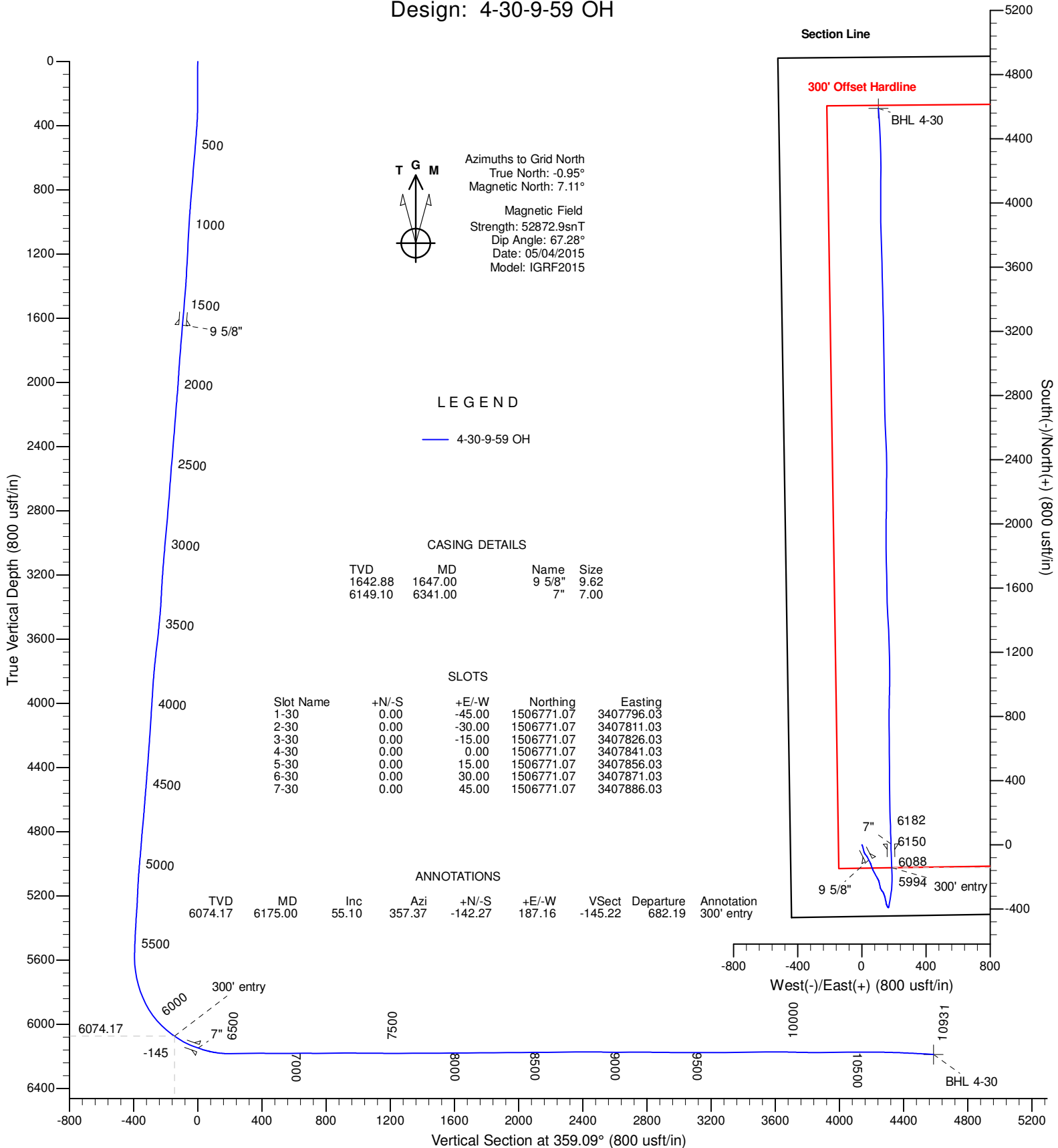




Project: Niobrara CON'83
County: Weld County, CO
Site: Ptasnik 1-30-9-59 Pad
Well: 4-30-9-59
Wellbore: 4-30-9-59 OH
Design: 4-30-9-59 OH



DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Shape
BHL 4-30	6188.81	4588.88	103.21	1511359.90	3407944.24	40° 43' 40.00 N	104° 1' 41.09 W	Point

Titan Directional Drilling, LLC

Survey Report

Company:	Carrizo Oil & Gas, Inc.	Local Co-ordinate Reference:	Well 4-30-9-59
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:	4-30-9-59	North Reference:	Grid
Wellbore:	4-30-9-59 OH	Survey Calculation Method:	Minimum Curvature
Design:	4-30-9-59 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	4-30-9-59		
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' 54.68 N
		Longitude:	104° 1' 43.42 W
		Ground Level:	4,917.00 usft

Wellbore	4-30-9-59 OH		
Magnetics	Model Name	Sample Date	Declination
			(°)
	IGRF2015	05/04/15	8.06
			(°)
			67.28
			52,873

Design	4-30-9-59 OH		
Audit Notes:			
Version:	1.0	Phase:	ACTUAL
		Tie On Depth:	0.00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W
	(usft)	(usft)	(usft)
	0.00	0.00	0.00
			359.09

Survey Program	Date	05/11/15		
From	To	Survey (Wellbore)	Tool Name	Description
(usft)	(usft)			
137.00	10,877.00	Survey #1 (4-30-9-59 OH)	MWD	MWD - Standard
10,931.00	10,931.00	Survey #2 (4-30-9-59 OH)	ZERO-ERROR	Zero Error

Survey										
Measured	Inclination	Azimuth	Vertical	+N/-S	+E/-W	Vertical	Dogleg	Build	Turn	
Depth	(°)	(°)	Depth	(usft)	(usft)	Section	Rate	Rate	Rate	
(usft)			(usft)			(usft)	(°/100usft)	(°/100usft)	(°/100usft)	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
137.00	0.30	109.20	137.00	-0.12	0.34	-0.12	0.22	0.22	0.00	
230.00	0.40	91.30	230.00	-0.21	0.89	-0.22	0.16	0.11	-19.25	
325.00	2.00	149.80	324.98	-1.65	2.06	-1.68	1.92	1.68	61.58	
415.00	4.40	163.00	414.83	-6.31	3.86	-6.37	2.77	2.67	14.67	
506.00	5.00	163.70	505.52	-13.45	5.99	-13.54	0.66	0.66	0.77	
597.00	4.70	166.40	596.20	-20.88	7.98	-21.00	0.41	-0.33	2.97	
687.00	4.80	165.70	685.89	-28.11	9.78	-28.26	0.13	0.11	-0.78	
777.00	5.00	166.90	775.56	-35.58	11.60	-35.76	0.25	0.22	1.33	
868.00	4.80	166.50	866.23	-43.15	13.39	-43.35	0.22	-0.22	-0.44	

