

PDC ENERGY

WELD COUNTY, COLORADO

SE SE SEC. 18 T4N R67W 6th P.M.

RIEDER 18Y-301

JOB #2015-047-135

15 July, 2015

Survey: FINAL SURVEYS





Project: WELD COUNTY, COLORADO
Site: SE SE SEC. 18 T4N R67W 6th P.M.
Well: RIEDER 18Y-301
Wellbore: JOB #2015-047-135
Design: FINAL SURVEYS

ANNOTATIONS									
TVD	MD	Inc	Azi	+N/-S	+E/-W	VSec	Dep	Annotation	
909.0	909.0	0.72	260.26	-4.7	-0.4	-4.7	7.1	SURFACE CASING	
6321.9	6400.0	3.20	359.91	-684.7	339.3	-653.6	800.2	KOP	
7049.0	7522.0	89.35	2.67	52.2	343.0	81.0	1536.1	ICP	
7011.3	11505.0	90.50	359.70	4033.9	341.7	4048.3	5518.6	LAST SURVEY - JULY 15, 2015	
7010.8	11558.0	90.50	359.70	4086.9	341.4	4101.1	5571.6	EXTRAPOLATION TO TD	

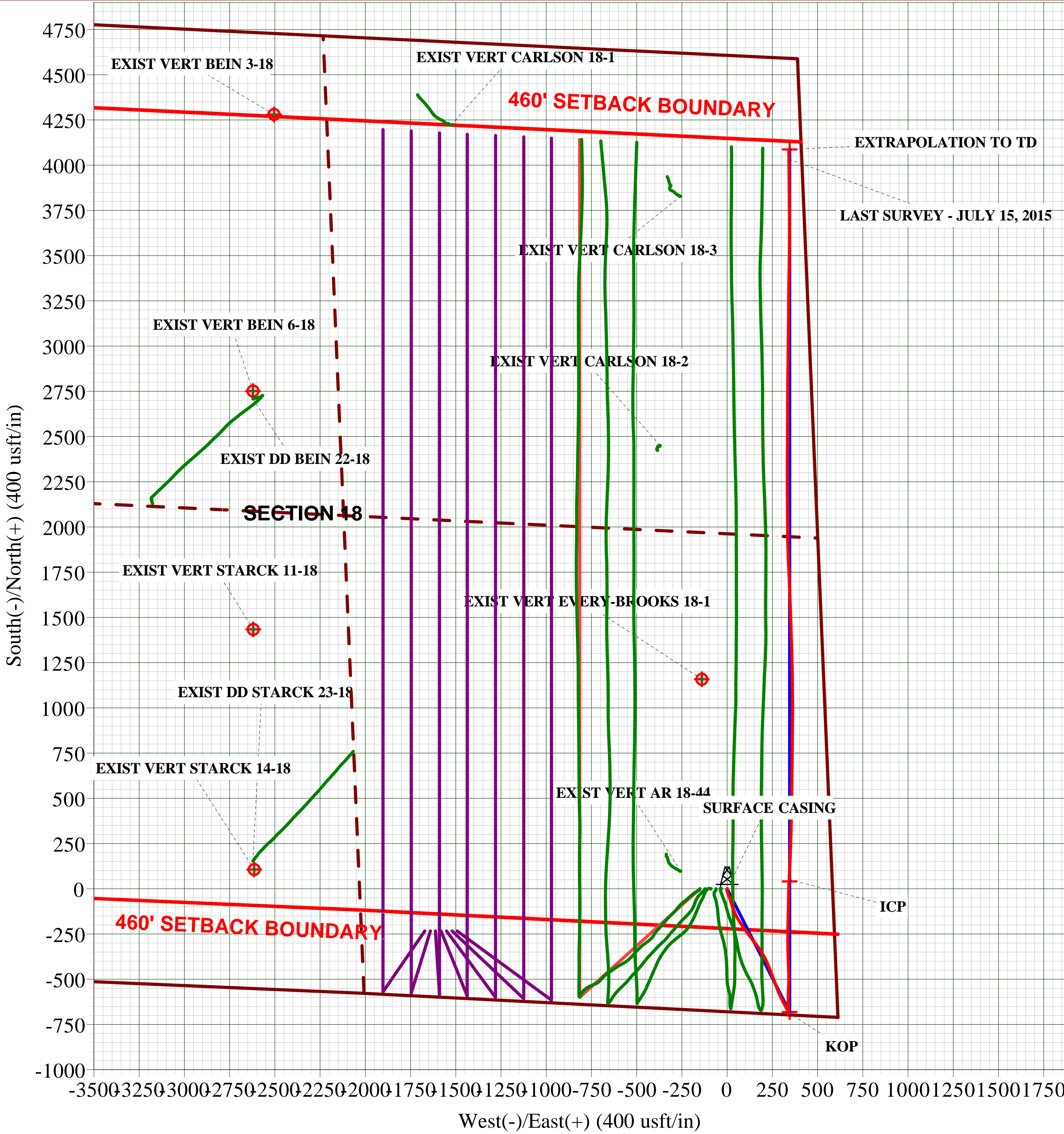
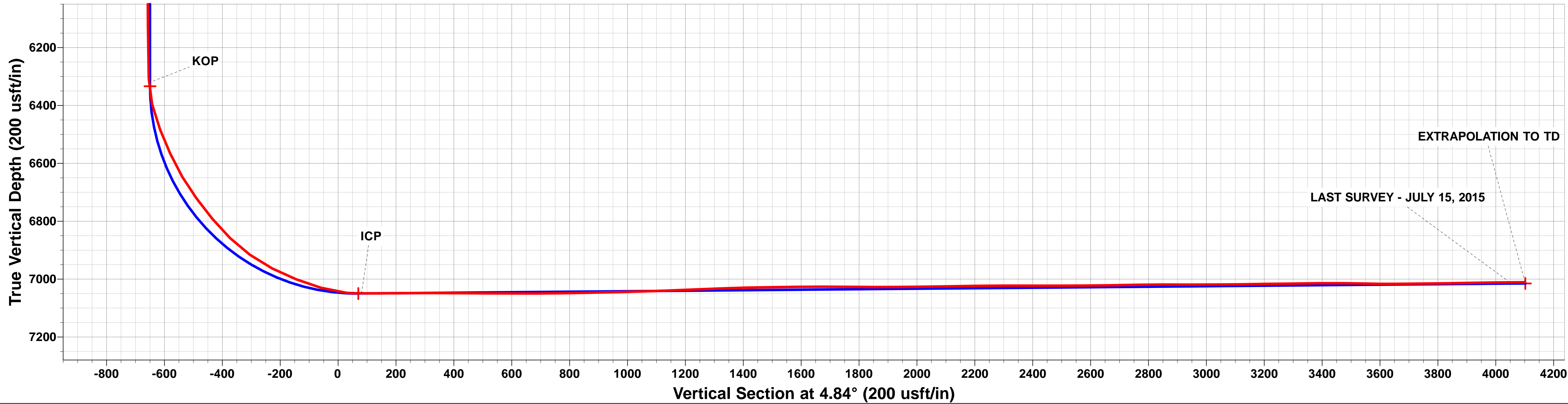
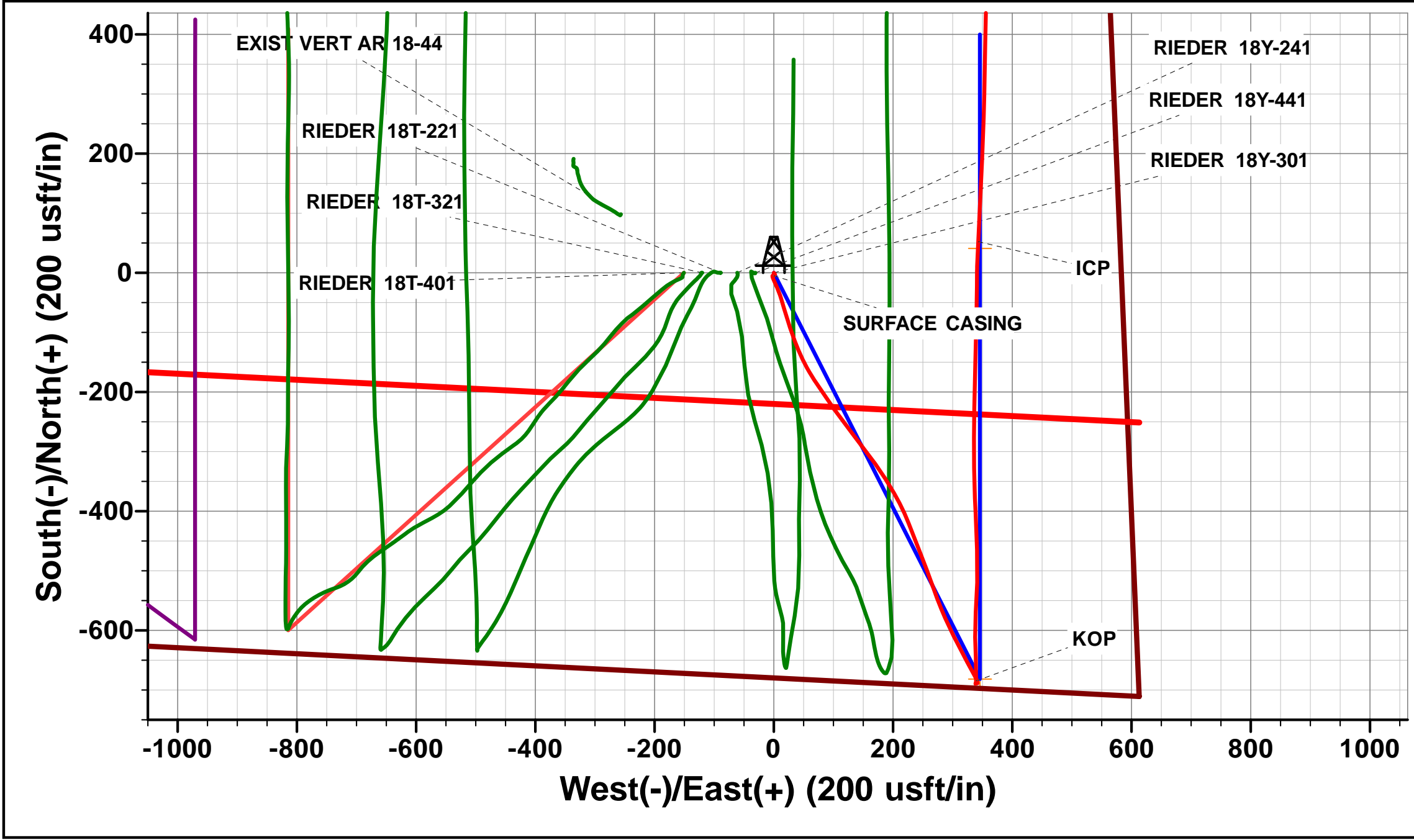
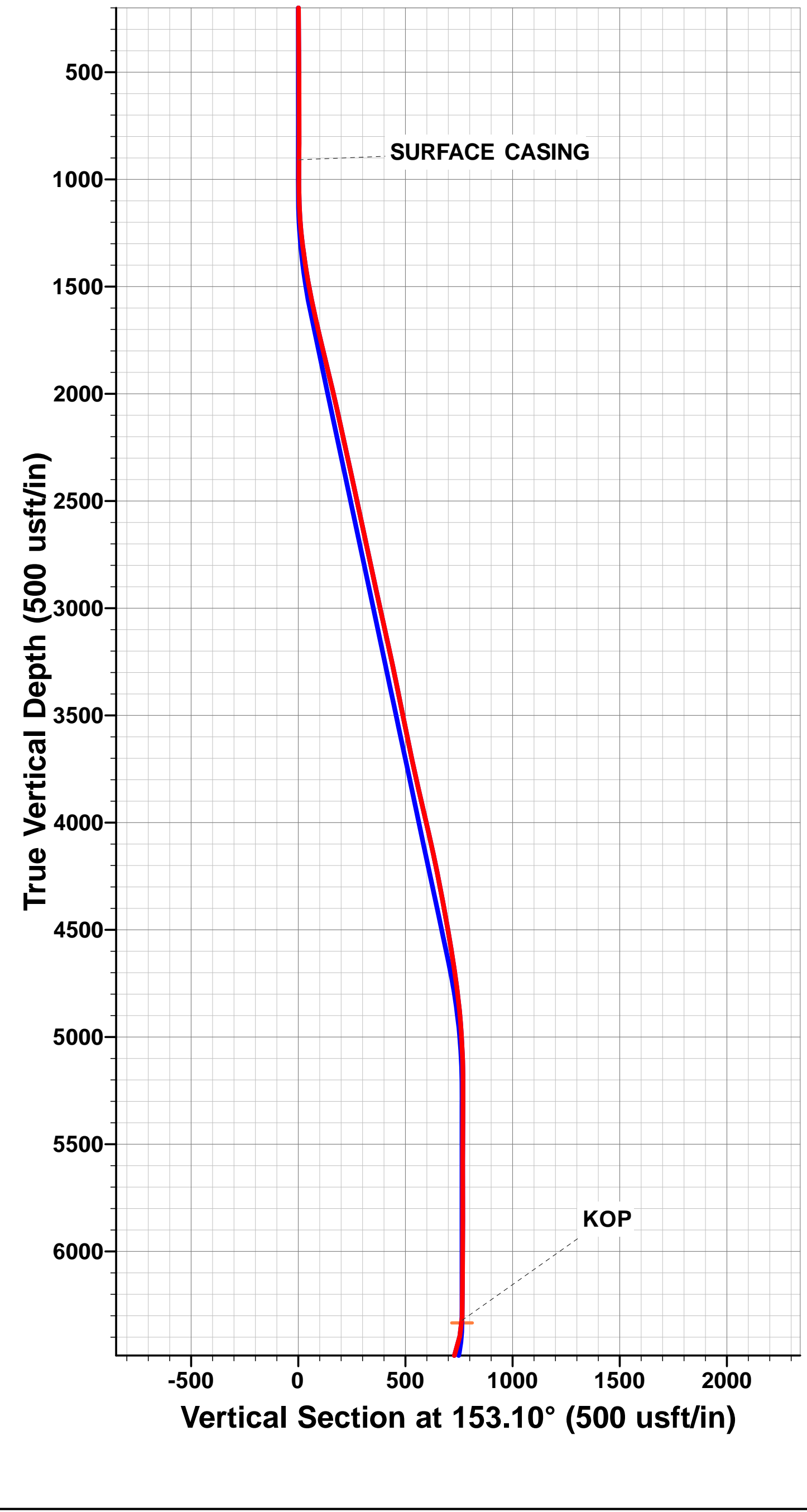
AS DRILLED LOCAL COORDINATES:

SHL: 681ft FSL & 592ft FEL Sec 18

ICP: 733.2ft FSL & 249ft FEL Sec 18

BHL: 500.6ft FNL & 79.4ft FEL Sec 18

WELLBORE TARGET DETAILS (LAT/LONG)						
Name	TVD	+N/-S	+E/-W	Latitude	Longitude	Shape
7" ICP *NEW* - RIEDER 18Y-301 (P2)	7050.0	40.8	345.8	40.307962	-104.924010	Point
BHL - RIEDER 18Y-301 (P2)	7015.0	4087.5	345.8	40.319070	-104.924010	Point
KOP - RIEDER 18Y-301 (P2)	6333.8	-681.5	345.8	40.305979	-104.924010	Point



Survey Report



Company:	PDC ENERGY	Local Co-ordinate Reference:	Well RIEDER 18Y-301
Project:	WELD COUNTY, COLORADO	TVD Reference:	KB-EST @ 4819.0usft
Site:	SE SE SEC. 18 T4N R67W 6th P.M.	MD Reference:	KB-EST @ 4819.0usft
Well:	RIEDER 18Y-301	North Reference:	True
Wellbore:	JOB #2015-047-135	Survey Calculation Method:	Minimum Curvature
Design:	FINAL SURVEYS	Database:	EDM 5000.1 Single User Db

Project	WELD COUNTY, COLORADO		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Northern Zone		Using geodetic scale factor

Site	SE SE SEC. 18 T4N R67W 6th P.M.				
Site Position:		Northing:	1,355,509.25 usft	Latitude:	40.307850
From:	Lat/Long	Easting:	3,160,139.69 usft	Longitude:	-104.925790
Position Uncertainty:	0.0 usft	Slot Radius:	1.10000 ft	Grid Convergence:	0.37 °

Well	RIEDER 18Y-301					
Well Position	+N/-S	0.0 usft	Northing:	1,355,510.20 usft	Latitude:	40.307850
	+E/-W	0.0 usft	Easting:	3,160,290.29 usft	Longitude:	-104.925250
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	4,806.0 usft

Wellbore	JOB #2015-047-135				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	08/07/2015	8.49	66.80	52,549

Design	FINAL SURVEYS				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.0	0.0	0.0	4.84	

Survey Program	Date	15/07/2015			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
272.0	11,558.0	FINAL SURVEYS (JOB #2015-047-135)	MWD	MWD - Standard	

