

CERTIFIED SURVEY SHEET

HALLIBURTON



Sperry Drilling

OPERATOR:	APC		
WELL:	Pettinger 4C-18HZ		
FIELD:	Wattenberg		
GRADED ELEVATION:	5007	ft. above MSL	
FLOOR (KB) HEIGHT:	13		
TVD REFERENCE:	5020	ft. above MSL	
RIG:	Ensign 123		
LEGALS:	Sec. 18	Twn. 1N	Rng. 65W
COUNTY	Weld		
STATE:	Colorado		
CAL. METHOD:	Minimum Curvature		
NORTH REFERENCE:	True	Declination:	
VERTICAL SEC. DIR.:	359.73		

SSDS Job Number:	900984320
Start Date of Job:	2/15/2014
End Date of Job:	2/22/2014
Lead Directional Driller:	Milo Spethman
	Bryan Seghetti
Other SSDS DDs:	Rob Walker
SSDS MWDs:	James Tilley
	Evan Ponder

Hole Section	Surface	Intermediate	Production	1st Sidetrack	2nd Sidetrack	3rd Sidetrack	4th Sidetrack
Hole Size	13 1/4	8 3/4	6 1/8				
Casing Size	9 5/8	7	4 1/2				
Casing Depth	1203	7844					
Survey Type	Gyro	MWD+IFR	MWD+IFR				
Tie-On Depth	0	1024	7811				
First Survey Depth	13	1305	7858				
Last Survey Depth	1024	7811	12423				
Bit Projection							

The following Halliburton - Sperry Drilling personnel, do certify the above information to be accurate:

Print Name: Milo Spethman	Print Name: Bryan Seghetti
Sign Name: 	Sign Name:
Print Name: James Tilley	Print Name: Evan Ponder
Sign Name:	Sign Name:  484566

Survey Tie-On to Surface Casing (Assumed Vertical), Tie-On to existing MWD Survey (prior drilled hole)

Gyro Surveys - Provided by third party vendor

MWD - Halliburton-Sperry Drilling - Measurement While Drilling Surveys

MWD+IFR - Measurement While Drilling Surveys + In-Field Referencing services

Version 1.2

Project: Weld County, CO (NAD 83)
 Site: Sec. 18-T1N-R65W
 Well: Pettinger 4C-18HZ
 Wellbore: Plan B
 Design: Actual Surveys

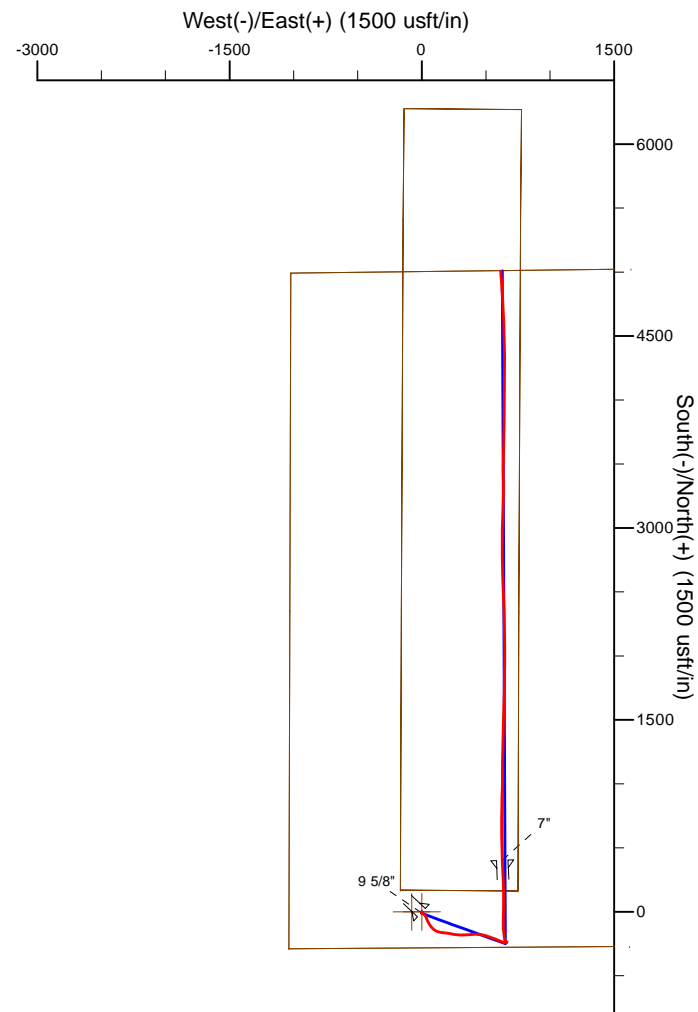
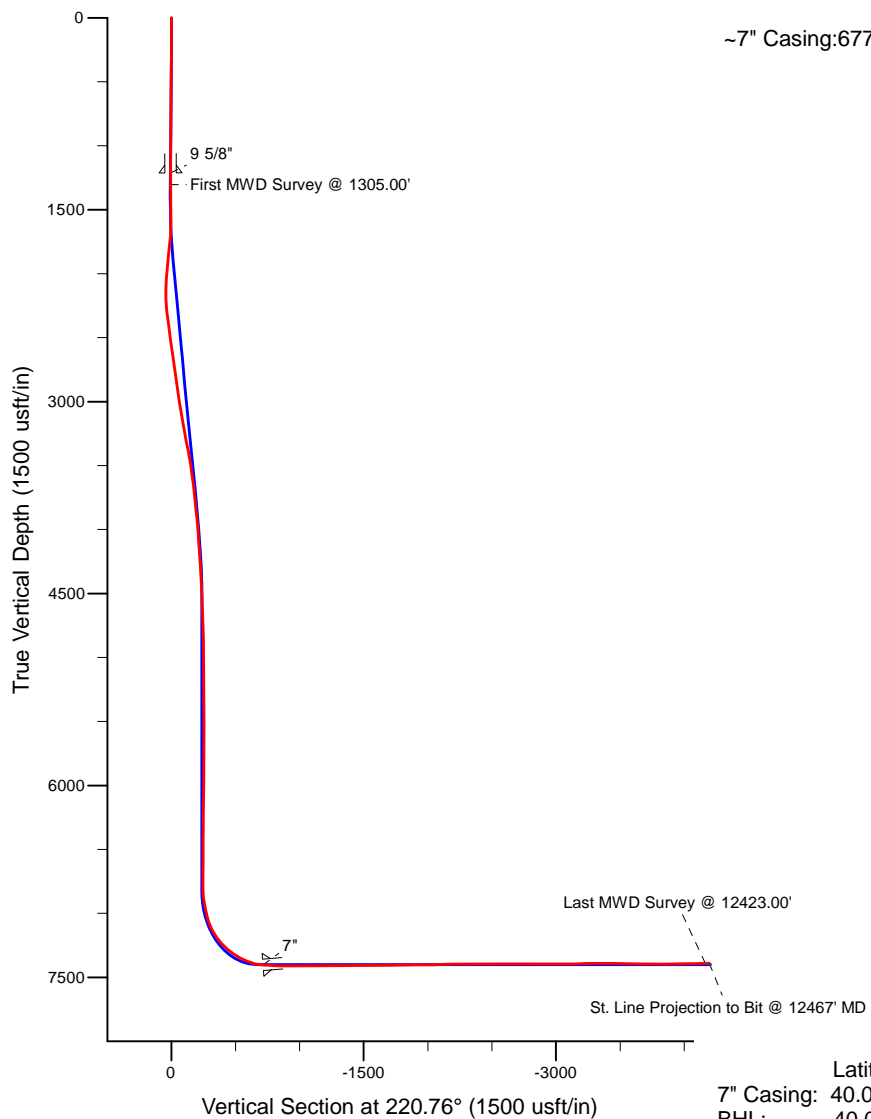