Titan Directional Drilling, LLC

Survey Report

Company:	Carrizo Oil & Gas, Inc.	Local Co-ordinate Reference:	Well 4-30-9-59
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:	4-30-9-59	North Reference:	Grid
Wellbore:	4-30-9-59 OH	Survey Calculation Method:	Minimum Curvature
Design:	4-30-9-59 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)
955.00	4.10	152.00	952.97	-49.43	15.70	-49.67	1.52	-0.80	-16.67
1,046.00	4.10	146.30	1,043.73	-55.01	19.03	-55.31	0.45	0.00	-6.26
1,137.00	3.80	143.00	1,134.52	-60.13	22.65	-60.48	0.41	-0.33	-3.63
1,229.00	3.70	142.10	1,226.32	-64.90	26.31	-65.31	0.13	-0.11	-0.98
1,320.00	3.60	138.10	1,317.14	-69.35	30.02	-69.81	0.30	-0.11	-4.40
1,412.00	5.20	152.70	1,408.87	-75.20	33.86	-75.73	2.11	1.74	15.87
1,504.00	5.20	153.90	1,500.49	-82.65	37.60	-83.24	0.12	0.00	1.30
1,589.00	5.30	153.40	1,585.13	-89.62	41.06	-90.26	0.13	0.12	-0.59
1,647.00	5.30	153.24	1,642.88	-94.41	43.46	-95.08	0.02	0.00	-0.27
9 5/8"									
1,663.00	5.30	153.20	1,658.81	-95.73	44.13	-96.41	0.02	0.00	-0.27
1,748.00	5.20	152.80	1,743.46	-102.66	47.66	-103.40	0.13	-0.12	-0.47
1,833.00	4.70	154.20	1,828.14	-109.22	50.94	-110.01	0.61	-0.59	1.65
1,918.00	4.50	156.90	1,912.87	-115.42	53.76	-116.26	0.35	-0.24	3.18
2,003.00	3.70	159.70	1,997.65	-121.06	56.02	-121.93	0.97	-0.94	3.29
2,088.00	5.20	161.80	2,082.39	-127.29	58.17	-128.20	1.77	1.76	2.47
2,173.00	4.80	160.20	2,167.07	-134.30	60.58	-135.24	0.50	-0.47	-1.88
2,257.00	4.90	159.20	2,250.77	-140.96	63.05	-141.94	0.16	0.12	-1.19
2,342.00	5.20	157.40	2,335.44	-147.91	65.82	-148.93	0.40	0.35	-2.12
2,427.00	4.80	157.20	2,420.11	-154.74	68.67	-155.81	0.47	-0.47	-0.24
2,512.00	4.90	156.20	2,504.81	-161.34	71.52	-162.46	0.15	0.12	-1.18
2,597.00	4.80	151.80	2,589.50	-167.80	74.66	-168.96	0.45	-0.12	-5.18
2,682.00	5.10	149.80	2,674.19	-174.20	78.24	-175.42	0.41	0.35	-2.35
2,768.00	5.40	151.30	2,759.83	-181.05	82.11	-182.33	0.38	0.35	1.74
2,853.00	5.50	151.60	2,844.44	-188.14	85.97	-189.48	0.12	0.12	0.35
2,938.00	5.70	150.20	2,929.04	-195.39	90.00	-196.79	0.28	0.24	-1.65
3,023.00	5.80	149.50	3,013.61	-202.75	94.28	-204.22	0.14	0.12	-0.82
3,107.00	5.40	151.60	3,097.21	-209.88	98.31	-211.42	0.53	-0.48	2.50
3,191.00	4.80	154.90	3,180.87	-216.54	101.69	-218.13	0.79	-0.71	3.93
3,276.00	3.70	155.10	3,265.64	-222.25	104.35	-223.88	1.29	-1.29	0.24
3,361.00	2.90	163.90	3,350.50	-226.81	106.10	-228.46	1.11	-0.94	10.35
3,446.00	4.90	164.80	3,435.30	-232.37	107.65	-234.06	2.35	2.35	1.06
3,531.00	5.80	167.90	3,519.93	-240.08	109.50	-241.79	1.11	1.06	3.65
3,615.00	6.40	167.80	3,603.45	-248.80	111.38	-250.54	0.71	0.71	-0.12
3,700.00	6.70	168.80	3,687.89	-258.30	113.34	-260.07	0.38	0.35	1.18
3,785.00	6.00	164.40	3,772.37	-267.44	115.50	-269.24	1.00	-0.82	-5.18
3,869.00	4.40	153.70	3,856.03	-274.56	118.11	-276.40	2.22	-1.90	-12.74
3,954.00	4.30	149.30	3,940.78	-280.22	121.18	-282.11	0.41	-0.12	-5.18
4,039.00	4.50	141.90	4,025.53	-285.59	124.87	-287.53	0.71	0.24	-8.71
4,124.00	4.60	136.80	4,110.26	-290.69	129.26	-292.71	0.49	0.12	-6.00
4,209.00	4.60	158.10	4,195.00	-296.34	132.86	-298.42	2.00	0.00	25.06
4,294.00	4.50	151.60	4,279.73	-302.44	135.72	-304.56	0.62	-0.12	-7.65
4,379.00	4.70	162.50	4,364.46	-308.69	138.35	-310.85	1.05	0.24	12.82

