

Noble Energy

Weld County, CO (NAD 83)

Sec. 17-T5N-R63W (70 Ranch State BB18 PAD)

70 Ranch State BB18-689

05-123-41530

Plan A

Design: Actual Surveys

Sperry Drilling Services

Final Survey Report

05 August, 2015

Surface UWI : 05-123-41530

Well Coordinates: 1,392,188.62 N, 3,291,401.16 E (40° 24' 18.86" N, 104° 27' 13.00" W)

Ground Level: 4,697.00 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 70 Ranch State BB18-689

KB = 24' @ 4721.00usft (H&P 273)

N

Grid

Dec-Deg - API - US Survey Feet - Custom

HALLIBURTON

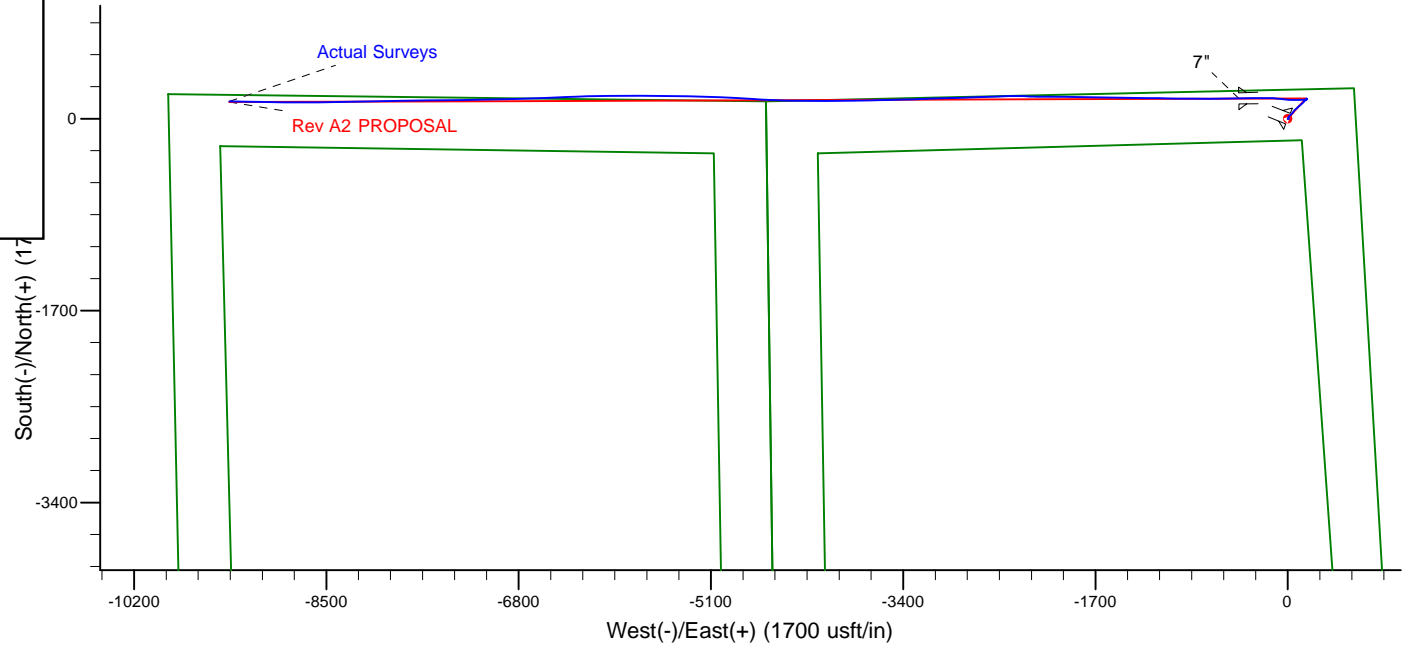
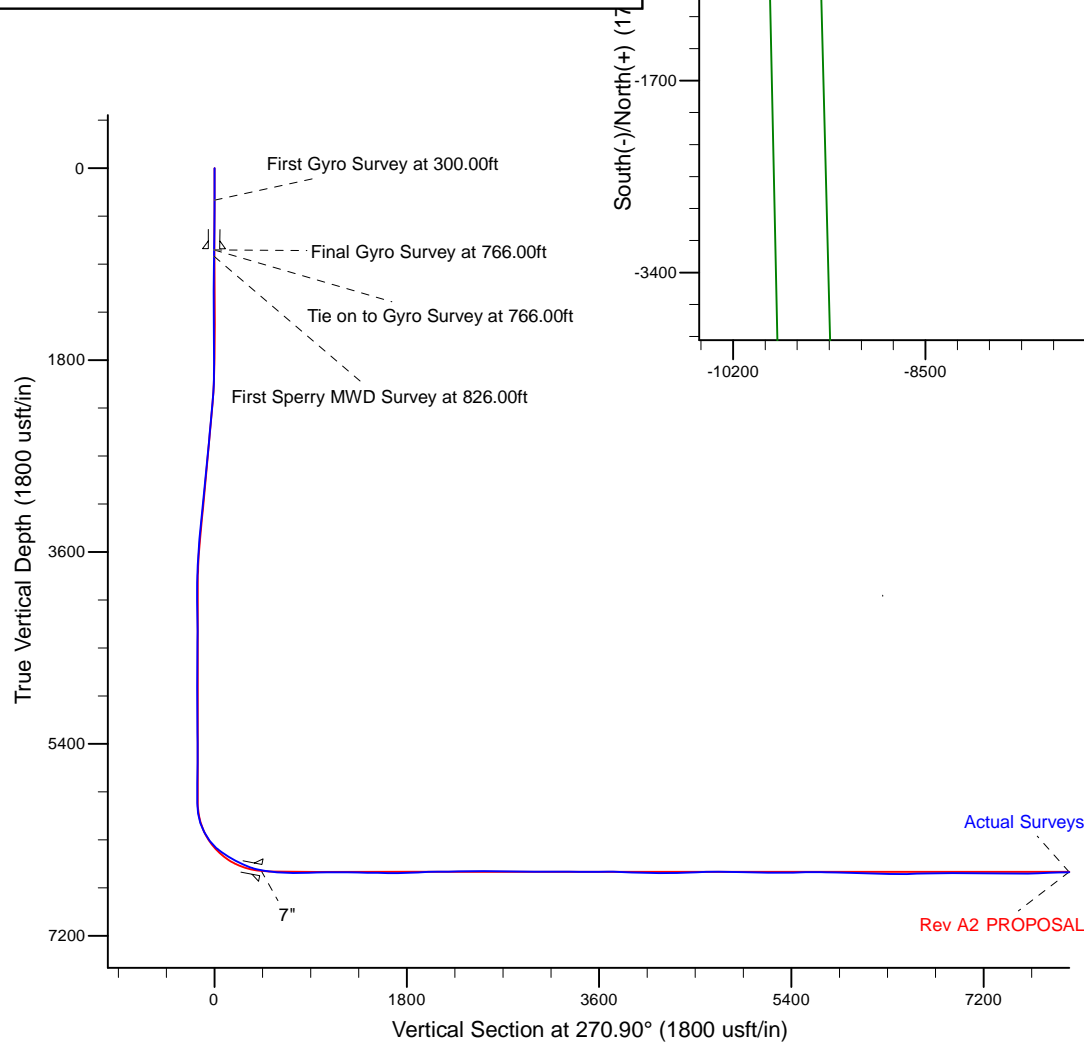
Project: Weld County, CO (NAD 83)
 Site: Sec. 17-T5N-R63W (70 Ranch State BB18 PAD)
 Well: 70 Ranch State BB18-689
 Wellbore: Plan A
 Design: Actual Surveys



