

PDC Energy Inc. DJ Basin

Well Name: **Josephine 190-314**

Surface Location: Josephine 5N64W19N Pad Sec.19-T5N-R64W
North American Datum 1983 , US State Plane 1983, Colorado Northern Zone

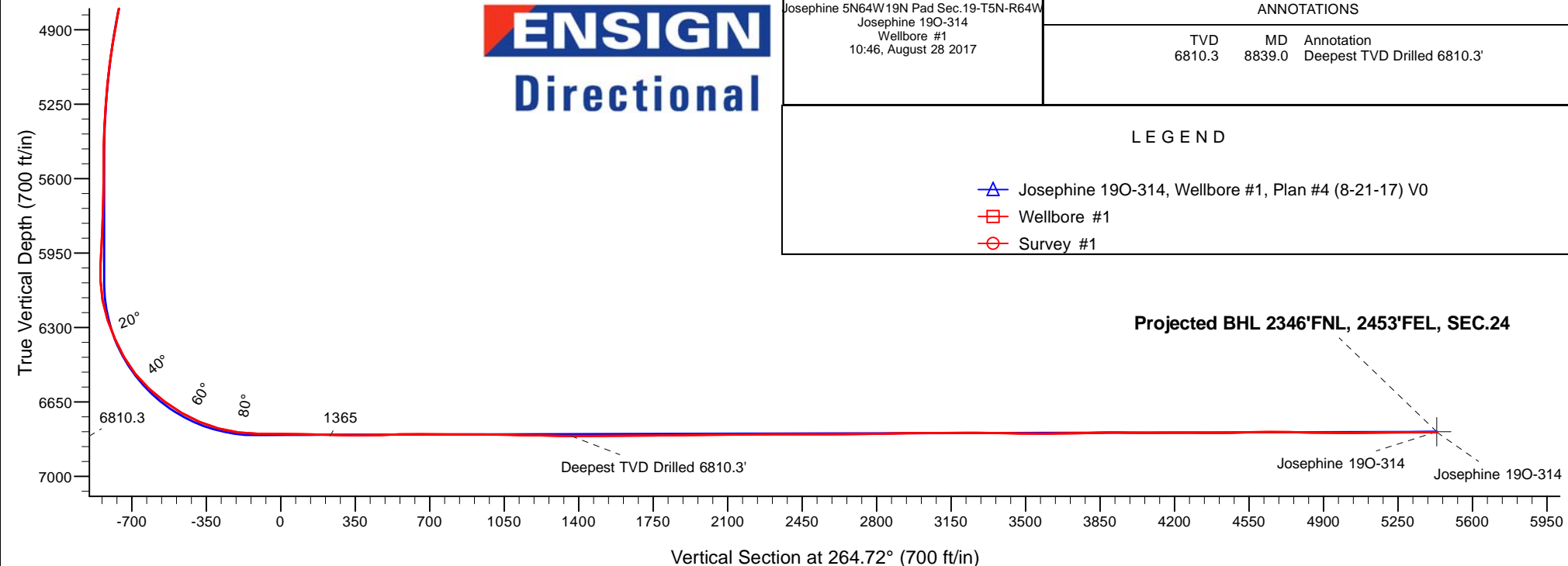
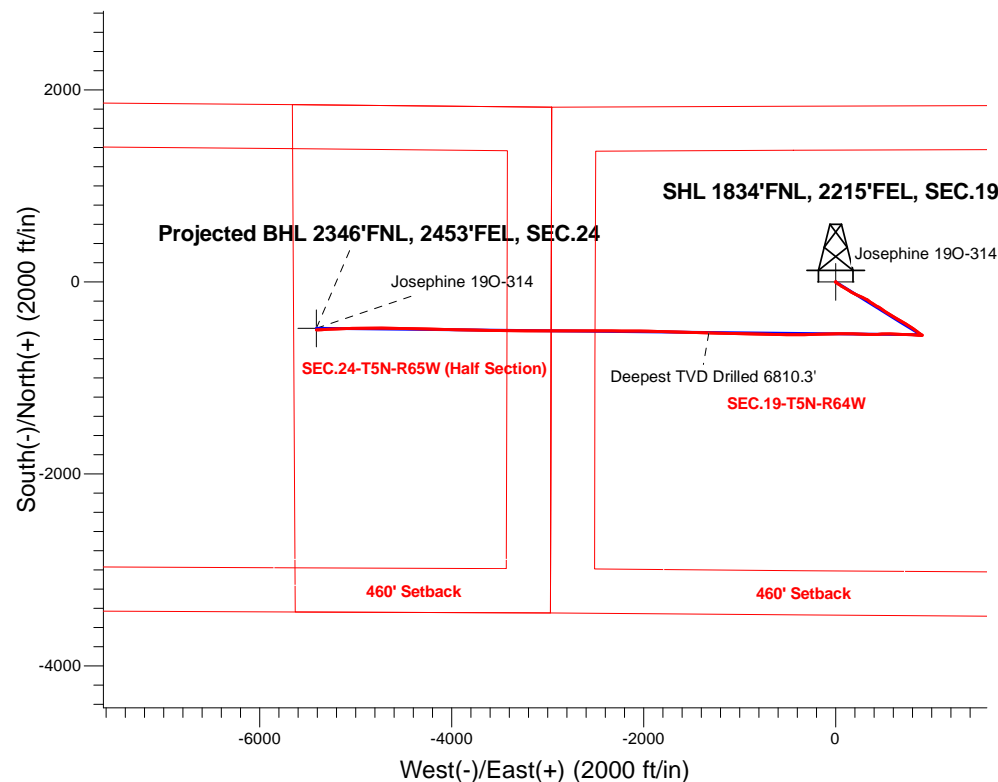
Ground Elevation: 4626.0

