

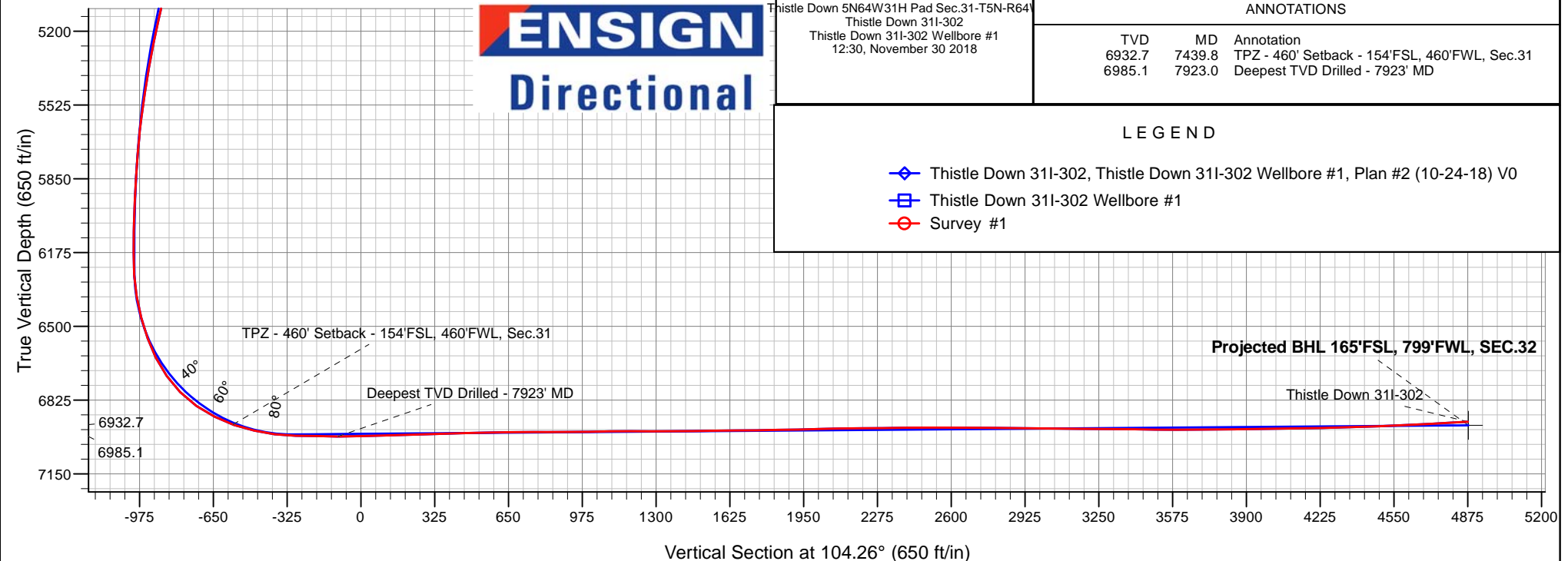
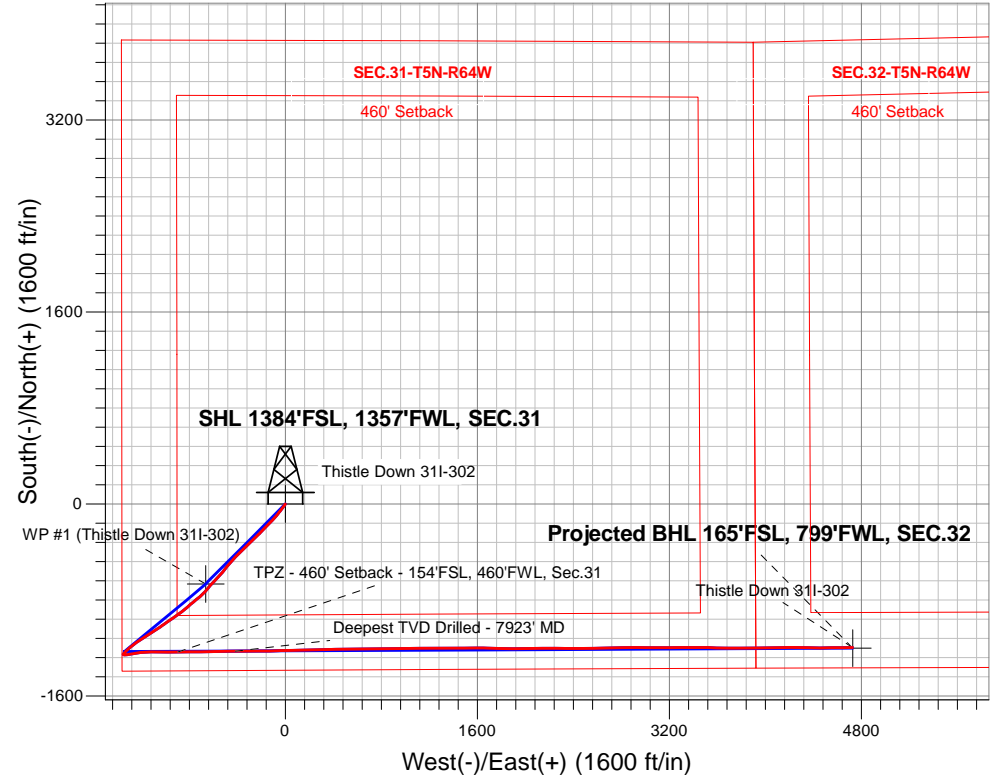
PDC Energy Inc. DJ Basin

