

PDC Energy Inc. DJ Basin

Well Name: **Popham 10N (Nio B)**

Surface Location: Popham 4N64W03 Pad Sec.3-T4N-R64W
North American Datum 1983 , US State Plane 1983, Colorado Northern Zone

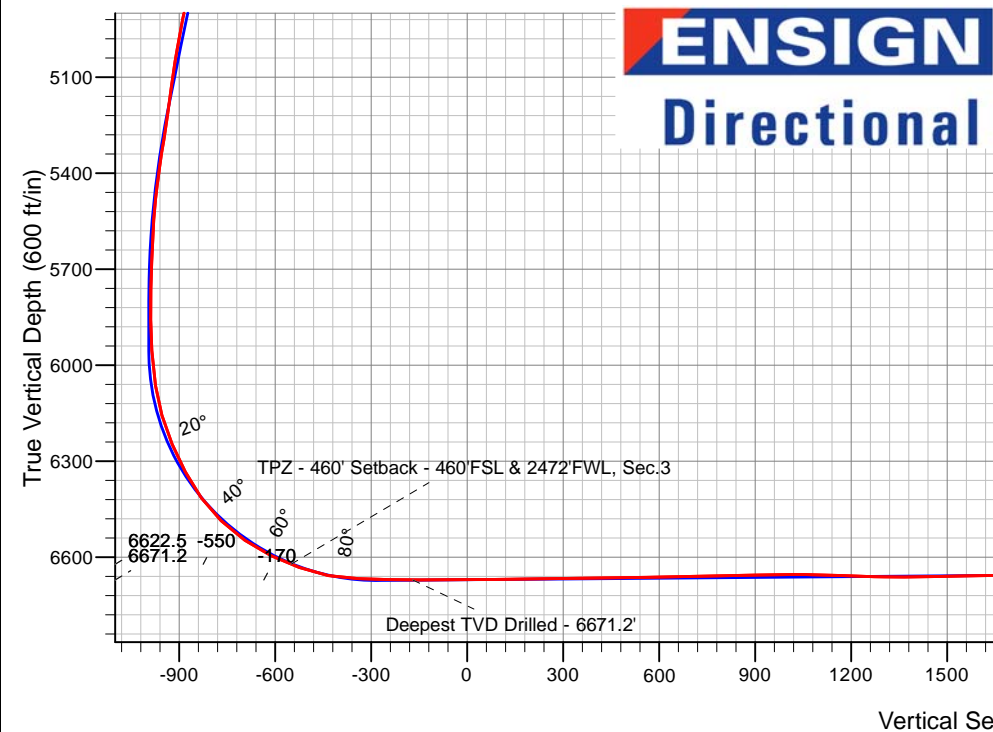
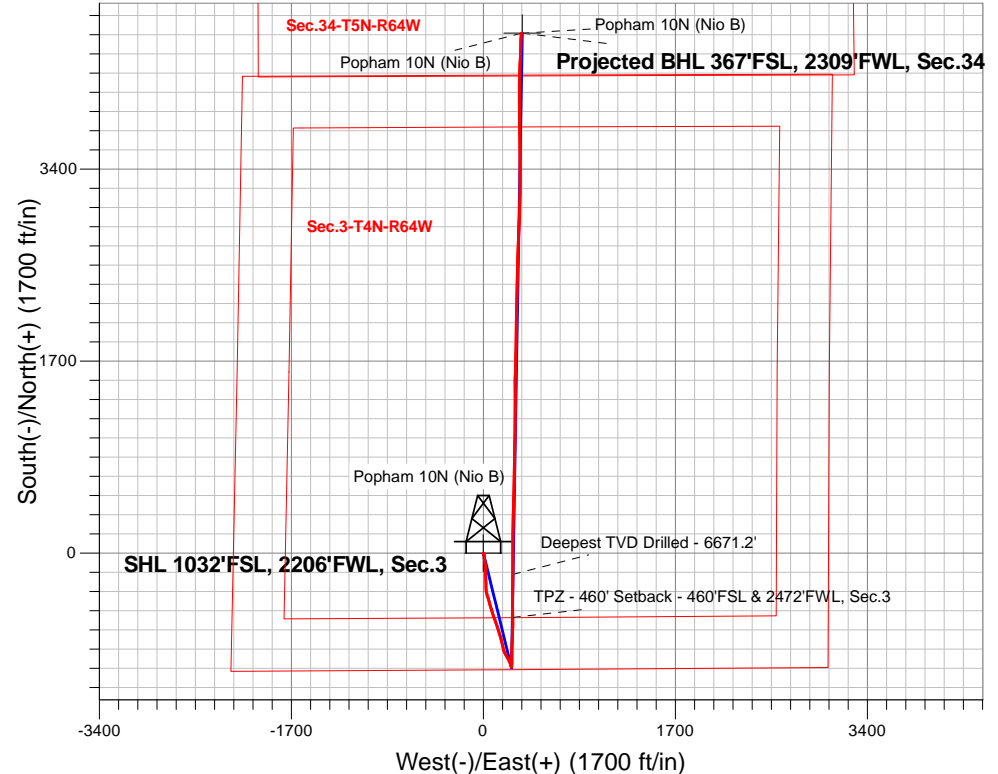
Ground Elevation: 4662.0

