

# PETROLEUM DEVELOPMENT CORP DJ Basin

Well Name: **Lajco 17R-223**

Surface Location: Lajco 4N67W17R Pad Sec.17-T4N-R67W

North American Datum 1983 , US State Plane 1983, Colorado Northern Zone

Ground Elevation: 4794.0

+N/-S +E/-W Northing Easting Latitude Longitude Slot

0.0 0.01359742.203163452.87 40.319410 -104.913810

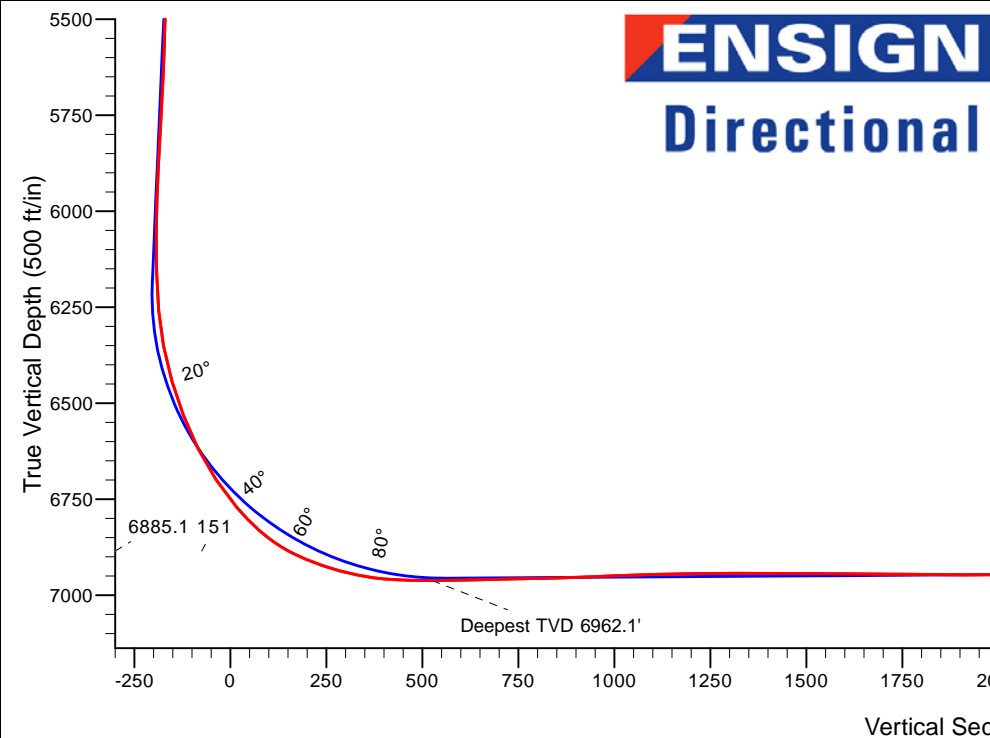
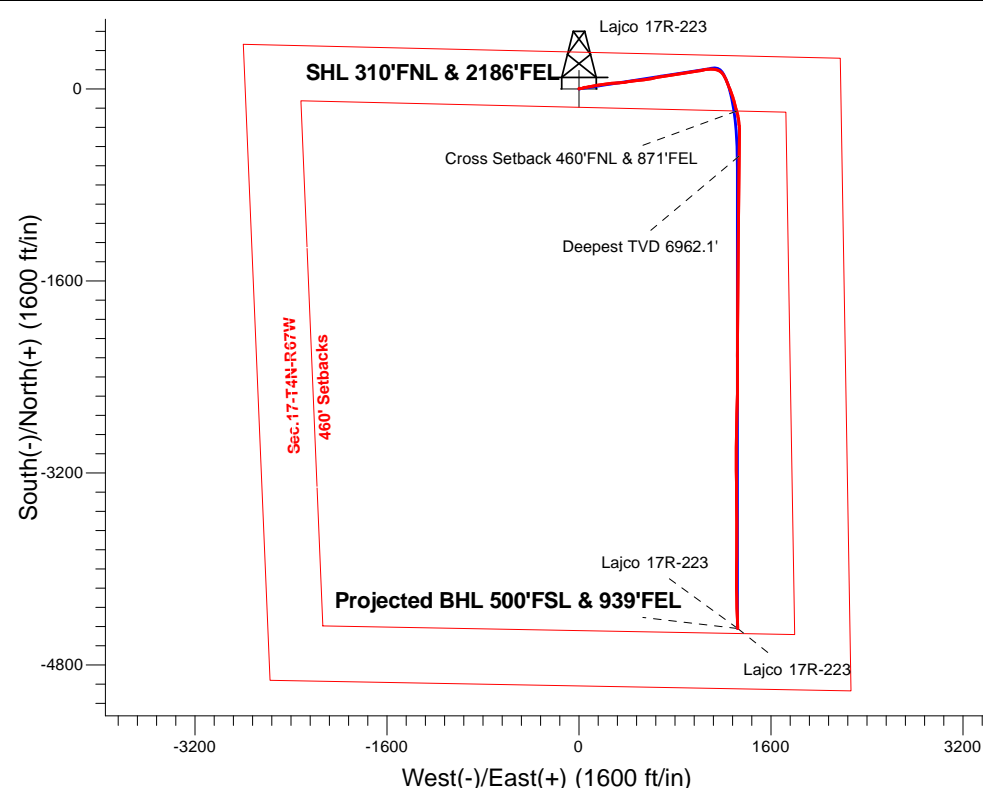
RKB - 13' WELL @ 4807.0ft (RKB - 13')

