

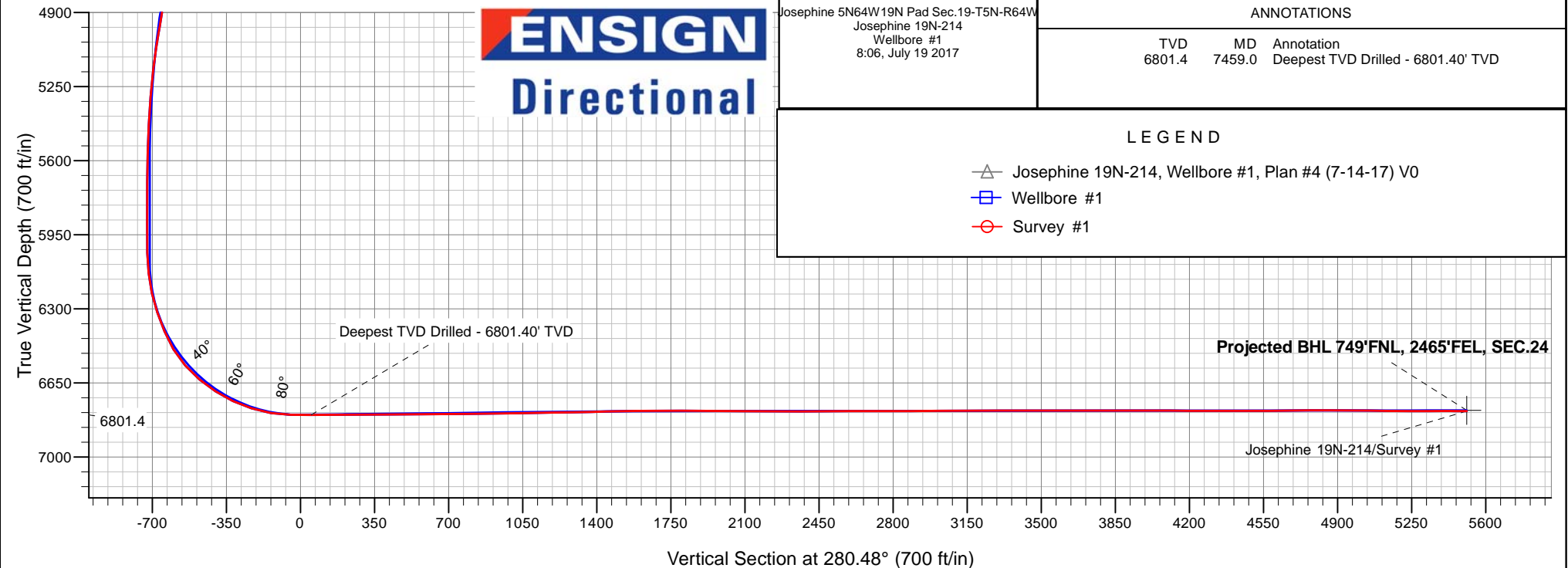
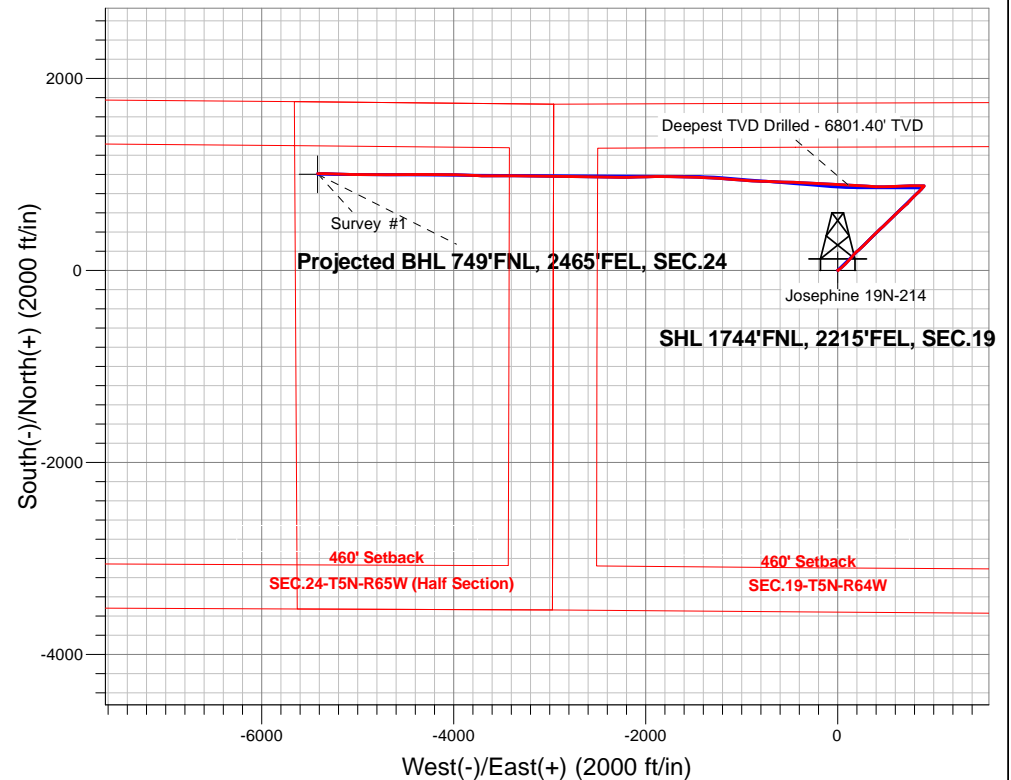
PDC Energy Inc. DJ Basin

