

Noble Energy

Weld County, CO (NAD 83)

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

Moser H22-776

05-123-40733

Plan A

Design: Actual Surveys

Sperry Drilling Services

Final Survey Report

24 November, 2015

Surface UWI : 05-123-40733

Well Coordinates: 1,318,584.84 N, 3,235,844.82 E (40° 12' 17.39" N, 104° 39' 20.20" 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 H22-776

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 H22-776
 Wellbore: Plan A
 Design: Actual Surveys



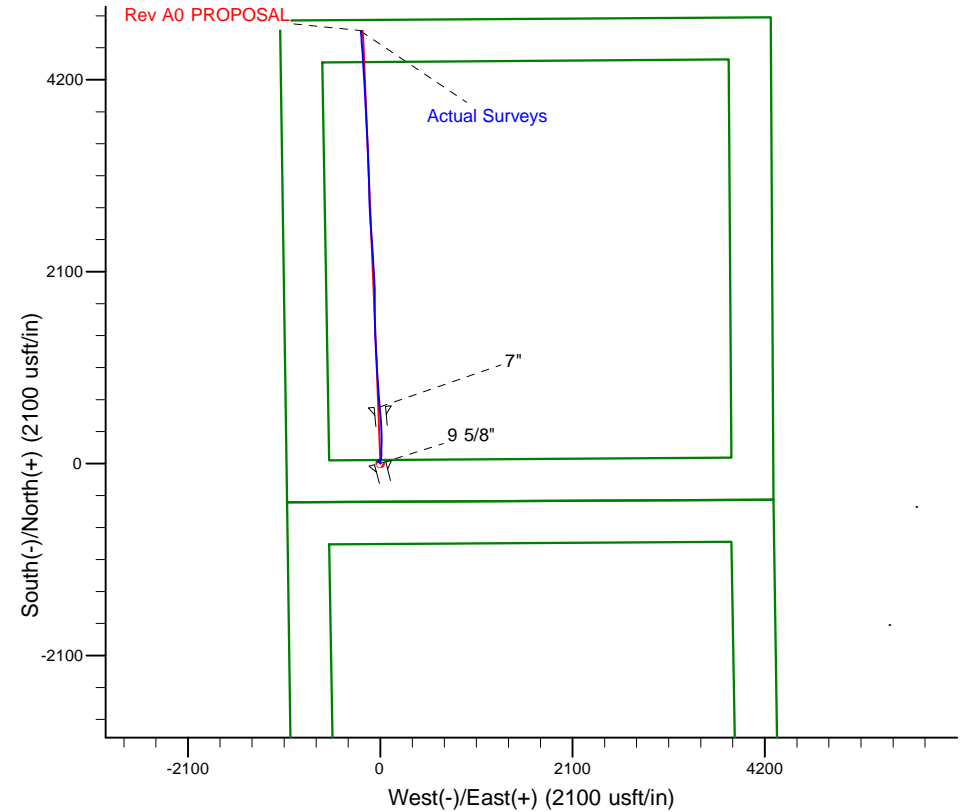
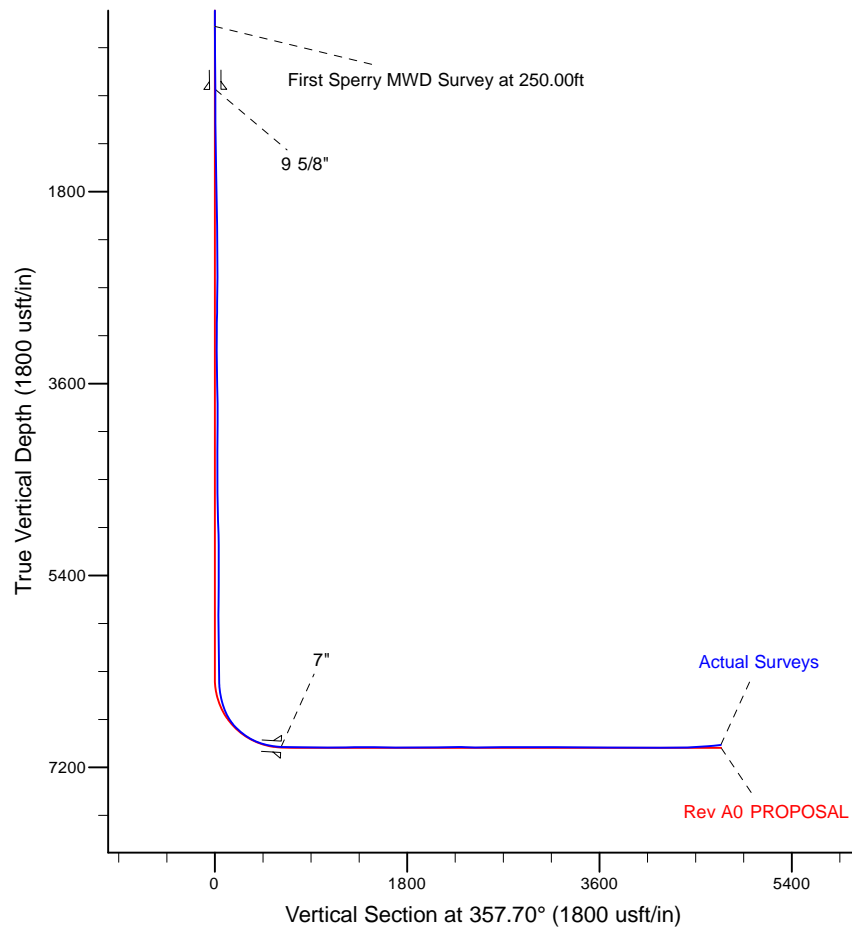
HALLIBURTON

