

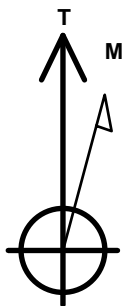
PETROLEUM DEVELOPMENT CORP DJ Basin

Well Name: **Hop 18E-402**

Surface Location: Hop 5N64W18A Pad Sec.18-T5N-R64W
 North American Datum 1983 , US State Plane 1983, Colorado Northern Zone
 Ground Elevation: 4628.0
 +N/-S +E/-W Northing Easting Longitude Slot
 0.0 0.0 1391153.68 3250968.30 40.403618 -104.598827
 Original Well Elev WELL @ 4641.0ft (Original Well Elev)

DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Shape
SHL 1000'FNL, 833'FWL, SEC.18	1.0	0.0	0.0	Point
BHL 175'FNL, 500'FEL, SEC.17	6847.0	892.0	9065.6	Point



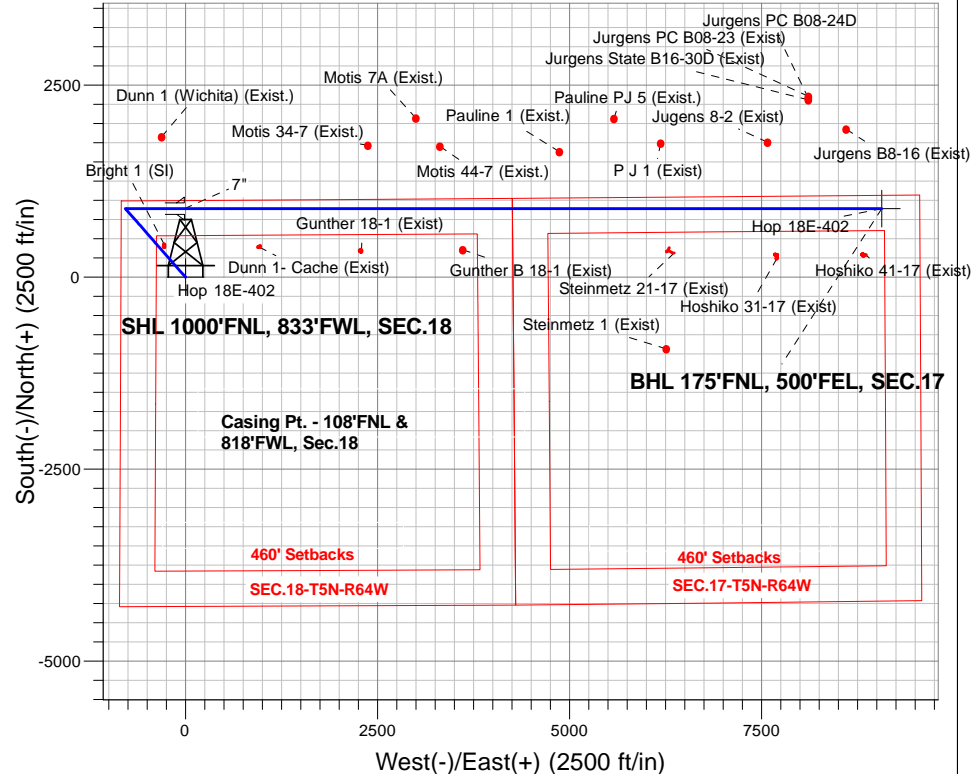
Azimuths to True North
 Magnetic North: 8.16°

Magnetic Field
 Strength: 52675.9snT
 Dip Angle: 66.92°
 Date: 12/21/2015
 Model: IGRF2010

Hop 5N64W18A Pad Sec.18-T5N-R64W
 Hop 18E-402
 Plan #1 (12-16-15)
 9:52, December 21 2015

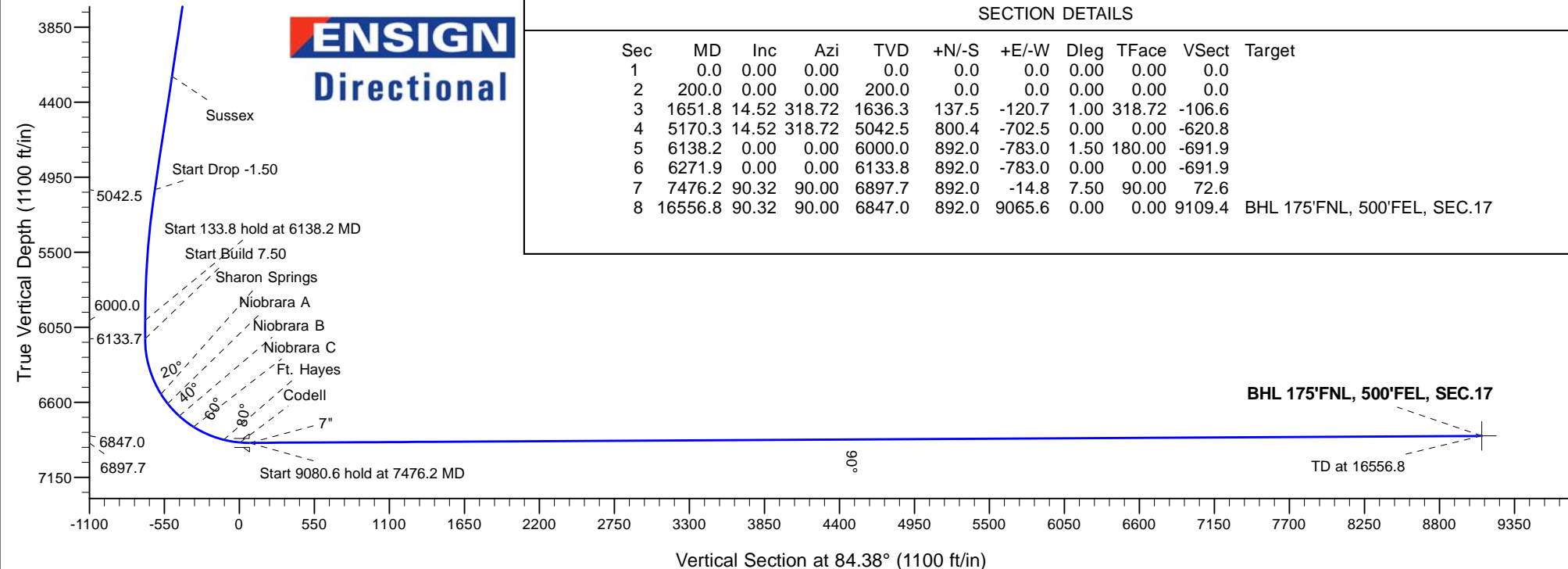
ANNOTATIONS

TVD	MD	Annotation
200.0	200.0	KOP - Start Build 1.00
5042.5	5170.3	Start Drop -1.50
6000.0	6138.2	Start 133.8 hold at 6138.2 MD
6133.8	6271.9	Start Build 7.50
6897.7	7476.2	Start 9080.6 hold at 7476.2 MD
6847.0	16556.8	TD at 16556.8



SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect	Target
1	0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.0	
2	200.0	0.00	0.00	200.0	0.0	0.0	0.00	0.00	0.0	
3	1651.8	14.52	318.72	1636.3	137.5	-120.7	1.00	318.72	-106.6	
4	5170.3	14.52	318.72	5042.5	800.4	-702.5	0.00	0.00	-620.8	
5	6138.2	0.00	0.00	6000.0	892.0	-783.0	1.50	180.00	-691.9	
6	6271.9	0.00	0.00	6133.8	892.0	-783.0	0.00	0.00	-691.9	
7	7476.2	90.32	90.00	6897.7	892.0	-14.8	7.50	90.00	72.6	
8	16556.8	90.32	90.00	6847.0	892.0	9065.6	0.00	0.00	9109.4	BHL 175'FNL, 500'FEL, SEC.17





PETROLEUM DEVELOPMENT CORP DJ Basin

SEC.18-T5N-R64W

Hop 5N64W18A Pad Sec.18-T5N-R64W

Hop 18E-402

Wellbore #1

Plan: Plan #1 (12-16-15)

Standard Planning Report

21 December, 2015

Database:	US_EDM	Local Co-ordinate Reference:	Well Hop 18E-402
Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Project:	SEC.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	North Reference:	True
Well:	Hop 18E-402	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (12-16-15)		

Project	SEC.18-T5N-R64W, Weld County, Colorado		
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		Hop 5N64W18A Pad Sec.18-T5N-R64W			
Site Position:		Northing:	1,391,153.68 usft	Latitude:	40.403618
From:	Lat/Long	Easting:	3,250,968.30 usft	Longitude:	-104.598827
Position Uncertainty:	0.0 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.58

Well	Hop 18E-402					
Well Position	+N/-S	0.0 ft	Northing:	1,391,153.68 usft	Latitude:	40.403618
	+E/-W	0.0 ft	Easting:	3,250,968.30 usft	Longitude:	-104.598827
Position Uncertainty		0.0 ft	Wellhead Elevation:	0.0 ft	Ground Level:	4,628.0 ft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	12/21/2015	8.17	66.92	52,676

Design	Plan #1 (12-16-15)			
Audit Notes:				
Version:	Phase:	PROTOTYPE	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)
	0.0	0.0	0.0	84.38

Plan Sections										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	
200.0	0.00	0.00	200.0	0.0	0.0	0.00	0.00	0.00	0.00	
1,651.8	14.52	318.72	1,636.3	137.5	-120.7	1.00	1.00	0.00	318.72	
5,170.3	14.52	318.72	5,042.5	800.4	-702.5	0.00	0.00	0.00	0.00	
6,138.2	0.00	0.00	6,000.0	892.0	-783.0	1.50	-1.50	0.00	180.00	
6,271.9	0.00	0.00	6,133.8	892.0	-783.0	0.00	0.00	0.00	0.00	
7,476.2	90.32	90.00	6,897.7	892.0	-14.8	7.50	7.50	0.00	90.00	
16,556.8	90.32	90.00	6,847.0	892.0	9,065.6	0.00	0.00	0.00	0.00	BHL 175°FNL, 500°F E

Database:	US_EDM	Local Co-ordinate Reference:	Well Hop 18E-402
Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Project:	SEC.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	North Reference:	True
Well:	Hop 18E-402	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (12-16-15)		

Planned 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	0.00	1.0	0.0	0.0	0.0	0.00	0.00	0.00
SHL 1000'FNL, 833'FWL, SEC.18									
100.0	0.00	0.00	100.0	0.0	0.0	0.0	0.00	0.00	0.00
200.0	0.00	0.00	200.0	0.0	0.0	0.0	0.00	0.00	0.00
KOP - Start Build 1.00									
300.0	1.00	318.72	300.0	0.7	-0.6	-0.5	1.00	1.00	0.00
400.0	2.00	318.72	400.0	2.6	-2.3	-2.0	1.00	1.00	0.00
500.0	3.00	318.72	499.9	5.9	-5.2	-4.6	1.00	1.00	0.00
600.0	4.00	318.72	599.7	10.5	-9.2	-8.1	1.00	1.00	0.00
700.0	5.00	318.72	699.4	16.4	-14.4	-12.7	1.00	1.00	0.00
800.0	6.00	318.72	798.9	23.6	-20.7	-18.3	1.00	1.00	0.00
900.0	7.00	318.72	898.3	32.1	-28.2	-24.9	1.00	1.00	0.00
1,000.0	8.00	318.72	997.4	41.9	-36.8	-32.5	1.00	1.00	0.00
1,100.0	9.00	318.72	1,096.3	53.0	-46.5	-41.1	1.00	1.00	0.00
1,200.0	10.00	318.72	1,194.9	65.4	-57.4	-50.7	1.00	1.00	0.00
1,300.0	11.00	318.72	1,293.3	79.1	-69.4	-61.4	1.00	1.00	0.00
1,400.0	12.00	318.72	1,391.2	94.1	-82.6	-73.0	1.00	1.00	0.00
1,500.0	13.00	318.72	1,488.9	110.4	-96.9	-85.6	1.00	1.00	0.00
1,600.0	14.00	318.72	1,586.1	127.9	-112.3	-99.2	1.00	1.00	0.00
1,651.8	14.52	318.72	1,636.3	137.5	-120.7	-106.6	1.00	1.00	0.00
1,700.0	14.52	318.72	1,683.0	146.6	-128.7	-113.7	0.00	0.00	0.00
1,800.0	14.52	318.72	1,779.8	165.4	-145.2	-128.3	0.00	0.00	0.00
1,900.0	14.52	318.72	1,876.6	184.3	-161.7	-142.9	0.00	0.00	0.00
2,000.0	14.52	318.72	1,973.4	203.1	-178.3	-157.5	0.00	0.00	0.00
2,100.0	14.52	318.72	2,070.2	221.9	-194.8	-172.1	0.00	0.00	0.00
2,200.0	14.52	318.72	2,167.0	240.8	-211.3	-186.8	0.00	0.00	0.00
2,300.0	14.52	318.72	2,263.8	259.6	-227.9	-201.4	0.00	0.00	0.00
2,400.0	14.52	318.72	2,360.6	278.5	-244.4	-216.0	0.00	0.00	0.00
2,500.0	14.52	318.72	2,457.4	297.3	-261.0	-230.6	0.00	0.00	0.00
2,600.0	14.52	318.72	2,554.2	316.1	-277.5	-245.2	0.00	0.00	0.00
2,700.0	14.52	318.72	2,651.0	335.0	-294.0	-259.8	0.00	0.00	0.00
2,800.0	14.52	318.72	2,747.9	353.8	-310.6	-274.4	0.00	0.00	0.00
2,900.0	14.52	318.72	2,844.7	372.7	-327.1	-289.0	0.00	0.00	0.00
3,000.0	14.52	318.72	2,941.5	391.5	-343.6	-303.7	0.00	0.00	0.00
3,100.0	14.52	318.72	3,038.3	410.3	-360.2	-318.3	0.00	0.00	0.00
3,200.0	14.52	318.72	3,135.1	429.2	-376.7	-332.9	0.00	0.00	0.00
3,300.0	14.52	318.72	3,231.9	448.0	-393.3	-347.5	0.00	0.00	0.00
3,400.0	14.52	318.72	3,328.7	466.9	-409.8	-362.1	0.00	0.00	0.00
3,500.0	14.52	318.72	3,425.5	485.7	-426.3	-376.7	0.00	0.00	0.00
3,566.6	14.52	318.72	3,490.0	498.3	-437.3	-386.4	0.00	0.00	0.00
Parkman									
3,600.0	14.52	318.72	3,522.3	504.5	-442.9	-391.3	0.00	0.00	0.00
3,700.0	14.52	318.72	3,619.1	523.4	-459.4	-405.9	0.00	0.00	0.00
3,800.0	14.52	318.72	3,715.9	542.2	-475.9	-420.6	0.00	0.00	0.00
3,900.0	14.52	318.72	3,812.7	561.1	-492.5	-435.2	0.00	0.00	0.00
4,000.0	14.52	318.72	3,909.5	579.9	-509.0	-449.8	0.00	0.00	0.00
4,100.0	14.52	318.72	4,006.3	598.7	-525.5	-464.4	0.00	0.00	0.00
4,200.0	14.52	318.72	4,103.1	617.6	-542.1	-479.0	0.00	0.00	0.00
4,300.0	14.52	318.72	4,200.0	636.4	-558.6	-493.6	0.00	0.00	0.00
4,310.4	14.52	318.72	4,210.0	638.4	-560.3	-495.1	0.00	0.00	0.00
Sussex									
4,400.0	14.52	318.72	4,296.8	655.3	-575.2	-508.2	0.00	0.00	0.00

