

PETRO OPERATING COMPANY LLC

Well Name: **BEF West 19**

Surface Location: BEF 1S66W2 Pad Sec.2-T1S-R66W

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

Ground Elevation: 5049.0

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

0.0 0.0 1241881.43214415.20 39.994810 -104.734700

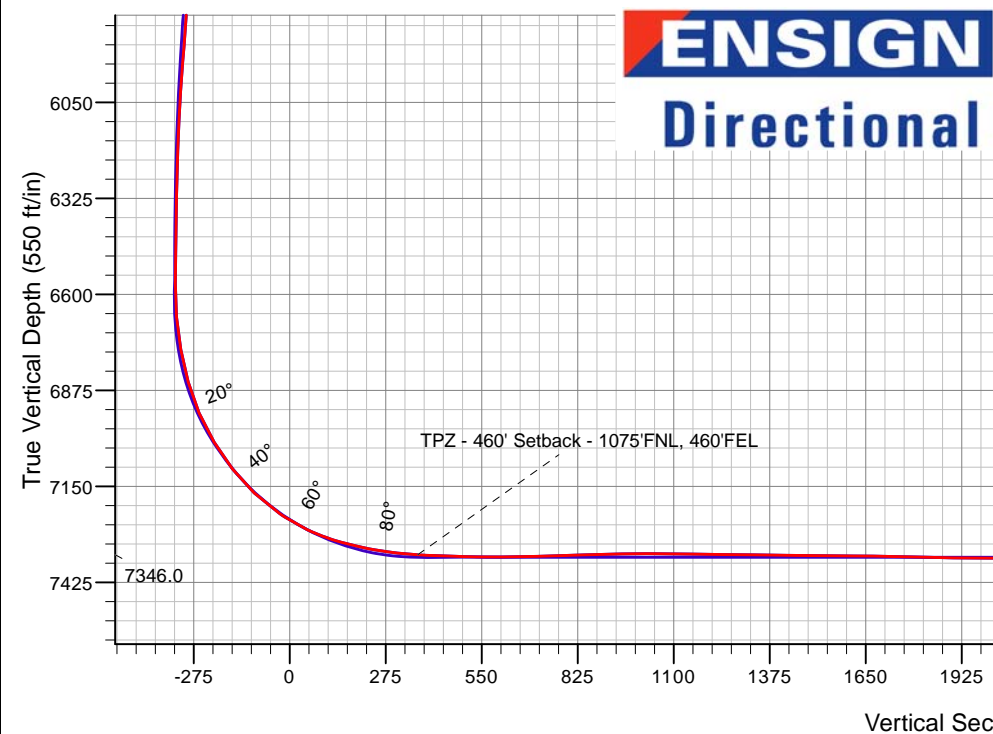
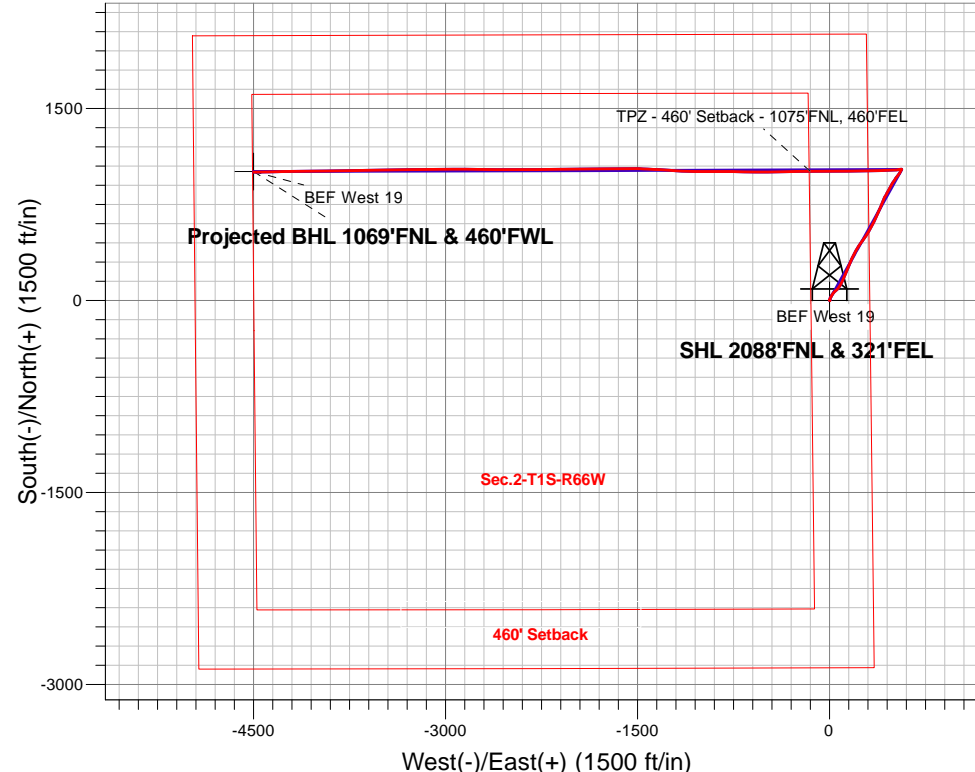
RKB - 27' WELL @ 5076.0ft (RKB - 27')

