

# Noble Energy

Weld County, CO (NAD 83)

Sec. 27-T3N-R65W (Moser Pad)

Moser H22-711

05-123-40757

Plan A

Design: Actual Surveys

## Sperry Drilling Services

### Final Survey Report

07 December, 2015

Surface UWI : 05-123-40757

Well Coordinates: 1,317,805.27 N, 3,239,642.80 E (40° 12' 09.32" N, 104° 38' 31.34" 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 H22-711

KB = 24' @ 4836.00usft (H&P 343)

N

Grid

Dec-Deg - API - US Survey Feet - Custom

**HALLIBURTON**

Project: Weld County, CO (NAD 83)  
 Site: Sec. 27-T3N-R65W (Moser Pad)  
 Well: Moser H22-711  
 Wellbore: Plan A  
 Design: Actual Surveys



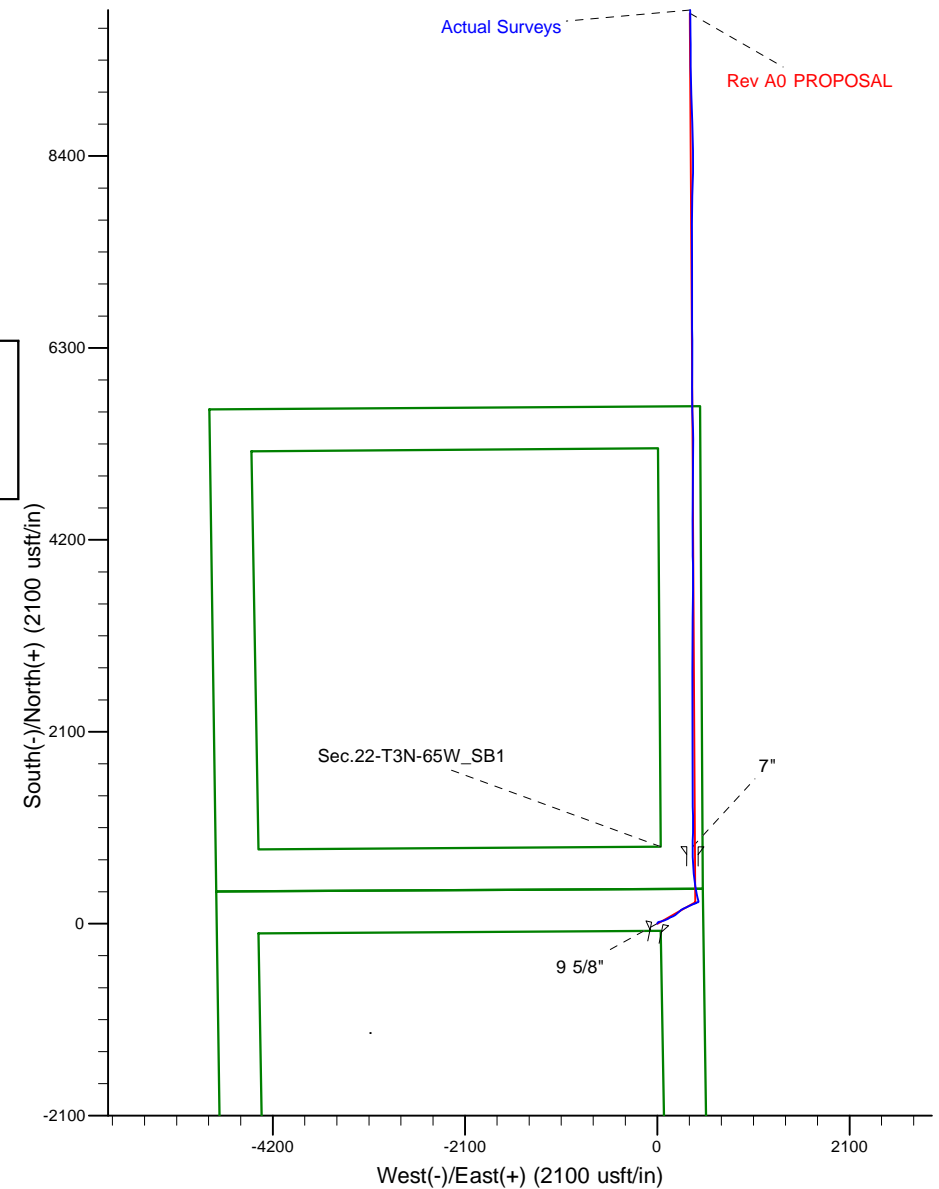
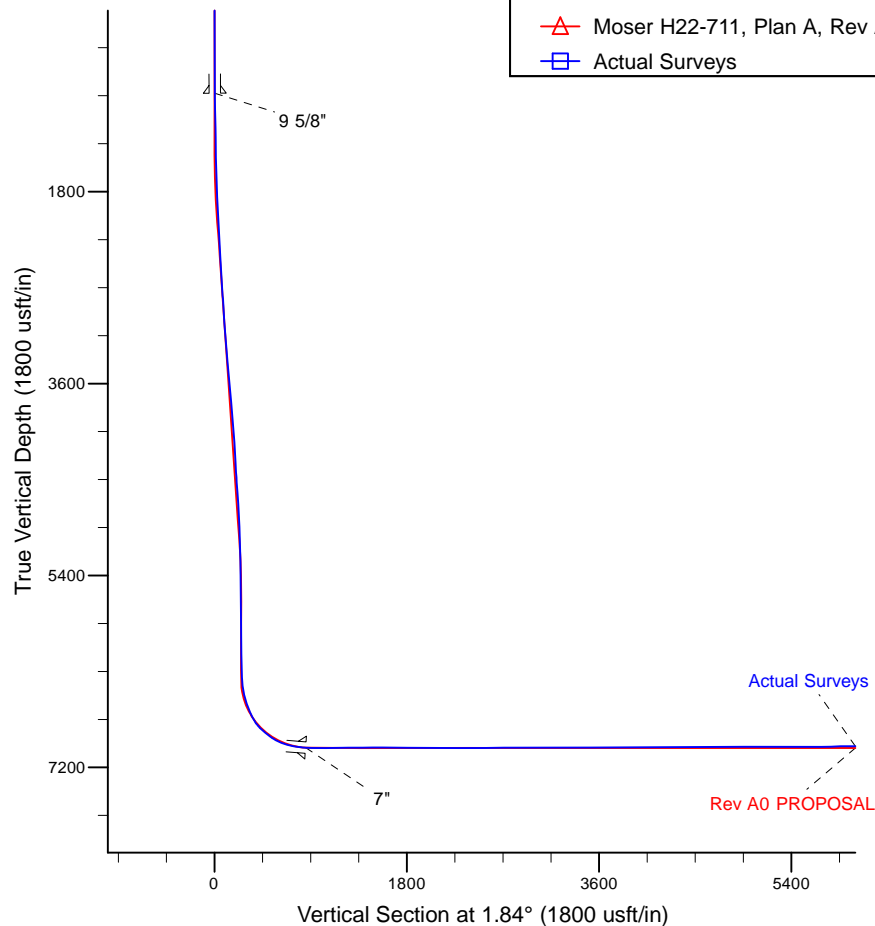
Platted SHL: 380' FNL, 501' FEL  
 Platted Lat/Long: 40.20259, -104.64204  
 Location: Sec. 27-T3N-R65W