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Project:	SEC.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	North Reference:	True
Well:	Hop 18E-402	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (12-16-15)		

Planned 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)
4,500.0	14.52	318.72	4,393.6	674.1	-591.7	-522.8	0.00	0.00	0.00
4,600.0	14.52	318.72	4,490.4	692.9	-608.2	-537.5	0.00	0.00	0.00
4,700.0	14.52	318.72	4,587.2	711.8	-624.8	-552.1	0.00	0.00	0.00
4,800.0	14.52	318.72	4,684.0	730.6	-641.3	-566.7	0.00	0.00	0.00
4,900.0	14.52	318.72	4,780.8	749.5	-657.8	-581.3	0.00	0.00	0.00
5,000.0	14.52	318.72	4,877.6	768.3	-674.4	-595.9	0.00	0.00	0.00
5,100.0	14.52	318.72	4,974.4	787.1	-690.9	-610.5	0.00	0.00	0.00
5,170.3	14.52	318.72	5,042.5	800.4	-702.5	-620.8	0.00	0.00	0.00
Start Drop -1.50									
5,200.0	14.07	318.72	5,071.2	805.9	-707.4	-625.1	1.50	-1.50	0.00
5,300.0	12.57	318.72	5,168.6	823.2	-722.6	-638.5	1.50	-1.50	0.00
5,400.0	11.07	318.72	5,266.4	838.6	-736.1	-650.4	1.50	-1.50	0.00
5,500.0	9.57	318.72	5,364.8	852.1	-747.9	-660.9	1.50	-1.50	0.00
5,600.0	8.07	318.72	5,463.6	863.6	-758.0	-669.8	1.50	-1.50	0.00
5,700.0	6.57	318.72	5,562.8	873.2	-766.4	-677.2	1.50	-1.50	0.00
5,800.0	5.07	318.72	5,662.3	880.8	-773.1	-683.2	1.50	-1.50	0.00
5,900.0	3.57	318.72	5,762.0	886.5	-778.1	-687.6	1.50	-1.50	0.00
6,000.0	2.07	318.72	5,861.9	890.2	-781.4	-690.4	1.50	-1.50	0.00
6,100.0	0.57	318.72	5,961.8	891.9	-782.9	-691.8	1.50	-1.50	0.00
6,138.2	0.00	0.00	6,000.0	892.0	-783.0	-691.9	1.50	-1.50	0.00
Start 133.8 hold at 6138.2 MD									
6,200.0	0.00	0.00	6,061.8	892.0	-783.0	-691.9	0.00	0.00	0.00
6,271.9	0.00	0.00	6,133.7	892.0	-783.0	-691.9	0.00	0.00	0.00
Start Build 7.50									
6,300.0	2.10	90.00	6,161.8	892.0	-782.5	-691.4	7.49	7.49	0.00
6,400.0	9.60	90.00	6,261.2	892.0	-772.3	-681.2	7.50	7.50	0.00
6,500.0	17.10	90.00	6,358.5	892.0	-749.2	-658.3	7.50	7.50	0.00
6,600.0	24.60	90.00	6,451.9	892.0	-713.6	-622.9	7.50	7.50	0.00
6,700.0	32.10	90.00	6,539.8	892.0	-666.2	-575.6	7.50	7.50	0.00
6,700.2	32.10	90.00	6,540.0	892.0	-666.0	-575.5	0.00	0.00	0.00
Sharon Springs									
6,786.1	38.56	90.00	6,610.0	892.0	-616.4	-526.1	7.52	7.52	0.00
Niobrara A									
6,800.0	39.60	90.00	6,620.8	892.0	-607.6	-517.4	7.50	7.50	0.00
6,900.0	47.10	90.00	6,693.4	892.0	-539.0	-449.1	7.50	7.50	0.00
6,909.7	47.83	90.00	6,700.0	892.0	-531.9	-442.0	7.50	7.50	0.00
Niobrara B									
7,000.0	54.60	90.00	6,756.5	892.0	-461.5	-372.0	7.50	7.50	0.00
7,042.2	57.77	90.00	6,780.0	892.0	-426.5	-337.1	7.50	7.50	0.00
Niobrara C									
7,100.0	62.10	90.00	6,809.0	892.0	-376.5	-287.3	7.50	7.50	0.00
7,200.0	69.60	90.00	6,849.8	892.0	-285.3	-196.6	7.50	7.50	0.00
7,285.1	75.99	90.00	6,875.0	892.0	-204.0	-115.7	7.50	7.50	0.00
Ft. Hayes									
7,300.0	77.10	90.00	6,878.5	892.0	-189.5	-101.3	7.50	7.50	0.00
7,400.0	84.60	90.00	6,894.3	892.0	-90.9	-3.1	7.50	7.50	0.00
7,407.4	85.16	90.00	6,895.0	892.0	-83.5	4.2	7.50	7.50	0.00
Codell									
7,476.2	90.32	90.00	6,897.7	892.0	-14.8	72.6	7.50	7.50	0.00
Start 9080.6 hold at 7476.2 MD - 7"									
7,500.0	90.32	90.00	6,897.6	892.0	9.0	96.3	0.00	0.00	0.00
7,600.0	90.32	90.00	6,897.0	892.0	109.0	195.8	0.00	0.00	0.00

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Project:	SEC.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	North Reference:	True
Well:	Hop 18E-402	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (12-16-15)		

Planned 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)
7,700.0	90.32	90.00	6,896.5	892.0	209.0	295.3	0.00	0.00	0.00
7,800.0	90.32	90.00	6,895.9	892.0	309.0	394.9	0.00	0.00	0.00
7,900.0	90.32	90.00	6,895.3	892.0	409.0	494.4	0.00	0.00	0.00
8,000.0	90.32	90.00	6,894.8	892.0	509.0	593.9	0.00	0.00	0.00
8,100.0	90.32	90.00	6,894.2	892.0	609.0	693.4	0.00	0.00	0.00
8,200.0	90.32	90.00	6,893.7	892.0	709.0	792.9	0.00	0.00	0.00
8,300.0	90.32	90.00	6,893.1	892.0	809.0	892.5	0.00	0.00	0.00
8,400.0	90.32	90.00	6,892.6	892.0	909.0	992.0	0.00	0.00	0.00
8,500.0	90.32	90.00	6,892.0	892.0	1,009.0	1,091.5	0.00	0.00	0.00
8,600.0	90.32	90.00	6,891.4	892.0	1,109.0	1,191.0	0.00	0.00	0.00
8,700.0	90.32	90.00	6,890.9	892.0	1,209.0	1,290.5	0.00	0.00	0.00
8,800.0	90.32	90.00	6,890.3	892.0	1,309.0	1,390.0	0.00	0.00	0.00
8,900.0	90.32	90.00	6,889.8	892.0	1,409.0	1,489.6	0.00	0.00	0.00
9,000.0	90.32	90.00	6,889.2	892.0	1,509.0	1,589.1	0.00	0.00	0.00
9,100.0	90.32	90.00	6,888.6	892.0	1,609.0	1,688.6	0.00	0.00	0.00
9,200.0	90.32	90.00	6,888.1	892.0	1,709.0	1,788.1	0.00	0.00	0.00
9,300.0	90.32	90.00	6,887.5	892.0	1,809.0	1,887.6	0.00	0.00	0.00
9,400.0	90.32	90.00	6,887.0	892.0	1,909.0	1,987.2	0.00	0.00	0.00
9,500.0	90.32	90.00	6,886.4	892.0	2,009.0	2,086.7	0.00	0.00	0.00
9,600.0	90.32	90.00	6,885.9	892.0	2,109.0	2,186.2	0.00	0.00	0.00
9,700.0	90.32	90.00	6,885.3	892.0	2,209.0	2,285.7	0.00	0.00	0.00
9,800.0	90.32	90.00	6,884.7	892.0	2,309.0	2,385.2	0.00	0.00	0.00
9,900.0	90.32	90.00	6,884.2	892.0	2,409.0	2,484.7	0.00	0.00	0.00
10,000.0	90.32	90.00	6,883.6	892.0	2,509.0	2,584.3	0.00	0.00	0.00
10,100.0	90.32	90.00	6,883.1	892.0	2,609.0	2,683.8	0.00	0.00	0.00
10,200.0	90.32	90.00	6,882.5	892.0	2,709.0	2,783.3	0.00	0.00	0.00
10,300.0	90.32	90.00	6,881.9	892.0	2,809.0	2,882.8	0.00	0.00	0.00
10,400.0	90.32	90.00	6,881.4	892.0	2,909.0	2,982.3	0.00	0.00	0.00
10,500.0	90.32	90.00	6,880.8	892.0	3,009.0	3,081.8	0.00	0.00	0.00
10,600.0	90.32	90.00	6,880.3	892.0	3,109.0	3,181.4	0.00	0.00	0.00
10,700.0	90.32	90.00	6,879.7	892.0	3,209.0	3,280.9	0.00	0.00	0.00
10,800.0	90.32	90.00	6,879.2	892.0	3,309.0	3,380.4	0.00	0.00	0.00
10,900.0	90.32	90.00	6,878.6	892.0	3,409.0	3,479.9	0.00	0.00	0.00
11,000.0	90.32	90.00	6,878.0	892.0	3,508.9	3,579.4	0.00	0.00	0.00
11,100.0	90.32	90.00	6,877.5	892.0	3,608.9	3,679.0	0.00	0.00	0.00
11,200.0	90.32	90.00	6,876.9	892.0	3,708.9	3,778.5	0.00	0.00	0.00
11,300.0	90.32	90.00	6,876.4	892.0	3,808.9	3,878.0	0.00	0.00	0.00
11,400.0	90.32	90.00	6,875.8	892.0	3,908.9	3,977.5	0.00	0.00	0.00
11,500.0	90.32	90.00	6,875.2	892.0	4,008.9	4,077.0	0.00	0.00	0.00
11,600.0	90.32	90.00	6,874.7	892.0	4,108.9	4,176.5	0.00	0.00	0.00
11,700.0	90.32	90.00	6,874.1	892.0	4,208.9	4,276.1	0.00	0.00	0.00
11,800.0	90.32	90.00	6,873.6	892.0	4,308.9	4,375.6	0.00	0.00	0.00
11,900.0	90.32	90.00	6,873.0	892.0	4,408.9	4,475.1	0.00	0.00	0.00
12,000.0	90.32	90.00	6,872.4	892.0	4,508.9	4,574.6	0.00	0.00	0.00
12,100.0	90.32	90.00	6,871.9	892.0	4,608.9	4,674.1	0.00	0.00	0.00
12,200.0	90.32	90.00	6,871.3	892.0	4,708.9	4,773.7	0.00	0.00	0.00
12,300.0	90.32	90.00	6,870.8	892.0	4,808.9	4,873.2	0.00	0.00	0.00
12,400.0	90.32	90.00	6,870.2	892.0	4,908.9	4,972.7	0.00	0.00	0.00
12,500.0	90.32	90.00	6,869.7	892.0	5,008.9	5,072.2	0.00	0.00	0.00
12,600.0	90.32	90.00	6,869.1	892.0	5,108.9	5,171.7	0.00	0.00	0.00
12,700.0	90.32	90.00	6,868.5	892.0	5,208.9	5,271.2	0.00	0.00	0.00
12,800.0	90.32	90.00	6,868.0	892.0	5,308.9	5,370.8	0.00	0.00	0.00
12,900.0	90.32	90.00	6,867.4	892.0	5,408.9	5,470.3	0.00	0.00	0.00

Database:	US_EDM	Local Co-ordinate Reference:	Well Hop 18E-402
Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Project:	SEC.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	North Reference:	True
Well:	Hop 18E-402	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (12-16-15)		

Planned 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)	
13,000.0	90.32	90.00	6,866.9	892.0	5,508.9	5,569.8	0.00	0.00	0.00	
13,100.0	90.32	90.00	6,866.3	892.0	5,608.9	5,669.3	0.00	0.00	0.00	
13,200.0	90.32	90.00	6,865.7	892.0	5,708.9	5,768.8	0.00	0.00	0.00	
13,300.0	90.32	90.00	6,865.2	892.0	5,808.9	5,868.3	0.00	0.00	0.00	
13,400.0	90.32	90.00	6,864.6	892.0	5,908.9	5,967.9	0.00	0.00	0.00	
13,500.0	90.32	90.00	6,864.1	892.0	6,008.9	6,067.4	0.00	0.00	0.00	
13,600.0	90.32	90.00	6,863.5	892.0	6,108.9	6,166.9	0.00	0.00	0.00	
13,700.0	90.32	90.00	6,863.0	892.0	6,208.9	6,266.4	0.00	0.00	0.00	
13,800.0	90.32	90.00	6,862.4	892.0	6,308.9	6,365.9	0.00	0.00	0.00	
13,900.0	90.32	90.00	6,861.8	892.0	6,408.9	6,465.5	0.00	0.00	0.00	
14,000.0	90.32	90.00	6,861.3	892.0	6,508.9	6,565.0	0.00	0.00	0.00	
14,100.0	90.32	90.00	6,860.7	892.0	6,608.9	6,664.5	0.00	0.00	0.00	
14,200.0	90.32	90.00	6,860.2	892.0	6,708.9	6,764.0	0.00	0.00	0.00	
14,300.0	90.32	90.00	6,859.6	892.0	6,808.9	6,863.5	0.00	0.00	0.00	
14,400.0	90.32	90.00	6,859.0	892.0	6,908.9	6,963.0	0.00	0.00	0.00	
14,500.0	90.32	90.00	6,858.5	892.0	7,008.9	7,062.6	0.00	0.00	0.00	
14,600.0	90.32	90.00	6,857.9	892.0	7,108.9	7,162.1	0.00	0.00	0.00	
14,700.0	90.32	90.00	6,857.4	892.0	7,208.9	7,261.6	0.00	0.00	0.00	
14,800.0	90.32	90.00	6,856.8	892.0	7,308.9	7,361.1	0.00	0.00	0.00	
14,900.0	90.32	90.00	6,856.3	892.0	7,408.9	7,460.6	0.00	0.00	0.00	
15,000.0	90.32	90.00	6,855.7	892.0	7,508.9	7,560.2	0.00	0.00	0.00	
15,100.0	90.32	90.00	6,855.1	892.0	7,608.9	7,659.7	0.00	0.00	0.00	
15,200.0	90.32	90.00	6,854.6	892.0	7,708.9	7,759.2	0.00	0.00	0.00	
15,300.0	90.32	90.00	6,854.0	892.0	7,808.9	7,858.7	0.00	0.00	0.00	
15,400.0	90.32	90.00	6,853.5	892.0	7,908.9	7,958.2	0.00	0.00	0.00	
15,500.0	90.32	90.00	6,852.9	892.0	8,008.9	8,057.7	0.00	0.00	0.00	
15,600.0	90.32	90.00	6,852.3	892.0	8,108.9	8,157.3	0.00	0.00	0.00	
15,700.0	90.32	90.00	6,851.8	892.0	8,208.9	8,256.8	0.00	0.00	0.00	
15,800.0	90.32	90.00	6,851.2	892.0	8,308.9	8,356.3	0.00	0.00	0.00	
15,900.0	90.32	90.00	6,850.7	892.0	8,408.9	8,455.8	0.00	0.00	0.00	
16,000.0	90.32	90.00	6,850.1	892.0	8,508.9	8,555.3	0.00	0.00	0.00	
16,100.0	90.32	90.00	6,849.6	892.0	8,608.9	8,654.8	0.00	0.00	0.00	
16,200.0	90.32	90.00	6,849.0	892.0	8,708.9	8,754.4	0.00	0.00	0.00	
16,300.0	90.32	90.00	6,848.4	892.0	8,808.9	8,853.9	0.00	0.00	0.00	
16,400.0	90.32	90.00	6,847.9	892.0	8,908.9	8,953.4	0.00	0.00	0.00	
16,500.0	90.32	90.00	6,847.3	892.0	9,008.9	9,052.9	0.00	0.00	0.00	
16,556.8	90.32	90.00	6,847.0	892.0	9,065.6	9,109.4	0.00	0.00	0.00	
TD at 16556.8 - BHL 175°FNL, 500°FEL, SEC.17										