Platted SHL: 255' FNL, 600' FEL
 Platted Lat/Long: 40.40524, -104.45361
 Location: Sec. 17-T5N-R63W

~7" Casing: 1023' FEL, 65' FNL
 Lat/Long: 40.405745 N, -104.455153 W
 State Planes - CO Northern: 1,392,367.58 N, 3,290,969.34 E
 Sec. 17-T5N-R63W

Platted BHL: 66' FNL, 535' FWL
 Platted Lat/Long: 40.405954 N, -104.486974 W
 State Planes - CO Northern: 1,392,340.71 N, 3,282,107.25 E
 Location: Sec. 18-T5N-R63W



LEGEND

70 Ranch State BB18-689, Plan A, Rev A2 PROPOSAL V0
 Actual Surveys

WELL DETAILS: 70 Ranch State BB18-689	
Ground Level:	4697.00
KB = 24' @ 4721.00usft (H&P 273)	
Created By:	Tatiana Gomez
Created On:	8/5/2015

Design Report for 70 Ranch State BB18-689 - 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
70 Ranch State BB18-689_Rev A0_SHL							
300.00	0.21	111.77	300.00	-0.20	0.51	-0.51	0.07
First Gyro Survey at 300.00ft							
600.00	0.43	111.77	599.99	-0.83	2.07	-2.08	0.07
756.00	0.54	111.77	755.99	-1.32	3.30	-3.32	0.07
9 5/8"							
766.00	0.55	111.77	765.99	-1.35	3.38	-3.41	0.07
Tie on to Gyro Survey at 766.00ft - Final Gyro Survey at 766.00ft							
826.00	0.59	111.77	825.99	-1.57	3.94	-3.96	0.07
First Sperry MWD Survey at 826.00ft							
921.00	0.83	119.24	920.98	-2.09	4.99	-5.03	0.27
1,015.00	0.75	114.89	1,014.97	-2.68	6.15	-6.19	0.11
1,201.00	0.60	109.72	1,200.96	-3.52	8.17	-8.22	0.09
1,293.00	1.21	328.32	1,292.95	-2.86	8.11	-8.15	1.87
1,384.00	1.09	336.30	1,383.93	-1.25	7.26	-7.28	0.22
1,475.00	0.92	330.60	1,474.92	0.18	6.55	-6.55	0.22
1,567.00	0.99	324.14	1,566.91	1.47	5.72	-5.70	0.14
1,658.00	1.01	323.47	1,657.89	2.75	4.79	-4.74	0.03
1,750.00	1.02	338.96	1,749.88	4.17	4.01	-3.94	0.30
1,841.00	2.01	11.89	1,840.85	6.48	4.05	-3.94	1.41
1,933.00	2.46	12.69	1,932.78	9.99	4.81	-4.66	0.49
2,025.00	3.90	37.04	2,024.64	14.41	7.13	-6.91	2.11
2,116.00	5.89	42.77	2,115.30	20.31	12.17	-11.85	2.25
2,208.00	7.55	46.25	2,206.66	27.96	19.74	-19.30	1.86
2,301.00	8.76	44.16	2,298.72	37.26	29.09	-28.50	1.34
2,392.00	7.93	36.67	2,388.76	47.27	37.66	-36.92	1.50
2,484.00	8.28	40.32	2,479.84	57.41	45.74	-44.84	0.68
2,576.00	7.70	36.53	2,570.95	67.41	53.69	-52.63	0.85
2,668.00	7.76	46.00	2,662.12	76.68	61.83	-60.63	1.38
2,759.00	7.15	45.14	2,752.35	84.94	70.27	-68.93	0.68
2,851.00	8.29	52.28	2,843.51	93.04	79.57	-78.11	1.62
2,942.00	7.92	50.00	2,933.61	101.08	89.56	-87.97	0.54
3,036.00	7.49	49.01	3,026.76	109.26	99.15	-97.43	0.48
3,131.00	8.58	49.79	3,120.82	117.90	109.23	-107.38	1.15
3,226.00	7.55	45.78	3,214.88	126.83	119.12	-117.12	1.23
3,320.00	6.65	46.96	3,308.16	134.85	127.52	-125.40	0.97
3,415.00	7.66	42.83	3,402.42	143.25	135.85	-133.59	1.19
3,510.00	6.86	41.36	3,496.66	152.15	143.90	-141.50	0.86
3,604.00	7.06	39.38	3,589.97	160.83	151.28	-148.74	0.33
3,699.00	5.69	42.51	3,684.38	168.81	158.16	-155.50	1.49
3,794.00	3.68	41.57	3,779.05	174.57	163.37	-160.62	2.12
3,888.00	0.77	37.30	3,872.97	177.33	165.75	-162.96	3.10
3,983.00	0.22	24.22	3,967.97	178.00	166.21	-163.41	0.59
4,078.00	0.52	242.40	4,062.97	177.97	165.91	-163.10	0.74
4,172.00	1.29	229.51	4,156.96	177.08	164.73	-161.94	0.84
4,267.00	1.74	226.82	4,251.92	175.40	162.86	-160.10	0.48
4,362.00	0.46	146.13	4,346.91	174.10	162.02	-159.28	1.82
4,457.00	0.81	111.35	4,441.90	173.54	162.86	-160.13	0.53
4,551.00	0.93	134.29	4,535.89	172.76	164.02	-161.30	0.39

