

Project: Weld County, CO (NAD 83)
 Site: Sec. 23-T9N-R58W
 Well: Fiscus Federal LD23-78HN
 Wellbore: Plan A
 Design: Final Surveys

Noble Energy



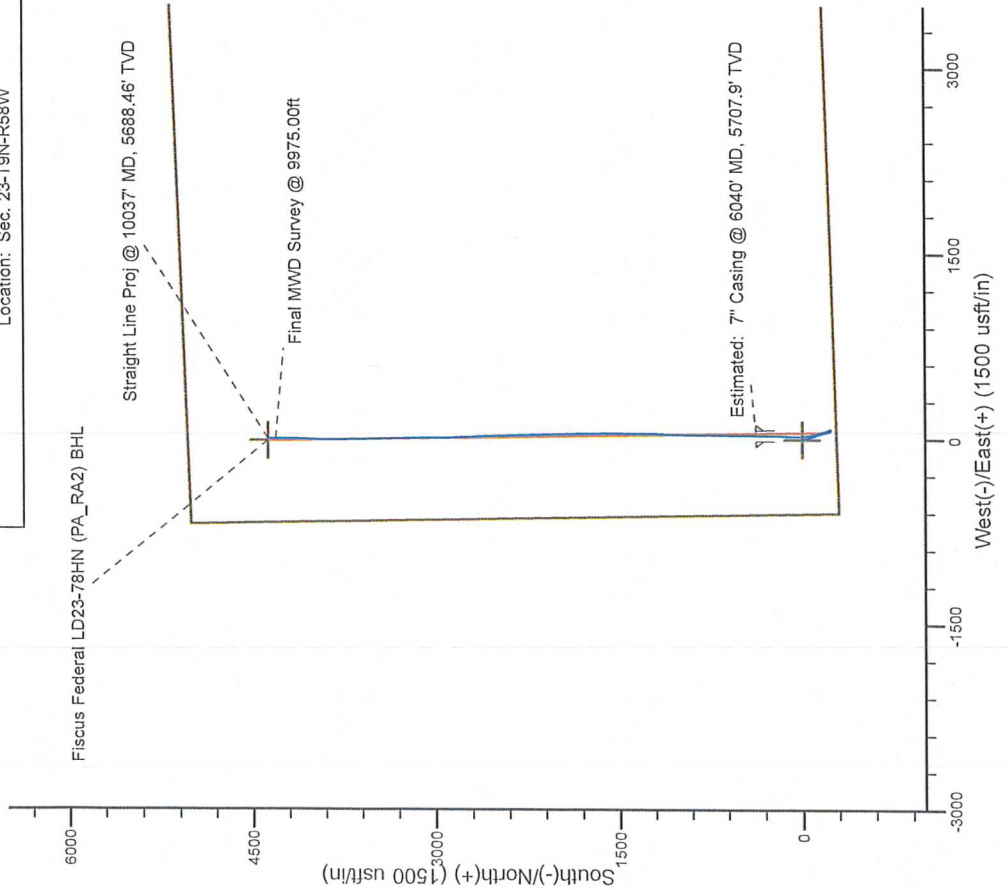
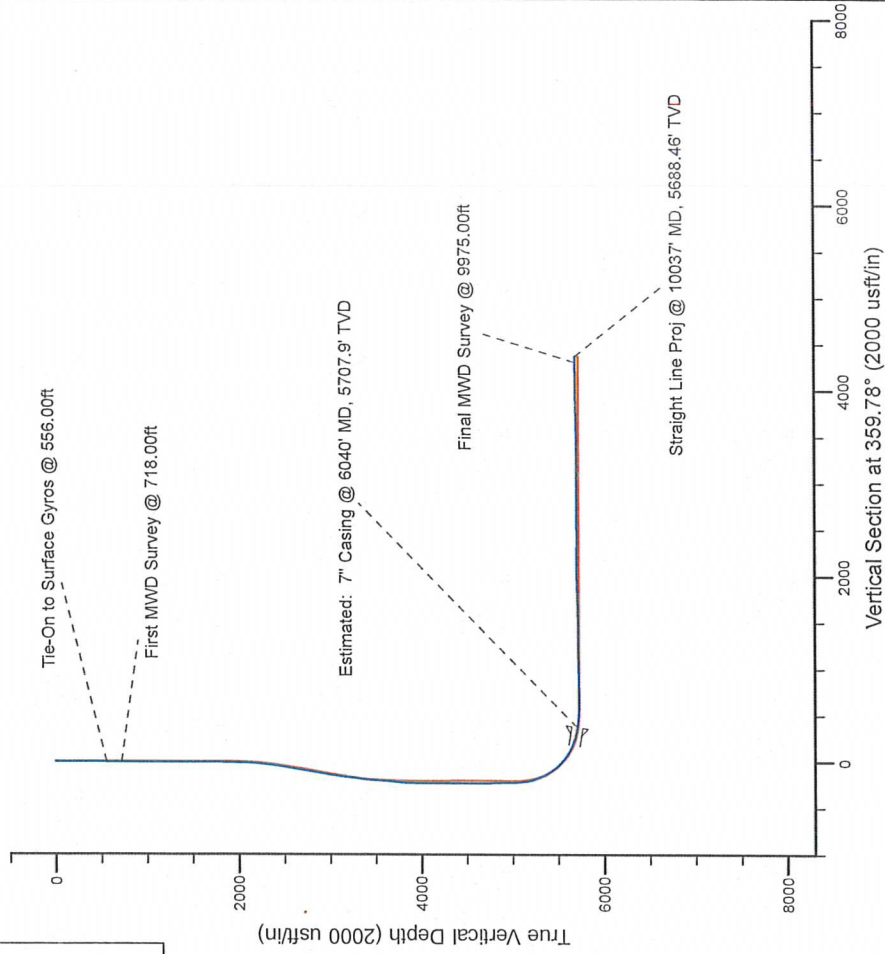
LEGEND