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 1000°FNL, 833°FWL	0.00	0.00	1.0	0.0	0.0	1,391,153.68	3,250,968.30	40.403618	-104.598827	
- plan hits target center										
- Point										
BHL 175°FNL, 500°FEL,	0.00	0.00	6,847.0	892.0	9,065.6	1,392,137.77	3,260,024.03	40.406062	-104.566275	
- plan hits target center										
- Point										

Database:	US_EDM	Local Co-ordinate Reference:	Well Hop 18E-402
Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Project:	SEC.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	North Reference:	True
Well:	Hop 18E-402	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (12-16-15)		

Casing Points				
Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
7,476.2	6,897.7	7"	7	8-3/4

Formations					
Measured Depth (ft)	Vertical Depth (ft)	Name	Lithology	Dip (°)	Dip Direction (°)
3,566.6	3,490.0	Parkman		0.00	
4,310.4	4,210.0	Sussex		0.00	
6,700.2	6,540.0	Sharon Springs		0.00	
6,786.1	6,610.0	Niobrara A		0.00	
6,909.7	6,700.0	Niobrara B		0.00	
7,042.2	6,780.0	Niobrara C		0.00	
7,285.1	6,875.0	Ft. Hayes		0.00	
7,407.4	6,895.0	Codell		0.00	

Plan Annotations				
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
200.0	200.0	0.0	0.0	KOP - Start Build 1.00
5,170.3	5,042.5	137.5	-120.7	Start Drop -1.50
6,138.2	6,000.0	800.4	-702.5	Start 133.8 hold at 6138.2 MD
6,271.9	6,133.8	892.0	-783.0	Start Build 7.50
7,476.2	6,897.7	892.0	-783.0	Start 9080.6 hold at 7476.2 MD
16,556.8	6,847.0	892.0	-14.8	TD at 16556.8



PETROLEUM DEVELOPMENT CORP DJ Basin

SEC.18-T5N-R64W

Hop 5N64W18A Pad Sec.18-T5N-R64W

Hop 18E-402

Wellbore #1

Plan #1 (12-16-15)

Anticollision Report

21 December, 2015



Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-402
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-402	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Reference	Plan #1 (12-16-15)		
Filter type:	NO GLOBAL FILTER: Using user defined selection & filtering criteria		
Interpolation Method:	Stations	Error Model:	ISCWSA
Depth Range:	Unlimited	Scan Method:	Closest Approach 3D
Results Limited by:	Maximum center-center distance of 500.0 ft	Error Surface:	Elliptical Conic
Warning Levels Evaluated at:	2.00 Sigma	Casing Method:	Not applied

Survey Tool Program	Date	12/21/2015		
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description
0.0	16,556.8	Plan #1 (12-16-15) (Wellbore #1)	MWD	MWD - Standard

Summary						
Site Name	Reference Measured Depth (ft)	Offset Measured Depth (ft)	Distance Between Centres (ft)	Distance Between Ellipses (ft)	Separation Factor	Warning
Offset Well - Wellbore - Design						
Existing Wells - Sec.17 & 18-T5N-R64W						
Bright 1 (SI) - Wellbore #1 - Wellbore #1	2,876.7	2,807.0	53.1	36.7	3.240	CC, ES, SF
Dunn 1- Cache (Exist) - Wellbore #1 - Wellbore #1	8,449.1	6,879.4	498.9	441.4	8.676	CC, ES, SF
Gunther 18-1 (Exist) - Wellbore #1 - Wellbore #1						Out of range
Gunther B 18-1 (Exist) - Wellbore #1 - Wellbore #1						Out of range
Hoshiko 31-17 (Exist) - Wellbore #1 - Wellbore #1						Out of range
Hoshiko 41-17 (Exist) - Wellbore #1 - Wellbore #1						Out of range
Steinmetz 1 (Exist) - Wellbore #1 - Wellbore #1						Out of range
Steinmetz 21-17 (Exist) - Wellbore #1 - Wellbore #1						Out of range
Existing Wells - Sec.7-T5N-R64W						
Dunn 1 (Wichita) (Exist.) - Wellbore #1 - Wellbore #1						Out of range
Jugens 8-2 (Exist) - Wellbore #1 - Wellbore #1						Out of range
Jurgens B8-16 (Exist) - Wellbore #1 - Wellbore #1						Out of range
Jurgens PC B08-23 (Exist) - Wellbore #1 - Wellbore #1						Out of range
Jurgens PC B08-24D - Wellbore #1 - Wellbore #1						Out of range
Jurgens State B16-30D (Exist) - Wellbore #1 - Wellbore #						Out of range
Motis 34-7 (Exist.) - Wellbore #1 - Wellbore #1						Out of range
Motis 44-7 (Exist.) - Wellbore #1 - Wellbore #1						Out of range
Motis 7A (Exist.) - Wellbore #1 - Wellbore #1						Out of range
P J 1 (Exist) - Wellbore #1 - Wellbore #1						Out of range
Pauline 1 (Exist.) - Wellbore #1 - Wellbore #1						Out of range
Pauline PJ 5 (Exist.) - Wellbore #1 - Wellbore #1						Out of range
Hop 5N64W18A Pad Sec.18-T5N-R64W						
Hop 18E-232 - Wellbore #1 - Plan #1 (12-16-15)	200.0	200.0	14.8	14.1	21.891	CC
Hop 18E-232 - Wellbore #1 - Plan #1 (12-16-15)	16,556.8	16,373.1	272.4	-131.0	0.675	Level 1, ES, SF
Hop 18E-332 - Wellbore #1 - Plan #1 (12-16-15)	200.0	200.0	29.8	29.1	44.198	CC
Hop 18E-332 - Wellbore #1 - Plan #1 (12-16-15)	16,556.8	16,424.2	451.7	-67.8	0.870	Level 1, ES, SF
Hop 18F-102 - Wellbore #1 - Plan #1 (12-16-15)	200.0	200.0	59.9	59.2	88.804	CC, ES
Hop 18F-102 - Wellbore #1 - Plan #1 (12-16-15)	900.0	898.3	93.9	90.0	24.235	SF
Hop 18F-212 - Wellbore #1 - Plan #1 (12-16-15)	200.0	200.0	44.8	44.2	66.501	CC, ES
Hop 18F-212 - Wellbore #1 - Plan #1 (12-16-15)	800.0	798.9	69.8	66.4	20.487	SF

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-402
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-402	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design Existing Wells - Sec.17 & 18-T5N-R64W - Bright 1 (SI) - Wellbore #1 - Wellbore #1												Offset Site Error:	0.0 ft
Survey Program: 100-NS-GYRO-MS												Offset Well Error:	0.0 ft
Reference	Offset	Semi Major Axis		Distance		Warning							
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	
0.0	0.0	0.0	0.0	0.0	0.0	-35.03	390.5	-273.8	477.2				
100.0	100.0	80.3	80.3	0.1	0.1	-35.03	390.8	-273.9	477.3	477.0	0.22	2,178.292	
200.0	200.0	177.1	177.1	0.3	0.3	-35.01	391.8	-274.4	478.4	477.7	0.67	709.017	
300.0	300.0	273.9	273.8	0.6	0.6	6.32	393.4	-275.1	479.3	478.2	1.15	415.275	
400.0	400.0	373.0	373.0	0.8	0.9	6.46	395.8	-275.7	479.0	477.3	1.64	291.934	
500.0	499.9	473.6	473.5	1.0	1.1	6.64	398.2	-276.2	476.9	474.8	2.13	223.624	
600.0	599.7	574.9	574.8	1.3	1.4	6.85	400.5	-276.5	472.9	470.2	2.63	179.957	
700.0	699.4	675.6	675.5	1.5	1.7	7.08	402.4	-276.8	466.8	463.7	3.12	149.481	
800.0	798.9	775.7	775.6	1.8	1.9	7.33	404.1	-277.2	459.0	455.3	3.62	126.815	
900.0	898.3	875.5	875.3	2.1	2.2	7.60	405.8	-277.6	449.3	445.2	4.12	109.164	
1,000.0	997.4	975.1	974.9	2.4	2.4	7.91	407.3	-278.0	437.9	433.2	4.61	94.904	
1,100.0	1,096.3	1,075.0	1,074.8	2.7	2.7	8.26	408.7	-278.4	424.6	419.5	5.11	83.028	
1,200.0	1,194.9	1,174.4	1,174.3	3.0	3.0	8.65	409.8	-278.9	409.5	403.9	5.61	72.927	
1,300.0	1,293.3	1,272.9	1,272.7	3.4	3.2	9.10	410.9	-279.3	392.6	386.5	6.12	64.186	
1,400.0	1,391.2	1,371.6	1,371.4	3.8	3.5	9.66	411.9	-279.7	374.0	367.4	6.62	56.473	
1,500.0	1,488.9	1,470.4	1,470.2	4.2	3.8	10.34	412.9	-279.9	353.6	346.4	7.13	49.556	
1,600.0	1,586.1	1,569.0	1,568.8	4.7	4.0	11.16	413.5	-280.0	331.2	323.5	7.65	43.287	
1,651.8	1,636.3	1,619.6	1,619.4	5.0	4.2	11.64	413.6	-280.0	318.8	310.9	7.92	40.264	
1,700.0	1,683.0	1,666.2	1,666.0	5.2	4.3	12.10	413.8	-280.1	307.1	298.9	8.17	37.570	
1,800.0	1,779.8	1,763.5	1,763.3	5.7	4.5	13.14	413.9	-280.3	282.9	274.2	8.67	32.634	
1,900.0	1,876.6	1,861.6	1,861.4	6.2	4.6	14.30	413.7	-280.8	258.5	249.4	9.09	28.444	
2,000.0	1,973.4	1,959.3	1,959.1	6.7	4.6	15.64	412.8	-281.2	233.7	224.2	9.46	24.702	
2,100.0	2,070.2	2,056.3	2,056.1	7.2	4.7	17.24	411.7	-281.7	208.7	198.9	9.84	21.216	
2,200.0	2,167.0	2,153.1	2,152.9	7.7	4.7	19.31	410.6	-282.0	183.9	173.7	10.25	17.945	
2,300.0	2,263.8	2,249.9	2,249.6	8.2	4.7	22.14	409.5	-282.0	159.3	148.6	10.71	14.879	
2,400.0	2,360.6	2,346.5	2,346.3	8.8	4.8	26.04	408.3	-281.8	135.1	123.9	11.25	12.013	
2,500.0	2,457.4	2,443.1	2,442.9	9.3	4.8	31.57	407.1	-281.6	111.8	99.8	11.94	9.359	
2,600.0	2,554.2	2,539.8	2,539.5	9.8	4.9	39.73	405.8	-281.5	89.8	76.9	12.87	6.976	
2,700.0	2,651.0	2,636.4	2,636.2	10.3	5.0	52.48	404.4	-281.7	70.5	56.3	14.16	4.979	
2,800.0	2,747.9	2,733.0	2,732.7	10.8	5.1	72.43	402.8	-281.8	56.8	41.1	15.66	3.626	
2,876.7	2,822.1	2,807.0	2,806.7	11.2	5.2	92.47	401.6	-281.9	53.1	36.7	16.39	3.240 CC, ES, SF	
2,900.0	2,844.7	2,829.5	2,829.2	11.4	5.2	98.79	401.3	-281.9	53.5	37.0	16.45	3.250	
3,000.0	2,941.5	2,926.2	2,925.9	11.9	5.3	122.79	399.8	-282.2	62.0	46.0	15.99	3.876	
3,100.0	3,038.3	3,023.0	3,022.7	12.4	5.5	138.99	398.7	-282.8	78.2	62.9	15.34	5.100	
3,200.0	3,135.1	3,119.5	3,119.2	12.9	5.6	148.91	398.0	-283.3	98.5	83.5	15.04	6.549	
3,300.0	3,231.9	3,216.1	3,215.7	13.5	5.8	155.20	397.7	-283.4	120.9	105.8	15.03	8.041	
3,400.0	3,328.7	3,312.6	3,312.3	14.0	5.9	159.41	397.4	-283.3	144.3	129.2	15.16	9.517	
3,500.0	3,425.5	3,409.3	3,409.0	14.5	6.0	162.41	397.3	-283.0	168.4	153.0	15.38	10.947	
3,600.0	3,522.3	3,505.9	3,505.6	15.0	6.2	164.66	397.1	-282.8	192.8	177.2	15.67	12.308	
3,700.0	3,619.1	3,602.7	3,602.4	15.6	6.3	166.44	396.8	-282.6	217.5	201.5	16.00	13.594	
3,800.0	3,715.9	3,699.3	3,699.0	16.1	6.5	167.89	396.4	-282.4	242.3	226.0	16.37	14.806	
3,900.0	3,812.7	3,796.2	3,795.9	16.6	6.6	169.08	396.0	-282.3	267.3	250.5	16.76	15.945	
4,000.0	3,909.5	3,893.6	3,893.3	17.2	6.8	170.08	395.6	-282.4	292.1	274.9	17.18	17.000	
4,100.0	4,006.3	3,990.1	3,989.8	17.7	7.0	170.90	395.4	-282.4	317.0	299.4	17.62	17.994	
4,200.0	4,103.1	4,086.6	4,086.2	18.2	7.2	171.57	395.2	-282.3	342.0	323.9	18.04	18.958	
4,300.0	4,200.0	4,183.0	4,182.7	18.7	7.3	172.14	395.0	-282.1	367.1	348.6	18.46	19.884	
4,400.0	4,296.8	4,279.7	4,279.4	19.3	7.5	172.65	394.7	-281.8	392.3	373.4	18.90	20.761	
4,500.0	4,393.6	4,376.5	4,376.2	19.8	7.7	173.10	394.5	-281.7	417.5	398.2	19.34	21.583	
4,600.0	4,490.4	4,474.2	4,473.8	20.3	7.9	173.53	394.1	-281.7	442.7	422.9	19.81	22.346	
4,700.0	4,587.2	4,572.0	4,571.7	20.9	8.1	173.90	394.0	-281.8	467.6	447.3	20.26	23.083	
4,800.0	4,684.0	4,668.7	4,668.3	21.4	8.2	174.20	394.1	-281.8	492.4	471.7	20.70	23.792	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-402
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-402	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design Existing Wells - Sec.17 & 18-T5N-R64W - Bright 1 (SI) - Wellbore #1 - Wellbore #1												Offset Site Error:	0.0 ft
Survey Program: 100-NS-GYRO-MS												Offset Well Error:	0.0 ft
Reference		Offset		Semi Major Axis		Distance							Warning
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	
7,050.0	6,784.1	6,764.0	6,763.2	24.7	11.8	80.51	423.7	-278.6	489.2	458.5	30.76	15.904	
7,100.0	6,809.0	6,788.5	6,787.7	24.6	11.9	83.84	423.5	-278.3	478.8	447.2	31.57	15.167	
7,150.0	6,830.9	6,810.7	6,809.9	24.5	11.9	86.77	423.3	-278.0	471.8	439.6	32.28	14.619	
7,200.0	6,849.8	6,830.3	6,829.5	24.5	11.9	89.19	423.1	-277.7	469.0	436.1	32.90	14.254	
7,206.5	6,852.1	6,832.7	6,831.9	24.5	11.9	89.45	423.1	-277.6	469.0	436.0	32.99	14.218	
7,250.0	6,865.7	6,846.9	6,846.1	24.5	12.0	90.96	423.0	-277.4	470.8	437.3	33.48	14.062	
7,300.0	6,878.5	6,860.3	6,859.6	24.5	12.0	92.04	422.8	-277.2	477.3	443.3	34.04	14.025	
7,350.0	6,888.0	6,870.6	6,869.8	24.5	12.0	92.39	422.8	-277.1	488.8	454.2	34.61	14.124	