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.0	0.0	1367048.41	3268156.81	40.336956	-104.538050	

Original Well Elev WELL @ 4685.0ft (Original Well Elev)

FINAL SURVEY

Projected Bottom Hole Location
12,086'MD 6623'TVD 4601'N & 335'E of SHL
90.96 degree Incl @ 1.65 degree AZM



ENSIGN
Directional

Popham 4N64W03 Pad Sec.3-T4N-R64W
Popham 10N (Nio B)
Popham 10N Wellbore #1
12:34, April 16 2019

ANNOTATIONS

TVD	MD	Annotation
6622.5	6906.8	TPZ - 460' Setback - 460'FSL & 2472'FWL, Sec.3
6671.2	7293.7	Deepest TVD Drilled - 6671.2'

LEGEND

- Popham 10N (Nio B), Popham 10N Wellbore #1, Plan #2 (4-08-19) V0
- Popham 10N Wellbore #1
- Survey #1

Projected BHL 367'FSL, 2309'FWL, Sec.34

Popham 10N (Nio B)

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PDC Energy Inc. DJ Basin

SEC.3-T4N-R64W

Popham 4N64W03 Pad Sec.3-T4N-R64W

Popham 10N (Nio B)

Popham 10N Wellbore #1

Survey: Survey #1

Standard Survey Report

16 April, 2019

Company:	PDC Energy Inc. DJ Basin	Local Co-ordinate Reference:	Well Popham 10N (Nio B)
Project:	SEC.3-T4N-R64W	TVD Reference:	WELL @ 4685.0ft (Original Well Elev)
Site:	Popham 4N64W03 Pad Sec.3-T4N-R64W	MD Reference:	WELL @ 4685.0ft (Original Well Elev)
Well:	Popham 10N (Nio B)	North Reference:	True
Wellbore:	Popham 10N Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Popham 10N Wellbore #1	Database:	US_EDM

Project	SEC.3-T4N-R64W, 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	Popham 4N64W03 Pad Sec.3-T4N-R64W				
Site Position:		Northing:	1,367,183.37 usft	Latitude:	40.337327
From:	Lat/Long	Easting:	3,268,156.99 usft	Longitude:	-104.538045
Position Uncertainty:	0.0 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.62 °

Well	Popham 10N (Nio B)					
Well Position	+N/-S	0.0 ft	Northing:	1,367,048.41 usft	Latitude:	40.336956
	+E/-W	0.0 ft	Easting:	3,268,156.81 usft	Longitude:	-104.538051
Position Uncertainty		0.0 ft	Wellhead Elevation:	0.0 ft	Ground Level:	4,662.0 ft

Wellbore	Popham 10N Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	4/1/2019	8.13	66.85	52,166

