

# Noble Energy

Weld County, CO (NAD 83)

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

Moser H34-769

05-123-40731

Plan A

Design: Actual Surveys

## Sperry Drilling Services

### Final Survey Report

02 November, 2015

Surface UWI : 05-123-40731

Well Coordinates: 1,318,585.06 N, 3,235,867.16 E (40° 12' 17.39" N, 104° 39' 19.91" 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 H34-769

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 H34-769  
 Wellbore: Plan A  
 Design: Actual Surveys



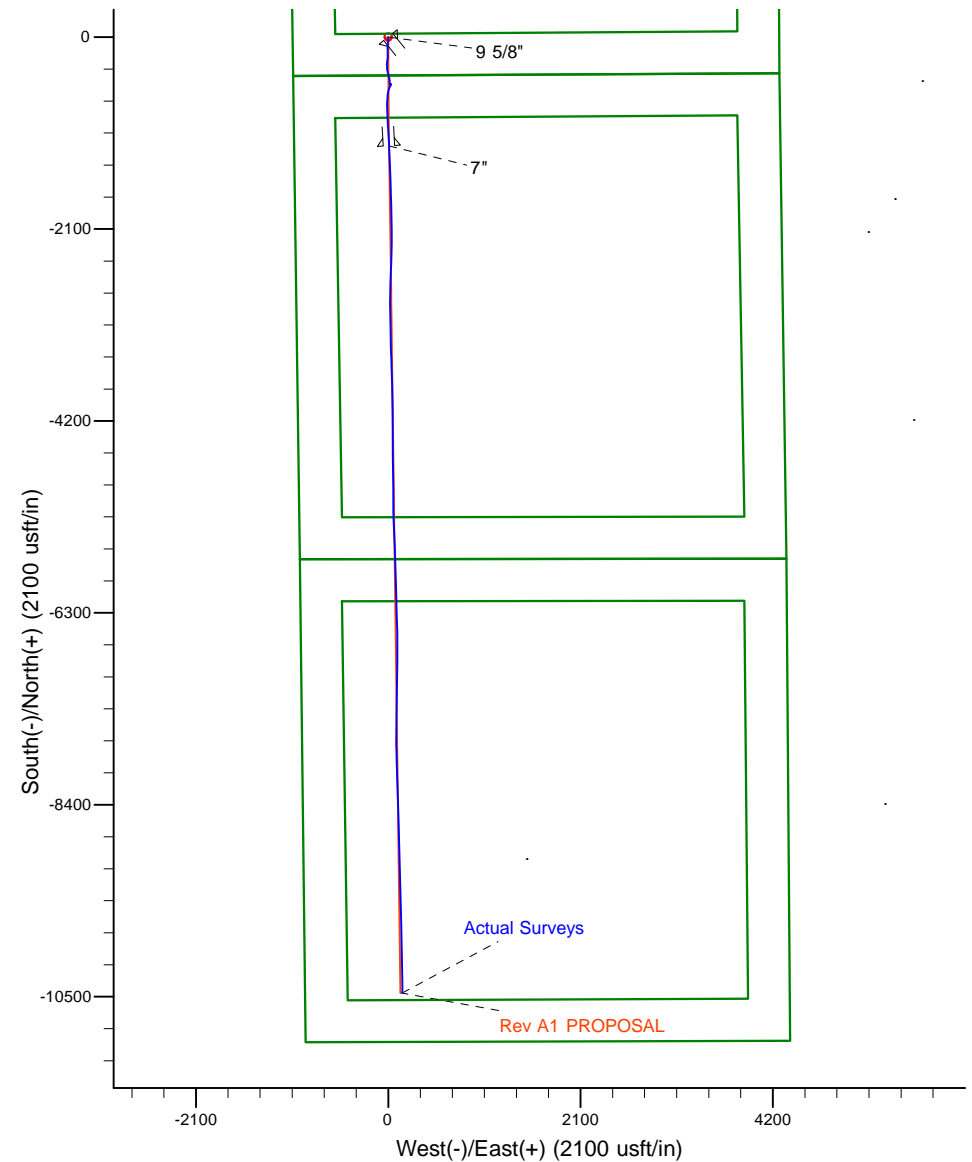
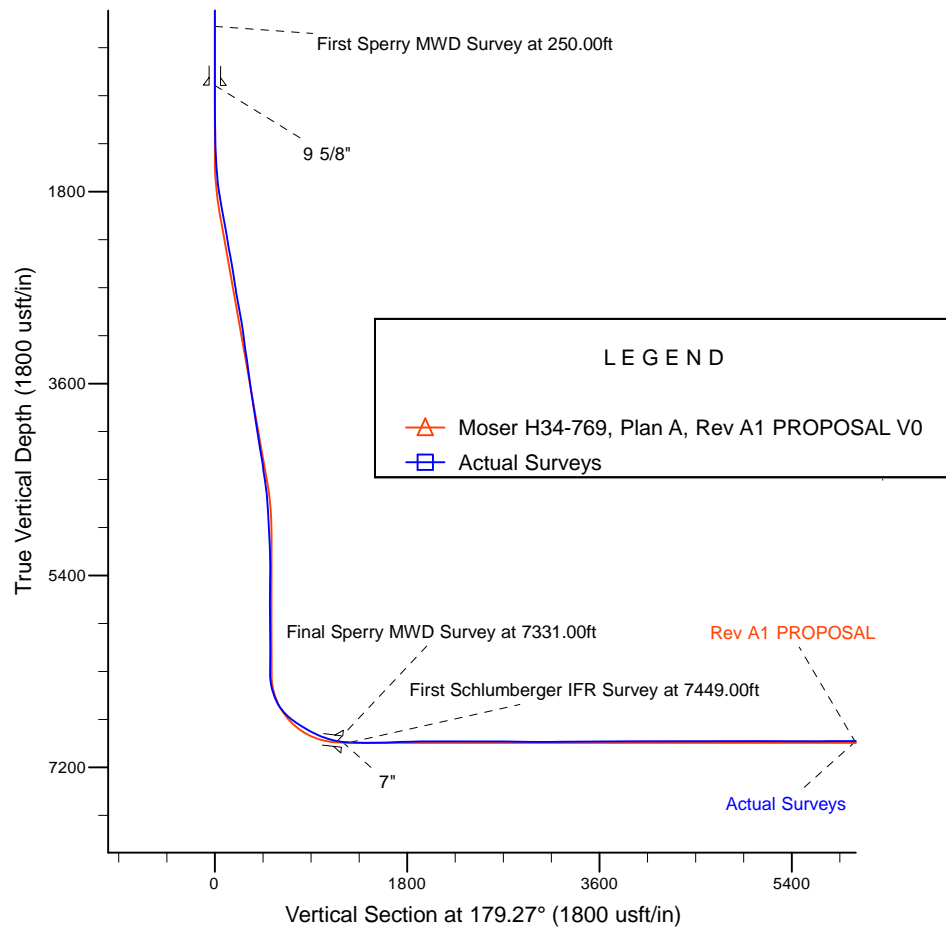
**HALLIBURTON**