FINAL SURVEY

Projected Bottom Hole Location

12,244'MD 7374'TVD 1002'N & 4499'W of SHL

90.7 degree Incl @ 268.8 degree AZM



BEF 1S66W2 Pad Sec.2-T1S-R66W
BEF West 19
BEF West 19 Wellbore #1
10:01, April 02 2019

ANNOTATIONS

TVD	MD	Annotation
7346.0	7894.4	TPZ - 460' Setback - 1075'FNL, 460'FEL

LEGEND

- BEF West 19, BEF West 19 Wellbore #1, Plan #4 (1-28-19) V0
- BEF West 19 Wellbore #1
- Survey #1



PETRO OPERATING COMPANY LLC

SEC.2-T1S-R66W

BEF 1S66W2 Pad Sec.2-T1S-R66W

BEF West 19

BEF West 19 Wellbore #1

Survey: Survey #1

Standard Survey Report

02 April, 2019

Company:	PETRO OPERATING COMPANY LLC	Local Co-ordinate Reference:	Well BEF West 19
Project:	SEC.2-T1S-R66W	TVD Reference:	WELL @ 5076.0ft (RKB - 27')
Site:	BEF 1S66W2 Pad Sec.2-T1S-R66W	MD Reference:	WELL @ 5076.0ft (RKB - 27')
Well:	BEF West 19	North Reference:	True
Wellbore:	BEF West 19 Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	BEF West 19 Wellbore #1	Database:	US_EDM

Project	SEC.2-T1S-R66W, Adams County, CO		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		Using Well Reference Point
Map Zone:	Colorado Northern Zone		Using geodetic scale factor

Site	BEF 1S66W2 Pad Sec.2-T1S-R66W				
Site Position:		Northing:	1,241,928.85 usft	Latitude:	39.994940
From:	Lat/Long	Easting:	3,214,414.79 usft	Longitude:	-104.734700
Position Uncertainty:	0.0 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.49 °

Well	BEF West 19					
Well Position	+N/-S	0.0 ft	Northing:	1,241,881.49 usft	Latitude:	39.994810
	+E/-W	0.0 ft	Easting:	3,214,415.20 usft	Longitude:	-104.734700
Position Uncertainty		0.0 ft	Wellhead Elevation:	0.0 ft	Ground Level:	5,049.0 ft

Wellbore	BEF West 19 Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	1/28/2019	8.07	66.28	51,926

Design	BEF West 19 Wellbore #1				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)	
	0.0	0.0	0.0	282.55	

Survey Program	Date	4/2/2019			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
215.0	12,244.0	Survey #1 (BEF West 19 Wellbore #1)	MWD	MWD - Standard	

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00	
1.0	0.00	130.20	1.0	0.0	0.0	0.0	0.19	0.19	0.00	
SHL 2088°FNL & 321°FEL										
215.0	0.40	130.20	215.0	-0.5	0.6	-0.7	0.19	0.19	0.00	
309.0	0.40	109.90	309.0	-0.8	1.1	-1.3	0.15	0.00	-21.60	
404.0	0.40	62.40	404.0	-0.8	1.7	-1.9	0.34	0.00	-50.00	
499.0	0.40	78.00	499.0	-0.5	2.4	-2.4	0.11	0.00	16.42	
594.0	0.50	44.50	594.0	-0.2	3.0	-2.9	0.29	0.11	-35.26	
689.0	0.50	35.70	689.0	0.5	3.5	-3.3	0.08	0.00	-9.26	
784.0	0.50	22.70	784.0	1.2	3.9	-3.6	0.12	0.00	-13.68	
879.0	0.50	4.60	879.0	2.0	4.1	-3.6	0.17	0.00	-19.05	