~7" Casing: 500' FSL, 110' FEL  
 Lat/Long: 40.204889 N, -104.640632 W  
 State Planes - CO Northern: 1,318,646.32 N, 3,240,028.09 E  
 Sec. 27-T3N-R65W

Platted BHL: 75' FNL, 75' FEL  
 Platted Lat/Long: 40.232233 N, -104.640469 W  
 State Planes - CO Northern: 1,328,607.31 N, 3,239,976.93 E  
 Location: Sec. 15-T3N-R65W

### LEGEND

- △ Moser H22-711, Plan A, Rev A0 PROPOSAL V0
- Actual Surveys



WELL DETAILS: Moser H22-711

Ground Level: 4812.00

KB = 24' @ 4836.00usft (H&P 343)

Created By: Tatiana Gomez  
 Created On: 12-7-15

## Design Report for Moser H22-711 - 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
877.00	0.49	11.60	876.99	3.68	0.76	3.71	0.06
<b>9 5/8"</b>							
928.00	0.52	11.60	927.99	4.13	0.85	4.15	0.06
<b>First Sperry MWD Survey at 928.00ft</b>							
1,022.00	0.76	17.85	1,021.98	5.14	1.12	5.17	0.27
1,203.00	1.24	24.65	1,202.95	8.06	2.31	8.13	0.27
1,294.00	1.22	28.19	1,293.93	9.81	3.18	9.90	0.09
1,386.00	1.18	29.17	1,385.91	11.50	4.10	11.62	0.05
1,477.00	1.20	33.51	1,476.89	13.11	5.08	13.27	0.10
1,568.00	1.67	49.02	1,567.86	14.77	6.61	14.98	0.67
1,659.00	3.71	63.83	1,658.76	16.94	10.25	17.26	2.35
1,750.00	6.73	74.00	1,749.37	19.71	18.02	20.28	3.46
1,842.00	9.26	76.12	1,840.47	22.97	30.39	23.94	2.77
1,933.00	9.06	74.37	1,930.31	26.66	44.40	28.08	0.38
2,024.00	8.62	73.57	2,020.23	30.52	57.84	32.37	0.50
2,115.00	8.05	69.98	2,110.27	34.63	70.37	36.88	0.85
2,205.00	7.50	67.87	2,199.44	39.00	81.73	41.61	0.69
2,297.00	6.51	67.48	2,290.75	43.26	92.11	46.20	1.08
2,388.00	8.20	64.11	2,381.00	48.07	102.72	51.35	1.92
2,480.00	7.49	64.36	2,472.14	53.53	114.03	57.17	0.77
2,571.00	6.74	62.39	2,562.44	58.57	124.11	62.54	0.87
2,663.00	6.96	58.85	2,653.78	63.96	133.66	68.23	0.52
2,755.00	6.64	57.86	2,745.14	69.67	142.93	74.23	0.37
2,849.00	9.12	68.35	2,838.25	75.31	154.46	80.24	3.04
2,944.00	8.75	66.80	2,932.09	80.93	168.10	86.30	0.46
3,038.00	8.39	62.92	3,025.04	86.87	180.78	92.65	0.72
3,133.00	7.57	58.59	3,119.12	93.29	192.29	99.43	1.07
3,228.00	7.12	54.87	3,213.35	99.94	202.45	106.40	0.69
3,322.00	5.93	49.51	3,306.74	106.44	210.90	113.18	1.42
3,417.00	7.85	47.32	3,401.05	114.03	219.41	121.03	2.04
3,512.00	6.95	43.21	3,495.25	122.62	228.11	129.90	1.10
3,606.00	9.03	51.53	3,588.34	131.35	237.78	138.94	2.53
3,701.00	7.69	48.84	3,682.33	140.17	248.41	148.10	1.47
3,795.00	6.56	45.24	3,775.60	148.09	256.95	156.29	1.29
3,890.00	8.94	59.46	3,869.74	155.67	267.17	164.19	3.20
3,985.00	9.47	64.70	3,963.51	162.76	280.59	171.71	1.04
4,079.00	8.65	66.42	4,056.34	168.89	294.06	178.27	0.92
4,174.00	8.06	63.65	4,150.33	174.71	306.58	184.48	0.75
4,268.00	7.60	65.46	4,243.46	180.21	318.13	190.36	0.56
4,363.00	7.18	64.60	4,337.67	185.37	329.21	195.87	0.46
4,458.00	6.77	61.58	4,431.96	190.58	339.50	201.41	0.58
4,552.00	8.32	65.72	4,525.15	196.01	350.57	207.20	1.75
4,646.00	9.04	66.26	4,618.07	201.78	363.53	213.38	0.77
4,740.00	9.04	67.71	4,710.90	207.56	377.13	219.59	0.24
4,835.00	8.49	64.94	4,804.79	213.36	390.38	225.81	0.73
4,929.00	5.76	73.78	4,898.06	217.62	401.20	230.42	3.12
5,024.00	5.49	68.42	4,992.60	220.62	410.01	233.70	0.62
5,119.00	4.99	63.93	5,087.21	224.11	417.94	237.44	0.68
5,213.00	1.43	57.09	5,181.04	226.54	422.60	240.03	3.80

