

US ROCKIES REGION PLANNING

COLORADO NORTHERN ZONE - 83

WELD_BUFFALO & BADGER 4W-15HZ PAD

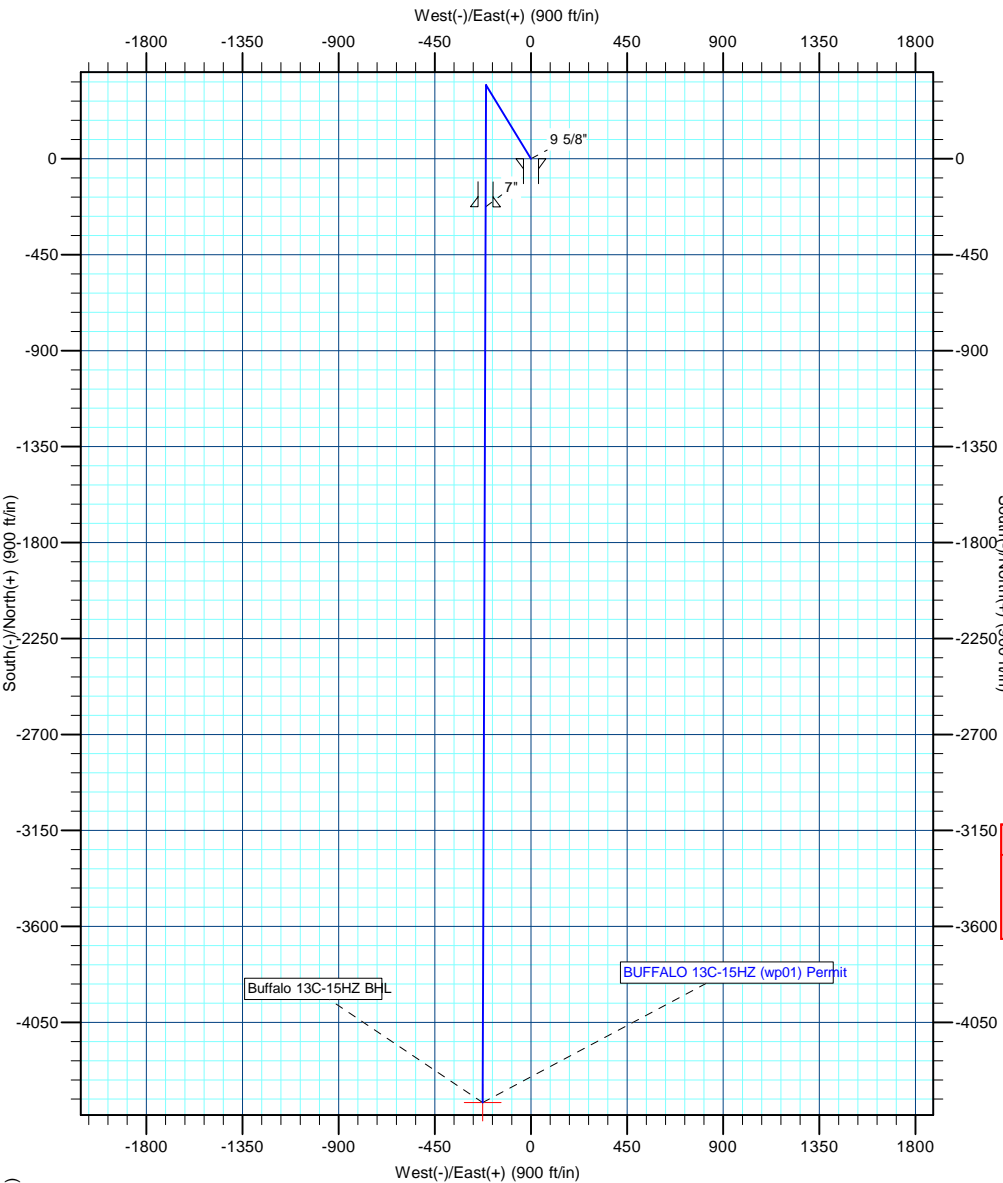
BUFFALO 13C-15HZ

BUFFALO 13C-15HZ

Plan: BUFFALO 13C-15HZ (wp01) Permit

Standard Planning Report

16 July, 2012



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Azimuths to True North

Magnetic North: 8.81°

Magnetic Field

Strength: 52808.8snT

Dip Angle: 66.70°

Date: 7/16/2012

Model: IGRF2010



Project: COLORADO NORTHERN ZONE - 83

Site: WELD_BUFFALO & BADGER 4W-15HZ PAD

Well: BUFFALO 13C-15HZ

Wellbore: BUFFALO 13C-15HZ

Section:

SHL:

Design: BUFFALO 13C-15HZ (wp01) Permit

Latitude: 40.057328

Longitude: -104.996561

GL: 5141.00

KB: 17' RKB + 5141' GL @ 5158.00ft

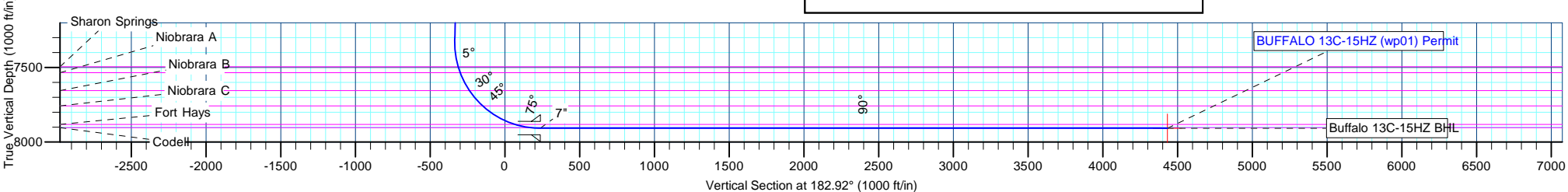
WELL DETAILS: BUFFALO 13C-15HZ						
+N/-S	+E/-W	Northing	Ground Level: Easting	5141.00 Latitude	Longitude	Slot
0.00	0.00	1264130.01	3140920.93	40.057328	-104.996561	

SECTION DETAILS								
MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1000.00	0.00	0.00	1000.00	0.00	0.00	0.00	0.00	0.00
1188.78	3.78	328.82	1188.64	5.32	-3.22	2.00	328.82	-5.15
7159.49	3.78	328.82	7146.40	341.68	-206.78	0.00	0.00	-330.72
7348.27	0.00	0.00	7335.04	347.00	-210.00	2.00	180.00	-335.87
8248.27	90.00	180.18	7908.00	-225.96	-211.80	10.00	180.18	236.43
8300.44	90.00	180.19	7908.00	-278.12	-211.97	0.01	90.16	288.54
12448.29	90.00	180.19	7908.00	-4425.95	-225.37	0.00	0.00	4431.69

WELLBORE TARGET DETAILS (MAP CO-ORDINATES AND LAT/LONG)						
Name	TVD	+N/-S	+E/-W	Latitude	Longitude	Shape
Buffalo 13C-15HZ BHL	7908.00	-4425.95	-225.37	40.045178	-104.997366	Point

FORMATION TOP DETAILS		
TVDPath	MDPath	Formation
4320.00	4326.95	Parkman
4778.00	4785.94	Sussex
5266.00	5275.01	Shannon
7495.00	7510.39	Sharon Springs
7535.00	7552.53	Niobrara A
7655.00	7687.75	Niobrara B
7758.00	7824.06	Niobrara C
7882.00	8075.01	Fort Hays
7904.00	8180.54	Codell

CASING DETAILS			
TVD	MD	Name	Size
900.00	900.00	9 5/8"	9-5/8
7908.00	8248.27	7"	7