Titan Directional Drilling, LLC

Survey Report

Company:	Carrizo Oil & Gas, Inc.	Local Co-ordinate Reference:	Well 4-30-9-59
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:	4-30-9-59	North Reference:	Grid
Wellbore:	4-30-9-59 OH	Survey Calculation Method:	Minimum Curvature
Design:	4-30-9-59 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)
4,464.00	4.20	160.60	4,449.20	-314.95	140.43	-317.14	0.61	-0.59	-2.24
4,548.00	5.20	165.50	4,532.92	-321.54	142.41	-323.76	1.28	1.19	5.83
4,633.00	4.20	161.80	4,617.63	-328.22	144.34	-330.47	1.23	-1.18	-4.35
4,717.00	5.30	171.10	4,701.34	-334.98	145.91	-337.25	1.59	1.31	11.07
4,802.00	5.30	167.80	4,785.98	-342.69	147.34	-344.99	0.36	0.00	-3.88
4,886.00	4.30	159.90	4,869.68	-349.44	149.24	-351.77	1.42	-1.19	-9.40
4,971.00	5.50	173.60	4,954.38	-356.48	150.79	-358.83	1.96	1.41	16.12
5,055.00	4.50	169.50	5,038.06	-363.73	151.84	-366.09	1.26	-1.19	-4.88
5,140.00	3.40	166.70	5,122.85	-369.46	153.03	-371.84	1.31	-1.29	-3.29
5,225.00	2.50	153.40	5,207.74	-373.57	154.44	-375.97	1.32	-1.06	-15.65
5,309.00	4.30	158.10	5,291.59	-378.13	156.44	-380.56	2.17	2.14	5.60
5,394.00	3.90	149.30	5,376.37	-383.57	159.10	-386.05	0.88	-0.47	-10.35
5,479.00	3.00	143.90	5,461.22	-387.85	161.89	-390.38	1.12	-1.06	-6.35
5,521.00	2.60	139.60	5,503.17	-389.47	163.15	-392.01	1.08	-0.95	-10.24
5,563.00	2.30	136.70	5,545.13	-390.81	164.35	-393.37	0.77	-0.71	-6.90
5,605.00	1.60	77.10	5,587.11	-391.29	165.50	-393.87	4.84	-1.67	-141.90
5,647.00	4.50	22.60	5,629.05	-389.64	166.70	-392.23	9.05	6.90	-129.76
5,690.00	8.40	14.70	5,671.77	-385.04	168.15	-387.66	9.28	9.07	-18.37
5,732.00	11.90	11.30	5,713.11	-377.82	169.78	-380.47	8.45	8.33	-8.10
5,775.00	16.10	10.10	5,754.82	-367.60	171.69	-370.28	9.79	9.77	-2.79
5,817.00	19.50	9.20	5,794.80	-354.94	173.83	-357.66	8.12	8.10	-2.14
5,859.00	23.30	8.70	5,833.90	-339.81	176.21	-342.56	9.06	9.05	-1.19
5,902.00	27.10	9.40	5,872.80	-321.73	179.10	-324.54	8.86	8.84	1.63
5,944.00	31.50	8.50	5,909.42	-301.43	182.28	-304.29	10.53	10.48	-2.14
5,987.00	36.20	6.20	5,945.12	-277.68	185.32	-280.59	11.33	10.93	-5.35
6,029.00	41.30	3.20	5,977.87	-251.49	187.43	-254.44	12.94	12.14	-7.14
6,072.00	46.00	0.60	6,008.98	-221.84	188.39	-224.81	11.70	10.93	-6.05
6,114.00	49.90	359.70	6,037.10	-190.66	188.46	-193.63	9.42	9.29	-2.14
6,156.00	53.60	358.00	6,063.10	-157.69	187.79	-160.66	9.36	8.81	-4.05
6,175.00	55.10	357.37	6,074.18	-142.27	187.16	-145.22	8.35	7.90	-3.33
300' entry									
6,199.00	57.00	356.60	6,087.58	-122.39	186.11	-125.33	8.35	7.92	-3.20
6,242.00	61.10	357.10	6,109.69	-85.57	184.09	-88.49	9.59	9.53	1.16
6,284.00	66.30	358.30	6,128.29	-47.96	182.59	-50.86	12.64	12.38	2.86
6,307.00	68.10	358.50	6,137.20	-26.77	182.00	-29.66	7.87	7.83	0.87
6,341.00	70.94	358.90	6,149.10	5.07	181.27	2.19	8.43	8.36	1.16
7"									
6,368.00	73.20	359.20	6,157.41	30.75	180.85	27.88	8.43	8.36	1.13
6,413.00	77.00	358.30	6,168.98	74.22	179.90	71.35	8.66	8.44	-2.00
6,458.00	81.30	358.00	6,177.45	118.38	178.47	115.53	9.58	9.56	-0.67
6,503.00	86.70	357.60	6,182.15	163.09	176.75	160.26	12.03	12.00	-0.89
6,549.00	90.20	358.10	6,183.39	209.03	175.03	206.22	7.69	7.61	1.09
6,641.00	91.70	359.60	6,181.87	300.99	173.18	298.20	2.31	1.63	1.63
6,732.00	89.20	359.90	6,181.15	391.98	172.78	389.19	2.77	-2.75	0.33

