CERTIFIED SURVEY SHEET

HALLIBURTON
Sperry Drilling

OPERATOR:	Anadarko		
WELL:	Pettinger 3N-18HZ		
FIELD:	WATTENBERG		
GRADED ELEVATION:	5,008.00		ft. above MSL
RIG FLOOR (KB) HEIGHT:	13		
TVD REFERENCE:	5021		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:**	8.49
VERTICAL SEC. DIR.:	359.96		

SSDS Job Number:	900984322
Start Date of Job:	2/24/2014
End Date of Job:	3/3/2014
Lead Directional Driller:	Bryan Seghetti
Other SSDS DDs:	Robert Walker
SSDS MWDs:	Evan Ponder
	Nichol Kessinger

Hole Section	**Surface**	**Intermediate**	**Production**	**1st Sidetrack**	**2nd Sidetrack**	**3rd Sidetrack**	**4th Sidetrack**
Hole Size	12.25	8.75	6.125				
Casing Size	9.625"	7.00"	N/A				
Casing Depth	1196	7746	12363				
Survey Type	GYRO	MWD	MWD				
Tie-On Depth	0	1107	7705				
First Survey Depth	13	1210	7768				
Last Survey Depth	1107	7705	12319				
Bit Projection	0	88.5	88.12				

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

Print Name: Bryan Seghetti	Print Name: Evan Ponder
Sign Name: Bryan Seghetti	Sign Name: 4/24/66
Print Name: Robert Walker	Print Name: Nichol Kessinger
Sign Name:	Sign Name: Nichol Kessinger

Examples of Survey Types:

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 3N-18HZ
Wellbore: Plan B
Design: Actual Surveys

Anadarko Petroleum Corporation

HALLIBURTON
Sperry Drilling

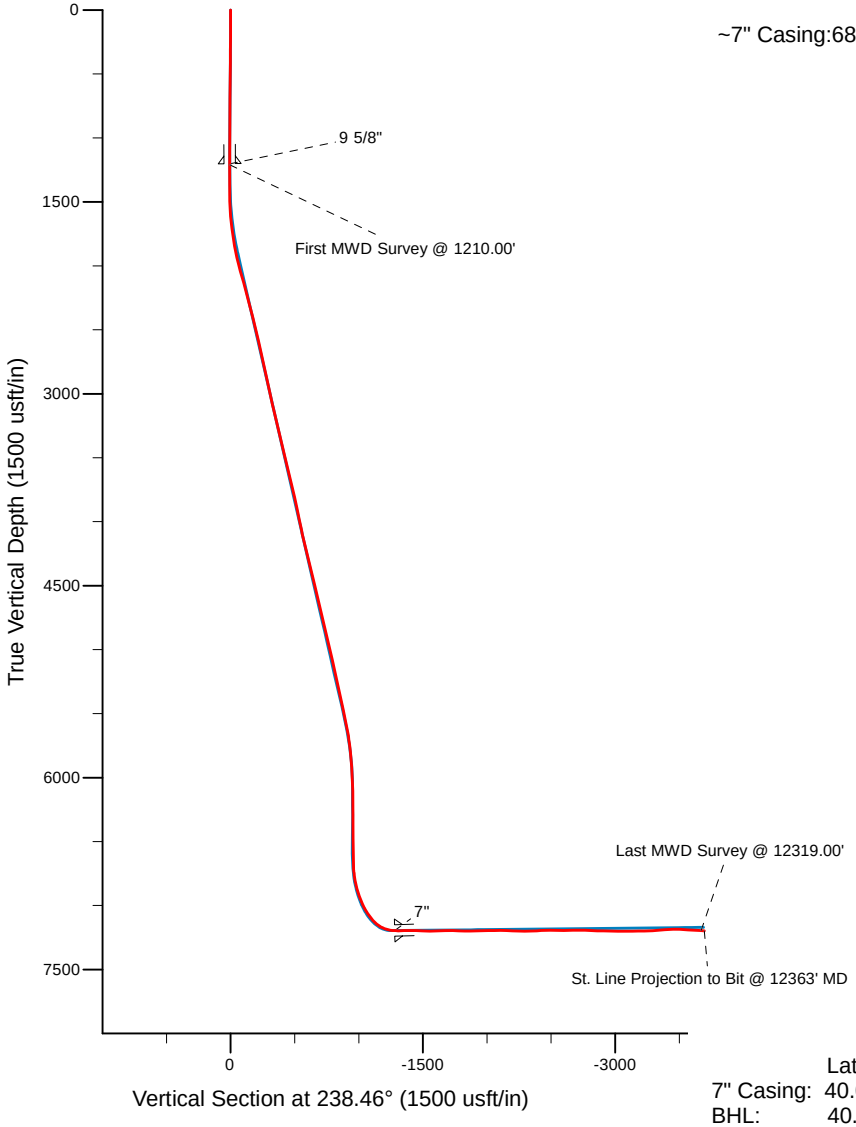
LEGEND

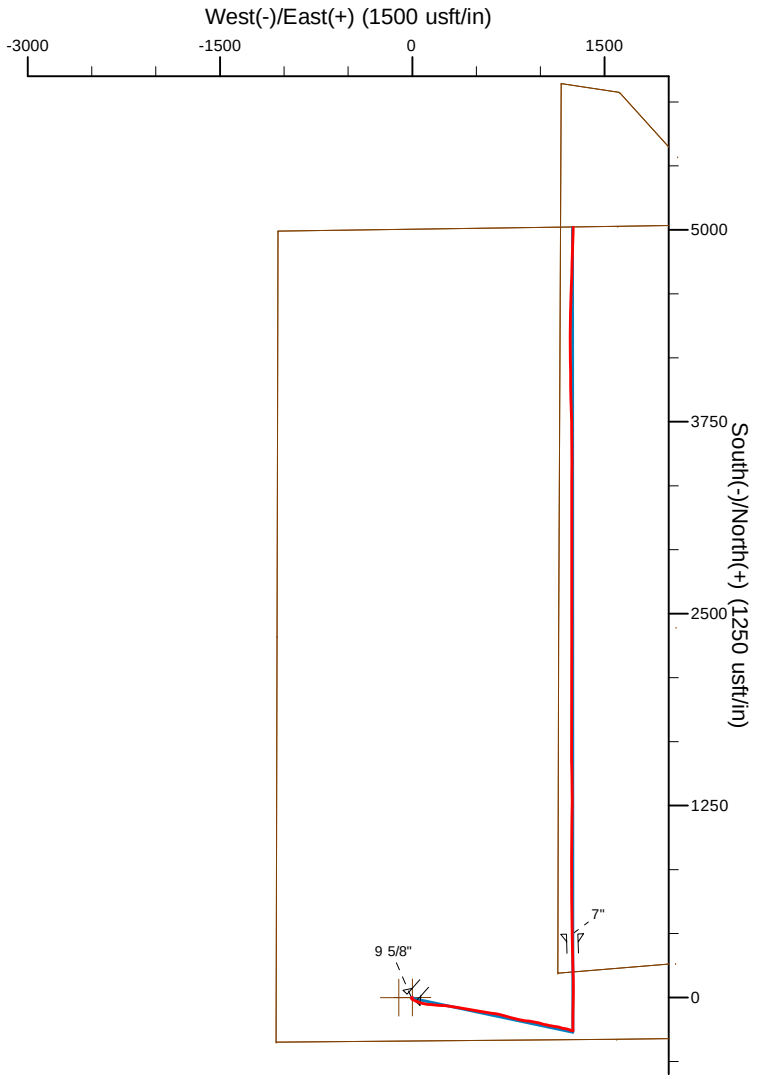
Pettinger 3N-18HZ, Plan B, Rev B0 V0
Actual Surveys

