0.41
5,447.00	0.82	141.93	5,422.03	297.66	1.86	-5.29	0.34
5,732.00	0.62	327.58	5,707.03	297.35	2.29	-5.72	0.50
5,920.00	0.93	110.59	5,895.02	297.67	3.18	-6.60	0.78
5,941.00	0.87	83.47	5,916.02	297.63	3.49	-6.92	2.03
6,061.00	8.36	263.61	6,035.63	296.76	-4.29	0.87	7.69
6,108.00	13.19	269.55	6,081.79	296.34	-13.05	9.64	10.53
6,156.00	17.17	271.46	6,128.11	296.48	-25.61	22.20	8.36

Design Report for HOLMAN B15-66HN - Vaughn ESS and Sperry MWD Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
6,203.00	20.53	272.24	6,172.58	296.98	-40.79	37.37	7.17
6,251.00	23.96	269.52	6,217.00	297.22	-58.95	55.52	7.46
6,298.00	27.48	266.27	6,259.34	296.44	-79.32	75.90	8.07
6,346.00	32.29	267.30	6,300.95	295.11	-103.19	99.79	10.08
6,392.00	37.48	270.50	6,338.67	294.66	-129.48	126.08	11.96
6,440.00	43.30	271.04	6,375.21	295.08	-160.57	157.16	12.15
6,487.00	47.56	270.75	6,408.19	295.60	-194.04	190.62	9.07
6,535.00	51.32	269.78	6,439.40	295.76	-230.50	227.08	7.98
6,582.00	52.97	268.93	6,468.24	295.34	-267.60	264.19	3.79
6,630.00	55.25	269.13	6,496.37	294.68	-306.48	303.07	4.76
6,677.00	61.14	269.93	6,521.13	294.37	-346.41	342.99	12.61
6,725.00	67.47	270.46	6,541.94	294.52	-389.64	386.22	13.22
6,772.00	71.15	270.74	6,558.54	294.98	-433.60	430.17	7.85
6,820.00	75.10	270.75	6,572.47	295.58	-479.52	476.08	8.23
6,867.00	78.26	269.75	6,583.30	295.77	-525.25	521.80	7.03
6,925.00	82.49	267.15	6,592.99	294.22	-582.39	578.96	8.53
6,975.00	84.66	266.27	6,598.59	291.37	-631.99	628.59	4.68
Estimated 7" Casing Point: 1859' FNL, 1685' FWL (Not a Survey Station) - 7" Casing PT							
7,064.00	88.52	264.71	6,603.88	284.38	-720.54	717.21	4.68
7,156.00	89.35	264.70	6,605.59	275.89	-812.13	808.90	0.90
7,249.00	90.43	263.79	6,605.77	266.56	-904.66	901.53	1.52
7,341.00	91.11	264.64	6,604.54	257.29	-996.18	993.15	1.18
7,433.00	91.02	264.93	6,602.83	248.93	-1,087.78	1,084.84	0.33
7,526.00	91.26	267.39	6,600.98	242.70	-1,180.55	1,177.67	2.66
7,618.00	91.51	267.05	6,598.75	238.24	-1,272.41	1,269.58	0.46
7,710.00	90.49	267.72	6,597.15	234.05	-1,364.30	1,361.52	1.33
7,804.00	88.77	267.16	6,597.75	229.85	-1,458.20	1,455.46	1.92
7,897.00	89.29	267.07	6,599.33	225.17	-1,551.07	1,548.37	0.57
7,989.00	88.80	267.44	6,600.86	220.76	-1,642.95	1,640.30	0.67
8,083.00	89.78	267.24	6,602.03	216.40	-1,736.84	1,734.23	1.06
8,177.00	89.17	267.16	6,602.89	211.81	-1,830.72	1,828.16	0.65
8,270.00	89.60	267.27	6,603.89	207.29	-1,923.61	1,921.09	0.48
8,363.00	90.43	267.27	6,603.86	202.86	-2,016.50	2,014.03	0.89
8,458.00	89.88	266.64	6,603.60	197.81	-2,111.37	2,108.95	0.88
8,553.00	90.68	266.47	6,603.14	192.11	-2,206.19	2,203.84	0.86
8,645.00	89.57	266.69	6,602.94	186.62	-2,298.03	2,295.73	1.23
8,740.00	90.06	266.17	6,603.25	180.70	-2,392.84	2,390.60	0.75
8,835.00	90.43	265.47	6,602.84	173.78	-2,487.59	2,485.42	0.83
8,930.00	91.66	265.51	6,601.11	166.31	-2,582.28	2,580.19	1.30
9,024.00	90.58	265.09	6,599.27	158.61	-2,675.94	2,673.94	1.23
9,119.00	90.34	266.50	6,598.51	151.64	-2,770.68	2,768.75	1.51
9,214.00	91.60	266.48	6,596.90	145.83	-2,865.49	2,863.62	1.33
9,309.00	91.20	266.43	6,594.58	139.96	-2,960.28	2,958.47	0.42
9,404.00	90.46	268.53	6,593.20	135.78	-3,055.17	3,053.40	2.34
9,499.00	90.28	266.89	6,592.59	131.98	-3,150.09	3,148.36	1.74
9,594.00	90.46	267.04	6,591.97	126.95	-3,244.95	3,243.27	0.25
9,688.00	88.92	266.97	6,592.48	122.04	-3,338.82	3,337.19	1.64
9,783.00	90.15	267.73	6,593.25	117.65	-3,433.71	3,432.13	1.52
9,878.00	88.64	266.86	6,594.26	113.17	-3,528.60	3,527.06	1.83
9,973.00	89.48	266.68	6,595.82	107.82	-3,623.43	3,621.95	0.90
10,068.00	89.97	266.02	6,596.27	101.77	-3,718.24	3,716.82	0.87