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-402
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-402	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design												Existing Wells - Sec.17 & 18-T5N-R64W - Dunn 1- Cache (Exist) - Wellbore #1 - Wellbore #1		Offset Site Error:		0.0 ft	
Survey Program:				100-NS-GYRO-MS								Offset Well Error:				0.0 ft	
Reference		Offset		Semi Major Axis			Distance							Warning			
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor					
8,449.1	6,892.3	6,879.4	6,878.9	45.0	12.6	90.07	393.2	958.1	498.9	441.4	57.50	8.676	CC, ES, SF				

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-402
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-402	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design Hop 5N64W18A Pad Sec.18-T5N-R64W - Hop 18E-232 - Wellbore #1 - Plan #1 (12-16-15)												Offset Site Error:	0.0 ft
Survey Program: 0-MWD												Offset Well Error:	0.0 ft
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Semi Major Axis Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning
0.0	0.0	0.0	0.0	0.0	0.0	90.03	0.0	14.8	14.8	14.8	0.00	N/A	
100.0	100.0	100.0	100.0	0.1	0.1	90.03	0.0	14.8	14.8	14.5	0.22	65.672	
200.0	200.0	200.0	200.0	0.3	0.3	90.03	0.0	14.8	14.8	14.1	0.67	21.891 CC	
300.0	300.0	300.0	300.0	0.6	0.6	133.75	0.0	14.8	15.4	14.2	1.12	13.672	
400.0	400.0	400.0	400.0	0.8	0.8	140.02	0.0	14.8	17.3	15.7	1.57	10.971	
500.0	499.9	500.2	500.2	1.0	1.0	146.74	0.6	14.1	20.0	18.0	2.02	9.888	
600.0	599.7	600.5	600.4	1.3	1.2	152.32	2.3	12.1	22.9	20.4	2.47	9.245	
700.0	699.4	700.8	700.7	1.5	1.5	157.13	5.2	8.8	25.8	22.9	2.93	8.815	
800.0	798.9	801.2	800.9	1.8	1.7	161.39	9.2	4.2	28.8	25.4	3.38	8.516	
900.0	898.3	901.7	901.0	2.1	1.9	165.25	14.4	-1.8	31.9	28.0	3.84	8.300	
1,000.0	997.4	1,002.2	1,001.1	2.4	2.2	168.80	20.7	-9.1	35.0	30.7	4.30	8.142	
1,100.0	1,096.3	1,102.7	1,101.0	2.7	2.5	172.11	28.2	-17.8	38.3	33.5	4.77	8.024	
1,200.0	1,194.9	1,203.4	1,200.7	3.0	2.8	175.22	36.8	-27.7	41.6	36.4	5.25	7.935	
1,300.0	1,293.3	1,304.0	1,300.3	3.4	3.1	178.17	46.6	-39.0	45.1	39.3	5.73	7.864	
1,400.0	1,391.2	1,404.8	1,399.6	3.8	3.4	-179.03	57.6	-51.6	48.6	42.4	6.23	7.805	
1,500.0	1,488.9	1,505.6	1,498.7	4.2	3.8	-176.35	69.7	-65.6	52.3	45.5	6.75	7.750	
1,600.0	1,586.1	1,606.4	1,597.5	4.7	4.2	-173.78	82.9	-80.8	56.1	48.8	7.29	7.694	
1,651.8	1,636.3	1,658.6	1,648.5	5.0	4.4	-172.50	90.2	-89.3	58.1	50.5	7.58	7.663	
1,700.0	1,683.0	1,707.3	1,696.0	5.2	4.6	-171.30	97.3	-97.4	59.8	51.9	7.87	7.602	
1,800.0	1,779.8	1,808.0	1,793.8	5.7	5.1	-168.65	112.7	-115.2	62.2	53.7	8.49	7.329	
1,900.0	1,876.6	1,907.9	1,890.9	6.2	5.5	-166.07	128.4	-133.3	64.3	55.2	9.15	7.026	
2,000.0	1,973.4	2,007.8	1,987.9	6.7	6.0	-163.66	144.0	-151.3	66.5	56.7	9.85	6.752	
2,100.0	2,070.2	2,107.8	2,085.0	7.2	6.5	-161.41	159.7	-169.4	68.9	58.3	10.59	6.504	
2,200.0	2,167.0	2,207.7	2,182.0	7.7	7.0	-159.30	175.3	-187.4	71.3	60.0	11.36	6.280	
2,300.0	2,263.8	2,307.6	2,279.1	8.2	7.5	-157.34	191.0	-205.4	73.8	61.7	12.15	6.076	
2,400.0	2,360.6	2,407.6	2,376.1	8.8	8.0	-155.51	206.6	-223.5	76.4	63.5	12.97	5.892	
2,500.0	2,457.4	2,507.5	2,473.1	9.3	8.5	-153.80	222.2	-241.5	79.1	65.3	13.82	5.725	
2,600.0	2,554.2	2,607.5	2,570.2	9.8	9.0	-152.21	237.9	-259.6	81.8	67.2	14.68	5.574	
2,700.0	2,651.0	2,707.4	2,667.2	10.3	9.5	-150.72	253.5	-277.6	84.6	69.1	15.57	5.437	
2,800.0	2,747.9	2,807.3	2,764.3	10.8	10.0	-149.32	269.2	-295.7	87.5	71.0	16.47	5.314	
2,900.0	2,844.7	2,907.3	2,861.3	11.4	10.5	-148.02	284.8	-313.7	90.4	73.0	17.38	5.201	
3,000.0	2,941.5	3,007.2	2,958.4	11.9	11.0	-146.79	300.5	-331.7	93.3	75.0	18.30	5.099	
3,100.0	3,038.3	3,107.1	3,055.4	12.4	11.5	-145.64	316.1	-349.8	96.3	77.1	19.24	5.007	
3,200.0	3,135.1	3,207.1	3,152.4	12.9	12.0	-144.56	331.8	-367.8	99.3	79.2	20.18	4.922	
3,300.0	3,231.9	3,307.0	3,249.5	13.5	12.5	-143.55	347.4	-385.9	102.4	81.3	21.13	4.845	
3,400.0	3,328.7	3,407.0	3,346.5	14.0	13.0	-142.59	363.1	-403.9	105.5	83.4	22.09	4.774	
3,500.0	3,425.5	3,506.9	3,443.6	14.5	13.5	-141.69	378.7	-421.9	108.6	85.5	23.06	4.710	
3,600.0	3,522.3	3,606.8	3,540.6	15.0	14.0	-140.84	394.4	-440.0	111.7	87.7	24.03	4.650	
3,700.0	3,619.1	3,706.8	3,637.6	15.6	14.5	-140.03	410.0	-458.0	114.9	89.9	25.00	4.595	
3,800.0	3,715.9	3,806.7	3,734.7	16.1	15.0	-139.27	425.6	-476.1	118.1	92.1	25.98	4.545	
3,900.0	3,812.7	3,906.6	3,831.7	16.6	15.5	-138.55	441.3	-494.1	121.3	94.3	26.96	4.498	
4,000.0	3,909.5	4,006.6	3,928.8	17.2	16.0	-137.87	456.9	-512.1	124.5	96.5	27.95	4.455	
4,100.0	4,006.3	4,106.5	4,025.8	17.7	16.5	-137.22	472.6	-530.2	127.7	98.8	28.93	4.415	
4,200.0	4,103.1	4,206.5	4,122.9	18.2	17.0	-136.60	488.2	-548.2	131.0	101.1	29.92	4.377	
4,300.0	4,200.0	4,306.4	4,219.9	18.7	17.5	-136.01	503.9	-566.3	134.3	103.3	30.91	4.343	
4,400.0	4,296.8	4,406.3	4,316.9	19.3	18.0	-135.45	519.5	-584.3	137.5	105.6	31.91	4.310	
4,500.0	4,393.6	4,506.3	4,414.0	19.8	18.5	-134.92	535.2	-602.4	140.8	107.9	32.90	4.280	
4,600.0	4,490.4	4,606.2	4,511.0	20.3	19.0	-134.41	550.8	-620.4	144.1	110.2	33.90	4.252	
4,700.0	4,587.2	4,706.1	4,608.1	20.9	19.6	-133.93	566.5	-638.4	147.4	112.6	34.89	4.226	
4,800.0	4,684.0	4,806.1	4,705.1	21.4	20.1	-133.46	582.1	-656.5	150.8	114.9	35.89	4.201	
4,900.0	4,780.8	4,906.0	4,802.2	21.9	20.6	-133.02	597.8	-674.5	154.1	117.2	36.89	4.177	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-402
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-402	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design		Hop 5N64W18A Pad Sec.18-T5N-R64W - Hop 18E-232 - Wellbore #1 - Plan #1 (12-16-15)											Offset Site Error:	0.0 ft
Survey Program: 0-MWD													Offset Well Error:	0.0 ft
Reference		Offset		Semi Major Axis			Distance							Warning
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor		
5,000.0	4,877.6	5,006.0	4,899.2	22.4	21.1	-132.59	613.4	-692.6	157.5	119.6	37.89	4.155		
5,100.0	4,974.4	5,104.5	4,995.0	23.0	21.5	-132.32	628.5	-710.0	161.1	122.3	38.81	4.151		
5,170.3	5,042.5	5,173.0	5,061.9	23.3	21.8	-132.54	638.2	-721.1	164.4	125.1	39.27	4.187		
5,200.0	5,071.2	5,202.0	5,090.2	23.5	21.9	-132.71	642.0	-725.6	166.0	126.5	39.43	4.209		
5,300.0	5,168.6	5,300.0	5,186.6	23.9	22.2	-133.33	654.0	-739.4	171.0	131.1	39.87	4.289		
5,400.0	5,266.4	5,396.6	5,281.9	24.2	22.5	-133.96	664.2	-751.1	175.7	135.5	40.24	4.367		
5,500.0	5,364.8	5,493.8	5,378.2	24.5	22.8	-134.61	672.9	-761.1	180.2	139.6	40.55	4.444		
5,600.0	5,463.6	5,590.9	5,474.7	24.8	23.0	-135.28	679.9	-769.3	184.4	143.6	40.79	4.520		
5,700.0	5,562.8	5,687.9	5,571.3	25.1	23.2	-135.97	685.4	-775.5	188.2	147.3	40.97	4.595		
5,800.0	5,662.3	5,784.8	5,668.0	25.3	23.4	-136.68	689.2	-780.0	191.8	150.7	41.08	4.670		
5,900.0	5,762.0	5,881.6	5,764.8	25.5	23.5	-137.41	691.4	-782.5	195.1	154.0	41.12	4.745		
6,000.0	5,861.9	5,978.7	5,861.9	25.6	23.6	-138.16	692.0	-783.2	198.1	157.0	41.10	4.821		
6,100.0	5,961.8	6,078.7	5,961.8	25.8	23.7	-138.62	692.0	-783.2	199.9	158.7	41.17	4.855		
6,138.2	6,000.0	6,116.8	6,000.0	25.8	23.7	179.93	692.0	-782.7	200.0	159.3	40.76	4.907		
6,200.0	6,061.8	6,178.3	6,061.3	25.9	23.8	178.59	692.0	-778.1	200.1	158.7	41.34	4.840		
6,271.9	6,133.8	6,248.3	6,130.4	25.9	23.8	175.36	692.0	-766.8	200.7	158.2	42.52	4.720		
6,300.0	6,161.8	6,275.1	6,156.5	26.0	23.7	83.75	692.0	-760.8	201.3	161.9	39.31	5.119		
6,350.0	6,211.7	6,322.3	6,201.9	26.0	23.7	80.95	692.0	-748.0	202.6	164.3	38.33	5.287		
6,400.0	6,261.2	6,369.1	6,246.0	26.0	23.6	78.23	692.0	-732.6	204.5	167.1	37.34	5.477		
6,450.0	6,310.2	6,415.2	6,288.6	26.0	23.5	75.63	692.0	-714.8	206.7	170.4	36.36	5.686		
6,500.0	6,358.5	6,460.9	6,329.6	25.9	23.4	73.14	692.0	-694.7	209.3	173.9	35.40	5.913		
6,550.0	6,405.7	6,506.1	6,369.0	25.9	23.3	70.78	692.0	-672.4	212.2	177.7	34.48	6.154		
6,600.0	6,451.9	6,550.0	6,405.8	25.8	23.2	68.60	692.0	-648.5	215.3	181.7	33.62	6.404		
6,650.0	6,496.6	6,595.3	6,442.3	25.7	23.1	66.48	692.0	-621.7	218.6	185.8	32.78	6.669		
6,700.0	6,539.8	6,639.3	6,476.2	25.6	23.0	64.55	692.0	-593.7	222.0	190.0	32.01	6.937		
6,750.0	6,581.2	6,683.0	6,508.2	25.4	22.9	62.76	692.0	-564.0	225.5	194.2	31.29	7.206		
6,800.0	6,620.8	6,726.3	6,538.2	25.3	22.8	61.12	692.0	-532.7	229.0	198.3	30.64	7.474		
6,850.0	6,658.2	6,769.4	6,566.3	25.2	22.7	59.61	692.0	-500.1	232.4	202.3	30.06	7.732		
6,900.0	6,693.4	6,812.2	6,592.2	25.1	22.6	58.24	692.0	-466.1	235.7	206.2	29.56	7.975		
6,950.0	6,726.3	6,854.7	6,616.1	24.9	22.6	57.01	692.0	-430.9	238.9	209.8	29.17	8.192		
7,000.0	6,756.5	6,900.0	6,639.4	24.8	22.5	55.84	692.0	-392.0	242.0	213.1	28.88	8.378		
7,050.0	6,784.1	6,939.1	6,657.6	24.7	22.5	54.92	692.0	-357.4	244.8	216.0	28.78	8.506		
7,100.0	6,809.0	6,981.0	6,675.1	24.6	22.5	54.06	692.0	-319.3	247.3	218.5	28.82	8.584		
7,150.0	6,830.9	7,022.8	6,690.5	24.5	22.6	53.31	692.0	-280.5	249.7	220.6	29.03	8.600		
7,200.0	6,849.8	7,064.5	6,703.6	24.5	22.7	52.68	692.0	-241.0	251.7	222.2	29.43	8.551		
7,250.0	6,865.7	7,106.0	6,714.6	24.5	22.8	52.16	692.0	-200.9	253.4	223.4	30.03	8.438		
7,300.0	6,878.5	7,150.0	6,723.8	24.5	23.0	51.73	692.0	-157.9	254.8	224.0	30.84	8.263		
7,350.0	6,888.0	7,188.8	6,729.9	24.5	23.3	51.44	692.0	-119.5	255.8	224.0	31.80	8.044		
7,400.0	6,894.3	7,230.2	6,734.2	24.7	23.6	51.24	692.0	-78.5	256.5	223.6	32.96	7.783		
7,450.0	6,897.4	7,271.5	6,736.3	24.9	24.0	51.14	692.0	-37.2	256.9	222.6	34.27	7.495		
7,476.2	6,897.7	7,295.6	6,736.5	25.1	24.3	51.13	692.0	-13.0	256.9	221.9	35.04	7.332		
7,478.9	6,897.7	7,295.6	6,736.5	25.1	24.3	51.13	692.0	-13.0	256.9	221.8	35.07	7.325		
7,500.0	6,897.6	7,316.4	6,736.3	25.2	24.6	51.12	692.0	7.7	256.9	221.3	35.59	7.219		
7,600.0	6,897.0	7,416.4	6,735.5	26.4	26.0	51.07	692.0	107.7	257.1	218.9	38.23	6.725		
