

Noble Energy

Weld County, CO (NAD 83)

Sec. 22-T3N-65W (Moser PAD)

Moser H34-778

05-123-40732

Plan A

Design: Actual Surveys

Sperry Drilling Services

Final Survey Report

19 November, 2015

Surface UWI : 05-123-40732

Well Coordinates: 1,318,584.61 N, 3,235,822.47 E (40° 12' 17.39" N, 104° 39' 20.48" W)

Ground Level: 4,812.00 usft

Local Coordinate Origin:

Viewing Datum:

TVDs to System:

North Reference:

Unit System:

Geodetic Scale Factor Applied

Version: 5000.1 Build: 73

Centered on Well Moser H34-778

KB = 24' @ 4836.00usft (H&P 273)

N

Grid

Dec-Deg - API - US Survey Feet - Custom

HALLIBURTON

Project: Weld County, CO (NAD 83)
 Site: Sec. 22-T3N-65W (Moser PAD)
 Well: Moser H34-778
 Wellbore: Plan A
 Design: Actual Surveys



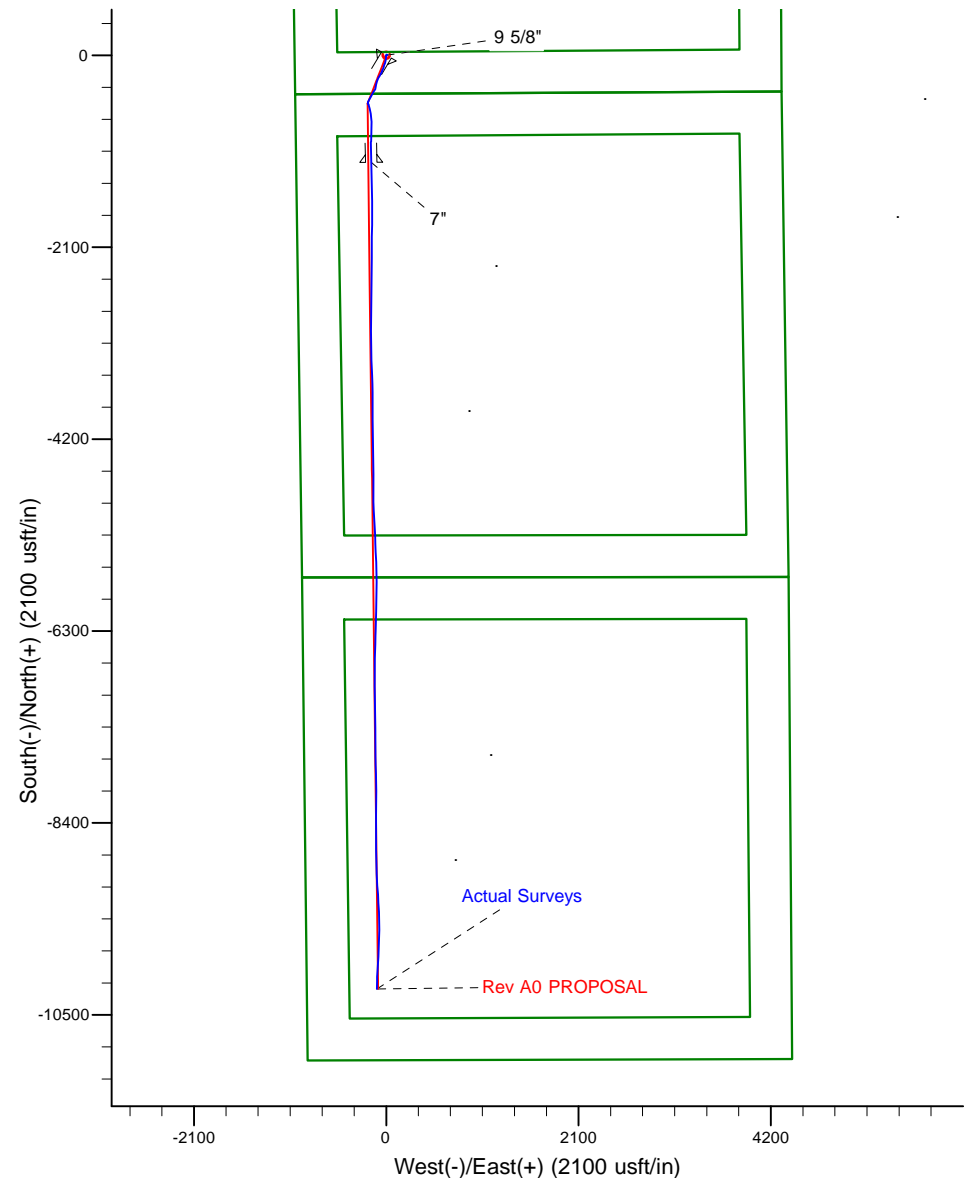
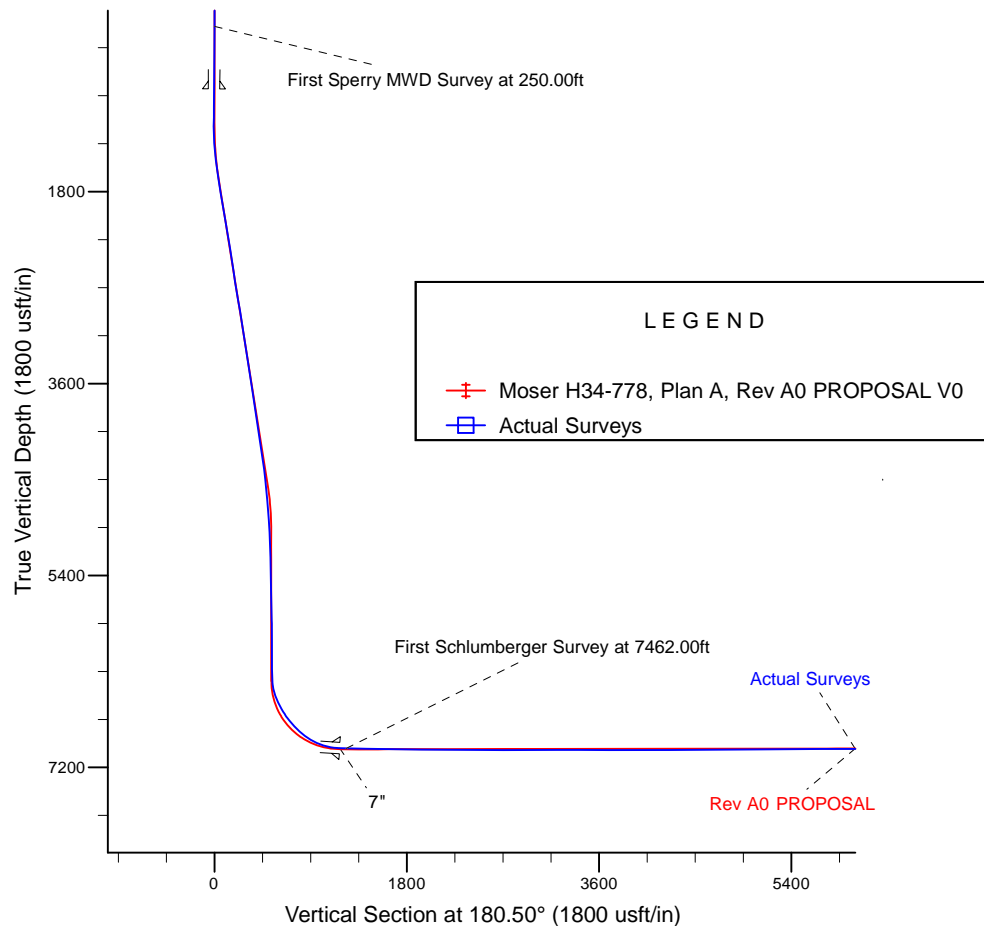
HALLIBURTON

Sperry Drilling

Platted SHL: 420' FSL, 1002' FWL
 Platted Lat/Long: 40.204830, -104.655690
 Location: Sec. 22-T3N-R65W

~7" Casing: 756' FNL, 830' FWL
 Lat/Long: 40.201621 N, -104.656318 W
 State Planes - CO Northern: 1,317,414.03 N, 3,235,658.20 E
 Sec. 22-T3N-R65W

