

PDC ENERGY

WELD COUNTY, COLORADO

NW NW SEC. 19 T4N R63W 6th P.M.

SATER 19E-203 - Slot SATER 19E-203

JOB #2016-003-135

28 January, 2016

Survey: FINAL SURVEYS





Project: WELD COUNTY, COLORADO
Site: NW NW SEC. 19 T4N R63W 6th P.M.
Well: SATER 19E-203
Wellbore: JOB #2016-003-135
Design: FINAL SURVEYS

ANNOTATIONS

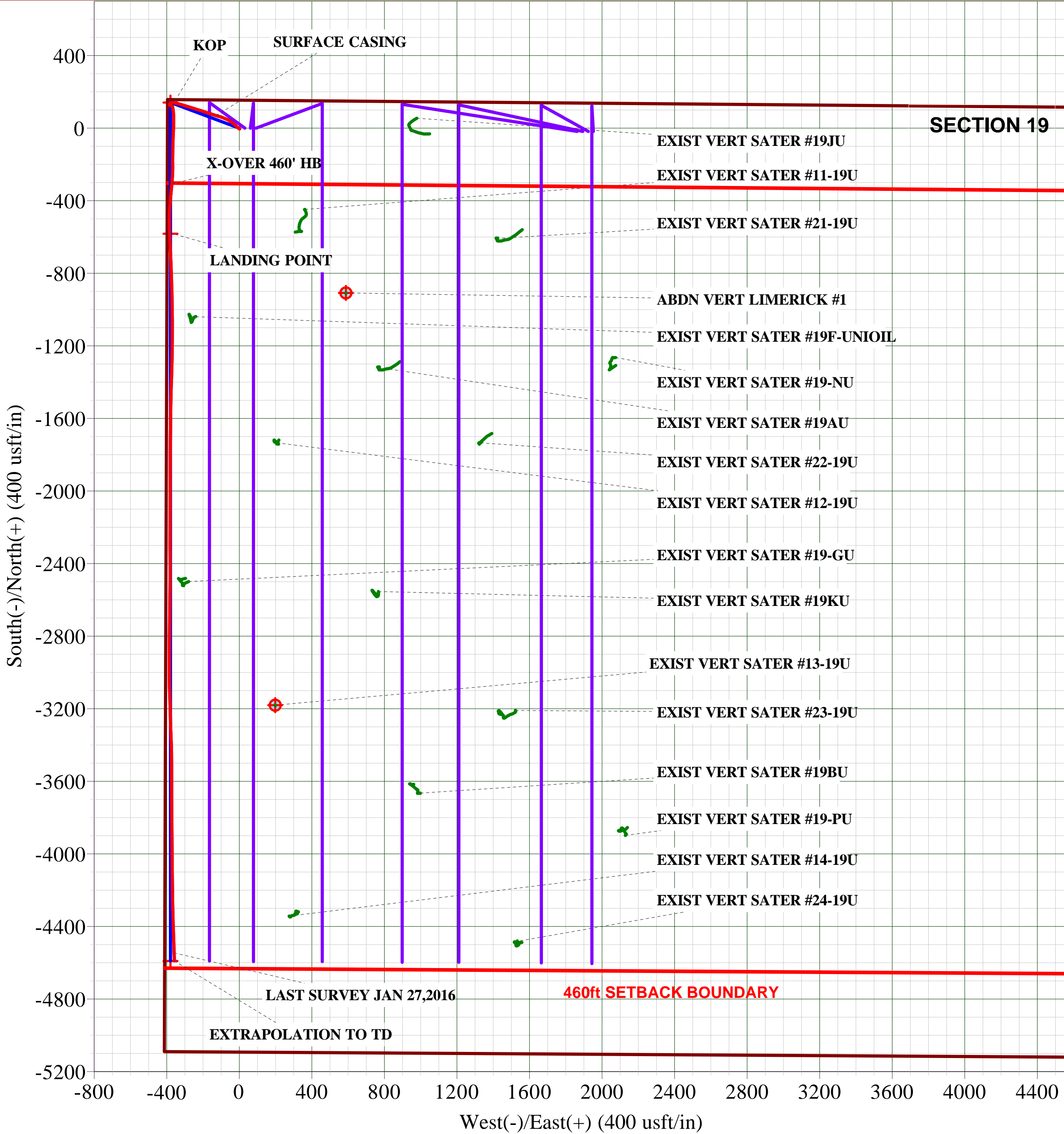
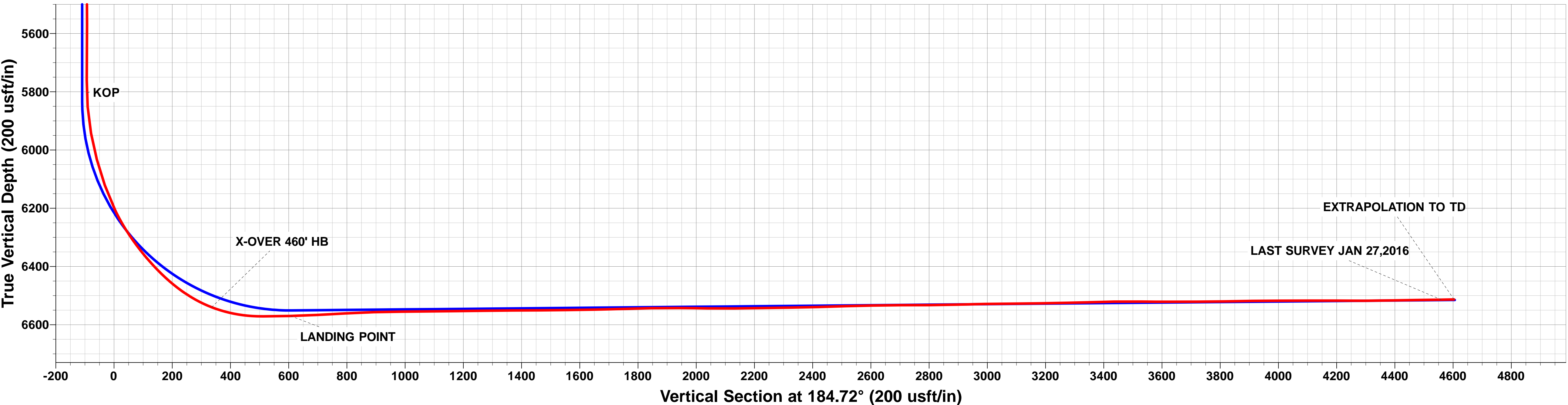
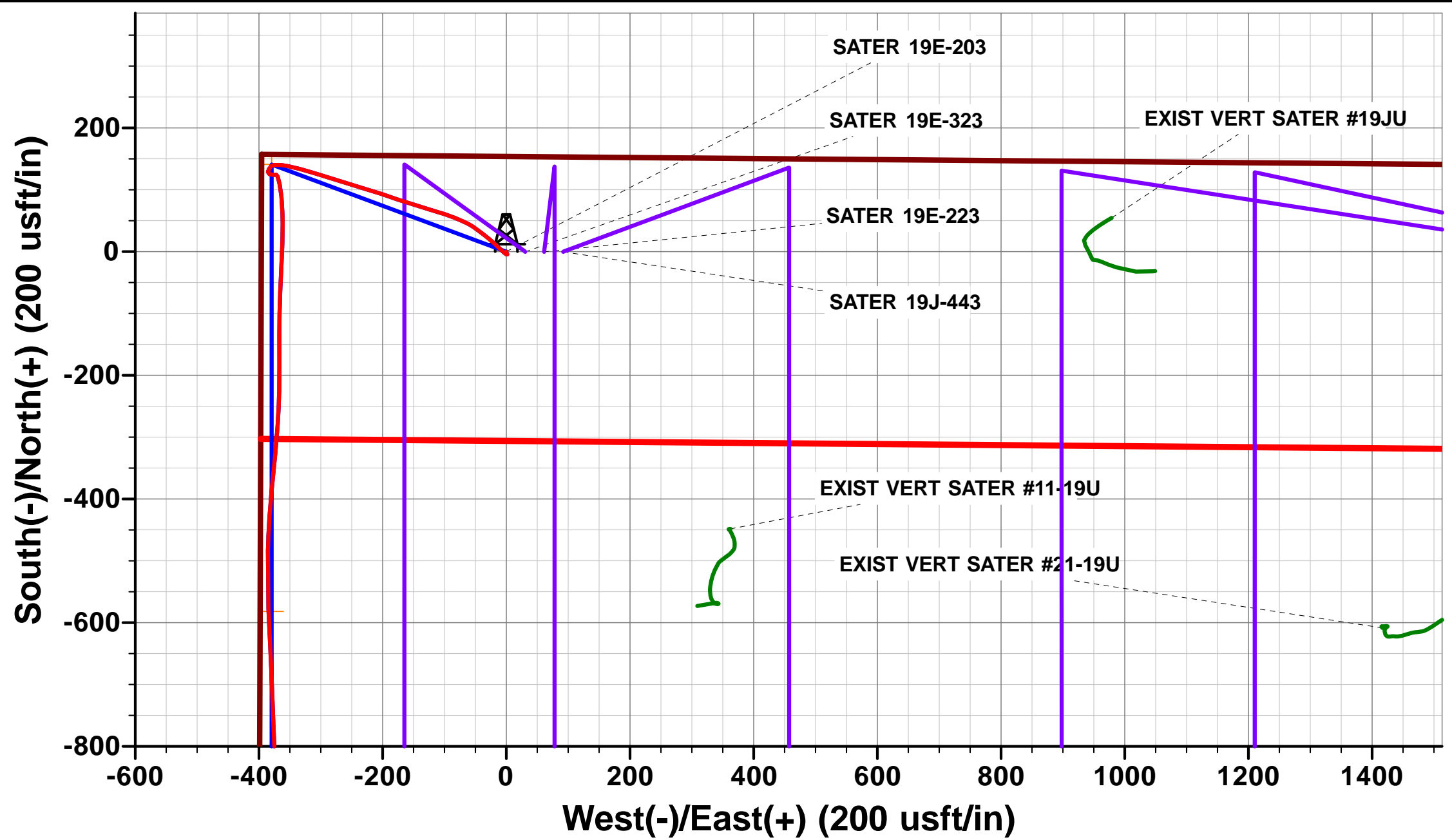
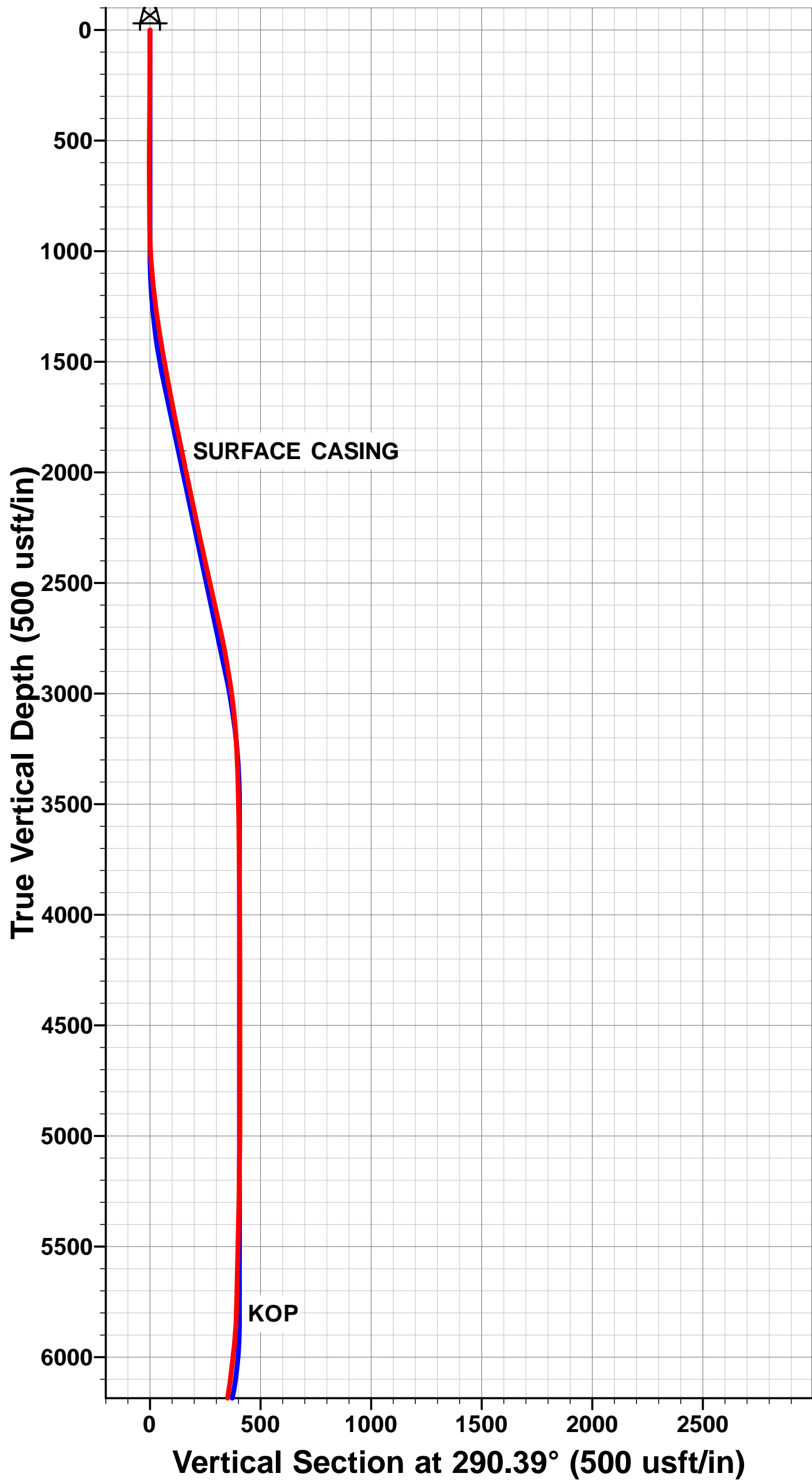
TVD	MD	Inc	Azi	+N/-S	+E/-W	VSec	Dep	Annotation
1903.4	1916.0	11.84	285.95	69.0	-127.8	-58.3	158.8	SURFACE CASING
5802.6	5840.0	2.43	142.03	123.9	-370.7	-93.0	457.0	KOP
6540.0	6739.5	68.67	184.92	-306.0	-371.7	335.6	888.1	X-OVER 460' HB
6569.8	7015.0	91.30	177.60	-577.1	-384.6	606.8	1159.5	LANDING POINT
6514.2	10985.0	91.20	177.70	-4545.5	-359.4	4559.7	5128.7	LAST SURVEY JAN 27,2016
6513.3	11029.0	91.20	177.70	-4589.5	-357.7	4603.4	5172.7	EXTRAPOLATION TO TD

