

Conoco Phillips Company

Arapahoe County, Colorado

Sec. 27-T4S-R65W

Cottonwood Creek 4-65-27-1H

Plan B (Pilot)

Design: Actual Field Surveys

Sperry Drilling Services

Standard Report

21 March, 2014

Well Coordinates: 1,672,631.98 N, 3,236,881.31 E (39° 40' 37.78" N, 104° 39' 30.29" W)

Ground Level: 5,706.00 usft

Local Coordinate Origin:

Centered on Well Cottonwood Creek 4-65-27-1H

Viewing Datum:

RKB 24 ft @ 5730.00usft (H&P 276)

TVDs to System:

N

North Reference:

True

Unit System:

API - US Survey Feet - Custom

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

HALLIBURTON

Design Report for Cottonwood Creek 4-65-27-1H - Actual Field Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
2,113.00	0.41	23.50	2,112.88	20.82	1.88	-20.89	0.02
Tie-On to Gyro Surveys @ 2113.00 ft							
2,210.00	0.57	72.79	2,209.88	21.28	2.48	-21.42	0.45
First Sperry MWD Survey @ 2210.00 ft							
2,305.00	0.57	76.81	2,304.88	21.53	3.39	-21.79	0.04
2,400.00	0.99	220.85	2,399.87	21.02	3.31	-21.27	1.57
2,495.00	2.33	216.00	2,494.83	18.83	1.64	-18.89	1.42
2,589.00	3.39	207.66	2,588.71	14.83	-0.77	-14.59	1.21
2,684.00	4.45	197.68	2,683.49	8.83	-3.19	-8.32	1.32
2,780.00	4.61	195.35	2,779.19	1.56	-5.35	-0.83	0.25
2,875.00	4.99	186.29	2,873.86	-6.23	-6.81	7.08	0.89
2,969.00	4.97	183.25	2,967.50	-14.36	-7.49	15.23	0.28
3,064.00	4.93	182.43	3,062.15	-22.55	-7.90	23.39	0.09
3,159.00	4.85	180.13	3,156.80	-30.64	-8.08	31.44	0.22
3,254.00	4.35	179.20	3,251.50	-38.26	-8.04	38.99	0.53
3,349.00	3.67	174.26	3,346.26	-44.89	-7.68	45.51	0.80
3,444.00	3.01	173.34	3,441.10	-50.39	-7.09	50.88	0.70
3,538.00	3.35	183.97	3,534.96	-55.58	-6.99	56.02	0.72
3,633.00	3.09	189.82	3,629.81	-60.87	-7.62	61.34	0.44
3,728.00	3.53	185.94	3,724.65	-66.30	-8.36	66.83	0.52
3,822.00	3.02	186.36	3,818.49	-71.64	-8.93	72.20	0.54
3,917.00	2.55	193.78	3,913.38	-76.18	-9.71	76.80	0.62
4,012.00	2.90	194.15	4,008.28	-80.57	-10.81	81.29	0.37
4,106.00	2.96	179.31	4,102.15	-85.30	-11.36	86.05	0.81
4,201.00	2.47	178.98	4,197.05	-89.80	-11.29	90.50	0.52
4,296.00	1.95	182.38	4,291.98	-93.46	-11.32	94.14	0.56
4,391.00	2.54	184.28	4,386.90	-97.17	-11.55	97.85	0.63
4,486.00	3.54	176.73	4,481.77	-102.20	-11.54	102.83	1.13
4,580.00	3.46	172.93	4,575.59	-107.91	-11.02	108.42	0.26
4,675.00	3.12	165.48	4,670.44	-113.26	-10.02	113.59	0.57
4,770.00	2.68	163.49	4,765.31	-117.89	-8.74	118.01	0.48
4,864.00	2.85	164.95	4,859.21	-122.26	-7.51	122.17	0.20
4,959.00	2.24	178.84	4,954.11	-126.39	-6.86	126.18	0.91
5,054.00	2.44	187.82	5,049.03	-130.25	-7.10	130.04	0.44
5,148.00	3.55	183.28	5,142.90	-135.14	-7.54	134.94	1.21
5,244.00	3.30	185.27	5,238.73	-140.86	-7.96	140.67	0.29
5,339.00	2.67	188.17	5,333.60	-145.77	-8.53	145.61	0.68
5,433.00	2.85	193.53	5,427.49	-150.21	-9.38	150.13	0.33
5,528.00	3.53	190.28	5,522.35	-155.39	-10.46	155.40	0.74
5,623.00	3.93	190.63	5,617.14	-161.46	-11.58	161.57	0.42
5,717.00	3.95	173.17	5,710.93	-167.84	-11.79	167.92	1.27
5,812.00	3.97	169.05	5,805.70	-174.32	-10.78	174.21	0.30
5,906.00	3.63	164.31	5,899.49	-180.38	-9.35	180.02	0.49
6,001.00	3.23	154.56	5,994.32	-185.69	-7.39	185.03	0.74
6,096.00	2.75	152.51	6,089.19	-190.13	-5.19	189.13	0.52
6,191.00	2.29	147.56	6,184.10	-193.76	-3.12	192.45	0.54
6,286.00	2.10	175.66	6,279.03	-197.09	-1.97	195.61	1.14
6,381.00	2.07	180.06	6,373.97	-200.54	-1.84	199.01	0.17
6,475.00	1.85	174.64	6,467.92	-203.75	-1.70	202.17	0.31

