Noble Energy

Weld County, CO (NAD 83)
Sec. 27-T3N-R65W (Moser Pad)
Moser H34-717
05-123-40755
Plan A

Design: Actual Surveys

Sperry Drilling Services

Final Survey Report

30 November, 2015

Surface UWI : 05-123-40755

Well Coordinates: 1,317,804.84 N, 3,239,598.11 E (40° 12' 09.32" N, 104° 38' 31.92" W)
Ground Level: 4,812.00 usft

Local Coordinate Origin:	Centered on Well Moser H34-717
Viewing Datum:	KB = 24' @ 4836.00usft (H&P 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: 73

HALLIBURTON

Project: Weld County, CO (NAD 83)
Site: Sec. 27-T3N-R65W (Moser Pad)
Well: Moser H34-717
Wellbore: Plan A
Design: Actual Surveys

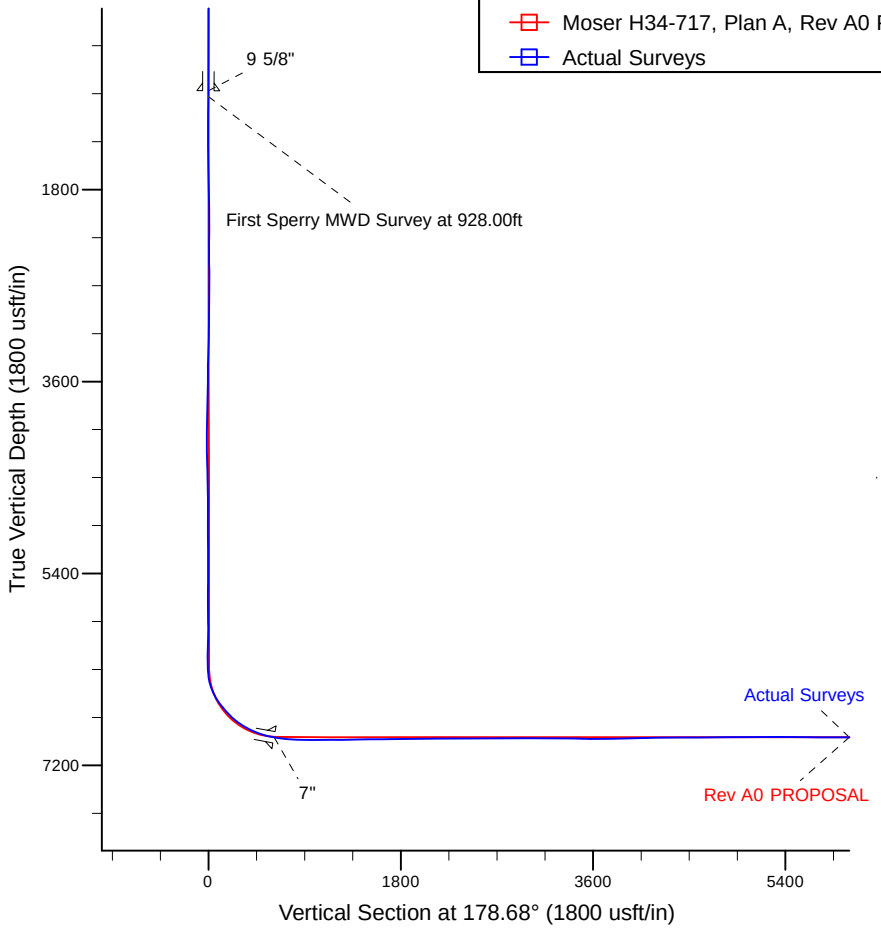