**Design Report for Moser H22-711 - Actual Surveys**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,307.00	1.68	56.21	5,275.01	227.94	424.73	241.50	0.27
5,402.00	1.87	53.95	5,369.96	229.63	427.14	243.26	0.21
5,497.00	1.74	56.69	5,464.92	231.33	429.60	245.04	0.16
5,591.00	1.78	50.66	5,558.87	233.04	431.92	246.83	0.20
5,686.00	0.82	113.27	5,653.85	233.71	433.69	247.55	1.66
5,780.00	1.57	96.59	5,747.83	233.30	435.58	247.20	0.87
5,875.00	1.49	82.68	5,842.80	233.31	438.10	247.29	0.40
5,969.00	1.62	68.09	5,936.76	233.96	440.55	248.02	0.44
6,064.00	1.45	67.26	6,031.73	234.92	442.90	249.06	0.18
6,158.00	1.72	55.37	6,125.69	236.18	445.16	250.39	0.45
6,253.00	1.57	55.70	6,220.65	237.73	447.41	252.01	0.16
6,348.00	1.88	36.26	6,315.61	239.72	449.40	254.06	0.69
6,443.00	5.71	353.73	6,410.40	245.67	449.81	260.03	4.74
6,538.00	11.91	344.79	6,504.24	259.85	446.72	274.09	6.66
6,633.00	19.48	346.07	6,595.63	284.72	440.32	298.74	7.98
6,727.00	24.30	344.00	6,682.83	318.54	431.21	332.26	5.19
6,822.00	32.33	348.82	6,766.40	362.33	420.88	375.69	8.78
6,916.00	46.06	355.33	6,839.11	421.02	413.21	434.11	15.23
7,011.00	53.57	352.75	6,900.37	493.14	405.59	505.94	8.17
7,105.00	62.09	353.55	6,950.37	572.07	396.14	584.52	9.09
7,200.00	74.42	358.42	6,985.52	659.90	390.14	672.11	13.82
7,322.00	83.15	357.96	7,009.22	779.39	386.35	791.42	7.17
7,384.00	85.90	0.09	7,015.14	841.09	385.30	853.06	5.60
<b>7"</b>							
7,443.00	88.52	2.10	7,018.01	900.00	386.43	911.97	5.60
7,538.00	90.43	0.56	7,018.88	994.96	388.64	1,006.96	2.58
7,632.00	90.74	0.23	7,017.92	1,088.96	389.28	1,100.92	0.48
7,727.00	90.71	359.48	7,016.72	1,183.95	389.04	1,195.86	0.79
7,822.00	90.77	359.03	7,015.49	1,278.93	387.81	1,290.75	0.48
7,917.00	90.89	358.77	7,014.12	1,373.90	385.98	1,385.62	0.30
8,011.00	90.37	0.01	7,013.08	1,467.89	384.98	1,479.52	1.43
8,106.00	90.22	359.56	7,012.60	1,562.89	384.63	1,574.46	0.50
8,200.00	88.64	0.59	7,013.53	1,656.88	384.75	1,668.41	2.01
8,295.00	89.14	0.13	7,015.37	1,751.86	385.35	1,763.36	0.72
8,390.00	89.29	359.62	7,016.67	1,846.85	385.14	1,858.29	0.56
8,484.00	89.11	358.95	7,017.99	1,940.83	383.97	1,952.19	0.74
8,579.00	89.75	0.70	7,018.93	2,035.82	383.68	2,047.12	1.96
8,674.00	90.12	0.60	7,019.04	2,130.82	384.75	2,142.10	0.40
8,768.00	90.12	0.08	7,018.84	2,224.82	385.31	2,236.07	0.55
8,863.00	90.12	359.79	7,018.64	2,319.82	385.20	2,331.01	0.31
8,957.00	89.69	359.28	7,018.80	2,413.81	384.44	2,424.94	0.71
9,052.00	90.77	359.96	7,018.42	2,508.81	383.81	2,519.86	1.34
9,146.00	91.39	358.78	7,016.64	2,602.78	382.78	2,613.75	1.42
9,241.00	90.65	0.12	7,014.95	2,697.76	381.87	2,708.65	1.61
9,336.00	90.18	1.60	7,014.27	2,792.74	383.29	2,803.63	1.63
9,525.00	90.18	359.82	7,013.67	2,981.72	385.63	2,992.59	0.94
9,714.00	89.23	359.71	7,014.64	3,170.71	384.86	3,181.46	0.51
9,809.00	89.88	0.22	7,015.38	3,265.71	384.80	3,276.40	0.87
9,904.00	89.88	359.24	7,015.58	3,360.71	384.35	3,371.34	1.03
9,998.00	90.12	1.19	7,015.58	3,454.70	384.71	3,465.30	2.09
10,093.00	90.59	1.41	7,014.99	3,549.68	386.86	3,560.29	0.55