Design Report for Cottonwood Creek 4-65-27-1H - Actual Field Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
6,570.00	2.56	178.82	6,562.85	-207.40	-1.51	205.76	0.77
6,665.00	2.78	180.29	6,657.74	-211.83	-1.48	210.14	0.24
6,760.00	2.47	181.07	6,752.64	-216.18	-1.53	214.46	0.33
6,854.00	2.13	179.65	6,846.57	-219.95	-1.56	218.20	0.37
6,949.00	1.75	181.29	6,941.51	-223.16	-1.58	221.39	0.40
7,044.00	1.49	177.48	7,036.47	-225.85	-1.56	224.05	0.30
7,139.00	1.31	175.45	7,131.45	-228.16	-1.42	226.33	0.20
7,234.00	0.74	156.72	7,226.43	-229.81	-1.09	227.92	0.69
7,329.00	0.39	154.53	7,321.43	-230.67	-0.71	228.71	0.37
7,424.00	0.57	176.28	7,416.42	-231.43	-0.54	229.45	0.27
7,519.00	0.96	202.26	7,511.41	-232.64	-0.81	230.68	0.54
7,613.00	1.99	204.97	7,605.38	-234.85	-1.79	233.00	1.10
7,708.00	1.11	277.87	7,700.35	-236.22	-3.40	234.57	2.08
7,803.00	1.38	314.34	7,795.33	-235.29	-5.13	233.88	0.86
7,898.00	1.27	331.13	7,890.31	-233.57	-6.46	232.35	0.42
7,993.00	1.11	342.56	7,985.29	-231.77	-7.24	230.67	0.30
8,088.00	0.94	356.85	8,080.27	-230.11	-7.56	229.08	0.32
8,185.00	0.88	9.15	8,177.26	-228.58	-7.49	227.55	0.21
Final Sperry MWD Survey @ 8185.00 ft							
8,248.00	0.88	9.15	8,240.25	-227.63	-7.33	226.58	0.00
Straight Line Projection to TD @ 8248.00 ft							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	+E/-W (usft)	Comment
2,113.00	2,112.88	20.82	1.88	Tie-On to Gyro Surveys @ 2113.00 ft
2,210.00	2,209.88	21.28	2.48	First Sperry MWD Survey @ 2210.00 ft
8,185.00	8,177.26	-228.58	-7.49	Final Sperry MWD Survey @ 8185.00 ft
8,248.00	8,240.25	-227.63	-7.33	Straight Line Projection to TD @ 8248.00 ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (usft)	+E/-W (usft)	Start TVD (usft)
User	No Target (Freehand)	187.64	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
84.00	2,113.00	Surface_GyroData	NS-GYRO-MS
2,210.00	8,248.00	Vertical_Sperry MWD Surveys	MWD

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
2,180.00		9 5/8"	9-5/8	13-1/2