noble energy

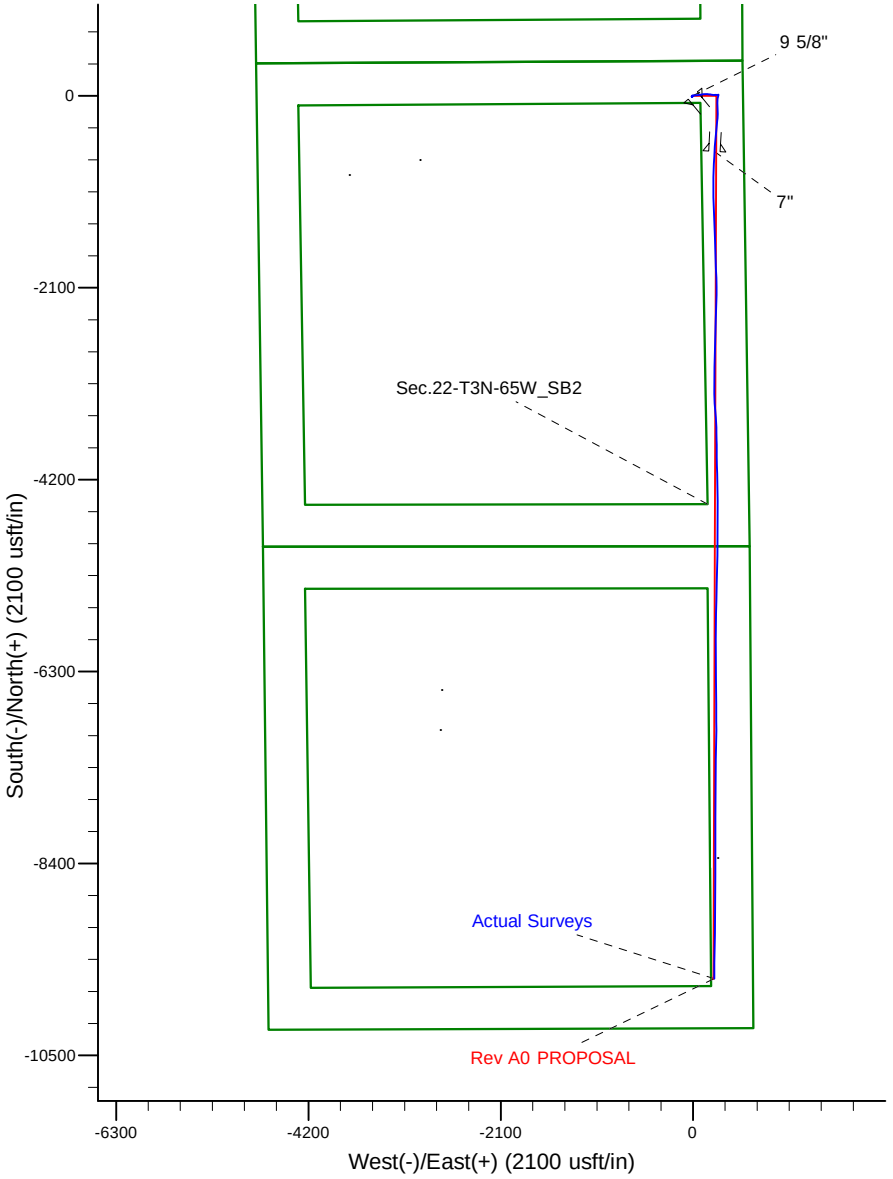
HALLIBURTON
Sperry Drilling

Platted SHL:	380' FNL, 546' FEL
Platted Lat/Long:	40.20259, -104.6422
Location:	Sec. 27-T3N-R65W
~7" Casing:	984' FNL, 328' FEL
Lat/Long:	40.200915 N, -104.641382 W
State Planes - CO Northern:	1,317,196.83 N, 3,239,832.67 E
	Sec. 27-T3N-R65W
Platted BHL:	540' FSL, 433 FEL
Platted Lat/Long:	40.176243 N,-104.641706 W
State Planes - CO Northern:	1,308,208.84 N, 3,239,829.06 E
Location:	Sec. 34-T3N-R65W

LEGEND

Moser H34-717, Plan A, Rev A0 PROPOSAL V0
Actual Surveys





WELL DETAILS: Moser H34-717
Ground Level: 4812.00
KB = 24' @ 4836.00usft (H&P 343)