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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)
973.0	1.10	13.40	973.0	3.3	4.3	-3.5	0.65	0.64	9.36
1,068.0	1.50	351.70	1,067.9	5.4	4.4	-3.1	0.66	0.42	-22.84
1,163.0	2.20	357.90	1,162.9	8.4	4.1	-2.2	0.77	0.74	6.53
1,257.0	3.30	7.90	1,256.8	12.9	4.4	-1.5	1.27	1.17	10.64
1,351.0	4.00	21.10	1,350.6	18.6	6.0	-1.8	1.16	0.74	14.04
1,446.0	5.00	30.80	1,445.3	25.3	9.3	-3.6	1.32	1.05	10.21
1,498.0	4.90	32.20	1,497.1	29.1	11.6	-5.0	0.30	-0.19	2.69
1,567.0	4.70	30.40	1,565.9	34.1	14.6	-6.9	0.36	-0.29	-2.61
1,661.0	6.40	31.10	1,659.4	41.9	19.3	-9.7	1.81	1.81	0.74
1,757.0	8.20	38.10	1,754.6	51.8	26.3	-14.4	2.09	1.88	7.29
1,851.0	9.50	41.70	1,847.5	62.9	35.6	-21.1	1.50	1.38	3.83
1,946.0	10.50	47.60	1,941.1	74.6	47.2	-29.9	1.51	1.05	6.21
2,041.0	12.00	45.00	2,034.3	87.4	60.6	-40.1	1.67	1.58	-2.74
2,136.0	14.20	34.30	2,126.8	104.0	74.1	-49.7	3.44	2.32	-11.26
2,230.0	15.70	26.70	2,217.6	124.9	86.3	-57.1	2.62	1.60	-8.09
2,325.0	15.10	25.30	2,309.2	147.6	97.4	-63.0	0.74	-0.63	-1.47
2,420.0	14.80	24.40	2,401.0	169.8	107.7	-68.2	0.40	-0.32	-0.95
2,515.0	14.30	23.20	2,492.9	191.7	117.3	-72.9	0.61	-0.53	-1.26
2,610.0	14.80	25.80	2,584.9	213.4	127.2	-77.8	0.87	0.53	2.74
2,704.0	14.20	22.80	2,675.9	234.8	136.9	-82.6	1.02	-0.64	-3.19
2,799.0	15.40	23.70	2,767.7	257.1	146.5	-87.1	1.29	1.26	0.95
2,894.0	14.90	22.70	2,859.4	279.9	156.3	-91.7	0.59	-0.53	-1.05
2,989.0	14.00	20.40	2,951.4	301.9	165.0	-95.5	1.12	-0.95	-2.42
3,084.0	13.50	18.80	3,043.7	323.2	172.6	-98.2	0.66	-0.53	-1.68
3,179.0	14.00	29.20	3,136.0	343.7	181.8	-102.7	2.65	0.53	10.95
3,274.0	13.90	29.70	3,228.2	363.7	193.0	-109.4	0.16	-0.11	0.53
3,368.0	15.70	30.20	3,319.1	384.5	205.0	-116.6	1.92	1.91	0.53
3,463.0	14.30	28.80	3,410.8	405.9	217.1	-123.8	1.52	-1.47	-1.47
3,558.0	15.10	34.10	3,502.7	426.4	229.7	-131.6	1.65	0.84	5.58
3,653.0	13.60	32.70	3,594.8	446.1	242.7	-140.0	1.62	-1.58	-1.47
3,748.0	14.90	37.80	3,686.9	465.1	256.2	-149.0	1.90	1.37	5.37
3,842.0	14.20	36.70	3,777.8	483.9	270.5	-158.9	0.80	-0.74	-1.17
3,936.0	13.90	33.70	3,869.0	502.5	283.7	-167.7	0.84	-0.32	-3.19
4,031.0	14.80	31.10	3,961.1	522.4	296.3	-175.7	1.16	0.95	-2.74
4,126.0	13.40	28.60	4,053.2	542.5	307.8	-182.6	1.61	-1.47	-2.63
4,221.0	14.80	29.50	4,145.3	562.7	319.1	-189.2	1.49	1.47	0.95
4,316.0	15.10	28.60	4,237.1	584.1	331.0	-196.1	0.40	0.32	-0.95
4,416.0	16.80	28.10	4,333.3	608.3	344.0	-203.6	1.71	1.70	-0.50
4,511.0	15.60	26.40	4,424.5	631.9	356.2	-210.3	1.36	-1.26	-1.79
4,605.0	17.10	25.30	4,514.7	655.7	367.7	-216.4	1.63	1.60	-1.17
4,700.0	15.90	24.20	4,605.8	680.2	379.0	-222.1	1.31	-1.26	-1.16
4,795.0	14.80	23.00	4,697.4	703.2	389.1	-227.0	1.21	-1.16	-1.26
4,890.0	15.50	21.40	4,789.1	726.2	398.4	-231.1	0.86	0.74	-1.68