~BHL: 2' FNL:: 2304' FWL

~7" Casing:686' FSL:: 2310' FWL

Sec 18-T1N-R65W





	Latitud	Longitude	Northing	Easting
7" Casing:	40.046026	-104.707788	1,260,603.77	3,221,788.44
BHL:	40.058663	-104.70776	2 1,265,206.86	3,221,754.60

WELL DETAILS: Pettinger 3N-18HZ

Ground Level: 5008.00
RKB=13' @ 5021.00usft (Ensign 123)

Design: Actual Surveys (Pettinger 3N-18HZ/Plan B)

Created By: Pari Amanlou Date: 2-21-2014

Anadarko Petroleum Corp.

Weld County, CO (NAD 83)
Sec. 18-T1N-R65W
Pettinger 3N-18HZ
Job # 900984322::API:05-123-38023
Plan B

Design: Actual Surveys

Sperry Drilling Services

Standard Report

21 August, 2014

Surface UWI : Job # 900984322::API:05-123-38023

Well Coordinates: 1,260,179.08 N, 3,220,543.38 E (40° 02' 41.61" N, 104° 42' 44.09" W)
Ground Level: 5,008.00 usft

Local Coordinate Origin:	Centered on Well Pettinger 3N-18HZ
Viewing Datum:	RKB=13' @ 5021.00usft (Ensign 123)
TVDs to System:	N
North Reference:	True
Unit System:	API - US Survey Feet - Custom

Geodetic Scale Factor Applied
Version: 5000.1 Build: 70

HALLIBURTON

Design Report for Pettinger 3N-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	0.76	226.78	113.00	-0.45	-0.48	-0.45	0.76
213.00	0.22	188.82	212.99	-1.10	-1.00	-1.10	0.60
313.00	0.48	286.93	312.99	-1.17	-1.43	-1.16	0.56
413.00	0.61	264.24	412.99	-1.10	-2.36	-1.10	0.25
513.00	0.77	219.32	512.98	-1.67	-3.31	-1.67	0.55
613.00	0.54	204.42	612.97	-2.62	-3.93	-2.62	0.28
713.00	0.21	99.96	712.97	-3.08	-3.95	-3.08	0.63
813.00	0.26	357.28	812.97	-2.89	-3.78	-2.88	0.37
913.00	0.51	281.49	912.97	-2.57	-4.22	-2.57	0.51
1,013.00	0.58	229.29	1,012.97	-2.81	-5.04	-2.81	0.48
1,107.00	0.21	133.30	1,106.96	-3.24	-5.28	-3.24	0.68
Tie-On to Surface Gyro @ 1107.00 FT							
1,203.00	0.54	221.45	1,202.96	-3.70	-5.45	-3.70	0.60
9 5/8"							
1,210.00	0.58	222.96	1,209.96	-3.75	-5.50	-3.75	0.60
First MWD Survey @ 1210.00'							
1,305.00	0.72	222.48	1,304.96	-4.54	-6.23	-4.54	0.15
1,400.00	2.65	145.87	1,399.92	-6.80	-5.40	-6.80	2.72
1,495.00	3.99	125.48	1,494.76	-10.54	-1.47	-10.54	1.86
1,590.00	7.13	114.28	1,589.30	-14.88	6.59	-14.89	3.48
1,684.00	10.28	108.59	1,682.21	-19.96	19.86	-19.97	3.47
1,777.00	13.41	109.72	1,773.22	-26.24	37.89	-26.27	3.37
1,871.00	16.04	106.96	1,864.13	-33.71	60.57	-33.75	2.89
1,964.00	17.87	99.89	1,953.09	-39.91	86.92	-39.97	2.96
2,058.00	18.99	94.03	2,042.27	-43.46	116.39	-43.54	2.30
2,151.00	18.65	94.73	2,130.30	-45.75	146.31	-45.85	0.44
2,338.00	18.11	94.22	2,307.76	-50.36	205.09	-50.50	0.30
2,526.00	16.24	92.44	2,487.37	-53.63	260.50	-53.81	1.03
2,619.00	15.77	98.12	2,576.77	-55.96	286.00	-56.16	1.76
2,713.00	16.81	98.53	2,667.00	-59.78	312.09	-60.00	1.11
2,806.00	15.46	96.75	2,756.33	-63.24	337.70	-63.47	1.55
2,900.00	15.80	97.41	2,846.86	-66.36	362.83	-66.61	0.41
2,993.00	14.49	96.24	2,936.62	-69.26	386.96	-69.53	1.45
3,087.00	15.98	97.19	3,027.32	-72.15	411.49	-72.44	1.61
3,180.00	18.40	99.96	3,116.16	-76.30	438.65	-76.60	2.75
3,273.00	17.31	98.81	3,204.68	-80.95	466.78	-81.28	1.23
3,363.00	16.22	98.08	3,290.85	-84.77	492.45	-85.12	1.23
3,454.00	17.29	98.11	3,377.99	-88.47	518.43	-88.83	1.18
3,544.00	17.94	99.98	3,463.77	-92.75	545.32	-93.14	0.96
3,634.00	16.27	97.10	3,549.79	-96.72	571.48	-97.11	2.08
3,724.00	17.00	95.91	3,636.02	-99.63	597.08	-100.05	0.90
3,814.00	17.82	97.69	3,721.89	-102.83	623.81	-103.26	1.09
3,904.00	15.91	97.25	3,808.02	-106.23	649.70	-106.68	2.13
3,994.00	16.08	99.45	3,894.54	-109.83	674.23	-110.30	0.70
4,084.00	14.99	103.78	3,981.25	-114.65	697.83	-115.14	1.77
4,174.00	15.94	101.44	4,067.99	-119.87	721.25	-120.38	1.26
4,264.00	18.80	103.45	4,153.88	-125.70	747.48	-126.22	3.25
4,354.00	18.09	102.19	4,239.26	-132.02	775.24	-132.56	0.90