7,700.0	6,896.5	7,516.4	6,734.7	28.0	27.7	51.03	692.0	207.7	257.3	216.1	41.18	6.248		
7,800.0	6,895.9	7,616.4	6,733.9	29.9	29.7	50.98	692.0	307.7	257.4	213.1	44.37	5.802		
7,900.0	6,895.3	7,716.4	6,733.0	32.0	31.7	50.94	692.0	407.7	257.6	209.8	47.76	5.394		
8,000.0	6,894.8	7,816.4	6,732.2	34.2	34.0	50.89	692.0	507.7	257.8	206.5	51.30	5.024		
8,100.0	6,894.2	7,916.4	6,731.4	36.5	36.3	50.85	692.0	607.7	257.9	202.9	54.97	4.692		
8,200.0	6,893.7	8,016.4	6,730.6	38.9	38.6	50.80	692.0	707.7	258.1	199.3	58.74	4.394		
8,300.0	6,893.1	8,116.4	6,729.8	41.3	41.1	50.76	692.0	807.7	258.3	195.7	62.59	4.126		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-402
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-402	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design Hop 5N64W18A Pad Sec.18-T5N-R64W - Hop 18E-232 - Wellbore #1 - Plan #1 (12-16-15)													Offset Site Error: 0.0 ft	
Survey Program: 0-MWD													Offset Well Error: 0.0 ft	
Reference		Offset		Semi Major Axis			Distance						Warning	
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor		
8,400.0	6,892.6	8,216.4	6,728.9	43.8	43.5	50.71	692.0	907.6	258.4	191.9	66.51	3.886		
8,500.0	6,892.0	8,316.4	6,728.1	46.3	46.0	50.67	692.0	1,007.6	258.6	188.1	70.48	3.669		
8,600.0	6,891.4	8,416.4	6,727.3	48.8	48.6	50.62	692.0	1,107.6	258.7	184.3	74.49	3.474		
8,700.0	6,890.9	8,516.4	6,726.5	51.4	51.2	50.58	692.0	1,207.6	258.9	180.4	78.54	3.297		
8,800.0	6,890.3	8,616.4	6,725.7	54.0	53.8	50.53	692.0	1,307.6	259.1	176.5	82.62	3.136		
8,900.0	6,889.8	8,716.4	6,724.8	56.6	56.4	50.49	692.0	1,407.6	259.2	172.5	86.73	2.989		
9,000.0	6,889.2	8,816.4	6,724.0	59.2	59.0	50.44	692.0	1,507.6	259.4	168.6	90.85	2.855		
9,100.0	6,888.6	8,916.4	6,723.2	61.9	61.6	50.40	692.0	1,607.6	259.6	164.6	95.00	2.732		
9,200.0	6,888.1	9,016.3	6,722.4	64.5	64.3	50.36	692.0	1,707.6	259.7	160.6	99.16	2.620		
9,300.0	6,887.5	9,116.3	6,721.5	67.2	67.0	50.31	692.0	1,807.6	259.9	156.6	103.33	2.515		
9,400.0	6,887.0	9,216.3	6,720.7	69.9	69.7	50.27	692.0	1,907.6	260.1	152.6	107.51	2.419		
9,500.0	6,886.4	9,316.3	6,719.9	72.6	72.4	50.22	692.0	2,007.6	260.2	148.5	111.70	2.330		
9,600.0	6,885.9	9,416.3	6,719.1	75.3	75.1	50.18	692.0	2,107.6	260.4	144.5	115.90	2.247		
9,700.0	6,885.3	9,516.3	6,718.3	78.0	77.8	50.13	692.0	2,207.6	260.6	140.5	120.10	2.170		
9,800.0	6,884.7	9,616.3	6,717.4	80.7	80.5	50.09	692.0	2,307.6	260.8	136.4	124.31	2.098		
9,900.0	6,884.2	9,716.3	6,716.6	83.4	83.2	50.05	692.0	2,407.6	260.9	132.4	128.53	2.030		
10,000.0	6,883.6	9,816.3	6,715.8	86.1	85.9	50.00	692.0	2,507.6	261.1	128.3	132.74	1.967		
10,100.0	6,883.1	9,916.3	6,715.0	88.8	88.7	49.96	692.0	2,607.6	261.3	124.3	136.96	1.908		
10,200.0	6,882.5	10,016.3	6,714.2	91.6	91.4	49.91	692.0	2,707.6	261.4	120.2	141.18	1.852		
10,300.0	6,881.9	10,116.3	6,713.3	94.3	94.1	49.87	692.0	2,807.6	261.6	116.2	145.40	1.799		
10,400.0	6,881.4	10,216.3	6,712.5	97.1	96.9	49.83	692.0	2,907.6	261.8	112.1	149.62	1.750		
10,500.0	6,880.8	10,316.3	6,711.7	99.8	99.6	49.78	692.0	3,007.6	261.9	108.1	153.84	1.703		
10,600.0	6,880.3	10,416.3	6,710.9	102.6	102.4	49.74	692.0	3,107.6	262.1	104.0	158.06	1.658		
10,700.0	6,879.7	10,516.3	6,710.1	105.3	105.1	49.70	692.0	3,207.6	262.3	100.0	162.28	1.616		
10,800.0	6,879.2	10,616.3	6,709.2	108.1	107.9	49.65	692.0	3,307.6	262.4	95.9	166.49	1.576		
10,900.0	6,878.6	10,716.3	6,708.4	110.8	110.7	49.61	692.0	3,407.6	262.6	91.9	170.71	1.538		
11,000.0	6,878.0	10,816.3	6,707.6	113.6	113.4	49.56	692.0	3,507.6	262.8	87.9	174.92	1.502		
11,100.0	6,877.5	10,916.3	6,706.8	116.3	116.2	49.52	692.0	3,607.5	262.9	83.8	179.14	1.468 Level 3		
11,200.0	6,876.9	11,016.3	6,706.0	119.1	119.0	49.48	692.0	3,707.5	263.1	79.8	183.35	1.435 Level 3		
11,300.0	6,876.4	11,116.3	6,705.1	121.9	121.7	49.43	692.0	3,807.5	263.3	75.7	187.56	1.404 Level 3		
11,400.0	6,875.8	11,216.3	6,704.3	124.6	124.5	49.39	692.0	3,907.5	263.5	71.7	191.76	1.374 Level 3		
11,500.0	6,875.2	11,316.3	6,703.5	127.4	127.3	49.35	692.0	4,007.5	263.6	67.7	195.96	1.345 Level 3		
11,600.0	6,874.7	11,416.3	6,702.7	130.2	130.0	49.30	692.0	4,107.5	263.8	63.6	200.17	1.318 Level 3		
11,700.0	6,874.1	11,516.3	6,701.9	133.0	132.8	49.26	692.0	4,207.5	264.0	59.6	204.36	1.292 Level 3		
11,800.0	6,873.6	11,616.3	6,701.0	135.7	135.6	49.22	692.0	4,307.5	264.1	55.6	208.56	1.267 Level 3		
11,900.0	6,873.0	11,716.3	6,700.2	138.5	138.4	49.18	692.0	4,407.5	264.3	51.6	212.75	1.242 Level 2		
12,000.0	6,872.4	11,816.3	6,699.4	141.3	141.2	49.13	692.0	4,507.5	264.5	47.5	216.94	1.219 Level 2		
12,100.0	6,871.9	11,916.3	6,698.6	144.1	143.9	49.09	692.0	4,607.5	264.7	43.5	221.12	1.197 Level 2		
12,200.0	6,871.3	12,016.3	6,697.8	146.9	146.7	49.05	692.0	4,707.5	264.8	39.5	225.30	1.175 Level 2		
12,300.0	6,870.8	12,116.3	6,696.9	149.6	149.5	49.00	692.0	4,807.5	265.0	35.5	229.48	1.155 Level 2		
12,400.0	6,870.2	12,216.3	6,696.1	152.4	152.3	48.96	692.0	4,907.5	265.2	31.5	233.65	1.135 Level 2		
12,500.0	6,869.7	12,316.3	6,695.3	155.2	155.1	48.92	692.0	5,007.5	265.3	27.5	237.82	1.116 Level 2		
12,600.0	6,869.1	12,416.3	6,694.5	158.0	157.9	48.88	692.0	5,107.5	265.5	23.5	241.99	1.097 Level 2		
12,700.0	6,868.5	12,516.3	6,693.7	160.8	160.6	48.83	692.0	5,207.5	265.7	19.5	246.15	1.079 Level 2		
12,800.0	6,868.0	12,616.3	6,692.8	163.6	163.4	48.79	692.0	5,307.5	265.9	15.5	250.31	1.062 Level 2		
12,900.0	6,867.4	12,716.3	6,692.0	166.3	166.2	48.75	692.0	5,407.5	266.0	11.6	254.47	1.045 Level 2		
13,000.0	6,866.9	12,816.3	6,691.2	169.1	169.0	48.71	692.0	5,507.5	266.2	7.6	258.62	1.029 Level 2		
13,100.0	6,866.3	12,916.3	6,690.4	171.9	171.8	48.66	692.0	5,607.5	266.4	3.6	262.76	1.014 Level 2		
13,200.0	6,865.7	13,016.3	6,689.6	174.7	174.6	48.62	692.0	5,707.5	266.5	-0.4	266.91	0.999 Level 1		
13,300.0	6,865.2	13,116.3	6,688.7	177.5	177.4	48.58	692.0	5,807.5	266.7	-4.3	271.05	0.984 Level 1		
13,400.0	6,864.6	13,216.3	6,687.9	180.3	180.2	48.54	692.0	5,907.5	266.9	-8.3	275.18	0.970 Level 1		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-402
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-402	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design Hop 5N64W18A Pad Sec.18-T5N-R64W - Hop 18E-232 - Wellbore #1 - Plan #1 (12-16-15)												Offset Site Error:	0.0 ft
Survey Program: 0-MWD												Offset Well Error:	0.0 ft
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Semi Major Axis Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning
13,500.0	6,864.1	13,316.3	6,687.1	183.1	183.0	48.50	692.0	6,007.5	267.1	-12.2	279.31	0.956	Level 1
13,600.0	6,863.5	13,416.3	6,686.3	185.9	185.7	48.45	692.0	6,107.5	267.2	-16.2	283.44	0.943	Level 1
13,700.0	6,863.0	13,516.3	6,685.5	188.7	188.5	48.41	692.0	6,207.5	267.4	-20.1	287.56	0.930	Level 1
13,800.0	6,862.4	13,616.3	6,684.6	191.5	191.3	48.37	692.0	6,307.4	267.6	-24.1	291.68	0.917	Level 1
13,900.0	6,861.8	13,716.3	6,683.8	194.2	194.1	48.33	692.0	6,407.4	267.8	-28.0	295.79	0.905	Level 1
14,000.0	6,861.3	13,816.3	6,683.0	197.0	196.9	48.29	692.0	6,507.4	267.9	-32.0	299.90	0.893	Level 1
14,100.0	6,860.7	13,916.3	6,682.2	199.8	199.7	48.24	692.0	6,607.4	268.1	-35.9	304.01	0.882	Level 1
14,200.0	6,860.2	14,016.3	6,681.4	202.6	202.5	48.20	692.0	6,707.4	268.3	-39.8	308.11	0.871	Level 1
14,300.0	6,859.6	14,116.3	6,680.5	205.4	205.3	48.16	692.0	6,807.4	268.5	-43.7	312.21	0.860	Level 1
14,400.0	6,859.0	14,216.3	6,679.7	208.2	208.1	48.12	692.0	6,907.4	268.6	-47.7	316.30	0.849	Level 1
14,500.0	6,858.5	14,316.3	6,678.9	211.0	210.9	48.08	692.0	7,007.4	268.8	-51.6	320.39	0.839	Level 1
14,600.0	6,857.9	14,416.3	6,678.1	213.8	213.7	48.04	692.0	7,107.4	269.0	-55.5	324.47	0.829	Level 1
14,700.0	6,857.4	14,516.3	6,677.3	216.6	216.5	47.99	692.0	7,207.4	269.2	-59.4	328.55	0.819	Level 1
14,800.0	6,856.8	14,616.3	6,676.4	219.4	219.3	47.95	692.0	7,307.4	269.3	-63.3	332.63	0.810	Level 1
14,900.0	6,856.3	14,716.3	6,675.6	222.2	222.1	47.91	692.0	7,407.4	269.5	-67.2	336.70	0.800	Level 1
15,000.0	6,855.7	14,816.3	6,674.8	225.0	224.9	47.87	692.0	7,507.4	269.7	-71.1	340.76	0.791	Level 1
15,100.0	6,855.1	14,916.3	6,674.0	227.8	227.7	47.83	692.0	7,607.4	269.9	-75.0	344.82	0.783	Level 1
15,200.0	6,854.6	15,016.3	6,673.2	230.6	230.5	47.79	692.0	7,707.4	270.0	-78.8	348.88	0.774	Level 1
15,300.0	6,854.0	15,116.3	6,672.3	233.4	233.3	47.75	692.0	7,807.4	270.2	-82.7	352.93	0.766	Level 1
15,400.0	6,853.5	15,216.3	6,671.5	236.2	236.1	47.71	692.0	7,907.4	270.4	-86.6	356.98	0.757	Level 1
15,500.0	6,852.9	15,316.3	6,670.7	239.0	238.9	47.66	692.0	8,007.4	270.6	-90.5	361.03	0.749	Level 1
15,600.0	6,852.3	15,416.3	6,669.9	241.8	241.7	47.62	692.0	8,107.4	270.7	-94.3	365.07	0.742	Level 1
15,700.0	6,851.8	15,516.3	6,669.1	244.6	244.5	47.58	692.0	8,207.4	270.9	-98.2	369.10	0.734	Level 1
15,800.0	6,851.2	15,616.3	6,668.2	247.4	247.3	47.54	692.0	8,307.4	271.1	-102.0	373.13	0.727	Level 1
15,900.0	6,850.7	15,716.3	6,667.4	250.2	250.1	47.50	692.0	8,407.4	271.3	-105.9	377.16	0.719	Level 1
16,000.0	6,850.1	15,816.3	6,666.6	253.0	252.9	47.46	692.0	8,507.4	271.4	-109.7	381.18	0.712	Level 1
16,100.0	6,849.6	15,916.3	6,665.8	255.8	255.7	47.42	692.0	8,607.4	271.6	-113.6	385.20	0.705	Level 1
16,200.0	6,849.0	16,016.3	6,664.9	258.6	258.5	47.38	692.0	8,707.4	271.8	-117.4	389.21	0.698	Level 1
16,300.0	6,848.4	16,116.3	6,664.1	261.4	261.3	47.34	692.0	8,807.4	272.0	-121.2	393.22	0.692	Level 1
16,400.0	6,847.9	16,216.3	6,663.3	264.2	264.1	47.30	692.0	8,907.4	272.2	-125.1	397.22	0.685	Level 1
16,500.0	6,847.3	16,316.3	6,662.5	267.0	266.9	47.26	692.0	9,007.3	272.3	-128.9	401.22	0.679	Level 1
16,556.8	6,847.0	16,373.1	6,662.0	268.6	268.5	47.23	692.0	9,064.1	272.4	-131.0	403.49	0.675	Level 1, ES, SF

