

Conoco Phillips Company

Arapahoe County, Colorado

Sec. 27-T4S-R65W

Cottonwood Creek 4-65-27-1H

Plan B

Plan: Rev B0 Proposal (Pilot Hole)

Sperry Drilling Services

Proposal Report

13 September, 2013

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:

Viewing Datum:

TVDs to System:

North Reference:

Unit System:

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

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

RKB 24 ft @ 5730.00usft (H&P 280)

N

True

API - US Survey Feet - Custom

HALLIBURTON

Plan Report for Cottonwood Creek 4-65-27-1H - Rev B0 Proposal (Pilot Hole)

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	Toolface Azimuth (°)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
200.00	0.00	0.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
300.00	0.00	0.00	300.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
400.00	0.00	0.00	400.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
500.00	0.00	0.00	500.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
600.00	0.00	0.00	600.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
700.00	0.00	0.00	700.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
800.00	0.00	0.00	800.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
900.00	0.00	0.00	900.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,000.00	0.00	0.00	1,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,100.00	0.00	0.00	1,100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,200.00	0.00	0.00	1,200.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,300.00	0.00	0.00	1,300.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,400.00	0.00	0.00	1,400.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,500.00	0.00	0.00	1,500.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,600.00	0.00	0.00	1,600.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,700.00	0.00	0.00	1,700.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,796.00	0.00	0.00	1,796.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fox Hills										
1,800.00	0.00	0.00	1,800.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,900.00	0.00	0.00	1,900.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,946.00	0.00	0.00	1,946.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pierre Shale										
2,000.00	0.00	0.00	2,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2,100.00	0.00	0.00	2,100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2,146.00	0.00	0.00	2,146.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Surface Casing										
2,200.00	0.00	0.00	2,200.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2,250.00	0.00	0.00	2,250.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Begin Nudge @ 2250.00 ft										
2,300.00	1.00	180.38	2,300.00	-0.44	0.00	0.44	2.00	2.00	0.00	180.38
2,390.00	2.80	180.38	2,389.94	-3.42	-0.02	3.42	2.00	2.00	0.00	0.00
End Nudge @ 2390.00 ft										
2,400.00	2.80	180.38	2,399.93	-3.91	-0.03	3.91	0.00	0.00	0.00	0.55
2,500.00	2.80	180.38	2,499.81	-8.79	-0.06	8.79	0.00	0.00	0.00	0.00
2,600.00	2.80	180.38	2,599.69	-13.68	-0.09	13.68	0.00	0.00	0.00	0.00
2,700.00	2.80	180.38	2,699.57	-18.56	-0.12	18.56	0.00	0.00	0.00	0.00
2,800.00	2.80	180.38	2,799.45	-23.45	-0.16	23.45	0.00	0.00	0.00	0.00
2,900.00	2.80	180.38	2,899.34	-28.33	-0.19	28.33	0.00	0.00	0.00	0.00
3,000.00	2.80	180.38	2,999.22	-33.22	-0.22	33.22	0.00	0.00	0.00	0.00
3,100.00	2.80	180.38	3,099.10	-38.10	-0.25	38.10	0.00	0.00	0.00	0.00
3,200.00	2.80	180.38	3,198.98	-42.99	-0.29	42.99	0.00	0.00	0.00	0.00
3,300.00	2.80	180.38	3,298.86	-47.87	-0.32	47.87	0.00	0.00	0.00	0.00
3,400.00	2.80	180.38	3,398.74	-52.76	-0.35	52.76	0.00	0.00	0.00	0.00
3,500.00	2.80	180.38	3,498.62	-57.64	-0.38	57.64	0.00	0.00	0.00	0.00
3,600.00	2.80	180.38	3,598.50	-62.53	-0.41	62.53	0.00	0.00	0.00	0.00
3,700.00	2.80	180.38	3,698.38	-67.41	-0.45	67.41	0.00	0.00	0.00	0.00
3,800.00	2.80	180.38	3,798.26	-72.30	-0.48	72.30	0.00	0.00	0.00	0.00
3,900.00	2.80	180.38	3,898.14	-77.18	-0.51	77.18	0.00	0.00	0.00	0.00
4,000.00	2.80	180.38	3,998.02	-82.07	-0.54	82.07	0.00	0.00	0.00	0.00
4,100.00	2.80	180.38	4,097.90	-86.95	-0.58	86.95	0.00	0.00	0.00	0.00
4,200.00	2.80	180.38	4,197.78	-91.84	-0.61	91.84	0.00	0.00	0.00	0.00
4,300.00	2.80	180.38	4,297.66	-96.72	-0.64	96.72	0.00	0.00	0.00	0.00
4,400.00	2.80	180.38	4,397.54	-101.61	-0.67	101.61	0.00	0.00	0.00	0.00
4,500.00	2.80	180.38	4,497.43	-106.49	-0.71	106.49	0.00	0.00	0.00	0.00
4,600.00	2.80	180.38	4,597.31	-111.38	-0.74	111.38	0.00	0.00	0.00	0.00
4,700.00	2.80	180.38	4,697.19	-116.26	-0.77	116.26	0.00	0.00	0.00	0.00