Design Report for Pettinger 3N-18HZ - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
4,444.00	19.78	102.60	4,324.38	-138.29	803.76	-138.86	1.88
4,624.00	17.75	97.72	4,494.82	-148.63	860.68	-149.23	1.42
4,714.00	16.68	94.71	4,580.78	-151.53	887.15	-152.15	1.55
4,894.00	16.71	97.15	4,753.20	-156.87	938.57	-157.53	0.39
4,984.00	16.50	100.82	4,839.45	-160.88	963.96	-161.55	1.19
5,074.00	18.44	102.94	4,925.29	-166.47	990.39	-167.16	2.27
5,164.00	17.07	102.17	5,011.01	-172.44	1,017.18	-173.15	1.54
5,254.00	16.13	99.96	5,097.25	-177.39	1,042.41	-178.12	1.26
5,344.00	15.87	99.04	5,183.77	-181.48	1,066.87	-182.23	0.40
5,434.00	16.93	98.73	5,270.11	-185.41	1,091.98	-186.17	1.18
5,524.00	16.81	97.94	5,356.23	-189.19	1,117.82	-189.97	0.29
5,614.00	16.53	101.62	5,442.45	-193.57	1,143.25	-194.37	1.21
5,704.00	16.20	102.49	5,528.81	-198.86	1,168.05	-199.68	0.46
5,794.00	12.97	96.77	5,615.90	-202.77	1,190.34	-203.60	3.93
5,884.00	11.06	103.52	5,703.93	-205.98	1,208.77	-206.82	2.63
5,974.00	8.30	107.81	5,792.64	-209.99	1,223.35	-210.84	3.17
6,065.00	6.12	103.25	5,882.91	-213.11	1,234.33	-213.97	2.47
6,155.00	3.97	96.61	5,972.56	-214.57	1,242.09	-215.43	2.47
6,335.00	2.48	102.59	6,152.27	-216.13	1,252.08	-217.01	0.85
6,425.00	0.64	145.49	6,242.24	-216.97	1,254.27	-217.85	2.29
6,515.00	0.41	127.77	6,332.23	-217.58	1,254.81	-218.46	0.31
6,605.00	0.25	146.70	6,422.23	-217.94	1,255.17	-218.82	0.21
6,695.00	0.41	238.82	6,512.23	-218.27	1,255.00	-219.15	0.54
6,757.00	0.61	264.44	6,574.23	-218.42	1,254.48	-219.30	0.48
6,785.00	0.49	253.75	6,602.23	-218.47	1,254.22	-219.34	0.56
6,830.00	3.13	353.53	6,647.20	-217.30	1,253.90	-218.18	7.22
6,875.00	7.73	358.45	6,691.99	-213.05	1,253.68	-213.93	10.27
6,920.00	12.80	357.85	6,736.26	-205.04	1,253.41	-205.92	11.27
6,965.00	17.68	357.77	6,779.66	-193.23	1,252.95	-194.10	10.84
7,010.00	21.33	357.90	6,822.07	-178.21	1,252.39	-179.09	8.11
7,055.00	25.62	2.19	6,863.34	-160.30	1,252.46	-161.18	10.26
7,100.00	30.28	1.81	6,903.08	-139.23	1,253.19	-140.11	10.36
7,145.00	34.05	2.10	6,941.17	-115.29	1,254.01	-116.17	8.38
7,190.00	38.33	1.91	6,977.47	-88.74	1,254.94	-89.62	9.51
7,235.00	43.23	0.71	7,011.54	-59.37	1,255.59	-60.25	11.03
7,280.00	48.32	1.00	7,042.92	-27.14	1,256.08	-28.01	11.32
7,325.00	52.41	1.25	7,071.62	7.51	1,256.76	6.63	9.10
7,370.00	56.24	359.74	7,097.86	44.05	1,257.07	43.17	8.94
7,415.00	60.71	359.12	7,121.38	82.40	1,256.68	81.52	10.00
7,460.00	67.00	358.19	7,141.20	122.76	1,255.72	121.88	14.10
7,505.00	71.40	357.90	7,157.17	164.79	1,254.29	163.92	9.80
7,550.00	75.17	358.54	7,170.11	207.86	1,252.95	206.99	8.49
7,595.00	79.05	359.42	7,180.15	251.71	1,252.17	250.84	8.83
7,640.00	82.00	359.31	7,187.56	296.09	1,251.68	295.22	6.56
7,685.00	84.07	358.65	7,193.01	340.75	1,250.88	339.88	4.82
7,705.00	86.70	358.37	7,194.62	360.68	1,250.37	359.80	13.22
7,758.00	89.09	358.29	7,196.57	413.61	1,248.82	412.74	4.51
7"							
7,768.00	89.54	358.28	7,196.69	423.61	1,248.53	422.74	4.51
7,813.00	89.63	357.90	7,197.02	468.58	1,247.03	467.71	0.87
7,903.00	90.52	358.39	7,196.90	558.53	1,244.11	557.67	1.13