Platted BHL: 780' FSL, 780' FWL
 Platted Lat/Long: 40.176791 N, -104.656408 W
 State Planes - CO Northern: 1,308,369.16 N, 3,235,719.05 E
 Location: Sec. 34-T3N-R65W



WELL DETAILS: Moser H34-778

Ground Level: 4812.00

KB = 24' @ 4836.00usft (H&P 273)

Created By: Tatiana Gomez
 Created On: 11/19/2015

Design Report for Moser H34-778 - 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
Moser PC #34-30D_OSW_No Casing_Abandoned Location - Moser PC #27-29D_OSW_No Casing_Abandoned Location							
250.00	0.16	30.75	250.00	0.30	0.18	-0.30	0.06
First Sperry MWD Survey at 250.00ft							
500.00	0.32	30.75	500.00	1.20	0.71	-1.21	0.06
837.00	0.54	30.75	836.99	3.37	2.00	-3.38	0.06
9 5/8"							
842.00	0.54	30.75	841.99	3.41	2.03	-3.42	0.06
1,010.00	0.65	30.75	1,009.98	4.91	2.92	-4.93	0.07
1,105.00	0.65	41.77	1,104.97	5.77	3.55	-5.80	0.13
1,197.00	0.69	6.76	1,196.97	6.71	3.97	-6.74	0.44
1,289.00	2.35	209.56	1,288.95	5.62	3.10	-5.65	3.26
1,380.00	4.57	197.17	1,379.78	0.53	1.11	-0.54	2.56
1,472.00	6.64	193.77	1,471.33	-8.14	-1.24	8.15	2.28
1,564.00	8.22	184.09	1,562.56	-19.87	-2.97	19.89	2.19
1,747.00	8.26	185.65	1,743.67	-46.00	-5.20	46.04	0.12
1,839.00	9.99	193.21	1,834.51	-60.34	-7.68	60.41	2.28
1,930.00	10.72	194.74	1,924.02	-76.21	-11.63	76.31	0.86
2,021.00	10.59	201.51	2,013.46	-92.18	-16.85	92.32	1.38
2,205.00	9.64	196.81	2,194.60	-122.66	-27.51	122.89	0.68
2,296.00	10.27	201.45	2,284.23	-137.50	-32.68	137.78	1.12
2,388.00	9.44	202.01	2,374.87	-152.13	-38.51	152.46	0.91
2,480.00	8.44	196.36	2,465.75	-165.60	-43.23	165.98	1.45
2,571.00	9.00	204.24	2,555.70	-178.50	-48.04	178.92	1.45
2,662.00	10.06	209.50	2,645.45	-191.91	-54.87	192.38	1.51
2,845.00	11.28	209.27	2,825.28	-221.43	-71.50	222.05	0.67
2,936.00	10.86	209.13	2,914.59	-236.69	-80.02	237.38	0.46
3,125.00	8.92	203.43	3,100.78	-265.69	-94.52	266.51	1.15
3,220.00	10.52	200.02	3,194.41	-280.59	-100.41	281.47	1.79
3,314.00	9.29	196.44	3,287.01	-295.93	-105.50	296.85	1.46
3,409.00	8.30	192.41	3,380.89	-309.99	-109.14	310.94	1.23
3,504.00	9.38	190.86	3,474.76	-324.29	-112.08	325.26	1.16
3,598.00	7.66	186.41	3,567.72	-338.04	-114.22	339.03	1.96
3,693.00	8.55	189.67	3,661.77	-351.29	-116.11	352.30	1.05
3,787.00	8.89	197.54	3,754.69	-365.10	-119.47	366.14	1.32
3,882.00	10.82	212.79	3,848.30	-379.60	-126.52	380.70	3.40
3,975.00	10.69	211.95	3,939.66	-394.26	-135.81	395.44	0.22
4,070.00	10.43	212.53	4,033.06	-408.99	-145.10	410.25	0.30
4,164.00	9.86	208.53	4,125.59	-423.23	-153.52	424.57	0.96
4,259.00	9.76	208.12	4,219.20	-437.48	-161.20	438.88	0.13
4,447.00	7.73	207.20	4,405.00	-462.78	-174.49	464.30	1.08
4,542.00	6.89	207.73	4,499.23	-473.51	-180.06	475.08	0.89
4,637.00	6.20	209.88	4,593.61	-483.00	-185.27	484.61	0.77
4,731.00	5.44	210.66	4,687.12	-491.24	-190.07	492.89	0.81
4,825.00	5.08	205.27	4,780.73	-498.83	-194.12	500.52	0.65
4,920.00	4.24	201.94	4,875.41	-505.89	-197.22	507.61	0.93
5,014.00	2.93	186.07	4,969.23	-511.51	-198.78	513.24	1.74
5,108.00	2.31	186.49	5,063.13	-515.78	-199.24	517.51	0.66
5,204.00	2.01	190.44	5,159.06	-519.35	-199.77	521.09	0.35
5,299.00	1.48	185.67	5,254.02	-522.21	-200.19	523.96	0.58