Anadarko Petroleum Corp

Planning Report

Database:	edmp	Local Co-ordinate Reference:	Well BUFFALO 13C-15HZ
Company:	US ROCKIES REGION PLANNING	TVD Reference:	17' RKB + 5141' GL @ 5158.00ft
Project:	COLORADO NORTHERN ZONE - 83	MD Reference:	17' RKB + 5141' GL @ 5158.00ft
Site:	WELD_BUFFALO & BADGER 4W-15HZ PAD	North Reference:	True
Well:	BUFFALO 13C-15HZ	Survey Calculation Method:	Minimum Curvature
Wellbore:	BUFFALO 13C-15HZ		
Design:	BUFFALO 13C-15HZ (wp01) Permit		

Project	COLORADO NORTHERN ZONE - 83		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Northern Zone		

Site	WELD_BUFFALO & BADGER 4W-15HZ PAD			
Site Position:		Northing:	1,264,129.48 usft	Latitude: 40.057327
From:	Lat/Long	Easting:	3,140,890.98 usft	Longitude: -104.996668
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "	Grid Convergence: 0.33 °

Well	BUFFALO 13C-15HZ			
Well Position	+N/-S	0.36 ft	Northing:	1,264,130.01 usft
	+E/-W	29.95 ft	Easting:	3,140,920.93 usft
Position Uncertainty		0.00 ft	Wellhead Elevation:	Latitude: 40.057328
				Longitude: -104.996561
				Ground Level: 5,141.00 ft

Wellbore	BUFFALO 13C-15HZ				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	7/16/2012	8.81	66.70	52,809

Design	BUFFALO 13C-15HZ (wp01) Permit			
Audit Notes:				
Version:	Phase:	PLAN	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)
	0.00	0.00	0.00	182.92

Plan Sections										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,000.00	0.00	0.00	1,000.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,188.78	3.78	328.82	1,188.64	5.32	-3.22	2.00	2.00	0.00	328.82	
7,159.49	3.78	328.82	7,146.40	341.68	-206.78	0.00	0.00	0.00	0.00	
7,348.27	0.00	0.00	7,335.04	347.00	-210.00	2.00	-2.00	0.00	180.00	
8,248.27	90.00	180.18	7,908.00	-225.96	-211.80	10.00	10.00	0.00	180.18	
8,300.44	90.00	180.19	7,908.00	-278.12	-211.97	0.01	0.00	0.01	90.16	
12,448.29	90.00	180.19	7,908.00	-4,425.95	-225.37	0.00	0.00	0.00	0.00	Buffalo 13C-15HZ BH

Anadarko Petroleum Corp

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Well:	BUFFALO 13C-15HZ	Survey Calculation Method:	Minimum Curvature
Wellbore:	BUFFALO 13C-15HZ		
Design:	BUFFALO 13C-15HZ (wp01) Permit		