Design Report for 70 Ranch State BB18-689 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
4,646.00	0.65	137.89	4,630.88	171.82	164.94	-162.23	0.30
4,740.00	0.07	99.37	4,724.88	171.42	165.35	-162.65	0.63
4,835.00	0.07	230.57	4,819.88	171.37	165.36	-162.66	0.13
4,929.00	0.19	254.53	4,913.88	171.30	165.17	-162.47	0.14
5,024.00	0.44	274.51	5,008.88	171.28	164.65	-161.96	0.28
5,119.00	0.43	263.39	5,103.87	171.27	163.94	-161.24	0.09
5,213.00	0.26	221.30	5,197.87	171.07	163.44	-160.75	0.31
5,308.00	0.79	245.21	5,292.87	170.63	162.71	-160.02	0.59
5,403.00	0.73	254.27	5,387.86	170.19	161.53	-158.85	0.14
5,497.00	0.76	179.08	5,481.85	169.41	160.96	-158.30	0.97
5,592.00	1.23	140.30	5,576.84	167.99	161.63	-158.98	0.84
5,687.00	0.98	119.65	5,671.82	166.81	162.98	-160.35	0.49
5,781.00	1.49	138.44	5,765.80	165.49	164.49	-161.88	0.69
5,876.00	0.58	16.10	5,860.79	165.03	165.45	-162.84	1.96
5,971.00	0.98	305.61	5,955.78	165.97	164.92	-162.30	1.01
6,066.00	8.81	274.72	6,050.37	167.04	156.99	-154.36	8.41
6,160.00	18.24	268.20	6,141.66	167.17	135.07	-132.44	10.15
6,255.00	27.31	267.12	6,229.17	165.61	98.36	-95.76	9.56
6,350.00	37.10	272.06	6,309.47	165.54	47.83	-45.24	10.66
6,444.00	49.12	275.29	6,377.97	169.85	-16.13	18.78	13.00
6,539.00	57.12	276.75	6,434.94	177.87	-91.63	94.40	8.51
6,634.00	61.23	269.99	6,483.65	182.55	-172.98	175.82	7.48
6,729.00	64.32	269.31	6,527.11	182.03	-257.45	260.26	3.31
6,823.00	71.79	268.71	6,562.21	180.51	-344.56	347.34	7.97
6,872.00	76.97	269.07	6,575.40	179.60	-391.73	394.49	10.60
6,913.00	79.29	269.12	6,583.84	178.97	-431.84	434.59	5.66
7"							
6,965.00	82.23	269.18	6,592.19	178.21	-483.15	485.88	5.66
7,060.00	84.42	269.68	6,603.23	177.27	-577.50	580.20	2.36
7,155.00	88.40	270.13	6,609.18	177.11	-672.29	674.98	4.22
7,249.00	90.40	270.27	6,610.16	177.44	-766.28	768.96	2.13
7,344.00	91.61	270.01	6,608.49	177.67	-861.27	863.94	1.30
7,439.00	92.00	270.25	6,605.50	177.89	-956.22	958.88	0.48
7,534.00	90.46	271.13	6,603.46	179.03	-1,051.19	1,053.86	1.87
7,628.00	89.88	270.60	6,603.18	180.45	-1,145.17	1,147.86	0.84
7,723.00	89.20	270.78	6,603.95	181.59	-1,240.16	1,242.85	0.74
7,818.00	88.21	271.01	6,606.09	183.08	-1,335.13	1,337.83	1.07
7,913.00	89.20	270.97	6,608.24	184.72	-1,430.09	1,432.80	1.04
8,007.00	88.86	270.61	6,609.83	186.01	-1,524.06	1,526.79	0.53
8,102.00	89.26	271.21	6,611.39	187.52	-1,619.04	1,621.77	0.76
8,197.00	91.11	271.15	6,611.08	189.48	-1,714.01	1,716.77	1.95
8,291.00	91.33	270.77	6,609.08	191.05	-1,807.98	1,810.75	0.47
8,386.00	93.14	271.09	6,605.38	192.59	-1,902.89	1,905.67	1.93
8,481.00	92.81	270.34	6,600.45	193.78	-1,997.75	2,000.54	0.86
8,575.00	89.88	269.44	6,598.24	193.60	-2,091.72	2,094.49	3.26
8,670.00	90.55	271.08	6,597.88	194.03	-2,186.71	2,189.48	1.86
8,765.00	92.22	272.52	6,595.59	197.01	-2,281.63	2,284.43	2.32
8,860.00	91.05	270.82	6,592.88	199.78	-2,376.55	2,379.38	2.17
8,954.00	89.78	269.14	6,592.20	199.74	-2,470.54	2,473.36	2.24
9,049.00	88.98	267.85	6,593.22	197.25	-2,565.50	2,568.27	1.60
9,144.00	89.57	267.38	6,594.43	193.30	-2,660.41	2,663.11	0.79

Design Report for 70 Ranch State BB18-689 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
9,238.00	89.01	268.02	6,595.59	189.52	-2,754.32	2,756.95	0.90
9,333.00	89.05	268.35	6,597.20	186.52	-2,849.26	2,851.83	0.35
9,427.00	89.35	268.11	6,598.51	183.61	-2,943.21	2,945.72	0.41
9,522.00	89.88	268.14	6,599.15	180.50	-3,038.16	3,040.61	0.56
9,617.00	90.22	268.23	6,599.07	177.50	-3,133.11	3,135.50	0.37
9,712.00	90.59	268.03	6,598.39	174.40	-3,228.05	3,230.39	0.44
9,803.00	89.35	268.21	6,598.44	171.41	-3,319.00	3,321.28	1.38
9,895.00	89.01	268.20	6,599.76	168.53	-3,410.95	3,413.17	0.37
9,986.00	89.94	268.56	6,600.59	165.96	-3,501.91	3,504.07	1.10
10,077.00	91.54	268.88	6,599.42	163.92	-3,592.87	3,595.00	1.79
10,169.00	89.75	269.45	6,598.38	162.58	-3,684.85	3,686.95	2.04
10,260.00	88.24	268.60	6,599.98	161.04	-3,775.82	3,777.88	1.90
10,351.00	87.44	268.22	6,603.41	158.51	-3,866.72	3,868.73	0.97
10,443.00	87.94	269.93	6,607.12	157.03	-3,958.63	3,960.60	1.94
10,535.00	88.49	270.53	6,609.98	157.40	-4,050.59	4,052.55	0.88
10,627.00	90.22	270.09	6,611.02	157.90	-4,142.58	4,144.54	1.94
10,718.00	90.59	269.81	6,610.37	157.82	-4,233.57	4,235.52	0.51
10,810.00	91.60	270.44	6,608.62	158.02	-4,325.55	4,327.50	1.29
10,902.00	91.14	271.23	6,606.42	159.36	-4,417.52	4,419.47	0.99
10,994.00	92.59	272.60	6,603.42	162.43	-4,509.41	4,511.40	2.17
11,086.00	90.65	273.08	6,600.82	166.99	-4,601.26	4,603.31	2.17
11,178.00	91.36	273.94	6,599.21	172.62	-4,693.07	4,695.20	1.21
11,270.00	89.29	272.79	6,598.69	178.02	-4,784.90	4,787.10	2.57
11,361.00	88.30	272.76	6,600.60	182.42	-4,875.78	4,878.03	1.09
11,453.00	87.84	271.94	6,603.70	186.19	-4,967.65	4,969.95	1.02
11,544.00	88.64	272.24	6,606.49	189.51	-5,058.54	5,060.89	0.94
11,639.00	89.48	272.17	6,608.05	193.16	-5,153.46	5,155.85	0.89
11,828.00	91.23	271.97	6,606.88	199.99	-5,342.32	5,344.80	0.93
11,923.00	91.48	270.17	6,604.63	201.76	-5,437.28	5,439.77	1.91
12,018.00	91.17	269.71	6,602.44	201.66	-5,532.25	5,534.73	0.58
12,112.00	89.88	270.26	6,601.58	201.64	-5,626.24	5,628.71	1.49
12,207.00	88.40	270.06	6,603.00	201.90	-5,721.23	5,723.69	1.57
12,302.00	88.95	270.04	6,605.20	201.99	-5,816.20	5,818.65	0.58
12,396.00	88.30	269.65	6,607.45	201.73	-5,910.18	5,912.61	0.81
12,491.00	88.18	270.07	6,610.37	201.50	-6,005.13	6,007.55	0.46
12,586.00	87.72	268.92	6,613.77	200.66	-6,100.06	6,102.46	1.30
12,680.00	89.02	268.50	6,616.44	198.55	-6,194.00	6,196.35	1.45
12,775.00	88.40	267.89	6,618.58	195.56	-6,288.93	6,291.22	0.92
12,870.00	89.60	267.84	6,620.24	192.02	-6,383.85	6,386.07	1.26
12,965.00	91.30	267.39	6,619.49	188.07	-6,478.76	6,480.91	1.85
13,059.00	91.79	267.58	6,616.96	183.94	-6,572.63	6,574.70	0.56
13,154.00	90.49	268.15	6,615.07	180.40	-6,667.54	6,669.55	1.49
13,249.00	90.28	267.36	6,614.43	176.68	-6,762.47	6,764.40	0.86
13,344.00	91.33	267.56	6,613.10	172.47	-6,857.36	6,859.22	1.13
13,438.00	90.89	269.07	6,611.28	169.71	-6,951.30	6,953.11	1.67
13,628.00	88.80	269.51	6,611.79	167.36	-7,141.28	7,143.02	1.12
13,722.00	89.45	269.35	6,613.23	166.42	-7,235.26	7,236.98	0.71
13,817.00	88.77	269.05	6,614.70	165.09	-7,330.24	7,331.92	0.78
13,886.65	89.36	269.55	6,615.84	164.24	-7,399.87	7,401.54	1.11
70 Ranch State BB18-689_Rev A0_BHL							
13,912.00	89.57	269.73	6,616.08	164.08	-7,425.22	7,426.88	1.11