Design Report for Moser H34-778 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,393.00	0.92	187.21	5,348.00	-524.17	-200.41	525.91	0.60
5,582.00	0.88	144.48	5,536.98	-526.86	-199.75	528.60	0.35
5,677.00	1.28	141.32	5,631.96	-528.28	-198.67	530.01	0.43
5,771.00	1.51	175.05	5,725.93	-530.33	-197.90	532.05	0.89
5,866.00	2.19	176.47	5,820.88	-533.39	-197.68	535.11	0.72
5,960.00	0.79	82.21	5,914.86	-535.10	-196.93	536.81	2.53
6,055.00	0.47	115.93	6,009.85	-535.18	-195.93	536.88	0.50
6,149.00	0.47	184.11	6,103.85	-535.73	-195.61	537.43	0.56
6,339.00	0.62	140.54	6,293.84	-537.30	-195.01	539.00	0.23
6,433.00	2.62	145.03	6,387.80	-539.46	-193.46	541.14	2.13
6,528.00	15.23	162.83	6,481.47	-553.21	-188.51	554.85	13.43
6,623.00	24.28	170.90	6,570.80	-584.49	-181.72	586.07	9.93
6,717.00	29.87	170.26	6,654.47	-626.68	-174.70	628.19	5.95
6,812.00	36.81	171.64	6,733.78	-678.22	-166.55	679.66	7.35
6,906.00	42.17	176.79	6,806.32	-737.64	-160.68	739.03	6.68
7,001.00	49.11	182.97	6,872.73	-805.46	-160.76	806.84	8.65
7,096.00	56.55	183.44	6,930.09	-880.98	-165.00	882.40	7.84
7,190.00	67.49	179.72	6,974.14	-963.82	-167.15	965.25	12.15
7,285.00	75.91	178.81	7,003.94	-1,053.93	-165.98	1,055.35	8.91
7,360.00	84.66	179.41	7,016.58	-1,127.77	-164.84	1,129.18	11.69
7,403.00	86.47	179.11	7,019.91	-1,170.64	-164.28	1,172.04	4.27
7"							
7,462.00	88.96	178.70	7,022.26	-1,229.57	-163.16	1,230.96	4.27
First Schlumberger Survey at 7462.00ft							
7,556.00	89.75	178.50	7,023.32	-1,323.54	-160.86	1,324.90	0.87
7,651.00	89.41	178.43	7,024.01	-1,418.50	-158.31	1,419.84	0.37
7,745.00	89.10	178.69	7,025.24	-1,512.46	-155.95	1,513.78	0.43
7,840.00	88.24	179.81	7,027.44	-1,607.43	-154.71	1,608.73	1.49
7,934.00	88.83	179.85	7,029.84	-1,701.40	-154.43	1,702.69	0.63
8,029.00	88.93	180.95	7,031.70	-1,796.37	-155.09	1,797.67	1.16
8,123.00	88.97	180.22	7,033.42	-1,890.35	-156.05	1,891.65	0.78
8,218.00	88.86	181.45	7,035.22	-1,985.32	-157.44	1,986.63	1.30
8,313.00	89.51	179.94	7,036.57	-2,080.30	-158.59	2,081.62	1.73
8,407.00	89.96	179.38	7,037.01	-2,174.30	-158.03	2,175.61	0.76
8,502.00	90.06	181.35	7,036.99	-2,269.29	-158.64	2,270.60	2.08
8,597.00	89.89	180.89	7,037.03	-2,364.28	-160.49	2,365.60	0.52
8,691.00	89.89	180.85	7,037.21	-2,458.26	-161.92	2,459.59	0.04
8,786.00	90.03	180.34	7,037.28	-2,553.26	-162.91	2,554.59	0.56
8,880.00	90.06	180.16	7,037.21	-2,647.26	-163.32	2,648.59	0.19
8,975.00	90.03	181.11	7,037.13	-2,742.25	-164.37	2,743.59	1.00
9,070.00	90.07	180.16	7,037.05	-2,837.24	-165.42	2,838.59	1.00
9,164.00	89.86	180.47	7,037.11	-2,931.24	-165.94	2,932.59	0.40
9,259.00	90.41	180.87	7,036.88	-3,026.24	-167.05	3,027.59	0.72
9,354.00	89.89	179.95	7,036.63	-3,121.23	-167.73	3,122.59	1.11
9,448.00	89.96	178.30	7,036.76	-3,215.22	-166.29	3,216.56	1.76
9,543.00	89.96	178.94	7,036.82	-3,310.19	-164.01	3,311.50	0.67
9,637.00	89.69	176.64	7,037.11	-3,404.11	-160.38	3,405.39	2.46
9,732.00	89.79	177.52	7,037.54	-3,498.99	-155.54	3,500.22	0.93
9,827.00	89.93	178.44	7,037.77	-3,593.93	-152.19	3,595.13	0.98
9,921.00	89.93	179.12	7,037.89	-3,687.90	-150.19	3,689.08	0.72
10,016.00	89.89	179.46	7,038.04	-3,782.90	-149.02	3,784.06	0.36