Planned 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)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
200.00	0.00	0.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00
300.00	0.00	0.00	300.00	0.00	0.00	0.00	0.00	0.00	0.00
400.00	0.00	0.00	400.00	0.00	0.00	0.00	0.00	0.00	0.00
500.00	0.00	0.00	500.00	0.00	0.00	0.00	0.00	0.00	0.00
600.00	0.00	0.00	600.00	0.00	0.00	0.00	0.00	0.00	0.00
700.00	0.00	0.00	700.00	0.00	0.00	0.00	0.00	0.00	0.00
800.00	0.00	0.00	800.00	0.00	0.00	0.00	0.00	0.00	0.00
900.00	0.00	0.00	900.00	0.00	0.00	0.00	0.00	0.00	0.00
9 5/8"									
1,000.00	0.00	0.00	1,000.00	0.00	0.00	0.00	0.00	0.00	0.00
Start Build 2.00									
1,100.00	2.00	328.82	1,099.98	1.49	-0.90	-1.45	2.00	2.00	0.00
1,188.78	3.78	328.82	1,188.64	5.32	-3.22	-5.15	2.00	2.00	0.00
Start 5970.71 hold at 1188.78 MD									
1,200.00	3.78	328.82	1,199.84	5.95	-3.60	-5.76	0.00	0.00	0.00
1,300.00	3.78	328.82	1,299.62	11.59	-7.01	-11.21	0.00	0.00	0.00
1,400.00	3.78	328.82	1,399.41	17.22	-10.42	-16.67	0.00	0.00	0.00
1,500.00	3.78	328.82	1,499.19	22.85	-13.83	-22.12	0.00	0.00	0.00
1,600.00	3.78	328.82	1,598.97	28.49	-17.24	-27.57	0.00	0.00	0.00
1,700.00	3.78	328.82	1,698.75	34.12	-20.65	-33.02	0.00	0.00	0.00
1,800.00	3.78	328.82	1,798.54	39.75	-24.06	-38.48	0.00	0.00	0.00
1,900.00	3.78	328.82	1,898.32	45.39	-27.47	-43.93	0.00	0.00	0.00
2,000.00	3.78	328.82	1,998.10	51.02	-30.88	-49.38	0.00	0.00	0.00
2,100.00	3.78	328.82	2,097.89	56.65	-34.29	-54.84	0.00	0.00	0.00
2,200.00	3.78	328.82	2,197.67	62.29	-37.70	-60.29	0.00	0.00	0.00
2,300.00	3.78	328.82	2,297.45	67.92	-41.10	-65.74	0.00	0.00	0.00
2,400.00	3.78	328.82	2,397.23	73.55	-44.51	-71.19	0.00	0.00	0.00
2,500.00	3.78	328.82	2,497.02	79.19	-47.92	-76.65	0.00	0.00	0.00
2,600.00	3.78	328.82	2,596.80	84.82	-51.33	-82.10	0.00	0.00	0.00
2,700.00	3.78	328.82	2,696.58	90.45	-54.74	-87.55	0.00	0.00	0.00
2,800.00	3.78	328.82	2,796.37	96.09	-58.15	-93.01	0.00	0.00	0.00
2,900.00	3.78	328.82	2,896.15	101.72	-61.56	-98.46	0.00	0.00	0.00
3,000.00	3.78	328.82	2,995.93	107.35	-64.97	-103.91	0.00	0.00	0.00
3,100.00	3.78	328.82	3,095.72	112.99	-68.38	-109.36	0.00	0.00	0.00
3,200.00	3.78	328.82	3,195.50	118.62	-71.79	-114.82	0.00	0.00	0.00
3,300.00	3.78	328.82	3,295.28	124.26	-75.20	-120.27	0.00	0.00	0.00
3,400.00	3.78	328.82	3,395.06	129.89	-78.61	-125.72	0.00	0.00	0.00
3,500.00	3.78	328.82	3,494.85	135.52	-82.02	-131.18	0.00	0.00	0.00
3,600.00	3.78	328.82	3,594.63	141.16	-85.43	-136.63	0.00	0.00	0.00
3,700.00	3.78	328.82	3,694.41	146.79	-88.84	-142.08	0.00	0.00	0.00
3,800.00	3.78	328.82	3,794.20	152.42	-92.24	-147.53	0.00	0.00	0.00
3,900.00	3.78	328.82	3,893.98	158.06	-95.65	-152.99	0.00	0.00	0.00
4,000.00	3.78	328.82	3,993.76	163.69	-99.06	-158.44	0.00	0.00	0.00
4,100.00	3.78	328.82	4,093.55	169.32	-102.47	-163.89	0.00	0.00	0.00
4,200.00	3.78	328.82	4,193.33	174.96	-105.88	-169.35	0.00	0.00	0.00
4,300.00	3.78	328.82	4,293.11	180.59	-109.29	-174.80	0.00	0.00	0.00
4,326.95	3.78	328.82	4,320.00	182.11	-110.21	-176.27	0.00	0.00	0.00
Parkman									
4,400.00	3.78	328.82	4,392.89	186.22	-112.70	-180.25	0.00	0.00	0.00
4,500.00	3.78	328.82	4,492.68	191.86	-116.11	-185.70	0.00	0.00	0.00
4,600.00	3.78	328.82	4,592.46	197.49	-119.52	-191.16	0.00	0.00	0.00
4,700.00	3.78	328.82	4,692.24	203.12	-122.93	-196.61	0.00	0.00	0.00