Design Report for Cottonwood Creek 4-65-27-1H - Actual Field 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
Cottonwood Creek 4-6	0.00	0.00	0.00	0.01	0.00	1,672,631.99	3,236,881.31	39° 40' 37.780 N	104° 39' 30.290 W
- actual wellpath misses target center by 2112.99usft at 2113.00usft MD (2112.88 TVD, 20.82 N, 1.88 E)									
- Polygon									
Point 1				0.00	1,292.90	4,473.38	1,673,966.26	3,241,342.46	
Point 2				0.00	-904.03	4,465.16	1,671,769.37	3,241,354.59	
Point 3				0.00	-3,101.35	4,456.38	1,669,572.10	3,241,366.17	
Point 4				0.00	-3,094.43	2,282.51	1,669,558.88	3,239,192.35	
Point 5				0.00	-3,088.71	108.92	1,669,544.46	3,237,018.83	
Point 6				0.00	-899.41	128.38	1,671,733.82	3,237,018.01	
Point 7				0.00	1,288.41	148.12	1,673,921.70	3,237,017.48	
Point 8				0.00	1,290.73	2,311.03	1,673,944.05	3,239,180.25	
Cottonwood Creek 4-6	0.00	0.00	0.00	0.01	0.00	1,672,631.99	3,236,881.31	39° 40' 37.780 N	104° 39' 30.290 W
- actual wellpath misses target center by 2112.99usft at 2113.00usft MD (2112.88 TVD, 20.82 N, 1.88 E)									
- Polygon									
Point 1				0.00	1,752.90	4,933.38	1,674,430.49	3,241,798.17	
Point 2				0.00	-904.03	4,925.16	1,671,773.63	3,241,814.56	
Point 3				0.00	-3,561.35	4,916.38	1,669,116.38	3,241,830.40	
Point 4				0.00	-3,554.43	2,282.51	1,669,098.90	3,239,196.62	
Point 5				0.00	-3,548.71	-351.08	1,669,080.23	3,236,563.12	
Point 6				0.00	-899.41	-331.62	1,671,729.56	3,236,558.04	
Point 7				0.00	1,748.41	-311.88	1,674,377.41	3,236,553.25	
Point 8				0.00	1,750.73	2,311.03	1,674,404.03	3,239,175.99	
Cottonwood Creek 4-6	0.00	0.00	8,297.00	-231.31	-1.53	1,672,400.66	3,236,881.92	39° 40' 35.494 N	104° 39' 30.310 W
- actual wellpath misses target center by 57.16usft at 8248.00usft MD (8240.25 TVD, -227.63 N, -7.33 E)									
- Point									

Directional Difficulty Index

Average Dogleg over Survey:	0.46 °/100usft	Maximum Dogleg over Survey:	2.08 °/100usft at 7,708.00 usft
Net Tortousity applicable to Plans:	0.39 °/100usft	Directional Difficulty Index:	4.058

Audit Info

**North Reference Sheet for Sec. 27-T4S-R65W - Cottonwood Creek 4-65-27-1H -
 Plan B (Pilot)**

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to True North Reference.

Vertical Depths are relative to RKB 24 ft @ 5730.00usft (H&P 276). Northing and Easting are relative to Cottonwood Creek 4-65-27-1H

Coordinate System is US State Plane 1983, Colorado Central Zone using datum North American Datum 1983, ellipsoid GRS 1980

Projection method is Lambert Conformal Conic (2 parallel)

Central Meridian is 105° 30' 0.000 W°, Longitude Origin:0° 0' 0.000 E°, Latitude Origin:39° 45' 0.000 N°

False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99998640

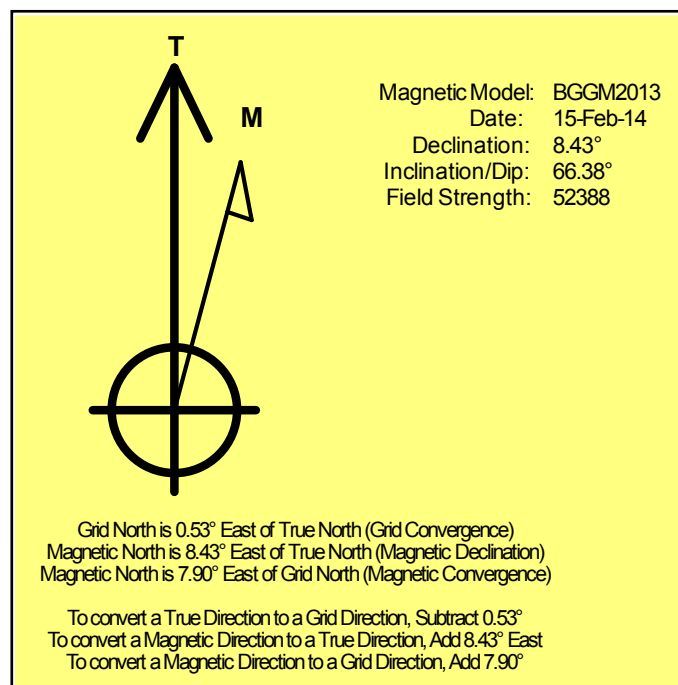
Grid Coordinates of Well: 1,672,631.98 usft N, 3,236,881.31 usft E

Geographical Coordinates of Well: 39° 40' 37.78" N, 104° 39' 30.29" W

Grid Convergence at Surface is: 0.53°

Based upon Minimum Curvature type calculations, at a Measured Depth of 8,248.00usft
 the Bottom Hole Displacement is 227.75usft in the Direction of 181.85° (True).

Magnetic Convergence at surface is: -7.90° (15 February 2014, , BGGM2013)



LEGEND

- Cottonwood Creek 4-65-27-1H, Rev B1 Proposal (Pilot Hole)
- Actual Field Surveys