Design Report for Moser H34-778 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
10,111.00	89.96	180.49	7,038.16	-3,877.90	-148.97	3,879.06	1.09
10,205.00	90.07	179.87	7,038.14	-3,971.89	-149.27	3,973.05	0.67
10,297.00	90.31	179.59	7,037.83	-4,063.89	-148.84	4,065.05	0.40
10,388.00	90.44	178.71	7,037.24	-4,154.88	-147.49	4,156.02	0.98
10,480.00	90.41	178.14	7,036.55	-4,246.84	-144.96	4,247.95	0.62
10,571.00	90.27	178.66	7,036.01	-4,337.80	-142.42	4,338.89	0.59
10,663.00	90.34	178.43	7,035.52	-4,429.77	-140.08	4,430.84	0.26
10,755.00	90.41	180.69	7,034.92	-4,521.76	-139.37	4,522.82	2.46
10,846.00	90.20	181.18	7,034.44	-4,612.75	-140.86	4,613.81	0.59
10,938.00	89.96	181.08	7,034.31	-4,704.73	-142.67	4,705.81	0.28
11,029.00	90.27	179.75	7,034.13	-4,795.73	-143.33	4,796.80	1.50
11,120.00	90.51	178.25	7,033.51	-4,886.71	-141.74	4,887.77	1.67
11,212.00	90.34	176.68	7,032.83	-4,978.61	-137.68	4,979.63	1.72
11,304.00	90.85	176.45	7,031.87	-5,070.44	-132.16	5,071.41	0.61
11,395.00	90.58	176.66	7,030.73	-5,161.27	-126.70	5,162.19	0.38
11,487.00	90.34	178.15	7,030.00	-5,253.17	-122.53	5,254.05	1.64
11,578.00	90.48	177.71	7,029.34	-5,344.11	-119.24	5,344.95	0.51
11,670.00	90.13	178.17	7,028.85	-5,436.05	-115.94	5,436.86	0.63
11,732.00	90.55	178.86	7,028.49	-5,498.02	-114.33	5,498.82	1.30
11,826.00	90.34	175.90	7,027.76	-5,591.91	-110.03	5,592.67	3.16
11,921.00	90.10	179.46	7,027.39	-5,686.82	-106.19	5,687.53	3.76
12,015.00	89.86	179.27	7,027.42	-5,780.81	-105.15	5,781.52	0.33
12,110.00	90.24	180.66	7,027.34	-5,875.81	-105.09	5,876.51	1.52
12,205.00	90.24	183.05	7,026.94	-5,970.75	-108.16	5,971.47	2.52
12,299.00	89.83	181.60	7,026.89	-6,064.67	-111.98	6,065.42	1.60
12,394.00	90.45	180.35	7,026.65	-6,159.66	-113.59	6,160.42	1.47
12,489.00	90.03	180.55	7,026.26	-6,254.65	-114.34	6,255.42	0.49
12,583.00	89.83	182.37	7,026.37	-6,348.62	-116.74	6,349.40	1.95
12,678.00	89.62	181.92	7,026.83	-6,443.55	-120.29	6,444.36	0.52
12,772.00	90.38	181.09	7,026.83	-6,537.52	-122.76	6,538.34	1.20
12,867.00	90.10	181.47	7,026.43	-6,632.49	-124.88	6,633.33	0.50
12,962.00	90.65	181.28	7,025.81	-6,727.46	-127.16	6,728.32	0.61
13,057.00	90.65	179.96	7,024.73	-6,822.45	-128.19	6,823.31	1.39
13,151.00	90.75	177.77	7,023.58	-6,916.42	-126.33	6,917.26	2.33
13,246.00	90.96	179.38	7,022.16	-7,011.37	-123.97	7,012.19	1.71
13,341.00	90.58	180.32	7,020.89	-7,106.36	-123.72	7,107.18	1.07
13,436.00	90.75	179.50	7,019.78	-7,201.36	-123.57	7,202.16	0.88
13,530.00	91.00	178.44	7,018.35	-7,295.33	-121.88	7,296.12	1.16
13,625.00	90.07	178.94	7,017.46	-7,390.30	-119.71	7,391.07	1.11
13,719.00	90.24	179.08	7,017.21	-7,484.28	-118.08	7,485.03	0.23
13,814.00	90.65	180.10	7,016.47	-7,579.28	-117.40	7,580.02	1.16
13,908.00	90.34	179.31	7,015.66	-7,673.27	-116.92	7,674.00	0.90
14,002.00	90.79	179.47	7,014.73	-7,767.26	-115.92	7,767.98	0.51
14,096.00	90.07	178.04	7,014.02	-7,861.23	-113.88	7,861.93	1.70
14,191.00	90.34	178.38	7,013.68	-7,956.19	-110.91	7,956.85	0.46
14,285.00	89.96	179.87	7,013.44	-8,050.17	-109.47	8,050.82	1.64
14,379.00	89.59	180.89	7,013.81	-8,144.17	-110.10	8,144.82	1.15
14,473.00	89.41	182.00	7,014.63	-8,238.13	-112.47	8,238.80	1.20
14,567.00	90.14	180.20	7,015.00	-8,332.11	-114.27	8,332.79	2.07
14,662.00	90.14	178.73	7,014.77	-8,427.10	-113.38	8,427.77	1.55
14,756.00	90.34	178.32	7,014.37	-8,521.07	-110.96	8,521.72	0.49