## FINAL SURVEY

Projected Bottom Hole Location

11477'MD 6924'TVD 4495'S & 1323'E of SHL

90.7 degree Incl @ 177.6 degree AZM



**ENSIGN**  
Directional

Lajco 4N67W17R Pad Sec.17-T4N-R67W  
Lajco 17R-223  
Wellbore #1  
15:55, January 08 2016

### ANNOTATIONS

TVD	MD	Annotation
6885.1	7150.7	Cross Setback 460'FNL & 871'FEL
6962.0	7540.2	Deepest TVD 6962.1'

### LEGEND

- △ Lajco 17R-223, Wellbore #1, Plan #3 (12-28-15)R V0
- Wellbore #1
- Survey #1

**Projected BHL 500'FSL & 939'FEL**

Lajco 17R-223

Lajco 17R-223



# Directional

## **PETROLEUM DEVELOPMENT CORP DJ Basin**

**SEC.17-T4N-R67W**

**Lajco 4N67W17R Pad Sec.17-T4N-R67W**

**Lajco 17R-223**

**Wellbore #1**

**Survey: Survey #1**

## **Standard Survey Report**

**08 January, 2016**

<b>Company:</b>	PETROLEUM DEVELOPMENT CORP DJ Basin	<b>Local Co-ordinate Reference:</b>	Well Lajco 17R-223
<b>Project:</b>	SEC.17-T4N-R67W	<b>TVD Reference:</b>	WELL @ 4807.0ft (RKB - 13')
<b>Site:</b>	Lajco 4N67W17R Pad Sec.17-T4N-R67W	<b>MD Reference:</b>	WELL @ 4807.0ft (RKB - 13')
<b>Well:</b>	Lajco 17R-223	<b>North Reference:</b>	True
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	US_EDM

<b>Project</b>	SEC.17-T4N-R67W, Weld County, Colorado		
<b>Map System:</b>	US State Plane 1983	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b>	North American Datum 1983		Using Well Reference Point
<b>Map Zone:</b>	Colorado Northern Zone		Using geodetic scale factor

Site	Lajco 4N67W17R Pad Sec.17-T4N-R67W				
Site Position:		Northing:	1,359,711.77 usft	Latitude:	40.319300
From:	Lat/Long	Easting:	3,164,903.08 usft	Longitude:	-104.908610
Position Uncertainty:	0.0 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.38 °

Well	Lajco 17R-223					
Well Position	+N-S	0.0 ft	Northing:	1,359,742.20 usft	Latitude:	40.319410
	+E-W	0.0 ft	Easting:	3,163,452.87 usft	Longitude:	-104.913810
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	4,794.0 ft

<b>Wellbore</b>	Wellbore #1				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2010	12/28/2015	8.33	66.80	52,596

<b>Design</b>	Wellbore #1				
<b>Audit Notes:</b>					
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b>	0.0
<b>Vertical Section:</b>	<b>Depth From (TVD) (ft)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Direction (°)</b>	
	0.0	0.0	0.0	181.42	