Sperry Drilling

Platted SHL: 420' FSL, 1024' FWL
 Platted Lat/Long: 40.204830, -104.655610
 Location: Sec. 22-T3N-R65W

~7" Casing: 1050' FSL, 1038' FWL
 Lat/Long: 40.206531 N, -104.655608 W
 State Planes - CO Northern: 1,319,204.48 N, 3,235,839.46 E
 Sec. 22-T3N-R65W

Platted BHL: 120' FNL, 902' FWL
 Platted Lat/Long: 40.217820 N, -104.656208 W
 State Planes - CO Northern: 1,323,314.89 N, 3,235,632.98 E
 Location: Sec. 22-T3N-R65W



LEGEND

- ✕ Moser H22-776, Plan A, Rev A0 PROPOSAL V0
- Actual Surveys

WELL DETAILS: Moser H22-776

Ground Level: 4812.00

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

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

Design Report for Moser H22-776 - 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	0.11	345.62	250.00	0.23	-0.06	0.23	0.04
First Sperry MWD Survey at 250.00ft							
500.00	0.23	345.62	500.00	0.95	-0.24	0.96	0.05
840.00	0.39	345.62	839.99	2.73	-0.70	2.75	0.05
9 5/8"							
845.00	0.39	345.62	844.99	2.76	-0.71	2.79	0.05
917.00	0.42	345.62	916.99	3.25	-0.83	3.28	0.04
1,011.00	0.31	19.55	1,010.99	3.83	-0.83	3.86	0.25
1,106.00	0.35	307.08	1,105.99	4.24	-0.98	4.28	0.41
1,198.00	0.66	327.35	1,197.99	4.86	-1.49	4.91	0.38
1,289.00	0.94	12.10	1,288.98	6.03	-1.62	6.09	0.73
1,381.00	0.97	15.39	1,380.96	7.52	-1.25	7.56	0.07
1,473.00	0.99	9.57	1,472.95	9.05	-0.91	9.08	0.11
1,565.00	1.10	10.89	1,564.94	10.70	-0.61	10.72	0.12
1,656.00	1.08	11.49	1,655.92	12.40	-0.28	12.40	0.03
1,748.00	1.09	22.99	1,747.90	14.06	0.24	14.04	0.24
1,839.00	1.08	13.73	1,838.89	15.69	0.78	15.64	0.19
1,930.00	0.95	356.92	1,929.87	17.27	0.94	17.22	0.36
2,022.00	1.07	324.93	2,021.86	18.74	0.41	18.71	0.62
2,113.00	1.03	307.79	2,112.84	19.93	-0.73	19.95	0.35
2,205.00	0.81	326.74	2,204.83	20.98	-1.74	21.04	0.40
2,297.00	0.80	329.55	2,296.82	22.08	-2.42	22.16	0.04
2,389.00	0.30	321.03	2,388.82	22.82	-2.90	22.92	0.55
2,480.00	0.62	276.38	2,479.82	23.06	-3.54	23.19	0.50
2,571.00	0.25	192.13	2,570.81	22.92	-4.07	23.07	0.71
2,663.00	1.03	200.42	2,662.81	21.95	-4.40	22.11	0.85
2,754.00	0.87	217.99	2,753.79	20.64	-5.11	20.83	0.36
2,845.00	0.82	226.28	2,844.78	19.65	-6.00	19.87	0.14
2,936.00	0.96	246.03	2,935.77	18.89	-7.17	19.16	0.37
3,031.00	1.07	247.57	3,030.76	18.23	-8.72	18.56	0.12
3,126.00	1.07	263.68	3,125.74	17.79	-10.42	18.19	0.32
3,220.00	0.79	266.24	3,219.73	17.65	-11.94	18.12	0.30
3,315.00	0.40	241.06	3,314.73	17.45	-12.88	17.95	0.48
3,409.00	0.34	204.62	3,408.72	17.03	-13.29	17.55	0.25
3,504.00	1.18	338.53	3,503.72	17.69	-13.76	18.23	1.51
3,598.00	2.08	323.15	3,597.68	19.95	-15.14	20.55	1.06
3,693.00	2.23	326.21	3,692.61	22.87	-17.20	23.54	0.20
3,788.00	0.46	229.87	3,787.59	24.16	-18.52	24.89	2.45
3,883.00	0.90	269.42	3,882.58	23.91	-19.56	24.67	0.65
3,977.00	1.16	269.07	3,976.57	23.88	-21.25	24.72	0.28
4,072.00	1.37	128.99	4,071.56	23.15	-21.33	23.99	2.50
4,167.00	0.78	118.85	4,166.54	22.13	-19.88	22.91	0.65
4,262.00	0.22	123.37	4,261.53	21.72	-19.16	22.47	0.59
4,346.00	0.22	318.01	4,345.53	21.82	-19.07	22.57	0.15
4,440.00	0.77	10.04	4,439.53	22.58	-19.08	23.32	0.70
4,529.00	1.45	352.69	4,528.49	26.20	-19.16	26.95	0.40
4,623.00	2.70	0.56	4,622.43	29.59	-19.29	30.34	1.36
5,017.00	1.71	354.47	5,016.36	33.20	-19.40	33.96	1.08
5,112.00	1.50	82.53	5,111.33	34.78	-18.31	35.48	2.35

