

Archer

Survey Report

Company:	Black Hills Production Co.	Local Co-ordinate Reference:	Well HDU 9-11CH
Project:	Garfield Co., CO.	TVD Reference:	WELL @ 5536.00usft (Original Well Elev)
Site:	Sec.9-T8S-R98W	MD Reference:	WELL @ 5536.00usft (Original Well Elev)
Well:	HDU 9-11CH	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDMDBBW

Project	Garfield Co., CO.		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Central Zone		

Site		Sec.9-T8S-R98W			
Site Position:		Northing:	1,575,537.582 usft	Latitude:	39° 22' 46.452 N
From:	Lat/Long	Easting:	2,202,119.135 usft	Longitude:	108° 19' 23.304 W
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	-1.78 °

Well		HDU 9-11CH				
Well Position	+N/-S	0.00 usft	Northing:	1,575,929.535 usft	Latitude:	39° 22' 48.900 N
	+E/-W	0.00 usft	Easting:	2,197,494.481 usft	Longitude:	108° 20' 22.330 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	usft	Ground Level:	5,521.00 usft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	2015/03/30	10.00	65.48	51,765

Design	Wellbore #1				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.00	0.00	0.00	145.04	

Survey Program	Date	2015/05/21			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
1,151.00	6,532.00	Survey #1 (Wellbore #1)	MWD	MWD - Standard	
6,547.00	18,988.00	Survey #2 (Wellbore #1)	MWD	MWD - Standard	

Survey										
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)	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
First Archer Survey										
1,151.00	0.80	197.50	1,150.96	-7.66	-2.42	4.90	0.07	0.07	0.00	
1,245.00	0.70	208.70	1,244.95	-8.79	-2.89	5.55	0.19	-0.11	11.91	
1,341.00	0.80	219.10	1,340.95	-9.83	-3.59	5.99	0.18	0.10	10.83	
1,436.00	0.80	219.50	1,435.94	-10.85	-4.43	6.35	0.01	0.00	0.42	
1,531.00	0.70	219.30	1,530.93	-11.81	-5.22	6.69	0.11	-0.11	-0.21	
1,626.00	1.10	332.00	1,625.92	-11.46	-6.02	5.94	1.59	0.42	118.63	
1,722.00	1.20	341.30	1,721.90	-9.69	-6.77	4.06	0.22	0.10	9.69	
1,817.00	1.10	338.50	1,816.88	-7.90	-7.43	2.22	0.12	-0.11	-2.95	
1,912.00	1.90	13.00	1,911.85	-5.52	-7.41	0.28	1.23	0.84	36.32	
2,007.00	1.70	13.60	2,006.81	-2.61	-6.72	-1.71	0.21	-0.21	0.63	

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Well:	HDU 9-11CH	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDMDBBW

Survey										
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)	
2,103.00	1.40	10.80	2,102.77	-0.08	-6.17	-3.47	0.32	-0.31	-2.92	
2,197.00	1.40	8.70	2,196.74	2.18	-5.78	-5.10	0.05	0.00	-2.23	
2,293.00	1.30	356.60	2,292.72	4.43	-5.66	-6.88	0.31	-0.10	-12.60	
2,389.00	1.20	354.10	2,388.69	6.52	-5.83	-8.68	0.12	-0.10	-2.60	
2,484.00	1.30	341.30	2,483.67	8.53	-6.28	-10.59	0.31	0.11	-13.47	
2,579.00	0.60	15.90	2,578.66	10.03	-6.49	-11.94	0.92	-0.74	36.42	
2,674.00	0.60	37.10	2,673.65	10.90	-6.05	-12.40	0.23	0.00	22.32	
2,770.00	0.60	21.90	2,769.65	11.77	-5.56	-12.83	0.17	0.00	-15.83	
2,865.00	0.40	16.00	2,864.64	12.55	-5.29	-13.31	0.22	-0.21	-6.21	
2,960.00	0.40	5.50	2,959.64	13.20	-5.16	-13.78	0.08	0.00	-11.05	
3,055.00	0.40	333.39	3,054.64	13.82	-5.28	-14.36	0.23	0.00	-33.80	
3,150.00	0.40	306.30	3,149.64	14.32	-5.70	-15.00	0.20	0.00	-28.52	
3,245.00	0.40	284.60	3,244.63	14.60	-6.28	-15.56	0.16	0.00	-22.84	
3,340.00	0.40	301.30	3,339.63	14.85	-6.89	-16.12	0.12	0.00	17.58	
3,436.00	0.50	281.30	3,435.63	15.11	-7.58	-16.73	0.19	0.10	-20.83	
3,531.00	0.50	285.50	3,530.63	15.30	-8.39	-17.35	0.04	0.00	4.42	
3,626.00	0.60	263.00	3,625.62	15.35	-9.28	-17.90	0.25	0.11	-23.68	
3,721.00	0.70	267.60	3,720.62	15.27	-10.36	-18.45	0.12	0.11	4.84	
3,816.00	0.80	270.10	3,815.61	15.24	-11.60	-19.14	0.11	0.11	2.63	
3,911.00	0.60	251.10	3,910.60	15.08	-12.73	-19.66	0.32	-0.21	-20.00	
4,006.00	0.40	167.20	4,005.60	14.60	-13.13	-19.49	0.72	-0.21	-88.32	
4,102.00	0.50	136.90	4,101.59	13.97	-12.77	-18.76	0.26	0.10	-31.56	
4,197.00	0.60	160.30	4,196.59	13.20	-12.32	-17.87	0.26	0.11	24.63	
4,292.00	0.90	198.20	4,291.58	12.02	-12.39	-16.95	0.59	0.32	39.89	
4,387.00	1.10	204.20	4,386.57	10.48	-12.99	-16.03	0.24	0.21	6.32	
4,483.00	1.30	210.70	4,482.55	8.70	-13.93	-15.11	0.25	0.21	6.77	
4,578.00	1.20	193.70	4,577.52	6.81	-14.71	-14.01	0.40	-0.11	-17.89	
4,673.00	0.70	219.10	4,672.51	5.39	-15.31	-13.19	0.68	-0.53	26.74	
4,769.00	0.70	238.60	4,768.50	4.63	-16.18	-13.07	0.25	0.00	20.31	
4,864.00	0.40	265.30	4,863.50	4.30	-17.01	-13.27	0.41	-0.32	28.11	
4,959.00	0.40	267.40	4,958.50	4.26	-17.67	-13.62	0.02	0.00	2.21	
5,055.00	0.60	243.10	5,054.49	4.02	-18.45	-13.87	0.30	0.21	-25.31	
5,150.00	0.70	112.00	5,149.49	3.57	-18.36	-13.45	1.25	0.11	-138.00	
5,245.00	0.80	119.50	5,244.48	3.03	-17.24	-12.36	0.15	0.11	7.89	
5,341.00	0.70	144.40	5,340.48	2.22	-16.32	-11.17	0.35	-0.10	25.94	
5,436.00	1.10	95.00	5,435.46	1.67	-15.07	-10.01	0.88	0.42	-52.00	
5,531.00	0.90	100.10	5,530.45	1.46	-13.43	-8.89	0.23	-0.21	5.37	
5,626.00	0.80	119.30	5,625.44	1.01	-12.12	-7.77	0.32	-0.11	20.21	
5,721.00	0.70	157.10	5,720.43	0.15	-11.31	-6.60	0.52	-0.11	39.79	
5,816.00	0.90	183.50	5,815.42	-1.13	-11.13	-5.45	0.44	0.21	27.79	
5,911.00	1.20	199.30	5,910.41	-2.82	-11.51	-4.29	0.44	0.32	16.63	
6,007.00	0.40	76.50	6,006.40	-3.69	-11.51	-3.58	1.52	-0.83	-127.92	
6,102.00	0.50	50.50	6,101.40	-3.35	-10.87	-3.49	0.24	0.11	-27.37	
6,197.00	0.10	142.70	6,196.40	-3.15	-10.50	-3.44	0.54	-0.42	97.05	
6,293.00	0.50	195.00	6,292.40	-3.62	-10.56	-3.08	0.46	0.42	54.48	
6,388.00	0.70	197.90	6,387.39	-4.57	-10.84	-2.47	0.21	0.21	3.05	
Last Archer Survey										
6,478.00	1.00	205.70	6,477.38	-5.80	-11.35	-1.75	0.36	0.33	8.67	
PTB										
6,532.00	1.00	205.70	6,531.37	-6.65	-11.76	-1.29	0.00	0.00	0.00	
First Archer Survey										
6,547.00	1.10	197.40	6,546.37	-6.91	-11.86	-1.14	1.21	0.67	-55.33	
6,579.00	1.40	194.90	6,578.36	-7.58	-12.06	-0.70	0.95	0.94	-7.81	
6,610.00	1.60	136.70	6,609.35	-8.26	-11.86	-0.03	4.74	0.65	-187.74	

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Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDMDBBW

Survey									
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)
6,642.00	3.90	114.20	6,641.31	-9.03	-10.56	1.35	7.81	7.19	-70.31
6,673.00	6.40	95.20	6,672.19	-9.62	-7.87	3.37	9.66	8.06	-61.29
6,704.00	9.10	88.30	6,702.90	-9.70	-3.70	5.83	9.20	8.71	-22.26
6,736.00	11.20	88.40	6,734.40	-9.54	1.93	8.93	6.56	6.56	0.31
6,768.00	12.40	91.10	6,765.72	-9.52	8.48	12.66	4.13	3.75	8.44
6,800.00	12.90	95.50	6,796.95	-9.93	15.47	17.00	3.39	1.56	13.75
6,831.00	13.60	97.10	6,827.12	-10.71	22.53	21.69	2.55	2.26	5.16
6,863.00	14.90	97.50	6,858.14	-11.71	30.34	26.98	4.07	4.06	1.25
6,894.00	16.90	98.20	6,887.95	-12.88	38.75	32.76	6.48	6.45	2.26
6,926.00	19.00	98.20	6,918.39	-14.28	48.51	39.50	6.56	6.56	0.00
6,958.00	20.40	100.80	6,948.52	-16.07	59.15	47.06	5.16	4.37	8.12
6,989.00	21.30	102.20	6,977.49	-18.27	69.96	55.06	3.32	2.90	4.52
7,021.00	22.00	101.10	7,007.23	-20.65	81.52	63.64	2.53	2.19	-3.44
7,052.00	23.70	98.20	7,035.80	-22.66	93.39	72.08	6.58	5.48	-9.35
7,084.00	26.20	95.80	7,064.81	-24.29	106.78	81.10	8.43	7.81	-7.50
7,116.00	28.70	93.60	7,093.21	-25.49	121.48	90.50	8.43	7.81	-6.87
7,147.00	31.30	91.50	7,120.05	-26.17	136.96	99.93	9.04	8.39	-6.77
7,179.00	33.50	90.70	7,147.07	-26.49	154.11	110.02	7.00	6.87	-2.50
7,210.00	35.40	91.00	7,172.63	-26.75	171.64	120.28	6.15	6.13	0.97
7,242.00	37.80	92.20	7,198.32	-27.29	190.71	131.65	7.83	7.50	3.75
7,273.00	39.70	95.40	7,222.50	-28.59	210.06	143.80	8.90	6.13	10.32
7,305.00	42.60	96.70	7,246.59	-30.82	231.00	157.62	9.45	9.06	4.06
7,336.00	46.30	95.00	7,268.72	-33.02	252.59	171.79	12.54	11.94	-5.48
7,368.00	49.70	93.40	7,290.13	-34.75	276.30	186.80	11.26	10.62	-5.00
7,399.00	52.50	91.90	7,309.59	-35.86	300.40	201.52	9.79	9.03	-4.84
7,431.00	56.00	89.70	7,328.29	-36.21	326.36	216.68	12.28	10.94	-6.87
7,462.00	59.20	87.80	7,344.90	-35.63	352.52	231.20	11.55	10.32	-6.13
7,494.00	62.60	86.30	7,360.46	-34.19	380.44	246.01	11.39	10.62	-4.69
7,525.00	65.50	85.80	7,374.02	-32.27	408.25	260.37	9.47	9.35	-1.61
7,556.00	67.80	86.20	7,386.31	-30.28	436.64	275.01	7.51	7.42	1.29
7,589.00	69.80	87.20	7,398.24	-28.51	467.35	291.16	6.69	6.06	3.03
7,620.00	72.20	87.40	7,408.33	-27.13	496.63	306.80	7.77	7.74	0.65
7,652.00	74.50	86.90	7,417.50	-25.61	527.24	323.10	7.34	7.19	-1.56
7,683.00	75.70	87.30	7,425.47	-24.09	557.16	339.00	4.07	3.87	1.29
7,714.00	79.60	88.20	7,432.10	-22.90	587.42	355.36	12.90	12.58	2.90
7,746.00	81.30	89.20	7,437.41	-22.19	618.96	372.85	6.14	5.31	3.12
7,777.00	82.70	90.10	7,441.72	-22.00	649.66	390.29	5.35	4.52	2.90
7,809.00	84.80	89.60	7,445.21	-21.92	681.47	408.45	6.74	6.56	-1.56
7,841.00	86.50	88.90	7,447.63	-21.50	713.37	426.39	5.74	5.31	-2.19
7,872.00	87.60	88.70	7,449.23	-20.85	744.32	443.59	3.61	3.55	-0.65
7,904.00	88.20	89.00	7,450.40	-20.21	776.29	461.38	2.10	1.87	0.94
7,935.00	88.50	88.80	7,451.30	-19.62	807.28	478.65	1.16	0.97	-0.65
7,967.00	88.60	88.80	7,452.10	-18.95	839.26	496.43	0.31	0.31	0.00
7,999.00	89.10	88.90	7,452.75	-18.30	871.25	514.23	1.59	1.56	0.31
8,031.00	89.20	90.20	7,453.22	-18.05	903.24	532.36	4.07	0.31	4.06
8,063.00	89.20	92.10	7,453.67	-18.69	935.23	551.21	5.94	0.00	5.94
8,094.00	89.50	93.60	7,454.02	-20.24	966.19	570.21	4.93	0.97	4.84
8,126.00	88.60	95.60	7,454.55	-22.80	998.08	590.59	6.85	-2.81	6.25
8,157.00	86.70	98.30	7,455.82	-26.55	1,028.82	611.28	10.64	-6.13	8.71
8,188.00	84.70	100.30	7,458.15	-31.54	1,059.32	632.85	9.11	-6.45	6.45
8,220.00	84.20	100.80	7,461.24	-37.37	1,090.64	655.57	2.20	-1.56	1.56
8,251.00	84.80	100.40	7,464.21	-43.05	1,120.97	677.60	2.32	1.94	-1.29
8,283.00	85.00	102.40	7,467.06	-49.35	1,152.21	700.67	6.26	0.62	6.25
8,315.00	83.60	102.80	7,470.24	-56.30	1,183.28	724.16	4.55	-4.37	1.25