Well Name: **Josephine 19N-214**

Surface Location: Josephine 5N64W19N Pad Sec.19-T5N-R64W
 North American Datum 1983 , US State Plane 1983, Colorado Northern Zone
 Ground Elevation: 4626.0
 +N/-S+E/-W Northing Easting Latitude Longitude Slot
 0.0 0.0 1385154.32 3253128.91 40.387090 -104.591290
 Original Well Elev WELL @ 4649.0ft (Original Well Elev)

FINAL SURVEY

Projected Bottom Hole Location
12,993'MD 6783'TVD 1008'N & 5417'W of SHL
89.7 degree Incl @ 270.4 degree AZM



ENSIGN
Directional

Josephine 5N64W19N Pad Sec.19-T5N-R64W
 Josephine 19N-214
 Wellbore #1
 8:06, July 19 2017

ANNOTATIONS

TVD	MD	Annotation
6801.4	7459.0	Deepest TVD Drilled - 6801.40' TVD

LEGEND

- △ Josephine 19N-214, Wellbore #1, Plan #4 (7-14-17) V0
- Wellbore #1
- Survey #1



PDC Energy Inc. DJ Basin

SEC.19-T5N-R64W

Josephine 5N64W19N Pad Sec.19-T5N-R64W

Josephine 19N-214

Wellbore #1

Survey: Survey #1

Standard Survey Report

19 July, 2017

Company:	PDC Energy Inc. DJ Basin	Local Co-ordinate Reference:	Well Josephine 19N-214
Project:	SEC.19-T5N-R64W	TVD Reference:	WELL @ 4649.0ft (Original Well Elev)
Site:	Josephine 5N64W19N Pad Sec.19-T5N-R64W	MD Reference:	WELL @ 4649.0ft (Original Well Elev)
Well:	Josephine 19N-214	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	US_EDM

Project	SEC.19-T5N-R64W		
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	Josephine 5N64W19N Pad Sec.19-T5N-R64W				
Site Position:		Northing:	1,385,202.34 usft	Latitude:	40.387220
From:	Lat/Long	Easting:	3,253,192.49 usft	Longitude:	-104.591060
Position Uncertainty:	0.0 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.59 °

Well	Josephine 19N-214					
Well Position	+N/-S	0.0 ft	Northing:	1,385,154.32 usft	Latitude:	40.387090
	+E/-W	0.0 ft	Easting:	3,253,128.91 usft	Longitude:	-104.591290
Position Uncertainty		0.0 ft	Wellhead Elevation:	0.0 ft	Ground Level:	4,626.0 ft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	7/14/2017	7.95	66.85	52,503

Design	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	280.48	

Survey Program	Date	7/19/2017			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
158.0	12,993.0	Survey #1 (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	
158.0	0.20	122.20	158.0	-0.1	0.2	-0.3	0.13	0.13	0.00	
254.0	0.10	113.80	254.0	-0.3	0.5	-0.5	0.11	-0.10	-8.75	
349.0	0.20	109.70	349.0	-0.4	0.7	-0.7	0.11	0.11	-4.32	
445.0	0.20	83.50	445.0	-0.4	1.0	-1.1	0.09	0.00	-27.29	
541.0	0.40	28.30	541.0	-0.1	1.3	-1.3	0.34	0.21	-57.50	
636.0	0.40	24.80	636.0	0.5	1.6	-1.5	0.03	0.00	-3.68	
732.0	0.40	31.70	732.0	1.1	1.9	-1.7	0.05	0.00	7.19	
828.0	1.70	52.30	828.0	2.3	3.2	-2.8	1.39	1.35	21.46	
923.0	3.90	55.80	922.9	4.9	7.0	-6.0	2.32	2.32	3.68	

