

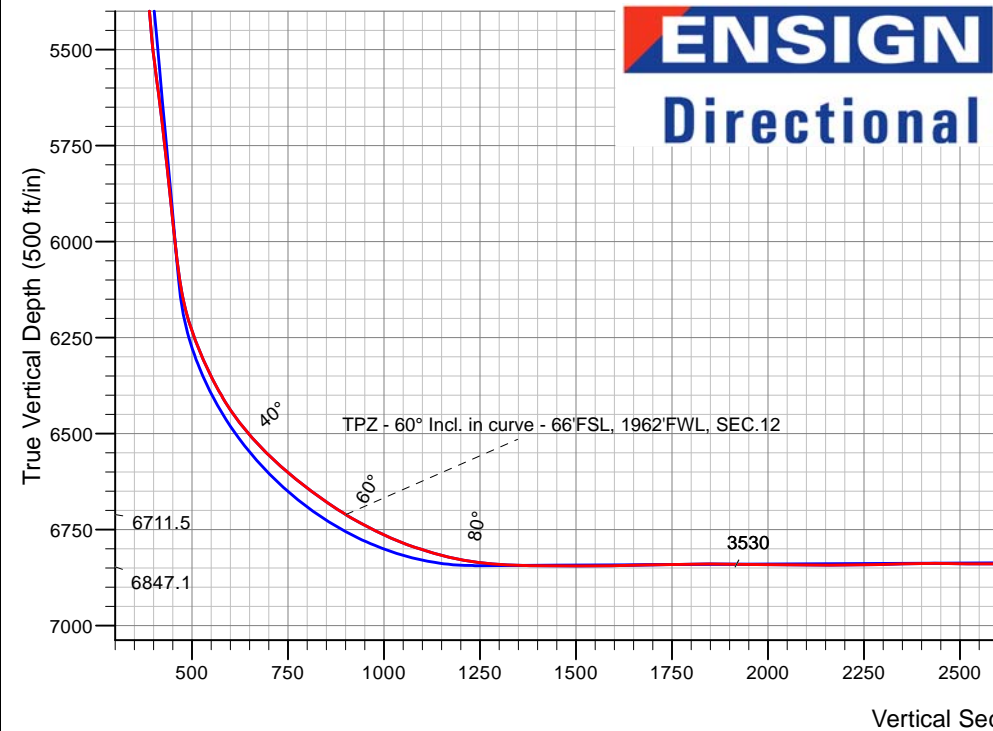
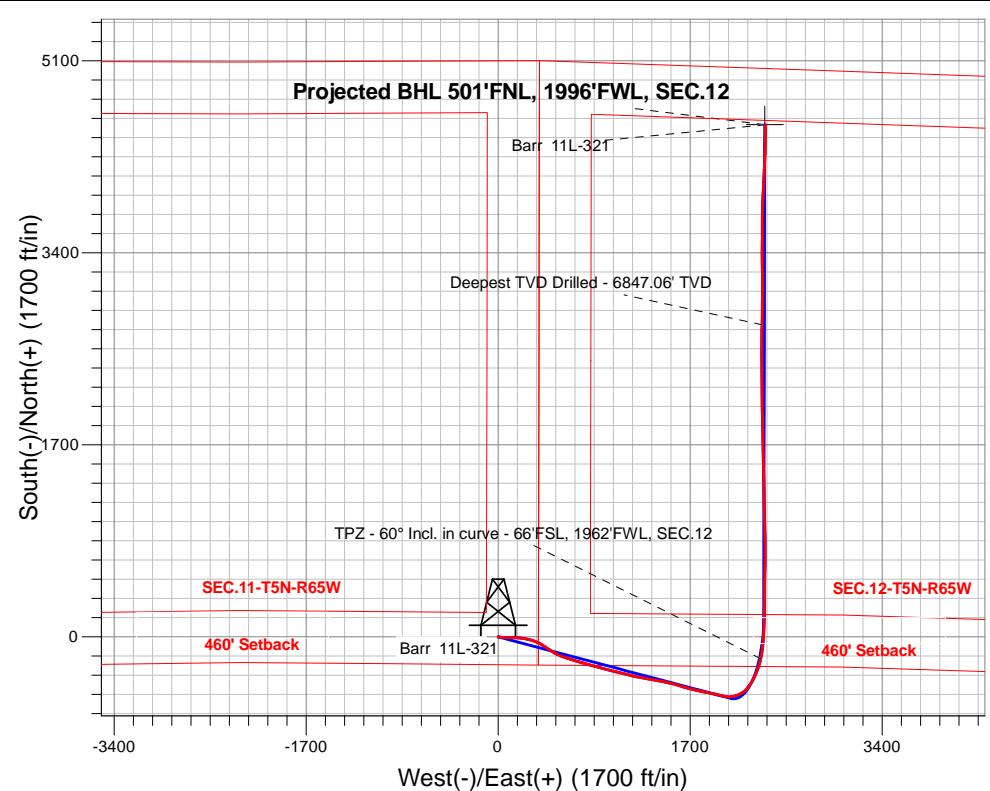
PDC Energy Inc. DJ Basin