Design Report for HOLMAN B15-66HN - Vaughn ESS and Sperry MWD Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
10,163.00	89.35	262.87	6,596.84	92.57	-3,812.78	3,811.46	3.38
10,258.00	90.37	265.59	6,597.07	83.02	-3,907.29	3,906.07	3.06
10,353.00	90.77	265.31	6,596.12	75.49	-4,001.98	4,000.85	0.51
10,447.00	91.39	264.79	6,594.35	67.38	-4,095.61	4,094.57	0.86
10,542.00	91.48	264.58	6,591.97	58.58	-4,190.18	4,189.22	0.24
10,637.00	90.37	265.48	6,590.44	50.35	-4,284.80	4,283.94	1.50
10,732.00	91.14	265.72	6,589.19	43.07	-4,379.51	4,378.73	0.85
10,827.00	90.43	266.15	6,587.88	36.33	-4,474.27	4,473.55	0.87
10,922.00	87.97	265.45	6,589.21	29.38	-4,568.99	4,568.35	2.69
11,017.00	89.44	264.82	6,591.36	21.32	-4,663.62	4,663.07	1.68
11,111.00	90.55	263.99	6,591.37	12.16	-4,757.17	4,756.72	1.47
11,206.00	90.06	265.25	6,590.86	3.25	-4,851.75	4,851.39	1.42
11,301.00	88.77	266.37	6,591.83	-3.69	-4,946.49	4,946.20	1.80
11,396.00	90.28	265.16	6,592.62	-10.71	-5,041.22	5,041.01	2.04
11,491.00	89.32	265.46	6,592.95	-18.47	-5,135.90	5,135.77	1.06
11,586.00	88.36	266.03	6,594.87	-25.52	-5,230.62	5,230.57	1.18
11,681.00	89.91	266.56	6,596.31	-31.66	-5,325.41	5,325.42	1.72
11,776.00	90.77	268.57	6,595.74	-35.69	-5,420.31	5,420.37	2.30
11,871.00	90.59	267.50	6,594.62	-38.95	-5,515.25	5,515.33	1.14
11,966.00	91.70	267.43	6,592.72	-43.15	-5,610.14	5,610.26	1.17
12,060.00	91.94	268.26	6,589.73	-46.69	-5,704.02	5,704.18	0.92
12,155.00	90.15	269.26	6,588.00	-48.74	-5,798.98	5,799.16	2.16
12,250.00	91.08	268.94	6,586.98	-50.23	-5,893.96	5,894.15	1.04
12,345.00	90.34	267.60	6,585.80	-53.10	-5,988.91	5,989.12	1.61
12,440.00	89.35	267.56	6,586.06	-57.11	-6,083.82	6,084.07	1.04
12,535.00	90.00	267.86	6,586.60	-60.91	-6,178.74	6,179.03	0.75
12,621.00	90.83	265.54	6,585.98	-65.86	-6,264.59	6,264.93	2.87
Final Sperry MWD Survey @ 12621.00 ft. MD							
12,684.00	90.83	265.54	6,585.06	-70.76	-6,327.39	6,327.79	0.00
Estimated BHL: 2185' FNL, 1191' FEL :: Straight Line Projection to TD @ 12684.00 ft. MD							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
615.00	615.00	1.49	0.04	Tie-On to VES Gyro Surveys @ 615.00 ft. MD
716.00	715.99	1.68	-0.49	First Sperry MWD Survey @ 716.00 ft. MD
6,975.00	6,598.59	291.37	-631.99	Estimated 7" Casing Point: 1859' FNL, 1685' FWL (Not a Survey Station)
12,621.00	6,585.98	-65.86	-6,264.59	Final Sperry MWD Survey @ 12621.00 ft. MD
12,684.00	6,585.06	-70.76	-6,327.39	Estimated BHL: 2185' FNL, 1191' FEL :: Straight Line Projection to TD @ 12684.00 ft. MD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/-S (usft)	+E/-W (usft)	
Target	HOLMAN B15-66HN (PA_RA0) BHL	269.34	Slot	0.00	0.00	0.00