Well Name: **Thistle Down 31I-302**

Surface Location: Thistle Down 5N64W31H Pad Sec.31-T5N-R64W
North American Datum 1983 , US State Plane 1983, Colorado Northern Zone
Ground Elevation: 4803.0
+N/-S+E/-W Northing Easting Latitude Longitude Slot
0.0 0.0 1372438.94 3251620.34 40.352230 -104.597170
Original Well Elev WELL @ 4826.0ft (Original Well Elev)

FINAL SURVEY

Projected Bottom Hole Location
13,069'MD 6920'TVD 1196'S & 4727'E of SHL
93.25 degree Incl @ 89.09 degree AZM





PDC Energy Inc. DJ Basin

SEC.31-T5N-R64W

Thistle Down 5N64W31H Pad Sec.31-T5N-R64W

Thistle Down 31I-302

Thistle Down 31I-302 Wellbore #1

Survey: Survey #1

Standard Survey Report

30 November, 2018

Company:	PDC Energy Inc. DJ Basin	Local Co-ordinate Reference:	Well Thistle Down 311-302
Project:	SEC.31-T5N-R64W	TVD Reference:	WELL @ 4826.0ft (Original Well Elev)
Site:	Thistle Down 5N64W31H Pad Sec.31-T5N-R64W	MD Reference:	WELL @ 4826.0ft (Original Well Elev)
Well:	Thistle Down 311-302	North Reference:	True
Wellbore:	Thistle Down 311-302 Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Thistle Down 311-302 Wellbore #1	Database:	US_EDM

Project	SEC.31-T5N-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	Thistle Down 5N64W31H Pad Sec.31-T5N-R64W				
Site Position:		Northing:	1,372,559.16 usft	Latitude:	40.352560
From:	Lat/Long	Easting:	3,251,619.12 usft	Longitude:	-104.597170
Position Uncertainty:	0.0 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.58 °

Well	Thistle Down 311-302					
Well Position	+N/-S	0.0 ft	Northing:	1,372,438.94 usft	Latitude:	40.352230
	+E/-W	0.0 ft	Easting:	3,251,620.34 usft	Longitude:	-104.597170
Position Uncertainty		0.0 ft	Wellhead Elevation:	0.0 ft	Ground Level:	4,803.0 ft

Wellbore	Thistle Down 311-302 Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	11/30/2018	8.17	66.83	52,188

Design	Thistle Down 311-302 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	104.26	