Well Name: **Barr 11L-321**

Surface Location: Barr 5N65W11TY Pad Sec.11-T5N-R65W
North American Datum 1983 , US State Plane 1983, Colorado Northern Zone
Ground Elevation: 4611.0
+N/-S+E/-W Northing Easting Latitude Longitude Slot
0.0 0.0 1392431.653244391.19 40.407307 -104.622397
Original Well Elev WELL @ 4634.0ft (Original Well Elev)

FINAL SURVEY

Projected Bottom Hole Location
12,050'MD 6816'TVD 4534'N & 2369'E of SHL
93.2 degree Incl @ 1.0 degree AZM



ENSIGN
Directional

Barr 5N65W11TY Pad Sec.11-T5N-R65W
Barr 11L-321
Barr 11L-321 Wellbore #1
8:02, April 19 2018

ANNOTATIONS

TVD	MD	Annotation
6711.5	7294.2	TPZ - 60° Incl. in curve - 66'FSL, 1962'FWL, SEC.12
6847.1	10277.0	Deepest TVD Drilled - 6847.06' TVD

LEGEND

- ▲ Barr 11L-321, Barr 11L-321 Wellbore #1, Plan #3 (3-26-18) V0
- Barr 11L-321 Wellbore #1
- Survey #1

Projected BHL 501'FNL, 1996'FWL, SEC.12

Deepest TVD Drilled - 6847.06' TVD

Barr 11L-321



PDC Energy Inc. DJ Basin

SEC.11-T5N-R65W

Barr 5N65W11TY Pad Sec.11-T5N-R65W

Barr 11L-321

Barr 11L-321 Wellbore #1

Survey: Survey #1

Standard Survey Report

19 April, 2018

Company:	PDC Energy Inc. DJ Basin	Local Co-ordinate Reference:	Well Barr 11L-321
Project:	SEC.11-T5N-R65W	TVD Reference:	WELL @ 4634.0ft (Original Well Elev)
Site:	Barr 5N65W11TY Pad Sec.11-T5N-R65W	MD Reference:	WELL @ 4634.0ft (Original Well Elev)
Well:	Barr 11L-321	North Reference:	True
Wellbore:	Barr 11L-321 Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Barr 11L-321 Wellbore #1	Database:	US_EDM

Project	SEC.11-T5N-R65W, Weld County, CO		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		Using Well Reference Point
Map Zone:	Colorado Northern Zone		Using geodetic scale factor

Site		Barr 5N65W11TY Pad Sec.11-T5N-R65W			
Site Position:		Northing:	1,392,431.50 usft	Latitude:	40.407311
From:	Lat/Long	Easting:	3,244,226.33 usft	Longitude:	-104.622989
Position Uncertainty:	0.0 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.57 °