LEGEND

- + Pettinger 4C-18HZ, Plan B, Rev B0 V0
- + Actual Surveys

~BHL: 3' FNL:: 1640' FWL

~7" Casing:677' FSL:: 1668' FWL



WELL DETAILS: Pettinger 4C-18HZ	
Ground Level:	5007.00
RKB=13' @ 5020.00usft (Ensign 123)	
Design: Actual Surveys (Pettinger 4C-18HZ/Plan B)	
Created By: Pari Amanlou	Date: 2-21-2014

	Latitude	Longitude	Northing	Easting
7" Casing:	40.045995	-104.710098	1,260,586.52	3,221,141.88
BHL:	40.058641	-104.710139	1,265,192.86	3,221,089.25

Anadarko Petroleum Corp.

Weld County, CO (NAD 83)

Sec. 18-T1N-R65W

Pettinger 4C-18HZ

Job # 900984320::API:05-123-38020

Plan B

Design: Actual Surveys

Sperry Drilling Services

Standard Report

20 August, 2014

Surface UWI : Job # 900984320::API:05-123-38020

Well Coordinates: 1,260,178.48 N, 3,220,517.35 E (40° 02' 41.60" N, 104° 42' 44.43" W)

Ground Level: 5,007.00 usft

Local Coordinate Origin:

Centered on Well Pettinger 4C-18HZ

Viewing Datum:

RKB=13' @ 5020.00usft (Ensign 123)

TVDs to System:

N

North Reference:

True

Unit System:

Dec-Deg - API - US Survey Feet - Custom

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

HALLIBURTON

Design Report for Pettinger 4C-18HZ - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13.00	0.00	0.00	13.00	0.00	0.00	0.00	0.00
113.00	0.44	167.22	113.00	-0.37	0.08	-0.37	0.44
213.00	0.39	290.49	213.00	-0.63	-0.15	-0.63	0.73
313.00	0.63	276.10	312.99	-0.45	-1.01	-0.45	0.27
413.00	0.71	246.57	412.99	-0.64	-2.13	-0.63	0.35
513.00	0.56	194.26	512.98	-1.36	-2.82	-1.35	0.58
613.00	0.43	181.55	612.98	-2.21	-2.95	-2.19	0.17
713.00	0.22	137.65	712.98	-2.73	-2.83	-2.71	0.31
813.00	0.55	233.58	812.97	-3.15	-3.09	-3.14	0.61
913.00	0.57	214.82	912.97	-3.85	-3.76	-3.83	0.18
1,013.00	0.57	193.52	1,012.97	-4.74	-4.16	-4.72	0.21
1,024.00	0.53	184.37	1,023.96	-4.84	-4.17	-4.82	0.88
Tie-On to Gyro Surveys @ 1024.00 FT							
1,213.00	1.24	133.04	1,212.94	-7.11	-2.74	-7.10	0.53
9 5/8"							
1,305.00	1.70	126.23	1,304.91	-8.60	-0.91	-8.60	0.53
First MWD Survey @ 1305.00'							
1,400.00	4.76	121.54	1,399.75	-11.50	3.59	-11.51	3.23
1,495.00	7.83	119.09	1,494.17	-16.71	12.60	-16.77	3.24
1,591.00	8.13	132.40	1,589.25	-24.46	23.33	-24.57	1.95
1,684.00	8.15	161.36	1,681.35	-35.15	30.30	-35.29	4.36
1,777.00	11.95	157.68	1,772.90	-50.31	36.06	-50.48	4.14
1,871.00	15.77	153.24	1,864.15	-70.72	45.51	-70.94	4.22
1,964.00	15.33	152.74	1,953.75	-92.94	56.83	-93.20	0.49
2,058.00	15.55	141.42	2,044.38	-113.84	70.39	-114.17	3.21
2,151.00	15.29	134.84	2,134.04	-132.23	86.86	-132.64	1.90
2,245.00	15.58	120.21	2,224.68	-147.33	106.56	-147.83	4.14
2,338.00	15.75	105.91	2,314.26	-157.07	129.50	-157.68	4.15
2,432.00	14.94	97.74	2,404.92	-162.20	153.78	-162.93	2.45
2,526.00	13.01	95.65	2,496.13	-164.88	176.32	-165.71	2.12
2,619.00	14.26	96.06	2,586.51	-167.12	198.13	-168.05	1.35
2,713.00	15.94	101.62	2,677.27	-170.94	222.29	-171.99	2.36
2,806.00	13.60	100.20	2,767.19	-175.45	245.56	-176.60	2.55
2,900.00	14.42	94.60	2,858.39	-178.34	268.10	-179.61	1.68
2,993.00	14.94	94.34	2,948.36	-180.18	291.60	-181.55	0.56
3,087.00	13.04	92.99	3,039.57	-181.65	314.27	-183.13	2.05
3,180.00	15.34	86.96	3,129.73	-181.55	337.04	-183.13	2.94
3,274.00	13.56	84.64	3,220.75	-179.86	360.43	-181.55	1.99
3,364.00	14.76	83.59	3,308.01	-177.59	382.33	-179.39	1.36
3,454.00	15.71	86.50	3,394.85	-175.57	405.88	-177.48	1.35
3,544.00	13.79	90.11	3,481.88	-174.84	428.78	-176.86	2.36
3,634.00	13.63	97.37	3,569.33	-176.23	450.02	-178.34	1.92
3,724.00	13.64	102.52	3,656.79	-179.89	470.90	-182.10	1.35
3,814.00	13.55	106.51	3,744.27	-185.18	491.37	-187.50	1.05
3,904.00	14.58	106.68	3,831.57	-191.43	512.33	-193.84	1.15
3,994.00	15.22	110.17	3,918.55	-198.76	534.27	-201.27	1.22
4,084.00	14.40	112.13	4,005.56	-207.05	555.72	-209.66	1.07
4,174.00	12.79	111.79	4,093.03	-214.96	575.34	-217.67	1.79
4,264.00	11.14	111.21	4,181.08	-221.80	592.70	-224.59	1.84