Design Report for Moser H34-778 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
14,850.00	90.51	180.07	7,013.67	-8,615.06	-109.64	8,615.69	1.87
14,945.00	90.10	179.72	7,013.17	-8,710.05	-109.47	8,710.68	0.57
15,039.00	90.75	179.66	7,012.47	-8,804.05	-108.96	8,804.67	0.69
15,134.00	90.20	179.58	7,011.68	-8,899.04	-108.33	8,899.65	0.59
15,160.36	90.14	178.77	7,011.60	-8,925.40	-107.95	8,926.01	3.07
Moser #34-33D_OSW_No Casing							
15,228.00	90.00	176.70	7,011.52	-8,992.98	-105.28	8,993.56	3.07
15,322.00	90.20	174.47	7,011.36	-9,086.70	-98.04	9,087.21	2.38
15,416.00	90.38	176.67	7,010.88	-9,180.41	-90.78	9,180.85	2.35
15,510.00	89.96	177.61	7,010.60	-9,274.29	-86.09	9,274.69	1.10
15,604.00	90.10	177.13	7,010.55	-9,368.19	-81.78	9,368.55	0.53
15,698.00	90.00	177.29	7,010.47	-9,462.08	-77.21	9,462.39	0.20
15,792.00	90.65	180.17	7,009.94	-9,556.05	-75.12	9,556.34	3.14
15,887.00	90.45	183.18	7,009.02	-9,650.99	-77.90	9,651.30	3.18
15,983.00	90.24	181.84	7,008.45	-9,746.89	-82.10	9,747.24	1.41
16,080.00	90.41	182.32	7,007.90	-9,843.83	-85.62	9,844.20	0.52
16,177.00	90.34	183.78	7,007.26	-9,940.69	-90.78	9,941.10	1.51
16,273.00	90.58	184.17	7,006.49	-10,036.45	-97.44	10,036.92	0.48
16,369.00	90.38	181.09	7,005.69	-10,132.34	-101.84	10,132.84	3.21
Final Schlumberger Survey at 16369.00ft							
16,452.58	90.38	181.09	7,005.13	-10,215.89	-103.43	10,216.41	0.00
Moser H34-778_Rev A0_BHL							
16,453.00	90.38	181.09	7,005.13	-10,216.32	-103.44	10,216.83	0.00
Schlumberger Straight Line Projection to TD at 16453.00ft							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
250.00	250.00	0.30	0.18	First Sperry MWD Survey at 250.00ft
7,462.00	7,022.26	-1,229.57	-163.16	First Schlumberger Survey at 7462.00ft
16,369.00	7,005.69	-10,132.34	-101.84	Final Schlumberger Survey at 16369.00ft
16,453.00	7,005.13	-10,216.32	-103.44	Schlumberger Straight Line Projection to TD at 16453.00ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
Target	Moser H34-778_Rev A0_BHL	180.50	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
250.00	7,360.00	Intermediate Sperry MWD Surveys	MWD
7,462.00	16,453.00	Schlumberger MWD+IFR Surveys	MWD+IFR1+MS_WY