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Planning Report

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Project:	COLORADO NORTHERN ZONE - 83	MD Reference:	17' RKB + 5141' GL @ 5158.00ft
Site:	WELD_BUFFALO & BADGER 4W-15HZ PAD	North Reference:	True
Well:	BUFFALO 13C-15HZ	Survey Calculation Method:	Minimum Curvature
Wellbore:	BUFFALO 13C-15HZ		
Design:	BUFFALO 13C-15HZ (wp01) Permit		

Planned 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)
4,785.94	3.78	328.82	4,778.00	207.97	-125.86	-201.30	0.00	0.00	0.00
Sussex									
4,800.00	3.78	328.82	4,792.03	208.76	-126.34	-202.06	0.00	0.00	0.00
4,900.00	3.78	328.82	4,891.81	214.39	-129.75	-207.52	0.00	0.00	0.00
5,000.00	3.78	328.82	4,991.59	220.03	-133.16	-212.97	0.00	0.00	0.00
5,100.00	3.78	328.82	5,091.37	225.66	-136.57	-218.42	0.00	0.00	0.00
5,200.00	3.78	328.82	5,191.16	231.29	-139.98	-223.87	0.00	0.00	0.00
5,275.01	3.78	328.82	5,266.00	235.52	-142.53	-227.96	0.00	0.00	0.00
Shannon									
5,300.00	3.78	328.82	5,290.94	236.93	-143.38	-229.33	0.00	0.00	0.00
5,400.00	3.78	328.82	5,390.72	242.56	-146.79	-234.78	0.00	0.00	0.00
5,500.00	3.78	328.82	5,490.51	248.19	-150.20	-240.23	0.00	0.00	0.00
5,600.00	3.78	328.82	5,590.29	253.83	-153.61	-245.69	0.00	0.00	0.00
5,700.00	3.78	328.82	5,690.07	259.46	-157.02	-251.14	0.00	0.00	0.00
5,800.00	3.78	328.82	5,789.86	265.09	-160.43	-256.59	0.00	0.00	0.00
5,900.00	3.78	328.82	5,889.64	270.73	-163.84	-262.04	0.00	0.00	0.00
6,000.00	3.78	328.82	5,989.42	276.36	-167.25	-267.50	0.00	0.00	0.00
6,100.00	3.78	328.82	6,089.20	281.99	-170.66	-272.95	0.00	0.00	0.00
6,200.00	3.78	328.82	6,188.99	287.63	-174.07	-278.40	0.00	0.00	0.00
6,300.00	3.78	328.82	6,288.77	293.26	-177.48	-283.86	0.00	0.00	0.00
6,400.00	3.78	328.82	6,388.55	298.89	-180.89	-289.31	0.00	0.00	0.00
6,500.00	3.78	328.82	6,488.34	304.53	-184.30	-294.76	0.00	0.00	0.00
6,600.00	3.78	328.82	6,588.12	310.16	-187.71	-300.21	0.00	0.00	0.00
6,700.00	3.78	328.82	6,687.90	315.80	-191.12	-305.67	0.00	0.00	0.00
6,800.00	3.78	328.82	6,787.69	321.43	-194.52	-311.12	0.00	0.00	0.00
6,900.00	3.78	328.82	6,887.47	327.06	-197.93	-316.57	0.00	0.00	0.00
7,000.00	3.78	328.82	6,987.25	332.70	-201.34	-322.03	0.00	0.00	0.00
7,100.00	3.78	328.82	7,087.03	338.33	-204.75	-327.48	0.00	0.00	0.00
7,159.49	3.78	328.82	7,146.40	341.68	-206.78	-330.72	0.00	0.00	0.00
Start Drop -2.00									
7,200.00	2.97	328.82	7,186.83	343.72	-208.01	-332.69	2.00	-2.00	0.00
7,300.00	0.97	328.82	7,286.77	346.65	-209.79	-335.53	2.00	-2.00	0.00
7,348.27	0.00	0.00	7,335.04	347.00	-210.00	-335.87	2.00	-2.00	0.00
Start Build 10.00									
7,350.00	0.17	180.18	7,336.77	347.00	-210.00	-335.87	10.00	10.00	0.00
7,400.00	5.17	180.18	7,386.70	344.67	-210.01	-333.54	10.00	10.00	0.00
7,450.00	10.17	180.18	7,436.23	337.99	-210.03	-326.87	10.00	10.00	0.00
7,500.00	15.17	180.18	7,485.00	327.03	-210.06	-315.92	10.00	10.00	0.00
7,510.39	16.21	180.18	7,495.00	324.22	-210.07	-313.12	10.00	10.00	0.00
Sharon Springs									
7,550.00	20.17	180.18	7,532.63	311.85	-210.11	-300.76	10.00	10.00	0.00
7,552.53	20.43	180.18	7,535.00	310.98	-210.11	-299.89	10.00	10.00	0.00
Niobrara A									
7,600.00	25.17	180.18	7,578.75	292.59	-210.17	-281.52	10.00	10.00	0.00
7,650.00	30.17	180.18	7,623.01	269.37	-210.24	-258.33	10.00	10.00	0.00
7,687.75	33.95	180.18	7,655.00	249.34	-210.31	-238.32	10.00	10.00	0.00
Niobrara B									
7,700.00	35.17	180.18	7,665.09	242.39	-210.33	-231.38	10.00	10.00	0.00
7,750.00	40.17	180.18	7,704.65	211.84	-210.42	-200.87	10.00	10.00	0.00
7,800.00	45.17	180.18	7,741.40	177.96	-210.53	-167.02	10.00	10.00	0.00
7,824.06	47.58	180.18	7,758.00	160.55	-210.59	-149.63	10.00	10.00	0.00
Niobrara C									
7,850.00	50.17	180.18	7,775.06	141.01	-210.65	-130.11	10.00	10.00	0.00