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.0	0.0	1385066.89	3253129.81	40.386850	-104.591290	

Original Well Elev WELL @ 4649.0ft (Original Well Elev)

FINAL SURVEY

Projected Bottom Hole Location
12,929'MD 6792'TVD 500'S & 5410'W of SHL
90.0 degree Incl @ 267.0 degree AZM



ENSIGN
Directional

Josephine 5N64W19N Pad Sec.19-T5N-R64W
Josephine 190-314
Wellbore #1
10:46, August 28 2017

ANNOTATIONS

TVD	MD	Annotation
6810.3	8839.0	Deepest TVD Drilled 6810.3'

LEGEND

- Josephine 190-314, Wellbore #1, Plan #4 (8-21-17) V0
- Wellbore #1
- Survey #1



PDC Energy Inc. DJ Basin

SEC.19-T5N-R64W

Josephine 5N64W19N Pad Sec.19-T5N-R64W

Josephine 19O-314

Wellbore #1

Survey: Survey #1

Standard Survey Report

28 August, 2017

Company:	PDC Energy Inc. DJ Basin	Local Co-ordinate Reference:	Well Josephine 190-314
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 190-314	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 19O-314					
Well Position	+N/-S	0.0 ft	Northing:	1,385,066.89 usft	Latitude:	40.386850
	+E/-W	0.0 ft	Easting:	3,253,129.81 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	8/21/2017	7.93	66.85	52,492

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	264.72	

Survey Program	Date	8/28/2017			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
155.0	12,929.0	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	
155.0	0.20	340.70	155.0	0.3	-0.1	0.1	0.13	0.13	0.00	
251.0	0.20	322.20	251.0	0.5	-0.2	0.2	0.07	0.00	-19.27	
347.0	0.40	351.90	347.0	1.0	-0.4	0.3	0.26	0.21	30.94	
442.0	0.40	44.30	442.0	1.6	-0.2	0.1	0.37	0.00	55.16	
538.0	0.60	204.60	538.0	1.4	-0.2	0.1	1.03	0.21	166.98	
633.0	0.50	193.00	633.0	0.5	-0.5	0.4	0.16	-0.11	-12.21	
729.0	0.40	189.70	729.0	-0.2	-0.6	0.7	0.11	-0.10	-3.44	
825.0	0.50	210.10	825.0	-0.9	-0.9	1.0	0.20	0.10	21.25	
920.0	0.60	207.60	920.0	-1.7	-1.3	1.5	0.11	0.11	-2.63	