Well	Barr 11L-321					
Well Position	+N/-S	0.0 ft	Northing:	1,392,431.65 usft	Latitude:	40.407307
	+E/-W	0.0 ft	Easting:	3,244,391.19 usft	Longitude:	-104.622397
Position Uncertainty		0.0 ft	Wellhead Elevation:	0.0 ft	Ground Level:	4,611.0 ft

Wellbore	Barr 11L-321 Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	3/26/2018	7.87	66.84	52,437

Design	Barr 11L-321 Wellbore #1				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)	
	0.0	0.0	0.0	27.50	

Survey Program	Date	4/19/2018			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
122.0	12,050.0	Survey #1 (Barr 11L-321 Wellbore #1)	MWD	MWD - Standard	

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
SHL 336'FNL, 688'FWL, SEC.11									
1.0	0.00	121.10	1.0	0.0	0.0	0.0	0.33	0.33	0.00
SHL 244'FSL, 364'FEL, SEC.11									
122.0	0.40	121.10	122.0	-0.2	0.4	0.0	0.33	0.33	0.00
217.0	2.10	107.20	217.0	-0.9	2.3	0.3	1.80	1.79	-14.63
312.0	3.60	97.20	311.9	-1.8	6.9	1.6	1.66	1.58	-10.53
407.0	5.60	99.50	406.5	-2.9	14.5	4.1	2.11	2.11	2.42
503.0	7.40	97.00	501.9	-4.5	25.2	7.7	1.90	1.88	-2.60
599.0	9.80	94.20	596.8	-5.8	39.5	13.1	2.54	2.50	-2.92

Company:	PDC Energy Inc. DJ Basin	Local Co-ordinate Reference:	Well Barr 11L-321
Project:	SEC.11-T5N-R65W	TVD Reference:	WELL @ 4634.0ft (Original Well Elev)
Site:	Barr 5N65W11TY Pad Sec.11-T5N-R65W	MD Reference:	WELL @ 4634.0ft (Original Well Elev)
Well:	Barr 11L-321	North Reference:	True
Wellbore:	Barr 11L-321 Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Barr 11L-321 Wellbore #1	Database:	US_EDM