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Subsea Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
0.0	0.00	0.00	0.0	-4,819.0	0.0	0.0	0.0	0.00	0.00	0.00
272.0	0.70	137.60	272.0	-4,547.0	-1.2	1.1	-1.1	0.26	0.26	0.00
552.0	0.20	201.30	552.0	-4,267.0	-2.9	2.1	-2.8	0.23	-0.18	22.75
833.0	0.70	236.90	833.0	-3,986.0	-4.3	0.5	-4.3	0.20	0.18	12.67
SURFACE CASING										
909.0	0.72	260.26	909.0	-3,910.0	-4.7	-0.4	-4.7	0.38	0.03	30.74
1,009.0	0.90	284.20	1,009.0	-3,810.0	-4.6	-1.8	-4.7	0.38	0.18	23.94
1,293.0	6.80	155.10	1,292.3	-3,526.7	-19.3	3.2	-19.0	2.61	2.08	-45.46
1,574.0	12.10	164.30	1,569.4	-3,249.6	-62.8	18.1	-61.0	1.96	1.89	3.27
1,855.0	13.90	158.60	1,843.2	-2,975.8	-122.6	38.4	-118.9	0.79	0.64	-2.03
2,136.0	12.60	146.30	2,116.8	-2,702.2	-179.5	67.8	-173.2	1.10	-0.46	-4.38
2,407.0	12.40	145.30	2,381.4	-2,437.6	-228.0	100.7	-218.7	0.11	-0.07	-0.37
2,678.0	12.20	141.10	2,646.2	-2,172.8	-274.2	135.3	-261.9	0.34	-0.07	-1.55

Survey Report



Company:	PDC ENERGY	Local Co-ordinate Reference:	Well RIEDER 18Y-301
Project:	WELD COUNTY, COLORADO	TVD Reference:	KB-EST @ 4819.0usft
Site:	SE SE SEC. 18 T4N R67W 6th P.M.	MD Reference:	KB-EST @ 4819.0usft
Well:	RIEDER 18Y-301	North Reference:	True
Wellbore:	JOB #2015-047-135	Survey Calculation Method:	Minimum Curvature
Design:	FINAL SURVEYS	Database:	EDM 5000.1 Single User Db