Sperry Drilling

Platted SHL: 420' FSL, 1047' FWL  
 Platted Lat/Long: 40.204830, -104.655530  
 Location: Sec. 22-T3N-R65W

~7" Casing: 748' FNL, 1054' FWL  
 Lat/Long: 40.201562 N, -104.655539 W  
 State Planes - CO Northern: 1,317,394.49 N, 3,235,876.10 E  
 Sec. 22-T3N-R65W

Platted BHL: 538' FSL, 1045' FWL  
 Platted Lat/Long: 40.176119 N, -104.655336 W  
 State Planes - CO Northern: 1,308,127.20 N, 3,236,020.99 E  
 Location: Sec. 34-T3N-R65W



WELL DETAILS: Moser H34-769

Ground Level: 4812.00

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

Created By: Tatiana Gomez  
 Created On: 11/2/2015

## Design Report for Moser H34-769 - 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
250.00	0.03	320.92	250.00	0.05	-0.04	-0.05	0.01
<b>First Sperry MWD Survey at 250.00ft</b>							
500.00	0.07	320.92	500.00	0.22	-0.18	-0.22	0.02
803.00	0.11	320.92	803.00	0.59	-0.48	-0.59	0.01
<b>9 5/8"</b>							
815.00	0.11	320.92	815.00	0.60	-0.49	-0.61	0.01
821.00	0.11	320.92	821.00	0.61	-0.50	-0.62	0.00
916.00	0.07	209.14	916.00	0.63	-0.58	-0.64	0.16
1,010.00	0.79	268.61	1,010.00	0.57	-1.26	-0.58	0.81
1,105.00	1.01	261.75	1,104.98	0.43	-2.74	-0.47	0.26
1,197.00	1.77	162.57	1,196.97	-1.04	-3.12	1.00	2.36
1,289.00	1.89	160.45	1,288.92	-3.83	-2.19	3.80	0.15
1,472.00	1.71	162.98	1,471.83	-9.28	-0.38	9.27	0.11
1,564.00	3.61	181.26	1,563.73	-13.49	-0.04	13.49	2.24
1,656.00	5.28	177.14	1,655.45	-20.61	0.11	20.61	1.85
1,747.00	7.01	188.99	1,745.92	-30.28	-0.55	30.27	2.35
1,839.00	9.88	188.49	1,836.92	-43.64	-2.59	43.60	3.12
1,930.00	9.12	186.61	1,926.67	-58.52	-4.58	58.46	0.90
2,021.00	11.09	184.80	2,016.25	-74.41	-6.14	74.32	2.19
2,113.00	10.42	184.54	2,106.64	-91.52	-7.54	91.42	0.73
2,205.00	9.53	185.37	2,197.25	-107.39	-8.91	107.27	0.98
2,296.00	9.36	181.76	2,287.01	-122.29	-9.84	122.16	0.68
2,388.00	10.72	175.71	2,377.60	-138.30	-9.43	138.17	1.87
2,480.00	10.08	174.39	2,468.09	-154.85	-8.00	154.73	0.74
2,662.00	8.60	173.94	2,647.67	-184.23	-5.01	184.15	0.81
2,753.00	9.91	186.64	2,737.50	-198.78	-5.20	198.70	2.66
2,845.00	10.02	187.09	2,828.11	-214.58	-7.10	214.48	0.15
2,936.00	9.88	186.12	2,917.74	-230.20	-8.91	230.07	0.24
3,030.00	9.50	185.90	3,010.40	-245.94	-10.57	245.78	0.41
3,125.00	8.01	185.59	3,104.29	-260.32	-12.02	260.15	1.57
3,314.00	7.86	187.28	3,291.48	-286.25	-14.94	286.04	0.15
3,408.00	8.94	177.10	3,384.48	-299.92	-15.38	299.70	1.95
3,503.00	7.39	171.08	3,478.51	-313.33	-14.06	313.12	1.86
3,597.00	7.94	175.27	3,571.67	-325.77	-12.59	325.59	0.83
3,692.00	8.05	180.42	3,665.75	-338.96	-12.10	338.78	0.76
3,787.00	8.24	181.46	3,759.79	-352.42	-12.32	352.23	0.25
3,881.00	9.56	167.77	3,852.67	-366.78	-10.84	366.62	2.65
3,976.00	8.99	166.42	3,946.43	-381.71	-7.42	381.58	0.64
4,071.00	8.57	166.41	4,040.31	-395.80	-4.02	395.72	0.44
4,165.00	9.86	164.79	4,133.10	-410.38	-0.26	410.34	1.40
4,260.00	8.93	161.61	4,226.82	-425.23	4.20	425.24	1.12
4,355.00	9.50	169.77	4,320.60	-439.94	7.92	440.00	1.50
4,449.00	8.24	165.12	4,413.48	-454.08	11.03	454.19	1.54
4,544.00	8.11	169.49	4,507.51	-467.25	14.00	467.39	0.67
4,639.00	7.20	180.84	4,601.67	-479.79	15.13	479.95	1.85
4,733.00	4.38	173.35	4,695.18	-489.25	15.46	489.41	3.10
4,828.00	3.95	175.64	4,789.93	-496.12	16.13	496.28	0.49
4,922.00	2.85	177.95	4,883.76	-501.68	16.46	501.85	1.18
5,017.00	2.72	172.53	4,978.65	-506.28	16.84	506.45	0.31