Company:	PDC Energy Inc. DJ Basin	Local Co-ordinate Reference:	Well Josephine 19N-214
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Site:	Josephine 5N64W19N Pad Sec.19-T5N-R64W	MD Reference:	WELL @ 4649.0ft (Original Well Elev)
Well:	Josephine 19N-214	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	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)	
1,019.0	5.80	55.20	1,018.5	9.5	13.7	-11.8	1.98	1.98	-0.63	
1,115.0	7.00	50.70	1,113.9	16.0	22.2	-18.9	1.35	1.25	-4.69	
1,210.0	7.20	50.30	1,208.2	23.5	31.3	-26.5	0.22	0.21	-0.42	
1,306.0	8.00	51.20	1,303.3	31.5	41.1	-34.7	0.84	0.83	0.94	
1,402.0	9.10	48.40	1,398.3	40.7	52.0	-43.7	1.22	1.15	-2.92	
1,497.0	9.10	45.70	1,492.1	51.0	63.0	-52.7	0.45	0.00	-2.84	
1,615.0	10.00	45.20	1,608.4	64.7	77.0	-63.9	0.77	0.76	-0.42	
1,786.0	11.30	43.60	1,776.5	87.3	99.0	-81.5	0.78	0.76	-0.94	
1,881.0	13.20	41.90	1,869.3	102.1	112.7	-92.2	2.04	2.00	-1.79	
1,977.0	14.70	42.40	1,962.5	119.3	128.2	-104.4	1.57	1.56	0.52	
2,073.0	16.20	42.20	2,055.0	138.2	145.4	-117.9	1.56	1.56	-0.21	
2,169.0	17.50	39.90	2,146.9	159.2	163.7	-132.0	1.52	1.35	-2.40	
2,264.0	18.00	43.10	2,237.4	180.9	182.9	-146.9	1.15	0.53	3.37	
2,359.0	18.70	49.80	2,327.6	201.4	204.6	-164.5	2.34	0.74	7.05	
2,455.0	19.90	47.90	2,418.2	222.3	228.4	-184.2	1.41	1.25	-1.98	
2,551.0	20.10	47.30	2,508.4	244.4	252.7	-204.0	0.30	0.21	-0.63	
2,647.0	19.80	46.40	2,598.6	266.8	276.6	-223.4	0.45	-0.31	-0.94	
2,742.0	19.70	45.00	2,688.0	289.3	299.6	-241.9	0.51	-0.11	-1.47	
2,838.0	19.90	44.20	2,778.3	312.4	322.4	-260.2	0.35	0.21	-0.83	
2,933.0	18.10	42.40	2,868.2	334.9	343.6	-276.9	1.99	-1.89	-1.89	
3,029.0	20.00	46.10	2,958.9	357.3	365.5	-294.4	2.34	1.98	3.85	
3,125.0	19.00	45.70	3,049.4	379.6	388.5	-313.0	1.05	-1.04	-0.42	
3,221.0	17.30	45.70	3,140.6	400.5	409.9	-330.2	1.77	-1.77	0.00	
3,317.0	17.70	45.70	3,232.2	420.6	430.6	-346.9	0.42	0.42	0.00	
3,412.0	18.50	48.20	3,322.5	440.8	452.1	-364.4	1.17	0.84	2.63	
3,508.0	18.60	49.10	3,413.5	461.0	475.1	-383.3	0.32	0.10	0.94	
3,604.0	16.70	47.10	3,505.0	480.4	496.8	-401.1	2.08	-1.98	-2.08	
3,699.0	18.60	46.10	3,595.5	500.2	517.7	-418.0	2.03	2.00	-1.05	
3,795.0	18.60	45.00	3,686.5	521.6	539.5	-435.6	0.37	0.00	-1.15	
3,891.0	18.90	44.30	3,777.4	543.6	561.2	-453.0	0.39	0.31	-0.73	
3,987.0	18.60	44.50	3,868.3	565.6	582.8	-470.2	0.32	-0.31	0.21	
4,083.0	17.50	43.10	3,959.6	587.1	603.4	-486.5	1.23	-1.15	-1.46	
4,179.0	17.60	47.50	4,051.1	607.4	624.0	-503.0	1.39	0.10	4.58	
4,275.0	18.20	49.60	4,142.4	626.9	646.1	-521.2	0.92	0.63	2.19	
4,370.0	18.80	49.10	4,232.5	646.6	668.9	-540.2	0.65	0.63	-0.53	
4,466.0	17.60	48.40	4,323.7	666.3	691.5	-558.7	1.27	-1.25	-0.73	
4,561.0	18.60	47.50	4,414.0	686.1	713.4	-576.7	1.09	1.05	-0.95	
4,657.0	18.60	43.10	4,505.0	707.6	735.2	-594.1	1.46	0.00	-4.58	
4,752.0	16.70	41.90	4,595.5	728.9	754.6	-609.4	2.04	-2.00	-1.26	
4,847.0	15.70	42.80	4,686.8	748.4	772.5	-623.4	1.09	-1.05	0.95	
4,943.0	14.60	43.50	4,779.4	766.8	789.6	-637.0	1.16	-1.15	0.73	
5,039.0	14.50	46.30	4,872.4	783.8	806.6	-650.6	0.74	-0.10	2.92	
5,135.0	15.30	47.50	4,965.1	800.7	824.7	-665.2	0.89	0.83	1.25	
5,230.0	14.30	46.80	5,057.0	817.2	842.5	-679.7	1.07	-1.05	-0.74	