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Subsea Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
2,950.0	12.50	144.60	2,911.9	-1,907.1	-320.6	170.4	-305.1	0.30	0.11	1.29
3,222.0	12.40	150.20	3,177.5	-1,641.5	-369.9	201.9	-351.6	0.45	-0.04	2.06
3,493.0	11.30	158.60	3,442.7	-1,376.3	-419.9	226.1	-399.4	0.75	-0.41	3.10
3,764.0	12.10	158.50	3,708.1	-1,110.9	-471.1	246.2	-448.6	0.30	0.30	-0.04
4,034.0	13.50	160.60	3,971.4	-847.6	-527.1	267.0	-502.7	0.55	0.52	0.78
4,305.0	11.40	155.90	4,236.0	-583.0	-581.4	288.5	-555.0	0.86	-0.77	-1.73
4,577.0	9.90	151.90	4,503.3	-315.7	-626.6	310.5	-598.2	0.61	-0.55	-1.47
4,848.0	7.50	152.10	4,771.2	-47.8	-662.8	329.7	-632.6	0.89	-0.89	0.07
5,120.0	2.70	150.50	5,042.0	223.0	-684.0	341.2	-652.8	1.77	-1.76	-0.59
5,391.0	1.10	294.70	5,312.9	493.9	-688.5	342.0	-657.2	1.35	-0.59	53.21
5,662.0	0.60	219.90	5,583.9	764.9	-688.5	338.7	-657.5	0.41	-0.18	-27.60
5,933.0	0.20	67.40	5,854.9	1,035.9	-689.4	338.2	-658.4	0.29	-0.15	-56.27
6,204.0	0.60	17.00	6,125.9	1,306.9	-687.9	339.1	-656.8	0.18	0.15	-18.60
6,385.0	1.10	358.70	6,306.9	1,487.9	-685.2	339.3	-654.2	0.31	0.28	-10.11
KOP										
6,400.0	3.20	359.91	6,321.9	1,502.9	-684.7	339.3	-653.6	14.00	14.00	8.08
6,475.0	13.70	0.40	6,396.0	1,577.0	-673.7	339.4	-642.7	14.00	14.00	0.65
6,566.0	21.60	358.00	6,482.6	1,663.6	-646.1	338.9	-615.2	8.72	8.68	-2.64
6,656.0	24.20	358.00	6,565.5	1,746.5	-611.1	337.6	-580.5	2.89	2.89	0.00
6,747.0	30.60	4.10	6,646.3	1,827.3	-569.3	338.6	-538.7	7.67	7.03	6.70
6,837.0	36.30	2.00	6,721.3	1,902.3	-519.8	341.2	-489.2	6.46	6.33	-2.33
6,927.0	39.80	357.70	6,792.2	1,973.2	-464.4	341.0	-434.0	4.88	3.89	-4.78
7,017.0	45.70	357.60	6,858.3	2,039.3	-403.3	338.5	-373.4	6.56	6.56	-0.11
7,107.0	54.50	358.80	6,915.9	2,096.9	-334.4	336.4	-304.9	9.83	9.78	1.33
7,198.0	62.60	0.50	6,963.4	2,144.4	-256.8	335.9	-227.6	9.04	8.90	1.87
7,289.0	69.00	1.70	7,000.7	2,181.7	-173.9	337.5	-144.8	7.13	7.03	1.32
7,379.0	73.10	0.90	7,029.9	2,210.9	-88.8	339.5	-59.9	4.63	4.56	-0.89
7,469.0	84.50	0.90	7,047.3	2,228.3	-0.7	340.9	28.0	12.67	12.67	0.00
7,488.0	88.90	2.70	7,048.4	2,229.4	18.3	341.4	47.0	25.01	23.16	9.47
ICP										
7,522.0	89.35	2.67	7,049.0	2,230.0	52.2	343.0	81.0	1.32	1.31	-0.10
7,587.0	90.20	2.60	7,049.2	2,230.2	117.2	346.0	145.9	1.32	1.31	-0.10
7,678.0	90.60	2.60	7,048.6	2,229.6	208.1	350.2	236.8	0.44	0.44	0.00
7,768.0	89.80	1.10	7,048.3	2,229.3	298.0	353.1	326.7	1.89	-0.89	-1.67
7,858.0	89.60	1.00	7,048.7	2,229.7	388.0	354.7	416.5	0.25	-0.22	-0.11
7,948.0	89.60	1.00	7,049.4	2,230.4	478.0	356.3	506.3	0.00	0.00	0.00
8,039.0	89.90	1.00	7,049.8	2,230.8	569.0	357.9	597.1	0.33	0.33	0.00
8,129.0	89.90	0.90	7,049.9	2,230.9	658.9	359.4	686.9	0.11	0.00	-0.11
8,219.0	91.30	0.30	7,049.0	2,230.0	748.9	360.3	776.6	1.69	1.56	-0.67
8,310.0	91.10	0.30	7,047.1	2,228.1	839.9	360.8	867.3	0.22	-0.22	0.00
8,400.0	91.30	0.50	7,045.2	2,226.2	929.9	361.4	957.0	0.31	0.22	0.22
8,490.0	91.60	0.30	7,042.9	2,223.9	1,019.9	362.0	1,046.7	0.40	0.33	-0.22
8,580.0	92.30	358.90	7,039.8	2,220.8	1,109.8	361.4	1,136.3	1.74	0.78	-1.56
8,671.0	92.40	358.90	7,036.1	2,217.1	1,200.7	359.7	1,226.8	0.11	0.11	0.00
8,761.0	92.00	358.50	7,032.7	2,213.7	1,290.6	357.6	1,316.2	0.63	-0.44	-0.44
8,852.0	91.60	358.00	7,029.8	2,210.8	1,381.5	354.8	1,406.5	0.70	-0.44	-0.55
8,942.0	90.60	358.60	7,028.1	2,209.1	1,471.5	352.2	1,495.9	1.30	-1.11	0.67
9,033.0	90.80	357.80	7,027.0	2,208.0	1,562.4	349.3	1,586.3	0.91	0.22	-0.88
9,123.0	90.00	357.80	7,026.3	2,207.3	1,652.4	345.9	1,675.6	0.89	-0.89	0.00
9,214.0	89.30	357.40	7,026.9	2,207.9	1,743.3	342.1	1,765.9	0.89	-0.77	-0.44
9,304.0	89.90	357.40	7,027.5	2,208.5	1,833.2	338.0	1,855.1	0.67	0.67	0.00
9,395.0	90.60	359.50	7,027.1	2,208.1	1,924.1	335.5	1,945.6	2.43	0.77	2.31
9,485.0	90.60	359.40	7,026.2	2,207.2	2,014.1	334.6	2,035.2	0.11	0.00	-0.11