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-402
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-402	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design Hop 5N64W18A Pad Sec.18-T5N-R64W - Hop 18E-332 - Wellbore #1 - Plan #1 (12-16-15)												Offset Site Error:	0.0 ft
Survey Program: 0-MWD												Offset Well Error:	0.0 ft
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Semi Major Axis Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Distance Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning
0.0	0.0	0.0	0.0	0.0	0.0	90.71	-0.4	29.8	29.8				
100.0	100.0	100.0	100.0	0.1	0.1	90.71	-0.4	29.8	29.8	29.6	0.22	132.594	
200.0	200.0	200.0	200.0	0.3	0.3	90.71	-0.4	29.8	29.8	29.1	0.67	44.198 CC	
300.0	300.0	300.0	300.0	0.6	0.6	133.20	-0.4	29.8	30.4	29.3	1.12	27.071	
400.0	400.0	400.0	400.0	0.8	0.8	136.58	-0.4	29.8	32.2	30.7	1.57	20.496	
500.0	499.9	499.9	499.9	1.0	1.0	141.40	-0.4	29.8	35.5	33.5	2.03	17.528	
600.0	599.7	599.7	599.7	1.3	1.2	146.77	-0.4	29.8	40.5	38.0	2.49	16.294	
700.0	699.4	700.2	700.2	1.5	1.5	151.83	0.1	29.0	46.4	43.5	2.94	15.796	
800.0	798.9	800.8	800.7	1.8	1.7	156.36	1.4	26.7	52.4	49.0	3.38	15.488	
900.0	898.3	901.5	901.3	2.1	1.9	160.51	3.5	22.9	58.6	54.8	3.84	15.274	
1,000.0	997.4	1,002.3	1,001.9	2.4	2.1	164.38	6.5	17.5	64.9	60.6	4.29	15.133	
1,100.0	1,096.3	1,103.2	1,102.5	2.7	2.4	168.03	10.4	10.5	71.5	66.7	4.75	15.048	
1,200.0	1,194.9	1,204.1	1,203.0	3.0	2.6	171.49	15.2	2.0	78.3	73.0	5.21	15.007	
1,300.0	1,293.3	1,305.2	1,303.4	3.4	2.9	174.80	20.8	-8.0	85.3	79.6	5.69	14.996	
1,400.0	1,391.2	1,406.3	1,403.7	3.8	3.2	177.96	27.3	-19.6	92.6	86.5	6.17	15.004	
1,500.0	1,488.9	1,507.5	1,503.7	4.2	3.5	-179.00	34.7	-32.8	100.3	93.6	6.68	15.018	
1,600.0	1,586.1	1,608.8	1,603.6	4.7	3.8	-176.09	42.9	-47.5	108.3	101.1	7.21	15.029	
1,651.8	1,636.3	1,661.2	1,655.2	5.0	4.0	-174.63	47.5	-55.7	112.6	105.1	7.49	15.028	
1,700.0	1,683.0	1,710.1	1,703.2	5.2	4.2	-173.29	52.0	-63.7	116.5	108.7	7.77	14.990	
1,800.0	1,779.8	1,811.6	1,802.6	5.7	4.6	-170.49	62.0	-81.5	123.5	115.2	8.38	14.741	
1,900.0	1,876.6	1,911.6	1,900.3	6.2	5.0	-167.77	72.4	-100.1	129.9	120.8	9.03	14.378	
2,000.0	1,973.4	2,011.2	1,997.6	6.7	5.4	-165.30	82.8	-118.6	136.4	126.7	9.72	14.040	
2,100.0	2,070.2	2,110.8	2,094.9	7.2	5.8	-163.07	93.2	-137.2	143.2	132.8	10.43	13.729	
2,200.0	2,167.0	2,210.4	2,192.2	7.7	6.3	-161.04	103.6	-155.7	150.2	139.0	11.17	13.443	
2,300.0	2,263.8	2,310.0	2,289.6	8.2	6.7	-159.19	114.0	-174.2	157.3	145.4	11.94	13.181	
2,400.0	2,360.6	2,409.7	2,386.9	8.8	7.1	-157.50	124.4	-192.8	164.6	151.9	12.72	12.942	
2,500.0	2,457.4	2,509.3	2,484.2	9.3	7.6	-155.96	134.7	-211.3	172.1	158.6	13.53	12.723	
2,600.0	2,554.2	2,608.9	2,581.6	9.8	8.0	-154.54	145.1	-229.8	179.6	165.3	14.34	12.523	
2,700.0	2,651.0	2,708.5	2,678.9	10.3	8.5	-153.24	155.5	-248.4	187.3	172.1	15.17	12.342	
2,800.0	2,747.9	2,808.1	2,776.2	10.8	8.9	-152.04	165.9	-266.9	195.0	179.0	16.02	12.176	
2,900.0	2,844.7	2,907.8	2,873.5	11.4	9.4	-150.94	176.3	-285.4	202.8	186.0	16.87	12.024	
3,000.0	2,941.5	3,007.4	2,970.9	11.9	9.8	-149.91	186.7	-303.9	210.7	193.0	17.73	11.885	
3,100.0	3,038.3	3,107.0	3,068.2	12.4	10.3	-148.97	197.0	-322.5	218.7	200.1	18.60	11.759	
3,200.0	3,135.1	3,206.6	3,165.5	12.9	10.7	-148.08	207.4	-341.0	226.7	207.2	19.47	11.642	
3,300.0	3,231.9	3,306.2	3,262.9	13.5	11.2	-147.26	217.8	-359.5	234.7	214.4	20.35	11.535	
3,400.0	3,328.7	3,405.9	3,360.2	14.0	11.7	-146.49	228.2	-378.1	242.8	221.6	21.23	11.437	
3,500.0	3,425.5	3,505.5	3,457.5	14.5	12.1	-145.77	238.6	-396.6	251.0	228.8	22.12	11.346	
3,600.0	3,522.3	3,605.1	3,554.9	15.0	12.6	-145.10	249.0	-415.1	259.1	236.1	23.01	11.262	
3,700.0	3,619.1	3,704.7	3,652.2	15.6	13.0	-144.47	259.4	-433.7	267.3	243.4	23.90	11.184	
3,800.0	3,715.9	3,804.3	3,749.5	16.1	13.5	-143.87	269.7	-452.2	275.6	250.8	24.80	11.112	
3,900.0	3,812.7	3,904.0	3,846.8	16.6	14.0	-143.32	280.1	-470.7	283.8	258.1	25.70	11.045	
4,000.0	3,909.5	4,003.6	3,944.2	17.2	14.4	-142.79	290.5	-489.3	292.1	265.5	26.60	10.982	
4,100.0	4,006.3	4,103.2	4,041.5	17.7	14.9	-142.29	300.9	-507.8	300.4	272.9	27.50	10.924	
4,200.0	4,103.1	4,202.8	4,138.8	18.2	15.3	-141.82	311.3	-526.3	308.8	280.4	28.41	10.870	
4,300.0	4,200.0	4,302.5	4,236.2	18.7	15.8	-141.37	321.7	-544.9	317.1	287.8	29.31	10.819	
4,400.0	4,296.8	4,402.1	4,333.5	19.3	16.3	-140.95	332.0	-563.4	325.5	295.3	30.22	10.771	
4,500.0	4,393.6	4,501.7	4,430.8	19.8	16.7	-140.54	342.4	-581.9	333.9	302.8	31.13	10.726	
4,600.0	4,490.4	4,601.3	4,528.1	20.3	17.2	-140.16	352.8	-600.4	342.3	310.3	32.04	10.684	
4,700.0	4,587.2	4,700.9	4,625.5	20.9	17.6	-139.79	363.2	-619.0	350.7	317.8	32.95	10.644	
4,800.0	4,684.0	4,800.6	4,722.8	21.4	18.1	-139.45	373.6	-637.5	359.2	325.3	33.86	10.607	
4,900.0	4,780.8	4,900.2	4,820.1	21.9	18.6	-139.12	384.0	-656.0	367.6	332.8	34.77	10.572	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-402
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-402	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design		Hop 5N64W18A Pad Sec.18-T5N-R64W - Hop 18E-332 - Wellbore #1 - Plan #1 (12-16-15)											Offset Site Error:		0.0 ft
Survey Program: 0-MWD													Offset Well Error:		0.0 ft
Reference		Offset		Semi Major Axis			Distance							Warning	
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor			
5,000.0	4,877.6	4,999.8	4,917.5	22.4	19.0	-138.80	394.4	-674.6	376.1	340.4	35.69	10.538			
5,100.0	4,974.4	5,099.4	5,014.8	23.0	19.5	-138.50	404.7	-693.1	384.5	347.9	36.60	10.506			
5,170.3	5,042.5	5,169.4	5,083.2	23.3	19.8	-138.29	412.0	-706.1	390.5	353.3	37.24	10.485			
5,200.0	5,071.2	5,197.7	5,110.9	23.5	19.9	-138.24	414.9	-711.3	393.0	355.5	37.48	10.484			
5,300.0	5,168.6	5,292.6	5,203.9	23.9	20.3	-138.09	424.0	-727.4	400.8	362.7	38.14	10.509			
5,400.0	5,266.4	5,387.5	5,297.4	24.2	20.5	-138.00	431.8	-741.5	408.0	369.2	38.74	10.532			
5,500.0	5,364.8	5,482.4	5,391.3	24.5	20.8	-137.96	438.6	-753.5	414.4	375.1	39.27	10.553			
5,600.0	5,463.6	5,577.2	5,485.5	24.8	21.0	-137.97	444.2	-763.5	420.0	380.3	39.73	10.573			
5,700.0	5,562.8	5,672.1	5,579.9	25.1	21.2	-138.03	448.7	-771.5	424.9	384.8	40.12	10.591			
5,800.0	5,662.3	5,766.9	5,674.5	25.3	21.4	-138.14	452.0	-777.4	429.0	388.6	40.44	10.608			
5,900.0	5,762.0	5,861.7	5,769.1	25.5	21.6	-138.29	454.1	-781.2	432.4	391.7	40.70	10.624			
6,000.0	5,861.9	5,956.5	5,863.9	25.6	21.7	-138.49	455.1	-783.1	435.0	394.1	40.89	10.639			
6,100.0	5,961.8	6,054.4	5,961.8	25.8	21.8	-138.68	455.2	-783.2	436.7	395.6	41.06	10.636			
6,138.2	6,000.0	6,092.6	6,000.0	25.8	21.9	-179.97	455.2	-783.2	436.8	398.7	38.08	11.471			
6,200.0	6,061.8	6,154.4	6,061.8	25.9	21.9	-179.99	455.2	-783.1	436.8	398.6	38.26	11.417			
6,209.7	6,071.6	6,164.2	6,071.6	25.9	22.0	179.98	455.2	-782.8	436.8	398.5	38.30	11.407			
6,271.9	6,133.8	6,226.0	6,133.3	25.9	22.0	179.39	455.2	-778.4	436.8	398.2	38.62	11.310			
6,300.0	6,161.8	6,253.7	6,160.7	26.0	22.0	88.98	455.2	-774.7	436.9	395.7	41.16	10.614			
6,350.0	6,211.7	6,302.7	6,208.9	26.0	22.0	88.25	455.2	-765.9	437.0	396.1	40.96	10.670			
6,400.0	6,261.2	6,351.4	6,256.1	26.0	21.9	87.54	455.2	-754.1	437.2	396.5	40.70	10.742			
6,450.0	6,310.2	6,400.0	6,302.4	26.0	21.8	86.83	455.2	-739.4	437.5	397.1	40.40	10.829			
6,500.0	6,358.5	6,447.7	6,346.9	25.9	21.8	86.15	455.2	-722.0	437.8	397.7	40.07	10.926			
6,550.0	6,405.7	6,495.5	6,390.2	25.9	21.7	85.48	455.2	-701.9	438.2	398.5	39.72	11.031			
6,600.0	6,451.9	6,542.9	6,431.9	25.8	21.5	84.84	455.2	-679.4	438.6	399.3	39.37	11.142			
6,650.0	6,496.6	6,590.1	6,471.9	25.7	21.4	84.21	455.2	-654.4	439.1	400.1	39.02	11.254			
6,700.0	6,539.8	6,637.0	6,510.1	25.6	21.3	83.61	455.2	-627.1	439.6	400.9	38.69	11.362			
6,750.0	6,581.2	6,683.7	6,546.3	25.4	21.2	83.04	455.2	-597.7	440.1	401.7	38.39	11.462			
6,800.0	6,620.8	6,730.1	6,580.5	25.3	21.1	82.50	455.2	-566.3	440.6	402.5	38.15	11.549			
6,850.0	6,658.2	6,776.3	6,612.6	25.2	21.0	81.99	455.2	-533.1	441.1	403.2	37.98	11.615			
6,900.0	6,693.4	6,822.4	6,642.6	25.1	21.0	81.52	455.2	-498.1	441.7	403.8	37.89	11.656			
6,950.0	6,726.3	6,868.2	6,670.2	24.9	21.0	81.08	455.2	-461.5	442.2	404.3	37.91	11.664			
7,000.0	6,756.5	6,913.9	6,695.5	24.8	21.0	80.67	455.2	-423.5	442.7	404.7	38.04	11.637			
7,050.0	6,784.1	6,959.5	6,718.5	24.7	21.0	80.31	455.2	-384.2	443.2	404.9	38.31	11.569			
7,100.0	6,809.0	7,004.9	6,739.0	24.6	21.1	79.98	455.2	-343.7	443.6	404.9	38.71	11.460			
7,150.0	6,830.9	7,050.0	6,756.9	24.5	21.3	79.69	455.2	-302.3	444.0	404.7	39.26	11.310			
7,200.0	6,849.8	7,095.4	6,772.5	24.5	21.5	79.44	455.2	-259.6	444.4	404.4	39.97	11.119			
7,250.0	6,865.7	7,140.5	6,785.4	24.5	21.8	79.23	455.2	-216.4	444.7	403.8	40.82	10.894			
7,300.0	6,878.5	7,185.5	6,795.7	24.5	22.2	79.06	455.2	-172.6	444.9	403.1	41.81	10.641			
7,350.0	6,888.0	7,230.5	6,803.5	24.5	22.6	78.93	455.2	-128.3	445.1	402.2	42.93	10.367			
7,400.0	6,894.3	7,275.5	6,808.6	24.7	23.1	78.85	455.2	-83.6	445.2	401.1	44.17	10.079			
7,450.0	6,897.4	7,320.4	6,811.0	24.9	23.7	78.81	455.2	-38.8	445.3	399.8	45.51	9.783			
7,476.2	6,897.7	7,343.9	6,811.3	25.1	24.0	78.81	455.2	-15.2	445.3	399.0	46.25	9.628			
7,478.9	6,897.7	7,346.6	6,811.2	25.1	24.0	78.80	455.2	-12.6	445.3	399.0	46.33	9.612			
7,500.0	6,897.6	7,367.4	6,811.1	25.2	24.3	78.80	455.2	8.2	445.3	398.4	46.95	9.485			
7,600.0	6,897.0	7,467.4	6,810.2	26.4	25.9	78.76	455.2	108.2	445.4	395.2	50.14	8.882			
7,700.0	6,896.5	7,567.4	6,809.3	28.0	27.7	78.72	455.2	208.2	445.4	391.7	53.70	8.294			
7,800.0	6,895.9	7,667.4	6,808.4	29.9	29.6	78.68	455.2	308.2	445.5	387.9	57.57	7.739			
7,900.0	6,895.3	7,767.4	6,807.6	32.0	31.7	78.64	455.2	408.2	445.6	383.9	61.68	7.223			
8,000.0	6,894.8	7,867.4	6,806.7	34.2	33.9	78.60	455.2	508.2	445.6	379.6	66.00	6.752			
8,100.0	6,894.2	7,967.4	6,805.8	36.5	36.2	78.56	455.2	608.2	445.7	375.2	70.48	6.323			
8,200.0	6,893.7	8,067.4	6,805.0	38.9	38.6	78.52	455.2	708.2	445.7	370.6	75.10	5.935			