Design Report for Pettinger 3N-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	90.83	0.22	7,195.84	648.52	1,243.02	647.65	2.06
8,083.00	88.70	0.04	7,196.21	738.51	1,243.23	737.64	2.38
8,173.00	89.04	359.88	7,197.98	828.49	1,243.16	827.63	0.42
8,263.00	89.72	359.92	7,198.96	918.49	1,243.01	917.62	0.76
8,353.00	89.88	0.98	7,199.27	1,008.48	1,243.71	1,007.61	1.19
8,443.00	91.20	1.43	7,198.42	1,098.46	1,245.60	1,097.59	1.55
8,533.00	91.05	1.18	7,196.65	1,188.42	1,247.65	1,187.54	0.32
8,623.00	89.11	359.94	7,196.53	1,278.41	1,248.53	1,277.53	2.56
8,713.00	89.20	359.31	7,197.86	1,368.39	1,247.94	1,367.52	0.71
8,803.00	89.08	357.93	7,199.21	1,458.35	1,245.78	1,457.48	1.54
8,893.00	90.65	358.66	7,199.42	1,548.31	1,243.10	1,547.44	1.92
8,983.00	90.93	0.39	7,198.18	1,638.30	1,242.35	1,637.43	1.95
9,163.00	90.15	0.43	7,196.48	1,818.28	1,243.64	1,817.41	0.43
9,253.00	90.89	359.87	7,195.67	1,908.28	1,243.88	1,907.41	1.03
9,343.00	89.35	0.14	7,195.48	1,998.27	1,243.89	1,997.41	1.74
9,433.00	89.20	359.39	7,196.62	2,088.27	1,243.52	2,087.40	0.85
9,523.00	89.14	0.08	7,197.92	2,178.25	1,243.10	2,177.39	0.77
9,613.00	88.95	359.49	7,199.42	2,268.24	1,242.76	2,267.37	0.69
9,703.00	89.85	1.34	7,200.36	2,358.23	1,243.41	2,357.36	2.29
9,883.00	92.10	359.95	7,197.30	2,538.18	1,245.44	2,537.31	1.47
9,973.00	91.42	359.57	7,194.53	2,628.13	1,245.06	2,627.26	0.87
10,063.00	89.57	359.56	7,193.76	2,718.12	1,244.38	2,717.25	2.06
10,153.00	90.06	0.20	7,194.05	2,808.12	1,244.19	2,807.25	0.90
10,333.00	89.88	359.90	7,194.14	2,988.12	1,244.35	2,987.25	0.19
10,423.00	91.17	359.66	7,193.32	3,078.11	1,244.00	3,077.24	1.46
10,603.00	88.67	0.07	7,193.57	3,258.10	1,243.58	3,257.23	1.41
10,693.00	88.74	0.64	7,195.60	3,348.07	1,244.14	3,347.20	0.64
10,783.00	89.14	0.36	7,197.27	3,438.05	1,244.92	3,437.18	0.54
10,874.00	89.32	0.21	7,198.49	3,529.04	1,245.38	3,528.17	0.26
10,964.00	89.41	359.42	7,199.49	3,619.04	1,245.08	3,618.17	0.88
11,054.00	89.48	358.66	7,200.36	3,709.02	1,243.58	3,708.15	0.85
11,144.00	89.57	357.76	7,201.11	3,798.97	1,240.77	3,798.11	1.00
11,234.00	90.31	358.12	7,201.20	3,888.91	1,237.53	3,888.05	0.91
11,324.00	90.89	359.73	7,200.26	3,978.89	1,235.84	3,978.03	1.90
11,414.00	90.15	359.37	7,199.44	4,068.88	1,235.14	4,068.02	0.91
11,504.00	89.88	359.69	7,199.42	4,158.88	1,234.40	4,158.02	0.47
11,684.00	93.27	0.06	7,194.47	4,338.78	1,234.00	4,337.92	1.89
11,774.00	92.16	0.54	7,190.21	4,428.68	1,234.47	4,427.82	1.34
11,864.00	91.88	2.05	7,187.03	4,518.60	1,236.51	4,517.73	1.71
11,954.00	90.37	2.42	7,185.27	4,608.51	1,240.02	4,607.64	1.73
12,044.00	88.03	2.32	7,186.52	4,698.42	1,243.74	4,697.55	2.60
12,134.00	87.93	2.32	7,189.70	4,788.29	1,247.38	4,787.42	0.11
12,224.00	88.12	2.29	7,192.80	4,878.16	1,251.00	4,877.29	0.21
12,319.00	88.12	1.87	7,195.92	4,973.05	1,254.44	4,972.17	0.44
Last MWD Survey @ 12319.00'							
12,363.00	88.12	1.87	7,197.36	5,017.00	1,255.88	5,016.12	0.00
St. Line Projection to Bit @ 12363' MD							

Design Report for Pettinger 3N-18HZ - Actual Surveys

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Comment
1,107.00	1,106.96	-3.24	-5.28	Tie-On to Surface Gyro @ 1107.00 FT
1,210.00	1,209.96	-3.75	-5.50	First MWD Survey @ 1210.00'
12,319.00	7,195.92	4,973.05	1,254.44	Last MWD Survey @ 12319.00'
12,363.00	7,197.36	5,017.00	1,255.88	St. Line Projection to Bit @ 12363' MD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (usft)	Origin +E/-W (usft)	Start TVD (usft)
User	No Target (Freehand)	359.96	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
13.00	1,107.00	Surface Gyro Surveys	NS-GYRO-MS
1,210.00	7,705.00	MWD Surveys-Intermediate	MWD+IFR1+SC
7,768.00	12,319.00	MWD Surveys-Lateral	MWD+IFR1+SC

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,203.00	1,202.96	9 5/8"	9-5/8	12-3/4
7,758.00	7,196.57	7"	7	8-3/4

Design Report for Pettinger 3N-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
Pettinger3N- 18 HZ SH	0.00	0.00	0.00	0.02	0.00	1,260,179.10	3,220,543.38	40° 2' 41.608 N	104° 42' 44.093 W
- actual wellpath misses target center by 0.02usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Point									
Pe6ttinger 3N-18HZ_L	0.00	0.00	0.00	0.01	0.00	1,260,179.09	3,220,543.38	40° 2' 41.607 N	104° 42' 44.093 W
- 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	2,340.54	1,142.77	1,262,529.60	3,221,665.27		
Point 2			0.00	157.61	1,136.44	1,260,346.78	3,221,678.33		
Point 3			0.00	222.40	2,054.61	1,260,419.72	3,222,595.86		
Point 4			0.00	2,412.37	2,058.24	1,262,609.56	3,222,580.03		
Point 5			0.00	5,475.68	2,070.17	1,265,672.74	3,222,564.75		
Point 6			0.00	5,895.10	1,615.63	1,266,088.09	3,222,106.52		
Point 7			0.00	5,953.20	1,161.10	1,266,142.15	3,221,651.51		
Pettinger Pad 460' SB_	0.00	0.00	14.00	-0.71	-104.15	1,260,177.45	3,220,439.24	40° 2' 41.600 N	104° 42' 45.432 W
- actual wellpath misses target center by 104.16usft at 14.51usft MD (14.51 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			14.00	4,538.44	-485.47	1,264,711.23	3,219,913.49		
Point 2			14.00	4,563.79	1,707.93	1,264,756.06	3,222,106.50		
Point 3			14.00	4,589.01	3,899.55	1,264,800.75	3,224,297.73		
Point 4			14.00	2,397.70	3,895.38	1,262,609.57	3,224,313.03		
Point 5			14.00	207.73	3,891.76	1,260,419.73	3,224,328.86		
Point 6			14.00	188.59	1,699.60	1,260,381.12	3,222,137.04		
Point 7			14.00	173.76	-497.41	1,260,346.78	3,219,940.33		
Point 8			14.00	2,356.69	-491.08	1,262,529.60	3,219,927.27		
Point 9			14.00	4,538.44	-485.47	1,264,711.23	3,219,913.49		
Pettinger Pad Sec_lin	0.00	0.00	14.00	-0.71	-104.15	1,260,177.45	3,220,439.24	40° 2' 41.600 N	104° 42' 45.432 W
- actual wellpath misses target center by 104.16usft at 14.51usft MD (14.51 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			14.00	4,993.18	-944.31	1,265,161.86	3,219,450.65		
Point 2			14.00	5,023.85	1,708.86	1,265,216.10	3,222,103.34		
Point 3			14.00	5,054.36	4,360.46	1,265,270.16	3,224,754.47		
Point 4			14.00	2,401.97	4,355.40	1,262,617.93	3,224,772.97		
Point 5			14.00	-248.30	4,351.02	1,259,967.82	3,224,792.14		
Point 6			14.00	-271.45	1,698.78	1,259,921.11	3,222,140.30		
Point 7			14.00	-289.38	-958.77	1,259,879.57	3,219,483.12		
Point 8			14.00	2,352.37	-951.11	1,262,521.19	3,219,467.31		
Point 9			14.00	4,993.18	-944.31	1,265,161.86	3,219,450.65		
Pettinger3N- 18 HZ BH	0.00	0.00	7,171.00	5,017.41	1,201.71	1,265,206.78	3,221,700.43	40° 3' 31.190 N	104° 42' 28.638 W
- actual wellpath misses target center by 60.20usft at 12360.77usft MD (7197.29 TVD, 5014.78 N, 1255.80 E)									
- Point									
Pettinger3N- 18 HZ BH	0.00	0.00	7,171.00	5,017.41	1,250.00	1,265,207.21	3,221,748.72	40° 3' 31.190 N	104° 42' 28.017 W
- actual wellpath misses target center by 27.00usft at 12362.35usft MD (7197.34 TVD, 5016.35 N, 1255.86 E)									
- Point									