## Design Report for Moser H22-711 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
10,187.00	90.77	1.01	7,013.88	3,643.65	388.85	3,654.28	0.47
10,282.00	90.68	359.91	7,012.68	3,738.64	389.61	3,749.24	1.16
10,471.00	90.71	359.74	7,010.38	3,927.62	389.03	3,938.11	0.09
10,566.00	89.72	358.60	7,010.03	4,022.61	387.66	4,033.00	1.59
10,660.00	90.46	0.86	7,009.88	4,116.60	387.21	4,126.93	2.53
10,846.00	90.80	359.73	7,007.83	4,302.58	388.17	4,312.85	0.63
10,937.00	89.57	359.33	7,007.54	4,393.58	387.42	4,403.77	1.42
11,028.00	89.29	359.90	7,008.44	4,484.57	386.81	4,494.70	0.70
11,119.00	89.35	359.17	7,009.52	4,575.56	386.07	4,585.62	0.80
11,302.00	91.14	0.69	7,008.74	4,758.55	385.85	4,768.50	1.28
11,393.00	89.91	1.29	7,007.91	4,849.53	387.42	4,859.48	1.50
11,484.00	90.06	1.21	7,007.93	4,940.50	389.41	4,950.48	0.19
11,575.00	89.94	1.09	7,007.93	5,031.49	391.23	5,041.47	0.19
11,666.00	89.94	0.34	7,008.03	5,122.48	392.37	5,132.45	0.82
11,848.00	90.40	358.95	7,007.49	5,304.47	391.24	5,314.31	0.80
11,939.00	89.54	358.48	7,007.54	5,395.45	389.20	5,405.18	1.08
12,030.00	89.75	358.05	7,008.10	5,486.40	386.45	5,496.00	0.53
12,122.00	89.82	357.56	7,008.44	5,578.33	382.92	5,587.77	0.54
12,213.00	91.33	358.55	7,007.53	5,669.27	379.83	5,678.56	1.98
12,305.00	91.30	359.30	7,005.42	5,761.23	378.11	5,770.42	0.82
12,396.00	91.94	0.62	7,002.85	5,852.19	378.04	5,861.33	1.61
12,488.00	90.03	1.01	7,001.27	5,944.17	379.35	5,953.30	2.12
12,583.00	89.29	1.14	7,001.83	6,039.15	381.14	6,048.28	0.79
12,677.00	88.92	0.41	7,003.30	6,133.13	382.41	6,142.26	0.87
12,772.00	90.12	359.57	7,004.09	6,228.12	382.39	6,237.20	1.54
12,867.00	91.45	358.68	7,002.79	6,323.10	380.94	6,332.08	1.68
12,961.00	89.85	359.72	7,001.73	6,417.08	379.63	6,425.97	2.03
13,056.00	90.31	359.38	7,001.59	6,512.07	378.88	6,520.89	0.60
13,150.00	90.09	0.24	7,001.26	6,606.07	378.57	6,614.83	0.94
13,339.00	89.57	359.70	7,001.83	6,795.07	378.47	6,803.73	0.40
13,434.00	88.37	0.53	7,003.53	6,890.05	378.66	6,898.67	1.54
13,528.00	88.37	359.92	7,006.21	6,984.01	379.03	6,992.59	0.65
13,623.00	89.69	359.83	7,007.82	7,079.00	378.82	7,087.52	1.39
13,717.00	90.22	0.04	7,007.89	7,173.00	378.72	7,181.47	0.61
13,812.00	90.99	359.54	7,006.89	7,267.99	378.37	7,276.40	0.97
14,001.00	90.12	0.11	7,005.06	7,456.98	377.79	7,465.27	0.55
14,096.00	91.76	359.59	7,003.50	7,551.96	377.54	7,560.20	1.81
14,190.00	90.49	0.25	7,001.65	7,645.94	377.41	7,654.12	1.52
14,285.00	88.80	0.49	7,002.24	7,740.93	378.02	7,749.09	1.80
14,379.00	89.66	1.39	7,003.50	7,834.91	379.57	7,843.07	1.32
14,474.00	90.71	1.69	7,003.20	7,929.87	382.12	7,938.06	1.15
14,663.00	88.95	1.43	7,003.76	8,118.79	387.26	8,127.05	0.94
14,758.00	89.17	0.76	7,005.32	8,213.76	389.08	8,222.03	0.74
14,853.00	89.63	0.09	7,006.31	8,308.75	389.78	8,317.00	0.86
14,947.00	90.22	359.50	7,006.43	8,402.75	389.45	8,410.93	0.89
15,042.00	90.40	358.90	7,005.92	8,497.74	388.12	8,505.83	0.66
15,137.00	89.26	359.55	7,006.20	8,592.73	386.84	8,600.73	1.38
15,231.00	89.45	358.58	7,007.26	8,686.71	385.30	8,694.61	1.05
15,325.00	90.12	357.94	7,007.61	8,780.67	382.45	8,788.43	0.99
15,419.00	91.26	356.77	7,006.48	8,874.56	378.11	8,882.13	1.74
15,513.00	90.15	357.53	7,005.32	8,968.43	373.44	8,975.80	1.43