Survey Program	Date	11/30/2018			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
125.0	13,069.0	Survey #1 (Thistle Down 311-302 Wellbore	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	
1.0	0.00	53.30	1.0	0.0	0.0	0.0	0.40	0.40	0.00	
SHL 1384'FSL, 1357'FWL, SEC.31										
125.0	0.50	53.30	125.0	0.3	0.4	0.3	0.40	0.40	0.00	
221.0	1.00	214.10	221.0	-0.1	0.3	0.3	1.54	0.52	167.50	
317.0	3.20	214.30	316.9	-3.0	-1.7	-0.9	2.29	2.29	0.21	
413.0	5.50	217.30	412.6	-8.9	-6.0	-3.6	2.41	2.40	3.13	
540.0	7.90	216.00	538.8	-20.8	-14.8	-9.2	1.89	1.89	-1.02	
668.0	9.80	216.00	665.2	-36.7	-26.4	-16.5	1.48	1.48	0.00	
827.0	12.80	217.30	821.1	-61.7	-45.0	-28.4	1.89	1.89	0.82	

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Site:	Thistle Down 5N64W31H Pad Sec.31-T5N-R64W	MD Reference:	WELL @ 4826.0ft (Original Well Elev)
Well:	Thistle Down 311-302	North Reference:	True
Wellbore:	Thistle Down 311-302 Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Thistle Down 311-302 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)
954.0	15.60	220.80	944.2	-85.8	-64.7	-41.5	2.31	2.20	2.76
1,050.0	15.10	219.20	1,036.8	-105.3	-81.0	-52.6	0.68	-0.52	-1.67
1,146.0	16.50	222.50	1,129.2	-125.0	-98.1	-64.3	1.73	1.46	3.44
1,241.0	16.50	223.80	1,220.3	-144.7	-116.6	-77.3	0.39	0.00	1.37
1,337.0	17.70	224.50	1,312.0	-165.0	-136.3	-91.4	1.27	1.25	0.73
1,433.0	18.20	224.80	1,403.4	-186.0	-157.0	-106.4	0.53	0.52	0.31
1,615.0	18.70	223.90	1,576.0	-227.2	-197.3	-135.2	0.32	0.27	-0.49
1,700.0	17.18	222.06	1,656.9	-246.3	-215.2	-147.8	1.91	-1.79	-2.16
1,795.0	19.39	225.20	1,747.1	-267.9	-235.8	-162.5	2.55	2.33	3.31
1,891.0	19.74	225.94	1,837.5	-290.4	-258.7	-179.2	0.45	0.36	0.77
1,986.0	22.24	228.00	1,926.2	-313.6	-283.6	-197.6	2.74	2.63	2.17
2,081.0	23.03	227.94	2,013.9	-338.0	-310.8	-217.9	0.83	0.83	-0.06
2,176.0	22.61	226.63	2,101.5	-363.0	-337.8	-238.0	0.69	-0.44	-1.38