Directional Difficulty Index

Average Dogleg over Survey:	1.90 °/100usft	Maximum Dogleg over Survey:	14.10 °/100usft at 7,460.00 usft
Net Tortousity applicable to Plans:	0.84 °/100usft	Directional Difficulty Index:	6.421

Audit Info

North Reference Sheet for Sec. 18-T1N-R65W - Pettinger 3N-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' @ 5021.00usft (Ensign 123). Northing and Easting are relative to Pettinger 3N-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° 30' 0.000 W°, Longitude Origin:0° 0' 0.000 E°, Latitude Origin:40° 47' 0.000 N°

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

Grid Coordinates of Well: 1,260,179.08 usft N, 3,220,543.38 usft E

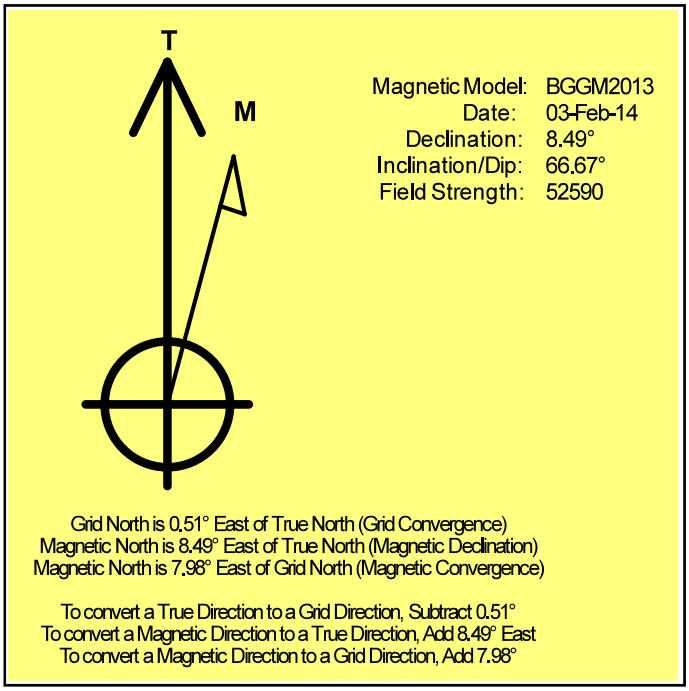
Geographical Coordinates of Well: 40° 02' 41.61" N, 104° 42' 44.09" W

Grid Convergence at Surface is: 0.51°

Based upon Minimum Curvature type calculations, at a Measured Depth of 12,363.00usft

the Bottom Hole Displacement is 5,171.80usft in the Direction of 14.05° (True).

Magnetic Convergence at surface is: -7.98° (3 February 2014, , BGGM2013)



Anadarko Petroleum Corp.

Weld County, CO (NAD 83)
Sec. 18-T1N-R65W
Pettinger 3N-18HZ
Job # 900984322::API:05-123-38023
Plan B

Design: Actual Surveys

Sperry Drilling Services

Geodetic Report

25 August, 2014

Well Coordinates: 1,260,179.08 N, 3,220,543.38 E (40° 02' 41.61" N, 104° 42' 44.09" W)
Ground Level: 5,008.00 usft