<b>Survey Program</b>	<b>Date</b>	1/8/2016			
<b>From (ft)</b>	<b>To (ft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
104.0	11,477.0	Survey #1 (Wellbore #1)	MWD	MWD - Standard	

<b>Survey</b>										
<b>Measured Depth (ft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (ft)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Vertical Section (ft)</b>	<b>Dogleg Rate (°/100usft)</b>	<b>Build Rate (°/100usft)</b>	<b>Turn Rate (°/100usft)</b>	
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00	
104.0	1.00	350.90	104.0	0.9	-0.1	-0.9	0.96	0.96	0.00	
200.0	0.90	350.90	200.0	2.5	-0.4	-2.5	0.10	-0.10	0.00	
295.0	1.20	54.10	295.0	3.8	0.3	-3.8	1.19	0.32	66.53	
391.0	1.90	82.90	390.9	4.6	2.7	-4.6	1.07	0.73	30.00	
487.0	2.20	88.20	486.9	4.8	6.1	-5.0	0.37	0.31	5.52	
583.0	2.20	93.10	582.8	4.8	9.8	-5.0	0.20	0.00	5.10	
678.0	1.80	90.80	677.7	4.7	13.1	-5.0	0.43	-0.42	-2.42	
774.0	1.50	99.60	773.7	4.4	15.8	-4.8	0.41	-0.31	9.17	
838.0	1.70	103.30	837.7	4.1	17.6	-4.5	0.35	0.31	5.78	

<b>Company:</b>	PETROLEUM DEVELOPMENT CORP DJ Basin	<b>Local Co-ordinate Reference:</b>	Well Lajco 17R-223
<b>Project:</b>	SEC.17-T4N-R67W	<b>TVD Reference:</b>	WELL @ 4807.0ft (RKB - 13')
<b>Site:</b>	Lajco 4N67W17R Pad Sec.17-T4N-R67W	<b>MD Reference:</b>	WELL @ 4807.0ft (RKB - 13')
<b>Well:</b>	Lajco 17R-223	<b>North Reference:</b>	True
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	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)
934.0	1.90	79.50	933.6	4.0	20.5	-4.5	0.80	0.21	-24.79
1,030.0	2.20	78.00	1,029.6	4.7	23.9	-5.3	0.32	0.31	-1.56
1,126.0	1.90	63.50	1,125.5	5.8	27.1	-6.5	0.62	-0.31	-15.10
1,198.0	2.10	69.70	1,197.5	6.8	29.4	-7.5	0.41	0.28	8.61
1,320.0	1.80	75.80	1,319.4	8.0	33.4	-8.9	0.30	-0.25	5.00
1,416.0	3.00	63.90	1,415.3	9.5	37.1	-10.4	1.35	1.25	-12.40
1,512.0	4.40	66.90	1,511.1	12.1	42.8	-13.1	1.47	1.46	3.13
1,608.0	5.10	89.40	1,606.8	13.6	50.4	-14.8	2.06	0.73	23.44
1,704.0	7.10	84.60	1,702.2	14.2	60.6	-15.7	2.15	2.08	-5.00
1,799.0	8.80	77.80	1,796.3	16.2	73.5	-18.1	2.04	1.79	-7.16
1,895.0	10.60	82.00	1,890.9	19.0	89.5	-21.2	2.01	1.88	4.38