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Site:	Sec.9-T8S-R98W	MD Reference:	WELL @ 5536.00usft (Original Well Elev)
Well:	HDU 9-11CH	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDMDBBW

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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)
8,346.00	81.40	103.50	7,474.28	-63.29	1,213.21	747.04	7.44	-7.10	2.26
8,377.00	78.90	104.40	7,479.58	-70.65	1,242.85	770.06	8.56	-8.06	2.90
8,409.00	78.40	105.10	7,485.88	-78.64	1,273.19	793.99	2.65	-1.56	2.19
8,440.00	78.90	104.90	7,491.98	-86.50	1,302.55	817.26	1.73	1.61	-0.65
8,472.00	79.40	104.90	7,498.01	-94.58	1,332.92	841.29	1.56	1.56	0.00
8,503.00	80.50	105.00	7,503.42	-102.46	1,362.41	864.64	3.56	3.55	0.32
8,535.00	81.80	104.70	7,508.34	-110.56	1,392.97	888.79	4.17	4.06	-0.94
8,566.00	83.30	104.10	7,512.36	-118.21	1,422.74	912.11	5.21	4.84	-1.94
8,598.00	85.20	104.20	7,515.57	-125.99	1,453.62	936.18	5.95	5.94	0.31
8,629.00	86.20	105.40	7,517.89	-133.88	1,483.50	959.78	5.03	3.23	3.87
8,661.00	86.40	107.90	7,519.95	-143.03	1,514.09	984.81	7.82	0.62	7.81
8,692.00	86.20	110.60	7,521.96	-153.23	1,543.30	1,009.90	8.72	-0.65	8.71
8,724.00	86.40	112.60	7,524.02	-164.99	1,572.99	1,036.54	6.27	0.62	6.25
8,755.00	86.60	114.90	7,525.91	-177.45	1,601.31	1,062.98	7.43	0.65	7.42
8,787.00	87.10	117.10	7,527.67	-191.45	1,630.02	1,090.92	7.04	1.56	6.87
8,818.00	87.50	119.60	7,529.13	-206.16	1,657.27	1,118.58	8.16	1.29	8.06
8,849.00	87.50	122.30	7,530.49	-222.08	1,683.83	1,146.85	8.70	0.00	8.71
8,881.00	87.90	124.50	7,531.77	-239.68	1,710.52	1,176.57	6.98	1.25	6.87
8,912.00	88.00	127.30	7,532.88	-257.85	1,735.61	1,205.83	9.03	0.32	9.03
8,944.00	88.00	130.10	7,534.00	-277.84	1,760.57	1,236.52	8.74	0.00	8.75
8,976.00	88.30	132.80	7,535.03	-299.01	1,784.54	1,267.60	8.49	0.94	8.44
9,007.00	89.20	136.00	7,535.71	-320.69	1,806.68	1,298.06	10.72	2.90	10.32
9,039.00	90.10	138.10	7,535.90	-344.11	1,828.48	1,329.75	7.14	2.81	6.56
9,070.00	90.20	140.60	7,535.82	-367.63	1,848.68	1,360.59	8.07	0.32	8.06
HDU 9-11CH LP Tgt									
9,102.00	90.20	142.70	7,535.71	-392.72	1,868.53	1,392.53	6.56	0.00	6.56
9,133.00	90.40	143.40	7,535.55	-417.50	1,887.16	1,423.51	2.35	0.65	2.26
9,165.00	90.50	143.40	7,535.29	-443.19	1,906.24	1,455.50	0.31	0.31	0.00
9,196.00	90.50	143.60	7,535.02	-468.11	1,924.68	1,486.49	0.65	0.00	0.65
9,228.00	90.50	143.50	7,534.74	-493.85	1,943.69	1,518.48	0.31	0.00	-0.31
9,259.00	90.40	143.20	7,534.50	-518.72	1,962.20	1,549.46	1.02	-0.32	-0.97
9,290.00	90.60	142.90	7,534.23	-543.49	1,980.83	1,580.44	1.16	0.65	-0.97
9,385.00	91.20	146.70	7,532.74	-621.09	2,035.57	1,675.41	4.05	0.63	4.00
9,480.00	92.10	146.80	7,530.00	-700.51	2,087.64	1,770.33	0.95	0.95	0.11
9,574.00	91.50	148.10	7,527.05	-779.70	2,138.19	1,864.20	1.52	-0.64	1.38
9,669.00	90.30	149.50	7,525.56	-860.95	2,187.39	1,958.98	1.94	-1.26	1.47
9,763.00	91.30	149.40	7,524.25	-941.89	2,235.17	2,052.69	1.07	1.06	-0.11
9,857.00	90.30	150.90	7,522.93	-1,023.41	2,281.95	2,146.30	1.92	-1.06	1.60
9,951.00	90.90	151.00	7,521.95	-1,105.58	2,327.59	2,239.80	0.65	0.64	0.11
10,045.00	88.70	151.30	7,522.28	-1,187.90	2,372.94	2,333.26	2.36	-2.34	0.32
10,138.00	89.30	151.20	7,523.90	-1,269.43	2,417.67	2,425.70	0.65	0.65	-0.11
10,233.00	90.40	151.00	7,524.15	-1,352.59	2,463.58	2,520.16	1.18	1.16	-0.21
10,326.00	90.70	150.40	7,523.26	-1,433.69	2,509.09	2,612.70	0.72	0.32	-0.65
10,421.00	91.00	149.60	7,521.85	-1,515.96	2,556.58	2,707.34	0.90	0.32	-0.84
10,515.00	90.80	148.80	7,520.37	-1,596.69	2,604.71	2,801.08	0.88	-0.21	-0.85
10,610.00	90.50	149.10	7,519.29	-1,678.07	2,653.70	2,895.85	0.45	-0.32	0.32
10,704.00	90.70	150.20	7,518.31	-1,759.18	2,701.20	2,989.54	1.19	0.21	1.17
10,799.00	91.30	149.70	7,516.65	-1,841.40	2,748.76	3,084.18	0.82	0.63	-0.53
10,894.00	90.90	151.50	7,514.83	-1,924.15	2,795.39	3,178.71	1.94	-0.42	1.89
10,988.00	91.00	150.40	7,513.27	-2,006.31	2,841.02	3,272.19	1.17	0.11	-1.17
11,082.00	91.20	149.30	7,511.46	-2,087.57	2,888.23	3,365.84	1.19	0.21	-1.17
11,177.00	90.60	149.80	7,509.97	-2,169.46	2,936.36	3,460.54	0.82	-0.63	0.53
11,271.00	90.10	148.30	7,509.40	-2,250.07	2,984.71	3,554.30	1.68	-0.53	-1.60
11,365.00	90.30	148.90	7,509.07	-2,330.31	3,033.68	3,648.12	0.67	0.21	0.64