Titan Directional Drilling, LLC

Survey Report

Company:	Carrizo Oil & Gas, Inc.	Local Co-ordinate Reference:	Well 4-30-9-59
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:	4-30-9-59	North Reference:	Grid
Wellbore:	4-30-9-59 OH	Survey Calculation Method:	Minimum Curvature
Design:	4-30-9-59 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)
6,824.00	89.50	359.20	6,182.20	483.97	172.06	481.18	0.83	0.33	-0.76
6,916.00	90.70	359.90	6,182.04	575.97	171.34	573.17	1.51	1.30	0.76
7,002.00	90.00	359.60	6,181.51	661.96	170.96	659.17	0.89	-0.81	-0.35
7,086.00	89.70	358.80	6,181.73	745.96	169.79	743.16	1.02	-0.36	-0.95
7,171.00	91.10	1.30	6,181.14	830.94	169.86	828.14	3.37	1.65	2.94
7,256.00	90.50	1.10	6,179.95	915.92	171.64	913.08	0.74	-0.71	-0.24
7,341.00	89.30	0.80	6,180.10	1,000.90	173.05	998.03	1.46	-1.41	-0.35
7,427.00	89.70	359.70	6,180.85	1,086.90	173.43	1,084.01	1.36	0.47	-1.28
7,512.00	89.00	359.00	6,181.81	1,171.89	172.46	1,169.00	1.16	-0.82	-0.82
7,597.00	90.70	358.10	6,182.04	1,256.85	170.31	1,253.99	2.26	2.00	-1.06
7,682.00	90.00	357.10	6,181.52	1,341.78	166.75	1,338.96	1.44	-0.82	-1.18
7,766.00	90.10	356.20	6,181.44	1,425.63	161.85	1,422.88	1.08	0.12	-1.07
7,850.00	90.90	358.30	6,180.71	1,509.53	157.82	1,506.83	2.68	0.95	2.50
7,935.00	90.80	359.60	6,179.45	1,594.50	156.26	1,591.82	1.53	-0.12	1.53
8,020.00	90.50	358.50	6,178.48	1,679.48	154.85	1,676.81	1.34	-0.35	-1.29
8,105.00	89.90	358.00	6,178.19	1,764.44	152.25	1,761.80	0.92	-0.71	-0.59
8,190.00	90.50	0.10	6,177.89	1,849.42	150.84	1,846.80	2.57	0.71	2.47
8,274.00	90.00	359.70	6,177.52	1,933.42	150.70	1,930.79	0.76	-0.60	-0.48
8,359.00	91.20	1.50	6,176.63	2,018.41	151.59	2,015.75	2.54	1.41	2.12
8,444.00	90.00	0.60	6,175.74	2,103.39	153.14	2,100.69	1.76	-1.41	-1.06
8,528.00	90.70	0.40	6,175.23	2,187.38	153.88	2,184.66	0.87	0.83	-0.24
8,613.00	90.60	0.30	6,174.27	2,272.38	154.40	2,269.64	0.17	-0.12	-0.12
8,699.00	90.60	359.90	6,173.37	2,358.37	154.55	2,355.62	0.47	0.00	-0.47
8,783.00	89.90	358.10	6,173.00	2,442.35	153.08	2,439.61	2.30	-0.83	-2.14
8,869.00	89.20	357.60	6,173.68	2,528.29	149.86	2,525.59	1.00	-0.81	-0.58
8,953.00	89.30	357.10	6,174.77	2,612.19	145.97	2,609.54	0.61	0.12	-0.60
9,038.00	91.30	358.50	6,174.33	2,697.12	142.71	2,694.51	2.87	2.35	1.65
9,123.00	89.40	359.70	6,173.81	2,782.10	141.37	2,779.51	2.64	-2.24	1.41
9,207.00	89.20	359.20	6,174.84	2,866.09	140.57	2,863.50	0.64	-0.24	-0.60
9,292.00	88.90	358.70	6,176.25	2,951.07	139.01	2,948.49	0.69	-0.35	-0.59
9,376.00	90.50	359.40	6,176.69	3,035.05	137.62	3,032.48	2.08	1.90	0.83
9,461.00	89.80	358.80	6,176.46	3,120.04	136.28	3,117.48	1.08	-0.82	-0.71
9,545.00	90.50	359.40	6,176.24	3,204.03	134.96	3,201.48	1.10	0.83	0.71
9,630.00	89.60	358.70	6,176.17	3,289.01	133.55	3,286.48	1.34	-1.06	-0.82
9,714.00	91.30	359.00	6,175.51	3,372.99	131.87	3,370.47	2.06	2.02	0.36
9,799.00	90.90	358.30	6,173.88	3,457.95	129.87	3,455.45	0.95	-0.47	-0.82
9,884.00	90.60	357.80	6,172.77	3,542.89	126.97	3,540.43	0.69	-0.35	-0.59
9,968.00	89.30	359.40	6,172.84	3,626.87	124.92	3,624.42	2.45	-1.55	1.90
10,053.00	89.10	358.50	6,174.03	3,711.84	123.36	3,709.41	1.08	-0.24	-1.06
10,138.00	88.50	357.80	6,175.81	3,796.78	120.62	3,794.38	1.08	-0.71	-0.82
10,223.00	90.00	358.30	6,176.92	3,881.72	117.73	3,879.36	1.86	1.76	0.59
10,308.00	91.30	0.80	6,175.95	3,966.70	117.06	3,964.34	3.31	1.53	2.94
10,393.00	90.80	0.10	6,174.40	4,051.68	117.73	4,049.30	1.01	-0.59	-0.82