1,991.0	12.20	79.50	1,985.1	22.1	108.2	-24.8	1.74	1.67	-2.60
2,087.0	13.70	75.70	2,078.6	26.8	129.2	-30.0	1.80	1.56	-3.96
2,182.0	13.50	79.90	2,170.9	31.5	151.0	-35.2	1.06	-0.21	4.42
2,278.0	15.20	82.70	2,264.0	35.1	174.5	-39.4	1.91	1.77	2.92
2,374.0	15.00	79.30	2,356.6	39.0	199.2	-43.9	0.95	-0.21	-3.54
2,470.0	16.30	86.20	2,449.1	42.2	224.9	-47.7	2.36	1.35	7.19
2,566.0	15.90	84.30	2,541.3	44.4	251.4	-50.6	0.69	-0.42	-1.98
2,662.0	13.50	80.80	2,634.2	47.5	275.5	-54.3	2.66	-2.50	-3.65
2,758.0	13.50	88.00	2,727.5	49.6	297.8	-57.0	1.75	0.00	7.50
2,854.0	14.80	88.50	2,820.6	50.4	321.2	-58.3	1.36	1.35	0.52
2,950.0	12.40	86.00	2,913.9	51.4	343.8	-59.9	2.57	-2.50	-2.60
3,042.0	13.10	86.20	3,003.6	52.8	364.0	-61.8	0.76	0.76	0.22
3,138.0	14.10	79.20	3,097.0	55.7	386.4	-65.2	2.00	1.04	-7.29
3,234.0	13.70	78.60	3,190.1	60.1	409.0	-70.2	0.44	-0.42	-0.63
3,330.0	14.00	84.10	3,283.4	63.6	431.7	-74.2	1.41	0.31	5.73
3,426.0	14.40	78.80	3,376.4	67.1	455.0	-78.3	1.42	0.42	-5.52
3,522.0	12.70	82.70	3,469.8	70.7	477.2	-82.5	2.01	-1.77	4.06
3,617.0	14.90	85.30	3,562.0	73.1	499.7	-85.4	2.41	2.32	2.74
3,713.0	15.40	86.20	3,654.7	74.9	524.7	-87.9	0.58	0.52	0.94
3,809.0	14.80	84.80	3,747.4	76.9	549.6	-90.5	0.73	-0.63	-1.46
3,904.0	14.50	82.30	3,839.3	79.6	573.5	-93.8	0.74	-0.32	-2.63
4,000.0	13.70	76.50	3,932.4	83.8	596.5	-98.6	1.69	-0.83	-6.04
4,098.0	13.60	74.60	4,027.6	89.6	618.9	-104.9	0.47	-0.10	-1.94
4,194.0	13.40	79.50	4,121.0	94.6	640.7	-110.5	1.21	-0.21	5.10
4,288.0	13.70	83.00	4,212.4	98.0	662.4	-114.4	0.93	0.32	3.72
4,384.0	14.80	80.80	4,305.4	101.3	685.8	-118.3	1.28	1.15	-2.29
4,479.0	12.40	81.60	4,397.7	104.7	707.9	-122.3	2.53	-2.53	0.84
4,575.0	13.10	80.00	4,491.4	108.1	728.8	-126.2	0.82	0.73	-1.67
4,671.0	13.50	80.80	4,584.8	111.8	750.6	-130.4	0.46	0.42	0.83
4,767.0	13.50	82.70	4,678.1	115.0	772.8	-134.1	0.46	0.00	1.98
4,863.0	12.60	79.50	4,771.7	118.4	794.2	-138.0	1.20	-0.94	-3.33
4,959.0	12.20	78.50	4,865.4	122.3	814.4	-142.4	0.47	-0.42	-1.04
5,055.0	12.80	83.40	4,959.1	125.5	834.9	-146.2	1.27	0.63	5.10