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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)
1,016.0	1.30	139.60	1,016.0	-3.0	-0.9	1.1	1.26	0.73	-70.83
1,112.0	2.20	111.80	1,111.9	-4.5	1.5	-1.1	1.26	0.94	-28.96
1,207.0	3.40	122.70	1,206.8	-6.7	5.6	-5.0	1.38	1.26	11.47
1,303.0	5.10	125.00	1,302.5	-10.7	11.5	-10.5	1.78	1.77	2.40
1,399.0	6.50	123.10	1,398.0	-16.1	19.5	-18.0	1.47	1.46	-1.98
1,494.0	6.90	124.60	1,492.4	-22.3	28.8	-26.6	0.46	0.42	1.58
1,590.0	8.20	123.40	1,587.6	-29.3	39.2	-36.3	1.36	1.35	-1.25
1,635.0	7.80	123.90	1,632.1	-32.8	44.4	-41.2	0.90	-0.89	1.11
1,783.0	10.00	123.10	1,778.3	-45.4	63.5	-59.1	1.49	1.49	-0.54
1,879.0	11.80	120.40	1,872.6	-54.9	79.0	-73.6	1.95	1.88	-2.81
1,975.0	13.70	120.30	1,966.2	-65.7	97.3	-90.8	1.98	1.98	-0.10
2,071.0	15.60	121.00	2,059.1	-78.0	118.1	-110.5	1.99	1.98	0.73
2,166.0	17.80	122.40	2,150.1	-92.4	141.4	-132.2	2.35	2.32	1.47
2,262.0	16.80	121.00	2,241.7	-107.4	165.6	-155.0	1.13	-1.04	-1.46
2,357.0	18.20	113.20	2,332.4	-120.3	191.0	-179.2	2.87	1.47	-8.21
2,549.0	18.10	116.00	2,514.8	-145.2	245.4	-231.0	0.46	-0.05	1.46
2,644.0	17.90	116.20	2,605.2	-158.1	271.8	-256.1	0.22	-0.21	0.21
2,740.0	17.80	115.50	2,696.5	-171.0	298.3	-281.3	0.25	-0.10	-0.73
2,835.0	18.10	119.70	2,786.9	-184.5	324.2	-305.8	1.40	0.32	4.42
2,931.0	18.40	125.50	2,878.1	-200.7	349.5	-329.5	1.92	0.31	6.04
3,027.0	17.60	125.00	2,969.4	-217.8	373.7	-352.1	0.85	-0.83	-0.52
3,123.0	16.40	123.10	3,061.2	-233.6	396.9	-373.8	1.38	-1.25	-1.98
3,219.0	15.40	118.70	3,153.5	-247.1	419.5	-394.9	1.63	-1.04	-4.58
3,314.0	16.00	117.80	3,245.0	-259.2	442.1	-416.4	0.68	0.63	-0.95
3,410.0	16.80	125.70	3,337.1	-273.5	465.1	-437.9	2.47	0.83	8.23
3,506.0	14.80	121.00	3,429.5	-287.9	486.9	-458.3	2.47	-2.08	-4.90
3,601.0	17.30	125.00	3,520.8	-302.3	508.9	-478.9	2.88	2.63	4.21
3,697.0	18.70	125.00	3,612.1	-319.3	533.2	-501.5	1.46	1.46	0.00
3,793.0	19.00	123.80	3,702.9	-336.8	558.7	-525.4	0.51	0.31	-1.25
3,889.0	18.70	121.70	3,793.8	-353.6	584.8	-549.8	0.77	-0.31	-2.19
3,984.0	17.70	121.30	3,884.0	-369.1	610.1	-573.5	1.06	-1.05	-0.42
4,080.0	16.10	119.00	3,975.9	-383.1	634.2	-596.3	1.81	-1.67	-2.40
4,176.0	15.20	116.90	4,068.3	-395.3	657.1	-617.9	1.11	-0.94	-2.19
4,272.0	13.50	117.30	4,161.3	-406.1	678.3	-638.0	1.77	-1.77	0.42
4,368.0	14.60	119.40	4,254.4	-417.2	698.8	-657.4	1.26	1.15	2.19
4,464.0	13.30	117.10	4,347.6	-428.2	719.2	-676.7	1.47	-1.35	-2.40
4,559.0	13.80	122.40	4,440.0	-439.2	738.5	-694.9	1.41	0.53	5.58
4,654.0	14.20	124.30	4,532.1	-451.9	757.6	-712.8	0.64	0.42	2.00
4,749.0	14.00	127.60	4,624.3	-465.4	776.4	-730.2	0.87	-0.21	3.47
4,845.0	13.90	129.60	4,717.4	-479.9	794.5	-746.9	0.51	-0.10	2.08
4,941.0	12.80	123.80	4,810.9	-493.1	812.2	-763.3	1.80	-1.15	-6.04
5,037.0	12.30	124.60	4,904.6	-504.9	829.4	-779.4	0.55	-0.52	0.83
5,132.0	12.00	123.60	4,997.4	-516.1	846.0	-794.9	0.39	-0.32	-1.05
5,228.0	9.80	132.60	5,091.7	-527.1	860.3	-808.1	2.89	-2.29	9.38

