

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Shape
BHL 3-30	6275.64	4586.98	-37.47	1511358.00	3407788.56	40° 43' 40.01 N	104° 1' 43.11 W	Point

Titan Directional Drilling, LLC

Survey Report

Company:	Carrizo Oil & Gas, Inc.	Local Co-ordinate Reference:	Well 3-30-9-59
Project:	Niobrara CON'83	TVD Reference:	GL+KB @ 4934.00usft (Xtreme 19)
Site:	Ptasnik 1-30-9-59 Pad	MD Reference:	GL+KB @ 4934.00usft (Xtreme 19)
Well:	3-30-9-59	North Reference:	Grid
Wellbore:	3-30-9-59 OH	Survey Calculation Method:	Minimum Curvature
Design:	3-30-9-59 OH	Database:	EDM 5000.1 Single User Db

Project	Niobrara CON'83, Weld County, CO		
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	Ptasnik 1-30-9-59 Pad,		
Site Position:		Northing:	1,506,771.07 usft
From:	Map	Easting:	3,407,796.03 usft
Position Uncertainty:	0.00 usft	Slot Radius:	13.20 in
		Latitude:	40° 42' 54.69 N
		Longitude:	104° 1' 44.00 W
		Grid Convergence:	0.95 °

Well	3-30-9-59		
Well Position	+N/-S	0.00 usft	Northing:
	+E/-W	0.00 usft	Easting:
Position Uncertainty	0.00 usft	Wellhead Elevation:	0.00 usft
		Latitude:	40° 42' 54.69 N
		Longitude:	104° 1' 43.61 W
		Ground Level:	4,917.00 usft

Wellbore	3-30-9-59 OH		
Magnetics	Model Name	Sample Date	Declination (°)
	IGRF2015	04/29/15	8.06
			Dip Angle (°)
			67.28
			Field Strength (nT)
			52,874

Design	3-30-9-59 OH		
Audit Notes:			
Version:	1.0	Phase:	ACTUAL
		Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)
	0.00	0.00	0.00
			Direction (°)
			359.09

Survey Program	Date	05/05/15		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
138.00	10,965.00	Survey #1 (3-30-9-59 OH)	MWD	MWD - Standard
11,019.00	11,019.00	Survey #2 (3-30-9-59 OH)	ZERO-ERROR	Zero Error

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
138.00	0.70	358.70	138.00	0.84	-0.02	0.84	0.51	0.51	0.00	
229.00	0.60	358.30	228.99	1.87	-0.05	1.88	0.11	-0.11	-0.44	
324.00	1.40	184.60	323.98	1.22	-0.15	1.22	2.10	0.84	-182.84	
414.00	3.70	178.70	413.89	-2.78	-0.18	-2.78	2.57	2.56	-6.56	
504.00	4.30	181.30	503.67	-9.06	-0.19	-9.06	0.70	0.67	2.89	
595.00	4.30	183.20	594.41	-15.88	-0.45	-15.87	0.16	0.00	2.09	
686.00	4.40	184.80	685.15	-22.76	-0.94	-22.74	0.17	0.11	1.76	
776.00	5.50	165.00	774.82	-30.37	-0.11	-30.36	2.24	1.22	-22.00	
866.00	5.80	162.30	864.38	-38.87	2.39	-38.90	0.45	0.33	-3.00	

Titan Directional Drilling, LLC

Survey Report

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Site:	Ptasnik 1-30-9-59 Pad	MD Reference:	GL+KB @ 4934.00usft (Xtreme 19)
Well:	3-30-9-59	North Reference:	Grid
Wellbore:	3-30-9-59 OH	Survey Calculation Method:	Minimum Curvature
Design:	3-30-9-59 OH	Database:	EDM 5000.1 Single User Db