Local Coordinate Origin:	Centered on Well Pettinger 3N-18HZ
Viewing Datum:	RKB=13' @ 5021.00usft (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 3N-18HZ - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Geographic Coordinates Latitude (usft)	Geographic Coordinates Longitude (usft)	UTM Coordinates Northing (usft)	UTM Coordinates Easting (usft)
0.00	0.00	0.00	0.00	0.00	0.00	40.044891	-104.712248	1,260,179.08	3,220,543.38
13.00	0.00	0.00	13.00	0.00	0.00	40.044891	-104.712248	1,260,179.08	3,220,543.38
113.00	0.76	226.78	113.00	-0.45	-0.48	40.044890	-104.712250	1,260,178.62	3,220,542.90
213.00	0.22	188.82	212.99	-1.10	-1.00	40.044888	-104.712252	1,260,177.98	3,220,542.39
313.00	0.48	286.93	312.99	-1.17	-1.43	40.044888	-104.712253	1,260,177.90	3,220,541.96
413.00	0.61	264.24	412.99	-1.10	-2.36	40.044888	-104.712257	1,260,177.96	3,220,541.03
513.00	0.77	219.32	512.98	-1.67	-3.31	40.044886	-104.712260	1,260,177.38	3,220,540.08
613.00	0.54	204.42	612.97	-2.62	-3.93	40.044884	-104.712262	1,260,176.43	3,220,539.47
713.00	0.21	99.96	712.97	-3.08	-3.95	40.044883	-104.712262	1,260,175.97	3,220,539.46
813.00	0.26	357.28	812.97	-2.89	-3.78	40.044883	-104.712262	1,260,176.16	3,220,539.63
913.00	0.51	281.49	912.97	-2.57	-4.22	40.044884	-104.712263	1,260,176.47	3,220,539.18
1,013.00	0.58	229.29	1,012.97	-2.81	-5.04	40.044883	-104.712266	1,260,176.23	3,220,538.36
1,107.00	0.21	133.30	1,106.96	-3.24	-5.28	40.044882	-104.712267	1,260,175.80	3,220,538.13
1,203.00	0.54	221.45	1,202.96	-3.70	-5.45	40.044881	-104.712268	1,260,175.33	3,220,537.96
1,210.00	0.58	222.96	1,209.96	-3.75	-5.50	40.044881	-104.712268	1,260,175.28	3,220,537.92
1,305.00	0.72	222.48	1,304.96	-4.54	-6.23	40.044879	-104.712271	1,260,174.48	3,220,537.19
1,400.00	2.65	145.87	1,399.92	-6.80	-5.40	40.044872	-104.712268	1,260,172.23	3,220,538.04
1,495.00	3.99	125.48	1,494.76	-10.54	-1.47	40.044862	-104.712254	1,260,168.53	3,220,542.00
1,590.00	7.13	114.28	1,589.30	-14.88	6.59	40.044850	-104.712225	1,260,164.26	3,220,550.11
1,684.00	10.28	108.59	1,682.21	-19.96	19.86	40.044836	-104.712177	1,260,159.30	3,220,563.42
1,777.00	13.41	109.72	1,773.22	-26.24	37.89	40.044819	-104.712113	1,260,153.18	3,220,581.50
1,871.00	16.04	106.96	1,864.13	-33.71	60.57	40.044798	-104.712032	1,260,145.91	3,220,604.25
1,964.00	17.87	99.89	1,953.09	-39.91	86.92	40.044781	-104.711938	1,260,139.95	3,220,630.65
2,058.00	18.99	94.03	2,042.27	-43.46	116.39	40.044772	-104.711833	1,260,136.66	3,220,660.15
2,151.00	18.65	94.73	2,130.30	-45.75	146.31	40.044765	-104.711726	1,260,134.63	3,220,690.08
2,338.00	18.11	94.22	2,307.76	-50.36	205.09	40.044753	-104.711516	1,260,130.55	3,220,748.90
2,526.00	16.24	92.44	2,487.37	-53.63	260.50	40.044744	-104.711318	1,260,127.77	3,220,804.34
2,619.00	15.77	98.12	2,576.77	-55.96	286.00	40.044737	-104.711227	1,260,125.66	3,220,829.86
2,713.00	16.81	98.53	2,667.00	-59.78	312.09	40.044727	-104.711134	1,260,122.07	3,220,855.98
2,806.00	15.46	96.75	2,756.33	-63.24	337.70	40.044717	-104.711042	1,260,118.85	3,220,881.62
2,900.00	15.80	97.41	2,846.86	-66.36	362.83	40.044709	-104.710952	1,260,115.95	3,220,906.78
2,993.00	14.49	96.24	2,936.62	-69.26	386.96	40.044701	-104.710866	1,260,113.27	3,220,930.92
3,087.00	15.98	97.19	3,027.32	-72.15	411.49	40.044693	-104.710779	1,260,110.59	3,220,955.48
3,180.00	18.40	99.96	3,116.16	-76.30	438.65	40.044682	-104.710682	1,260,106.69	3,220,982.67
3,273.00	17.31	98.81	3,204.68	-80.95	466.78	40.044669	-104.710581	1,260,102.28	3,221,010.84
3,363.00	16.22	98.08	3,290.85	-84.77	492.45	40.044658	-104.710489	1,260,098.69	3,221,036.55
3,454.00	17.29	98.11	3,377.99	-88.47	518.43	40.044648	-104.710397	1,260,095.23	3,221,062.55
3,544.00	17.94	99.98	3,463.77	-92.75	545.32	40.044636	-104.710301	1,260,091.18	3,221,089.48
3,634.00	16.27	97.10	3,549.79	-96.72	571.48	40.044626	-104.710207	1,260,087.45	3,221,115.68
3,724.00	17.00	95.91	3,636.02	-99.63	597.08	40.044618	-104.710116	1,260,084.76	3,221,141.30
3,814.00	17.82	97.69	3,721.89	-102.83	623.81	40.044609	-104.710020	1,260,081.80	3,221,168.06
3,904.00	15.91	97.25	3,808.02	-106.23	649.70	40.044599	-104.709928	1,260,078.64	3,221,193.98

Design Report for Pettinger 3N-18HZ - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Geographic Coordinates Latitude (usft)	Geographic Coordinates Longitude (usft)	UTM Coordinates Northing (usft)	UTM Coordinates Easting (usft)
3,994.00	16.08	99.45	3,894.54	-109.83	674.23	40.044590	-104.709840	1,260,075.25	3,221,218.54
4,084.00	14.99	103.78	3,981.25	-114.65	697.83	40.044576	-104.709756	1,260,070.64	3,221,242.18
4,174.00	15.94	101.44	4,067.99	-119.87	721.25	40.044562	-104.709672	1,260,065.63	3,221,265.64
4,264.00	18.80	103.45	4,153.88	-125.70	747.48	40.044546	-104.709579	1,260,060.03	3,221,291.92
4,354.00	18.09	102.19	4,239.26	-132.02	775.24	40.044529	-104.709479	1,260,053.96	3,221,319.73
4,444.00	19.78	102.60	4,324.38	-138.29	803.76	40.044511	-104.709377	1,260,047.94	3,221,348.31
4,624.00	17.75	97.72	4,494.82	-148.63	860.68	40.044483	-104.709174	1,260,038.11	3,221,405.32
4,714.00	16.68	94.71	4,580.78	-151.53	887.15	40.044475	-104.709080	1,260,035.44	3,221,431.81
4,894.00	16.71	97.15	4,753.20	-156.87	938.57	40.044460	-104.708896	1,260,030.56	3,221,483.27
4,984.00	16.50	100.82	4,839.45	-160.88	963.96	40.044449	-104.708805	1,260,026.78	3,221,508.70
5,074.00	18.44	102.94	4,925.29	-166.47	990.39	40.044434	-104.708711	1,260,021.42	3,221,535.18
5,164.00	17.07	102.17	5,011.01	-172.44	1,017.18	40.044418	-104.708615	1,260,015.69	3,221,562.01
5,254.00	16.13	99.96	5,097.25	-177.39	1,042.41	40.044404	-104.708525	1,260,010.97	3,221,587.28
5,344.00	15.87	99.04	5,183.77	-181.48	1,066.87	40.044393	-104.708438	1,260,007.09	3,221,611.78
5,434.00	16.93	98.73	5,270.11	-185.41	1,091.98	40.044382	-104.708348	1,260,003.39	3,221,636.92
5,524.00	16.81	97.94	5,356.23	-189.19	1,117.82	40.044372	-104.708256	1,259,999.83	3,221,662.80
5,614.00	16.53	101.62	5,442.45	-193.57	1,143.25	40.044360	-104.708165	1,259,995.68	3,221,688.26
5,704.00	16.20	102.49	5,528.81	-198.86	1,168.05	40.044345	-104.708076	1,259,990.61	3,221,713.11
5,794.00	12.97	96.77	5,615.90	-202.77	1,190.34	40.044334	-104.707997	1,259,986.90	3,221,735.43
5,884.00	11.06	103.52	5,703.93	-205.98	1,208.77	40.044326	-104.707931	1,259,983.86	3,221,753.89
5,974.00	8.30	107.81	5,792.64	-209.99	1,223.35	40.044315	-104.707879	1,259,979.98	3,221,768.50
6,065.00	6.12	103.25	5,882.91	-213.11	1,234.33	40.044306	-104.707840	1,259,976.96	3,221,779.51
6,155.00	3.97	96.61	5,972.56	-214.57	1,242.09	40.044302	-104.707812	1,259,975.57	3,221,787.28
6,335.00	2.48	102.59	6,152.27	-216.13	1,252.08	40.044298	-104.707776	1,259,974.09	3,221,797.29
6,425.00	0.64	145.49	6,242.24	-216.97	1,254.27	40.044295	-104.707768	1,259,973.27	3,221,799.48
6,515.00	0.41	127.77	6,332.23	-217.58	1,254.81	40.044294	-104.707767	1,259,972.66	3,221,800.03
6,605.00	0.25	146.70	6,422.23	-217.94	1,255.17	40.044293	-104.707765	1,259,972.30	3,221,800.39
6,695.00	0.41	238.82	6,512.23	-218.27	1,255.00	40.044292	-104.707766	1,259,971.97	3,221,800.23
6,757.00	0.61	264.44	6,574.23	-218.42	1,254.48	40.044291	-104.707768	1,259,971.82	3,221,799.71
6,785.00	0.49	253.75	6,602.23	-218.47	1,254.22	40.044291	-104.707769	1,259,971.77	3,221,799.45
6,830.00	3.13	353.53	6,647.20	-217.30	1,253.90	40.044294	-104.707770	1,259,972.94	3,221,799.11
6,875.00	7.73	358.45	6,691.99	-213.05	1,253.68	40.044306	-104.707771	1,259,977.18	3,221,798.85
6,920.00	12.80	357.85	6,736.26	-205.04	1,253.41	40.044328	-104.707772	1,259,985.19	3,221,798.51
6,965.00	17.68	357.77	6,779.66	-193.23	1,252.95	40.044361	-104.707773	1,259,997.00	3,221,797.96
7,010.00	21.33	357.90	6,822.07	-178.21	1,252.39	40.044402	-104.707775	1,260,012.01	3,221,797.26
7,055.00	25.62	2.19	6,863.34	-160.30	1,252.46	40.044451	-104.707775	1,260,029.92	3,221,797.17
7,100.00	30.28	1.81	6,903.08	-139.23	1,253.19	40.044509	-104.707772	1,260,050.99	3,221,797.71
7,145.00	34.05	2.10	6,941.17	-115.29	1,254.01	40.044574	-104.707769	1,260,074.94	3,221,798.32
7,190.00	38.33	1.91	6,977.47	-88.74	1,254.94	40.044647	-104.707766	1,260,101.49	3,221,799.01
7,235.00	43.23	0.71	7,011.54	-59.37	1,255.59	40.044728	-104.707764	1,260,130.87	3,221,799.41
7,280.00	48.32	1.00	7,042.92	-27.14	1,256.08	40.044816	-104.707762	1,260,163.11	3,221,799.61
7,325.00	52.41	1.25	7,071.62	7.51	1,256.76	40.044912	-104.707759	1,260,197.75	3,221,799.98