Design Report for Moser H34-778 - Actual Surveys

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
837.00	9 5/8"		9-5/8	13-3/4
7,403.00	7,019.91 7"		7	7

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 PC #34-30D_O	0.00	0.00	0.00	-6,395.71	-210.13	1,312,189.18	3,235,612.35	40.187280	-104.656660
- actual wellpath misses target center by 6399.16usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Point									
Moser PC #27-29D_O	0.00	0.00	0.00	33.54	-690.28	1,318,618.15	3,235,132.22	40.204940	-104.658160
- actual wellpath misses target center by 691.09usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Point									
Moser H34-778_Rev A	0.00	0.00	0.00	0.02	0.00	1,318,584.64	3,235,822.47	40.204830	-104.655690
- actual wellpath misses target center by 0.02usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Point									
Moser #34-33D_OSW	0.00	0.00	0.00	-8,916.88	-222.48	1,309,668.12	3,235,600.01	40.180360	-104.656790
- actual wellpath misses target center by 7012.54usft at 15160.36usft MD (7011.60 TVD, -8925.40 N, -107.95 E)									
- Point									
Moser H34-778_Rev A	0.00	0.00	7,015.00	-10,216.22	-89.96	1,308,368.84	3,235,732.52	40.176790	-104.656360
- actual wellpath misses target center by 16.71usft at 16452.58usft MD (7005.13 TVD, -10215.89 N, -103.43 E)									
- Point									

Directional Difficulty Index

Average Dogleg over Survey:	1.54 °/100usft	Maximum Dogleg over Survey:	13.43 °/100usft at 6,528.00 usft
Net Tortousity applicable to Plans:	0.87 °/100usft	Directional Difficulty Index:	6.784

Audit Info

North Reference Sheet for Sec. 22-T3N-65W (Moser PAD) - Moser H34-778 - 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 273). Northing and Easting are relative to Moser H34-778

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: 0.99995717

Grid Coordinates of Well: 1,318,584.61 usft N, 3,235,822.47 usft E

Geographical Coordinates of Well: 40° 12' 17.39" N, 104° 39' 20.48" W

Grid Convergence at Surface is: 0.55°

Based upon Minimum Curvature type calculations, at a Measured Depth of 16,453.00usft
the Bottom Hole Displacement is 10,216.84usft in the Direction of 180.58° (Grid).

Magnetic Convergence at surface is: -7.91° (2 November 2015, , BGGM2015)