## Design Report for Moser H22-711 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
15,701.00	90.52	358.83	7,004.22	9,156.33	367.47	9,163.41	0.72
15,795.00	88.98	359.91	7,004.63	9,250.32	366.43	9,257.32	2.00
15,889.00	89.45	359.48	7,005.92	9,344.31	365.93	9,351.24	0.68
15,984.00	90.59	359.35	7,005.89	9,439.30	364.96	9,446.16	1.21
16,077.00	88.24	359.98	7,006.84	9,532.29	364.42	9,539.08	2.62
16,171.00	88.03	358.53	7,009.90	9,626.23	363.20	9,632.93	1.56
16,265.00	88.89	359.55	7,012.42	9,720.18	361.62	9,726.78	1.42
16,454.00	88.95	358.84	7,015.99	9,909.12	358.97	9,915.54	0.38
16,548.00	89.63	359.50	7,017.15	10,003.11	357.61	10,009.43	1.01
16,642.00	90.71	359.19	7,016.87	10,097.10	356.53	10,103.34	1.20
16,736.00	90.43	359.16	7,015.94	10,191.08	355.18	10,197.23	0.30
16,830.00	90.59	359.17	7,015.10	10,285.07	353.81	10,291.13	0.17
16,924.00	89.94	358.37	7,014.67	10,379.04	351.79	10,384.99	1.10
17,110.00	91.39	357.85	7,012.51	10,564.93	345.66	10,570.58	0.83
17,204.00	91.70	357.40	7,009.97	10,658.81	341.77	10,664.29	0.58
17,298.00	92.25	356.95	7,006.73	10,752.64	337.14	10,757.92	0.76
17,348.00	92.66	356.17	7,004.59	10,802.50	334.14	10,807.66	1.76
Final Sperry MWD Survey at 17348.00ft							
17,410.00	92.66	356.17	7,001.71	10,864.30	330.00	10,869.29	0.00
Straight Line Projection to TD at 17410.00ft							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	+E/-W (usft)	Comment
928.00	927.99	4.13	0.85	First Sperry MWD Survey at 928.00ft
17,348.00	7,004.59	10,802.50	334.14	Final Sperry MWD Survey at 17348.00ft
17,410.00	7,001.71	10,864.30	330.00	Straight Line Projection to TD at 17410.00ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/-S (usft)	+E/-W (usft)	Start TVD (usft)
Target	Moser H22-711_Rev A0_BHL	1.84	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
928.00	7,322.00	Intermediate Sperry MWD Surveys	MWD
7,443.00	17,410.00	Production Sperry MWD Surveys	MWD+IFR1+MS_WY

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
877.00	876.99	9 5/8"	9-5/8	13-3/4
7,384.00	7,015.14	7"	7	8-3/4

## Design Report for Moser H22-711 - Actual Surveys

### 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 H22-711_Rev A	0.00	0.00	0.00	0.01	0.00	1,317,805.28	3,239,642.80	40.202590	-104.642040
- actual wellpath misses target center by 0.01usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Point									
Moser H22-711_Rev A	0.00	0.00	7,018.00	10,867.33	349.99	1,328,672.13	3,239,992.78	40.232410	-104.640410
- actual wellpath misses target center by 25.96usft at 17410.00usft MD (7001.71 TVD, 10864.30 N, 330.00 E)									
- Point									

### Directional Difficulty Index

Average Dogleg over Survey:	1.42 °/100usft	Maximum Dogleg over Survey:	15.23 °/100usft at 6,916.00 usft
Net Tortosity applicable to Plans:	0.82 °/100usft	Directional Difficulty Index:	6.836

### Audit Info