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5,324.0	6.50	131.70	5,186.7	-536.3	870.4	-817.3	3.44	-3.44	-0.94
5,419.0	5.00	121.00	5,281.2	-542.0	878.0	-824.3	1.93	-1.58	-11.26
5,515.0	2.50	96.20	5,377.0	-544.4	883.6	-829.8	3.05	-2.60	-25.83
5,610.0	0.70	175.60	5,472.0	-545.2	885.7	-831.8	2.60	-1.89	83.58
5,706.0	0.90	129.40	5,568.0	-546.2	886.4	-832.3	0.68	0.21	-48.13
5,801.0	2.00	139.20	5,663.0	-548.0	888.0	-833.8	1.18	1.16	10.32
5,897.0	2.50	130.80	5,758.9	-550.6	890.7	-836.2	0.62	0.52	-8.75
5,992.0	3.00	122.50	5,853.8	-553.3	894.4	-839.6	0.67	0.53	-8.74
6,118.0	3.50	89.80	5,979.6	-555.0	901.0	-846.1	1.50	0.40	-25.95
6,214.0	1.00	260.80	6,075.5	-555.2	903.1	-848.1	4.68	-2.60	178.13
6,310.0	10.90	265.60	6,170.9	-556.0	893.2	-838.2	10.32	10.31	5.00
6,405.0	18.60	273.00	6,262.7	-555.9	869.1	-814.2	8.33	8.11	7.79
6,501.0	24.00	274.40	6,352.1	-553.6	834.3	-779.8	5.65	5.63	1.46
6,597.0	29.50	273.20	6,437.8	-550.8	791.2	-737.1	5.76	5.73	-1.25
6,692.0	38.00	271.40	6,516.7	-548.7	738.5	-684.8	9.01	8.95	-1.89
6,788.0	47.70	273.90	6,587.0	-545.6	673.4	-620.3	10.26	10.10	2.60
6,883.0	53.80	271.40	6,647.1	-542.3	599.9	-547.5	6.74	6.42	-2.63
6,979.0	58.90	267.90	6,700.3	-542.8	520.1	-467.9	6.12	5.31	-3.65
7,075.0	67.10	268.80	6,743.9	-545.3	434.6	-382.6	8.58	8.54	0.94
7,170.0	75.40	269.80	6,774.4	-546.3	344.8	-293.0	8.79	8.74	1.05
7,266.0	82.20	272.30	6,793.0	-544.6	250.7	-199.5	7.53	7.08	2.60
7,361.0	90.00	272.10	6,799.5	-541.0	156.0	-105.6	8.21	8.21	-0.21
7,457.0	89.40	269.30	6,800.0	-539.8	60.1	-10.1	2.98	-0.63	-2.92
7,553.0	89.00	268.60	6,801.3	-541.6	-35.9	85.6	0.84	-0.42	-0.73
7,649.0	89.10	268.40	6,802.9	-544.1	-131.9	181.4	0.23	0.10	-0.21
7,744.0	88.20	268.10	6,805.1	-547.0	-226.8	276.2	1.00	-0.95	-0.32
7,840.0	89.70	268.30	6,806.9	-550.0	-322.7	372.0	1.58	1.56	0.21
7,936.0	92.60	270.70	6,805.0	-550.8	-418.7	467.6	3.92	3.02	2.50
8,030.0	91.10	271.40	6,801.9	-549.1	-512.6	561.0	1.76	-1.60	0.74
8,126.0	89.70	272.30	6,801.3	-546.0	-608.6	656.3	1.73	-1.46	0.94
8,222.0	89.70	270.90	6,801.8	-543.3	-704.5	751.6	1.46	0.00	-1.46
8,317.0	89.80	269.30	6,802.2	-543.2	-799.5	846.1	1.69	0.11	-1.68
8,413.0	89.70	272.00	6,802.6	-542.1	-895.5	941.6	2.81	-0.10	2.81
8,508.0	89.10	271.30	6,803.6	-539.3	-990.5	1,035.9	0.97	-0.63	-0.74
8,604.0	88.60	271.30	6,805.5	-537.1	-1,086.4	1,131.3	0.52	-0.52	0.00
8,699.0	89.30	271.10	6,807.3	-535.2	-1,181.4	1,225.6	0.77	0.74	-0.21
8,794.0	88.20	271.10	6,809.3	-533.3	-1,276.3	1,320.0	1.16	-1.16	0.00
8,839.0	89.32	271.76	6,810.3	-532.2	-1,321.3	1,364.7	2.89	2.50	1.46
Deepest TVD Drilled 6810.3'									
8,890.0	90.60	272.50	6,810.3	-530.3	-1,372.3	1,415.3	2.89	2.50	1.46
8,986.0	89.90	272.30	6,809.9	-526.3	-1,468.2	1,510.4	0.76	-0.73	-0.21
9,081.0	91.50	271.80	6,808.8	-522.9	-1,563.1	1,604.6	1.76	1.68	-0.53
9,177.0	90.70	271.40	6,806.9	-520.2	-1,659.1	1,699.9	0.93	-0.83	-0.42