2,271.0	21.51	225.72	2,189.5	-387.7	-363.6	-256.8	1.21	-1.16	-0.96
2,366.0	20.99	223.53	2,278.1	-412.2	-387.8	-274.3	1.00	-0.55	-2.31
2,460.0	22.71	224.18	2,365.3	-437.4	-412.0	-291.5	1.85	1.83	0.69
2,555.0	21.82	221.16	2,453.2	-463.9	-436.4	-308.7	1.53	-0.94	-3.18
2,650.0	21.00	219.18	2,541.7	-490.4	-458.8	-323.8	1.15	-0.86	-2.08
2,745.0	20.60	217.97	2,630.5	-516.8	-479.8	-337.7	0.62	-0.42	-1.27
2,840.0	20.47	218.20	2,719.4	-543.0	-500.4	-351.2	0.16	-0.14	0.24
2,935.0	22.82	223.61	2,807.7	-569.4	-523.4	-367.0	3.24	2.47	5.69
3,125.0	22.86	222.56	2,982.8	-623.2	-573.7	-402.5	0.22	0.02	-0.55
3,220.0	22.85	222.57	3,070.4	-650.4	-598.7	-420.0	0.01	-0.01	0.01
3,316.0	22.11	221.89	3,159.1	-677.6	-623.4	-437.2	0.82	-0.77	-0.71
3,411.0	21.06	219.43	3,247.4	-704.1	-646.2	-452.8	1.46	-1.11	-2.59
3,468.8	20.06	220.32	3,301.5	-719.7	-659.2	-461.5	1.81	-1.72	1.54
WP #1 (Thistle Down 311-302)									
3,532.0	18.98	221.40	3,361.1	-735.6	-673.0	-471.0	1.81	-1.71	1.71
3,627.0	18.75	230.96	3,451.0	-756.9	-695.1	-487.2	3.26	-0.24	10.06
3,818.0	19.27	229.45	3,631.6	-796.7	-742.9	-523.7	0.37	0.27	-0.79
3,914.0	18.71	229.28	3,722.4	-817.0	-766.6	-541.6	0.59	-0.58	-0.18
4,009.0	19.66	229.49	3,812.1	-837.3	-790.3	-559.6	1.00	1.00	0.22
4,105.0	22.23	230.47	3,901.8	-859.4	-816.5	-579.6	2.70	2.68	1.02
4,201.0	22.39	230.48	3,990.6	-882.6	-844.7	-601.2	0.17	0.17	0.01
4,297.0	21.11	230.22	4,079.7	-905.3	-872.0	-622.1	1.34	-1.33	-0.27
4,392.0	22.54	236.21	4,167.9	-926.4	-900.3	-644.3	2.78	1.51	6.31
4,487.0	21.93	235.99	4,255.9	-946.4	-930.2	-668.3	0.65	-0.64	-0.23
4,583.0	21.30	235.59	4,345.1	-966.3	-959.4	-691.8	0.67	-0.66	-0.42
4,678.0	20.39	234.51	4,433.9	-985.7	-987.1	-713.9	1.04	-0.96	-1.14
4,773.0	19.77	233.82	4,523.1	-1,004.7	-1,013.6	-734.8	0.70	-0.65	-0.73
4,869.0	21.36	236.42	4,613.0	-1,024.0	-1,041.2	-756.9	1.91	1.66	2.71
4,964.0	21.92	237.90	4,701.3	-1,043.0	-1,070.7	-780.7	0.82	0.59	1.56