Design Report for Pettinger 4C-18HZ - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
4,354.00	10.43	111.75	4,269.49	-227.97	608.37	-230.83	0.80
4,444.00	8.91	113.60	4,358.20	-233.78	622.32	-236.71	1.72
4,534.00	7.81	110.77	4,447.25	-238.74	634.43	-241.72	1.30
4,624.00	6.27	97.10	4,536.57	-241.51	645.03	-244.55	2.52
4,714.00	4.24	93.58	4,626.19	-242.33	653.22	-245.40	2.28
4,804.00	1.12	89.84	4,716.08	-242.53	657.43	-245.63	3.47
4,894.00	1.35	56.08	4,806.06	-241.94	659.18	-245.04	0.83
4,984.00	1.12	46.42	4,896.04	-240.74	660.70	-243.85	0.34
5,074.00	1.12	42.66	4,986.02	-239.49	661.93	-242.60	0.08
5,254.00	1.42	17.77	5,165.98	-236.07	663.81	-239.20	0.34
5,344.00	1.00	224.87	5,255.97	-235.56	663.59	-238.69	2.62
5,434.00	1.27	256.05	5,345.95	-236.36	662.07	-239.48	0.74
5,524.00	1.54	254.88	5,435.93	-236.92	659.94	-240.02	0.30
5,614.00	1.04	3.77	5,525.91	-236.42	658.82	-239.52	2.35
5,704.00	0.74	6.81	5,615.90	-235.03	658.94	-238.13	0.34
5,795.00	0.65	5.71	5,706.90	-233.93	659.07	-237.03	0.10
5,885.00	1.05	222.11	5,796.89	-234.03	658.56	-237.13	1.80
5,975.00	0.58	221.99	5,886.88	-234.98	657.71	-238.08	0.52
6,065.00	0.30	263.69	5,976.88	-235.35	657.17	-238.44	0.45
6,245.00	0.63	205.20	6,156.87	-236.29	656.28	-239.38	0.30
6,335.00	0.52	220.43	6,246.87	-237.05	655.80	-240.14	0.21
6,425.00	0.56	261.38	6,336.87	-237.43	655.10	-240.51	0.42
6,515.00	0.70	248.85	6,426.86	-237.69	654.15	-240.77	0.22
6,605.00	0.64	290.56	6,516.86	-237.72	653.17	-240.79	0.53
6,695.00	0.70	294.73	6,606.85	-237.31	652.20	-240.38	0.09
6,785.00	1.20	304.25	6,696.84	-236.55	650.92	-239.61	0.58
6,875.00	1.31	301.69	6,786.81	-235.48	649.27	-238.54	0.14
6,920.00	3.07	342.80	6,831.78	-234.06	648.47	-237.11	5.01
6,965.00	9.83	358.79	6,876.47	-229.06	648.04	-232.11	15.40
7,010.00	15.20	353.21	6,920.39	-219.35	647.26	-222.40	12.22
7,055.00	16.79	350.59	6,963.65	-207.08	645.50	-210.12	3.88
7,100.00	19.59	351.52	7,006.39	-193.21	643.32	-196.24	6.26
7,145.00	24.76	351.85	7,048.05	-176.41	640.87	-179.42	11.49
7,190.00	30.20	352.10	7,087.96	-155.85	637.98	-158.86	12.09
7,235.00	34.55	355.81	7,125.96	-131.90	635.49	-134.89	10.62
7,280.00	39.20	1.25	7,161.96	-104.93	634.87	-107.93	12.62
7,325.00	44.24	0.64	7,195.53	-75.00	635.35	-77.99	11.24
7,370.00	48.12	1.13	7,226.69	-42.54	635.86	-45.54	8.66
7,415.00	52.19	1.82	7,255.51	-8.01	636.75	-11.01	9.12
7,460.00	56.05	1.66	7,281.88	28.42	637.86	25.42	8.58
7,505.00	60.32	0.57	7,305.60	66.65	638.59	63.64	9.71
7,550.00	64.67	359.49	7,326.38	106.55	638.61	103.54	9.90
7,595.00	67.62	358.48	7,344.58	147.69	637.87	144.69	6.87
7,640.00	70.92	358.21	7,360.50	189.76	636.66	186.76	7.35
7,685.00	74.23	357.77	7,373.98	232.66	635.15	229.66	7.41
7,730.00	76.02	357.62	7,385.53	276.11	633.40	273.13	3.99
7,775.00	79.44	358.33	7,395.09	320.05	631.85	317.07	7.75
7,811.00	84.81	356.92	7,400.02	355.67	630.37	352.69	15.41
7,858.00	86.67	357.66	7,403.51	402.48	628.15	399.52	4.27
7"							
7,903.00	88.46	358.37	7,405.42	447.41	626.60	444.46	4.27