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9,273.0	90.40	271.40	6,806.0	-517.9	-1,755.0	1,795.3	0.31	-0.31	0.00
9,368.0	89.80	271.30	6,805.8	-515.6	-1,850.0	1,889.6	0.64	-0.63	-0.11
9,464.0	91.20	270.90	6,805.0	-513.8	-1,946.0	1,985.0	1.52	1.46	-0.42
9,560.0	90.70	270.70	6,803.4	-512.5	-2,042.0	2,080.5	0.56	-0.52	-0.21
9,656.0	90.20	270.40	6,802.6	-511.5	-2,137.9	2,176.0	0.61	-0.52	-0.31
9,752.0	89.70	270.00	6,802.7	-511.2	-2,233.9	2,271.5	0.67	-0.52	-0.42
9,848.0	90.90	270.20	6,802.2	-511.0	-2,329.9	2,367.1	1.27	1.25	0.21
9,943.0	90.10	269.80	6,801.4	-511.0	-2,424.9	2,461.7	0.94	-0.84	-0.42
10,039.0	89.80	270.00	6,801.5	-511.2	-2,520.9	2,557.3	0.38	-0.31	0.21
10,134.0	90.70	270.90	6,801.1	-510.5	-2,615.9	2,651.8	1.34	0.95	0.95
10,230.0	90.60	270.50	6,800.0	-509.3	-2,711.9	2,747.3	0.43	-0.10	-0.42
10,326.0	90.90	270.00	6,798.7	-508.9	-2,807.9	2,842.8	0.61	0.31	-0.52
10,421.0	91.30	269.30	6,796.9	-509.4	-2,902.9	2,937.5	0.85	0.42	-0.74
10,517.0	90.00	270.00	6,795.8	-510.0	-2,998.9	3,033.1	1.54	-1.35	0.73
10,612.0	90.70	269.30	6,795.2	-510.6	-3,093.9	3,127.7	1.04	0.74	-0.74
10,707.0	90.10	270.70	6,794.6	-510.6	-3,188.9	3,222.3	1.60	-0.63	1.47
10,803.0	89.00	270.90	6,795.3	-509.3	-3,284.9	3,317.8	1.16	-1.15	0.21
10,899.0	89.20	270.90	6,796.8	-507.8	-3,380.8	3,413.2	0.21	0.21	0.00
10,994.0	89.30	270.40	6,798.1	-506.7	-3,475.8	3,507.7	0.54	0.11	-0.53
11,090.0	90.10	271.40	6,798.6	-505.2	-3,571.8	3,603.1	1.33	0.83	1.04
11,185.0	91.00	271.10	6,797.7	-503.1	-3,666.8	3,697.5	1.00	0.95	-0.32
11,280.0	91.90	270.70	6,795.3	-501.6	-3,761.7	3,791.9	1.04	0.95	-0.42
11,376.0	90.40	271.30	6,793.3	-499.9	-3,857.7	3,887.3	1.68	-1.56	0.63
11,472.0	88.90	271.30	6,793.9	-497.8	-3,953.7	3,982.7	1.56	-1.56	0.00
11,567.0	89.90	271.30	6,794.9	-495.6	-4,048.6	4,077.1	1.05	1.05	0.00
11,662.0	91.20	271.30	6,794.0	-493.4	-4,143.6	4,171.4	1.37	1.37	0.00