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Site:	Thistle Down 5N64W31H Pad Sec.31-T5N-R64W	MD Reference:	WELL @ 4826.0ft (Original Well Elev)
Well:	Thistle Down 311-302	North Reference:	True
Wellbore:	Thistle Down 311-302 Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Thistle Down 311-302 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)
5,060.0	21.00	237.41	4,790.7	-1,061.8	-1,100.4	-804.8	0.98	-0.96	-0.51
5,155.0	20.29	237.57	4,879.6	-1,079.8	-1,128.6	-827.8	0.75	-0.75	0.17
5,250.0	19.45	236.72	4,968.9	-1,097.3	-1,155.7	-849.7	0.94	-0.88	-0.89
5,346.0	18.89	236.93	5,059.6	-1,114.5	-1,182.1	-871.1	0.59	-0.58	0.22
5,441.0	18.58	235.63	5,149.5	-1,131.5	-1,207.5	-891.5	0.55	-0.33	-1.37
5,537.0	17.45	234.10	5,240.8	-1,148.6	-1,231.8	-910.8	1.28	-1.18	-1.59
5,632.0	15.96	234.08	5,331.8	-1,164.6	-1,253.9	-928.3	1.57	-1.57	-0.02
5,727.0	14.68	232.15	5,423.4	-1,179.6	-1,274.0	-944.1	1.45	-1.35	-2.03
5,822.0	13.42	231.14	5,515.6	-1,193.9	-1,292.1	-958.1	1.35	-1.33	-1.06
5,918.0	11.79	228.83	5,609.3	-1,207.4	-1,308.1	-970.3	1.78	-1.70	-2.41
6,013.0	9.88	224.21	5,702.6	-1,219.6	-1,321.1	-979.9	2.21	-2.01	-4.86
6,109.0	7.73	224.75	5,797.5	-1,230.1	-1,331.4	-987.3	2.24	-2.24	0.56
6,204.0	6.83	221.92	5,891.7	-1,238.8	-1,339.7	-993.2	1.02	-0.95	-2.98
6,300.0	4.48	222.73	5,987.2	-1,245.8	-1,346.0	-997.6	2.45	-2.45	0.84
6,395.0	2.46	212.61	6,082.0	-1,250.3	-1,349.6	-1,000.0	2.21	-2.13	-10.65
6,490.0	2.26	205.37	6,177.0	-1,253.7	-1,351.5	-1,001.0	0.38	-0.21	-7.62
6,586.0	3.39	106.48	6,272.9	-1,256.2	-1,349.6	-998.5	4.54	1.18	-103.01
6,681.0	9.81	92.18	6,367.2	-1,257.3	-1,338.8	-987.8	6.92	6.76	-15.05
6,777.0	15.88	83.22	6,460.8	-1,256.1	-1,317.6	-967.5	6.64	6.32	-9.33
6,873.0	21.02	79.74	6,551.8	-1,251.5	-1,287.6	-939.6	5.47	5.35	-3.63
6,968.0	28.59	79.77	6,638.0	-1,244.4	-1,248.4	-903.3	7.97	7.97	0.03
7,064.0	37.00	83.54	6,718.6	-1,237.0	-1,197.0	-855.3	9.01	8.76	3.93
7,159.0	45.56	88.93	6,790.0	-1,233.2	-1,134.6	-795.8	9.75	9.01	5.67
7,255.0	55.64	91.09	6,850.8	-1,233.3	-1,060.5	-723.9	10.64	10.50	2.25
7,350.0	64.13	89.93	6,898.4	-1,234.0	-978.4	-644.2	9.00	8.94	-1.22
7,439.8	71.06	89.10	6,932.7	-1,233.3	-895.4	-564.0	7.76	7.72	-0.93
TPZ - 460' Setback - 154'FSL, 460'FWL, Sec.31									
7,445.0	71.46	89.05	6,934.3	-1,233.2	-890.5	-559.2	7.76	7.72	-0.88
7,541.0	78.11	89.76	6,959.5	-1,232.2	-797.9	-469.7	6.96	6.93	0.74
7,636.0	82.45	89.34	6,975.5	-1,231.5	-704.3	-379.2	4.59	4.57	-0.44
7,719.8	88.48	89.27	6,982.2	-1,230.5	-620.8	-298.5	7.20	7.20	-0.08
LPL 160'FSL, 735'FWL, SEC.31									
7,732.0	89.36	89.26	6,982.4	-1,230.3	-608.6	-286.7	7.20	7.20	-0.08
7,827.0	89.06	89.09	6,983.7	-1,228.9	-513.6	-195.0	0.36	-0.32	-0.18
7,923.0	89.28	89.07	6,985.1	-1,227.4	-417.7	-102.4	0.23	0.23	-0.02
Deepest TVD Drilled - 7923' MD									
8,018.0	91.76	89.97	6,984.2	-1,226.6	-322.7	-10.5	2.78	2.61	0.95
8,114.0	91.62	89.45	6,981.4	-1,226.1	-226.7	82.4	0.56	-0.15	-0.54
8,209.0	91.65	89.02	6,978.7	-1,224.9	-131.8	174.1	0.45	0.03	-0.45
8,305.0	91.67	88.57	6,975.9	-1,222.8	-35.8	266.6	0.47	0.02	-0.47
8,401.0	91.79	88.22	6,973.0	-1,220.2	60.1	358.9	0.39	0.13	-0.36
8,496.0	91.68	87.50	6,970.1	-1,216.6	155.0	450.0	0.77	-0.12	-0.76
8,592.0	90.71	90.34	6,968.1	-1,214.8	250.9	542.5	3.13	-1.01	2.96