Design Report for Pettinger 4C-18HZ - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
7,993.00	87.60	359.46	7,408.51	537.34	624.90	534.39	1.54
8,083.00	89.05	359.01	7,411.14	627.29	623.69	624.35	1.69
8,173.00	91.08	0.46	7,411.04	717.29	623.28	714.34	2.77
8,353.00	90.71	1.76	7,408.23	897.23	626.76	894.26	0.75
8,443.00	90.52	1.11	7,407.26	987.19	629.02	984.22	0.75
8,623.00	89.54	359.90	7,407.17	1,167.18	630.60	1,164.19	0.87
8,713.00	88.95	0.53	7,408.36	1,257.17	630.94	1,254.18	0.96
8,803.00	89.51	1.21	7,409.56	1,347.15	632.31	1,344.16	0.98
8,893.00	90.83	2.60	7,409.30	1,437.10	635.30	1,434.09	2.13
8,983.00	90.46	1.80	7,408.28	1,527.02	638.75	1,524.00	0.98
9,073.00	91.66	1.54	7,406.62	1,616.97	641.38	1,613.93	1.36
9,163.00	91.85	0.78	7,403.86	1,706.91	643.20	1,703.86	0.87
9,253.00	90.74	1.29	7,401.83	1,796.87	644.82	1,793.81	1.36
9,343.00	89.26	0.77	7,401.83	1,886.85	646.44	1,883.78	1.74
9,433.00	90.31	359.94	7,402.17	1,976.85	647.00	1,973.77	1.49
9,523.00	90.00	359.51	7,401.92	2,066.84	646.57	2,063.77	0.59
9,613.00	91.11	358.65	7,401.05	2,156.83	645.12	2,153.76	1.56
9,703.00	91.63	358.78	7,398.90	2,246.78	643.10	2,243.72	0.60
9,794.00	90.15	358.97	7,397.49	2,337.75	641.32	2,334.70	1.64
9,884.00	90.40	357.92	7,397.05	2,427.71	638.88	2,424.67	1.20
9,974.00	90.15	356.75	7,396.62	2,517.61	634.69	2,514.59	1.33
10,064.00	90.37	359.08	7,396.21	2,607.54	631.42	2,604.54	2.60
10,154.00	90.86	358.63	7,395.25	2,697.52	629.62	2,694.52	0.74
10,244.00	89.51	359.38	7,394.96	2,787.50	628.06	2,784.51	1.72
10,334.00	89.57	0.34	7,395.68	2,877.50	627.84	2,874.51	1.07
10,424.00	90.06	359.78	7,395.97	2,967.50	627.93	2,964.51	0.83
10,514.00	90.40	2.80	7,395.61	3,057.46	629.96	3,054.46	3.38
10,604.00	89.94	1.96	7,395.34	3,147.38	633.69	3,144.36	1.06
10,694.00	89.60	0.97	7,395.70	3,237.35	635.99	3,234.32	1.16
10,784.00	90.03	359.86	7,395.99	3,327.35	636.65	3,324.31	1.32
10,874.00	89.60	358.57	7,396.28	3,417.34	635.41	3,414.31	1.51
10,964.00	90.22	2.02	7,396.43	3,507.32	635.88	3,504.29	3.89
11,054.00	90.99	0.66	7,395.48	3,597.29	637.98	3,594.24	1.74
11,144.00	91.69	0.59	7,393.37	3,687.26	638.96	3,684.21	0.78
11,234.00	89.78	0.74	7,392.22	3,777.24	640.01	3,774.18	2.13
11,324.00	92.28	2.27	7,390.60	3,867.19	642.37	3,864.12	3.26
11,414.00	89.11	0.84	7,389.51	3,957.13	644.81	3,954.05	3.86
11,594.00	88.55	0.13	7,393.18	4,137.09	646.33	4,134.00	0.50
11,684.00	89.17	359.88	7,394.97	4,227.07	646.34	4,223.98	0.74
11,774.00	88.95	359.42	7,396.45	4,317.05	645.79	4,313.96	0.57
11,864.00	90.31	358.52	7,397.03	4,407.04	644.18	4,403.95	1.81
11,954.00	89.97	358.56	7,396.81	4,497.01	641.88	4,493.93	0.38
12,045.00	91.39	358.48	7,395.73	4,587.97	639.53	4,584.90	1.56
12,135.00	90.95	357.09	7,393.89	4,677.88	636.05	4,674.83	1.62
12,225.00	90.55	357.11	7,392.72	4,767.75	631.50	4,764.73	0.44
12,315.00	90.12	356.23	7,392.19	4,857.60	626.27	4,854.60	1.09
12,405.00	90.34	356.37	7,391.83	4,947.41	620.47	4,944.43	0.29
12,423.00	90.40	356.26	7,391.71	4,965.37	619.31	4,962.40	0.70
Last MWD Survey @ 12423.00'							
12,467.00	90.40	356.26	7,391.40	5,009.28	616.44	5,006.32	0.00
St. Line Projection to Bit @ 12467' MD							

Design Report for Pettinger 4C-18HZ - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
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Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
1,024.00	1,023.96	-4.84	-4.17	Tie-On to Gyro Surveys @ 1024.00 FT
1,305.00	1,304.91	-8.60	-0.91	First MWD Survey @ 1305.00'
12,423.00	7,391.71	4,965.37	619.31	Last MWD Survey @ 12423.00'
12,467.00	7,391.40	5,009.28	616.44	St. Line Projection to Bit @ 12467' MD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
User	No Target (Freehand)	359.73	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
13.00	1,024.00	Surface Gyro Surveys	NS-GYRO-MS
1,305.00	7,858.00	MWD Surveys-Intermediate	MWD+IFR1+SC
7,903.00	12,423.00	MWD Surveys-Lateral	MWD+IFR1+SC

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,213.00		9 5/8"	9-5/8	12-3/4
7,858.00		7"	7	8-3/4

Design Report for Pettinger 4C-18HZ - Actual Surveys**Wellbore 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
Pettinger 4C-18HZ_LC	0.00	0.00	0.00	0.01	0.00	1,260,178.49	3,220,517.35	40.044890	-104.712341
- actual wellpath misses target center by 0.01usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				0.00	5,406.46	-146.83	1,265,583.23	3,220,322.51	
Point 2				0.00	2,352.71	-160.19	1,262,529.60	3,220,336.27	
Point 3				0.00	169.78	-166.52	1,260,346.78	3,220,349.33	
Point 4				0.00	161.64	750.48	1,260,346.78	3,221,266.33	
Point 5				0.00	2,344.57	756.80	1,262,529.60	3,221,253.27	
Point 6				0.00	5,398.31	770.17	1,265,583.23	3,221,239.51	
Point 7				0.00	6,270.31	777.92	1,266,455.23	3,221,239.51	
Point 8				0.00	6,278.45	-139.08	1,266,455.23	3,220,322.51	
Pettinger 4C-18HZ_SH	0.00	0.00	0.00	0.01	0.00	1,260,178.49	3,220,517.35	40.044890	-104.712341
- actual wellpath misses target center by 0.01usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Point									
Pettinger Pad 460' SB	0.00	0.00	13.00	-0.34	-78.11	1,260,177.45	3,220,439.24	40.044889	-104.712620
- actual wellpath misses target center by 78.12usft at 13.00usft MD (13.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				13.00	4,538.44	-485.47	1,264,711.23	3,219,913.50	
Point 2				13.00	4,563.79	1,707.93	1,264,756.06	3,222,106.51	
Point 3				13.00	4,589.01	3,899.55	1,264,800.75	3,224,297.74	
Point 4				13.00	2,397.70	3,895.38	1,262,609.57	3,224,313.03	
Point 5				13.00	207.73	3,891.76	1,260,419.73	3,224,328.86	
Point 6				13.00	188.59	1,699.60	1,260,381.12	3,222,137.04	
Point 7				13.00	173.76	-497.41	1,260,346.78	3,219,940.33	
Point 8				13.00	2,356.69	-491.08	1,262,529.60	3,219,927.27	
Point 9				13.00	4,538.44	-485.47	1,264,711.23	3,219,913.50	
Pettinger Pad Sec Lin	0.00	0.00	13.00	-0.34	-78.11	1,260,177.45	3,220,439.24	40.044889	-104.712620
- actual wellpath misses target center by 78.12usft at 13.00usft MD (13.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				13.00	4,993.18	-944.31	1,265,161.86	3,219,450.65	
Point 2				13.00	5,023.85	1,708.86	1,265,216.10	3,222,103.35	
Point 3				13.00	5,054.36	4,360.46	1,265,270.15	3,224,754.48	
Point 4				13.00	2,401.97	4,355.40	1,262,617.92	3,224,772.98	
Point 5				13.00	-248.30	4,351.02	1,259,967.81	3,224,792.14	
Point 6				13.00	-271.45	1,698.78	1,259,921.11	3,222,140.30	
Point 7				13.00	-289.38	-958.77	1,259,879.58	3,219,483.12	
Point 8				13.00	2,352.37	-951.11	1,262,521.19	3,219,467.31	
Point 9				13.00	4,993.18	-944.31	1,265,161.86	3,219,450.65	
Pettinger 4C-18HZ_BH	0.00	0.00	7,400.00	5,010.83	627.59	1,265,194.51	3,221,100.38	40.058645	-104.710099
- actual wellpath misses target center by 14.16usft at 12467.00usft MD (7391.40 TVD, 5009.28 N, 616.44 E)									
- Point									

Directional Difficulty Index

Average Dogleg over Survey:	1.99 °/100usft	Maximum Dogleg over Survey:	15.41 °/100usft at 7,811.00 usft
Net Tortousity applicable to Plans:	0.99 °/100usft	Directional Difficulty Index:	6.402

Audit Info

North Reference Sheet for Sec. 18-T1N-R65W - Pettinger 4C-18HZ - Plan B

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to True North Reference.