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7,900.00	55.17	180.18	7,805.37	101.26	-210.77	-90.41	10.00	10.00	0.00
7,950.00	60.17	180.18	7,832.10	59.03	-210.90	-48.22	10.00	10.00	0.00
8,000.00	65.17	180.18	7,855.04	14.62	-211.04	-3.87	10.00	10.00	0.00
8,050.00	70.17	180.18	7,874.03	-31.62	-211.19	42.32	10.00	10.00	0.00
8,075.01	72.67	180.18	7,882.00	-55.32	-211.26	65.99	10.00	10.00	0.00
Fort Hays									
8,100.00	75.17	180.18	7,888.92	-79.33	-211.34	89.98	10.00	10.00	0.00
8,150.00	80.17	180.18	7,899.59	-128.16	-211.49	138.75	10.00	10.00	0.00
8,180.54	83.23	180.18	7,904.00	-158.38	-211.59	168.94	10.00	10.00	0.00
Codell									
8,200.00	85.17	180.18	7,905.97	-177.74	-211.65	188.27	10.00	10.00	0.00
8,248.27	90.00	180.18	7,908.00	-225.95	-211.80	236.43	10.00	10.00	0.00
Start DLS 0.01 TFO 90.16 - 7"									
8,300.44	90.00	180.19	7,908.00	-278.12	-211.97	288.54	0.01	0.00	0.01
Start 4147.85 hold at 8300.44 MD									
8,400.00	90.00	180.19	7,908.00	-377.68	-212.29	387.99	0.00	0.00	0.00
8,500.00	90.00	180.19	7,908.00	-477.68	-212.61	487.88	0.00	0.00	0.00
8,600.00	90.00	180.19	7,908.00	-577.68	-212.93	587.76	0.00	0.00	0.00
8,700.00	90.00	180.19	7,908.00	-677.68	-213.26	687.65	0.00	0.00	0.00
8,800.00	90.00	180.19	7,908.00	-777.68	-213.58	787.54	0.00	0.00	0.00
8,900.00	90.00	180.19	7,908.00	-877.68	-213.90	887.42	0.00	0.00	0.00
9,000.00	90.00	180.19	7,908.00	-977.68	-214.23	987.31	0.00	0.00	0.00
9,100.00	90.00	180.19	7,908.00	-1,077.68	-214.55	1,087.19	0.00	0.00	0.00
9,200.00	90.00	180.19	7,908.00	-1,177.68	-214.87	1,187.08	0.00	0.00	0.00
9,300.00	90.00	180.19	7,908.00	-1,277.68	-215.20	1,286.97	0.00	0.00	0.00
9,400.00	90.00	180.19	7,908.00	-1,377.68	-215.52	1,386.85	0.00	0.00	0.00
9,500.00	90.00	180.19	7,908.00	-1,477.68	-215.84	1,486.74	0.00	0.00	0.00
9,600.00	90.00	180.19	7,908.00	-1,577.68	-216.17	1,586.63	0.00	0.00	0.00