Design Report for 70 Ranch State BB18-689 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
14,007.00	89.85	269.23	6,616.56	163.22	-7,520.22	7,521.85	0.60
14,101.00	91.26	269.11	6,615.65	161.86	-7,614.20	7,615.80	1.51
14,196.00	91.97	269.11	6,612.97	160.39	-7,709.15	7,710.72	0.75
14,291.00	92.37	269.16	6,609.37	158.95	-7,804.07	7,805.60	0.42
14,386.00	92.13	269.19	6,605.64	157.59	-7,898.99	7,900.49	0.25
14,480.00	91.05	269.04	6,603.04	156.13	-7,992.94	7,994.40	1.16
14,575.00	90.09	268.76	6,602.09	154.31	-8,087.92	8,089.34	1.05
14,670.00	90.37	268.49	6,601.71	152.03	-8,182.89	8,184.26	0.41
14,764.00	91.69	268.47	6,600.02	149.54	-8,276.84	8,278.16	1.40
14,859.00	90.65	268.92	6,598.08	147.37	-8,371.79	8,373.07	1.19
14,954.00	90.28	268.75	6,597.31	145.44	-8,466.77	8,468.01	0.43
15,048.00	89.78	269.63	6,597.26	144.11	-8,560.76	8,561.96	1.08
15,143.00	88.18	270.44	6,598.95	144.17	-8,655.74	8,656.94	1.89
15,238.00	87.85	270.71	6,602.24	145.12	-8,750.68	8,751.88	0.45
15,332.00	87.93	270.30	6,605.70	145.95	-8,844.61	8,845.81	0.44
15,427.00	87.68	270.59	6,609.34	146.69	-8,939.54	8,940.74	0.40
15,522.00	89.97	270.84	6,611.29	147.88	-9,034.50	9,035.71	2.42
15,616.00	91.42	270.91	6,610.15	149.31	-9,128.48	9,129.70	1.54
15,711.00	92.90	270.95	6,606.57	150.85	-9,223.40	9,224.63	1.56
15,782.00	93.51	271.06	6,602.60	152.09	-9,294.28	9,295.52	0.87
Final Sperry MWD Survey at 15782.00ft							
15,845.00	93.51	271.06	6,598.74	153.26	-9,357.15	9,358.40	0.00
Straight Line Projection to TD at 15845.00ft - 70 Ranch State BB18-689_Rev A1_BHL - 70 Ranch State BB18-689_Rev A2							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	+E/-W (usft)	Comment
300.00	300.00	-0.20	0.51	First Gyro Survey at 300.00ft
766.00	765.99	-1.35	3.38	Tie on to Gyro Survey at 766.00ft
766.00	765.99	-1.35	3.38	Final Gyro Survey at 766.00ft
826.00	825.99	-1.57	3.94	First Sperry MWD Survey at 826.00ft
15,782.00	6,602.60	152.09	-9,294.28	Final Sperry MWD Survey at 15782.00ft
15,845.00	6,598.74	153.26	-9,357.15	Straight Line Projection to TD at 15845.00ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/-S (usft)	+E/-W (usft)	Start TVD (usft)
Target	70 Ranch State BB18-689_Rev A2_BHL	270.90	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
300.00	766.00	Surface Surveys	Flexi-Shot
766.00	6,872.00	Intermediate Surveys	MWD
6,965.00	15,845.00	Production Surveys	MWD+IFR1+MS_WY

Design Report for 70 Ranch State BB18-689 - Actual Surveys

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
756.00	755.99	9 5/8"	9-5/8	13-3/4
6,913.00	6,583.84	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
70 Ranch State BB18- - actual wellpath misses target center by 0.02usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E) - Point	0.00	0.00	0.00	0.02	0.00	1,392,188.64	3,291,401.16	40.405240	-104.453610
70 Ranch State BB18- - actual wellpath misses target center by 37164220.50usft at 15845.00usft MD (6598.74 TVD, 153.26 N, -9357.15 E) - Point	0.00	0.00	0.00	17,682,490.15	14,805,878.39	29,073,584.53	-21,513,496.69	40.405240	104.453610
70 Ranch State BB18- - actual wellpath misses target center by 28.23usft at 13886.68usft MD (6615.84 TVD, 164.24 N, -7399.91 E) - Point	0.00	0.00	6,594.00	146.36	-7,400.00	1,392,334.98	3,284,001.46	40.405878	-104.480173
70 Ranch State BB18- - actual wellpath misses target center by 8.80usft at 15845.00usft MD (6598.74 TVD, 153.26 N, -9357.15 E) - Point	0.00	0.00	6,594.00	146.37	-9,359.88	1,392,334.99	3,282,041.66	40.405940	-104.487210
70 Ranch State BB18- - actual wellpath misses target center by 7.74usft at 15845.00usft MD (6598.74 TVD, 153.26 N, -9357.15 E) - Point	0.00	0.00	6,601.00	146.37	-9,359.88	1,392,334.99	3,282,041.66	40.405940	-104.487210

Directional Difficulty Index

Average Dogleg over Survey:	1.50 °/100usft	Maximum Dogleg over Survey:	13.00 °/100usft at 6,444.00 usft
Net Tortousity applicable to Plans:	0.83 °/100usft	Directional Difficulty Index:	6.747

Audit Info

North Reference Sheet for Sec. 17-T5N-R63W (70 Ranch State BB18 PAD) - 70
Ranch State BB18-689 - 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' @ 4721.00usft (H&P 273). Northing and Easting are relative to 70 Ranch State BB18-689