ASDRILLED LOCAL COORDINATES:

SHL: 154ft FNL & 396t FWL Sec 19
Heel: 733.1t FNL & 11.7ft FWL Sec 19
BHL: 499.3ft FSL & 53.7ft FWL Sec 19

WELLBORE TARGET DETAILS (LAT/LONG)

Name	TVD	+N/-S	+E/-W	Latitude	Longitude	Shape
KOP - SATER 19E-203	5834.8	141.0	-379.4	40.304867	-104.489630	Point
BHL - SATER 19E-203	6515.0	-4590.2	-379.4	40.291880	-104.489630	Point
7" ICP *NEW* - SATER 19E-203	6551.0	-581.7	-379.4	40.302883	-104.489630	Point



Company:	PDC ENERGY	Local Co-ordinate Reference:	Well SATER 19E-203 - Slot SATER 19E-203
Project:	WELD COUNTY, COLORADO	TVD Reference:	KB @ 4674.0usft (ENSIGN 135)
Site:	NW NW SEC. 19 T4N R63W 6th P.M.	MD Reference:	KB @ 4674.0usft (ENSIGN 135)
Well:	SATER 19E-203	North Reference:	True
Wellbore:	JOB #2016-003-135	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	NW NW SEC. 19 T4N R63W 6th P.M.				
Site Position:		Northing:	1,355,372.81 usft	Latitude:	40.304480
From:	Lat/Long	Easting:	3,282,168.18 usft	Longitude:	-104.488270
Position Uncertainty:	0.0 usft	Slot Radius:	1.10000 ft	Grid Convergence:	0.65 °

Well	SATER 19E-203 - Slot SATER 19E-203					
Well Position	+N/-S	0.0 usft	Northing:	1,355,372.81 usft	Latitude:	40.304480
	+E/-W	0.0 usft	Easting:	3,282,168.18 usft	Longitude:	-104.488270
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	4,661.0 usft

Wellbore	JOB #2016-003-135				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	29/12/2015	8.21	66.86	52,540

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	184.72

Survey Program	Date	28/01/2016			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
325.0	11,029.0	FINAL SURVEYS (JOB #2016-003-135)	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	-4,674.0	0.0	0.0	0.0	0.00	0.00	0.00
325.0	0.60	163.30	325.0	-4,349.0	-1.6	0.5	1.6	0.18	0.18	0.00
601.0	0.60	146.50	601.0	-4,073.0	-4.2	1.7	4.1	0.06	0.00	-6.09
885.0	1.00	296.60	885.0	-3,789.0	-4.3	0.3	4.3	0.55	0.14	52.85
1,172.0	6.90	314.10	1,171.2	-3,502.8	8.8	-14.3	-7.6	2.07	2.06	6.10
1,458.0	10.30	306.50	1,453.9	-3,220.1	36.0	-47.2	-31.9	1.25	1.19	-2.66
1,585.0	10.50	295.40	1,578.8	-3,095.2	47.7	-66.8	-42.0	1.58	0.16	-8.74
1,867.0	11.90	285.20	1,855.5	-2,818.5	66.3	-118.1	-56.4	0.86	0.50	-3.62
SURFACE CASING										
1,916.0	11.84	285.95	1,903.4	-2,770.6	69.0	-127.8	-58.3	0.34	-0.11	1.53
2,154.0	11.60	289.70	2,136.5	-2,537.5	83.8	-173.8	-69.2	0.34	-0.10	1.57
2,442.0	12.80	286.60	2,418.0	-2,256.0	102.7	-231.6	-83.3	0.47	0.42	-1.08
2,729.0	12.30	287.80	2,698.1	-1,975.9	121.1	-291.2	-96.7	0.20	-0.17	0.42