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
954.00	5.60	165.70	951.95	-47.26	4.80	-47.34	0.45	-0.23	3.86
1,044.00	4.70	179.20	1,041.59	-55.21	5.94	-55.29	1.67	-1.00	15.00
1,135.00	4.40	182.00	1,132.30	-62.42	5.87	-62.51	0.41	-0.33	3.08
1,227.00	4.20	182.90	1,224.04	-69.32	5.57	-69.40	0.23	-0.22	0.98
1,319.00	4.30	169.40	1,315.79	-76.07	6.04	-76.16	1.09	0.11	-14.67
1,411.00	4.20	166.70	1,407.54	-82.74	7.45	-82.85	0.24	-0.11	-2.93
1,502.00	4.00	166.40	1,498.30	-89.07	8.96	-89.20	0.22	-0.22	-0.33
1,582.00	4.00	166.90	1,578.11	-94.50	10.25	-94.65	0.04	0.00	0.63
1,619.00	4.00	166.90	1,615.02	-97.01	10.83	-97.17	0.00	0.00	0.00
9 5/8"									
1,662.00	4.00	166.90	1,657.92	-99.93	11.51	-100.10	0.00	0.00	0.00
1,747.00	3.80	161.80	1,742.72	-105.50	13.07	-105.69	0.47	-0.24	-6.00
1,832.00	3.30	147.90	1,827.56	-110.24	15.25	-110.47	1.17	-0.59	-16.35
1,917.00	4.60	160.70	1,912.35	-115.53	17.67	-115.80	1.84	1.53	15.06
2,002.00	4.00	160.00	1,997.11	-121.54	19.81	-121.84	0.71	-0.71	-0.82
2,087.00	4.70	158.50	2,081.87	-127.56	22.10	-127.90	0.83	0.82	-1.76
2,172.00	4.20	156.50	2,166.61	-133.66	24.62	-134.03	0.62	-0.59	-2.35
2,257.00	5.40	162.50	2,251.31	-140.33	27.06	-140.74	1.53	1.41	7.06
2,342.00	5.60	163.90	2,335.92	-148.12	29.42	-148.57	0.28	0.24	1.65
2,426.00	4.70	163.20	2,419.58	-155.36	31.55	-155.84	1.07	-1.07	-0.83
2,511.00	4.70	150.70	2,504.30	-161.73	34.26	-162.25	1.20	0.00	-14.71
2,596.00	4.40	146.90	2,589.03	-167.50	37.74	-168.07	0.50	-0.35	-4.47
2,682.00	4.30	147.20	2,674.78	-172.97	41.29	-173.60	0.12	-0.12	0.35
2,767.00	5.50	161.10	2,759.47	-179.50	44.34	-180.18	1.98	1.41	16.35
2,852.00	6.10	164.80	2,844.04	-187.72	46.84	-188.44	0.83	0.71	4.35
2,937.00	6.20	164.60	2,928.55	-196.50	49.25	-197.26	0.12	0.12	-0.24
3,022.00	6.10	165.50	3,013.06	-205.30	51.59	-206.09	0.16	-0.12	1.06
3,106.00	5.50	163.90	3,096.63	-213.48	53.83	-214.31	0.74	-0.71	-1.90
3,190.00	3.80	178.50	3,180.35	-220.14	55.02	-220.98	2.45	-2.02	17.38
3,275.00	2.60	184.60	3,265.22	-224.87	54.94	-225.72	1.47	-1.41	7.18
3,360.00	2.20	189.90	3,350.15	-228.40	54.50	-229.24	0.54	-0.47	6.24
3,445.00	3.30	175.20	3,435.05	-232.45	54.43	-233.28	1.53	1.29	-17.29
3,530.00	4.00	173.00	3,519.87	-237.83	54.99	-238.67	0.84	0.82	-2.59
3,615.00	4.30	174.80	3,604.65	-243.94	55.64	-244.80	0.38	0.35	2.12
3,699.00	4.70	173.80	3,688.39	-250.50	56.30	-251.36	0.49	0.48	-1.19
3,784.00	5.00	175.30	3,773.09	-257.66	56.98	-258.53	0.38	0.35	1.76
3,869.00	5.50	174.10	3,857.73	-265.40	57.70	-266.28	0.60	0.59	-1.41
3,954.00	5.40	173.80	3,942.35	-273.43	58.55	-274.32	0.12	-0.12	-0.35
4,039.00	5.50	167.40	4,026.96	-281.38	59.87	-282.29	0.72	0.12	-7.53
4,124.00	5.60	160.70	4,111.57	-289.27	62.13	-290.22	0.77	0.12	-7.88
4,209.00	5.20	156.50	4,196.19	-296.71	65.04	-297.71	0.66	-0.47	-4.94
4,294.00	4.60	151.40	4,280.88	-303.24	68.21	-304.28	0.87	-0.71	-6.00
4,378.00	4.50	149.00	4,364.61	-309.02	71.52	-310.12	0.26	-0.12	-2.86

Titan Directional Drilling, LLC

Survey Report

Company:	Carrizo Oil & Gas, Inc.	Local Co-ordinate Reference:	Well 3-30-9-59
Project:	Niobrara CON'83	TVD Reference:	GL+KB @ 4934.00usft (Xtreme 19)
Site:	Ptasnik 1-30-9-59 Pad	MD Reference:	GL+KB @ 4934.00usft (Xtreme 19)
Well:	3-30-9-59	North Reference:	Grid
Wellbore:	3-30-9-59 OH	Survey Calculation Method:	Minimum Curvature
Design:	3-30-9-59 OH	Database:	EDM 5000.1 Single User Db