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: 0.99996047

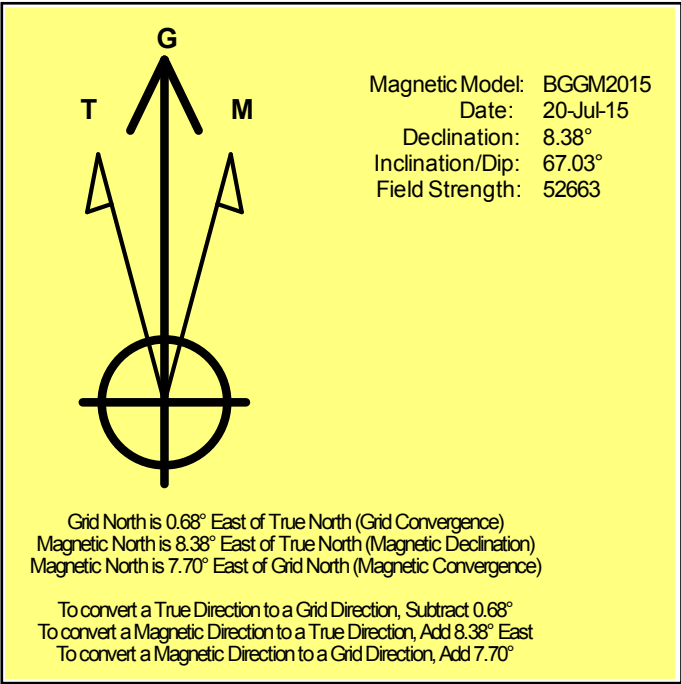
Grid Coordinates of Well: 1,392,188.62 usft N, 3,291,401.16 usft E

Geographical Coordinates of Well: 40° 24' 18.86" N, 104° 27' 13.00" W

Grid Convergence at Surface is: 0.68°

Based upon Minimum Curvature type calculations, at a Measured Depth of 15,845.00usft
the Bottom Hole Displacement is 9,358.40usft in the Direction of 270.94° (Grid).

Magnetic Convergence at surface is: -7.70° (20 July 2015, , BGGM2015)



Noble Energy

Weld County, CO (NAD 83)

Sec. 17-T5N-R63W (70 Ranch State BB18 PAD)

70 Ranch State BB18-689

05-123-41530

Plan A

Design: Actual Surveys

Sperry Drilling Services

Geodetic Report

05 August, 2015

Well Coordinates: 1,392,188.62 N, 3,291,401.16 E (40° 24' 18.86" N, 104° 27' 13.00" W)

Ground Level: 4,697.00 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 70 Ranch State BB18-689

KB = 24' @ 4721.00usft (H&P 273)

N

Grid

Dec-Deg - API - US Survey Feet - Custom

HALLIBURTON

Design Report for 70 Ranch State BB18-689 - Actual Surveys

Measured			Vertical	Local Coordinates		Geographic Coordinates		UTM Coordinates	
Depth	Inclination	Azimuth	Depth	+N/-S	+E/-W	Latitude	Longitude	Northing	Easting
(usft)	(°)	(°)	(usft)	(usft)	(usft)	(usft)	(usft)	(usft)	(usft)
0.00	0.00	0.00	0.00	0.00	0.00	40.405240	-104.453610	1,392,188.62	3,291,401.16
300.00	0.21	111.77	300.00	-0.20	0.51	40.405239	-104.453608	1,392,188.42	3,291,401.67
600.00	0.43	111.77	599.99	-0.83	2.07	40.405238	-104.453603	1,392,187.80	3,291,403.23
756.00	0.54	111.77	755.99	-1.32	3.30	40.405236	-104.453598	1,392,187.31	3,291,404.46
766.00	0.55	111.77	765.99	-1.35	3.38	40.405236	-104.453598	1,392,187.27	3,291,404.55
826.00	0.59	111.77	825.99	-1.57	3.94	40.405236	-104.453596	1,392,187.05	3,291,405.10
921.00	0.83	119.24	920.98	-2.09	4.99	40.405234	-104.453592	1,392,186.53	3,291,406.16
1,015.00	0.75	114.89	1,014.97	-2.68	6.15	40.405232	-104.453588	1,392,185.94	3,291,407.31
1,201.00	0.60	109.72	1,200.96	-3.52	8.17	40.405230	-104.453581	1,392,185.10	3,291,409.33
1,293.00	1.21	328.32	1,292.95	-2.86	8.11	40.405232	-104.453581	1,392,185.76	3,291,409.27
1,384.00	1.09	336.30	1,383.93	-1.25	7.26	40.405236	-104.453584	1,392,187.37	3,291,408.42
1,475.00	0.92	330.60	1,474.92	0.18	6.55	40.405240	-104.453587	1,392,188.80	3,291,407.71
1,567.00	0.99	324.14	1,566.91	1.47	5.72	40.405244	-104.453590	1,392,190.09	3,291,406.89
1,658.00	1.01	323.47	1,657.89	2.75	4.79	40.405247	-104.453593	1,392,191.37	3,291,405.95
1,750.00	1.02	338.96	1,749.88	4.17	4.01	40.405251	-104.453596	1,392,192.79	3,291,405.17
1,841.00	2.01	11.89	1,840.85	6.48	4.05	40.405258	-104.453595	1,392,195.11	3,291,405.21
1,933.00	2.46	12.69	1,932.78	9.99	4.81	40.405267	-104.453593	1,392,198.61	3,291,405.98
2,025.00	3.90	37.04	2,024.64	14.41	7.13	40.405279	-104.453584	1,392,203.03	3,291,408.29
2,116.00	5.89	42.77	2,115.30	20.31	12.17	40.405295	-104.453566	1,392,208.93	3,291,413.33
2,208.00	7.55	46.25	2,206.66	27.96	19.74	40.405316	-104.453538	1,392,216.58	3,291,420.90
2,301.00	8.76	44.16	2,298.72	37.26	29.09	40.405341	-104.453504	1,392,225.88	3,291,430.25
2,392.00	7.93	36.67	2,388.76	47.27	37.66	40.405369	-104.453473	1,392,235.89	3,291,438.82
2,484.00	8.28	40.32	2,479.84	57.41	45.74	40.405396	-104.453444	1,392,246.03	3,291,446.90
2,576.00	7.70	36.53	2,570.95	67.41	53.69	40.405423	-104.453415	1,392,256.03	3,291,454.86
2,668.00	7.76	46.00	2,662.12	76.68	61.83	40.405449	-104.453385	1,392,265.30	3,291,462.99
2,759.00	7.15	45.14	2,752.35	84.94	70.27	40.405471	-104.453354	1,392,273.56	3,291,471.43
2,851.00	8.29	52.28	2,843.51	93.04	79.57	40.405493	-104.453321	1,392,281.66	3,291,480.73
2,942.00	7.92	50.00	2,933.61	101.08	89.56	40.405515	-104.453284	1,392,289.70	3,291,490.72
3,036.00	7.49	49.01	3,026.76	109.26	99.15	40.405537	-104.453250	1,392,297.88	3,291,500.31
3,131.00	8.58	49.79	3,120.82	117.90	109.23	40.405560	-104.453213	1,392,306.52	3,291,510.39
3,226.00	7.55	45.78	3,214.88	126.83	119.12	40.405584	-104.453177	1,392,315.45	3,291,520.28
3,320.00	6.65	46.96	3,308.16	134.85	127.52	40.405606	-104.453147	1,392,323.47	3,291,528.68
3,415.00	7.66	42.83	3,402.42	143.25	135.85	40.405629	-104.453116	1,392,331.87	3,291,537.01
3,510.00	6.86	41.36	3,496.66	152.15	143.90	40.405653	-104.453087	1,392,340.77	3,291,545.06
3,604.00	7.06	39.38	3,589.97	160.83	151.28	40.405677	-104.453060	1,392,349.45	3,291,552.43
3,699.00	5.69	42.51	3,684.38	168.81	158.16	40.405698	-104.453035	1,392,357.43	3,291,559.32
3,794.00	3.68	41.57	3,779.05	174.57	163.37	40.405714	-104.453016	1,392,363.18	3,291,564.53
3,888.00	0.77	37.30	3,872.97	177.33	165.75	40.405721	-104.453008	1,392,365.94	3,291,566.91
3,983.00	0.22	24.22	3,967.97	178.00	166.21	40.405723	-104.453006	1,392,366.62	3,291,567.37
4,078.00	0.52	242.40	4,062.97	177.97	165.91	40.405723	-104.453007	1,392,366.58	3,291,567.06
4,172.00	1.29	229.51	4,156.96	177.08	164.73	40.405721	-104.453011	1,392,365.70	3,291,565.88
4,267.00	1.74	226.82	4,251.92	175.40	162.86	40.405716	-104.453018	1,392,364.02	3,291,564.02