Vertical Depths are relative to RKB=13' @ 5020.00usft (Ensign 123). Northing and Easting are relative to Pettinger 4C-18HZ

Coordinate System is US State Plane 1983, Colorado Northern Zone using datum North American Datum 1983, ellipsoid GRS 1980

Projection method is Lambert Conformal Conic (2 parallel)

Central Meridian is -105.500000°, Longitude Origin:0.000000°, Latitude Origin:40.783333°

False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99996327

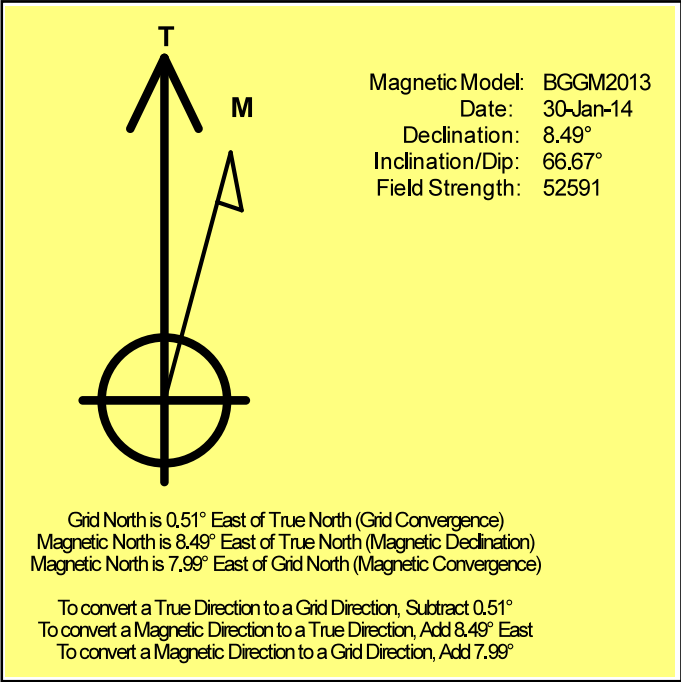
Grid Coordinates of Well: 1,260,178.48 usft N, 3,220,517.35 usft E

Geographical Coordinates of Well: 40° 02' 41.60" N, 104° 42' 44.43" W

Grid Convergence at Surface is: 0.51°

Based upon Minimum Curvature type calculations, at a Measured Depth of 12,467.00usft the Bottom Hole Displacement is 5,047.07usft in the Direction of 7.02° (True).

Magnetic Convergence at surface is: -7.99° (30 January 2014, , BGGM2013)



Anadarko Petroleum Corp.

Weld County, CO (NAD 83)

Sec. 18-T1N-R65W

Pettinger 4C-18HZ

Job # 900984320::API:05-123-38020

Plan B

Design: Actual Surveys

Sperry Drilling Services

Geodetic Report

25 August, 2014

Well Coordinates: 1,260,178.48 N, 3,220,517.35 E (40° 02' 41.60" N, 104° 42' 44.43" W)

Ground Level: 5,007.00 usft

Local Coordinate Origin:

Viewing Datum:

TVDs to System:

North Reference:

Unit System:

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

Centered on Well Pettinger 4C-18HZ

RKB=13' @ 5020.00usft (Ensign 123)