Plan Report for Cottonwood Creek 4-65-27-1H - Rev B0 Proposal (Pilot Hole)

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	Toolface Azimuth (°)
4,800.00	2.80	180.38	4,797.07	-121.15	-0.80	121.15	0.00	0.00	0.00	0.00
4,900.00	2.80	180.38	4,896.95	-126.03	-0.84	126.03	0.00	0.00	0.00	0.00
5,000.00	2.80	180.38	4,996.83	-130.92	-0.87	130.92	0.00	0.00	0.00	0.00
Hold Inc 2.80°, Azi 180.38°										
5,100.00	2.80	180.38	5,096.71	-135.80	-0.90	135.80	0.00	0.00	0.00	0.00
5,200.00	2.80	180.38	5,196.59	-140.68	-0.93	140.69	0.00	0.00	0.00	0.00
5,300.00	2.80	180.38	5,296.47	-145.57	-0.97	145.57	0.00	0.00	0.00	0.00
5,400.00	2.80	180.38	5,396.35	-150.45	-1.00	150.46	0.00	0.00	0.00	0.00
5,500.00	2.80	180.38	5,496.23	-155.34	-1.03	155.34	0.00	0.00	0.00	0.00
5,600.00	2.80	180.38	5,596.11	-160.22	-1.06	160.23	0.00	0.00	0.00	0.00
5,700.00	2.80	180.38	5,695.99	-165.11	-1.10	165.11	0.00	0.00	0.00	0.00
5,800.00	2.80	180.38	5,795.87	-169.99	-1.13	170.00	0.00	0.00	0.00	0.00
5,900.00	2.80	180.38	5,895.75	-174.88	-1.16	174.88	0.00	0.00	0.00	0.00
6,000.00	2.80	180.38	5,995.63	-179.76	-1.19	179.77	0.00	0.00	0.00	0.00
6,100.00	2.80	180.38	6,095.52	-184.65	-1.22	184.65	0.00	0.00	0.00	0.00
6,200.00	2.80	180.38	6,195.40	-189.53	-1.26	189.54	0.00	0.00	0.00	0.00
6,300.00	2.80	180.38	6,295.28	-194.42	-1.29	194.42	0.00	0.00	0.00	0.00
6,400.00	2.80	180.38	6,395.16	-199.30	-1.32	199.31	0.00	0.00	0.00	0.00
6,500.00	2.80	180.38	6,495.04	-204.19	-1.35	204.19	0.00	0.00	0.00	0.00
6,600.00	2.80	180.38	6,594.92	-209.07	-1.39	209.08	0.00	0.00	0.00	0.00
6,700.00	2.80	180.38	6,694.80	-213.96	-1.42	213.96	0.00	0.00	0.00	0.00
6,800.00	2.80	180.38	6,794.68	-218.84	-1.45	218.85	0.00	0.00	0.00	0.00
6,900.00	2.80	180.38	6,894.56	-223.73	-1.48	223.73	0.00	0.00	0.00	0.00
6,985.50	2.80	180.38	6,979.96	-227.90	-1.51	227.91	0.00	0.00	0.00	0.00
Begin Drop @ 6985.50 ft										
7,000.00	2.51	180.38	6,994.44	-228.58	-1.52	228.58	2.00	-2.00	0.00	-180.00
7,100.00	0.51	180.38	7,094.40	-231.21	-1.53	231.22	2.00	-2.00	0.00	180.00
7,125.50	0.00	0.00	7,119.90	-231.32	-1.53	231.33	2.00	-2.00	0.00	180.00
End Drop @ 7125.50 ft										
7,200.00	0.00	0.00	7,194.40	-231.32	-1.53	231.33	0.00	0.00	0.00	0.00
7,300.00	0.00	0.00	7,294.40	-231.32	-1.53	231.33	0.00	0.00	0.00	0.00
7,400.00	0.00	0.00	7,394.40	-231.32	-1.53	231.33	0.00	0.00	0.00	0.00
7,500.00	0.00	0.00	7,494.40	-231.32	-1.53	231.33	0.00	0.00	0.00	0.00
7,600.00	0.00	0.00	7,594.40	-231.32	-1.53	231.33	0.00	0.00	0.00	0.00
7,700.00	0.00	0.00	7,694.40	-231.32	-1.53	231.33	0.00	0.00	0.00	0.00
7,706.60	0.00	0.00	7,701.00	-231.32	-1.53	231.33	0.00	0.00	0.00	0.00
Sharon Springs										
7,796.60	0.00	0.00	7,791.00	-231.32	-1.53	231.33	0.00	0.00	0.00	0.00
Niobrara										
7,800.00	0.00	0.00	7,794.40	-231.32	-1.53	231.33	0.00	0.00	0.00	0.00
7,861.60	0.00	0.00	7,856.00	-231.32	-1.53	231.33	0.00	0.00	0.00	0.00
Niobrara B										
7,900.00	0.00	0.00	7,894.40	-231.32	-1.53	231.33	0.00	0.00	0.00	0.00
7,902.60	0.00	0.00	7,897.00	-231.32	-1.53	231.33	0.00	0.00	0.00	0.00
Niobrara C										
7,982.60	0.00	0.00	7,977.00	-231.32	-1.53	231.33	0.00	0.00	0.00	0.00
Niobrara D										
8,000.00	0.00	0.00	7,994.40	-231.32	-1.53	231.33	0.00	0.00	0.00	0.00
8,100.00	0.00	0.00	8,094.40	-231.32	-1.53	231.33	0.00	0.00	0.00	0.00
8,129.60	0.00	0.00	8,124.00	-231.32	-1.53	231.33	0.00	0.00	0.00	0.00
Fort Hays										
8,157.60	0.00	0.00	8,152.00	-231.32	-1.53	231.33	0.00	0.00	0.00	0.00
Carlisle Shale										
8,200.00	0.00	0.00	8,194.40	-231.32	-1.53	231.33	0.00	0.00	0.00	0.00
8,222.60	0.00	0.00	8,217.00	-231.32	-1.53	231.33	0.00	0.00	0.00	0.00
Greenhorn										
8,300.00	0.00	0.00	8,294.40	-231.32	-1.53	231.33	0.00	0.00	0.00	0.00
8,302.60	0.00	0.00	8,297.00	-231.32	-1.53	231.33	0.00	0.00	0.00	0.00