9,700.00	90.00	180.19	7,908.00	-1,677.67	-216.49	1,686.51	0.00	0.00	0.00
9,800.00	90.00	180.19	7,908.00	-1,777.67	-216.81	1,786.40	0.00	0.00	0.00
9,900.00	90.00	180.19	7,908.00	-1,877.67	-217.14	1,886.29	0.00	0.00	0.00
10,000.00	90.00	180.19	7,908.00	-1,977.67	-217.46	1,986.17	0.00	0.00	0.00
10,100.00	90.00	180.19	7,908.00	-2,077.67	-217.78	2,086.06	0.00	0.00	0.00
10,200.00	90.00	180.19	7,908.00	-2,177.67	-218.11	2,185.95	0.00	0.00	0.00
10,300.00	90.00	180.19	7,908.00	-2,277.67	-218.43	2,285.83	0.00	0.00	0.00
10,400.00	90.00	180.19	7,908.00	-2,377.67	-218.75	2,385.72	0.00	0.00	0.00
10,500.00	90.00	180.19	7,908.00	-2,477.67	-219.08	2,485.61	0.00	0.00	0.00
10,600.00	90.00	180.19	7,908.00	-2,577.67	-219.40	2,585.49	0.00	0.00	0.00
10,700.00	90.00	180.19	7,908.00	-2,677.67	-219.72	2,685.38	0.00	0.00	0.00
10,800.00	90.00	180.19	7,908.00	-2,777.67	-220.05	2,785.27	0.00	0.00	0.00
10,900.00	90.00	180.19	7,908.00	-2,877.67	-220.37	2,885.15	0.00	0.00	0.00
11,000.00	90.00	180.19	7,908.00	-2,977.67	-220.69	2,985.04	0.00	0.00	0.00
11,100.00	90.00	180.19	7,908.00	-3,077.67	-221.02	3,084.93	0.00	0.00	0.00
11,200.00	90.00	180.19	7,908.00	-3,177.67	-221.34	3,184.81	0.00	0.00	0.00
11,300.00	90.00	180.19	7,908.00	-3,277.67	-221.66	3,284.70	0.00	0.00	0.00
11,400.00	90.00	180.19	7,908.00	-3,377.67	-221.99	3,384.58	0.00	0.00	0.00
11,500.00	90.00	180.19	7,908.00	-3,477.67	-222.31	3,484.47	0.00	0.00	0.00
11,600.00	90.00	180.19	7,908.00	-3,577.67	-222.63	3,584.36	0.00	0.00	0.00
11,700.00	90.00	180.19	7,908.00	-3,677.66	-222.96	3,684.24	0.00	0.00	0.00
11,800.00	90.00	180.19	7,908.00	-3,777.66	-223.28	3,784.13	0.00	0.00	0.00
11,900.00	90.00	180.19	7,908.00	-3,877.66	-223.60	3,884.02	0.00	0.00	0.00
12,000.00	90.00	180.19	7,908.00	-3,977.66	-223.93	3,983.90	0.00	0.00	0.00
12,100.00	90.00	180.19	7,908.00	-4,077.66	-224.25	4,083.79	0.00	0.00	0.00