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
4,463.00	4.30	145.80	4,449.36	-314.52	75.02	-315.67	0.37	-0.24	-3.76
4,548.00	4.70	157.80	4,534.10	-320.38	78.13	-321.58	1.20	0.47	14.12
4,632.00	4.00	158.30	4,617.86	-326.28	80.51	-327.52	0.83	-0.83	0.60
4,717.00	4.30	169.50	4,702.64	-332.17	82.19	-333.44	1.01	0.35	13.18
4,802.00	4.00	161.40	4,787.42	-338.11	83.72	-339.40	0.77	-0.35	-9.53
4,886.00	3.40	163.00	4,871.24	-343.27	85.38	-344.59	0.72	-0.71	1.90
4,970.00	4.50	163.20	4,955.04	-348.81	87.06	-350.15	1.31	1.31	0.24
5,055.00	3.90	166.00	5,039.81	-354.81	88.72	-356.17	0.75	-0.71	3.29
5,139.00	3.40	162.30	5,123.64	-359.95	90.17	-361.34	0.66	-0.60	-4.40
5,224.00	3.80	170.60	5,208.47	-365.13	91.40	-366.54	0.77	0.47	9.76
5,309.00	2.90	166.90	5,293.33	-370.01	92.35	-371.43	1.09	-1.06	-4.35
5,394.00	2.10	155.10	5,378.25	-373.51	93.49	-374.95	1.11	-0.94	-13.88
5,479.00	2.70	165.30	5,463.17	-376.86	94.65	-378.32	0.86	0.71	12.00
5,564.00	2.90	153.00	5,548.07	-380.71	96.14	-382.19	0.74	0.24	-14.47
5,648.00	2.40	124.40	5,631.98	-383.60	98.55	-385.12	1.66	-0.60	-34.05
5,691.00	1.10	12.70	5,674.97	-383.71	99.39	-385.24	6.95	-3.02	-259.77
5,733.00	5.00	342.90	5,716.91	-381.56	98.94	-383.09	9.72	9.29	-70.95
5,776.00	9.70	339.00	5,759.54	-376.39	97.09	-377.88	10.99	10.93	-9.07
5,818.00	10.80	346.40	5,800.87	-369.26	94.89	-370.72	4.08	2.62	17.62
5,860.00	13.00	346.90	5,841.97	-360.83	92.90	-362.26	5.24	5.24	1.19
5,903.00	17.10	346.00	5,883.48	-349.98	90.27	-351.37	9.55	9.53	-2.09
5,945.00	21.30	346.20	5,923.14	-336.58	86.96	-337.92	10.00	10.00	0.48
5,988.00	25.70	345.10	5,962.56	-319.97	82.69	-321.25	10.28	10.23	-2.56
6,030.00	29.70	345.30	5,999.74	-301.10	77.71	-302.30	9.53	9.52	0.48
6,073.00	34.60	344.80	6,036.14	-279.00	71.80	-280.11	11.41	11.40	-1.16
6,115.00	39.60	345.10	6,069.62	-254.54	65.23	-255.55	11.91	11.90	0.71
6,158.00	44.10	348.80	6,101.65	-226.61	58.80	-227.51	11.93	10.47	8.60
6,200.00	48.70	353.80	6,130.62	-196.56	54.25	-197.40	13.93	10.95	11.90
6,243.00	52.80	356.40	6,157.82	-163.39	51.43	-164.19	10.62	9.53	6.05
6,266.00	55.15	357.75	6,171.35	-144.82	50.48	-145.60	11.26	10.21	5.85
300' entry									
6,285.00	57.10	358.80	6,181.94	-129.05	50.01	-129.83	11.26	10.27	5.55
6,327.00	63.00	0.10	6,202.90	-92.68	49.67	-93.45	14.30	14.05	3.10
6,369.00	68.00	1.00	6,220.31	-54.47	50.04	-55.26	12.06	11.90	2.14
6,399.00	70.80	1.10	6,230.86	-26.40	50.56	-27.20	9.34	9.33	0.33
6,445.00	74.33	0.71	6,244.64	17.47	51.25	16.66	7.71	7.67	-0.84
7"									
6,459.00	75.40	0.60	6,248.30	30.99	51.41	30.17	7.71	7.67	-0.82
6,504.00	79.00	359.70	6,258.27	74.86	51.52	74.03	8.23	8.00	-2.00
6,550.00	86.40	359.40	6,264.11	120.46	51.16	119.63	16.10	16.09	-0.65
6,596.00	89.30	358.80	6,265.84	166.41	50.44	165.59	6.44	6.30	-1.30
6,642.00	89.50	359.00	6,266.32	212.40	49.55	211.59	0.61	0.43	0.43
6,733.00	88.90	358.10	6,267.59	303.36	47.25	302.57	1.19	-0.66	-0.99
6,825.00	89.10	358.30	6,269.19	395.30	44.36	394.55	0.31	0.22	0.22