- Final Surveys
- Fiscus Federal LD23-78HN, Plan A, Rev A2 V0
- Final Surveys

Platted SHL: 275' FSL, 600' FWL
 Platted Lat/Long: 40.730350° N, 103.838325° W
 Location: Sec. 23-T9N-R58W

7" Casing: ~654.26' FSL, ~637.89' FWL
 Lat/Long: 40° 43' 52.962" N, 103° 50' 17.484" W
 State Planes - CO Northern: 1,513,601.06' N, 3,460,541.88' E
 Location: Sec. 23-T9N-R58W

BHL: ~661.27' FNL, ~677.35' FWL
 Lat/Long: 40° 44' 32.427" N, 103° 50' 16.919" W
 State Planes - CO Northern: 1,517,595.15' N, 3,460,510.56' E
 Location: Sec. 23-T9N-R58W



WELL DETAILS: Fiscus Federal LD23-78HN

Ground Level: 4779.00
 RKB 24 ft. @ 4803.00usft (H&P 315)

Created By: Fred Hartmann
 Created On: 10/30/2013

Noble Energy

Weld County, CO (NAD 83)

Sec. 23-T9N-R58W

Fiscus Federal LD23-78HN

Design: Final Surveys

Sperry Drilling Services

30 October, 2013

Well Coordinates: 1,513,225.76 N, 3,460,511.50 E (40° 43' 49.26" N, 103° 50' 17.97" W)

Ground Level: 4,779.00 usft

Local Coordinate Origin:

Centered on Well Fiscus Federal LD23-78HN

Viewing Datum:

RKB 24 ft. @ 4803.00usft (H&P 315)

TVDs to System:

N

North Reference:

Grid

Unit System:

API - US Survey Feet - Custom

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

HALLIBURTON

Design Report for Fiscus Federal LD23-78HN - Final 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
244.00	0.80	202.93	243.99	-1.57	-0.66	-1.57	0.33
556.00	0.30	253.63	555.98	-3.81	-2.30	-3.80	0.21
Tie-On to Surface Gyros @ 556.00ft							
718.00	0.38	212.12	717.98	-4.38	-2.99	-4.37	0.16
First MWD Survey @ 718.00ft							
811.00	0.36	348.64	810.97	-4.35	-3.21	-4.34	0.74
903.00	0.53	246.33	902.97	-4.24	-3.66	-4.23	0.76
994.00	0.31	165.53	993.97	-4.65	-3.98	-4.63	0.63
1,087.00	0.48	119.62	1,086.97	-5.09	-3.58	-5.07	0.37
1,179.00	0.10	278.27	1,178.97	-5.26	-3.32	-5.25	0.62
1,273.00	0.74	240.09	1,272.97	-5.56	-3.93	-5.54	0.71
1,366.00	0.28	356.19	1,365.96	-5.63	-4.47	-5.61	0.97
1,458.00	0.37	291.43	1,457.96	-5.29	-4.76	-5.28	0.39
1,553.00	0.49	42.39	1,552.96	-4.88	-4.77	-4.86	0.75
1,648.00	0.36	354.06	1,647.96	-4.29	-4.53	-4.27	0.39
1,743.00	0.77	119.62	1,742.95	-4.30	-4.00	-4.29	1.08
1,838.00	0.56	168.71	1,837.95	-5.08	-3.36	-5.06	0.62
1,933.00	0.26	158.24	1,932.95	-5.73	-3.19	-5.72	0.32
2,027.00	1.73	147.02	2,026.93	-7.12	-2.33	-7.11	1.57
2,122.00	3.49	170.01	2,121.83	-11.17	-1.05	-11.17	2.12
2,217.00	5.54	165.32	2,216.53	-18.45	0.61	-18.46	2.19
2,312.00	6.39	159.42	2,311.02	-27.84	3.63	-27.85	1.10
2,407.00	7.94	163.14	2,405.27	-39.07	7.39	-39.10	1.70
2,501.00	9.60	162.61	2,498.17	-52.76	11.62	-52.81	1.77
2,596.00	10.66	162.38	2,591.69	-68.70	16.65	-68.76	1.12
2,691.00	10.78	161.74	2,685.03	-85.51	22.09	-85.59	0.18
2,786.00	10.58	162.61	2,778.38	-102.27	27.48	-102.37	0.27
2,881.00	9.90	156.32	2,871.87	-118.07	33.37	-118.20	1.38
2,976.00	8.58	163.22	2,965.64	-132.34	38.69	-132.48	1.81
3,071.00	7.90	164.13	3,059.66	-145.40	42.53	-145.56	0.73
3,166.00	8.06	164.33	3,153.74	-158.09	46.11	-158.27	0.17
3,260.00	8.34	163.25	3,246.78	-170.97	49.85	-171.15	0.34
3,355.00	6.89	162.46	3,340.94	-183.00	53.56	-183.20	1.53
3,450.00	5.63	161.69	3,435.37	-192.86	56.74	-193.07	1.33
3,545.00	3.67	159.93	3,530.05	-200.14	59.25	-200.36	2.07
3,640.00	4.50	175.42	3,624.81	-206.71	60.59	-206.93	1.45
3,735.00	6.60	173.65	3,719.36	-215.85	61.49	-216.08	2.22
3,830.00	4.06	149.80	3,813.96	-224.18	63.78	-224.42	3.49
3,925.00	1.34	155.37	3,908.84	-228.10	65.94	-228.35	2.87
4,020.00	0.32	168.76	4,003.83	-229.37	66.45	-229.62	1.09
4,305.00	1.20	80.33	4,288.81	-229.65	69.55	-229.91	0.43
4,400.00	1.57	103.14	4,383.78	-229.78	71.80	-230.05	0.69
4,495.00	2.06	109.18	4,478.73	-230.64	74.68	-230.92	0.55
4,590.00	2.17	80.21	4,573.67	-230.89	78.06	-231.18	1.12
4,685.00	1.49	324.19	4,668.64	-229.58	79.11	-229.88	3.29
4,780.00	1.60	327.80	4,763.61	-227.46	77.69	-227.75	0.15
4,875.00	1.53	341.12	4,858.57	-225.14	76.57	-225.42	0.39
4,968.00	0.77	331.52	4,951.55	-223.41	75.87	-223.70	0.84
5,040.00	0.62	328.54	5,023.55	-222.66	75.43	-222.94	0.21