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Site:	Josephine 5N64W19N Pad Sec.19-T5N-R64W	MD Reference:	WELL @ 4649.0ft (Original Well Elev)
Well:	Josephine 19N-214	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	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)
5,326.0	12.80	44.30	5,150.3	832.9	858.5	-692.7	1.68	-1.56	-2.60
5,422.0	10.90	40.80	5,244.3	847.4	871.9	-703.2	2.12	-1.98	-3.65
5,517.0	8.00	40.60	5,338.0	859.2	882.1	-711.0	3.05	-3.05	-0.21
5,613.0	5.10	48.70	5,433.3	867.1	889.6	-717.0	3.16	-3.02	8.44
5,708.0	2.10	40.50	5,528.1	871.2	893.9	-720.5	3.20	-3.16	-8.63
5,804.0	1.90	39.10	5,624.1	873.8	896.1	-722.1	0.21	-0.21	-1.46
5,900.0	1.90	34.80	5,720.0	876.3	898.0	-723.6	0.15	0.00	-4.48
5,995.0	1.50	22.90	5,815.0	878.8	899.4	-724.5	0.56	-0.42	-12.53
6,091.0	1.30	10.80	5,910.9	881.0	900.1	-724.8	0.37	-0.21	-12.60
6,120.0	1.30	0.40	5,939.9	881.7	900.1	-724.7	0.81	0.00	-35.86
6,216.0	1.10	284.10	6,035.9	883.0	899.2	-723.6	1.55	-0.21	-79.48
6,311.0	6.30	270.20	6,130.7	883.2	893.1	-717.5	5.51	5.47	-14.63
6,407.0	12.90	269.70	6,225.3	883.2	877.1	-701.8	6.88	6.88	-0.52
6,502.0	18.50	269.90	6,316.7	883.1	851.4	-676.6	5.90	5.89	0.21
6,598.0	23.20	269.90	6,406.4	883.0	817.3	-643.0	4.90	4.90	0.00
6,694.0	31.30	267.10	6,491.7	881.7	773.4	-600.1	8.54	8.44	-2.92
6,789.0	41.90	269.70	6,567.8	880.3	716.9	-544.7	11.27	11.16	2.74
6,885.0	50.60	267.80	6,634.2	878.7	647.6	-476.9	9.17	9.06	-1.98
6,981.0	58.20	266.50	6,690.0	874.8	569.7	-401.0	7.99	7.92	-1.35
7,076.0	64.40	269.20	6,735.6	871.7	486.5	-319.8	6.99	6.53	2.84
7,172.0	73.30	271.80	6,770.2	872.6	397.1	-231.7	9.61	9.27	2.71
7,268.0	80.20	274.30	6,792.2	877.6	303.8	-139.1	7.62	7.19	2.60
7,363.0	89.10	273.20	6,801.1	883.8	209.5	-45.2	9.44	9.37	-1.16
7,459.0	90.50	273.40	6,801.4	889.3	113.7	50.0	1.47	1.46	0.21
Deepest TVD Drilled - 6801.40' TVD									
7,555.0	90.20	273.40	6,800.8	895.0	17.9	145.3	0.31	-0.31	0.00
7,650.0	90.30	273.00	6,800.4	900.3	-77.0	239.5	0.43	0.11	-0.42
7,746.0	90.00	272.50	6,800.1	904.9	-172.9	334.6	0.61	-0.31	-0.52
7,842.0	90.70	272.70	6,799.6	909.2	-268.8	429.7	0.76	0.73	0.21
7,937.0	90.70	272.50	6,798.4	913.5	-363.7	523.8	0.21	0.00	-0.21
8,032.0	90.50	272.30	6,797.4	917.5	-458.6	617.9	0.30	-0.21	-0.21
8,128.0	90.30	272.30	6,796.7	921.4	-554.5	712.9	0.21	-0.21	0.00
8,223.0	89.70	271.80	6,796.7	924.8	-649.4	806.9	0.82	-0.63	-0.53
8,319.0	91.30	272.10	6,795.9	928.0	-745.4	901.8	1.70	1.67	0.31
8,414.0	91.50	271.80	6,793.6	931.3	-840.3	995.7	0.38	0.21	-0.32
8,510.0	90.80	274.60	6,791.6	936.6	-936.1	1,090.9	3.01	-0.73	2.92
8,606.0	90.70	274.30	6,790.4	944.1	-1,031.8	1,186.4	0.33	-0.10	-0.31
8,701.0	90.80	274.10	6,789.1	951.0	-1,126.6	1,280.8	0.24	0.11	-0.21
8,796.0	91.10	273.90	6,787.6	957.7	-1,221.3	1,375.2	0.38	0.32	-0.21
8,892.0	91.50	273.90	6,785.4	964.2	-1,317.1	1,470.5	0.42	0.42	0.00
8,987.0	91.00	272.30	6,783.3	969.3	-1,411.9	1,564.7	1.76	-0.53	-1.68
9,083.0	90.90	272.10	6,781.7	973.0	-1,507.8	1,659.7	0.23	-0.10	-0.21
9,179.0	90.00	271.10	6,781.0	975.7	-1,603.8	1,754.5	1.40	-0.94	-1.04