Design Report for Moser H22-776 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,300.00	0.62	228.05	5,299.32	34.42	-16.62	35.06	1.09
5,394.00	0.49	350.60	5,393.31	34.47	-17.07	35.13	1.04
5,489.00	0.77	303.66	5,488.31	35.23	-17.67	35.91	0.59
5,677.00	1.97	133.24	5,676.28	33.71	-16.36	34.34	1.45
5,772.00	2.16	91.36	5,771.22	32.55	-13.38	33.06	1.56
5,866.00	2.15	78.69	5,865.16	32.86	-9.88	33.23	0.51
5,960.00	2.30	77.28	5,959.09	33.62	-6.32	33.84	0.17
6,055.00	2.38	53.56	6,054.01	35.21	-2.87	35.29	1.02
6,149.00	1.83	53.68	6,147.95	37.26	-0.09	37.23	0.59
6,337.00	1.23	105.08	6,335.89	38.51	4.28	38.31	0.76
6,431.00	4.00	23.61	6,429.80	41.25	6.57	40.95	4.26
6,525.00	10.41	3.90	6,523.02	52.74	8.46	52.36	7.21
6,619.00	17.53	3.44	6,614.18	75.38	9.89	74.92	7.58
6,713.00	25.67	359.10	6,701.51	109.92	10.42	109.42	8.82
6,808.00	37.94	2.19	6,782.10	159.88	11.21	159.30	13.03
6,902.00	47.63	3.05	6,851.01	223.58	14.17	222.83	10.33
6,999.00	56.14	357.69	6,910.85	299.78	14.46	298.95	9.79
7,091.00	66.98	356.98	6,954.60	380.46	10.68	379.73	11.80
7,186.00	75.04	356.77	6,985.49	470.09	5.78	469.47	8.49
7,293.00	84.29	355.31	7,004.66	574.98	-1.50	574.58	8.75
7,338.00	86.57	354.84	7,008.25	619.67	-5.36	619.38	5.17
7"							
7,393.00	89.35	354.26	7,010.21	674.38	-10.58	674.26	5.17
7,456.00	89.35	354.92	7,010.92	737.09	-16.52	737.16	1.05
7,551.00	89.51	356.14	7,011.87	831.80	-23.92	832.09	1.30
7,646.00	89.75	356.51	7,012.48	926.60	-30.01	927.06	0.46
7,741.00	90.06	356.69	7,012.64	1,021.43	-35.64	1,022.04	0.38
7,834.00	90.25	356.76	7,012.39	1,114.28	-40.96	1,115.03	0.22
7,929.00	89.94	356.63	7,012.23	1,209.12	-46.43	1,210.01	0.35
8,023.00	90.59	357.61	7,011.80	1,303.00	-51.16	1,304.00	1.25
8,117.00	89.75	357.80	7,011.52	1,396.92	-54.92	1,398.00	0.92
8,212.00	89.78	358.92	7,011.91	1,491.88	-57.64	1,492.99	1.18
8,306.00	89.51	359.17	7,012.49	1,585.87	-59.21	1,586.97	0.39
8,400.00	89.69	359.25	7,013.14	1,679.86	-60.50	1,680.93	0.21
8,495.00	90.03	359.81	7,013.38	1,774.85	-61.28	1,775.88	0.69
8,590.00	90.00	359.90	7,013.35	1,869.85	-61.52	1,870.81	0.10
8,684.00	90.19	358.10	7,013.20	1,963.83	-63.16	1,964.79	1.93
8,778.00	90.34	356.55	7,012.76	2,057.73	-67.55	2,058.78	1.66
8,873.00	91.23	356.35	7,011.46	2,152.54	-73.43	2,153.75	0.96
8,968.00	90.77	355.62	7,009.80	2,247.29	-80.08	2,248.69	0.91
9,063.00	88.64	356.47	7,010.29	2,342.05	-86.63	2,343.64	2.41
9,157.00	89.26	356.81	7,012.01	2,435.88	-92.14	2,437.61	0.75
9,252.00	90.06	356.20	7,012.58	2,530.70	-97.93	2,532.59	1.06
9,346.00	90.52	355.52	7,012.10	2,624.45	-104.72	2,626.54	0.87
9,441.00	90.52	356.52	7,011.24	2,719.21	-111.31	2,721.49	1.05
9,536.00	90.37	357.02	7,010.50	2,814.06	-116.66	2,816.48	0.55
9,630.00	90.12	358.80	7,010.10	2,907.99	-120.09	2,910.47	1.91
9,725.00	89.44	358.80	7,010.46	3,002.97	-122.08	3,005.45	0.72
9,819.00	89.85	358.54	7,011.05	3,096.94	-124.26	3,099.44	0.52
9,913.00	90.03	357.91	7,011.14	3,190.90	-127.17	3,193.43	0.70
10,008.00	90.43	357.41	7,010.76	3,285.82	-131.05	3,288.43	0.67