Design Report for Fiscus Federal LD23-78HN - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,156.00	7.96	339.54	5,139.15	-214.58	72.29	-214.86	6.34
5,204.00	15.39	344.43	5,186.12	-205.32	69.42	-205.58	15.60
5,251.00	19.63	342.99	5,230.93	-191.76	65.43	-192.00	9.07
5,299.00	21.80	341.63	5,275.83	-175.59	60.27	-175.81	4.63
5,345.00	24.54	342.99	5,318.11	-158.34	54.78	-158.55	6.07
5,393.00	27.59	346.16	5,361.23	-138.01	49.20	-138.20	6.98
5,440.00	31.52	346.11	5,402.11	-115.51	43.65	-115.67	8.36
5,488.00	36.60	347.15	5,441.86	-89.36	37.45	-89.50	10.65
5,535.00	40.43	348.81	5,478.63	-60.74	31.37	-60.86	8.44
5,583.00	44.57	352.80	5,514.02	-28.74	26.24	-28.84	10.29
5,630.00	48.30	355.67	5,546.40	5.13	22.84	5.05	9.08
5,678.00	52.35	359.03	5,577.05	42.02	21.17	41.94	10.01
5,725.00	57.18	2.13	5,604.16	80.39	21.59	80.31	11.60
5,773.00	62.58	2.60	5,628.24	121.86	23.31	121.77	11.28
5,820.00	67.19	3.51	5,648.18	164.34	25.58	164.24	9.96
5,868.00	70.09	3.30	5,665.66	208.96	28.23	208.85	6.06
5,915.00	72.68	1.22	5,680.67	253.46	29.98	253.35	6.92
5,963.00	76.04	0.52	5,693.60	299.67	30.68	299.55	7.14
5,991.00	79.17	359.59	5,699.61	327.02	30.71	326.90	11.64
6,040.00	81.36	359.63	5,707.90	375.31	30.38	375.19	4.48
Estimated: 7" Casing @ 6040' MD, 5707.9' TVD							
6,090.00	83.60	359.67	5,714.44	424.87	30.08	424.76	4.48
6,183.00	85.90	0.59	5,722.95	517.47	30.29	517.36	2.66
6,276.00	89.04	1.26	5,727.05	610.36	31.79	610.23	3.45
6,371.00	90.00	0.67	5,727.85	705.34	33.39	705.21	1.19
6,466.00	90.31	359.62	5,727.59	800.34	33.63	800.21	1.15
6,561.00	90.89	359.76	5,726.60	895.33	33.11	895.20	0.63
6,656.00	92.62	1.86	5,723.69	990.27	34.46	990.13	2.86
6,751.00	92.06	2.30	5,719.81	1,085.13	37.90	1,084.98	0.75
6,845.00	90.99	1.06	5,717.31	1,179.05	40.66	1,178.89	1.74
6,940.00	89.54	1.11	5,716.87	1,274.03	42.45	1,273.86	1.53
7,035.00	89.60	0.84	5,717.58	1,369.01	44.07	1,368.84	0.29
7,130.00	89.85	1.07	5,718.04	1,464.00	45.65	1,463.82	0.36
7,225.00	91.45	0.66	5,716.96	1,558.98	47.09	1,558.79	1.74
7,320.00	91.42	359.04	5,714.58	1,653.94	46.84	1,653.76	1.71
7,415.00	91.11	359.07	5,712.48	1,748.91	45.27	1,748.72	0.33
7,510.00	91.39	358.44	5,710.41	1,843.86	43.21	1,843.69	0.73
7,605.00	93.30	358.24	5,706.52	1,938.74	40.46	1,938.57	2.02
7,699.00	90.96	358.86	5,703.03	2,032.64	38.08	2,032.48	2.58
7,794.00	89.88	358.44	5,702.33	2,127.61	35.85	2,127.46	1.22
7,889.00	89.26	357.60	5,703.05	2,222.55	32.56	2,222.41	1.10
7,984.00	88.86	358.61	5,704.61	2,317.48	29.42	2,317.35	1.14
8,079.00	91.02	359.22	5,704.71	2,412.46	27.62	2,412.33	2.36
8,174.00	89.20	358.08	5,704.52	2,507.42	25.39	2,507.31	2.26
8,269.00	89.54	357.00	5,705.57	2,602.33	21.31	2,602.23	1.19
8,363.00	91.20	357.00	5,704.96	2,696.20	16.39	2,696.11	1.77
8,458.00	90.77	358.51	5,703.33	2,791.11	12.67	2,791.04	1.65
8,553.00	89.81	358.35	5,702.85	2,886.07	10.07	2,886.01	1.02
8,648.00	91.63	359.08	5,701.65	2,981.03	7.93	2,980.98	2.06
8,743.00	90.74	359.26	5,699.69	3,076.00	6.56	3,075.95	0.96
8,838.00	89.23	358.63	5,699.71	3,170.98	4.81	3,170.94	1.72