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Design:	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)
9,274.0	89.40	270.60	6,781.5	977.1	-1,698.8	1,848.2	0.82	-0.63	-0.53
9,370.0	89.30	270.20	6,782.6	977.8	-1,794.8	1,942.7	0.43	-0.10	-0.42
9,466.0	89.30	269.70	6,783.7	977.7	-1,890.7	2,037.1	0.52	0.00	-0.52
9,562.0	89.80	268.60	6,784.5	976.3	-1,986.7	2,131.2	1.26	0.52	-1.15
9,657.0	90.00	268.10	6,784.7	973.5	-2,081.7	2,224.1	0.57	0.21	-0.53
9,753.0	90.00	269.20	6,784.7	971.3	-2,177.7	2,318.0	1.15	0.00	1.15
9,848.0	90.00	270.70	6,784.7	971.2	-2,272.7	2,411.4	1.58	0.00	1.58
9,945.0	90.40	270.20	6,784.3	971.9	-2,369.7	2,506.9	0.66	0.41	-0.52
10,040.0	90.60	269.90	6,783.5	972.0	-2,464.7	2,600.4	0.38	0.21	-0.32
10,136.0	89.80	272.10	6,783.2	973.7	-2,560.6	2,695.0	2.44	-0.83	2.29
10,232.0	89.90	272.00	6,783.4	977.1	-2,656.6	2,790.0	0.15	0.10	-0.10
10,327.0	90.30	271.30	6,783.2	979.9	-2,751.5	2,883.9	0.85	0.42	-0.74
10,423.0	90.50	271.10	6,782.6	981.9	-2,847.5	2,978.6	0.29	0.21	-0.21
10,518.0	90.50	270.70	6,781.7	983.4	-2,942.5	3,072.3	0.42	0.00	-0.42
10,614.0	90.10	270.40	6,781.2	984.3	-3,038.5	3,166.9	0.52	-0.42	-0.31
10,709.0	90.10	269.90	6,781.1	984.5	-3,133.5	3,260.3	0.53	0.00	-0.53
10,805.0	90.00	270.00	6,781.0	984.5	-3,229.5	3,354.7	0.15	-0.10	0.10
10,900.0	90.00	270.60	6,781.0	985.0	-3,324.5	3,448.2	0.63	0.00	0.63
10,996.0	90.00	270.60	6,781.0	986.0	-3,420.5	3,542.8	0.00	0.00	0.00
11,091.0	89.80	270.00	6,781.2	986.5	-3,515.5	3,636.3	0.67	-0.21	-0.63
11,186.0	89.80	269.70	6,781.5	986.2	-3,610.5	3,729.6	0.32	0.00	-0.32
11,282.0	90.30	271.30	6,781.4	987.0	-3,706.5	3,824.2	1.75	0.52	1.67
11,377.0	90.00	272.90	6,781.2	990.5	-3,801.4	3,918.2	1.71	-0.32	1.68
11,473.0	89.90	272.50	6,781.2	995.1	-3,897.3	4,013.3	0.43	-0.10	-0.42
11,568.0	89.70	271.10	6,781.6	998.0	-3,992.2	4,107.2	1.49	-0.21	-1.47
11,663.0	89.90	271.00	6,781.9	999.8	-4,087.2	4,200.9	0.24	0.21	-0.11
11,759.0	89.90	270.40	6,782.1	1,000.9	-4,183.2	4,295.5	0.63	0.00	-0.63