Design Report for 70 Ranch State BB18-689 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
4,362.00	0.46	146.13	4,346.91	174.10	162.02	40.405713	-104.453021	1,392,362.71	3,291,563.18
4,457.00	0.81	111.35	4,441.90	173.54	162.86	40.405711	-104.453018	1,392,362.15	3,291,564.02
4,551.00	0.93	134.29	4,535.89	172.76	164.02	40.405709	-104.453014	1,392,361.38	3,291,565.18
4,646.00	0.65	137.89	4,630.88	171.82	164.94	40.405706	-104.453011	1,392,360.44	3,291,566.09
4,740.00	0.07	99.37	4,724.88	171.42	165.35	40.405705	-104.453009	1,392,360.04	3,291,566.51
4,835.00	0.07	230.57	4,819.88	171.37	165.36	40.405705	-104.453009	1,392,359.99	3,291,566.52
4,929.00	0.19	254.53	4,913.88	171.30	165.17	40.405705	-104.453010	1,392,359.91	3,291,566.33
5,024.00	0.44	274.51	5,008.88	171.28	164.65	40.405705	-104.453012	1,392,359.90	3,291,565.81
5,119.00	0.43	263.39	5,103.87	171.27	163.94	40.405705	-104.453014	1,392,359.89	3,291,565.09
5,213.00	0.26	221.30	5,197.87	171.07	163.44	40.405704	-104.453016	1,392,359.68	3,291,564.60
5,308.00	0.79	245.21	5,292.87	170.63	162.71	40.405703	-104.453019	1,392,359.25	3,291,563.86
5,403.00	0.73	254.27	5,387.86	170.19	161.53	40.405702	-104.453023	1,392,358.81	3,291,562.69
5,497.00	0.76	179.08	5,481.85	169.41	160.96	40.405700	-104.453025	1,392,358.02	3,291,562.12
5,592.00	1.23	140.30	5,576.84	167.99	161.63	40.405696	-104.453023	1,392,356.61	3,291,562.78
5,687.00	0.98	119.65	5,671.82	166.81	162.98	40.405693	-104.453018	1,392,355.42	3,291,564.14
5,781.00	1.49	138.44	5,765.80	165.49	164.49	40.405689	-104.453013	1,392,354.11	3,291,565.65
5,876.00	0.58	16.10	5,860.79	165.03	165.45	40.405688	-104.453009	1,392,353.65	3,291,566.60
5,971.00	0.98	305.61	5,955.78	165.97	164.92	40.405690	-104.453011	1,392,354.58	3,291,566.07
6,066.00	8.81	274.72	6,050.37	167.04	156.99	40.405693	-104.453040	1,392,355.66	3,291,558.15
6,160.00	18.24	268.20	6,141.66	167.17	135.07	40.405695	-104.453118	1,392,355.79	3,291,536.22
6,255.00	27.31	267.12	6,229.17	165.61	98.36	40.405691	-104.453250	1,392,354.22	3,291,499.52
6,350.00	37.10	272.06	6,309.47	165.54	47.83	40.405693	-104.453432	1,392,354.16	3,291,448.99
6,444.00	49.12	275.29	6,377.97	169.85	-16.13	40.405707	-104.453661	1,392,358.47	3,291,385.04
6,539.00	57.12	276.75	6,434.94	177.87	-91.63	40.405731	-104.453932	1,392,366.48	3,291,309.54
6,634.00	61.23	269.99	6,483.65	182.55	-172.98	40.405747	-104.454224	1,392,371.17	3,291,228.19
6,729.00	64.32	269.31	6,527.11	182.03	-257.45	40.405748	-104.454527	1,392,370.65	3,291,143.73
6,823.00	71.79	268.71	6,562.21	180.51	-344.56	40.405747	-104.454840	1,392,369.13	3,291,056.62
6,872.00	76.97	269.07	6,575.40	179.60	-391.73	40.405746	-104.455009	1,392,368.22	3,291,009.45
6,913.00	79.29	269.12	6,583.84	178.97	-431.84	40.405745	-104.455153	1,392,367.58	3,290,969.34
6,965.00	82.23	269.18	6,592.19	178.21	-483.15	40.405745	-104.455337	1,392,366.82	3,290,918.03
7,060.00	84.42	269.68	6,603.23	177.27	-577.50	40.405745	-104.455676	1,392,365.88	3,290,823.69
7,155.00	88.40	270.13	6,609.18	177.11	-672.29	40.405748	-104.456017	1,392,365.73	3,290,728.90
7,249.00	90.40	270.27	6,610.16	177.44	-766.28	40.405752	-104.456354	1,392,366.06	3,290,634.91
7,344.00	91.61	270.01	6,608.49	177.67	-861.27	40.405756	-104.456695	1,392,366.29	3,290,539.93
7,439.00	92.00	270.25	6,605.50	177.89	-956.22	40.405759	-104.457036	1,392,366.50	3,290,444.98
7,534.00	90.46	271.13	6,603.46	179.03	-1,051.19	40.405765	-104.457377	1,392,367.65	3,290,350.02
7,628.00	89.88	270.60	6,603.18	180.45	-1,145.17	40.405772	-104.457714	1,392,369.07	3,290,256.03
7,723.00	89.20	270.78	6,603.95	181.59	-1,240.16	40.405779	-104.458055	1,392,370.21	3,290,161.05
7,818.00	88.21	271.01	6,606.09	183.08	-1,335.13	40.405786	-104.458396	1,392,371.69	3,290,066.09
7,913.00	89.20	270.97	6,608.24	184.72	-1,430.09	40.405793	-104.458737	1,392,373.33	3,289,971.13
8,007.00	88.86	270.61	6,609.83	186.01	-1,524.06	40.405800	-104.459074	1,392,374.63	3,289,877.16
8,102.00	89.26	271.21	6,611.39	187.52	-1,619.04	40.405807	-104.459415	1,392,376.14	3,289,782.19