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
694.0	13.10	90.70	689.9	-6.5	58.3	21.1	3.55	3.47	-3.68
822.0	14.80	90.30	814.2	-6.8	89.2	35.2	1.33	1.33	-0.31
981.0	16.50	91.40	967.3	-7.5	132.1	54.4	1.09	1.07	0.69
1,077.0	17.90	93.80	1,059.0	-8.8	160.4	66.3	1.63	1.46	2.50
1,172.0	17.00	92.90	1,149.6	-10.4	188.9	78.0	0.99	-0.95	-0.95
1,267.0	16.60	98.90	1,240.5	-13.2	216.1	88.1	1.87	-0.42	6.32
1,364.0	16.00	100.30	1,333.6	-17.8	243.0	96.4	0.74	-0.62	1.44
1,428.0	14.80	101.40	1,395.3	-21.0	259.7	101.3	1.93	-1.88	1.72
1,523.0	13.70	106.50	1,487.4	-26.6	282.4	106.8	1.76	-1.16	5.37
1,586.0	13.00	107.90	1,548.7	-30.9	296.3	109.4	1.22	-1.11	2.22
1,679.0	12.80	108.40	1,639.4	-37.3	316.0	112.8	0.25	-0.22	0.54
1,775.0	13.30	108.80	1,732.9	-44.2	336.5	116.2	0.53	0.52	0.42
1,869.0	14.40	114.40	1,824.2	-52.6	357.4	118.4	1.84	1.17	5.96
1,965.0	16.40	120.40	1,916.7	-64.3	380.0	118.4	2.66	2.08	6.25
2,060.0	18.70	124.90	2,007.3	-79.8	404.0	115.8	2.81	2.42	4.74
2,156.0	22.30	124.90	2,097.2	-99.1	431.6	111.4	3.75	3.75	0.00
2,251.0	24.40	125.50	2,184.4	-120.8	462.4	106.4	2.22	2.21	0.63
2,346.0	26.00	118.80	2,270.4	-142.2	496.6	103.2	3.44	1.68	-7.05
2,442.0	27.90	113.70	2,356.0	-161.4	535.6	104.2	3.12	1.98	-5.31
2,537.0	28.10	109.30	2,439.9	-177.7	577.1	108.9	2.18	0.21	-4.63
2,632.0	27.30	108.20	2,524.0	-191.9	618.9	115.6	1.00	-0.84	-1.16
2,728.0	27.40	108.20	2,609.2	-205.7	660.8	122.7	0.10	0.10	0.00
2,824.0	28.10	104.90	2,694.2	-218.4	703.6	131.2	1.76	0.73	-3.44
2,919.0	27.30	105.10	2,778.3	-229.8	746.3	140.8	0.85	-0.84	0.21
3,015.0	26.80	106.00	2,863.8	-241.5	788.4	149.8	0.67	-0.52	0.94
3,110.0	26.40	105.60	2,948.8	-253.1	829.3	158.5	0.46	-0.42	-0.42
3,206.0	25.60	105.80	3,035.0	-264.5	869.8	167.1	0.84	-0.83	0.21
3,302.0	24.60	104.70	3,122.0	-275.2	909.1	175.7	1.15	-1.04	-1.15
3,398.0	23.90	104.70	3,209.5	-285.2	947.2	184.4	0.73	-0.73	0.00
3,493.0	22.80	104.20	3,296.7	-294.6	983.7	192.9	1.18	-1.16	-0.53
3,590.0	21.50	103.10	3,386.6	-303.3	1,019.2	201.7	1.41	-1.34	-1.13
3,684.0	20.60	104.20	3,474.3	-311.2	1,052.0	209.8	1.05	-0.96	1.17
3,779.0	20.60	104.50	3,563.2	-319.5	1,084.4	217.4	0.11	0.00	0.32
3,875.0	20.80	104.20	3,653.0	-327.9	1,117.3	225.1	0.24	0.21	-0.31
3,971.0	20.60	103.80	3,742.8	-336.1	1,150.2	233.0	0.26	-0.21	-0.42
4,067.0	20.40	102.60	3,832.7	-343.8	1,182.9	241.3	0.48	-0.21	-1.25
4,162.0	19.10	102.60	3,922.1	-350.8	1,214.3	249.6	1.37	-1.37	0.00
4,257.0	18.30	102.40	4,012.1	-357.4	1,244.0	257.5	0.84	-0.84	-0.21
4,353.0	18.90	101.40	4,103.1	-363.7	1,274.0	265.7	0.71	0.63	-1.04
4,448.0	18.00	98.90	4,193.2	-369.0	1,303.5	274.7	1.26	-0.95	-2.63
4,543.0	17.10	98.60	4,283.8	-373.4	1,331.9	283.9	0.95	-0.95	-0.32
4,639.0	17.60	98.20	4,375.4	-377.6	1,360.2	293.2	0.54	0.52	-0.42
4,735.0	18.80	99.60	4,466.6	-382.2	1,389.8	302.8	1.33	1.25	1.46

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Well:	Barr 11L-321	North Reference:	True
Wellbore:	Barr 11L-321 Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Barr 11L-321 Wellbore #1	Database:	US_EDM