N

True

Dec-Deg - API - US Survey Feet - Custom

HALLIBURTON

Design Report for Pettinger 4C-18HZ - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
0.00	0.00	0.00	0.00	0.00	0.00	40.044890	-104.712341	1,260,178.48	3,220,517.35
13.00	0.00	0.00	13.00	0.00	0.00	40.044890	-104.712341	1,260,178.48	3,220,517.35
113.00	0.44	167.22	113.00	-0.37	0.08	40.044889	-104.712341	1,260,178.11	3,220,517.44
213.00	0.39	290.49	213.00	-0.63	-0.15	40.044888	-104.712342	1,260,177.85	3,220,517.20
313.00	0.63	276.10	312.99	-0.45	-1.01	40.044889	-104.712345	1,260,178.02	3,220,516.34
413.00	0.71	246.57	412.99	-0.64	-2.13	40.044888	-104.712349	1,260,177.82	3,220,515.22
513.00	0.56	194.26	512.98	-1.36	-2.82	40.044886	-104.712351	1,260,177.10	3,220,514.54
613.00	0.43	181.55	612.98	-2.21	-2.95	40.044884	-104.712352	1,260,176.25	3,220,514.42
713.00	0.22	137.65	712.98	-2.73	-2.83	40.044883	-104.712351	1,260,175.73	3,220,514.54
813.00	0.55	233.58	812.97	-3.15	-3.09	40.044881	-104.712352	1,260,175.30	3,220,514.29
913.00	0.57	214.82	912.97	-3.85	-3.76	40.044879	-104.712355	1,260,174.60	3,220,513.63
1,013.00	0.57	193.52	1,012.97	-4.74	-4.16	40.044877	-104.712356	1,260,173.71	3,220,513.23
1,024.00	0.53	184.37	1,023.96	-4.84	-4.17	40.044877	-104.712356	1,260,173.60	3,220,513.22
1,213.00	1.24	133.04	1,212.94	-7.11	-2.74	40.044870	-104.712351	1,260,171.34	3,220,514.67
1,305.00	1.70	126.23	1,304.91	-8.60	-0.91	40.044866	-104.712345	1,260,169.87	3,220,516.51
1,400.00	4.76	121.54	1,399.75	-11.50	3.59	40.044858	-104.712328	1,260,167.02	3,220,521.04
1,495.00	7.83	119.09	1,494.17	-16.71	12.60	40.044844	-104.712296	1,260,161.89	3,220,530.10
1,591.00	8.13	132.40	1,589.25	-24.46	23.33	40.044823	-104.712258	1,260,154.23	3,220,540.89
1,684.00	8.15	161.36	1,681.35	-35.15	30.30	40.044794	-104.712233	1,260,143.61	3,220,547.95
1,777.00	11.95	157.68	1,772.90	-50.31	36.06	40.044752	-104.712212	1,260,128.50	3,220,553.85
1,871.00	15.77	153.24	1,864.15	-70.72	45.51	40.044696	-104.712179	1,260,108.17	3,220,563.49
1,964.00	15.33	152.74	1,953.75	-92.94	56.83	40.044635	-104.712138	1,260,086.06	3,220,575.00
2,058.00	15.55	141.42	2,044.38	-113.84	70.39	40.044578	-104.712090	1,260,065.28	3,220,588.74
2,151.00	15.29	134.84	2,134.04	-132.23	86.86	40.044527	-104.712031	1,260,047.03	3,220,605.37
2,245.00	15.58	120.21	2,224.68	-147.33	106.56	40.044486	-104.711961	1,260,032.11	3,220,625.21
2,338.00	15.75	105.91	2,314.26	-157.07	129.50	40.044459	-104.711879	1,260,022.57	3,220,648.23
2,432.00	14.94	97.74	2,404.92	-162.20	153.78	40.044445	-104.711792	1,260,017.66	3,220,672.56
2,526.00	13.01	95.65	2,496.13	-164.88	176.32	40.044437	-104.711712	1,260,015.18	3,220,695.12
2,619.00	14.26	96.06	2,586.51	-167.12	198.13	40.044431	-104.711634	1,260,013.14	3,220,716.94
2,713.00	15.94	101.62	2,677.27	-170.94	222.29	40.044421	-104.711547	1,260,009.53	3,220,741.13
2,806.00	13.60	100.20	2,767.19	-175.45	245.56	40.044408	-104.711464	1,260,005.23	3,220,764.45
2,900.00	14.42	94.60	2,858.39	-178.34	268.10	40.044400	-104.711384	1,260,002.53	3,220,787.01
2,993.00	14.94	94.34	2,948.36	-180.18	291.60	40.044395	-104.711300	1,260,000.91	3,220,810.53
3,087.00	13.04	92.99	3,039.57	-181.65	314.27	40.044391	-104.711219	1,259,999.64	3,220,833.21
3,180.00	15.34	86.96	3,129.73	-181.55	337.04	40.044392	-104.711137	1,259,999.94	3,220,855.98
3,274.00	13.56	84.64	3,220.75	-179.86	360.43	40.044396	-104.711054	1,260,001.84	3,220,879.35
3,364.00	14.76	83.59	3,308.01	-177.59	382.33	40.044403	-104.710976	1,260,004.30	3,220,901.22
3,454.00	15.71	86.50	3,394.85	-175.57	405.88	40.044408	-104.710892	1,260,006.53	3,220,924.76
3,544.00	13.79	90.11	3,481.88	-174.84	428.78	40.044410	-104.710810	1,260,007.46	3,220,947.64
3,634.00	13.63	97.37	3,569.33	-176.23	450.02	40.044406	-104.710734	1,260,006.27	3,220,968.90
3,724.00	13.64	102.52	3,656.79	-179.89	470.90	40.044396	-104.710659	1,260,002.79	3,220,989.81
3,814.00	13.55	106.51	3,744.27	-185.18	491.37	40.044382	-104.710586	1,259,997.68	3,221,010.32

Design Report for Pettinger 4C-18HZ - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
3,904.00	14.58	106.68	3,831.57	-191.43	512.33	40.044365	-104.710511	1,259,991.62	3,221,031.34
3,994.00	15.22	110.17	3,918.55	-198.76	534.27	40.044344	-104.710433	1,259,984.49	3,221,053.34
4,084.00	14.40	112.13	4,005.56	-207.05	555.72	40.044322	-104.710356	1,259,976.39	3,221,074.87
4,174.00	12.79	111.79	4,093.03	-214.96	575.34	40.044300	-104.710286	1,259,968.65	3,221,094.55
4,264.00	11.14	111.21	4,181.08	-221.80	592.70	40.044281	-104.710224	1,259,961.96	3,221,111.97
4,354.00	10.43	111.75	4,269.49	-227.97	608.37	40.044264	-104.710168	1,259,955.94	3,221,127.70
4,444.00	8.91	113.60	4,358.20	-233.78	622.32	40.044248	-104.710119	1,259,950.25	3,221,141.70
4,534.00	7.81	110.77	4,447.25	-238.74	634.43	40.044235	-104.710075	1,259,945.40	3,221,153.85
4,624.00	6.27	97.10	4,536.57	-241.51	645.03	40.044227	-104.710037	1,259,942.72	3,221,164.47
4,714.00	4.24	93.58	4,626.19	-242.33	653.22	40.044225	-104.710008	1,259,941.98	3,221,172.67
4,804.00	1.12	89.84	4,716.08	-242.53	657.43	40.044224	-104.709993	1,259,941.81	3,221,176.88
4,894.00	1.35	56.08	4,806.06	-241.94	659.18	40.044226	-104.709987	1,259,942.42	3,221,178.63
4,984.00	1.12	46.42	4,896.04	-240.74	660.70	40.044229	-104.709981	1,259,943.63	3,221,180.14
5,074.00	1.12	42.66	4,986.02	-239.49	661.93	40.044233	-104.709977	1,259,944.89	3,221,181.36
5,254.00	1.42	17.77	5,165.98	-236.07	663.81	40.044242	-104.709970	1,259,948.33	3,221,183.20
5,344.00	1.00	224.87	5,255.97	-235.56	663.59	40.044243	-104.709971	1,259,948.83	3,221,182.98
5,434.00	1.27	256.05	5,345.95	-236.36	662.07	40.044241	-104.709977	1,259,948.02	3,221,181.47
5,524.00	1.54	254.88	5,435.93	-236.92	659.94	40.044240	-104.709984	1,259,947.44	3,221,179.34
5,614.00	1.04	3.77	5,525.91	-236.42	658.82	40.044241	-104.709988	1,259,947.93	3,221,178.22
5,704.00	0.74	6.81	5,615.90	-235.03	658.94	40.044245	-104.709988	1,259,949.33	3,221,178.33
5,795.00	0.65	5.71	5,706.90	-233.93	659.07	40.044248	-104.709987	1,259,950.43	3,221,178.44
5,885.00	1.05	222.11	5,796.89	-234.03	658.56	40.044248	-104.709989	1,259,950.32	3,221,177.94
5,975.00	0.58	221.99	5,886.88	-234.98	657.71	40.044245	-104.709992	1,259,949.36	3,221,177.09
6,065.00	0.30	263.69	5,976.88	-235.35	657.17	40.044244	-104.709994	1,259,948.99	3,221,176.56
6,245.00	0.63	205.20	6,156.87	-236.29	656.28	40.044241	-104.709997	1,259,948.03	3,221,175.67
6,335.00	0.52	220.43	6,246.87	-237.05	655.80	40.044239	-104.709999	1,259,947.27	3,221,175.21
6,425.00	0.56	261.38	6,336.87	-237.43	655.10	40.044238	-104.710001	1,259,946.89	3,221,174.51
6,515.00	0.70	248.85	6,426.86	-237.69	654.15	40.044238	-104.710005	1,259,946.62	3,221,173.56
6,605.00	0.64	290.56	6,516.86	-237.72	653.17	40.044237	-104.710008	1,259,946.59	3,221,172.58
6,695.00	0.70	294.73	6,606.85	-237.31	652.20	40.044239	-104.710012	1,259,946.98	3,221,171.61
6,785.00	1.20	304.25	6,696.84	-236.55	650.92	40.044241	-104.710016	1,259,947.73	3,221,170.32
6,875.00	1.31	301.69	6,786.81	-235.48	649.27	40.044244	-104.710022	1,259,948.79	3,221,168.66
6,920.00	3.07	342.80	6,831.78	-234.06	648.47	40.044247	-104.710025	1,259,950.20	3,221,167.85
6,965.00	9.83	358.79	6,876.47	-229.06	648.04	40.044261	-104.710027	1,259,955.20	3,221,167.37
7,010.00	15.20	353.21	6,920.39	-219.35	647.26	40.044288	-104.710029	1,259,964.89	3,221,166.50
7,055.00	16.79	350.59	6,963.65	-207.08	645.50	40.044322	-104.710036	1,259,977.15	3,221,164.63
7,100.00	19.59	351.52	7,006.39	-193.21	643.32	40.044360	-104.710044	1,259,991.00	3,221,162.34
7,145.00	24.76	351.85	7,048.05	-176.41	640.87	40.044406	-104.710052	1,260,007.78	3,221,159.74
7,190.00	30.20	352.10	7,087.96	-155.85	637.98	40.044462	-104.710063	1,260,028.31	3,221,156.66
7,235.00	34.55	355.81	7,125.96	-131.90	635.49	40.044528	-104.710072	1,260,052.24	3,221,153.96
7,280.00	39.20	1.25	7,161.96	-104.93	634.87	40.044602	-104.710074	1,260,079.19	3,221,153.10
7,325.00	44.24	0.64	7,195.53	-75.00	635.35	40.044684	-104.710072	1,260,109.13	3,221,153.32