Design Report for Fiscus Federal LD23-78HN - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
8,933.00	89.32	359.24	5,700.92	3,265.96	3.04	3,265.92	0.65
9,028.00	88.74	358.07	5,702.52	3,360.91	0.81	3,360.89	1.37
9,122.00	89.78	359.91	5,703.74	3,454.89	-0.84	3,454.87	2.25
9,218.00	90.52	358.19	5,703.49	3,550.87	-2.43	3,550.85	1.95
9,313.00	91.76	356.97	5,701.60	3,645.76	-6.44	3,645.76	1.83
9,407.00	91.51	359.14	5,698.91	3,739.66	-9.63	3,739.67	2.32
9,502.00	92.04	0.39	5,695.97	3,834.61	-10.02	3,834.63	1.43
9,597.00	90.93	1.36	5,693.51	3,929.57	-8.57	3,929.57	1.55
9,692.00	91.23	2.23	5,691.72	4,024.50	-5.60	4,024.50	0.97
9,787.00	90.43	1.12	5,690.34	4,119.45	-2.82	4,119.43	1.44
9,882.00	89.72	0.12	5,690.22	4,214.44	-1.79	4,214.42	1.29
9,975.00	91.05	0.40	5,689.59	4,307.44	-1.37	4,307.41	1.46
Final MWD Survey @ 9975.00ft							
10,037.00	91.05	0.40	5,688.46	4,369.43	-0.94	4,369.40	0.00
Straight Line Proj @ 10037' MD, 5688.46' TVD							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
556.00	555.98	-3.81	-2.30	Tie-On to Surface Gyros @ 556.00ft
718.00	717.98	-4.38	-2.99	First MWD Survey @ 718.00ft
9,975.00	5,689.59	4,307.44	-1.37	Final MWD Survey @ 9975.00ft
10,037.00	5,688.46	4,369.43	-0.94	Straight Line Proj @ 10037' MD, 5688.46' TVD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/-S (usft)	Origin +E/-W (usft)	Start TVD (usft)
Target	Fiscus Federal LD23-78HN (PA_RA2) BHL	359.78	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
244.00	556.00	Surface Gyros	Flexi-Shot
718.00	5,991.00	MWD Surveys - Vert/Build	MWD
6,090.00	9,975.00	MWD Surveys - Lateral	MWD

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
6,040.00	5,707.90	Estimated: 7" Casing @ 6040' MD, 5707.9' TVD	7	8-3/4