Company:	PDC ENERGY	Local Co-ordinate Reference:	Well SATER 19E-203 - Slot SATER 19E-203
Project:	WELD COUNTY, COLORADO	TVD Reference:	KB @ 4674.0usft (ENSGN 135)
Site:	NW NW SEC. 19 T4N R63W 6th P.M.	MD Reference:	KB @ 4674.0usft (ENSGN 135)
Well:	SATER 19E-203	North Reference:	True
Wellbore:	JOB #2016-003-135	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)
3,017.0	8.20	283.90	2,981.5	-1,692.5	135.4	-340.4	-106.9	1.44	-1.42	-1.35
3,305.0	2.70	267.50	3,268.1	-1,405.9	140.1	-367.1	-109.4	1.97	-1.91	-5.69
3,592.0	0.90	277.40	3,554.9	-1,119.1	140.1	-376.1	-108.6	0.63	-0.63	3.45
3,880.0	1.00	224.30	3,842.9	-831.1	138.6	-380.1	-106.8	0.30	0.03	-18.44
4,168.0	1.00	209.20	4,130.8	-543.2	134.6	-383.1	-102.6	0.09	0.00	-5.24
4,456.0	0.40	28.80	4,418.8	-255.2	133.3	-383.8	-101.2	0.49	-0.21	62.36
4,744.0	0.70	206.80	4,706.8	32.8	132.6	-384.1	-100.5	0.38	0.10	61.81
5,031.0	0.80	189.70	4,993.8	319.8	129.0	-385.3	-96.8	0.08	0.03	-5.96
5,319.0	1.20	122.40	5,281.8	607.8	125.4	-383.1	-93.4	0.40	0.14	-23.37
5,606.0	1.50	86.50	5,568.7	894.7	124.0	-376.8	-92.6	0.31	0.10	-12.51
5,797.0	1.50	81.60	5,759.6	1,085.6	124.6	-371.8	-93.5	0.07	0.00	-2.57
KOP										
5,840.0	2.43	142.03	5,802.6	1,128.6	123.9	-370.7	-93.0	4.96	2.16	140.53
5,889.0	4.60	160.90	5,851.5	1,177.5	121.2	-369.4	-90.4	4.96	4.43	38.52
5,981.0	10.60	167.80	5,942.7	1,268.7	109.5	-366.4	-78.9	6.59	6.52	7.50
6,073.0	15.10	174.90	6,032.3	1,358.3	89.3	-363.6	-59.0	5.17	4.89	7.72
6,166.0	19.60	178.00	6,121.1	1,447.1	61.6	-361.9	-31.6	4.94	4.84	3.33
6,258.0	25.70	180.60	6,205.9	1,531.9	26.2	-361.6	3.7	6.72	6.63	2.83
6,350.0	33.10	183.30	6,286.0	1,612.0	-18.9	-363.3	48.8	8.17	8.04	2.93
6,442.0	39.60	182.10	6,360.1	1,686.1	-73.3	-365.8	103.2	7.11	7.07	-1.30
6,538.0	46.20	180.00	6,430.4	1,756.4	-138.6	-366.9	168.4	7.03	6.87	-2.19
6,633.0	55.60	180.20	6,490.2	1,816.2	-212.3	-367.0	241.8	9.90	9.89	0.21
6,729.0	67.30	184.80	6,536.1	1,862.1	-296.3	-370.9	325.9	12.89	12.19	4.79
X-OVER 460' HB										
6,739.5	68.67	184.92	6,540.0	1,866.0	-306.0	-371.7	335.6	13.06	13.02	1.11