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-402
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-402	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design Hop 5N64W18A Pad Sec.18-T5N-R64W - Hop 18E-332 - Wellbore #1 - Plan #1 (12-16-15)													Offset Site Error:	0.0 ft
Survey Program: 0-MWD													Offset Well Error:	0.0 ft
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Semi Major Axis (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning
8,300.0	6,893.1	8,167.4	6,804.1	41.3	41.0	78.48		455.2	808.2	445.8	366.0	79.83	5.584	
8,400.0	6,892.6	8,267.4	6,803.2	43.8	43.4	78.44		455.2	908.2	445.9	361.2	84.65	5.267	
8,500.0	6,892.0	8,367.4	6,802.3	46.3	45.9	78.40		455.2	1,008.2	445.9	356.4	89.55	4.980	
8,600.0	6,891.4	8,467.4	6,801.5	48.8	48.5	78.36		455.2	1,108.2	446.0	351.5	94.51	4.719	
8,700.0	6,890.9	8,567.4	6,800.6	51.4	51.1	78.32		455.2	1,208.2	446.1	346.5	99.53	4.482	
8,800.0	6,890.3	8,667.4	6,799.7	54.0	53.6	78.28		455.2	1,308.2	446.1	341.5	104.60	4.265	
8,900.0	6,889.8	8,767.4	6,798.8	56.6	56.3	78.24		455.2	1,408.2	446.2	336.5	109.70	4.067	
9,000.0	6,889.2	8,867.4	6,798.0	59.2	58.9	78.20		455.2	1,508.2	446.2	331.4	114.84	3.886	
9,100.0	6,888.6	8,967.4	6,797.1	61.9	61.5	78.16		455.2	1,608.2	446.3	326.3	120.01	3.719	
9,200.0	6,888.1	9,067.4	6,796.2	64.5	64.2	78.12		455.2	1,708.2	446.4	321.2	125.20	3.565	
9,300.0	6,887.5	9,167.4	6,795.4	67.2	66.9	78.08		455.2	1,808.2	446.4	316.0	130.42	3.423	
9,400.0	6,887.0	9,267.4	6,794.5	69.9	69.5	78.04		455.2	1,908.2	446.5	310.8	135.66	3.291	
9,500.0	6,886.4	9,367.4	6,793.6	72.6	72.2	78.01		455.2	2,008.2	446.6	305.7	140.91	3.169	
9,600.0	6,885.9	9,467.4	6,792.7	75.3	74.9	77.97		455.2	2,108.2	446.6	300.4	146.18	3.055	
9,700.0	6,885.3	9,567.4	6,791.9	78.0	77.6	77.93		455.2	2,208.2	446.7	295.2	151.47	2.949	
9,800.0	6,884.7	9,667.4	6,791.0	80.7	80.4	77.89		455.2	2,308.1	446.8	290.0	156.76	2.850	
9,900.0	6,884.2	9,767.4	6,790.1	83.4	83.1	77.85		455.2	2,408.1	446.8	284.8	162.07	2.757	
10,000.0	6,883.6	9,867.4	6,789.2	86.1	85.8	77.81		455.2	2,508.1	446.9	279.5	167.39	2.670	
10,100.0	6,883.1	9,967.4	6,788.4	88.8	88.5	77.77		455.2	2,608.1	447.0	274.3	172.71	2.588	
10,200.0	6,882.5	10,067.4	6,787.5	91.6	91.3	77.73		455.2	2,708.1	447.0	269.0	178.04	2.511	
10,300.0	6,881.9	10,167.4	6,786.6	94.3	94.0	77.69		455.2	2,808.1	447.1	263.7	183.38	2.438	
10,400.0	6,881.4	10,267.4	6,785.8	97.1	96.8	77.65		455.2	2,908.1	447.2	258.4	188.73	2.369	
10,500.0	6,880.8	10,367.4	6,784.9	99.8	99.5	77.61		455.2	3,008.1	447.2	253.2	194.08	2.304	
10,600.0	6,880.3	10,467.4	6,784.0	102.6	102.3	77.57		455.2	3,108.1	447.3	247.9	199.43	2.243	
10,700.0	6,879.7	10,567.4	6,783.1	105.3	105.0	77.53		455.2	3,208.1	447.4	242.6	204.79	2.184	
10,800.0	6,879.2	10,667.4	6,782.3	108.1	107.8	77.49		455.2	3,308.1	447.4	237.3	210.16	2.129	
10,900.0	6,878.6	10,767.4	6,781.4	110.8	110.5	77.45		455.2	3,408.1	447.5	232.0	215.52	2.076	
11,000.0	6,878.0	10,867.4	6,780.5	113.6	113.3	77.42		455.2	3,508.1	447.6	226.7	220.89	2.026	
11,100.0	6,877.5	10,967.4	6,779.6	116.3	116.1	77.38		455.2	3,608.1	447.6	221.4	226.26	1.978	
11,200.0	6,876.9	11,067.4	6,778.8	119.1	118.8	77.34		455.2	3,708.1	447.7	216.1	231.64	1.933	
11,300.0	6,876.4	11,167.4	6,777.9	121.9	121.6	77.30		455.2	3,808.1	447.8	210.8	237.02	1.889	
11,400.0	6,875.8	11,267.4	6,777.0	124.6	124.4	77.26		455.2	3,908.1	447.8	205.4	242.39	1.848	
11,500.0	6,875.2	11,367.4	6,776.2	127.4	127.1	77.22		455.2	4,008.1	447.9	200.1	247.78	1.808	
11,600.0	6,874.7	11,467.4	6,775.3	130.2	129.9	77.18		455.2	4,108.1	448.0	194.8	253.16	1.770	
11,700.0	6,874.1	11,567.4	6,774.4	133.0	132.7	77.14		455.2	4,208.1	448.1	189.5	258.54	1.733	
11,800.0	6,873.6	11,667.4	6,773.5	135.7	135.5	77.10		455.2	4,308.1	448.1	184.2	263.92	1.698	
11,900.0	6,873.0	11,767.4	6,772.7	138.5	138.2	77.06		455.2	4,408.1	448.2	178.9	269.31	1.664	
12,000.0	6,872.4	11,867.4	6,771.8	141.3	141.0	77.02		455.2	4,508.1	448.3	173.6	274.69	1.632	
12,100.0	6,871.9	11,967.4	6,770.9	144.1	143.8	76.98		455.2	4,608.1	448.3	168.3	280.08	1.601	
12,200.0	6,871.3	12,067.4	6,770.0	146.9	146.6	76.95		455.2	4,708.0	448.4	162.9	285.47	1.571	
12,300.0	6,870.8	12,167.4	6,769.2	149.6	149.4	76.91		455.2	4,808.0	448.5	157.6	290.85	1.542	
12,400.0	6,870.2	12,267.4	6,768.3	152.4	152.2	76.87		455.2	4,908.0	448.5	152.3	296.24	1.514	
12,500.0	6,869.7	12,367.4	6,767.4	155.2	154.9	76.83		455.2	5,008.0	448.6	147.0	301.63	1.487 Level 3	
12,600.0	6,869.1	12,467.4	6,766.6	158.0	157.7	76.79		455.2	5,108.0	448.7	141.7	307.01	1.461 Level 3	
12,700.0	6,868.5	12,567.4	6,765.7	160.8	160.5	76.75		455.2	5,208.0	448.8	136.4	312.40	1.436 Level 3	
12,800.0	6,868.0	12,667.4	6,764.8	163.6	163.3	76.71		455.2	5,308.0	448.8	131.0	317.79	1.412 Level 3	
12,900.0	6,867.4	12,767.4	6,763.9	166.3	166.1	76.67		455.2	5,408.0	448.9	125.7	323.17	1.389 Level 3	
13,000.0	6,866.9	12,867.4	6,763.1	169.1	168.9	76.63		455.2	5,508.0	449.0	120.4	328.56	1.367 Level 3	
13,100.0	6,866.3	12,967.4	6,762.2	171.9	171.7	76.59		455.2	5,608.0	449.1	115.1	333.94	1.345 Level 3	
13,200.0	6,865.7	13,067.4	6,761.3	174.7	174.5	76.55		455.2	5,708.0	449.1	109.8	339.33	1.324 Level 3	
13,300.0	6,865.2	13,167.4	6,760.4	177.5	177.2	76.52		455.2	5,808.0	449.2	104.5	344.71	1.303 Level 3	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-402
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-402	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design Hop 5N64W18A Pad Sec.18-T5N-R64W - Hop 18E-332 - Wellbore #1 - Plan #1 (12-16-15)													Offset Site Error:	0.0 ft
Survey Program: 0-MWD													Offset Well Error:	0.0 ft
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Semi Major Axis Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning	
13,400.0	6,864.6	13,267.4	6,759.6	180.3	180.0	76.48	455.2	5,908.0	449.3	99.2	350.10	1.283	Level 3	
13,500.0	6,864.1	13,367.4	6,758.7	183.1	182.8	76.44	455.2	6,008.0	449.3	93.9	355.48	1.264	Level 3	
13,600.0	6,863.5	13,467.4	6,757.8	185.9	185.6	76.40	455.2	6,108.0	449.4	88.6	360.86	1.245	Level 2	
13,700.0	6,863.0	13,567.4	6,757.0	188.7	188.4	76.36	455.2	6,208.0	449.5	83.2	366.24	1.227	Level 2	
13,800.0	6,862.4	13,667.4	6,756.1	191.5	191.2	76.32	455.2	6,308.0	449.6	77.9	371.62	1.210	Level 2	
13,900.0	6,861.8	13,767.4	6,755.2	194.2	194.0	76.28	455.2	6,408.0	449.6	72.6	377.00	1.193	Level 2	
14,000.0	6,861.3	13,867.4	6,754.3	197.0	196.8	76.24	455.2	6,508.0	449.7	67.3	382.38	1.176	Level 2	
14,100.0	6,860.7	13,967.4	6,753.5	199.8	199.6	76.20	455.2	6,608.0	449.8	62.0	387.76	1.160	Level 2	
14,200.0	6,860.2	14,067.4	6,752.6	202.6	202.4	76.17	455.2	6,708.0	449.9	56.7	393.13	1.144	Level 2	
14,300.0	6,859.6	14,167.4	6,751.7	205.4	205.2	76.13	455.2	6,808.0	449.9	51.4	398.51	1.129	Level 2	
14,400.0	6,859.0	14,267.4	6,750.9	208.2	208.0	76.09	455.2	6,908.0	450.0	46.1	403.88	1.114	Level 2	
14,500.0	6,858.5	14,367.4	6,750.0	211.0	210.8	76.05	455.2	7,007.9	450.1	40.8	409.26	1.100	Level 2	
14,600.0	6,857.9	14,467.4	6,749.1	213.8	213.6	76.01	455.2	7,107.9	450.2	35.5	414.63	1.086	Level 2	
14,700.0	6,857.4	14,567.4	6,748.2	216.6	216.4	75.97	455.2	7,207.9	450.2	30.2	420.00	1.072	Level 2	
14,800.0	6,856.8	14,667.4	6,747.4	219.4	219.2	75.93	455.2	7,307.9	450.3	25.0	425.37	1.059	Level 2	
14,900.0	6,856.3	14,767.4	6,746.5	222.2	222.0	75.89	455.2	7,407.9	450.4	19.7	430.73	1.046	Level 2	
15,000.0	6,855.7	14,867.4	6,745.6	225.0	224.8	75.86	455.2	7,507.9	450.5	14.4	436.10	1.033	Level 2	
15,100.0	6,855.1	14,967.4	6,744.7	227.8	227.6	75.82	455.2	7,607.9	450.5	9.1	441.47	1.021	Level 2	
15,200.0	6,854.6	15,067.4	6,743.9	230.6	230.4	75.78	455.2	7,707.9	450.6	3.8	446.83	1.008	Level 2	
15,300.0	6,854.0	15,167.4	6,743.0	233.4	233.2	75.74	455.2	7,807.9	450.7	-1.5	452.19	0.997	Level 1	
15,400.0	6,853.5	15,267.4	6,742.1	236.2	236.0	75.70	455.2	7,907.9	450.8	-6.8	457.55	0.985	Level 1	
15,500.0	6,852.9	15,367.4	6,741.3	239.0	238.8	75.66	455.2	8,007.9	450.9	-12.1	462.91	0.974	Level 1	
15,600.0	6,852.3	15,467.4	6,740.4	241.8	241.6	75.62	455.2	8,107.9	450.9	-17.3	468.27	0.963	Level 1	
15,700.0	6,851.8	15,567.4	6,739.5	244.6	244.4	75.58	455.2	8,207.9	451.0	-22.6	473.63	0.952	Level 1	
15,800.0	6,851.2	15,667.4	6,738.6	247.4	247.2	75.55	455.2	8,307.9	451.1	-27.9	478.98	0.942	Level 1	
15,900.0	6,850.7	15,767.4	6,737.8	250.2	250.0	75.51	455.2	8,407.9	451.2	-33.2	484.34	0.932	Level 1	
16,000.0	6,850.1	15,867.4	6,736.9	253.0	252.8	75.47	455.2	8,507.9	451.2	-38.4	489.69	0.921	Level 1	
16,100.0	6,849.6	15,967.4	6,736.0	255.8	255.6	75.43	455.2	8,607.9	451.3	-43.7	495.04	0.912	Level 1	
16,200.0	6,849.0	16,067.4	6,735.1	258.6	258.4	75.39	455.2	8,707.9	451.4	-49.0	500.39	0.902	Level 1	
16,300.0	6,848.4	16,167.4	6,734.3	261.4	261.2	75.35	455.2	8,807.9	451.5	-54.3	505.74	0.893	Level 1	
16,400.0	6,847.9	16,267.4	6,733.4	264.2	264.0	75.31	455.2	8,907.9	451.6	-59.5	511.08	0.884	Level 1	
16,500.0	6,847.3	16,367.4	6,732.5	267.0	266.8	75.28	455.2	9,007.9	451.6	-64.8	516.43	0.875	Level 1	
16,556.8	6,847.0	16,424.2	6,732.0	268.6	268.4	75.25	455.2	9,064.6	451.7	-67.8	519.46	0.870	Level 1, ES, SF	