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8,687.0	90.67	89.46	6,967.0	-1,214.6	345.9	634.5	0.93	-0.04	-0.93
8,782.0	90.31	89.29	6,966.2	-1,213.6	440.9	726.3	0.42	-0.38	-0.18
8,878.0	90.41	88.52	6,965.6	-1,211.8	536.9	818.9	0.81	0.10	-0.80
8,974.0	90.15	88.09	6,965.1	-1,208.9	632.9	911.2	0.52	-0.27	-0.45
9,069.0	90.93	89.80	6,964.2	-1,207.2	727.8	1,002.8	1.98	0.82	1.80
9,165.0	90.72	89.48	6,962.8	-1,206.6	823.8	1,095.7	0.40	-0.22	-0.33
9,260.0	90.01	88.96	6,962.2	-1,205.3	918.8	1,187.4	0.93	-0.75	-0.55
9,356.0	89.91	88.51	6,962.3	-1,203.2	1,014.8	1,279.9	0.48	-0.10	-0.47
9,451.0	90.31	90.62	6,962.1	-1,202.4	1,109.8	1,371.8	2.26	0.42	2.22
9,546.0	90.75	90.24	6,961.2	-1,203.1	1,204.8	1,464.1	0.61	0.46	-0.40
9,642.0	90.84	89.84	6,959.9	-1,203.2	1,300.8	1,557.1	0.43	0.09	-0.42
9,738.0	90.38	89.77	6,958.9	-1,202.9	1,396.8	1,650.1	0.48	-0.48	-0.07
9,834.0	90.73	89.30	6,957.9	-1,202.1	1,492.7	1,742.9	0.61	0.36	-0.49
9,929.0	91.14	88.96	6,956.4	-1,200.7	1,587.7	1,834.6	0.56	0.43	-0.36
10,023.0	91.21	91.92	6,954.5	-1,201.4	1,681.7	1,925.8	3.15	0.07	3.15
10,119.0	91.27	91.32	6,952.4	-1,204.1	1,777.6	2,019.5	0.63	0.06	-0.63
10,214.0	91.02	90.66	6,950.5	-1,205.7	1,872.6	2,111.9	0.74	-0.26	-0.69
10,310.0	90.63	89.89	6,949.1	-1,206.2	1,968.6	2,205.1	0.90	-0.41	-0.80
10,406.0	90.66	89.09	6,948.0	-1,205.4	2,064.6	2,297.9	0.83	0.03	-0.83
10,502.0	90.24	88.56	6,947.3	-1,203.4	2,160.5	2,390.4	0.70	-0.44	-0.55
10,597.0	90.14	90.86	6,947.0	-1,202.9	2,255.5	2,482.4	2.42	-0.11	2.42
10,693.0	90.16	90.52	6,946.7	-1,204.1	2,351.5	2,575.7	0.35	0.02	-0.35
10,788.0	89.94	89.82	6,946.6	-1,204.3	2,446.5	2,667.8	0.77	-0.23	-0.74
10,884.0	89.70	89.27	6,946.9	-1,203.6	2,542.5	2,760.7	0.63	-0.25	-0.57
10,979.0	89.51	88.91	6,947.6	-1,202.1	2,637.5	2,852.4	0.43	-0.20	-0.38
11,075.0	89.18	88.39	6,948.7	-1,199.8	2,733.5	2,944.8	0.64	-0.34	-0.54
11,170.0	88.86	88.46	6,950.3	-1,197.2	2,828.4	3,036.2	0.34	-0.34	0.07
11,266.0	89.84	91.04	6,951.4	-1,196.8	2,924.4	3,129.1	2.87	1.02	2.69
11,362.0	89.61	90.58	6,951.8	-1,198.1	3,020.4	3,222.5	0.54	-0.24	-0.48
11,457.0	89.63	89.90	6,952.5	-1,198.5	3,115.4	3,314.7	0.72	0.02	-0.72
11,553.0	89.26	89.67	6,953.4	-1,198.2	3,211.4	3,407.6	0.45	-0.39	-0.24
11,648.0	89.47	89.47	6,954.5	-1,197.5	3,306.4	3,499.5	0.31	0.22	-0.21
11,744.0	89.44	89.25	6,955.4	-1,196.4	3,402.4	3,592.3	0.23	-0.03	-0.23
11,840.0	90.72	91.60	6,955.2	-1,197.1	3,498.4	3,685.5	2.79	1.33	2.45
11,935.0	90.36	91.17	6,954.3	-1,199.4	3,593.3	3,778.1	0.59	-0.38	-0.45
12,031.0	90.70	90.86	6,953.5	-1,201.1	3,689.3	3,871.5	0.48	0.35	-0.32
12,127.0	90.79	90.28	6,952.2	-1,202.1	3,785.3	3,964.8	0.61	0.09	-0.60
12,222.0	90.87	89.46	6,950.8	-1,201.8	3,880.3	4,056.8	0.87	0.08	-0.86
12,318.0	91.12	88.72	6,949.2	-1,200.3	3,976.3	4,149.4	0.81	0.26	-0.77
12,414.0	91.17	87.97	6,947.2	-1,197.5	4,072.2	4,241.7	0.78	0.05	-0.78
12,510.0	91.14	90.61	6,945.3	-1,196.3	4,168.2	4,334.4	2.75	-0.03	2.75
12,605.0	91.96	91.03	6,942.7	-1,197.7	4,263.1	4,426.8	0.97	0.86	0.44
12,701.0	92.47	90.38	6,939.0	-1,198.9	4,359.0	4,520.0	0.86	0.53	-0.68