Titan Directional Drilling, LLC

Survey Report

Company:	Carrizo Oil & Gas, Inc.	Local Co-ordinate Reference:	Well 4-30-9-59
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:	4-30-9-59	North Reference:	Grid
Wellbore:	4-30-9-59 OH	Survey Calculation Method:	Minimum Curvature
Design:	4-30-9-59 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)	
10,477.00	90.10	0.40	6,173.74	4,135.68	118.10	4,133.28	0.91	-0.83	0.36	
10,562.00	90.00	0.40	6,173.66	4,220.68	118.69	4,218.26	0.12	-0.12	0.00	
10,647.00	88.20	358.70	6,175.00	4,305.66	118.02	4,303.24	2.91	-2.12	-2.00	
10,732.00	87.70	357.60	6,178.04	4,390.56	115.28	4,388.17	1.42	-0.59	-1.29	
10,817.00	87.00	356.60	6,181.97	4,475.36	110.98	4,473.03	1.44	-0.82	-1.18	
10,877.00	86.40	355.90	6,185.42	4,535.13	107.07	4,532.86	1.54	-1.00	-1.17	
10,931.00	86.40	355.90	6,188.81	4,588.88	103.21	4,586.67	0.00	0.00	0.00	

Design Targets										
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude		Longitude
BHL 4-30	0.00	0.00	6,188.81	4,588.88	103.21	1,511,359.91	3,407,944.24	40° 43' 40.00 N		104° 1' 41.09 W
- hit/miss target										
- Shape										
- actual wellpath hits target center										
- Point										

Casing Points						
Measured Depth (usft)	Vertical Depth (usft)	Name			Casing Diameter (in)	Hole Diameter (in)
1,647.00	1,642.88	9 5/8"			9.62	12.25
6,341.00	6,149.10	7"			7.00	7.50

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment	
		+N/-S (usft)	+E/-W (usft)		
6,175.00	6,074.18	-142.27	187.16	300' entry	