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<b>Well:</b>	Lajco 17R-223	<b>North Reference:</b>	True
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	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)
5,151.0	13.70	80.90	5,052.6	128.6	856.7	-149.8	1.11	0.94	-2.60
5,247.0	13.30	83.00	5,145.9	131.7	878.9	-153.4	0.66	-0.42	2.19
5,343.0	13.20	82.30	5,239.4	134.5	900.7	-156.8	0.20	-0.10	-0.73
5,439.0	13.10	78.60	5,332.9	138.1	922.2	-161.0	0.88	-0.10	-3.85
5,534.0	13.80	76.90	5,425.3	142.8	943.8	-166.2	0.85	0.74	-1.79
5,630.0	13.50	83.70	5,518.5	146.7	966.1	-170.6	1.70	-0.31	7.08
5,725.0	13.20	83.40	5,611.0	149.1	987.9	-173.6	0.32	-0.32	-0.32
5,821.0	14.70	80.80	5,704.1	152.3	1,010.8	-177.3	1.69	1.56	-2.71
5,917.0	14.20	77.10	5,797.1	156.9	1,034.3	-182.5	1.09	-0.52	-3.85
6,012.0	14.40	79.00	5,889.2	161.8	1,057.3	-187.9	0.54	0.21	2.00
6,108.0	12.90	86.60	5,982.5	164.7	1,079.7	-191.4	2.43	-1.56	7.92
6,204.0	14.40	91.50	6,075.8	165.0	1,102.3	-192.3	1.97	1.56	5.10
6,299.0	14.60	95.90	6,167.7	163.5	1,126.1	-191.3	1.18	0.21	4.63
6,395.0	17.70	107.30	6,260.0	157.9	1,152.0	-186.4	4.61	3.23	11.88
6,491.0	18.60	124.70	6,351.2	144.8	1,178.6	-174.0	5.70	0.94	18.13
6,587.0	20.30	144.70	6,441.9	122.5	1,200.8	-152.2	7.12	1.77	20.83
6,682.0	22.70	155.30	6,530.3	92.4	1,218.0	-122.5	4.80	2.53	11.16
6,778.0	29.00	157.00	6,616.6	54.1	1,234.9	-84.7	6.61	6.56	1.77
6,875.0	35.30	157.00	6,698.7	6.6	1,255.0	-37.7	6.49	6.49	0.00
6,970.0	42.50	162.00	6,772.6	-49.3	1,275.7	17.7	8.26	7.58	5.26
7,066.0	50.60	164.20	6,838.6	-115.9	1,295.8	83.8	8.60	8.44	2.29
7,150.7	62.69	164.92	6,885.1	-184.0	1,314.6	151.4	14.29	14.27	0.85
Cross Setback 460'FNL & 871'FEL									
7,162.0	64.30	165.00	6,890.1	-193.8	1,317.2	161.1	14.29	14.27	0.73
7,258.0	72.10	173.90	6,925.8	-281.3	1,333.3	248.1	11.83	8.13	9.27
7,354.0	79.30	181.30	6,949.5	-374.1	1,337.1	340.8	10.58	7.50	7.71
7,450.0	87.90	180.20	6,960.2	-469.4	1,335.9	436.1	9.03	8.96	-1.15
7,540.2	89.78	181.23	6,962.0	-559.6	1,334.8	526.3	2.38	2.08	1.15
Deepest TVD 6962.1'									
7,546.0	89.90	181.30	6,962.1	-565.4	1,334.6	532.1	2.38	2.08	1.15
7,642.0	91.60	180.60	6,960.8	-661.3	1,333.1	628.1	1.92	1.77	-0.73
7,737.0	91.20	180.20	6,958.5	-756.3	1,332.4	723.0	0.60	-0.42	-0.42
7,862.0	91.30	179.40	6,955.8	-881.3	1,332.8	848.0	0.64	0.08	-0.64
7,957.0	92.90	180.10	6,952.3	-976.2	1,333.2	942.9	1.84	1.68	0.74
8,053.0	92.00	181.10	6,948.2	-1,072.1	1,332.2	1,038.8	1.40	-0.94	1.04
8,149.0	90.90	181.50	6,945.7	-1,168.0	1,330.1	1,134.7	1.22	-1.15	0.42
8,244.0	91.30	180.40	6,943.9	-1,263.0	1,328.5	1,229.7	1.23	0.42	-1.16
8,340.0	89.60	180.60	6,943.2	-1,359.0	1,327.6	1,325.7	1.78	-1.77	0.21
8,436.0	89.60	179.90	6,943.8	-1,455.0	1,327.2	1,421.7	0.73	0.00	-0.73
8,532.0	90.00	181.80	6,944.2	-1,551.0	1,325.8	1,517.6	2.02	0.42	1.98
8,628.0	89.70	181.00	6,944.4	-1,646.9	1,323.5	1,613.6	0.89	-0.31	-0.83
8,724.0	89.50	180.60	6,945.1	-1,742.9	1,322.1	1,709.6	0.47	-0.21	-0.42
8,819.0	89.30	179.50	6,946.1	-1,837.9	1,322.0	1,804.6	1.18	-0.21	-1.16