## Design Report for Moser H34-769 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,112.00	2.47	170.48	5,073.55	-510.53	17.47	510.71	0.28
5,206.00	2.31	169.83	5,167.47	-514.39	18.14	514.58	0.17
5,396.00	0.84	75.85	5,357.42	-517.82	20.17	518.04	1.32
5,490.00	1.10	56.72	5,451.40	-517.16	21.59	517.39	0.44
5,585.00	1.41	50.57	5,546.38	-515.91	23.25	516.17	0.36
5,680.00	1.60	61.85	5,641.35	-514.55	25.33	514.83	0.37
5,774.00	1.27	222.23	5,735.34	-514.70	25.78	514.99	3.01
5,869.00	0.90	190.39	5,830.32	-516.21	24.94	516.49	0.73
5,964.00	0.74	183.51	5,925.31	-517.56	24.77	517.83	0.20
6,058.00	0.50	120.25	6,019.31	-518.37	25.09	518.65	0.73
6,153.00	0.73	74.96	6,114.30	-518.42	26.03	518.71	0.55
6,247.00	1.93	56.02	6,208.27	-517.38	27.92	517.70	1.34
6,342.00	1.74	63.23	6,303.22	-515.84	30.53	516.19	0.31
6,436.00	8.00	201.91	6,396.95	-521.28	29.36	521.61	9.98
6,531.00	19.46	207.09	6,489.09	-541.57	19.66	541.77	12.12
6,626.00	26.34	200.42	6,576.56	-575.45	5.08	575.47	7.73
6,721.00	38.20	186.91	6,656.85	-624.60	-5.86	624.48	14.55
6,816.00	48.55	182.78	6,725.82	-689.52	-11.14	689.32	11.29
6,910.00	57.04	178.80	6,782.62	-764.28	-12.02	764.07	9.64
7,005.00	57.78	178.05	6,833.79	-844.29	-9.82	844.10	1.02
7,100.00	64.36	177.19	6,879.73	-927.32	-6.35	927.16	6.97
7,195.00	69.16	176.41	6,917.20	-1,014.45	-1.47	1,014.35	5.11
7,289.00	76.41	176.63	6,945.00	-1,104.01	3.97	1,103.97	7.72
7,331.00	80.97	176.60	6,953.24	-1,145.11	6.41	1,145.10	10.86
<b>Final Sperry MWD Survey at 7331.00ft - Tie on to Sperry MWD Survey at 7331.00ft</b>							
7,377.00	83.42	177.02	6,959.48	-1,190.61	8.94	1,190.63	5.40
<b>7"</b>							
7,449.00	87.25	177.68	6,965.34	-1,262.29	12.25	1,262.34	5.40
<b>First Schlumberger IFR Survey at 7449.00ft</b>							
7,544.00	88.59	177.80	6,968.79	-1,357.15	16.00	1,357.24	1.42
7,638.00	89.87	177.76	6,970.05	-1,451.07	19.64	1,451.20	1.36
7,733.00	91.69	177.81	6,968.76	-1,545.98	23.31	1,546.15	1.92
7,827.00	92.20	178.30	6,965.57	-1,639.87	26.50	1,640.08	0.75
7,922.00	92.96	178.97	6,961.29	-1,734.75	28.76	1,734.97	1.07
8,017.00	90.81	179.09	6,958.17	-1,829.68	30.37	1,829.92	2.27
8,111.00	89.88	178.20	6,957.60	-1,923.65	32.59	1,923.91	1.37
8,206.00	90.40	178.39	6,957.37	-2,018.61	35.42	2,018.89	0.58
8,300.00	89.85	178.99	6,957.16	-2,112.58	37.56	2,112.89	0.87
8,394.00	90.13	180.16	6,957.18	-2,206.58	38.26	2,206.88	1.28
8,489.00	90.34	181.58	6,956.79	-2,301.56	36.82	2,301.84	1.51
8,584.00	90.23	181.81	6,956.32	-2,396.52	34.01	2,396.76	0.27
8,678.00	90.37	182.03	6,955.82	-2,490.46	30.86	2,490.66	0.28
8,773.00	89.41	182.44	6,956.01	-2,585.39	27.15	2,585.53	1.10
8,868.00	89.24	182.21	6,957.13	-2,680.31	23.30	2,680.38	0.30
8,962.00	89.07	181.20	6,958.51	-2,774.25	20.50	2,774.29	1.09
9,057.00	89.24	180.00	6,959.91	-2,869.23	19.51	2,869.25	1.28
9,151.00	89.92	179.27	6,960.60	-2,963.23	20.11	2,963.25	1.06
9,246.00	90.20	178.90	6,960.50	-3,058.22	21.63	3,058.24	0.49
9,341.00	90.44	178.90	6,959.97	-3,153.20	23.45	3,153.24	0.25
9,436.00	90.41	178.98	6,959.27	-3,248.18	25.21	3,248.24	0.09
9,530.00	90.34	178.56	6,958.65	-3,342.16	27.22	3,342.23	0.45