6,825.0	79.80	185.80	6,563.2	1,889.2	-387.8	-379.4	417.8	13.06	13.02	1.03
6,921.0	90.50	181.40	6,571.3	1,897.3	-483.1	-385.4	513.2	12.04	11.15	-4.58
LANDING POINT										
7,015.0	91.30	177.60	6,569.8	1,895.8	-577.1	-384.6	606.8	4.13	0.85	-4.04
7,111.0	92.90	177.10	6,566.3	1,892.3	-672.9	-380.1	702.0	1.75	1.67	-0.52
7,206.0	93.40	178.30	6,561.1	1,887.1	-767.7	-376.3	796.1	1.37	0.53	1.26
7,303.0	91.60	178.00	6,556.9	1,882.9	-864.6	-373.2	892.4	1.88	-1.86	-0.31
7,398.0	90.20	178.40	6,555.4	1,881.4	-959.5	-370.2	986.7	1.53	-1.47	0.42
7,494.0	91.00	180.20	6,554.4	1,880.4	-1,055.5	-369.0	1,082.3	2.05	0.83	1.87
7,590.0	90.30	180.60	6,553.3	1,879.3	-1,151.5	-369.7	1,178.0	0.84	-0.73	0.42
7,685.0	91.20	180.60	6,552.0	1,878.0	-1,246.5	-370.7	1,272.8	0.95	0.95	0.00
7,781.0	90.00	181.90	6,551.0	1,877.0	-1,342.4	-372.8	1,368.6	1.84	-1.25	1.35
7,877.0	90.60	181.60	6,550.5	1,876.5	-1,438.4	-375.7	1,464.4	0.70	0.62	-0.31
7,973.0	90.60	181.00	6,549.5	1,875.5	-1,534.4	-377.9	1,560.3	0.62	0.00	-0.62
8,068.0	91.00	180.60	6,548.2	1,874.2	-1,629.3	-379.2	1,655.0	0.60	0.42	-0.42
8,163.0	92.00	180.40	6,545.7	1,871.7	-1,724.3	-380.1	1,749.7	1.07	1.05	-0.21
8,259.0	90.80	180.10	6,543.4	1,869.4	-1,820.3	-380.5	1,845.4	1.29	-1.25	-0.31
8,355.0	89.90	180.40	6,542.8	1,868.8	-1,916.3	-380.9	1,941.1	0.99	-0.94	0.31
8,451.0	88.80	180.30	6,543.9	1,869.9	-2,012.2	-381.5	2,036.8	1.15	-1.15	-0.10
8,546.0	90.80	180.00	6,544.2	1,870.2	-2,107.2	-381.7	2,131.5	2.13	2.11	-0.32
8,642.0	91.00	180.30	6,542.7	1,868.7	-2,203.2	-382.0	2,227.2	0.38	0.21	0.31
8,737.0	90.60	179.90	6,541.4	1,867.4	-2,298.2	-382.1	2,321.9	0.60	-0.42	-0.42
8,833.0	91.80	179.30	6,539.3	1,865.3	-2,394.2	-381.5	2,417.5	1.40	1.25	-0.62
8,929.0	91.90	180.60	6,536.2	1,862.2	-2,490.1	-381.4	2,513.1	1.36	0.10	1.35
9,024.0	90.80	180.70	6,534.0	1,860.0	-2,585.1	-382.5	2,607.8	1.16	-1.16	0.11
9,120.0	90.50	180.60	6,532.9	1,858.9	-2,681.1	-383.6	2,703.6	0.33	-0.31	-0.10
9,216.0	89.80	180.50	6,532.7	1,858.7	-2,777.1	-384.5	2,799.3	0.74	-0.73	-0.10
9,312.0	92.00	180.40	6,531.2	1,857.2	-2,873.1	-385.2	2,895.0	2.29	2.29	-0.10