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
4,830.0	19.80	101.60	4,556.3	-388.0	1,420.7	311.9	1.26	1.05	2.11
4,926.0	19.30	100.90	4,646.8	-394.3	1,452.2	320.9	0.58	-0.52	-0.73
5,021.0	19.60	104.50	4,736.3	-401.2	1,483.0	329.0	1.30	0.32	3.79
5,117.0	20.00	103.80	4,826.7	-409.2	1,514.5	336.5	0.48	0.42	-0.73
5,212.0	23.30	104.40	4,915.0	-417.7	1,548.5	344.6	3.48	3.47	0.63
5,308.0	22.90	103.80	5,003.3	-426.9	1,585.0	353.3	0.48	-0.42	-0.63
5,404.0	25.30	107.50	5,090.9	-437.5	1,622.8	361.3	2.95	2.50	3.85
5,499.0	23.60	106.10	5,177.4	-448.9	1,660.4	368.6	1.89	-1.79	-1.47
5,595.0	22.10	104.20	5,265.8	-458.7	1,696.4	376.5	1.74	-1.56	-1.98
5,690.0	20.60	102.30	5,354.3	-466.6	1,730.0	385.0	1.74	-1.58	-2.00
5,786.0	22.10	105.60	5,443.7	-475.1	1,763.9	393.2	2.00	1.56	3.44
5,881.0	23.90	100.90	5,531.2	-483.5	1,800.0	402.4	2.71	1.89	-4.95
5,977.0	22.70	100.00	5,619.3	-490.4	1,837.4	413.5	1.30	-1.25	-0.94
6,072.0	23.40	101.90	5,706.8	-497.5	1,873.9	424.1	1.08	0.74	2.00
6,168.0	21.90	101.60	5,795.4	-505.0	1,910.1	434.1	1.57	-1.56	-0.31
6,264.0	23.50	103.80	5,883.9	-513.2	1,946.2	443.6	1.89	1.67	2.29
6,359.0	23.00	102.60	5,971.2	-521.8	1,982.7	452.8	0.72	-0.53	-1.26
6,455.0	21.50	100.30	6,060.1	-529.0	2,018.3	462.9	1.81	-1.56	-2.40
6,551.0	23.30	89.60	6,148.8	-532.0	2,054.6	477.0	4.64	1.88	-11.15
6,646.0	28.00	75.20	6,234.5	-526.2	2,095.0	500.8	8.19	4.95	-15.16
6,741.0	29.10	64.50	6,318.0	-510.5	2,137.5	534.3	5.50	1.16	-11.26
6,837.0	32.70	52.30	6,400.5	-484.6	2,179.1	576.5	7.51	3.75	-12.71
6,933.0	38.40	37.40	6,478.7	-444.9	2,217.9	629.6	10.77	5.94	-15.52
7,028.0	46.10	27.00	6,549.1	-390.8	2,251.4	693.0	10.93	8.11	-10.95
7,124.0	50.10	24.00	6,613.2	-326.3	2,282.1	764.4	4.77	4.17	-3.13
7,220.0	55.00	17.90	6,671.6	-255.2	2,309.2	840.0	7.17	5.10	-6.35
7,294.2	59.97	12.91	6,711.5	-194.9	2,325.7	901.2	8.78	6.70	-6.73
TPZ - 60° Incl. in curve - 66°FSL, 1962'FWL, SEC.12									
7,315.0	61.40	11.60	6,721.6	-177.2	2,329.6	918.6	8.78	6.86	-6.28
7,411.0	66.50	4.40	6,763.8	-91.9	2,341.5	999.8	8.58	5.31	-7.50
7,506.0	72.90	5.10	6,796.8	-3.1	2,348.8	1,081.9	6.77	6.74	0.74
7,602.0	77.60	1.70	6,821.2	89.5	2,354.3	1,166.6	5.97	4.90	-3.54
7,685.1	83.14	0.92	6,835.1	171.4	2,356.2	1,240.1	6.73	6.67	-0.94
LPL 431'FSL, 1988'FWL, SEC.12									
7,698.0	84.00	0.80	6,836.6	184.2	2,356.4	1,251.6	6.73	6.67	-0.92
7,793.0	88.80	1.00	6,842.5	279.0	2,357.9	1,336.3	5.06	5.05	0.21
7,888.0	89.40	1.00	6,844.0	373.9	2,359.5	1,421.3	0.63	0.63	0.00
7,984.0	90.00	0.70	6,844.5	469.9	2,360.9	1,507.1	0.70	0.63	-0.31
8,080.0	90.50	0.80	6,844.1	565.9	2,362.2	1,592.8	0.53	0.52	0.10
8,175.0	91.50	0.80	6,842.4	660.9	2,363.5	1,677.7	1.05	1.05	0.00
8,271.0	90.20	359.60	6,841.0	756.9	2,363.9	1,763.0	1.84	-1.35	-1.25
8,366.0	91.20	359.60	6,839.8	851.9	2,363.2	1,846.9	1.05	1.05	0.00
8,462.0	88.60	358.70	6,840.0	947.9	2,361.8	1,931.4	2.87	-2.71	-0.94
8,557.0	89.10	358.40	6,841.9	1,042.8	2,359.4	2,014.5	0.61	0.53	-0.32