11,854.0	89.90	269.20	6,782.2	1,000.6	-4,278.2	4,388.9	1.26	0.00	-1.26
11,950.0	90.10	268.60	6,782.2	998.8	-4,374.2	4,482.9	0.66	0.21	-0.63
12,046.0	90.50	270.20	6,781.7	997.8	-4,470.2	4,577.1	1.72	0.42	1.67
12,141.0	90.50	269.70	6,780.9	997.7	-4,565.2	4,670.5	0.53	0.00	-0.53
12,237.0	90.50	269.30	6,780.1	996.8	-4,661.2	4,764.7	0.42	0.00	-0.42
12,333.0	89.80	271.50	6,779.8	997.5	-4,757.2	4,859.3	2.40	-0.73	2.29
12,429.0	89.40	270.90	6,780.5	999.5	-4,853.1	4,954.0	0.75	-0.42	-0.63
12,525.0	89.30	270.70	6,781.6	1,000.9	-4,949.1	5,048.6	0.23	-0.10	-0.21
12,620.0	89.40	270.60	6,782.7	1,001.9	-5,044.1	5,142.2	0.15	0.11	-0.11
12,716.0	90.00	271.60	6,783.2	1,003.8	-5,140.1	5,236.9	1.21	0.63	1.04
12,811.0	90.10	271.10	6,783.1	1,006.0	-5,235.1	5,330.7	0.54	0.11	-0.53
12,907.0	90.00	270.70	6,783.0	1,007.5	-5,331.1	5,425.4	0.43	-0.10	-0.42
12,938.0	89.70	270.40	6,783.1	1,007.8	-5,362.1	5,455.9	1.37	-0.97	-0.97
12,993.0	89.70	270.40	6,783.4	1,008.2	-5,417.1	5,510.1	0.00	0.00	0.00

Company:	PDC Energy Inc. DJ Basin	Local Co-ordinate Reference:	Well Josephine 19N-214
Project:	SEC.19-T5N-R64W	TVD Reference:	WELL @ 4649.0ft (Original Well Elev)
Site:	Josephine 5N64W19N Pad Sec.19-T5N-R64W	MD Reference:	WELL @ 4649.0ft (Original Well Elev)
Well:	Josephine 19N-214	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	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 1744'FNL, 2215'FE	0.00	0.00	1.0	0.0	0.0	1,385,154.33	3,253,128.91	40.387090	-104.591290
- survey hits target center									
- Point									
BHL 755'FNL, 2466'FEL	0.00	0.00	6,780.0	1,002.5	-5,418.1	1,386,101.16	3,247,701.09	40.389840	-104.610740
- survey misses target center by 6.7ft at 12993.0ft MD (6783.4 TVD, 1008.2 N, -5417.1 E)									
- Point									

Survey Annotations				
Measured Depth	Vertical Depth	Local Coordinates		Comment
(ft)	(ft)	+N/-S (ft)	+E/-W (ft)	
7,459.0	6,801.4	889.3	113.7	Deepest TVD Drilled - 6801.40' TVD

Checked By: _____	Approved By: _____	Date: _____
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