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-402
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-402	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design Hop 5N64W18A Pad Sec.18-T5N-R64W - Hop 18F-102 - Wellbore #1 - Plan #1 (12-16-15)													Offset Site Error:	0.0 ft
Survey Program: 0-MWD													Offset Well Error:	0.0 ft
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Semi Major Axis Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning	
0.0	0.0	0.0	0.0	0.0	0.0	90.37	-0.4	59.9	59.9					
100.0	100.0	100.0	100.0	0.1	0.1	90.37	-0.4	59.9	59.9	59.7	0.22	266.412		
200.0	200.0	200.0	200.0	0.3	0.3	90.37	-0.4	59.9	59.9	59.2	0.67	88.804 CC, ES		
300.0	300.0	300.0	300.0	0.6	0.6	132.26	-0.4	59.9	60.5	59.3	1.12	53.857		
400.0	400.0	400.0	400.0	0.8	0.8	134.03	-0.4	59.9	62.3	60.7	1.57	39.586		
500.0	499.9	499.9	499.9	1.0	1.0	136.75	-0.4	59.9	65.4	63.3	2.03	32.252		
600.0	599.7	599.7	599.7	1.3	1.2	140.15	-0.4	59.9	69.9	67.5	2.48	28.151		
700.0	699.4	699.4	699.4	1.5	1.5	143.90	-0.4	59.9	76.1	73.2	2.95	25.848		
800.0	798.9	798.9	798.9	1.8	1.7	147.70	-0.4	59.9	84.1	80.7	3.41	24.666		
900.0	898.3	898.3	898.3	2.1	1.9	151.34	-0.4	59.9	93.9	90.0	3.87	24.235 SF		
1,000.0	997.4	997.4	997.4	2.4	2.1	154.69	-0.4	59.9	105.5	101.2	4.34	24.330		
1,100.0	1,096.3	1,097.9	1,097.9	2.7	2.3	157.98	-0.6	59.1	118.4	113.6	4.78	24.754		
1,200.0	1,194.9	1,198.3	1,198.2	3.0	2.5	161.39	-1.2	56.5	132.0	126.8	5.22	25.311		
1,300.0	1,293.3	1,298.6	1,298.5	3.4	2.7	164.84	-2.2	52.3	146.5	140.8	5.65	25.913		
1,400.0	1,391.2	1,398.8	1,398.4	3.8	3.0	168.26	-3.6	46.4	161.9	155.8	6.10	26.565		
1,500.0	1,488.9	1,498.7	1,498.1	4.2	3.2	171.63	-5.3	38.8	178.5	172.0	6.55	27.263		
1,600.0	1,586.1	1,598.4	1,597.3	4.7	3.4	174.89	-7.5	29.5	196.4	189.3	7.01	27.993		
1,651.8	1,636.3	1,650.0	1,648.6	5.0	3.5	176.53	-8.8	24.0	206.1	198.9	7.27	28.372		
1,700.0	1,683.0	1,697.9	1,696.1	5.2	3.7	178.02	-10.1	18.6	215.4	207.9	7.51	28.686		
1,800.0	1,779.8	1,797.3	1,794.7	5.7	3.9	178.98	-13.0	6.0	234.3	226.3	8.04	29.162		
1,900.0	1,876.6	1,896.6	1,892.9	6.2	4.2	176.08	-16.4	-8.3	253.1	244.5	8.60	29.436		
2,000.0	1,973.4	1,995.8	1,990.8	6.7	4.5	173.24	-20.1	-24.2	271.8	262.6	9.20	29.533		
2,100.0	2,070.2	2,094.8	2,088.2	7.2	4.9	170.47	-24.2	-41.7	290.4	280.6	9.85	29.478		
2,200.0	2,167.0	2,193.6	2,185.0	7.7	5.2	167.73	-28.7	-60.7	309.2	298.6	10.55	29.297		
2,300.0	2,263.8	2,292.1	2,281.2	8.2	5.6	165.02	-33.5	-81.4	328.2	316.8	11.31	29.017		
2,400.0	2,360.6	2,389.4	2,375.9	8.8	6.0	162.44	-38.5	-102.9	347.5	335.4	12.11	28.702		
2,500.0	2,457.4	2,486.4	2,470.3	9.3	6.5	160.13	-43.6	-124.4	367.4	354.5	12.93	28.415		
2,600.0	2,554.2	2,583.3	2,564.7	9.8	6.9	158.06	-48.6	-146.0	387.9	374.1	13.77	28.160		
2,700.0	2,651.0	2,680.3	2,659.1	10.3	7.3	156.19	-53.7	-167.5	408.8	394.2	14.63	27.935		
2,800.0	2,747.9	2,777.2	2,753.5	10.8	7.8	154.51	-58.7	-189.0	430.1	414.6	15.51	27.738		
2,900.0	2,844.7	2,874.2	2,847.9	11.4	8.2	152.98	-63.8	-210.6	451.7	435.4	16.39	27.566		
3,000.0	2,941.5	2,971.1	2,942.3	11.9	8.7	151.59	-68.8	-232.1	473.6	456.4	17.28	27.416		
3,100.0	3,038.3	3,068.1	3,036.7	12.4	9.1	150.32	-73.9	-253.6	495.8	477.6	18.17	27.286		

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-402
Project:	SEC.18-T5N-R64W	TVD Reference:	WELL @ 4641.0ft (Original Well Elev)
Reference Site:	Hop 5N64W18A Pad Sec.18-T5N-R64W	MD Reference:	WELL @ 4641.0ft (Original Well Elev)
Site Error:	0.0 ft	North Reference:	True
Reference Well:	Hop 18E-402	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Offset Design Hop 5N64W18A Pad Sec.18-T5N-R64W - Hop 18F-212 - Wellbore #1 - Plan #1 (12-16-15)													Offset Site Error:	0.0 ft
Survey Program: 0-MWD													Offset Well Error:	0.0 ft
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Semi Major Axis Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning	
0.0	0.0	0.0	0.0	0.0	0.0	90.48	-0.4	44.8	44.8					
100.0	100.0	100.0	100.0	0.1	0.1	90.48	-0.4	44.8	44.8	44.6	0.22	199.502		
200.0	200.0	200.0	200.0	0.3	0.3	90.48	-0.4	44.8	44.8	44.2	0.67	66.501 CC, ES		
300.0	300.0	300.0	300.0	0.6	0.6	132.57	-0.4	44.8	45.4	44.3	1.12	40.463		
400.0	400.0	400.0	400.0	0.8	0.8	134.90	-0.4	44.8	47.2	45.7	1.57	30.035		
500.0	499.9	499.9	499.9	1.0	1.0	138.39	-0.4	44.8	50.4	48.4	2.03	24.872		
600.0	599.7	599.7	599.7	1.3	1.2	142.58	-0.4	44.8	55.1	52.6	2.48	22.188		
700.0	699.4	699.4	699.4	1.5	1.5	146.98	-0.4	44.8	61.5	58.6	2.94	20.900		
800.0	798.9	798.9	798.9	1.8	1.7	151.23	-0.4	44.8	69.8	66.4	3.41	20.487 SF		
900.0	898.3	899.5	899.5	2.1	1.9	155.37	-0.3	44.0	79.1	75.3	3.86	20.518		
1,000.0	997.4	1,000.2	1,000.2	2.4	2.1	159.51	-0.2	41.3	88.8	84.5	4.29	20.681		
1,100.0	1,096.3	1,101.0	1,100.8	2.7	2.3	163.63	0.0	36.9	99.0	94.3	4.74	20.898		
1,200.0	1,194.9	1,201.7	1,201.3	3.0	2.5	167.67	0.3	30.8	109.8	104.7	5.19	21.180		
1,300.0	1,293.3	1,302.3	1,301.7	3.4	2.8	171.61	0.6	22.9	121.5	115.8	5.64	21.519		
1,400.0	1,391.2	1,402.9	1,401.8	3.8	3.0	175.42	1.1	13.2	133.9	127.8	6.12	21.904		
1,500.0	1,488.9	1,503.4	1,501.6	4.2	3.3	179.07	1.6	1.8	147.4	140.8	6.61	22.314		
1,600.0	1,586.1	1,603.8	1,601.1	4.7	3.6	-177.45	2.2	-11.4	161.9	154.8	7.12	22.729		
1,651.8	1,636.3	1,655.7	1,652.5	5.0	3.7	-175.71	2.5	-18.9	169.9	162.5	7.41	22.934		
1,700.0	1,683.0	1,704.0	1,700.3	5.2	3.9	-174.15	2.8	-26.3	177.3	169.7	7.68	23.084		
1,800.0	1,779.8	1,804.3	1,799.2	5.7	4.2	-170.97	3.6	-42.9	192.5	184.2	8.29	23.213		
1,900.0	1,876.6	1,904.6	1,897.8	6.2	4.5	-167.86	4.4	-61.2	207.1	198.2	8.95	23.141		
2,000.0	1,973.4	2,004.1	1,995.2	6.7	4.9	-164.84	5.3	-80.9	221.5	211.9	9.66	22.927		
2,100.0	2,070.2	2,102.4	2,091.5	7.2	5.3	-162.15	6.2	-100.7	236.3	225.9	10.41	22.706		
2,200.0	2,167.0	2,200.7	2,187.8	7.7	5.7	-159.78	7.1	-120.5	251.6	240.4	11.18	22.500		
2,300.0	2,263.8	2,299.0	2,284.2	8.2	6.1	-157.68	8.0	-140.3	267.2	255.2	11.98	22.311		
2,400.0	2,360.6	2,397.3	2,380.5	8.8	6.5	-155.82	8.9	-160.1	283.2	270.4	12.79	22.139		
2,500.0	2,457.4	2,495.7	2,476.8	9.3	6.9	-154.15	9.8	-179.9	299.4	285.7	13.62	21.985		
2,600.0	2,554.2	2,594.0	2,573.1	9.8	7.3	-152.65	10.7	-199.7	315.8	301.3	14.46	21.846		
2,700.0	2,651.0	2,692.3	2,669.4	10.3	7.7	-151.30	11.6	-219.5	332.4	317.1	15.30	21.722		
2,800.0	2,747.9	2,790.6	2,765.7	10.8	8.2	-150.09	12.4	-239.3	349.2	333.0	16.16	21.611		
2,900.0	2,844.7	2,888.9	2,862.0	11.4	8.6	-148.98	13.3	-259.1	366.1	349.1	17.02	21.511		
3,000.0	2,941.5	2,987.3	2,958.3	11.9	9.0	-147.97	14.2	-278.9	383.1	365.3	17.89	21.422		
3,100.0	3,038.3	3,085.6	3,054.6	12.4	9.4	-147.04	15.1	-298.7	400.3	381.5	18.76	21.343		
3,200.0	3,135.1	3,183.9	3,150.9	12.9	9.9	-146.19	16.0	-318.5	417.5	397.9	19.63	21.271		
3,300.0	3,231.9	3,282.2	3,247.2	13.5	10.3	-145.41	16.9	-338.3	434.9	414.4	20.51	21.206		
3,400.0	3,328.7	3,380.5	3,343.5	14.0	10.7	-144.69	17.8	-358.1	452.3	430.9	21.38	21.148		
3,500.0	3,425.5	3,478.9	3,439.8	14.5	11.2	-144.02	18.7	-377.9	469.7	447.5	22.27	21.096		
3,600.0	3,522.3	3,577.2	3,536.1	15.0	11.6	-143.40	19.6	-397.7	487.2	464.1	23.15	21.048		

Company:	PETROLEUM DEVELOPMENT CORP DJ Basin	Local Co-ordinate Reference:	Well Hop 18E-402
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Reference Well:	Hop 18E-402	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	US_EDM
Reference Design:	Plan #1 (12-16-15)	Offset TVD Reference:	Offset Datum

Reference Depths are relative to WELL @ 4641.0ft (Original Well Elev)

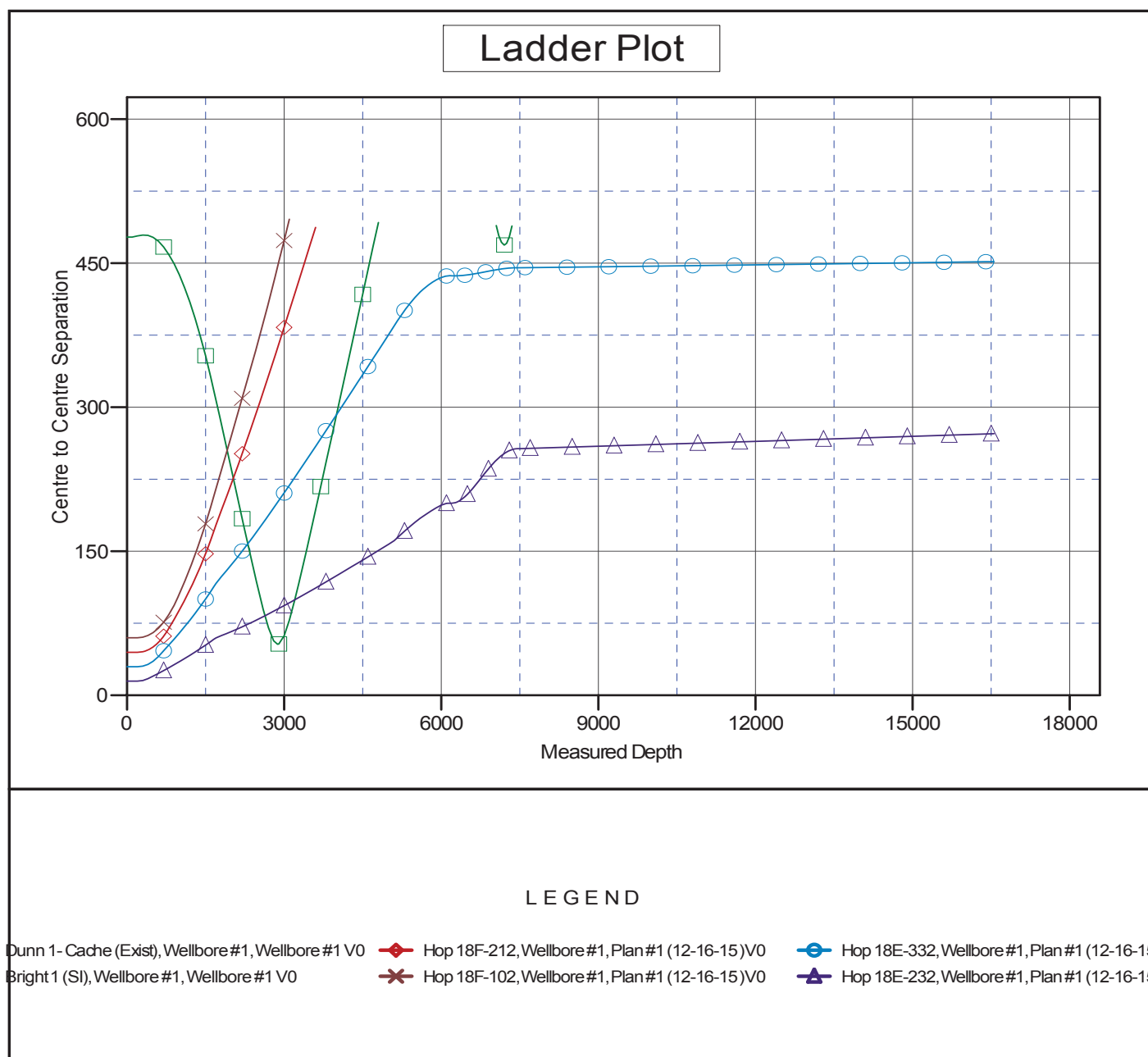
Offset Depths are relative to Offset Datum

Central Meridian is -105.500000

Coordinates are relative to: Hop 18E-402

Coordinate System is US State Plane 1983, Colorado Northern Zone

Grid Convergence at Surface is: 0.58°



Reference Depths are relative to WELL @ 4641.0ft (Original Well Elev)	Coordinates are relative to: Hop 18E-402
Offset Depths are relative to Offset Datum	Coordinate System is US State Plane 1983, Colorado Northern Zone
Central Meridian is -105.500000	Grid Convergence at Surface is: 0.58°