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Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
8,653.0	89.70	358.60	6,842.9	1,138.8	2,356.9	2,098.5	0.66	0.63	0.21
8,749.0	90.70	359.10	6,842.6	1,234.7	2,354.9	2,182.7	1.16	1.04	0.52
8,845.0	91.00	358.70	6,841.2	1,330.7	2,353.1	2,267.0	0.52	0.31	-0.42
8,941.0	91.50	358.70	6,839.1	1,426.7	2,350.9	2,351.1	0.52	0.52	0.00
9,036.0	89.20	358.90	6,838.5	1,521.6	2,348.9	2,434.4	2.43	-2.42	0.21
9,132.0	89.70	359.10	6,839.4	1,617.6	2,347.3	2,518.8	0.56	0.52	0.21
9,227.0	90.40	359.30	6,839.3	1,712.6	2,345.9	2,602.4	0.77	0.74	0.21
9,322.0	90.80	358.70	6,838.3	1,807.6	2,344.3	2,685.9	0.76	0.42	-0.63
9,418.0	91.50	358.60	6,836.4	1,903.5	2,342.0	2,770.0	0.74	0.73	-0.10
9,514.0	89.70	359.30	6,835.4	1,999.5	2,340.2	2,854.3	2.01	-1.88	0.73
9,609.0	89.30	358.90	6,836.2	2,094.5	2,338.8	2,937.8	0.60	-0.42	-0.42
9,704.0	89.40	358.40	6,837.3	2,189.5	2,336.5	3,021.0	0.54	0.11	-0.53
9,800.0	88.60	0.30	6,839.0	2,285.4	2,335.4	3,105.7	2.15	-0.83	1.98
9,895.0	88.70	0.30	6,841.2	2,380.4	2,335.9	3,190.1	0.11	0.11	0.00
9,991.0	88.80	0.30	6,843.3	2,476.4	2,336.4	3,275.5	0.10	0.10	0.00
10,086.0	89.10	0.00	6,845.1	2,571.4	2,336.7	3,359.8	0.45	0.32	-0.32
10,181.0	89.30	359.80	6,846.4	2,666.4	2,336.5	3,444.0	0.30	0.21	-0.21
10,277.0	89.90	1.40	6,847.1	2,762.4	2,337.5	3,529.6	1.78	0.63	1.67
Deepest TVD Drilled - 6847.06' TVD									
10,372.0	90.40	0.70	6,846.8	2,857.3	2,339.3	3,614.7	0.91	0.53	-0.74
10,468.0	90.70	0.50	6,845.9	2,953.3	2,340.3	3,700.3	0.38	0.31	-0.21
10,563.0	90.90	0.30	6,844.6	3,048.3	2,340.9	3,784.8	0.30	0.21	-0.21
10,659.0	91.10	359.80	6,842.9	3,144.3	2,341.0	3,870.0	0.56	0.21	-0.52
10,754.0	91.50	359.40	6,840.7	3,239.3	2,340.3	3,954.0	0.60	0.42	-0.42
10,850.0	91.70	359.30	6,838.0	3,335.2	2,339.3	4,038.6	0.23	0.21	-0.10
10,945.0	91.70	359.80	6,835.2	3,430.2	2,338.5	4,122.4	0.53	0.00	0.53
11,041.0	89.60	0.70	6,834.1	3,526.2	2,338.9	4,207.8	2.38	-2.19	0.94
11,136.0	89.80	0.50	6,834.6	3,621.2	2,339.9	4,292.5	0.30	0.21	-0.21
11,232.0	89.60	359.60	6,835.1	3,717.2	2,340.0	4,377.7	0.96	-0.21	-0.94
11,328.0	89.70	2.80	6,835.7	3,813.1	2,342.0	4,463.7	3.33	0.10	3.33
11,423.0	89.70	2.60	6,836.2	3,908.0	2,346.5	4,550.0	0.21	0.00	-0.21
11,519.0	89.80	2.20	6,836.6	4,003.9	2,350.5	4,636.9	0.43	0.10	-0.42
11,615.0	91.70	2.80	6,835.4	4,099.8	2,354.7	4,723.9	2.08	1.98	0.63
11,710.0	92.50	2.80	6,831.9	4,194.6	2,359.3	4,810.1	0.84	0.84	0.00
11,805.0	92.00	1.70	6,828.2	4,289.5	2,363.1	4,896.0	1.27	-0.53	-1.16
11,900.0	92.70	1.50	6,824.3	4,384.4	2,365.7	4,981.4	0.77	0.74	-0.21
11,992.0	93.20	1.00	6,819.5	4,476.2	2,367.7	5,063.8	0.77	0.54	-0.54
12,050.0	93.20	1.00	6,816.3	4,534.1	2,368.7	5,115.6	0.00	0.00	0.00
BHL 500'FNL, 1988'FWL, SEC.12									