Design Report for 70 Ranch State BB18-689 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
8,197.00	91.11	271.15	6,611.08	189.48	-1,714.01	40.405815	-104.459756	1,392,378.09	3,289,687.22
8,291.00	91.33	270.77	6,609.08	191.05	-1,807.98	40.405823	-104.460094	1,392,379.67	3,289,593.25
8,386.00	93.14	271.09	6,605.38	192.59	-1,902.89	40.405830	-104.460434	1,392,381.21	3,289,498.35
8,481.00	92.81	270.34	6,600.45	193.78	-1,997.75	40.405836	-104.460775	1,392,382.39	3,289,403.49
8,575.00	89.88	269.44	6,598.24	193.60	-2,091.72	40.405839	-104.461112	1,392,382.21	3,289,309.53
8,670.00	90.55	271.08	6,597.88	194.03	-2,186.71	40.405843	-104.461453	1,392,382.64	3,289,214.54
8,765.00	92.22	272.52	6,595.59	197.01	-2,281.63	40.405854	-104.461794	1,392,385.63	3,289,119.62
8,860.00	91.05	270.82	6,592.88	199.78	-2,376.55	40.405865	-104.462135	1,392,388.39	3,289,024.71
8,954.00	89.78	269.14	6,592.20	199.74	-2,470.54	40.405868	-104.462472	1,392,388.36	3,288,930.72
9,049.00	88.98	267.85	6,593.22	197.25	-2,565.50	40.405864	-104.462813	1,392,385.87	3,288,835.77
9,144.00	89.57	267.38	6,594.43	193.30	-2,660.41	40.405856	-104.463154	1,392,381.91	3,288,740.86
9,238.00	89.01	268.02	6,595.59	189.52	-2,754.32	40.405849	-104.463491	1,392,378.14	3,288,646.95
9,333.00	89.05	268.35	6,597.20	186.52	-2,849.26	40.405844	-104.463832	1,392,375.13	3,288,552.01
9,427.00	89.35	268.11	6,598.51	183.61	-2,943.21	40.405839	-104.464170	1,392,372.23	3,288,458.07
9,522.00	89.88	268.14	6,599.15	180.50	-3,038.16	40.405833	-104.464511	1,392,369.12	3,288,363.13
9,617.00	90.22	268.23	6,599.07	177.50	-3,133.11	40.405828	-104.464852	1,392,366.11	3,288,268.18
9,712.00	90.59	268.03	6,598.39	174.40	-3,228.05	40.405823	-104.465193	1,392,363.01	3,288,173.24
9,803.00	89.35	268.21	6,598.44	171.41	-3,319.00	40.405817	-104.465520	1,392,360.03	3,288,082.29
9,895.00	89.01	268.20	6,599.76	168.53	-3,410.95	40.405812	-104.465850	1,392,357.15	3,287,990.35
9,986.00	89.94	268.56	6,600.59	165.96	-3,501.91	40.405808	-104.466177	1,392,354.57	3,287,899.39
10,077.00	91.54	268.88	6,599.42	163.92	-3,592.87	40.405806	-104.466503	1,392,352.54	3,287,808.43
10,169.00	89.75	269.45	6,598.38	162.58	-3,684.85	40.405805	-104.466834	1,392,351.20	3,287,716.45
10,260.00	88.24	268.60	6,599.98	161.04	-3,775.82	40.405804	-104.467160	1,392,349.65	3,287,625.49
10,351.00	87.44	268.22	6,603.41	158.51	-3,866.72	40.405800	-104.467487	1,392,347.13	3,287,534.59
10,443.00	87.94	269.93	6,607.12	157.03	-3,958.63	40.405798	-104.467817	1,392,345.65	3,287,442.69
10,535.00	88.49	270.53	6,609.98	157.40	-4,050.59	40.405802	-104.468147	1,392,346.01	3,287,350.74
10,627.00	90.22	270.09	6,611.02	157.90	-4,142.58	40.405807	-104.468477	1,392,346.51	3,287,258.75
10,718.00	90.59	269.81	6,610.37	157.82	-4,233.57	40.405809	-104.468804	1,392,346.43	3,287,167.76
10,810.00	91.60	270.44	6,608.62	158.02	-4,325.55	40.405813	-104.469134	1,392,346.63	3,287,075.78
10,902.00	91.14	271.23	6,606.42	159.36	-4,417.52	40.405819	-104.469464	1,392,347.97	3,286,983.82
10,994.00	92.59	272.60	6,603.42	162.43	-4,509.41	40.405831	-104.469794	1,392,351.05	3,286,891.93
11,086.00	90.65	273.08	6,600.82	166.99	-4,601.26	40.405846	-104.470124	1,392,355.60	3,286,800.09
11,178.00	91.36	273.94	6,599.21	172.62	-4,693.07	40.405865	-104.470453	1,392,361.23	3,286,708.28
11,270.00	89.29	272.79	6,598.69	178.02	-4,784.90	40.405882	-104.470783	1,392,366.63	3,286,616.45
11,361.00	88.30	272.76	6,600.60	182.42	-4,875.78	40.405897	-104.471109	1,392,371.04	3,286,525.58
11,453.00	87.84	271.94	6,603.70	186.19	-4,967.65	40.405911	-104.471438	1,392,374.81	3,286,433.71
11,544.00	88.64	272.24	6,606.49	189.51	-5,058.54	40.405923	-104.471765	1,392,378.12	3,286,342.82
11,639.00	89.48	272.17	6,608.05	193.16	-5,153.46	40.405936	-104.472105	1,392,381.78	3,286,247.91
11,828.00	91.23	271.97	6,606.88	199.99	-5,342.32	40.405960	-104.472783	1,392,388.61	3,286,059.05
11,923.00	91.48	270.17	6,604.63	201.76	-5,437.28	40.405968	-104.473124	1,392,390.38	3,285,964.10
12,018.00	91.17	269.71	6,602.44	201.66	-5,532.25	40.405971	-104.473465	1,392,390.28	3,285,869.13
12,112.00	89.88	270.26	6,601.58	201.64	-5,626.24	40.405974	-104.473802	1,392,390.25	3,285,775.14