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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)
4,985.0	14.60	19.50	4,880.8	749.3	407.1	-234.5	1.08	-0.95	-2.00
5,080.0	15.10	24.80	4,972.7	771.8	416.2	-238.6	1.52	0.53	5.58
5,175.0	14.90	23.40	5,064.4	794.3	426.3	-243.5	0.44	-0.21	-1.47
5,269.0	15.30	30.60	5,155.2	816.1	437.4	-249.6	2.04	0.43	7.66
5,364.0	13.70	28.50	5,247.2	836.7	449.2	-256.6	1.77	-1.68	-2.21
5,458.0	14.40	28.80	5,338.3	856.8	460.1	-262.9	0.75	0.74	0.32
5,552.0	12.90	25.80	5,429.7	876.4	470.3	-268.6	1.76	-1.60	-3.19
5,646.0	14.20	31.10	5,521.1	895.8	480.8	-274.7	1.91	1.38	5.64
5,741.0	13.50	29.20	5,613.3	915.4	492.2	-281.6	0.88	-0.74	-2.00
5,836.0	12.70	36.20	5,705.8	933.5	503.8	-288.9	1.87	-0.84	7.37
5,931.0	11.00	32.30	5,798.8	949.6	514.8	-296.2	1.98	-1.79	-4.11
6,025.0	10.70	38.10	5,891.1	964.1	525.0	-303.0	1.20	-0.32	6.17
6,120.0	9.40	37.10	5,984.7	977.2	535.1	-310.0	1.38	-1.37	-1.05
6,214.0	8.50	33.60	6,077.5	989.1	543.6	-315.7	1.12	-0.96	-3.72
6,308.0	7.40	29.00	6,170.6	1,000.2	550.4	-319.9	1.35	-1.17	-4.89
6,403.0	6.20	25.10	6,265.0	1,010.2	555.5	-322.7	1.35	-1.26	-4.11
6,497.0	4.10	24.40	6,358.6	1,017.8	559.1	-324.5	2.24	-2.23	-0.74
6,615.0	1.60	45.70	6,476.4	1,022.8	562.0	-326.3	2.27	-2.12	18.05
6,709.0	1.30	39.00	6,570.4	1,024.6	563.6	-327.5	0.37	-0.32	-7.13
6,803.0	4.70	262.10	6,664.3	1,024.9	560.5	-324.4	6.08	3.62	-145.64
6,898.0	11.80	261.50	6,758.3	1,022.9	547.0	-311.6	7.47	7.47	-0.63
6,993.0	15.50	264.00	6,850.6	1,020.1	524.7	-290.5	3.94	3.89	2.63
7,088.0	23.70	272.40	6,940.0	1,019.6	493.0	-259.6	9.11	8.63	8.84
7,182.0	32.60	266.10	7,022.8	1,018.7	448.7	-216.7	9.97	9.47	-6.70
7,277.0	38.70	267.00	7,100.0	1,015.4	393.5	-163.5	6.44	6.42	0.95
7,371.0	47.30	268.90	7,168.7	1,013.2	329.5	-101.5	9.25	9.15	2.02
7,466.0	56.00	268.80	7,227.5	1,011.7	255.1	-29.1	9.16	9.16	-0.11
7,561.0	65.20	268.40	7,274.1	1,009.6	172.4	51.1	9.69	9.68	-0.42
7,655.0	74.00	270.20	7,306.9	1,008.6	84.4	136.8	9.53	9.36	1.91
7,750.0	79.50	270.00	7,328.6	1,008.8	-8.0	227.0	5.79	5.79	-0.21
7,844.0	84.30	270.90	7,341.9	1,009.5	-101.0	318.0	5.19	5.11	0.96
7,894.4	86.32	269.57	7,346.0	1,009.7	-151.3	367.1	4.78	4.00	-2.64
TPZ - 460' Setback - 1075'FNL, 460'FEL									
7,894.6	86.32	269.57	7,346.0	1,009.7	-151.5	367.2	0.00	0.00	0.00
LPL 1065'FNL & 460'FEL									
7,939.0	88.10	268.40	7,348.2	1,008.9	-195.8	410.4	4.80	4.02	-2.64
8,034.0	88.10	267.90	7,351.3	1,005.9	-290.7	502.3	0.53	0.00	-0.53
8,128.0	90.50	269.60	7,352.5	1,003.8	-384.7	593.6	3.13	2.55	1.81
8,223.0	91.50	269.60	7,350.8	1,003.1	-479.6	686.2	1.05	1.05	0.00
8,318.0	91.40	270.90	7,348.4	1,003.6	-574.6	779.0	1.37	-0.11	1.37
8,411.0	92.00	270.50	7,345.6	1,004.7	-667.6	869.9	0.78	0.65	-0.43
8,506.0	91.00	271.00	7,343.2	1,005.9	-762.5	962.9	1.18	-1.05	0.53
8,601.0	89.20	270.20	7,343.0	1,006.9	-857.5	1,055.8	2.07	-1.89	-0.84
8,695.0	89.10	269.50	7,344.4	1,006.7	-951.5	1,147.5	0.75	-0.11	-0.74