Survey Report



Company:	PDC ENERGY	Local Co-ordinate Reference:	Well RIEDER 18Y-301
Project:	WELD COUNTY, COLORADO	TVD Reference:	KB-EST @ 4819.0usft
Site:	SE SE SEC. 18 T4N R67W 6th P.M.	MD Reference:	KB-EST @ 4819.0usft
Well:	RIEDER 18Y-301	North Reference:	True
Wellbore:	JOB #2015-047-135	Survey Calculation Method:	Minimum Curvature
Design:	FINAL SURVEYS	Database:	EDM 5000.1 Single User Db

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Subsea Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
9,576.0	91.00	359.50	7,024.9	2,205.9	2,105.1	333.8	2,125.8	0.45	0.44	0.11
9,666.0	91.00	359.60	7,023.3	2,204.3	2,195.1	333.1	2,215.4	0.11	0.00	0.11
9,756.0	89.80	0.40	7,022.7	2,203.7	2,285.1	333.1	2,305.0	1.60	-1.33	0.89
9,847.0	90.00	0.10	7,022.9	2,203.9	2,376.1	333.5	2,395.7	0.40	0.22	-0.33
9,938.0	89.90	0.30	7,022.9	2,203.9	2,467.1	333.8	2,486.4	0.25	-0.11	0.22
10,028.0	90.60	0.20	7,022.6	2,203.6	2,557.1	334.2	2,576.2	0.79	0.78	-0.11
10,118.0	90.80	0.40	7,021.5	2,202.5	2,647.1	334.6	2,665.9	0.31	0.22	0.22
10,209.0	91.20	0.10	7,019.9	2,200.9	2,738.1	335.0	2,756.6	0.55	0.44	-0.33
10,299.0	89.90	0.80	7,019.0	2,200.0	2,828.1	335.7	2,846.3	1.64	-1.44	0.78
10,390.0	89.90	0.90	7,019.2	2,200.2	2,919.0	337.1	2,937.1	0.11	0.00	0.11
10,480.0	90.40	0.70	7,018.9	2,199.9	3,009.0	338.4	3,026.8	0.60	0.56	-0.22
10,571.0	90.70	0.60	7,018.0	2,199.0	3,100.0	339.4	3,117.6	0.35	0.33	-0.11
10,661.0	90.90	0.30	7,016.8	2,197.8	3,190.0	340.1	3,207.3	0.40	0.22	-0.33
10,751.0	90.60	0.60	7,015.6	2,196.6	3,280.0	340.8	3,297.1	0.47	-0.33	0.33
10,841.0	91.00	0.90	7,014.4	2,195.4	3,370.0	342.0	3,386.8	0.56	0.44	0.33
10,932.0	89.10	0.90	7,014.3	2,195.3	3,461.0	343.4	3,477.6	2.09	-2.09	0.00
11,022.0	88.80	0.80	7,015.9	2,196.9	3,550.9	344.7	3,567.4	0.35	-0.33	-0.11
11,113.0	90.60	359.80	7,016.4	2,197.4	3,641.9	345.2	3,658.1	2.26	1.98	-1.10
11,203.0	90.50	359.50	7,015.5	2,196.5	3,731.9	344.7	3,747.7	0.35	-0.11	-0.33
11,293.0	90.80	359.50	7,014.5	2,195.5	3,821.9	343.9	3,837.3	0.33	0.33	0.00
11,384.0	91.30	359.20	7,012.9	2,193.9	3,912.9	342.8	3,927.9	0.64	0.55	-0.33
11,474.0	90.40	359.60	7,011.5	2,192.5	4,002.9	341.9	4,017.5	1.09	-1.00	0.44
LAST SURVEY - JULY 15, 2015										
11,505.0	90.50	359.70	7,011.3	2,192.3	4,033.9	341.7	4,048.3	0.46	0.32	0.32
EXTRAPOLATION TO TD										
11,558.0	90.50	359.70	7,010.8	2,191.8	4,086.9	341.4	4,101.1	0.00	0.00	0.00