## Design Report for Moser H34-769 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
9,625.00	90.37	177.91	6,958.06	-3,437.11	30.15	3,437.21	0.68
9,719.00	90.17	178.15	6,957.62	-3,531.05	33.38	3,531.19	0.33
9,814.00	90.10	178.67	6,957.40	-3,626.01	36.02	3,626.18	0.55
9,909.00	90.34	178.64	6,957.03	-3,720.99	38.25	3,721.17	0.25
10,003.00	90.13	177.70	6,956.65	-3,814.94	41.25	3,815.15	1.02
10,098.00	90.34	178.64	6,956.26	-3,909.89	44.28	3,910.13	1.01
10,193.00	90.00	178.98	6,955.98	-4,004.87	46.26	4,005.13	0.51
10,287.00	89.79	179.23	6,956.15	-4,098.85	47.72	4,099.13	0.35
10,382.00	90.58	179.97	6,955.84	-4,193.85	48.39	4,194.13	1.14
10,474.00	90.27	180.04	6,955.16	-4,285.85	48.38	4,286.12	0.35
10,566.00	90.24	179.63	6,954.75	-4,377.85	48.64	4,378.11	0.45
10,657.00	90.24	179.16	6,954.37	-4,468.84	49.61	4,469.11	0.52
10,749.00	90.51	179.75	6,953.77	-4,560.83	50.48	4,561.11	0.71
10,840.00	90.72	180.14	6,952.79	-4,651.83	50.57	4,652.09	0.49
10,932.00	89.82	178.64	6,952.36	-4,743.82	51.55	4,744.09	1.90
11,023.00	89.89	179.55	6,952.59	-4,834.80	52.98	4,835.09	1.00
11,114.00	89.69	179.81	6,952.92	-4,925.80	53.49	4,926.08	0.36
11,206.00	89.69	179.83	6,953.42	-5,017.80	53.78	5,018.08	0.02
11,298.00	89.65	179.71	6,953.95	-5,109.80	54.15	5,110.07	0.14
11,390.00	89.34	179.03	6,954.76	-5,201.79	55.16	5,202.07	0.81
11,481.00	89.03	176.91	6,956.05	-5,292.72	58.39	5,293.03	2.35
11,573.00	89.51	177.06	6,957.22	-5,384.58	63.22	5,384.95	0.55
11,664.00	90.55	178.57	6,957.18	-5,475.51	66.69	5,475.92	2.01
11,755.00	90.34	177.92	6,956.47	-5,566.47	69.48	5,566.90	0.75
11,846.00	90.96	176.70	6,955.44	-5,657.36	73.75	5,657.84	1.50
11,941.00	90.37	178.54	6,954.34	-5,752.26	77.70	5,752.79	2.03
12,036.00	90.06	178.65	6,953.98	-5,847.24	80.02	5,847.78	0.35
12,130.00	90.17	178.48	6,953.79	-5,941.21	82.38	5,941.77	0.22
12,225.00	90.24	178.51	6,953.45	-6,036.17	84.87	6,036.76	0.08
12,320.00	90.10	177.58	6,953.17	-6,131.12	88.11	6,131.74	0.99
12,414.00	90.37	178.89	6,952.78	-6,225.07	91.01	6,225.72	1.42
12,509.00	89.96	179.28	6,952.51	-6,320.06	92.53	6,320.72	0.60
12,604.00	90.00	178.33	6,952.54	-6,415.03	94.51	6,415.72	1.00
12,698.00	89.34	177.67	6,953.08	-6,508.97	97.79	6,509.69	0.99
12,793.00	89.65	178.97	6,953.92	-6,603.93	100.57	6,604.67	1.41
12,887.00	89.58	180.59	6,954.55	-6,697.92	100.93	6,698.66	1.72
12,982.00	89.27	181.50	6,955.51	-6,792.90	99.20	6,793.61	1.01
13,077.00	89.24	181.27	6,956.74	-6,887.86	96.91	6,888.54	0.24
13,172.00	89.28	180.95	6,957.97	-6,982.84	95.07	6,983.48	0.34
13,266.00	89.62	180.48	6,958.87	-7,076.83	93.89	7,077.45	0.62
13,361.00	90.00	179.63	6,959.19	-7,171.82	93.80	7,172.44	0.98
13,456.00	89.96	180.64	6,959.22	-7,266.82	93.58	7,267.42	1.06
13,551.00	90.72	182.87	6,958.65	-7,361.77	90.67	7,362.33	2.48
13,645.00	90.03	180.31	6,958.04	-7,455.72	88.06	7,456.24	2.82
13,740.00	90.27	180.90	6,957.79	-7,550.72	87.06	7,551.21	0.67
13,835.00	90.17	180.34	6,957.43	-7,645.71	86.03	7,646.19	0.60
13,929.00	90.03	179.10	6,957.26	-7,739.71	86.49	7,740.18	1.33
14,024.00	90.14	177.73	6,957.12	-7,834.67	89.12	7,835.17	1.45
14,118.00	89.93	178.09	6,957.06	-7,928.61	92.54	7,929.14	0.44
14,212.00	89.93	177.84	6,957.18	-8,022.55	95.88	8,023.12	0.27
14,306.00	89.96	177.37	6,957.27	-8,116.46	99.81	8,117.08	0.50