Design Report for Pettinger 3N-18HZ - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Geographic Coordinates Latitude (usft)	Geographic Coordinates Longitude (usft)	UTM Coordinates Northing (usft)	UTM Coordinates Easting (usft)
7,370.00	56.24	359.74	7,097.86	44.05	1,257.07	40.045012	-104.707758	1,260,234.30	3,221,799.96
7,415.00	60.71	359.12	7,121.38	82.40	1,256.68	40.045117	-104.707760	1,260,272.64	3,221,799.23
7,460.00	67.00	358.19	7,141.20	122.76	1,255.72	40.045228	-104.707763	1,260,312.99	3,221,797.92
7,505.00	71.40	357.90	7,157.17	164.79	1,254.29	40.045343	-104.707768	1,260,355.00	3,221,796.11
7,550.00	75.17	358.54	7,170.11	207.86	1,252.95	40.045462	-104.707773	1,260,398.06	3,221,794.39
7,595.00	79.05	359.42	7,180.15	251.71	1,252.17	40.045582	-104.707776	1,260,441.90	3,221,793.22
7,640.00	82.00	359.31	7,187.56	296.09	1,251.68	40.045704	-104.707778	1,260,486.27	3,221,792.34
7,685.00	84.07	358.65	7,193.01	340.75	1,250.88	40.045826	-104.707780	1,260,530.92	3,221,791.14
7,705.00	86.70	358.37	7,194.62	360.68	1,250.37	40.045881	-104.707782	1,260,550.84	3,221,790.45
7,758.00	89.09	358.29	7,196.57	413.61	1,248.82	40.046026	-104.707788	1,260,603.76	3,221,788.44
7,768.00	89.54	358.28	7,196.69	423.61	1,248.53	40.046054	-104.707789	1,260,613.75	3,221,788.05
7,813.00	89.63	357.90	7,197.02	468.58	1,247.03	40.046177	-104.707794	1,260,658.71	3,221,786.15
7,903.00	90.52	358.39	7,196.90	558.53	1,244.11	40.046424	-104.707805	1,260,748.63	3,221,782.44
7,993.00	90.83	0.22	7,195.84	648.52	1,243.02	40.046671	-104.707808	1,260,838.59	3,221,780.55
8,083.00	88.70	0.04	7,196.21	738.51	1,243.23	40.046918	-104.707808	1,260,928.58	3,221,779.95
8,173.00	89.04	359.88	7,197.98	828.49	1,243.16	40.047165	-104.707808	1,261,018.56	3,221,779.09
8,263.00	89.72	359.92	7,198.96	918.49	1,243.01	40.047412	-104.707808	1,261,108.54	3,221,778.13
8,353.00	89.88	0.98	7,199.27	1,008.48	1,243.71	40.047659	-104.707806	1,261,198.54	3,221,778.04
8,443.00	91.20	1.43	7,198.42	1,098.46	1,245.60	40.047906	-104.707799	1,261,288.52	3,221,779.13
8,533.00	91.05	1.18	7,196.65	1,188.42	1,247.65	40.048153	-104.707792	1,261,378.49	3,221,780.38
8,623.00	89.11	359.94	7,196.53	1,278.41	1,248.53	40.048400	-104.707789	1,261,468.48	3,221,780.46
8,713.00	89.20	359.31	7,197.86	1,368.39	1,247.94	40.048647	-104.707791	1,261,558.46	3,221,779.07
8,803.00	89.08	357.93	7,199.21	1,458.35	1,245.78	40.048894	-104.707798	1,261,648.39	3,221,776.11
8,893.00	90.65	358.66	7,199.42	1,548.31	1,243.10	40.049141	-104.707808	1,261,738.32	3,221,772.63
8,983.00	90.93	0.39	7,198.18	1,638.30	1,242.35	40.049388	-104.707811	1,261,828.29	3,221,771.09
9,163.00	90.15	0.43	7,196.48	1,818.28	1,243.64	40.049882	-104.707806	1,262,008.27	3,221,770.78
9,253.00	90.89	359.87	7,195.67	1,908.28	1,243.88	40.050129	-104.707805	1,262,098.26	3,221,770.21
9,343.00	89.35	0.14	7,195.48	1,998.27	1,243.89	40.050376	-104.707805	1,262,188.25	3,221,769.42
9,433.00	89.20	359.39	7,196.62	2,088.27	1,243.52	40.050623	-104.707806	1,262,278.23	3,221,768.25
9,523.00	89.14	0.08	7,197.92	2,178.25	1,243.10	40.050870	-104.707808	1,262,368.21	3,221,767.04
9,613.00	88.95	359.49	7,199.42	2,268.24	1,242.76	40.051117	-104.707809	1,262,458.19	3,221,765.90
9,703.00	89.85	1.34	7,200.36	2,358.23	1,243.41	40.051364	-104.707807	1,262,548.18	3,221,765.75
9,883.00	92.10	359.95	7,197.30	2,538.18	1,245.44	40.051858	-104.707799	1,262,728.13	3,221,766.18
9,973.00	91.42	359.57	7,194.53	2,628.13	1,245.06	40.052105	-104.707801	1,262,818.07	3,221,765.00
10,063.00	89.57	359.56	7,193.76	2,718.12	1,244.38	40.052352	-104.707803	1,262,908.05	3,221,763.52
10,153.00	90.06	0.20	7,194.05	2,808.12	1,244.19	40.052599	-104.707804	1,262,998.04	3,221,762.53
10,333.00	89.88	359.90	7,194.14	2,988.12	1,244.35	40.053094	-104.707803	1,263,178.03	3,221,761.09
10,423.00	91.17	359.66	7,193.32	3,078.11	1,244.00	40.053341	-104.707805	1,263,268.01	3,221,759.95
10,603.00	88.67	0.07	7,193.57	3,258.10	1,243.58	40.053835	-104.707806	1,263,447.98	3,221,757.92
10,693.00	88.74	0.64	7,195.60	3,348.07	1,244.14	40.054082	-104.707804	1,263,537.95	3,221,757.68
10,783.00	89.14	0.36	7,197.27	3,438.05	1,244.92	40.054329	-104.707801	1,263,627.93	3,221,757.67
10,874.00	89.32	0.21	7,198.49	3,529.04	1,245.38	40.054578	-104.707800	1,263,718.92	3,221,757.31