Design	Popham 10N 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	4.16	

Survey Program	Date	4/16/2019			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
156.0	12,086.0	Survey #1 (Popham 10N 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	
156.0	0.54	126.78	156.0	-0.4	0.6	-0.4	0.35	0.35	0.00	
252.0	1.52	147.90	252.0	-1.8	1.6	-1.7	1.08	1.02	22.00	
348.0	3.29	153.69	347.9	-5.3	3.5	-5.1	1.86	1.84	6.03	
443.0	4.50	165.44	442.7	-11.4	5.7	-10.9	1.52	1.27	12.37	
539.0	6.21	175.90	538.3	-20.2	7.0	-19.7	2.04	1.78	10.90	
635.0	7.84	177.01	633.5	-31.9	7.7	-31.3	1.70	1.70	1.16	
731.0	10.04	174.17	728.4	-46.8	8.9	-46.0	2.34	2.29	-2.96	
826.0	11.91	171.54	821.6	-64.7	11.2	-63.8	2.04	1.97	-2.77	
922.0	12.43	171.85	915.5	-84.8	14.1	-83.5	0.55	0.54	0.32	

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Site:	Popham 4N64W03 Pad Sec.3-T4N-R64W	MD Reference:	WELL @ 4685.0ft (Original Well Elev)
Well:	Popham 10N (Nio B)	North Reference:	True
Wellbore:	Popham 10N Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Popham 10N 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)
1,017.0	12.03	173.58	1,008.3	-104.7	16.7	-103.2	0.57	-0.42	1.82
1,113.0	11.30	173.76	1,102.3	-124.0	18.8	-122.3	0.76	-0.76	0.19
1,208.0	11.41	177.24	1,195.5	-142.6	20.3	-140.8	0.73	0.12	3.66
1,304.0	12.11	180.92	1,289.4	-162.2	20.6	-160.3	1.07	0.73	3.83
1,400.0	11.60	180.89	1,383.4	-181.9	20.2	-180.0	0.53	-0.53	-0.03
1,495.0	10.13	181.13	1,476.7	-199.8	19.9	-197.9	1.55	-1.55	0.25
1,595.0	10.34	177.29	1,575.1	-217.6	20.2	-215.5	0.71	0.21	-3.84
1,677.0	11.67	178.51	1,655.6	-233.2	20.7	-231.1	1.65	1.62	1.49
1,772.0	11.65	175.51	1,748.6	-252.4	21.7	-250.1	0.64	-0.02	-3.16
1,867.0	12.65	179.31	1,841.5	-272.4	22.6	-270.0	1.35	1.05	4.00
1,963.0	11.56	178.25	1,935.4	-292.5	23.0	-290.0	1.16	-1.14	-1.10
2,059.0	11.18	177.31	2,029.5	-311.4	23.8	-308.8	0.44	-0.40	-0.98
2,155.0	12.89	178.36	2,123.4	-331.4	24.5	-328.7	1.80	1.78	1.09
2,251.0	13.37	163.80	2,216.9	-352.8	27.9	-349.8	3.47	0.50	-15.17
2,346.0	12.30	162.76	2,309.5	-373.0	34.0	-369.5	1.15	-1.13	-1.09
2,442.0	11.18	164.38	2,403.5	-391.7	39.5	-387.8	1.22	-1.17	1.69
2,537.0	11.74	162.68	2,496.6	-409.8	44.9	-405.5	0.69	0.59	-1.79
2,633.0	12.69	165.92	2,590.4	-429.4	50.4	-424.6	1.22	0.99	3.38
2,729.0	12.54	163.83	2,684.1	-449.6	55.8	-444.4	0.50	-0.16	-2.18
2,824.0	12.45	162.07	2,776.9	-469.2	61.8	-463.5	0.41	-0.09	-1.85
2,920.0	11.62	162.61	2,870.8	-488.3	67.9	-482.1	0.87	-0.86	0.56
3,015.0	12.94	163.26	2,963.6	-507.6	73.8	-500.9	1.40	1.39	0.68
3,110.0	11.89	163.14	3,056.4	-527.2	79.7	-520.0	1.11	-1.11	-0.13
3,206.0	10.77	160.45	3,150.5	-545.1	85.6	-537.4	1.29	-1.17	-2.80
3,301.0	11.92	161.37	3,243.6	-562.8	91.7	-554.6	1.23	1.21	0.97
3,397.0	10.75	160.74	3,337.8	-580.6	97.8	-572.0	1.23	-1.22	-0.66
3,492.0	11.79	160.64	3,430.9	-598.1	104.0	-589.0	1.09	1.09	-0.11
3,588.0	12.33	161.32	3,524.8	-617.1	110.5	-607.4	0.58	0.56	0.71
3,683.0	11.47	162.72	3,617.8	-635.7	116.6	-625.6	0.95	-0.91	1.47
3,778.0	13.11	161.41	3,710.6	-655.0	122.8	-644.3	1.75	1.73	-1.38
3,873.0	12.73	161.97	3,803.2	-675.1	129.5	-663.9	0.42	-0.40	0.59
3,969.0	11.67	161.43	3,897.0	-694.4	135.9	-682.7	1.11	-1.10	-0.56
4,064.0	10.31	160.49	3,990.3	-711.5	141.7	-699.3	1.44	-1.43	-0.99
4,159.0	11.47	161.55	4,083.6	-728.5	147.6	-715.8	1.24	1.22	1.12
4,253.0	11.55	163.72	4,175.7	-746.4	153.2	-733.3	0.47	0.09	2.31
4,348.0	13.22	166.81	4,268.4	-766.1	158.3	-752.6	1.89	1.76	3.25
4,443.0	11.50	168.83	4,361.2	-786.0	162.6	-772.1	1.87	-1.81	2.13
4,538.0	12.63	170.20	4,454.1	-805.5	166.2	-791.3	1.23	1.19	1.44
4,633.0	13.32	165.78	4,546.7	-826.3	170.7	-811.7	1.27	0.73	-4.65
4,727.0	12.19	166.24	4,638.4	-846.5	175.7	-831.5	1.21	-1.20	0.49
4,823.0	13.70	160.21	4,732.0	-867.0	182.0	-851.5	2.11	1.57	-6.28
4,918.0	12.92	151.69	4,824.4	-886.9	190.8	-870.7	2.22	-0.82	-8.97
5,014.0	12.59	152.62	4,918.0	-905.7	200.7	-888.7	0.40	-0.34	0.97
5,109.0	11.90	152.37	5,010.9	-923.5	210.0	-905.9	0.73	-0.73	-0.26