Created By: Tatiana Gomez
Created On: 11/30/2015

Design Report for Moser H34-717 - 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
873.00	0.35	320.52	872.99	2.05	-1.69	-2.08	0.04
9 5/8"							
928.00	0.37	320.52	927.99	2.31	-1.91	-2.36	0.04
First Sperry MWD Survey at 928.00ft							
1,112.00	0.67	298.69	1,111.99	3.29	-3.23	-3.36	0.19
1,203.00	0.61	291.33	1,202.98	3.72	-4.14	-3.81	0.11
1,294.00	0.78	284.21	1,293.97	4.05	-5.20	-4.17	0.21
1,386.00	0.74	281.90	1,385.97	4.32	-6.38	-4.47	0.05
1,568.00	1.40	170.85	1,567.95	2.37	-7.18	-2.54	0.99
1,659.00	1.35	172.24	1,658.92	0.21	-6.86	-0.37	0.07
1,750.00	1.22	173.20	1,749.90	-1.81	-6.60	1.66	0.14
1,842.00	1.15	177.48	1,841.88	-3.71	-6.44	3.56	0.12
1,933.00	0.82	181.36	1,932.86	-5.27	-6.42	5.12	0.37
2,024.00	0.34	177.03	2,023.86	-6.19	-6.42	6.04	0.53
2,115.00	0.09	231.04	2,114.86	-6.51	-6.46	6.36	0.33
2,205.00	0.48	286.70	2,204.86	-6.44	-6.88	6.28	0.48
2,297.00	0.85	288.88	2,296.85	-6.11	-7.89	5.93	0.40
2,480.00	1.38	253.52	2,479.82	-6.30	-11.29	6.04	0.46
2,663.00	0.18	115.45	2,662.80	-7.05	-13.14	6.74	0.83
2,755.00	0.26	0.94	2,754.80	-6.90	-13.01	6.60	0.40
2,849.00	0.25	348.97	2,848.80	-6.48	-13.05	6.18	0.06
2,944.00	0.64	323.97	2,943.80	-5.85	-13.40	5.54	0.45
3,038.00	2.05	79.44	3,037.78	-5.12	-12.05	4.84	2.55
3,228.00	4.16	63.77	3,227.49	-1.45	-2.53	1.39	1.19
3,322.00	3.83	61.43	3,321.26	1.56	3.29	-1.48	0.39
3,417.00	6.08	74.93	3,415.90	4.38	10.93	-4.13	2.65
3,512.00	8.05	87.22	3,510.18	6.02	22.44	-5.50	2.60
3,606.00	8.35	82.68	3,603.22	7.20	35.78	-6.38	0.76
3,701.00	11.20	82.68	3,696.83	9.26	51.78	-8.07	3.00
3,795.00	10.80	83.45	3,789.11	11.43	69.58	-9.83	0.45
3,985.00	11.65	79.60	3,975.47	16.92	106.13	-14.48	0.60
4,079.00	11.68	83.63	4,067.53	19.69	124.93	-16.81	0.87
4,174.00	10.76	99.17	4,160.74	19.34	143.24	-16.05	3.32
4,268.00	9.70	95.40	4,253.24	17.20	159.79	-13.52	1.33
4,363.00	8.09	93.91	4,347.10	15.99	174.43	-11.98	1.71
4,458.00	8.09	96.50	4,441.15	14.78	187.74	-10.46	0.38
4,552.00	8.10	100.18	4,534.22	12.86	200.83	-8.24	0.55
4,646.00	8.00	98.56	4,627.29	10.71	213.81	-5.80	0.26
4,740.00	7.66	89.34	4,720.42	9.81	226.55	-4.61	1.38
4,835.00	7.47	83.91	4,814.59	10.54	239.02	-5.05	0.78
4,929.00	4.04	84.83	4,908.10	11.49	248.39	-5.78	3.65
5,024.00	1.33	121.55	5,003.00	11.21	252.67	-5.41	3.24
5,119.00	1.36	107.32	5,097.97	10.30	254.68	-4.45	0.35
5,213.00	1.44	89.35	5,191.94	9.98	256.93	-4.08	0.47
5,307.00	1.66	93.63	5,285.91	9.91	259.47	-3.95	0.26
5,402.00	1.18	81.90	5,380.88	9.96	261.81	-3.94	0.59
5,497.00	1.21	70.29	5,475.86	10.44	263.72	-4.37	0.26
5,591.00	1.33	74.97	5,569.84	11.05	265.71	-4.95	0.17
5,686.00	0.96	137.44	5,664.82	10.75	267.32	-4.61	1.29