Design Report for Pettinger 3N-18HZ - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Geographic Coordinates Latitude (usft)	Geographic Coordinates Longitude (usft)	UTM Coordinates Northing (usft)	UTM Coordinates Easting (usft)
10,964.00	89.41	359.42	7,199.49	3,619.04	1,245.08	40.054825	-104.707801	1,263,808.90	3,221,756.22
11,054.00	89.48	358.66	7,200.36	3,709.02	1,243.58	40.055072	-104.707806	1,263,898.87	3,221,753.91
11,144.00	89.57	357.76	7,201.11	3,798.97	1,240.77	40.055319	-104.707816	1,263,988.79	3,221,750.30
11,234.00	90.31	358.12	7,201.20	3,888.91	1,237.53	40.055566	-104.707827	1,264,078.69	3,221,746.27
11,324.00	90.89	359.73	7,200.26	3,978.89	1,235.84	40.055813	-104.707834	1,264,168.65	3,221,743.78
11,414.00	90.15	359.37	7,199.44	4,068.88	1,235.14	40.056060	-104.707836	1,264,258.63	3,221,742.28
11,504.00	89.88	359.69	7,199.42	4,158.88	1,234.40	40.056307	-104.707839	1,264,348.61	3,221,740.74
11,684.00	93.27	0.06	7,194.47	4,338.78	1,234.00	40.056801	-104.707840	1,264,528.50	3,221,738.75
11,774.00	92.16	0.54	7,190.21	4,428.68	1,234.47	40.057048	-104.707838	1,264,618.39	3,221,738.42
11,864.00	91.88	2.05	7,187.03	4,518.60	1,236.51	40.057295	-104.707831	1,264,708.32	3,221,739.65
11,954.00	90.37	2.42	7,185.27	4,608.51	1,240.02	40.057542	-104.707818	1,264,798.26	3,221,742.36
12,044.00	88.03	2.32	7,186.52	4,698.42	1,243.74	40.057788	-104.707805	1,264,888.19	3,221,745.29
12,134.00	87.93	2.32	7,189.70	4,788.29	1,247.38	40.058035	-104.707792	1,264,978.09	3,221,748.13
12,224.00	88.12	2.29	7,192.80	4,878.16	1,251.00	40.058282	-104.707779	1,265,067.98	3,221,750.95
12,319.00	88.12	1.87	7,195.92	4,973.05	1,254.44	40.058542	-104.707767	1,265,162.89	3,221,753.55
12,363.00	88.12	1.87	7,197.36	5,017.00	1,255.88	40.058663	-104.707762	1,265,206.86	3,221,754.60

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Comment
1,107.00	1,106.96	-3.24	-5.28	Tie-On to Surface Gyro @ 1107.00 FT
1,210.00	1,209.96	-3.75	-5.50	First MWD Survey @ 1210.00'
12,319.00	7,195.92	4,973.05	1,254.44	Last MWD Survey @ 12319.00'
12,363.00	7,197.36	5,017.00	1,255.88	St. Line Projection to Bit @ 12363' MD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (usft)	Origin +E/-W (usft)	Start TVD (usft)
User	No Target (Freehand)	359.96	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
13.00	1,107.00	Surface Gyro Surveys	NS-GYRO-MS
1,210.00	7,705.00	MWD Surveys-Intermediate	MWD+IFR1+SC

Design Report for Pettinger 3N-18HZ - Actual Surveys

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
7,768.00	12,319.00	MWD Surveys-Lateral	MWD+IFR1+SC

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,203.00	1,202.96	9 5/8"	9-5/8	12-3/4
7,758.00	7,196.57	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	Pe6ttinger 3N-18HZ_LD	0.00	1,260,179.09	3,220,543.38	0.01	0.00	1/6/2014	1/13/2014
Polygon	Pettinger Pad Sec_line (S	14.00	1,260,177.45	3,220,439.24	-0.71	-104.15	1/3/2014	1/3/2014

Directional Difficulty Index

Average Dogleg over Survey:	1.90 °/100usft	Maximum Dogleg over Survey:	14.10 °/100usft at 7,460.00 usft
Net Tortousity applicable to Plans:	0.84 °/100usft	Directional Difficulty Index:	6.421

Audit Info

North Reference Sheet for Sec. 18-T1N-R65W - Pettinger 3N-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' @ 5021.00usft (Ensign 123). Northing and Easting are relative to Pettinger 3N-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: 1,260,179.08 usft N, 3,220,543.38 usft E

Geographical Coordinates of Well: 40° 02' 41.61" N, 104° 42' 44.09" W

Grid Convergence at Surface is: 0.51°

Based upon Minimum Curvature type calculations, at a Measured Depth of 12,363.00usft

the Bottom Hole Displacement is 5,171.80usft in the Direction of 14.05° (True).

Magnetic Convergence at surface is: -7.98° (3 February 2014, , BGGM2013)