Company:	PDC ENERGY	Local Co-ordinate Reference:	Well SATER 19E-203 - Slot SATER 19E-203
Project:	WELD COUNTY, COLORADO	TVD Reference:	KB @ 4674.0usft (ENSIGN 135)
Site:	NW NW SEC. 19 T4N R63W 6th P.M.	MD Reference:	KB @ 4674.0usft (ENSIGN 135)
Well:	SATER 19E-203	North Reference:	True
Wellbore:	JOB #2016-003-135	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)
9,407.0	90.90	179.90	6,528.8	1,854.8	-2,968.0	-385.5	2,989.7	1.27	-1.16	-0.53
9,503.0	90.30	179.30	6,527.7	1,853.7	-3,064.0	-384.8	3,085.3	0.88	-0.62	-0.62
9,599.0	91.20	177.80	6,526.5	1,852.5	-3,160.0	-382.4	3,180.7	1.82	0.94	-1.56
9,694.0	91.00	179.20	6,524.7	1,850.7	-3,254.9	-379.9	3,275.2	1.49	-0.21	1.47
9,759.0	91.50	177.40	6,523.3	1,849.3	-3,319.9	-378.0	3,339.7	2.87	0.77	-2.77
9,855.0	91.50	178.30	6,520.7	1,846.7	-3,415.8	-374.4	3,435.0	0.94	0.00	0.94
9,951.0	88.90	180.10	6,520.4	1,846.4	-3,511.8	-373.0	3,530.6	3.29	-2.71	1.87
10,046.0	90.20	179.60	6,521.1	1,847.1	-3,606.8	-372.8	3,625.2	1.47	1.37	-0.53
10,142.0	90.20	180.20	6,520.8	1,846.8	-3,702.8	-372.6	3,720.9	0.62	0.00	0.62
10,238.0	90.90	179.90	6,519.9	1,845.9	-3,798.8	-372.7	3,816.5	0.79	0.73	-0.31
10,333.0	91.10	179.30	6,518.2	1,844.2	-3,893.7	-372.0	3,911.1	0.67	0.21	-0.63
10,429.0	89.80	179.60	6,517.5	1,843.5	-3,989.7	-371.1	4,006.7	1.39	-1.35	0.31
10,524.0	90.50	178.40	6,517.2	1,843.2	-4,084.7	-369.5	4,101.3	1.46	0.74	-1.26
10,620.0	89.40	179.90	6,517.3	1,843.3	-4,180.7	-368.0	4,196.8	1.94	-1.15	1.56
10,716.0	90.20	179.20	6,517.7	1,843.7	-4,276.7	-367.3	4,292.4	1.11	0.83	-0.73
10,811.0	91.30	177.90	6,516.4	1,842.4	-4,371.6	-364.9	4,386.8	1.79	1.16	-1.37
10,907.0	90.20	178.60	6,515.2	1,841.2	-4,467.6	-361.9	4,482.2	1.36	-1.15	0.73
LAST SURVEY JAN 27, 2016										
10,985.0	91.20	177.70	6,514.2	1,840.2	-4,545.5	-359.4	4,559.7	1.72	1.28	-1.15
EXTRAPOLATION TO TD										
11,029.0	91.20	177.70	6,513.3	1,839.3	-4,589.5	-357.7	4,603.4	0.00	0.00	0.00