Design Report for Moser H34-717 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,875.00	0.93	85.19	5,853.80	9.72	269.91	-3.51	0.44
6,064.00	1.36	47.31	6,042.76	11.36	273.09	-5.09	0.45
6,158.00	1.70	50.80	6,136.73	13.00	274.99	-6.68	0.37
6,253.00	1.06	93.26	6,231.70	13.84	276.96	-7.48	1.23
6,348.00	3.49	192.12	6,326.64	10.96	277.23	-4.59	4.00
6,443.00	14.59	194.18	6,420.31	-3.51	273.68	9.79	11.69
6,538.00	23.38	189.29	6,510.06	-33.77	267.70	39.91	9.40
6,632.00	33.89	179.07	6,592.50	-78.53	265.10	84.60	12.30
6,727.00	41.01	175.26	6,667.88	-136.16	268.11	142.28	7.88
6,822.00	44.66	182.40	6,737.58	-200.64	269.29	206.78	6.39
6,916.00	54.80	187.87	6,798.28	-271.91	262.63	277.87	11.66
7,228.00	76.61	182.83	6,925.95	-553.31	237.36	558.62	7.14
7,284.00	79.63	183.01	6,937.47	-608.04	234.57	613.26	5.40
7"							
7,344.00	82.86	183.20	6,946.61	-667.24	231.36	672.38	5.40
7,439.00	86.02	182.64	6,955.81	-761.66	226.54	766.66	3.38
7,534.00	88.37	181.81	6,960.46	-856.47	222.86	861.36	2.62
7,628.00	90.18	179.98	6,961.65	-950.44	221.39	955.28	2.74
7,723.00	90.12	179.56	6,961.40	-1,045.44	221.77	1,050.26	0.45
7,817.00	89.85	178.85	6,961.43	-1,139.43	223.08	1,144.25	0.81
7,912.00	91.05	178.36	6,960.68	-1,234.40	225.39	1,239.25	1.36
8,102.00	90.86	177.38	6,957.51	-1,424.24	232.45	1,429.20	0.53
8,196.00	91.08	177.01	6,955.92	-1,518.11	237.05	1,523.15	0.46
8,291.00	90.65	177.89	6,954.49	-1,613.00	241.28	1,618.12	1.03
8,385.00	90.80	178.67	6,953.30	-1,706.95	244.10	1,712.11	0.84
8,480.00	91.11	178.66	6,951.71	-1,801.91	246.31	1,807.10	0.33
8,574.00	89.91	177.25	6,950.88	-1,895.85	249.66	1,901.08	1.97
8,669.00	90.74	177.91	6,950.34	-1,990.76	253.68	1,996.06	1.12
8,764.00	91.17	178.83	6,948.75	-2,085.71	256.38	2,091.05	1.07
8,858.00	89.91	180.83	6,947.87	-2,179.69	256.66	2,185.02	2.51
8,953.00	90.03	180.88	6,947.92	-2,274.68	255.24	2,279.95	0.14
9,047.00	89.78	181.64	6,948.07	-2,368.66	253.17	2,373.85	0.85
9,142.00	91.08	183.35	6,947.36	-2,463.56	249.04	2,468.63	2.26
9,237.00	89.66	182.47	6,946.75	-2,558.43	244.21	2,563.37	1.76
9,332.00	89.35	182.10	6,947.57	-2,653.36	240.43	2,658.18	0.51
9,426.00	89.88	180.85	6,948.20	-2,747.32	238.01	2,752.06	1.44
9,521.00	89.82	180.31	6,948.45	-2,842.31	237.05	2,847.01	0.57
9,615.00	90.43	180.97	6,948.24	-2,936.31	236.00	2,940.95	0.96
9,710.00	90.28	180.48	6,947.66	-3,031.30	234.79	3,035.89	0.54
9,805.00	90.74	180.66	6,946.81	-3,126.29	233.85	3,130.84	0.52
9,899.00	91.14	182.28	6,945.27	-3,220.24	231.44	3,224.71	1.77
9,994.00	88.40	176.12	6,945.65	-3,315.18	232.76	3,319.65	7.10
10,088.00	88.95	174.75	6,947.82	-3,408.85	240.24	3,413.47	1.57
10,179.00	88.52	175.79	6,949.83	-3,499.52	247.74	3,504.29	1.24
10,270.00	89.75	178.46	6,951.21	-3,590.38	252.31	3,595.23	3.23
10,360.00	90.52	178.67	6,950.99	-3,680.35	254.56	3,685.23	0.89
10,452.00	90.52	178.43	6,950.16	-3,772.32	256.89	3,777.23	0.26
10,543.00	91.54	179.45	6,948.52	-3,863.29	258.57	3,868.21	1.59
10,634.00	92.22	179.02	6,945.54	-3,954.23	259.79	3,959.15	0.88
10,726.00	90.99	179.42	6,942.96	-4,046.18	261.04	4,051.11	1.41
10,817.00	90.77	178.95	6,941.56	-4,137.16	262.33	4,142.10	0.57