Survey Report



Company:	PDC ENERGY	Local Co-ordinate Reference:	Well RIEDER 18Y-301
Project:	WELD COUNTY, COLORADO	TVD Reference:	KB-EST @ 4819.0usft
Site:	SE SE SEC. 18 T4N R67W 6th P.M.	MD Reference:	KB-EST @ 4819.0usft
Well:	RIEDER 18Y-301	North Reference:	True
Wellbore:	JOB #2015-047-135	Survey Calculation Method:	Minimum Curvature
Design:	FINAL SURVEYS	Database:	EDM 5000.1 Single User Db

Targets									
Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
7" ICP *NEW* - RIEDER - survey misses target center by 3.5usft at 7510.7usft MD (7048.8 TVD, 41.0 N, 342.5 E) - Point	0.00	0.00	7,050.0	40.8	345.8	1,355,553.24	3,160,635.80	40.307962	-104.924010
KOP - RIEDER 18Y-301 - survey misses target center by 6.9usft at 6412.3usft MD (6334.1 TVD, -683.8 N, 339.3 E) - Point	0.00	0.00	6,333.8	-681.5	345.8	1,354,831.00	3,160,640.48	40.305979	-104.924010
EXIST VERT EVERY-BF - survey misses target center by 523.1usft at 8632.0usft MD (7037.7 TVD, 1161.8 N, 360.4 E) - Circle (radius 30.0)	0.00	0.00	7,192.0	1,158.5	-139.4	1,356,667.73	3,160,143.35	40.311030	-104.925750
BHL - RIEDER 18Y-301 - survey misses target center by 13.0usft at 11558.0usft MD (7010.8 TVD, 4086.9 N, 341.4 E) - Point	0.00	0.00	7,023.0	4,087.5	345.8	1,359,599.72	3,160,609.55	40.319070	-104.924010
7" ICP *NEW* - RIEDER - survey misses target center by 27.1usft at 7320.1usft MD (7011.4 TVD, -144.8 N, 338.3 E) - Point	0.00	0.00	7,036.0	-153.4	345.8	1,355,359.06	3,160,637.06	40.307429	-104.924010
BHL - RIEDER 18Y-301 - survey misses target center by 6.1usft at 11558.0usft MD (7010.8 TVD, 4086.9 N, 341.4 E) - Point	0.00	0.00	7,015.0	4,087.5	345.8	1,359,599.72	3,160,609.55	40.319070	-104.924010
EXIST VERT STARCK 1 - survey misses target center by 3067.9usft at 8988.6usft MD (7027.5 TVD, 1518.1 N, 350.9 E) - Circle (radius 30.0)	0.00	0.00	7,791.0	1,434.1	-2,619.3	1,356,927.19	3,157,661.88	40.311786	-104.934642
EXIST VERT BEIN 6-18 - survey misses target center by 3045.9usft at 10196.9usft MD (7020.1 TVD, 2726.0 N, 335.0 E) - Circle (radius 30.0)	0.00	0.00	7,756.0	2,751.8	-2,620.5	1,358,244.80	3,157,652.08	40.315403	-104.934647
EXIST VERT BEIN 3-18 - survey misses target center by 2863.3usft at 11558.0usft MD (7010.8 TVD, 4086.9 N, 341.4 E) - Circle (radius 30.0)	0.00	0.00	7,264.0	4,280.7	-2,504.1	1,359,774.44	3,157,758.61	40.319600	-104.934230
KOP - RIEDER 18Y-301 - survey misses target center by 32.7usft at 6552.2usft MD (6469.7 TVD, -651.1 N, 339.0 E) - Point	0.00	0.00	6,479.4	-681.5	345.8	1,354,831.00	3,160,640.48	40.305979	-104.924010
EXIST VERT STARCK 1 - survey misses target center by 3050.2usft at 7488.0usft MD (7048.4 TVD, 18.3 N, 341.4 E) - Circle (radius 30.0)	0.00	0.00	7,798.0	106.5	-2,613.8	1,355,599.78	3,157,675.92	40.308142	-104.934622

Survey Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
909.0	909.0	-4.7	-0.4	SURFACE CASING
6,400.0	6,321.9	-684.7	339.3	KOP
7,522.0	7,049.0	52.2	343.0	ICP
11,505.0	7,011.3	4,033.9	341.7	LAST SURVEY - JULY 15, 2015
11,558.0	7,010.8	4,086.9	341.4	EXTRAPOLATION TO TD

Checked By: _____ Approved By: _____ Date: _____