

# Conoco Phillips Company

Arapahoe County, Colorado

Sec. 27-T4S-R65W

Cottonwood Creek 4-65-27-1H

## Plan B

Plan: Rev B0 Proposal (Lateral)

## 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: Rev B0 Proposal (Lateral) (Cottonwood Creek 4-65-27-1H/Plan B)	
Created By: Matthew R. Epp	Date: 6:39, September 13 2013
Checked: _____	Date: _____
Reviewed: _____	Date: _____
Approved: _____	Date: _____

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

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 (°)
7,150.00	0.00	0.00	7,144.40	-231.32	-1.53	10.23	0.00	0.00	0.00	0.00
<b>Tie-On to Pilot Hole Surveys @ 7150.00 ft</b>										
7,200.00	0.00	0.00	7,194.40	-231.32	-1.53	10.23	0.00	0.00	0.00	0.00
7,300.00	0.00	0.00	7,294.40	-231.32	-1.53	10.23	0.00	0.00	0.00	0.00
7,349.74	0.00	0.00	7,344.14	-231.32	-1.53	10.23	0.00	0.00	0.00	0.00
<b>Kick Off Point 7349.74 ft</b>										
7,400.00	5.03	89.93	7,394.34	-231.32	0.67	12.43	10.00	10.00	0.00	89.93
7,500.00	15.03	89.93	7,492.68	-231.30	18.06	29.79	10.00	10.00	0.00	0.00
7,600.00	25.03	89.93	7,586.52	-231.26	52.26	63.94	10.00	10.00	0.00	0.00
7,700.00	35.03	89.93	7,672.99	-231.20	102.24	113.85	10.00	10.00	0.00	0.00
7,734.98	38.52	89.93	7,701.00	-231.18	123.17	134.76	10.00	10.00	0.00	0.00
<b>Sharon Springs</b>										
7,800.00	45.03	89.93	7,749.47	-231.13	166.47	178.00	10.00	10.00	0.00	0.00
<b>Build Rate 10.00 °/100 ft</b>										
7,862.27	51.25	89.93	7,791.00	-231.08	212.82	224.29	10.00	10.00	0.00	0.00
<b>Niobrara</b>										
7,900.00	55.03	89.93	7,813.63	-231.04	243.01	254.43	10.00	10.00	0.00	0.00
7,982.73	63.30	89.93	7,856.00	-230.96	313.98	325.31	10.00	10.00	0.00	0.00
<b>Niobrara B</b>										
8,000.00	65.03	89.93	7,863.53	-230.94	329.52	340.83	10.00	10.00	0.00	0.00
8,097.54	74.78	89.93	7,897.00	-230.84	421.01	432.19	10.00	10.00	0.00	0.00
<b>Niobrara C</b>										
8,100.00	75.03	89.93	7,897.64	-230.84	423.39	434.57	10.00	10.00	0.00	0.00
8,200.00	85.03	89.93	7,914.94	-230.73	521.75	532.80	10.00	10.00	0.00	0.00
8,260.41	91.07	89.93	7,917.00	-230.66	582.10	593.06	10.00	10.00	0.00	0.00
<b>End Build 8260.41 ft - 7" Casing Pt.</b>										
8,300.00	91.07	89.93	7,916.26	-230.61	621.68	632.59	0.00	0.00	0.00	0.00
8,400.00	91.07	89.93	7,914.40	-230.50	721.66	732.44	0.00	0.00	0.00	0.00
8,500.00	91.07	89.93	7,912.54	-230.38	821.65	832.29	0.00	0.00	0.00	0.00
8,600.00	91.07	89.93	7,910.67	-230.27	921.63	932.14	0.00	0.00	0.00	0.00
8,700.00	91.07	89.93	7,908.81	-230.16	1,021.61	1,031.98	0.00	0.00	0.00	0.00
8,800.00	91.07	89.93	7,906.95	-230.04	1,121.59	1,131.83	0.00	0.00	0.00	0.00
8,900.00	91.07	89.93	7,905.09	-229.93	1,221.58	1,231.68	0.00	0.00	0.00	0.00
9,000.00	91.07	89.93	7,903.22	-229.82	1,321.56	1,331.53	0.00	0.00	0.00	0.00
9,100.00	91.07	89.93	7,901.36	-229.70	1,421.54	1,431.38	0.00	0.00	0.00	0.00
9,200.00	91.07	89.93	7,899.50	-229.59	1,521.52	1,531.22	0.00	0.00	0.00	0.00
9,300.00	91.07	89.93	7,897.64	-229.48	1,621.51	1,631.07	0.00	0.00	0.00	0.00
9,400.00	91.07	89.93	7,895.78	-229.36	1,721.49	1,730.92	0.00	0.00	0.00	0.00
9,500.00	91.07	89.93	7,893.91	-229.25	1,821.47	1,830.77	0.00	0.00	0.00	0.00
9,600.00	91.07	89.93	7,892.05	-229.13	1,921.45	1,930.61	0.00	0.00	0.00	0.00
9,700.00	91.07	89.93	7,890.19	-229.02	2,021.44	2,030.46	0.00	0.00	0.00	0.00
9,800.00	91.07	89.93	7,888.33	-228.91	2,121.42	2,130.31	0.00	0.00	0.00	0.00
9,900.00	91.07	89.93	7,886.46	-228.79	2,221.40	2,230.16	0.00	0.00	0.00	0.00
10,000.00	91.07	89.93	7,884.60	-228.68	2,321.38	2,330.00	0.00	0.00	0.00	0.00
10,100.00	91.07	89.93	7,882.74	-228.57	2,421.37	2,429.85	0.00	0.00	0.00	0.00
10,200.00	91.07	89.93	7,880.88	-228.45	2,521.35	2,529.70	0.00	0.00	0.00	0.00
<b>Hold Inc 91.07° and Azi 89.93°</b>										
10,300.00	91.07	89.93	7,879.01	-228.34	2,621.33	2,629.55	0.00	0.00	0.00	0.00
10,400.00	91.07	89.93	7,877.15	-228.23	2,721.31	2,729.40	0.00	0.00	0.00	0.00
10,500.00	91.07	89.93	7,875.29	-228.11	2,821.30	2,829.24	0.00	0.00	0.00	0.00
10,600.00	91.07	89.93	7,873.43	-228.00	2,921.28	2,929.09	0.00	0.00	0.00	0.00
10,700.00	91.07	89.93	7,871.56	-227.88	3,021.26	3,028.94	0.00	0.00	0.00	0.00
10,800.00	91.07	89.93	7,869.70	-227.77	3,121.24	3,128.79	0.00	0.00	0.00	0.00
10,900.00	91.07	89.93	7,867.84	-227.66	3,221.23	3,228.63	0.00	0.00	0.00	0.00
11,000.00	91.07	89.93	7,865.98	-227.54	3,321.21	3,328.48	0.00	0.00	0.00	0.00
11,100.00	91.07	89.93	7,864.11	-227.43	3,421.19	3,428.33	0.00	0.00	0.00	0.00
11,200.00	91.07	89.93	7,862.25	-227.32	3,521.18	3,528.18	0.00	0.00	0.00	0.00
11,300.00	91.07	89.93	7,860.39	-227.20	3,621.16	3,628.02	0.00	0.00	0.00	0.00