Design Report for Moser H34-717 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
10,908.00	90.92	178.36	6,940.22	-4,228.13	264.47	4,233.09	0.67
10,999.00	90.22	179.17	6,939.32	-4,319.10	266.43	4,324.08	1.18
11,090.00	90.03	178.98	6,939.12	-4,410.09	267.90	4,415.08	0.30
11,181.00	89.78	179.43	6,939.27	-4,501.08	269.16	4,506.07	0.57
11,272.00	89.97	179.15	6,939.47	-4,592.07	270.29	4,597.07	0.37
11,363.00	91.11	181.02	6,938.61	-4,683.06	270.15	4,688.03	2.41
11,546.00	90.80	180.54	6,935.56	-4,866.02	267.66	4,870.88	0.31
11,638.00	91.14	180.29	6,934.00	-4,958.00	267.00	4,962.83	0.46
11,729.00	89.88	181.30	6,933.19	-5,048.99	265.73	5,053.76	1.77
11,821.00	90.12	181.96	6,933.19	-5,140.95	263.12	5,145.64	0.76
11,916.00	89.91	181.34	6,933.17	-5,235.91	260.38	5,240.51	0.69
12,010.00	89.57	181.30	6,933.59	-5,329.88	258.22	5,334.41	0.36
12,105.00	89.75	181.33	6,934.16	-5,424.86	256.04	5,429.31	0.19
12,200.00	89.78	180.97	6,934.55	-5,519.84	254.13	5,524.22	0.38
12,294.00	89.44	181.09	6,935.19	-5,613.82	252.44	5,618.14	0.38
12,389.00	89.01	180.42	6,936.47	-5,708.80	251.19	5,713.07	0.84
12,484.00	89.91	180.60	6,937.37	-5,803.79	250.34	5,808.01	0.97
12,578.00	90.12	180.87	6,937.34	-5,897.79	249.14	5,901.95	0.36
12,673.00	90.03	180.22	6,937.22	-5,992.78	248.23	5,996.90	0.69
12,768.00	90.34	179.92	6,936.91	-6,087.78	248.12	6,091.87	0.45
12,862.00	90.34	179.75	6,936.35	-6,181.78	248.39	6,185.85	0.18
12,957.00	89.82	179.23	6,936.22	-6,276.77	249.23	6,280.84	0.77
13,051.00	89.38	179.00	6,936.88	-6,370.76	250.69	6,374.84	0.53
13,146.00	90.80	179.93	6,936.73	-6,465.75	251.57	6,469.82	1.79
13,240.00	90.89	179.77	6,935.34	-6,559.74	251.82	6,563.79	0.20
13,335.00	90.77	179.50	6,933.97	-6,654.73	252.42	6,658.77	0.31
13,429.00	90.00	179.78	6,933.33	-6,748.72	253.01	6,752.76	0.87
13,524.00	90.52	179.72	6,932.90	-6,843.72	253.43	6,847.74	0.55
13,619.00	90.22	179.98	6,932.29	-6,938.72	253.68	6,942.72	0.42
13,713.00	90.03	179.78	6,932.08	-7,032.72	253.87	7,036.69	0.29
13,807.00	89.97	181.43	6,932.08	-7,126.71	252.88	7,130.64	1.76
13,902.00	90.12	181.94	6,932.01	-7,221.67	250.09	7,225.51	0.56
13,997.00	89.78	180.78	6,932.09	-7,316.64	247.83	7,320.40	1.27
14,092.00	89.57	180.39	6,932.63	-7,411.63	246.86	7,415.35	0.47
14,186.00	89.48	180.48	6,933.41	-7,505.63	246.15	7,509.30	0.14
14,281.00	89.41	180.30	6,934.33	-7,600.62	245.50	7,604.25	0.20
14,375.00	89.35	180.61	6,935.35	-7,694.61	244.76	7,698.20	0.34
14,470.00	89.78	180.96	6,936.07	-7,789.60	243.46	7,793.14	0.58
14,564.00	89.94	180.56	6,936.30	-7,883.59	242.21	7,887.08	0.46
14,659.00	89.75	179.87	6,936.56	-7,978.59	241.85	7,982.04	0.75
14,753.00	90.31	180.31	6,936.51	-8,072.59	241.70	8,076.01	0.76
14,848.00	89.78	178.98	6,936.43	-8,167.58	242.29	8,171.00	1.51
14,943.00	90.25	180.23	6,936.41	-8,262.58	242.95	8,265.98	1.41
15,038.00	89.85	179.83	6,936.32	-8,357.58	242.90	8,360.95	0.60
15,132.00	89.54	179.73	6,936.82	-8,451.58	243.26	8,454.94	0.35
15,227.00	88.61	179.35	6,938.36	-8,546.56	244.02	8,549.91	1.06
15,321.00	89.57	180.51	6,939.85	-8,640.55	244.14	8,643.87	1.60
15,415.00	89.69	180.17	6,940.46	-8,734.54	243.58	8,737.83	0.38
15,509.00	89.20	179.88	6,941.37	-8,828.54	243.54	8,831.80	0.61
15,603.00	90.49	181.27	6,941.62	-8,922.53	242.59	8,925.75	2.02
15,697.00	90.22	181.20	6,941.04	-9,016.50	240.57	9,019.65	0.30