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Survey									
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5,203.0	9.84	143.79	5,103.2	-938.6	219.3	-920.2	2.78	-2.19	-9.13
5,298.0	9.17	152.15	5,196.9	-951.9	227.6	-932.8	1.61	-0.71	8.80
5,393.0	10.26	161.01	5,290.5	-966.6	233.9	-947.0	1.94	1.15	9.33
5,487.0	8.95	156.63	5,383.2	-981.2	239.5	-961.2	1.59	-1.39	-4.66
5,583.0	6.47	165.02	5,478.4	-993.3	243.9	-972.9	2.83	-2.58	8.74
5,678.0	3.71	159.61	5,573.0	-1,001.3	246.3	-980.8	2.95	-2.91	-5.69
5,774.0	1.98	169.77	5,668.8	-1,005.9	247.7	-985.2	1.87	-1.80	10.58
5,869.0	1.45	161.33	5,763.8	-1,008.6	248.4	-987.9	0.62	-0.56	-8.88
5,964.0	1.33	70.65	5,858.8	-1,009.4	249.8	-988.6	2.08	-0.13	-95.45
6,060.0	3.51	359.25	5,954.7	-1,006.1	250.8	-985.2	3.47	2.27	-74.38
6,170.0	8.30	4.47	6,064.1	-994.8	251.4	-973.9	4.38	4.35	4.75
6,265.0	16.25	2.14	6,156.8	-974.6	252.4	-953.7	8.38	8.37	-2.45
6,361.0	23.18	358.62	6,247.2	-942.3	252.5	-921.5	7.32	7.22	-3.67
6,456.0	27.59	0.36	6,333.0	-901.6	252.2	-880.9	4.71	4.64	1.83
6,552.0	35.01	0.62	6,414.9	-851.7	252.6	-831.2	7.73	7.73	0.27
6,647.0	47.38	2.50	6,486.3	-789.3	254.4	-768.8	13.08	13.02	1.98
6,743.0	54.01	3.08	6,547.1	-715.2	258.1	-694.6	6.92	6.91	0.60
6,838.0	65.01	0.02	6,595.2	-633.5	260.1	-612.9	11.90	11.58	-3.22
6,906.8	68.28	359.43	6,622.5	-570.3	259.8	-550.0	4.83	4.76	-0.86
TPZ - 460' Setback - 460'FSL & 2472'FWL, Sec.3									
6,934.0	69.58	359.20	6,632.3	-544.9	259.5	-524.7	4.83	4.76	-0.83
7,029.0	79.53	358.53	6,657.5	-453.5	257.7	-433.6	10.50	10.47	-0.71
7,124.0	88.32	1.00	6,667.6	-359.1	257.3	-339.5	9.61	9.25	2.60
7,219.0	88.55	0.95	6,670.2	-264.2	259.0	-244.7	0.25	0.24	-0.05
7,293.7	89.78	1.04	6,671.2	-189.5	260.3	-170.1	1.66	1.65	0.13
Deepest TVD Drilled - 6671.2'									
7,314.0	90.12	1.07	6,671.3	-169.2	260.6	-149.8	1.66	1.65	0.13
7,410.0	90.13	0.03	6,671.1	-73.2	261.5	-54.0	1.08	0.01	-1.08
7,504.0	90.57	359.65	6,670.5	20.8	261.3	39.7	0.62	0.47	-0.40
7,599.0	91.13	359.89	6,669.1	115.8	260.9	134.4	0.64	0.59	0.25
7,694.0	90.49	1.40	6,667.7	210.7	262.0	229.2	1.73	-0.67	1.59
7,788.0	90.58	1.18	6,666.9	304.7	264.1	323.1	0.25	0.10	-0.23
7,883.0	91.06	0.58	6,665.5	399.7	265.5	417.9	0.81	0.51	-0.63
7,978.0	90.78	2.30	6,664.0	494.6	267.9	512.8	1.83	-0.29	1.81
8,073.0	91.03	1.55	6,662.5	589.6	271.1	607.7	0.83	0.26	-0.79
8,169.0	91.22	1.48	6,660.6	685.5	273.7	703.6	0.21	0.20	-0.07
8,264.0	91.24	0.97	6,658.5	780.5	275.7	798.4	0.54	0.02	-0.54
8,359.0	91.40	0.75	6,656.4	875.4	277.1	893.3	0.29	0.17	-0.23
8,454.0	90.92	1.64	6,654.4	970.4	279.1	988.1	1.06	-0.51	0.94
8,549.0	88.35	0.26	6,655.0	1,065.4	280.7	1,082.9	3.07	-2.71	-1.45
8,643.0	88.18	0.18	6,657.9	1,159.3	281.0	1,176.7	0.20	-0.18	-0.09
8,738.0	87.86	0.15	6,661.2	1,254.3	281.3	1,271.4	0.34	-0.34	-0.03
8,833.0	90.81	359.68	6,662.3	1,349.3	281.2	1,366.1	3.14	3.11	-0.49