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<b>Well:</b>	Lajco 17R-223	<b>North Reference:</b>	True
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	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)
8,915.0	89.30	180.80	6,947.3	-1,933.9	1,321.8	1,900.6	1.35	0.00	1.35
9,011.0	91.20	180.60	6,946.8	-2,029.9	1,320.6	1,996.6	1.99	1.98	-0.21
9,107.0	91.00	180.20	6,945.0	-2,125.9	1,319.9	2,092.5	0.47	-0.21	-0.42
9,203.0	90.50	179.70	6,943.7	-2,221.9	1,320.0	2,188.5	0.74	-0.52	-0.52
9,299.0	90.80	179.00	6,942.7	-2,317.9	1,321.1	2,284.4	0.79	0.31	-0.73
9,394.0	90.70	179.70	6,941.4	-2,412.9	1,322.2	2,379.3	0.74	-0.11	0.74
9,490.0	89.30	181.50	6,941.4	-2,508.8	1,321.2	2,475.3	2.38	-1.46	1.88
9,586.0	89.60	181.30	6,942.3	-2,604.8	1,318.8	2,571.3	0.38	0.31	-0.21
9,682.0	89.10	180.90	6,943.4	-2,700.8	1,317.0	2,667.3	0.67	-0.52	-0.42
9,778.0	90.50	181.70	6,943.8	-2,796.8	1,314.8	2,763.3	1.68	1.46	0.83
9,874.0	90.00	181.10	6,943.3	-2,892.7	1,312.5	2,859.3	0.81	-0.52	-0.63
9,969.0	91.10	180.90	6,942.4	-2,987.7	1,310.8	2,954.3	1.18	1.16	-0.21
10,065.0	91.00	179.50	6,940.7	-3,083.7	1,310.5	3,050.3	1.46	-0.10	-1.46
10,161.0	91.10	179.20	6,938.9	-3,179.7	1,311.6	3,146.2	0.33	0.10	-0.31
10,257.0	90.30	179.90	6,937.7	-3,275.7	1,312.3	3,242.1	1.11	-0.83	0.73
10,352.0	90.20	179.70	6,937.3	-3,370.6	1,312.7	3,337.1	0.24	-0.11	-0.21
10,448.0	89.90	179.50	6,937.2	-3,466.6	1,313.3	3,433.0	0.38	-0.31	-0.21
10,544.0	89.10	179.20	6,938.1	-3,562.6	1,314.4	3,529.0	0.89	-0.83	-0.31
10,640.0	90.70	180.20	6,938.2	-3,658.6	1,314.9	3,624.9	1.97	1.67	1.04
10,735.0	92.00	179.20	6,936.0	-3,753.6	1,315.4	3,719.8	1.73	1.37	-1.05
10,830.0	91.40	180.80	6,933.2	-3,848.6	1,315.4	3,814.8	1.80	-0.63	1.68
10,925.0	92.10	180.60	6,930.3	-3,943.5	1,314.3	3,909.7	0.77	0.74	-0.21
11,021.0	91.40	181.50	6,927.4	-4,039.4	1,312.5	4,005.7	1.19	-0.73	0.94
11,117.0	90.30	178.80	6,925.9	-4,135.4	1,312.2	4,101.6	3.04	-1.15	-2.81
11,213.0	90.90	178.70	6,924.9	-4,231.4	1,314.3	4,197.5	0.63	0.63	-0.10
11,309.0	89.60	178.10	6,924.5	-4,327.3	1,317.0	4,293.4	1.49	-1.35	-0.63
11,427.0	90.70	177.60	6,924.2	-4,445.3	1,321.4	4,411.2	1.02	0.93	-0.42
11,477.0	90.70	177.60	6,923.6	-4,495.2	1,323.5	4,461.0	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
SHL 310'FNL & 2186'FE	0.00	0.00	1.0	0.0	0.0	1,359,742.21	3,163,452.87	40.319410	-104.913810
- hit/miss target									
- Shape									
- survey hits target center									
- Point									

Survey Annotations				
Measured Depth (ft)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Comment
7,150.7	6,885.1	-184.0	1,314.6	Cross Setback 460'FNL & 871'FEL
7,540.2	6,962.0	-559.6	1,334.8	Deepest TVD 6962.1'

<b>Company:</b>	PETROLEUM DEVELOPMENT CORP DJ Basin	<b>Local Co-ordinate Reference:</b>	Well Lajco 17R-223
<b>Project:</b>	SEC.17-T4N-R67W	<b>TVD Reference:</b>	WELL @ 4807.0ft (RKB - 13')
<b>Site:</b>	Lajco 4N67W17R Pad Sec.17-T4N-R67W	<b>MD Reference:</b>	WELL @ 4807.0ft (RKB - 13')
<b>Well:</b>	Lajco 17R-223	<b>North Reference:</b>	True
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	US_EDM

Checked By: _____	Approved By: _____	Date: _____
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