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Site:	NW NW SEC. 19 T4N R63W 6th P.M.	MD Reference:	KB @ 4674.0usft (ENSIGN 135)
Well:	SATER 19E-203	North Reference:	True
Wellbore:	JOB #2016-003-135	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
EXIST VERT SATER #1 - survey misses target center by 981.4usft at 9619.4usft MD (6526.1 TVD, -3180.4 N, -381.7 E) - Circle (radius 30.0)	0.00	0.00	7,318.0	-3,180.4	198.1	1,352,195.02	3,282,402.50	40.295750	-104.487560
7" ICP *NEW* - SATER - survey misses target center by 19.4usft at 7020.5usft MD (6569.7 TVD, -582.6 N, -384.3 E) - Point	0.00	0.00	6,551.0	-581.7	-379.4	1,354,786.84	3,281,795.46	40.302883	-104.489630
BHL - SATER 19E-203 - survey misses target center by 21.8usft at 11028.8usft MD (6513.3 TVD, -4589.3 N, -357.7 E) - Point	0.00	0.00	6,515.0	-4,590.2	-379.4	1,350,778.74	3,281,841.19	40.291880	-104.489630
KOP - SATER 19E-203 - survey misses target center by 20.9usft at 5871.0usft MD (5833.5 TVD, 122.5 N, -369.9 E) - Point	0.00	0.00	5,834.8	141.0	-379.4	1,355,509.46	3,281,787.21	40.304867	-104.489630
ABDN VERT LIMERICK - survey misses target center by 1160.1usft at 7366.6usft MD (6555.6 TVD, -928.1 N, -371.1 E) - Circle (radius 30.0)	0.00	0.00	7,208.0	-908.2	588.0	1,354,471.40	3,282,766.45	40.301987	-104.486162

Survey Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
1,916.0	1,903.4	69.0	-127.8	SURFACE CASING
5,840.0	5,802.6	123.9	-370.7	KOP
6,739.5	6,540.0	-306.0	-371.7	X-OVER 460' HB
7,015.0	6,569.8	-577.1	-384.6	LANDING POINT
10,985.0	6,514.2	-4,545.5	-359.4	LAST SURVEY JAN 27, 2016
11,029.0	6,513.3	-4,589.5	-357.7	EXTRAPOLATION TO TD

Checked By: _____ Approved By: _____ Date: _____