Design Report for Pettinger 4C-18HZ - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
7,370.00	48.12	1.13	7,226.69	-42.54	635.86	40.044773	-104.710070	1,260,141.59	3,221,153.53
7,415.00	52.19	1.82	7,255.51	-8.01	636.75	40.044868	-104.710067	1,260,176.13	3,221,154.12
7,460.00	56.05	1.66	7,281.88	28.42	637.86	40.044968	-104.710063	1,260,212.57	3,221,154.91
7,505.00	60.32	0.57	7,305.60	66.65	638.59	40.045073	-104.710060	1,260,250.80	3,221,155.30
7,550.00	64.67	359.49	7,326.38	106.55	638.61	40.045182	-104.710060	1,260,290.70	3,221,154.96
7,595.00	67.62	358.48	7,344.58	147.69	637.87	40.045295	-104.710063	1,260,331.83	3,221,153.86
7,640.00	70.92	358.21	7,360.50	189.76	636.66	40.045411	-104.710067	1,260,373.88	3,221,152.27
7,685.00	74.23	357.77	7,373.98	232.66	635.15	40.045529	-104.710073	1,260,416.77	3,221,150.38
7,730.00	76.02	357.62	7,385.53	276.11	633.40	40.045648	-104.710079	1,260,460.20	3,221,148.25
7,775.00	79.44	358.33	7,395.09	320.05	631.85	40.045769	-104.710084	1,260,504.12	3,221,146.31
7,811.00	84.81	356.92	7,400.02	355.67	630.37	40.045866	-104.710090	1,260,539.72	3,221,144.51
7,858.00	86.67	357.66	7,403.51	402.48	628.15	40.045995	-104.710098	1,260,586.51	3,221,141.88
7,903.00	88.46	358.37	7,405.42	447.41	626.60	40.046118	-104.710103	1,260,631.43	3,221,139.92
7,993.00	87.60	359.46	7,408.51	537.34	624.90	40.046365	-104.710109	1,260,721.33	3,221,137.42
8,083.00	89.05	359.01	7,411.14	627.29	623.69	40.046612	-104.710114	1,260,811.27	3,221,135.42
8,173.00	91.08	0.46	7,411.04	717.29	623.28	40.046859	-104.710115	1,260,901.25	3,221,134.21
8,353.00	90.71	1.76	7,408.23	897.23	626.76	40.047353	-104.710103	1,261,081.21	3,221,136.10
8,443.00	90.52	1.11	7,407.26	987.19	629.02	40.047600	-104.710095	1,261,171.19	3,221,137.55
8,623.00	89.54	359.90	7,407.17	1,167.18	630.60	40.048094	-104.710089	1,261,351.17	3,221,137.54
8,713.00	88.95	0.53	7,408.36	1,257.17	630.94	40.048341	-104.710088	1,261,441.16	3,221,137.08
8,803.00	89.51	1.21	7,409.56	1,347.15	632.31	40.048588	-104.710083	1,261,531.15	3,221,137.64
8,893.00	90.83	2.60	7,409.30	1,437.10	635.30	40.048835	-104.710072	1,261,621.11	3,221,139.84
8,983.00	90.46	1.80	7,408.28	1,527.02	638.75	40.049082	-104.710060	1,261,711.06	3,221,142.49
9,073.00	91.66	1.54	7,406.62	1,616.97	641.38	40.049329	-104.710050	1,261,801.02	3,221,144.31
9,163.00	91.85	0.78	7,403.86	1,706.91	643.20	40.049576	-104.710044	1,261,890.97	3,221,145.34
9,253.00	90.74	1.29	7,401.83	1,796.87	644.82	40.049823	-104.710038	1,261,980.94	3,221,146.16
9,343.00	89.26	0.77	7,401.83	1,886.85	646.44	40.050070	-104.710032	1,262,070.93	3,221,146.98
9,433.00	90.31	359.94	7,402.17	1,976.85	647.00	40.050317	-104.710030	1,262,160.92	3,221,146.74
9,523.00	90.00	359.51	7,401.92	2,066.84	646.57	40.050564	-104.710032	1,262,250.91	3,221,145.51
9,613.00	91.11	358.65	7,401.05	2,156.83	645.12	40.050811	-104.710037	1,262,340.87	3,221,143.26
9,703.00	91.63	358.78	7,398.90	2,246.78	643.10	40.051058	-104.710044	1,262,430.80	3,221,140.45
9,794.00	90.15	358.97	7,397.49	2,337.75	641.32	40.051307	-104.710050	1,262,521.75	3,221,137.85
9,884.00	90.40	357.92	7,397.05	2,427.71	638.88	40.051554	-104.710059	1,262,611.68	3,221,134.61
9,974.00	90.15	356.75	7,396.62	2,517.61	634.69	40.051801	-104.710074	1,262,701.54	3,221,129.63
10,064.00	90.37	359.08	7,396.21	2,607.54	631.42	40.052048	-104.710086	1,262,791.44	3,221,125.56
10,154.00	90.86	358.63	7,395.25	2,697.52	629.62	40.052295	-104.710092	1,262,881.39	3,221,122.96
10,244.00	89.51	359.38	7,394.96	2,787.50	628.06	40.052542	-104.710098	1,262,971.35	3,221,120.60
10,334.00	89.57	0.34	7,395.68	2,877.50	627.84	40.052789	-104.710099	1,263,061.34	3,221,119.58
10,424.00	90.06	359.78	7,395.97	2,967.50	627.93	40.053036	-104.710098	1,263,151.33	3,221,118.87
10,514.00	90.40	2.80	7,395.61	3,057.46	629.96	40.053283	-104.710091	1,263,241.31	3,221,120.10
10,604.00	89.94	1.96	7,395.34	3,147.38	633.69	40.053530	-104.710078	1,263,331.26	3,221,123.04
10,694.00	89.60	0.97	7,395.70	3,237.35	635.99	40.053777	-104.710069	1,263,421.24	3,221,124.54