Company:	PDC Energy Inc. DJ Basin	Local Co-ordinate Reference:	Well Thistle Down 31I-302
Project:	SEC.31-T5N-R64W	TVD Reference:	WELL @ 4826.0ft (Original Well Elev)
Site:	Thistle Down 5N64W31H Pad Sec.31-T5N-R64W	MD Reference:	WELL @ 4826.0ft (Original Well Elev)
Well:	Thistle Down 31I-302	North Reference:	True
Wellbore:	Thistle Down 31I-302 Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Thistle Down 31I-302 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)
12,796.0	92.72	90.04	6,934.7	-1,199.2	4,453.9	4,612.1	0.44	0.26	-0.36
12,892.0	93.02	89.55	6,929.9	-1,198.9	4,549.8	4,704.9	0.60	0.31	-0.51
12,987.0	93.25	89.09	6,924.7	-1,197.8	4,644.7	4,796.6	0.54	0.24	-0.48
13,068.8	93.25	89.09	6,920.1	-1,196.5	4,726.3	4,875.4	0.00	0.00	0.00
Projected BHL 165'FSL, 799'FWL, SEC.32									
13,069.0	93.25	89.09	6,920.1	-1,196.5	4,726.5	4,875.6	0.00	0.00	0.00

Design Targets									
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (usft)	Easting (usft)	Latitude	Longitude
- hit/miss target									
- Shape									
SHL 1384'FSL, 1357'FW	0.00	0.00	1.0	0.0	0.0	1,372,438.95	3,251,620.34	40.352230	-104.597170
- survey hits target center									
- Point									
WP #1 (Thistle Down 31	0.00	0.00	3,315.0	-667.0	-664.1	1,371,765.25	3,250,963.09	40.350399	-104.599553
- survey misses target center by 54.6ft at 3468.3ft MD (3301.1 TVD, -719.5 N, -659.1 E)									
- Point									
Projected BHL 165'FSL,	0.00	0.00	6,936.0	-1,201.8	4,727.3	1,371,285.42	3,256,359.42	40.348930	-104.580210
- survey misses target center by 16.8ft at 13068.8ft MD (6920.1 TVD, -1196.5 N, 4726.3 E)									
- Point									

Survey Annotations				
Measured Depth (ft)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Comment
7,439.8	6,932.7	-1,233.3	-895.4	TPZ - 460' Setback - 154'FSL, 460'FWL, Sec.31
7,923.0	6,985.1	-1,227.4	-417.7	Deepest TVD Drilled - 7923' MD

Checked By: _____	Approved By: _____	Date: _____
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