Design Report for HOLMAN B15-66HN - Vaughn ESS and Sperry MWD Survey

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
330.00	615.00	Vaughn ESS Survey	Flexi-Shot
716.00	12,684.00	Sperry MWD Survey	MWD+IFR1+MS_WY
6,975.00	12,684.00	Sperry MWD Survey	MWD+IFR1+MS_WY

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
6,975.00	6,598.59	7" Casing PT	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 B15-66HN (;	0.00	0.00	0.00	0.00	0.00	1,390,277.08	3,273,338.94	40.400560	-104.518540
- actual wellpath hits target center									
- Point									
Holman B15 (SEC 15 I	0.00	0.00	0.00	0.00	0.00	1,390,277.08	3,273,338.94	40.400560	-104.518540
- actual wellpath hits target center									
- 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	1,391,928.46	3,266,245.05	
Holman B15 (SEC 14 I	0.00	0.00	0.00	0.00	0.00	1,390,277.08	3,273,338.94	40.400560	-104.518540
- actual wellpath hits target center									
- 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	0.00	0.00	1,390,277.08	3,273,338.94	40.400560	-104.518540
- actual wellpath hits target center									
- 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	0.00	0.00	1,390,277.08	3,273,338.94	40.400560	-104.518540
- actual wellpath hits target center									
- 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 B15-66HN (;	0.00	0.00	3,607.68	320.00	0.00	1,390,597.06	3,273,338.94	40.401438	-104.518527
- actual wellpath misses target center by 22.25usft at 3633.20usft MD (3608.39 TVD, 298.81 N, 6.77 E)									
- Point									
HOLMAN B15-66HN (I	0.00	0.00	6,585.91	-72.87	-6,327.54	1,390,204.22	3,267,011.65	40.400550	-104.541260
- actual wellpath misses target center by 2.28usft at 12684.00usft MD (6585.06 TVD, -70.76 N, -6327.39 E)									
- Point									
HOLMAN B15-66HN (I	0.00	0.00	6,602.70	281.93	-613.22	1,390,558.99	3,272,725.74	40.401352	-104.520730
- actual wellpath misses target center by 12.13usft at 6957.38usft MD (6596.83 TVD, 292.46 N, -614.49 E)									
- Point									

Design Report for HOLMAN B15-66HN - Vaughn ESS and Sperry MWD Survey

Directional Difficulty Index

Average Dogleg over Survey:	1.67 °/100usft	Maximum Dogleg over Survey:	13.22 °/100usft at 6,725.00 usft
Net Tortosity applicable to Plans:	0.76 °/100usft	Directional Difficulty Index:	6.434

Audit Info

North Reference Sheet for Sec. 14-T05N-R64W (Holman Pad) - HOLMAN B15-66HN

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 B15-66HN

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: 0.99996026

Grid Coordinates of Well: 1,390,277.08 usft N, 3,273,338.94 usft E

Geographical Coordinates of Well: 40° 24' 02.02" N, 104° 31' 06.74" W

Grid Convergence at Surface is: 0.63°

Based upon Minimum Curvature type calculations, at a Measured Depth of 12,684.00usft
the Bottom Hole Displacement is 6,327.79usft in the Direction of 269.36° (Grid).

Magnetic Convergence at surface is: -7.83° (22 August 2013, , BGGM2013)