Design Report for 70 Ranch State BB18-689 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
12,207.00	88.40	270.06	6,603.00	201.90	-5,721.23	40.405978	-104.474144	1,392,390.52	3,285,680.16
12,302.00	88.95	270.04	6,605.20	201.99	-5,816.20	40.405981	-104.474485	1,392,390.60	3,285,585.19
12,396.00	88.30	269.65	6,607.45	201.73	-5,910.18	40.405983	-104.474822	1,392,390.35	3,285,491.22
12,491.00	88.18	270.07	6,610.37	201.50	-6,005.13	40.405986	-104.475163	1,392,390.12	3,285,396.27
12,586.00	87.72	268.92	6,613.77	200.66	-6,100.06	40.405986	-104.475504	1,392,389.28	3,285,301.34
12,680.00	89.02	268.50	6,616.44	198.55	-6,194.00	40.405983	-104.475841	1,392,387.16	3,285,207.41
12,775.00	88.40	267.89	6,618.58	195.56	-6,288.93	40.405978	-104.476182	1,392,384.17	3,285,112.48
12,870.00	89.60	267.84	6,620.24	192.02	-6,383.85	40.405972	-104.476523	1,392,380.63	3,285,017.57
12,965.00	91.30	267.39	6,619.49	188.07	-6,478.76	40.405964	-104.476864	1,392,376.68	3,284,922.66
13,059.00	91.79	267.58	6,616.96	183.94	-6,572.63	40.405955	-104.477201	1,392,372.56	3,284,828.79
13,154.00	90.49	268.15	6,615.07	180.40	-6,667.54	40.405949	-104.477542	1,392,369.02	3,284,733.88
13,249.00	90.28	267.36	6,614.43	176.68	-6,762.47	40.405941	-104.477883	1,392,365.30	3,284,638.96
13,344.00	91.33	267.56	6,613.10	172.47	-6,857.36	40.405933	-104.478224	1,392,361.09	3,284,544.07
13,438.00	90.89	269.07	6,611.28	169.71	-6,951.30	40.405928	-104.478561	1,392,358.33	3,284,450.13
13,628.00	88.80	269.51	6,611.79	167.36	-7,141.28	40.405928	-104.479244	1,392,355.97	3,284,260.17
13,722.00	89.45	269.35	6,613.23	166.42	-7,235.26	40.405928	-104.479581	1,392,355.04	3,284,166.19
13,817.00	88.77	269.05	6,614.70	165.09	-7,330.24	40.405928	-104.479922	1,392,353.71	3,284,071.21
13,886.65	89.36	269.55	6,615.84	164.24	-7,399.87	40.405927	-104.480172	1,392,352.86	3,284,001.58
13,912.00	89.57	269.73	6,616.08	164.08	-7,425.22	40.405928	-104.480263	1,392,352.70	3,283,976.23
14,007.00	89.85	269.23	6,616.56	163.22	-7,520.22	40.405928	-104.480604	1,392,351.84	3,283,881.24
14,101.00	91.26	269.11	6,615.65	161.86	-7,614.20	40.405928	-104.480942	1,392,350.48	3,283,787.26
14,196.00	91.97	269.11	6,612.97	160.39	-7,709.15	40.405927	-104.481283	1,392,349.00	3,283,692.32
14,291.00	92.37	269.16	6,609.37	158.95	-7,804.07	40.405926	-104.481624	1,392,347.57	3,283,597.40
14,386.00	92.13	269.19	6,605.64	157.59	-7,898.99	40.405925	-104.481965	1,392,346.20	3,283,502.49
14,480.00	91.05	269.04	6,603.04	156.13	-7,992.94	40.405924	-104.482302	1,392,344.75	3,283,408.54
14,575.00	90.09	268.76	6,602.09	154.31	-8,087.92	40.405922	-104.482643	1,392,342.93	3,283,313.57
14,670.00	90.37	268.49	6,601.71	152.03	-8,182.89	40.405919	-104.482984	1,392,340.65	3,283,218.60
14,764.00	91.69	268.47	6,600.02	149.54	-8,276.84	40.405915	-104.483322	1,392,338.15	3,283,124.65
14,859.00	90.65	268.92	6,598.08	147.37	-8,371.79	40.405912	-104.483663	1,392,335.99	3,283,029.70
14,954.00	90.28	268.75	6,597.31	145.44	-8,466.77	40.405910	-104.484004	1,392,334.06	3,282,934.73
15,048.00	89.78	269.63	6,597.26	144.11	-8,560.76	40.405909	-104.484341	1,392,332.73	3,282,840.74
15,143.00	88.18	270.44	6,598.95	144.17	-8,655.74	40.405912	-104.484682	1,392,332.79	3,282,745.77
15,238.00	87.85	270.71	6,602.24	145.12	-8,750.68	40.405918	-104.485023	1,392,333.74	3,282,650.83
15,332.00	87.93	270.30	6,605.70	145.95	-8,844.61	40.405923	-104.485360	1,392,334.57	3,282,556.90
15,427.00	87.68	270.59	6,609.34	146.69	-8,939.54	40.405928	-104.485701	1,392,335.31	3,282,461.98
15,522.00	89.97	270.84	6,611.29	147.88	-9,034.50	40.405934	-104.486042	1,392,336.49	3,282,367.02
15,616.00	91.42	270.91	6,610.15	149.31	-9,128.48	40.405941	-104.486379	1,392,337.93	3,282,273.04
15,711.00	92.90	270.95	6,606.57	150.85	-9,223.40	40.405948	-104.486720	1,392,339.47	3,282,178.13
15,782.00	93.51	271.06	6,602.60	152.09	-9,294.28	40.405954	-104.486974	1,392,340.71	3,282,107.25
15,845.00	93.51	271.06	6,598.74	153.26	-9,357.15	40.405959	-104.487200	1,392,341.87	3,282,044.38

Design Report for 70 Ranch State BB18-689 - Actual Surveys

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
300.00	300.00	-0.20	0.51	First Gyro Survey at 300.00ft
766.00	765.99	-1.35	3.38	Tie on to Gyro Survey at 766.00ft
766.00	765.99	-1.35	3.38	Final Gyro Survey at 766.00ft
826.00	825.99	-1.57	3.94	First Sperry MWD Survey at 826.00ft
15,782.00	6,602.60	152.09	-9,294.28	Final Sperry MWD Survey at 15782.00ft
15,845.00	6,598.74	153.26	-9,357.15	Straight Line Projection to TD at 15845.00ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
Target	70 Ranch State BB18-689_Rev A2_BHL	270.90	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
300.00	766.00	Surface Surveys	Flexi-Shot
766.00	6,872.00	Intermediate Surveys	MWD
6,965.00	15,845.00	Production Surveys	MWD+IFR1+MS_WY

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
756.00	755.99	9 5/8"	9-5/8	13-3/4
6,913.00	6,583.84	7"	7	8-3/4

Design Report for 70 Ranch State BB18-689 - Actual Surveys

Design Targets

Shape	Target Name	TVD ()	Northing ()	Easting ()	+N/-S	+E/-W	Created	Updated
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Directional Difficulty Index

Average Dogleg over Survey:	1.50 °/100usft	Maximum Dogleg over Survey:	13.00 °/100usft at 6,444.00 usft
Net Tortousity applicable to Plans:	0.83 °/100usft	Directional Difficulty Index:	6.747

Audit Info

North Reference Sheet for Sec. 17-T5N-R63W (70 Ranch State BB18 PAD) - 70 Ranch State BB18-689 - 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' @ 4721.00usft (H&P 273). Northing and Easting are relative to 70 Ranch State BB18-689

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: 0.99996047

Grid Coordinates of Well: 1,392,188.62 usft N, 3,291,401.16 usft E

Geographical Coordinates of Well: 40° 24' 18.86" N, 104° 27' 13.00" W

Grid Convergence at Surface is: 0.68°

Based upon Minimum Curvature type calculations, at a Measured Depth of 15,845.00usft

the Bottom Hole Displacement is 9,358.40usft in the Direction of 270.94° (Grid).

Magnetic Convergence at surface is: -7.70° (20 July 2015, , BGGM2015)