Design Report for Moser H22-776 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
10,103.00	89.38	357.46	7,010.92	3,380.72	-135.30	3,383.43	1.11
10,197.00	89.57	357.55	7,011.78	3,474.63	-139.40	3,477.42	0.22
10,292.00	89.35	357.16	7,012.68	3,569.52	-143.78	3,572.42	0.47
10,387.00	89.54	357.96	7,013.60	3,664.43	-147.82	3,667.41	0.87
10,481.00	89.78	357.30	7,014.16	3,758.35	-151.71	3,761.41	0.75
10,576.00	89.69	357.35	7,014.60	3,853.24	-156.15	3,856.41	0.11
10,670.00	89.41	357.38	7,015.33	3,947.14	-160.47	3,950.40	0.30
10,765.00	89.63	356.81	7,016.13	4,042.02	-165.28	4,045.39	0.64
10,861.00	90.25	356.00	7,016.23	4,137.83	-171.30	4,141.37	1.06
10,955.00	90.80	355.35	7,015.37	4,231.55	-178.39	4,235.30	0.91
11,049.00	90.55	356.45	7,014.26	4,325.30	-185.11	4,329.25	1.20
11,144.00	91.73	356.77	7,012.37	4,420.12	-190.73	4,424.21	1.29
11,238.00	93.40	356.30	7,008.16	4,513.85	-196.40	4,518.09	1.85
11,333.00	94.69	355.92	7,001.46	4,608.39	-202.83	4,612.82	1.42
11,389.00	95.41	355.72	6,996.53	4,664.02	-206.90	4,668.57	1.33
Final Sperry MWD Survey at 11389.00ft							
11,457.00	95.41	355.72	6,990.12	4,731.53	-211.95	4,736.23	0.00
Straight Line Projection to TD at 11457.00ft							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
250.00	250.00	0.23	-0.06	First Sperry MWD Survey at 250.00ft
11,389.00	6,996.53	4,664.02	-206.90	Final Sperry MWD Survey at 11389.00ft
11,457.00	6,990.12	4,731.53	-211.95	Straight Line Projection to TD at 11457.00ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
Target	Moser H22-776_Rev A0_BHL	357.70	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
250.00	7,293.00	Intermediate Sperry MWD Surveys	MWD
7,393.00	11,457.00	Produccion Sperry MWD Surveys	MWD

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
840.00	839.99	9 5/8"	9-5/8	13-3/4
7,338.00	7,008.25	7"	7	8-3/4

Design Report for Moser H22-776 - 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 PC #34-30D_O - actual wellpath misses target center by 6400.15usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E) - Point	0.00	0.00	0.00	-6,395.93	-232.47	1,312,189.18	3,235,612.35	40.187280	-104.656660
Moser H22-776_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	1,318,584.85	3,235,844.82	40.204830	-104.655610
Moser PC #27-29D_O - actual wellpath misses target center by 713.40usft at 0.20usft MD (0.20 TVD, 0.00 N, 0.00 E) - Point	0.00	0.00	0.00	33.32	-712.62	1,318,618.15	3,235,132.22	40.204940	-104.658160
Moser #34-33D_OSW - actual wellpath misses target center by 8920.46usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E) - Point	0.00	0.00	0.00	-8,917.10	-244.82	1,309,668.12	3,235,600.01	40.180360	-104.656790
Moser H22-776_Rev A - actual wellpath misses target center by 33.82usft at 11455.71usft MD (6990.24 TVD, 4730.25 N, -211.85 E) - Point	0.00	0.00	7,016.00	4,734.31	-190.31	1,323,318.94	3,235,654.52	40.217830	-104.656130

Directional Difficulty Index

Average Dogleg over Survey:	1.42 °/100usft	Maximum Dogleg over Survey:	13.03 °/100usft at 6,808.00 usft
Net Tortousity applicable to Plans:	0.63 °/100usft	Directional Difficulty Index:	6.107

Audit Info

North Reference Sheet for Sec. 22-T3N-65W (Moser PAD) - Moser H22-776 - 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 H22-776

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: 1,318,584.84 usft N, 3,235,844.82 usft E

Geographical Coordinates of Well: 40° 12' 17.39" N, 104° 39' 20.20" W

Grid Convergence at Surface is: 0.55°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,457.00usft the Bottom Hole Displacement is 4,736.28usft in the Direction of 357.44° (Grid).

Magnetic Convergence at surface is: -7.91° (27 October 2015, , BGGM2015)