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8,790.0	89.60	271.20	7,345.5	1,007.3	-1,046.5	1,240.4	1.87	0.53	1.79
8,884.0	89.40	272.40	7,346.3	1,010.2	-1,140.4	1,332.7	1.29	-0.21	1.28
8,979.0	89.30	274.00	7,347.4	1,015.5	-1,235.3	1,426.4	1.69	-0.11	1.68
9,074.0	89.40	272.40	7,348.4	1,020.8	-1,330.1	1,520.2	1.69	0.11	-1.68
9,169.0	89.40	273.50	7,349.4	1,025.7	-1,425.0	1,613.8	1.16	0.00	1.16
9,263.0	89.10	271.40	7,350.7	1,029.7	-1,518.9	1,706.4	2.26	-0.32	-2.23
9,357.0	88.80	269.10	7,352.4	1,030.1	-1,612.9	1,798.2	2.47	-0.32	-2.45
9,451.0	88.40	268.90	7,354.7	1,028.5	-1,706.8	1,889.5	0.48	-0.43	-0.21
9,545.0	90.50	269.50	7,355.6	1,027.2	-1,800.8	1,981.0	2.32	2.23	0.64
9,640.0	90.70	269.50	7,354.6	1,026.4	-1,895.8	2,073.5	0.21	0.21	0.00
9,735.0	90.70	268.80	7,353.4	1,024.9	-1,990.8	2,165.9	0.74	0.00	-0.74
9,830.0	89.20	269.80	7,353.5	1,023.8	-2,085.8	2,258.4	1.90	-1.58	1.05
9,924.0	88.80	269.50	7,355.2	1,023.2	-2,179.8	2,350.0	0.53	-0.43	-0.32
10,019.0	88.40	269.30	7,357.5	1,022.2	-2,274.7	2,442.5	0.47	-0.42	-0.21
10,113.0	89.50	269.60	7,359.2	1,021.3	-2,368.7	2,534.0	1.21	1.17	0.32
10,208.0	89.60	270.20	7,359.9	1,021.2	-2,463.7	2,626.7	0.64	0.11	0.63
10,303.0	89.60	270.30	7,360.6	1,021.6	-2,558.7	2,719.5	0.11	0.00	0.11
10,398.0	89.80	270.90	7,361.1	1,022.6	-2,653.7	2,812.5	0.67	0.21	0.63
10,493.0	89.40	270.50	7,361.8	1,023.7	-2,748.7	2,905.5	0.60	-0.42	-0.42
10,587.0	88.90	271.00	7,363.2	1,025.0	-2,842.7	2,997.5	0.75	-0.53	0.53
10,682.0	88.80	269.10	7,365.1	1,025.0	-2,937.6	3,090.2	2.00	-0.11	-2.00
10,777.0	89.70	268.80	7,366.3	1,023.3	-3,032.6	3,182.5	1.00	0.95	-0.32
10,872.0	90.00	269.50	7,366.6	1,021.9	-3,127.6	3,274.9	0.80	0.32	0.74
10,966.0	90.30	269.80	7,366.3	1,021.3	-3,221.6	3,366.5	0.45	0.32	0.32
11,061.0	89.90	269.60	7,366.1	1,020.8	-3,316.6	3,459.2	0.47	-0.42	-0.21
11,156.0	89.30	269.60	7,366.8	1,020.1	-3,411.6	3,551.7	0.63	-0.63	0.00
11,250.0	90.10	268.90	7,367.3	1,018.9	-3,505.6	3,643.2	1.13	0.85	-0.74
11,345.0	89.80	268.60	7,367.4	1,016.8	-3,600.6	3,735.5	0.45	-0.32	-0.32
11,440.0	90.40	268.90	7,367.2	1,014.8	-3,695.5	3,827.7	0.71	0.63	0.32
11,535.0	90.50	268.90	7,366.5	1,012.9	-3,790.5	3,920.0	0.11	0.11	0.00
11,630.0	88.50	269.60	7,367.3	1,011.7	-3,885.5	4,012.5	2.23	-2.11	0.74
11,724.0	88.30	269.30	7,369.9	1,010.8	-3,979.5	4,104.0	0.38	-0.21	-0.32
11,819.0	88.10	268.90	7,372.9	1,009.3	-4,074.4	4,196.4	0.47	-0.21	-0.42
11,914.0	89.50	269.10	7,374.9	1,007.7	-4,169.4	4,288.7	1.49	1.47	0.21
12,009.0	89.60	269.10	7,375.6	1,006.2	-4,264.3	4,381.1	0.11	0.11	0.00
12,104.0	90.20	268.90	7,375.8	1,004.5	-4,359.3	4,473.4	0.67	0.63	-0.21
12,184.0	90.70	268.80	7,375.2	1,002.9	-4,439.3	4,551.2	0.64	0.63	-0.13
12,244.0	90.70	268.80	7,374.5	1,001.6	-4,499.3	4,609.4	0.00	0.00	0.00
Projected BHL 1069'FNL & 460'FWL									