Anadarko Petroleum Corp

Planning Report

Database:	edmp	Local Co-ordinate Reference:	Well BUFFALO 13C-15HZ
Company:	US ROCKIES REGION PLANNING	TVD Reference:	17' RKB + 5141' GL @ 5158.00ft
Project:	COLORADO NORTHERN ZONE - 83	MD Reference:	17' RKB + 5141' GL @ 5158.00ft
Site:	WELD_BUFFALO & BADGER 4W-15HZ PAD	North Reference:	True
Well:	BUFFALO 13C-15HZ	Survey Calculation Method:	Minimum Curvature
Wellbore:	BUFFALO 13C-15HZ		
Design:	BUFFALO 13C-15HZ (wp01) Permit		

Planned 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)	
12,200.00	90.00	180.19	7,908.00	-4,177.66	-224.57	4,183.68	0.00	0.00	0.00	
12,300.00	90.00	180.19	7,908.00	-4,277.66	-224.90	4,283.56	0.00	0.00	0.00	
12,400.00	90.00	180.19	7,908.00	-4,377.66	-225.22	4,383.45	0.00	0.00	0.00	
12,448.29	90.00	180.19	7,908.00	-4,425.95	-225.37	4,431.69	0.00	0.00	0.00	
TD at 12448.29 - Buffalo 13C-15HZ BHL										

Design Targets									
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (usft)	Easting (usft)	Latitude	Longitude
- hit/miss target									
- Shape									
Buffalo 13C-15HZ BHL	0.00	0.00	7,908.00	-4,425.95	-225.37	1,259,702.86	3,140,720.68	40.045178	-104.997366
- plan hits target center									
- Point									

Casing Points					
Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")	
900.00	900.00	9 5/8"	9-5/8	12-1/4	
8,248.27	7,908.00	7"	7	8-3/4	

Formations						
Measured Depth (ft)	Vertical Depth (ft)	Name	Lithology	Dip (°)	Dip Direction (°)	
4,326.95	4,320.00	Parkman				
4,785.94	4,778.00	Sussex				
5,275.01	5,266.00	Shannon				
7,510.39	7,495.00	Sharon Springs				
7,552.53	7,535.00	Niobrara A				
7,687.75	7,655.00	Niobrara B				
7,824.06	7,758.00	Niobrara C				
8,075.01	7,882.00	Fort Hays				
8,180.54	7,904.00	Codell				

Plan Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment	
		+N/-S (ft)	+E/-W (ft)		
1,000.00	1,000.00	0.00	0.00	Start Build 2.00	
1,188.78	1,188.64	5.32	-3.22	Start 5970.71 hold at 1188.78 MD	
7,159.49	7,146.40	341.68	-206.78	Start Drop -2.00	
7,348.27	7,335.04	347.00	-210.00	Start Build 10.00	
8,248.27	7,908.00	-225.96	-211.80	Start DLS 0.01 TFO 90.16	
8,300.44	7,908.00	-278.12	-211.97	Start 4147.85 hold at 8300.44 MD	
12,448.29	7,908.00	-4,425.95	-225.37	TD at 12448.29	