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8,928.0	91.00	0.42	6,660.8	1,444.3	281.3	1,460.9	0.80	0.20	0.78
9,024.0	91.29	0.45	6,658.8	1,540.2	282.0	1,556.6	0.30	0.30	0.03
9,120.0	91.09	2.14	6,656.9	1,636.2	284.2	1,652.5	1.77	-0.21	1.76
9,215.0	91.20	1.47	6,655.0	1,731.1	287.1	1,747.4	0.71	0.12	-0.71
9,310.0	91.23	1.04	6,652.9	1,826.1	289.2	1,842.2	0.45	0.03	-0.45
9,405.0	91.13	0.17	6,651.0	1,921.0	290.2	1,937.0	0.92	-0.11	-0.92
9,501.0	90.68	2.25	6,649.5	2,017.0	292.3	2,032.9	2.22	-0.47	2.17
9,597.0	91.23	1.38	6,647.9	2,112.9	295.3	2,128.8	1.07	0.57	-0.91
9,693.0	90.96	0.48	6,646.0	2,208.9	296.9	2,224.6	0.98	-0.28	-0.94
9,788.0	91.24	0.18	6,644.2	2,303.9	297.4	2,319.4	0.43	0.29	-0.32
9,884.0	90.43	1.32	6,642.8	2,399.9	298.7	2,415.2	1.46	-0.84	1.19
9,979.0	90.81	1.06	6,641.8	2,494.8	300.6	2,510.1	0.48	0.40	-0.27
10,075.0	90.36	2.33	6,640.8	2,590.8	303.5	2,606.0	1.40	-0.47	1.32
10,171.0	89.57	2.89	6,640.9	2,686.7	307.8	2,702.0	1.01	-0.82	0.58
10,266.0	89.84	2.45	6,641.4	2,781.6	312.3	2,796.9	0.54	0.28	-0.46
10,362.0	89.66	1.92	6,641.8	2,877.5	315.9	2,892.9	0.58	-0.19	-0.55
10,458.0	89.70	1.87	6,642.3	2,973.5	319.1	2,988.8	0.07	0.04	-0.05
10,553.0	89.92	1.61	6,642.6	3,068.4	322.0	3,083.7	0.36	0.23	-0.27
10,649.0	89.91	0.90	6,642.8	3,164.4	324.1	3,179.6	0.74	-0.01	-0.74
10,744.0	89.91	0.68	6,642.9	3,259.4	325.4	3,274.4	0.23	0.00	-0.23
10,839.0	90.13	0.11	6,642.9	3,354.4	326.0	3,369.2	0.64	0.23	-0.60
10,935.0	90.56	359.82	6,642.3	3,450.4	326.0	3,464.9	0.54	0.45	-0.30
11,030.0	90.96	359.24	6,641.0	3,545.4	325.2	3,559.6	0.74	0.42	-0.61
11,126.0	90.80	358.91	6,639.6	3,641.3	323.7	3,655.2	0.38	-0.17	-0.34
11,222.0	90.62	358.05	6,638.4	3,737.3	321.1	3,750.8	0.92	-0.19	-0.90
11,317.0	90.15	357.82	6,637.7	3,832.2	317.7	3,845.2	0.55	-0.49	-0.24
11,413.0	89.83	0.42	6,637.8	3,928.2	316.2	3,940.8	2.73	-0.33	2.71
11,508.0	91.03	1.79	6,637.0	4,023.2	318.1	4,035.7	1.92	1.26	1.44
11,604.0	91.93	0.97	6,634.6	4,119.1	320.4	4,131.5	1.27	0.94	-0.85
11,699.0	92.60	0.68	6,630.8	4,214.0	321.7	4,226.3	0.77	0.71	-0.31
11,794.0	91.31	2.66	6,627.6	4,308.9	324.5	4,321.1	2.49	-1.36	2.08
11,889.0	90.58	2.23	6,626.0	4,403.8	328.5	4,416.1	0.89	-0.77	-0.45
12,026.0	90.96	1.65	6,624.2	4,540.8	333.2	4,553.0	0.51	0.28	-0.42
12,086.0	90.96	1.65	6,623.2	4,600.7	334.9	4,612.9	0.00	0.00	0.00