Plan Report for Cottonwood Creek 4-65-27-1H - Rev B0 Proposal (Pilot Hole)

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	Toolface Azimuth (°)
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Total Depth 8302.60 ft - Pilot Hole TD

Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	+E/-W (usft)	Comment
2,250.00	2,250.00	0.00	0.00	Begin Nudge @ 2250.00 ft
2,390.00	2,389.94	-3.42	-0.02	End Nudge @ 2390.00 ft
5,000.00	4,996.83	-130.92	-0.87	Hold Inc 2.80°, Azi 180.38°
6,985.50	6,979.96	-227.90	-1.51	Begin Drop @ 6985.50 ft
7,125.50	7,119.90	-231.32	-1.53	End Drop @ 7125.50 ft
8,302.60	8,297.00	-231.32	-1.53	Total Depth 8302.60 ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/-S (usft)	+E/-W (usft)	Start TVD (usft)
Target	Cottonwood Creek 4-65-27-1H_BHL Tgt (Pilot Hole)	180.38	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
0.00	2,146.00	Rev B0 Proposal (Pilot Hole)	Assumed Vertical - 30
2,146.00	8,302.60	Rev B0 Proposal (Pilot Hole)	Inclinometer MWD

Formation Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
1,796.00	1,796.00	Fox Hills			
1,946.00	1,946.00	Pierre Shale			
2,146.00	2,146.00	Surface Casing			
7,706.60	7,701.00	Sharon Springs			
7,796.60	7,791.00	Niobrara			
7,861.60	7,856.00	Niobrara B			
7,902.60	7,897.00	Niobrara C			
7,982.60	7,977.00	Niobrara D			
8,129.60	8,124.00	Fort Hays			
8,157.60	8,152.00	Carlisle Shale			
8,222.60	8,217.00	Greenhorn			
8,302.60	8,297.00	Pilot Hole TD			

Plan Report for Cottonwood Creek 4-65-27-1H - Rev B0 Proposal (Pilot Hole)

Targets associated with this wellbore

Target Name	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Shape
Cottonwood Creek 4-65-27-1H_SB	0.00	0.00	0.00	Polygon
Cottonwood Creek 4-65-27-1H_SL	0.00	0.00	0.00	Polygon
Cottonwood Creek 4-65-27-1H_BHL Tgt (Latera	7,845.00	-226.26	4,447.39	Point
Cottonwood Creek 4-65-27-1H_BHL Tgt (Pilot H	8,297.00	-231.32	-1.53	Point

Directional Difficulty Index

Average Dogleg over Survey:	0.07 °/100usft	Maximum Dogleg over Survey:	2.00 °/100usft at 2,390.00 usft
Net Tortousity applicable to Plans:	0.07 °/100usft	Directional Difficulty Index:	4.025

Audit Info

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

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 280). 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 -105.50°, 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 8,302.60usft
the Bottom Hole Displacement is 231.33usft in the Direction of 180.38° (True).
Magnetic Convergence at surface is: -7.91° (15 January 2014, , BGGM2013)