Company:	PDC Energy Inc. DJ Basin	Local Co-ordinate Reference:	Well Barr 11L-321
Project:	SEC.11-T5N-R65W	TVD Reference:	WELL @ 4634.0ft (Original Well Elev)
Site:	Barr 5N65W11TY Pad Sec.11-T5N-R65W	MD Reference:	WELL @ 4634.0ft (Original Well Elev)
Well:	Barr 11L-321	North Reference:	True
Wellbore:	Barr 11L-321 Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Barr 11L-321 Wellbore #1	Database:	US_EDM

Design Targets									
Target Name	Dip Angle	Dip Dir.	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
- hit/miss target	(°)	(°)	(ft)	(ft)	(ft)	(usft)	(usft)		
- Shape									
SHL 336'FNL, 688'FWL, - survey misses target center by 6378.6ft at 0.0ft MD (0.0 TVD, 0.0 N, 0.0 E) - Point	0.00	0.00	-7.0	4,764.9	-4,240.6	1,397,154.13	3,240,103.81	40.420385	-104.637627
BHL 500'FNL, 1988'FWL - survey misses target center by 10.8ft at 12050.0ft MD (6816.3 TVD, 4534.1 N, 2368.7 E) - Point	0.00	0.00	6,824.0	4,535.0	2,361.1	1,396,989.61	3,246,707.23	40.419755	-104.613917

Survey Annotations					
Measured Depth	Vertical Depth	Local Coordinates			
(ft)	(ft)	+N/-S	+E/-W		
(ft)	(ft)	(ft)	(ft)	Comment	
7,294.2	6,711.5	-194.9	2,325.7	TPZ - 60° Incl. in curve - 66'FSL, 1962'FWL, SEC.12	
10,277.0	6,847.1	2,762.4	2,337.5	Deepest TVD Drilled - 6847.06' TVD	

Checked By: _____	Approved By: _____	Date: _____
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