Titan Directional Drilling, LLC

Survey Report

Company:	Carrizo Oil & Gas, Inc.	Local Co-ordinate Reference:	Well 3-30-9-59
Project:	Niobrara CON'83	TVD Reference:	GL+KB @ 4934.00usft (Xtreme 19)
Site:	Ptasnik 1-30-9-59 Pad	MD Reference:	GL+KB @ 4934.00usft (Xtreme 19)
Well:	3-30-9-59	North Reference:	Grid
Wellbore:	3-30-9-59 OH	Survey Calculation Method:	Minimum Curvature
Design:	3-30-9-59 OH	Database:	EDM 5000.1 Single User Db

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
6,917.00	91.30	359.00	6,268.87	487.27	42.20	486.54	2.51	2.39	0.76	
7,001.00	90.30	358.00	6,267.70	571.23	40.00	570.52	1.68	-1.19	-1.19	
7,086.00	89.60	357.40	6,267.77	656.16	36.59	655.50	1.08	-0.82	-0.71	
7,170.00	88.90	355.90	6,268.87	740.01	31.68	739.41	1.97	-0.83	-1.79	
7,254.00	90.80	357.80	6,269.09	823.87	27.06	823.34	3.20	2.26	2.26	
7,338.00	89.80	356.70	6,268.65	907.77	23.03	907.29	1.77	-1.19	-1.31	
7,422.00	89.80	359.90	6,268.95	991.72	20.54	991.27	3.81	0.00	3.81	
7,507.00	89.20	359.70	6,269.69	1,076.72	20.24	1,076.26	0.74	-0.71	-0.24	
7,591.00	88.40	359.70	6,271.45	1,160.70	19.80	1,160.24	0.95	-0.95	0.00	
7,675.00	89.30	0.10	6,273.13	1,244.68	19.66	1,244.21	1.17	1.07	0.48	
7,760.00	91.10	1.00	6,272.84	1,329.67	20.47	1,329.18	2.37	2.12	1.06	
7,845.00	90.70	359.00	6,271.50	1,414.66	20.47	1,414.15	2.40	-0.47	-2.35	
7,930.00	90.40	358.10	6,270.69	1,499.63	18.32	1,499.15	1.12	-0.35	-1.06	
8,015.00	90.50	357.40	6,270.02	1,584.56	14.99	1,584.12	0.83	0.12	-0.82	
8,100.00	89.70	359.70	6,269.87	1,669.52	12.83	1,669.11	2.86	-0.94	2.71	
8,185.00	90.00	359.60	6,270.09	1,754.52	12.32	1,754.10	0.37	0.35	-0.12	
8,270.00	89.40	0.80	6,270.54	1,839.52	12.61	1,839.09	1.58	-0.71	1.41	
8,355.00	89.30	359.70	6,271.50	1,924.51	12.98	1,924.06	1.30	-0.12	-1.29	
8,440.00	89.10	358.10	6,272.69	2,009.48	11.35	2,009.05	1.90	-0.24	-1.88	
8,525.00	90.60	358.50	6,272.91	2,094.44	8.83	2,094.04	1.83	1.76	0.47	
8,609.00	89.80	356.40	6,272.62	2,178.35	5.09	2,178.00	2.68	-0.95	-2.50	
8,694.00	90.00	357.40	6,272.77	2,263.23	0.50	2,262.93	1.20	0.24	1.18	
8,779.00	89.90	356.90	6,272.84	2,348.12	-3.73	2,347.89	0.60	-0.12	-0.59	
8,864.00	90.80	359.00	6,272.32	2,433.06	-6.77	2,432.86	2.69	1.06	2.47	
8,948.00	89.30	1.80	6,272.25	2,517.05	-6.18	2,516.83	3.78	-1.79	3.33	
9,032.00	88.70	1.50	6,273.71	2,601.00	-3.77	2,600.73	0.80	-0.71	-0.36	
9,117.00	91.20	2.20	6,273.79	2,685.95	-1.02	2,685.63	3.05	2.94	0.82	
9,201.00	91.10	1.70	6,272.10	2,769.88	1.84	2,769.50	0.61	-0.12	-0.60	
9,285.00	90.70	0.30	6,270.78	2,853.86	3.30	2,853.45	1.73	-0.48	-1.67	
9,370.00	90.30	359.60	6,270.04	2,938.85	3.23	2,938.43	0.95	-0.47	-0.82	
9,455.00	90.70	0.10	6,269.30	3,023.85	3.01	3,023.42	0.75	0.47	0.59	
9,540.00	88.10	358.50	6,270.19	3,108.83	1.97	3,108.41	3.59	-3.06	-1.88	
9,624.00	87.60	358.00	6,273.34	3,192.73	-0.60	3,192.34	0.84	-0.60	-0.60	
9,709.00	89.50	359.60	6,275.49	3,277.68	-2.38	3,277.30	2.92	2.24	1.88	
9,794.00	89.10	358.80	6,276.53	3,362.66	-3.56	3,362.29	1.05	-0.47	-0.94	
9,879.00	91.80	0.10	6,275.86	3,447.65	-4.38	3,447.28	3.53	3.18	1.53	
9,964.00	91.30	359.40	6,273.56	3,532.61	-4.75	3,532.24	1.01	-0.59	-0.82	
10,049.00	90.90	358.80	6,271.93	3,617.59	-6.08	3,617.23	0.85	-0.47	-0.71	
10,134.00	90.20	357.60	6,271.11	3,702.54	-8.75	3,702.21	1.63	-0.82	-1.41	
10,219.00	90.20	357.40	6,270.82	3,787.46	-12.46	3,787.18	0.24	0.00	-0.24	
10,304.00	90.40	359.40	6,270.37	3,872.42	-14.83	3,872.17	2.36	0.24	2.35	
10,389.00	89.10	358.10	6,270.74	3,957.39	-16.69	3,957.16	2.16	-1.53	-1.53	
10,473.00	89.80	359.40	6,271.55	4,041.37	-18.52	4,041.15	1.76	0.83	1.55	