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

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 (°)
11,400.00	91.07	89.93	7,858.53	-227.09	3,721.14	3,727.87	0.00	0.00	0.00	0.00
11,500.00	91.07	89.93	7,856.67	-226.98	3,821.12	3,827.72	0.00	0.00	0.00	0.00
11,600.00	91.07	89.93	7,854.80	-226.86	3,921.11	3,927.57	0.00	0.00	0.00	0.00
11,700.00	91.07	89.93	7,852.94	-226.75	4,021.09	4,027.42	0.00	0.00	0.00	0.00
11,800.00	91.07	89.93	7,851.08	-226.63	4,121.07	4,127.26	0.00	0.00	0.00	0.00
11,900.00	91.07	89.93	7,849.22	-226.52	4,221.05	4,227.11	0.00	0.00	0.00	0.00
12,000.00	91.07	89.93	7,847.35	-226.41	4,321.04	4,326.96	0.00	0.00	0.00	0.00
12,100.00	91.07	89.93	7,845.49	-226.29	4,421.02	4,426.81	0.00	0.00	0.00	0.00
12,126.37	91.07	89.93	7,845.00	-226.26	4,447.38	4,453.14	0.00	0.00	0.00	0.00
<b>Total Depth 12126.38 ft</b>										
12,126.38	91.07	89.93	7,845.00	-226.26	4,447.39	4,453.14	0.01	0.00	0.00	0.00

Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
7,150.00	7,144.40	-231.32	-1.53	Tie-On to Pilot Hole Surveys @ 7150.00 ft
7,349.74	7,344.14	-231.32	-1.53	Kick Off Point 7349.74 ft
7,800.00	7,749.47	-231.13	166.47	Build Rate 10.00 °/100 ft
8,260.41	7,917.00	-230.66	582.10	End Build 8260.41 ft
10,200.00	7,880.88	-228.45	2,521.35	Hold Inc 91.07° and Azi 89.93°
12,126.37	7,845.00	-226.26	4,447.38	Total Depth 12126.38 ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	+N/_S (usft)	+E/-W (usft)	Start TVD (usft)
Target	Cottonwood Creek 4-65-27-1H_BHL Tgt (Lateral)	92.91	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
7,150.00	12,126.32	Rev B0 Proposal (Lateral)	MWD

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
8,260.41	7,917.00	7" Casing Pt.	7	8-3/4

Formation Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
7,734.98	7,701.00	Sharon Springs			
7,862.27	7,791.00	Niobrara			
7,982.73	7,856.00	Niobrara B			
8,097.54	7,897.00	Niobrara C			

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

### 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 t	8,297.00	-231.32	-1.53	Point

### Directional Difficulty Index

Average Dogleg over Survey:	1.83 °/100usft	Maximum Dogleg over Survey:	10.00 °/100usft at 8,260.41 usft
Net Tortousity applicable to Plans:	1.83 °/100usft	Directional Difficulty Index:	6.182

### 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 12,126.38usft  
the Bottom Hole Displacement is 4,453.14usft in the Direction of 92.91° ( True).  
Magnetic Convergence at surface is: -7.91° (15 January 2014, , BGGM2013)