## Design Report for Moser H34-769 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
14,400.00	90.20	180.11	6,957.14	-8,210.43	101.88	8,211.06	2.93
14,495.00	90.62	178.64	6,956.46	-8,305.42	102.91	8,306.06	1.61
14,588.00	89.96	177.75	6,955.99	-8,398.37	105.84	8,399.04	1.19
14,683.00	90.58	178.44	6,955.54	-8,493.32	109.00	8,494.02	0.98
14,777.00	90.03	178.12	6,955.04	-8,587.27	111.82	8,588.00	0.68
14,871.00	90.07	178.51	6,954.96	-8,681.23	114.59	8,681.99	0.42
14,966.00	90.00	178.98	6,954.90	-8,776.21	116.67	8,776.98	0.50
15,060.00	89.76	178.37	6,955.10	-8,870.18	118.84	8,870.98	0.70
15,155.00	89.96	178.29	6,955.33	-8,965.14	121.61	8,965.96	0.23
15,249.00	90.41	177.40	6,955.02	-9,059.07	125.14	9,059.93	1.06
15,343.00	90.38	178.62	6,954.38	-9,153.01	128.41	9,153.91	1.30
15,438.00	90.38	178.69	6,953.75	-9,247.99	130.64	9,248.90	0.07
15,531.00	90.03	178.53	6,953.41	-9,340.96	132.89	9,341.89	0.41
15,626.00	89.65	178.56	6,953.68	-9,435.93	135.31	9,436.88	0.40
15,720.00	90.03	179.65	6,953.94	-9,529.91	136.77	9,530.88	1.23
15,814.00	89.52	177.20	6,954.31	-9,623.87	139.36	9,624.86	2.66
15,908.00	90.07	179.04	6,954.65	-9,717.81	142.44	9,718.84	2.04
16,002.00	90.10	178.75	6,954.51	-9,811.80	144.25	9,812.84	0.31
16,097.00	89.79	179.42	6,954.60	-9,906.78	145.77	9,907.84	0.78
16,193.00	89.69	178.95	6,955.03	-10,002.77	147.14	10,003.83	0.50
16,290.00	89.72	179.33	6,955.53	-10,099.76	148.59	10,100.83	0.39
16,386.00	90.17	178.02	6,955.63	-10,195.73	150.81	10,196.83	1.44
16,483.00	89.59	178.96	6,955.83	-10,292.70	153.37	10,293.81	1.14
16,578.00	89.55	179.74	6,956.54	-10,387.69	154.45	10,388.81	0.82
16,611.00	89.76	180.73	6,956.74	-10,420.69	154.31	10,421.81	3.07
<b>Final Schlumberger IFR Survey at 16611.00ft</b>							
16,648.63	89.76	180.73	6,956.90	-10,458.31	153.83	10,459.42	0.00
<b>Moser H34-769_Rev A0_BHL - Moser H34-769_Rev A1_BHL</b>							
16,650.00	89.76	180.73	6,956.90	-10,459.68	153.81	10,460.79	0.00
<b>Schlumberger Straight Line Projection to TD 16650.00ft</b>							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
250.00	250.00	0.05	-0.04	First Sperry MWD Survey at 250.00ft
7,331.00	6,953.24	-1,145.11	6.41	Final Sperry MWD Survey at 7331.00ft
7,331.00	6,953.24	-1,145.11	6.41	Tie on to Sperry MWD Survey at 7331.00ft
7,449.00	6,965.34	-1,262.29	12.25	First Schlumberger IFR Survey at 7449.00ft
16,611.00	6,956.74	-10,420.69	154.31	Final Schlumberger IFR Survey at 16611.00ft
16,650.00	6,956.90	-10,459.68	153.81	Schlumberger Straight Line Projection to TD 16650.00ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/-S (usft)	+E/-W (usft)	
Target	Moser H34-769_Rev A1_BHL	179.27	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
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## Design Report for Moser H34-769 - Actual Surveys

### Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
250.00	7,331.00	Intermediate Sperry MWD Surveys	MWD
7,331.00	16,650.00	Schlumberger MWD+IFR Surveys	MWD+IFR1+MS_WY

### Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
803.00	803.00	9 5/8"	9-5/8	13-3/4
7,377.00	6,959.48	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 H34-769_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	1,318,585.06	3,235,867.16	40.204830	-104.655530
Moser H34-769_Rev A - actual wellpath misses target center by 42.31usft at 16648.63usft MD (6956.90 TVD, -10458.31 N, 153.83 E) - Point	0.00	0.00	6,920.00	-10,458.20	133.13	1,308,127.30	3,236,000.29	40.176120	-104.655410
Moser H34-769_Rev A - actual wellpath misses target center by 23.98usft at 16648.63usft MD (6956.90 TVD, -10458.31 N, 153.83 E) - Point	0.00	0.00	6,969.00	-10,458.20	133.13	1,308,127.30	3,236,000.29	40.176120	-104.655410

### Directional Difficulty Index

Average Dogleg over Survey:	1.42 °/100usft	Maximum Dogleg over Survey:	14.55 °/100usft at 6,721.00 usft
Net Tortosity applicable to Plans:	0.76 °/100usft	Directional Difficulty Index:	6.773

### Audit Info

North Reference Sheet for Sec. 22-T3N-65W (Moser PAD) - Moser H34-769 - 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 H34-769

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: 1,318,585.06 usft N, 3,235,867.16 usft E

Geographical Coordinates of Well: 40° 12' 17.39" N, 104° 39' 19.91" W

Grid Convergence at Surface is: 0.55°

Based upon Minimum Curvature type calculations, at a Measured Depth of 16,650.00usft the Bottom Hole Displacement is 10,460.81usft in the Direction of 179.16° (Grid).

Magnetic Convergence at surface is: -7.91° (15 October 2015, , BGGM2015)