Design Report for Fiscus Federal LD23-78HN - Final 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
Fiscus Federal LD23-7 - actual wellpath misses target center by 0.01usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)	0.00	0.01	0.00	0.01	0.00	1,513,225.77	3,460,511.50	40° 43' 49.260 N	103° 50' 17.970 W
- Polygon									
Point 1				0.00	320.34	-6.58	1,513,546.11	3,460,504.95	
Point 2				0.00	464.06	4,061.28	1,513,689.47	3,464,572.79	
Point 3				0.00	4,607.56	3,984.49	1,517,832.94	3,464,496.36	
Point 4				0.00	4,427.50	-78.90	1,517,653.24	3,460,432.99	
Point 5				0.00	320.34	-6.58	1,513,546.11	3,460,504.95	
Fiscus Federal LD23-7 - actual wellpath misses target center by 208.81usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)	0.00	0.00	0.00	200.00	60.00	1,513,425.76	3,460,571.50	40° 43' 51.225 N	103° 50' 17.142 W
- Point									
Fiscus Federal LD23-7 - actual wellpath misses target center by 0.01usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)	0.00	0.00	0.00	0.01	0.00	1,513,225.77	3,460,511.50	40° 43' 49.260 N	103° 50' 17.970 W
- Point									
Fiscus Federal LD23-7 - actual wellpath misses target center by 0.01usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)	0.00	0.00	0.00	0.01	0.00	1,513,225.77	3,460,511.50	40° 43' 49.260 N	103° 50' 17.970 W
- Polygon									
Point 1				0.00	-298.66	-595.67	1,512,927.11	3,459,915.83	
Point 2				0.00	-135.94	4,661.28	1,513,089.83	3,465,172.74	
Point 3				0.00	5,209.06	4,584.49	1,518,434.79	3,465,095.95	
Point 4				0.00	5,004.47	-689.66	1,518,230.20	3,459,821.85	
Point 5				0.00	-298.66	-595.67	1,512,927.11	3,459,915.83	
Fiscus Federal LD23-7 - actual wellpath misses target center by 25.11usft at 5097.33usft MD (5080.82 TVD, -220.41 N, 74.50 E)	0.00	0.01	5,079.00	-200.00	60.00	1,513,025.77	3,460,571.50	40° 43' 47.273 N	103° 50' 17.239 W
- Circle (radius 35.00)									
Fiscus Federal LD23-7 - actual wellpath misses target center by 45.67usft at 6038.65usft MD (5707.70 TVD, 373.97 N, 30.39 E)	0.00	0.00	5,667.20	381.06	50.27	1,513,606.81	3,460,561.77	40° 43' 53.015 N	103° 50' 17.224 W
- Point									
Fiscus Federal LD23-7 - actual wellpath misses target center by 55.26usft at 6480.44usft MD (5727.50 TVD, 814.78 N, 33.53 E)	0.00	0.00	5,674.38	814.30	48.74	1,514,040.06	3,460,560.24	40° 43' 57.296 N	103° 50' 17.139 W
- Point									
Fiscus Federal LD23-7 - actual wellpath misses target center by 19.34usft at 10037.00usft MD (5688.46 TVD, 4369.43 N, -0.94 E)	0.00	0.00	5,677.00	4,370.28	-16.50	1,517,596.00	3,460,495.00	40° 44' 32.438 N	103° 50' 17.120 W
- Point									
Fiscus Federal LD23-7 - actual wellpath misses target center by 19.34usft at 10037.00usft MD (5688.46 TVD, 4369.43 N, -0.94 E)	0.00	0.00	5,677.00	4,370.28	-16.50	1,517,596.00	3,460,495.00	40° 44' 32.438 N	103° 50' 17.120 W
- Point									
Fiscus Federal LD23-7 - actual wellpath misses target center by 20.41usft at 6046.27usft MD (5708.83 TVD, 381.51 N, 30.34 E)	0.00	0.00	5,713.20	381.06	50.27	1,513,606.81	3,460,561.77	40° 43' 53.015 N	103° 50' 17.224 W
- Point									
Fiscus Federal LD23-7 - actual wellpath misses target center by 37.89usft at 10037.00usft MD (5688.46 TVD, 4369.43 N, -0.94 E)	0.00	0.00	5,723.00	4,370.28	-16.50	1,517,596.00	3,460,495.00	40° 44' 32.438 N	103° 50' 17.120 W
- Point									
Fiscus Federal LD23-7 - actual wellpath misses target center by 16.72usft at 6221.45usft MD (5725.26 TVD, 555.85 N, 30.78 E)	0.00	0.00	5,723.00	555.68	47.34	1,513,781.44	3,460,558.84	40° 43' 54.741 N	103° 50' 17.220 W
- Rectangle (sides W3,815.13 H70.00 D8.00)									

Directional Difficulty Index

Average Dogleg over Survey:	1.94 °/100usft	Maximum Dogleg over Survey:	15.60 °/100usft at 5,204.00 usft
Net Tortousity applicable to Plans:	0.85 °/100usft	Directional Difficulty Index:	6.222

Audit Info

North Reference Sheet for Sec. 23-T9N-R58W - Fiscus Federal LD23-78HN

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

Vertical Depths are relative to RKB 24 ft. @ 4803.00usft (H&P 315). Northing and Easting are relative to Fiscus Federal LD23-78HN

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: 0.99999183

Grid Coordinates of Well: 1,513,225.76 usft N, 3,460,511.50 usft E

Geographical Coordinates of Well: 40° 43' 49.26" N, 103° 50' 17.97" W

Grid Convergence at Surface is: 1.07°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,037.00usft

the Bottom Hole Displacement is 4,369.43usft in the Direction of 359.99° (Grid).

Magnetic Convergence at surface is: -7.03° (15 September 2013, , BGGM2013)