Titan Directional Drilling, LLC

Survey Report

Company:	Carrizo Oil & Gas, Inc.	Local Co-ordinate Reference:	Well 3-30-9-59
Project:	Niobrara CON'83	TVD Reference:	GL+KB @ 4934.00usft (Xtreme 19)
Site:	Ptasnik 1-30-9-59 Pad	MD Reference:	GL+KB @ 4934.00usft (Xtreme 19)
Well:	3-30-9-59	North Reference:	Grid
Wellbore:	3-30-9-59 OH	Survey Calculation Method:	Minimum Curvature
Design:	3-30-9-59 OH	Database:	EDM 5000.1 Single User Db

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
10,558.00	88.50	358.30	6,272.81	4,126.34	-20.23	4,126.14	2.00	-1.53	-1.29	
10,643.00	90.40	358.80	6,273.63	4,211.30	-22.38	4,211.13	2.31	2.24	0.59	
10,728.00	89.40	357.80	6,273.78	4,296.26	-24.90	4,296.12	1.66	-1.18	-1.18	
10,812.00	90.20	358.00	6,274.07	4,380.20	-27.98	4,380.10	0.98	0.95	0.24	
10,897.00	89.40	357.10	6,274.37	4,465.13	-31.61	4,465.06	1.42	-0.94	-1.06	
10,965.00	89.40	357.30	6,275.08	4,533.04	-34.93	4,533.02	0.29	0.00	0.29	
11,019.00	89.40	357.30	6,275.64	4,586.98	-37.47	4,586.99	0.00	0.00	0.00	

Design Targets									
Target Name									
- hit/miss target	Dip Angle	Dip Dir.	TVD	+N/-S	+E/-W	Northing	Easting		
- Shape	(°)	(°)	(usft)	(usft)	(usft)	(usft)	(usft)	Latitude	Longitude
BHL 3-30	0.00	0.00	6,275.64	4,586.98	-37.47	1,511,358.01	3,407,788.56	40° 43' 40.01 N	104° 1' 43.11 W
- actual wellpath misses target center by 0.01usft at 11019.00usft MD (6275.64 TVD, 4586.98 N, -37.47 E)									
- Point									

Casing Points						
Measured Depth (usft)	Vertical Depth (usft)	Name			Casing Diameter (in)	Hole Diameter (in)
1,619.00	1,615.02	9 5/8"			9.62	12.25
6,445.00	6,244.64	7"			7.00	7.50

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
6,266.00	6,171.35	-144.82	50.48	300' entry	