Company:	PDC Energy Inc. DJ Basin	Local Co-ordinate Reference:	Well Popham 10N (Nio B)
Project:	SEC.3-T4N-R64W	TVD Reference:	WELL @ 4685.0ft (Original Well Elev)
Site:	Popham 4N64W03 Pad Sec.3-T4N-R64W	MD Reference:	WELL @ 4685.0ft (Original Well Elev)
Well:	Popham 10N (Nio B)	North Reference:	True
Wellbore:	Popham 10N Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Popham 10N Wellbore #1	Database:	US_EDM

Design Targets									
Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (usft)	Easting (usft)	Latitude	Longitude
SHL 1032'FSL, 2206'FW - survey hits target center - Point	0.00	0.00	1.0	0.0	0.0	1,367,048.43	3,268,156.81	40.336956	-104.538051
BHL 370'FSL, 2318'FWL - survey misses target center by 13.9ft at 12086.0ft MD (6623.2 TVD, 4600.7 N, 334.9 E) - Point	0.00	0.00	6,633.0	4,603.5	344.3	1,371,655.13	3,268,451.16	40.349592	-104.536815

Survey Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates			
		+N/-S (ft)	+E/-W (ft)	Comment	
6,906.8	6,622.5	-570.3	259.8	TPZ - 460' Setback - 460'FSL & 2472'FWL, Sec.3	
7,293.7	6,671.2	-189.5	260.3	Deepest TVD Drilled - 6671.2'	

Checked By: _____	Approved By: _____	Date: _____
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