Archer

Survey Report

Company:	Black Hills Production Co.	Local Co-ordinate Reference:	Well HDU 9-11CH
Project:	Garfield Co., CO.	TVD Reference:	WELL @ 5536.00usft (Original Well Elev)
Site:	Sec.9-T8S-R98W	MD Reference:	WELL @ 5536.00usft (Original Well Elev)
Well:	HDU 9-11CH	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDMDBBW

Survey										
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)	
11,460.00	90.80	150.00	7,508.16	-2,412.11	3,081.96	3,742.83	1.27	0.53	1.16	
11,554.00	91.50	149.30	7,506.27	-2,493.21	3,129.45	3,836.51	1.05	0.74	-0.74	
11,649.00	90.50	150.50	7,504.61	-2,575.39	3,177.09	3,931.15	1.64	-1.05	1.26	
11,743.00	90.10	150.40	7,504.12	-2,657.16	3,223.44	4,024.73	0.44	-0.43	-0.11	
11,838.00	90.20	149.90	7,503.87	-2,739.56	3,270.73	4,119.35	0.54	0.11	-0.53	
11,932.00	89.50	151.00	7,504.12	-2,821.33	3,317.09	4,212.93	1.39	-0.74	1.17	
12,027.00	89.70	151.50	7,504.78	-2,904.61	3,362.78	4,307.37	0.57	0.21	0.53	
12,122.00	90.40	151.20	7,504.70	-2,987.98	3,408.33	4,401.79	0.80	0.74	-0.32	
12,216.00	90.20	150.40	7,504.20	-3,070.03	3,454.18	4,495.32	0.88	-0.21	-0.85	
12,311.00	89.80	151.20	7,504.20	-3,152.96	3,500.53	4,589.84	0.94	-0.42	0.84	
12,405.00	90.20	151.40	7,504.20	-3,235.41	3,545.67	4,683.27	0.48	0.43	0.21	
12,500.00	90.20	152.60	7,503.87	-3,319.29	3,590.27	4,777.57	1.26	0.00	1.26	
12,595.00	91.30	152.40	7,502.63	-3,403.55	3,634.13	4,871.76	1.18	1.16	-0.21	
12,689.00	91.10	151.80	7,500.66	-3,486.60	3,678.11	4,965.03	0.67	-0.21	-0.64	
12,783.00	91.00	151.10	7,498.94	-3,569.16	3,723.02	5,058.42	0.75	-0.11	-0.74	
12,878.00	91.50	150.90	7,496.87	-3,652.23	3,769.07	5,152.88	0.57	0.53	-0.21	
12,972.00	91.70	150.10	7,494.24	-3,734.01	3,815.34	5,246.42	0.88	0.21	-0.85	
13,066.00	92.20	149.90	7,491.04	-3,815.37	3,862.31	5,340.01	0.57	0.53	-0.21	
13,160.00	90.50	149.60	7,488.83	-3,896.54	3,909.65	5,433.67	1.84	-1.81	-0.32	
13,254.00	90.70	149.70	7,487.84	-3,977.65	3,957.15	5,527.36	0.24	0.21	0.11	
13,348.00	91.30	149.10	7,486.20	-4,058.55	4,004.99	5,621.07	0.90	0.64	-0.64	
13,443.00	91.00	149.80	7,484.30	-4,140.35	4,053.27	5,715.77	0.80	-0.32	0.74	
13,537.00	90.00	149.10	7,483.48	-4,221.29	4,101.04	5,809.49	1.30	-1.06	-0.74	
13,631.00	89.90	148.40	7,483.56	-4,301.66	4,149.81	5,903.29	0.75	-0.11	-0.74	
13,726.00	90.10	148.30	7,483.56	-4,382.53	4,199.66	5,998.13	0.24	0.21	-0.11	
13,820.00	89.90	147.90	7,483.56	-4,462.33	4,249.33	6,092.00	0.48	-0.21	-0.43	
13,869.00	89.80	147.80	7,483.69	-4,503.81	4,275.40	6,140.94	0.29	-0.20	-0.20	