Company:	PETRO OPERATING COMPANY LLC	Local Co-ordinate Reference:	Well BEF West 19
Project:	SEC.2-T1S-R66W	TVD Reference:	WELL @ 5076.0ft (RKB - 27')
Site:	BEF 1S66W2 Pad Sec.2-T1S-R66W	MD Reference:	WELL @ 5076.0ft (RKB - 27')
Well:	BEF West 19	North Reference:	True
Wellbore:	BEF West 19 Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	BEF West 19 Wellbore #1	Database:	US_EDM

Design Targets									
Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (usft)	Easting (usft)	Latitude	Longitude
SHL 2088'FNL & 321'FE - survey hits target center - Point	0.00	0.00	1.0	0.0	0.0	1,241,881.50	3,214,415.20	39.994810	-104.734700
Projected BHL 1069'FNL - survey misses target center by 21.9ft at 12244.0ft MD (7374.5 TVD, 1001.6 N, -4499.3 E) - Point	0.00	0.00	7,353.0	1,005.9	-4,499.6	1,242,848.43	3,209,907.26	39.997570	-104.750760

Survey Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates			
		+N/-S (ft)	+E/-W (ft)	Comment	
7,894.4	7,346.0	1,009.7	-151.3	TPZ - 460' Setback - 1075'FNL, 460'FEL	

Checked By: _____	Approved By: _____	Date: _____
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