Design Report for Pettinger 4C-18HZ - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
10,784.00	90.03	359.86	7,395.99	3,327.35	636.65	40.054024	-104.710067	1,263,511.23	3,221,124.39
10,874.00	89.60	358.57	7,396.28	3,417.34	635.41	40.054271	-104.710071	1,263,601.20	3,221,122.36
10,964.00	90.22	2.02	7,396.43	3,507.32	635.88	40.054518	-104.710070	1,263,691.19	3,221,122.02
11,054.00	90.99	0.66	7,395.48	3,597.29	637.98	40.054765	-104.710062	1,263,781.16	3,221,123.33
11,144.00	91.69	0.59	7,393.37	3,687.26	638.96	40.055012	-104.710059	1,263,871.14	3,221,123.51
11,234.00	89.78	0.74	7,392.22	3,777.24	640.01	40.055259	-104.710055	1,263,961.12	3,221,123.76
11,324.00	92.28	2.27	7,390.60	3,867.19	642.37	40.055506	-104.710047	1,264,051.08	3,221,125.32
11,414.00	89.11	0.84	7,389.51	3,957.13	644.81	40.055753	-104.710038	1,264,141.04	3,221,126.96
11,594.00	88.55	0.13	7,393.18	4,137.09	646.33	40.056247	-104.710032	1,264,320.99	3,221,126.89
11,684.00	89.17	359.88	7,394.97	4,227.07	646.34	40.056494	-104.710032	1,264,410.97	3,221,126.10
11,774.00	88.95	359.42	7,396.45	4,317.05	645.79	40.056741	-104.710034	1,264,500.94	3,221,124.75
11,864.00	90.31	358.52	7,397.03	4,407.04	644.18	40.056988	-104.710040	1,264,590.90	3,221,122.33
11,954.00	89.97	358.56	7,396.81	4,497.01	641.88	40.057235	-104.710048	1,264,680.85	3,221,119.24
12,045.00	91.39	358.48	7,395.73	4,587.97	639.53	40.057484	-104.710057	1,264,771.78	3,221,116.08
12,135.00	90.95	357.09	7,393.89	4,677.88	636.05	40.057731	-104.710069	1,264,861.65	3,221,111.80
12,225.00	90.55	357.11	7,392.72	4,767.75	631.50	40.057978	-104.710085	1,264,951.48	3,221,106.45
12,315.00	90.12	356.23	7,392.19	4,857.60	626.27	40.058224	-104.710104	1,265,041.27	3,221,100.43
12,405.00	90.34	356.37	7,391.83	4,947.41	620.47	40.058471	-104.710125	1,265,131.03	3,221,093.82
12,423.00	90.40	356.26	7,391.71	4,965.37	619.31	40.058520	-104.710129	1,265,148.98	3,221,092.51
12,467.00	90.40	356.26	7,391.40	5,009.28	616.44	40.058641	-104.710139	1,265,192.86	3,221,089.25

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
1,024.00	1,023.96	-4.84	-4.17	Tie-On to Gyro Surveys @ 1024.00 FT
1,305.00	1,304.91	-8.60	-0.91	First MWD Survey @ 1305.00'
12,423.00	7,391.71	4,965.37	619.31	Last MWD Survey @ 12423.00'
12,467.00	7,391.40	5,009.28	616.44	St. Line Projection to Bit @ 12467' MD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
User	No Target (Freehand)	359.73	Slot	0.00	0.00	0.00

Design Report for Pettinger 4C-18HZ - Actual Surveys

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
13.00	1,024.00	Surface Gyro Surveys	NS-GYRO-MS
1,305.00	7,858.00	MWD Surveys-Intermediate	MWD+IFR1+SC
7,903.00	12,423.00	MWD Surveys-Lateral	MWD+IFR1+SC

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,213.00	1,212.94	9 5/8"	9-5/8	12-3/4
7,858.00	7,403.51	7"	7	8-3/4

Design Targets

Shape	Target Name	TVD (usft)	Northing (usft)	Easting (usft)	+N/-S usft	+E/-W usft	Created	Updated
Polygon	Pettinger 4C-18HZ_LD	0.00	1,260,178.49	3,220,517.35	0.01	0.00	1/6/2014	1/6/2014
Polygon	Pettinger Pad Sec_line (S)	13.00	1,260,177.45	3,220,439.24	-0.34	-78.11	1/3/2014	1/3/2014

Directional Difficulty Index

Average Dogleg over Survey:	1.99 °/100usft	Maximum Dogleg over Survey:	15.41 °/100usft at 7,811.00 usft
Net Tortousity applicable to Plans:	0.99 °/100usft	Directional Difficulty Index:	6.402

Audit Info

North Reference Sheet for Sec. 18-T1N-R65W - Pettinger 4C-18HZ - Plan B

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to True North Reference.

Vertical Depths are relative to RKB=13' @ 5020.00usft (Ensign 123). Northing and Easting are relative to Pettinger 4C-18HZ

Coordinate System is US State Plane 1983, Colorado Northern Zone using datum North American Datum 1983, ellipsoid GRS 1980

Projection method is Lambert Conformal Conic (2 parallel)

Central Meridian is -105.500000°, Longitude Origin:0.000000°, Latitude Origin:40.783333°

False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99996327

Grid Coordinates of Well: 1,260,178.48 usft N, 3,220,517.35 usft E

Geographical Coordinates of Well: 40° 02' 41.60" N, 104° 42' 44.43" W

Grid Convergence at Surface is: 0.51°

Based upon Minimum Curvature type calculations, at a Measured Depth of 12,467.00usft

the Bottom Hole Displacement is 5,047.07usft in the Direction of 7.02° (True).

Magnetic Convergence at surface is: -7.99° (30 January 2014, , BGGM2013)