13,964.00	90.30	147.90	7,483.60	-4,584.25	4,325.96	6,235.82	0.54	0.53	0.11	
14,057.00	91.20	149.00	7,482.39	-4,663.49	4,374.61	6,328.65	1.53	0.97	1.18	
14,152.00	90.90	150.70	7,480.65	-4,745.62	4,422.32	6,423.29	1.82	-0.32	1.79	
14,247.00	91.60	150.20	7,478.57	-4,828.24	4,469.16	6,517.85	0.91	0.74	-0.53	
14,342.00	90.30	150.40	7,477.00	-4,910.75	4,516.22	6,612.43	1.38	-1.37	0.21	
14,436.00	92.00	151.20	7,475.11	-4,992.79	4,562.07	6,705.93	2.00	1.81	0.85	
14,531.00	90.20	151.10	7,473.29	-5,075.98	4,607.90	6,800.37	1.90	-1.89	-0.11	
14,625.00	91.60	151.00	7,471.81	-5,158.22	4,653.39	6,893.84	1.49	1.49	-0.11	
14,720.00	90.10	151.50	7,470.40	-5,241.50	4,699.08	6,988.27	1.66	-1.58	0.53	
14,814.00	89.80	151.10	7,470.48	-5,323.95	4,744.22	7,081.71	0.53	-0.32	-0.43	
14,908.00	89.40	150.40	7,471.14	-5,405.96	4,790.15	7,175.24	0.86	-0.43	-0.74	
15,002.00	88.90	150.40	7,472.53	-5,487.68	4,836.57	7,268.82	0.53	-0.53	0.00	
15,097.00	90.80	150.80	7,472.78	-5,570.44	4,883.21	7,363.37	2.04	2.00	0.42	
15,191.00	90.50	151.10	7,471.72	-5,652.61	4,928.85	7,456.86	0.45	-0.32	0.32	
15,286.00	90.00	151.10	7,471.30	-5,735.78	4,974.76	7,551.33	0.53	-0.53	0.00	
15,380.00	91.00	150.60	7,470.48	-5,817.87	5,020.54	7,644.84	1.19	1.06	-0.53	
15,473.00	90.20	150.20	7,469.51	-5,898.73	5,066.48	7,737.43	0.96	-0.86	-0.43	
15,568.00	92.20	150.10	7,467.52	-5,981.10	5,113.75	7,832.03	2.11	2.11	-0.11	
15,662.00	90.60	149.90	7,465.22	-6,062.48	5,160.73	7,925.64	1.72	-1.70	-0.21	
15,757.00	90.20	150.00	7,464.56	-6,144.71	5,208.30	8,020.29	0.43	-0.42	0.11	
15,851.00	89.20	149.80	7,465.05	-6,226.03	5,255.44	8,113.95	1.08	-1.06	-0.21	
15,946.00	90.90	148.90	7,464.97	-6,307.76	5,303.87	8,208.68	2.02	1.79	-0.95	
16,041.00	90.80	148.50	7,463.56	-6,388.92	5,353.22	8,303.47	0.43	-0.11	-0.42	
16,135.00	91.40	148.30	7,461.75	-6,468.97	5,402.47	8,397.29	0.67	0.64	-0.21	
16,229.00	92.70	149.60	7,458.39	-6,549.44	5,450.92	8,491.01	1.96	1.38	1.38	
16,324.00	92.00	148.90	7,454.50	-6,631.02	5,499.45	8,585.67	1.04	-0.74	-0.74	
16,418.00	90.10	148.50	7,452.77	-6,711.32	5,548.27	8,679.46	2.07	-2.02	-0.43	

Archer

Survey Report

Company:	Black Hills Production Co.	Local Co-ordinate Reference:	Well HDU 9-11CH
Project:	Garfield Co., CO.	TVD Reference:	WELL @ 5536.00usft (Original Well Elev)
Site:	Sec.9-T8S-R98W	MD Reference:	WELL @ 5536.00usft (Original Well Elev)
Well:	HDU 9-11CH	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDMDBBW

Survey										
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)	
16,512.00	91.10	148.60	7,451.79	-6,791.51	5,597.31	8,773.28	1.07	1.06	0.11	
16,607.00	90.20	149.70	7,450.71	-6,873.06	5,646.03	8,868.03	1.50	-0.95	1.16	
16,700.00	91.20	149.40	7,449.58	-6,953.22	5,693.15	8,960.73	1.12	1.08	-0.32	
16,795.00	91.30	149.50	7,447.50	-7,035.02	5,741.43	9,055.43	0.15	0.11	0.11	
16,890.00	90.00	150.80	7,446.43	-7,117.40	5,788.71	9,150.04	1.94	-1.37	1.37	
16,984.00	90.60	150.30	7,445.93	-7,199.26	5,834.92	9,243.60	0.83	0.64	-0.53	
17,079.00	91.60	149.50	7,444.11	-7,281.43	5,882.56	9,338.24	1.35	1.05	-0.84	
17,173.00	90.50	150.40	7,442.39	-7,362.78	5,929.62	9,431.88	1.51	-1.17	0.96	
17,267.00	91.10	149.70	7,441.07	-7,444.22	5,976.54	9,525.51	0.98	0.64	-0.74	
17,361.00	90.60	150.60	7,439.68	-7,525.74	6,023.32	9,619.12	1.10	-0.53	0.96	
17,456.00	91.00	150.40	7,438.35	-7,608.41	6,070.10	9,713.68	0.47	0.42	-0.21	
17,550.00	92.10	150.50	7,435.81	-7,690.15	6,116.44	9,807.23	1.18	1.17	0.11	
17,644.00	90.00	150.50	7,434.09	-7,771.95	6,162.72	9,900.78	2.23	-2.23	0.00	
17,739.00	90.50	150.40	7,433.67	-7,854.59	6,209.57	9,995.36	0.54	0.53	-0.11	
17,833.00	91.50	150.50	7,432.03	-7,936.35	6,255.92	10,088.92	1.07	1.06	0.11	
17,928.00	91.00	151.60	7,429.96	-8,019.46	6,301.89	10,183.38	1.27	-0.53	1.16	
18,022.00	92.70	151.30	7,426.93	-8,101.98	6,346.79	10,276.74	1.84	1.81	-0.32	
18,117.00	92.40	152.50	7,422.70	-8,185.70	6,391.49	10,370.96	1.30	-0.32	1.26	
18,210.00	91.60	153.90	7,419.45	-8,268.66	6,433.40	10,462.96	1.73	-0.86	1.51	
18,304.00	90.60	152.60	7,417.65	-8,352.58	6,475.70	10,555.98	1.74	-1.06	-1.38	
18,399.00	91.30	152.30	7,416.07	-8,436.79	6,519.63	10,650.17	0.80	0.74	-0.32	
18,492.00	90.20	152.60	7,414.86	-8,519.24	6,562.64	10,742.38	1.23	-1.18	0.32	
18,588.00	90.50	152.10	7,414.27	-8,604.27	6,607.19	10,837.60	0.61	0.31	-0.52	
18,682.00	90.40	151.80	7,413.53	-8,687.23	6,651.39	10,930.92	0.34	-0.11	-0.32	
18,777.00	90.40	151.50	7,412.87	-8,770.83	6,696.50	11,025.28	0.32	0.00	-0.32	
18,871.00	90.50	150.90	7,412.13	-8,853.20	6,741.79	11,118.74	0.65	0.11	-0.64	
Last Archer survey										
18,931.00	90.80	150.50	7,411.45	-8,905.52	6,771.15	11,178.44	0.83	0.50	-0.67	
PTB - HDU 9-11CH Tgt										
18,988.00	90.80	150.50	7,410.65	-8,955.13	6,799.21	11,235.18	0.00	0.00	0.00	

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
1,151.00	1,150.96	-7.66	-2.42	First Archer Survey	
6,478.00	6,477.38	-5.80	-11.35	Last Archer Survey	
6,532.00	6,531.37	-6.65	-11.76	PTB	
6,547.00	6,546.37	-6.91	-11.86	First Archer Survey	
18,931.00	7,411.45	-8,905.52	6,771.15	Last Archer survey	
18,988.00	7,410.65	-8,955.13	6,799.21	PTB	

Checked By: _____ Approved By: _____ Date: _____

Company Name: Black Hills Production Co.