11,757.0	88.90	271.60	6,793.9	-491.0	-4,238.6	4,265.8	2.44	-2.42	0.32
11,853.0	89.40	271.10	6,795.3	-488.8	-4,334.5	4,361.1	0.74	0.52	-0.52
11,948.0	91.20	271.30	6,794.8	-486.8	-4,429.5	4,455.5	1.91	1.89	0.21
12,044.0	92.30	270.90	6,791.9	-485.0	-4,525.4	4,550.9	1.22	1.15	-0.42
12,140.0	89.60	271.10	6,790.3	-483.3	-4,621.4	4,646.3	2.82	-2.81	0.21
12,236.0	89.10	270.50	6,791.4	-481.9	-4,717.4	4,741.7	0.81	-0.52	-0.63
12,331.0	88.50	270.40	6,793.4	-481.2	-4,812.4	4,836.2	0.64	-0.63	-0.11
12,427.0	89.50	269.70	6,795.1	-481.1	-4,908.3	4,931.8	1.27	1.04	-0.73
12,523.0	90.60	267.90	6,795.0	-483.1	-5,004.3	5,027.5	2.20	1.15	-1.88
12,619.0	90.40	268.10	6,794.1	-486.5	-5,100.3	5,123.4	0.29	-0.21	0.21
12,714.0	90.70	267.60	6,793.2	-490.0	-5,195.2	5,218.2	0.61	0.32	-0.53
12,810.0	90.30	267.40	6,792.4	-494.2	-5,291.1	5,314.1	0.47	-0.42	-0.21
12,874.0	90.00	267.00	6,792.2	-497.3	-5,355.0	5,378.1	0.78	-0.47	-0.63
12,929.0	90.00	267.00	6,792.2	-500.2	-5,409.9	5,433.0	0.00	0.00	0.00

Company:	PDC Energy Inc. DJ Basin	Local Co-ordinate Reference:	Well Josephine 19O-314
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 19O-314	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	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 1834'FNL, 2215'FE - survey hits target center - Point	0.00	0.00	1.0	0.0	0.0	1,385,066.90	3,253,129.81	40.386850	-104.591290
BHL 2330'FNL, 2453'FE - survey misses target center by 16.4ft at 12928.3ft MD (6792.2 TVD, -500.2 N, -5409.2 E) - Point	0.00	0.00	6,790.0	-483.9	-5,410.1	1,384,527.57	3,247,725.23	40.385520	-104.610710

Survey Annotations				
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
+N/-S (ft)	+E/-W (ft)			
8,839.0	6,810.3	-532.2	-1,321.3	Deepest TVD Drilled 6810.3'

Checked By: _____	Approved By: _____	Date: _____
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