Design Report for Moser H34-717 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
15,791.00	90.00	181.40	6,940.86	-9,110.48	238.44	9,113.55	0.32
15,885.00	90.12	181.47	6,940.76	-9,204.45	236.08	9,207.45	0.15
15,979.00	90.09	181.19	6,940.59	-9,298.43	233.90	9,301.34	0.30
16,074.00	90.25	180.67	6,940.31	-9,393.41	232.36	9,396.27	0.57
16,167.00	90.12	180.24	6,940.01	-9,486.41	231.62	9,489.23	0.48
16,261.00	90.40	180.45	6,939.58	-9,580.41	231.05	9,583.19	0.37
16,277.00	90.40	180.25	6,939.47	-9,596.40	230.96	9,599.18	1.25
Final Sperry MWD Survey at 16342.00ft							
16,342.00	90.40	180.25	6,939.02	-9,661.40	230.67	9,664.15	0.00
Straight Line Projection to TD at 16342.00ft							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Comment
928.00	927.99	2.31	-1.91	First Sperry MWD Survey at 928.00ft
16,277.00	6,939.47	-9,596.40	230.96	Final Sperry MWD Survey at 16342.00ft
16,342.00	6,939.02	-9,661.40	230.67	Straight Line Projection to TD at 16342.00ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (usft)	Origin +E/-W (usft)	Start TVD (usft)
Target	Moser H34-717_Rev A0_BHL	178.68	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
928.00	6,916.00	Intermediate Sperry MWD Surveys	MWD
7,011.00	16,342.00	Production Sperry MWD Surveys	MWD+IFR1+MS_WY

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
873.00	872.99	9 5/8"	9-5/8	13-3/4
7,284.00	6,937.47	7"	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
Moser H34-717_Rev A - actual wellpath misses target center by 0.01usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E) - Point	0.00	0.00	0.00	0.01	0.00	1,317,804.84	3,239,598.11	40.202590	-104.642200
Moser H34-717_Rev A - actual wellpath misses target center by 9.68usft at 16342.00usft MD (6939.02 TVD, -9661.40 N, 230.67 E) - Point	0.00	0.00	6,935.00	-9,663.13	222.03	1,308,142.12	3,239,820.13	40.176060	-104.641740

Design Report for Moser H34-717 - Actual Surveys

Directional Difficulty Index

Average Dogleg over Survey:	1.35 °/100usft	Maximum Dogleg over Survey:	12.30 °/100usft at 6,632.00 usft
Net Tortousity applicable to Plans:	0.68 °/100usft	Directional Difficulty Index:	6.715

Audit Info

North Reference Sheet for Sec. 27-T3N-R65W (Moser Pad) - Moser H34-717 - Plan A

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

Vertical Depths are relative to KB = 24' @ 4836.00usft (H&P 343). Northing and Easting are relative to Moser H34-717

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: 0.99995720

Grid Coordinates of Well: 1,317,804.84 usft N, 3,239,598.11 usft E

Geographical Coordinates of Well: 40° 12' 09.32" N, 104° 38' 31.92" W

Grid Convergence at Surface is: 0.55°

Based upon Minimum Curvature type calculations, at a Measured Depth of 16,342.00usft

the Bottom Hole Displacement is 9,664.16usft in the Direction of 178.63° (Grid).

Magnetic Convergence at surface is: -7.89° (15 November 2015, , BGGM2015)