Black Hills Production Co.
Project: Garfield Co., CO.
Site: Sec.9-T8S-R98W
Well: HDU 9-11CH
Wellbore: Wellbore #1
Design: Design #1
Lat: 39° 22' 48.900 N
Long: 108° 20' 22.330 W
Pad GL: 5521.0
KB: WELL @ 5536.00usft (Orig



Azimuths to True North
Magnetic North: 10.01°
Magnetic Field
Strength: 51842.6snT
Dip Angle: 65.50°
Date: 12/09/2014
Model: IGRF200510

Archer

SECTION DETAILS

MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect	Annotation
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
6415.21	0.00	0.00	6415.21	0.00	0.00	0.00	0.00	0.00	Start Build 8.00
7165.21	60.00	90.00	7035.46	0.00	358.10	8.00	90.00	205.19	Start 592.49 hold at 7165.21 MD
7757.70	60.00	90.00	7331.70	0.00	871.21	0.00	0.00	499.21	Start DLS 8.00 TFO 70.06
8515.88	90.71	145.04	7536.00	-343.32	1474.13	8.00	70.06	1126.05	Start 10509.48 hold at 8515.88 MD
19025.36	90.71	145.04	7406.00	-8955.22	7496.36	0.00	0.00	11634.73	TD at 19025.36

+N/-S	+E/-W	Northing	Ground Level: Easting	5521.00 Latitude	Longitude	Slot
0.00	0.00	1575929.535	2197494.481	39° 22' 48.900 N	108° 20' 22.330 W	

WELLBORE TARGET DETAILS (LAT/LONG)

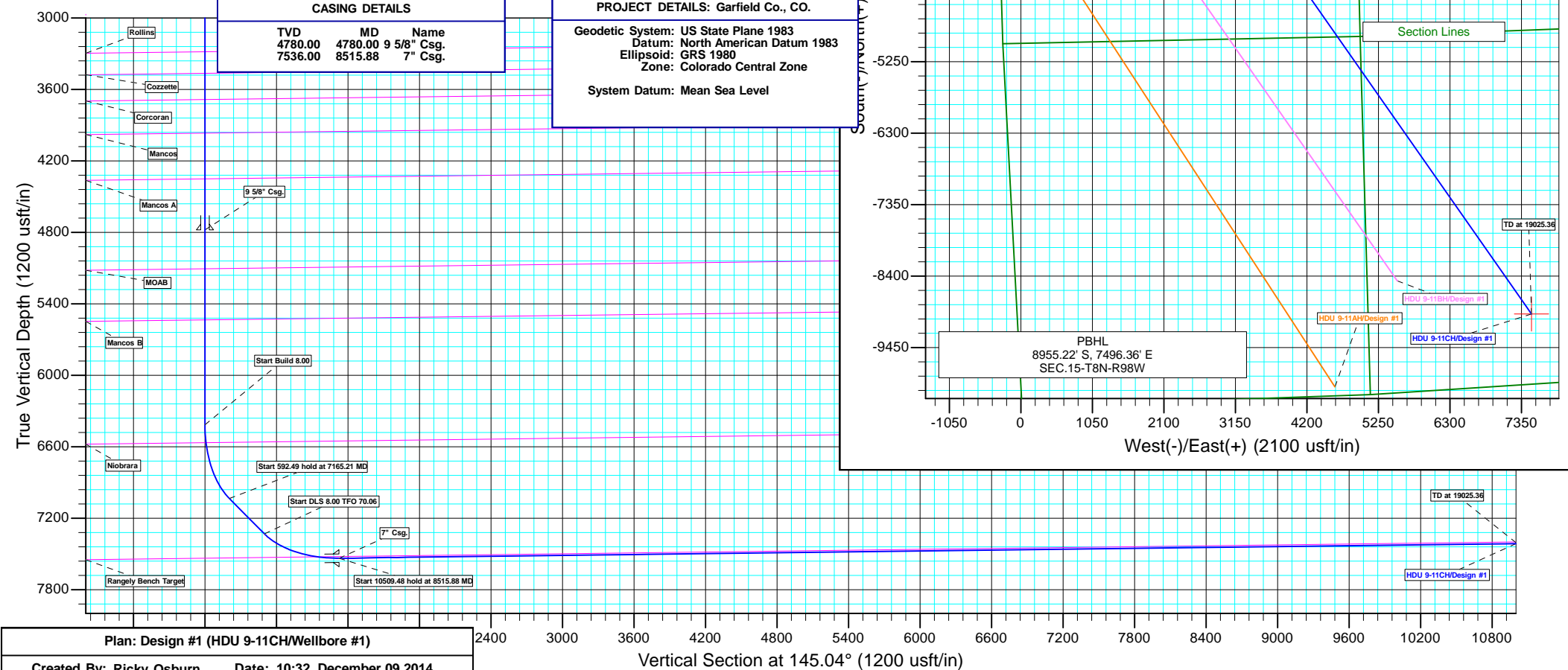
Name	TVD	+N/-S	+E/-W	Latitude	Longitude	Shape Point
HDU 9-11CH Tgt	7406.00	-8955.22	7496.36	39° 21' 20.376 N	108° 18' 46.890 W	

CASING DETAILS

TVD	MD	Name
4780.00	4780.00	9 5/8" Csg.
7536.00	8515.88	7" Csg.

PROJECT DETAILS: Garfield Co., CO.

Geodetic System: US State Plane 1983
Datum: North American Datum 1983
Ellipsoid: GRS 1980
Zone: Colorado Central Zone
System Datum: Mean Sea Level



Plan: Design #1 (HDU 9-11CH/Wellbore #1)

Created By: Ricky Osburn Date: 10:32, December 09 2014

Vertical Section at 145.04° (1200 usft/in)