



# **Noble Energy, Inc**

**Weld County, CO (NAD 83)**

**Crow Creek State Pad**

**Crow Creek State AC36-75HN**

**Wellbore #1**

**Design: OH**

## **Final Survey Report**

**26 September, 2013**





# IDS

## Final Survey Report



<b>Company:</b>	Noble Energy, Inc	<b>Local Co-ordinate Reference:</b>	Well Crow Creek State AC36-75HN
<b>Project:</b>	Weld County, CO (NAD 83)	<b>TVD Reference:</b>	WELL @ 4871.0usft (H&P 277)
<b>Site:</b>	Crow Creek State Pad	<b>MD Reference:</b>	WELL @ 4871.0usft (H&P 277)
<b>Well:</b>	Crow Creek State AC36-75HN	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	OH	<b>Database:</b>	EDM 5000.1 Single User Db

<b>Project</b>	Weld County, CO (NAD 83)		
<b>Map System:</b>	US State Plane 1983	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b>	North American Datum 1983		
<b>Map Zone:</b>	Colorado Northern Zone		

Site		Crow Creek State Pad			
Site Position:		Northing:	1,435,563.26 usft	Latitude:	40° 31' 25.032 N
From:	Lat/Long	Easting:	3,311,476.82 usft	Longitude:	104° 22' 46.416 W
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.72 °

Well	Crow Creek State AC36-75HN					
Well Position	+N-S	0.0 usft	Northing:	1,435,555.81 usft	Latitude:	40° 31' 24.996 N
	+E-W	0.0 usft	Easting:	3,311,176.65 usft	Longitude:	104° 22' 50.304 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	4,847.0 usft

<b>Wellbore</b>	Wellbore #1				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2010	8/10/2013	8.38	67.14	53,009

<b>Design</b>	OH				
<b>Audit Notes:</b>					
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b>	0.0
<b>Vertical Section:</b>	<b>Depth From (TVD) (usft)</b>	<b>+N-S (usft)</b>	<b>+E-W (usft)</b>	<b>Direction (°)</b>	
	0.0	0.0	0.0	345.75	

<b>Survey Program</b>	<b>Date</b>	9/26/2013			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
369.0	369.0	Survey #1 (Wellbore #1)	EMS	EMS - Standard	
580.0	11,030.0	Survey #2 (Wellbore #1)	MWD	MWD - Standard	

Survey								
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	
369.0	0.30	62.25	369.0	0.4	0.9	0.2	0.08	
580.0	0.20	319.60	580.0	1.0	1.1	0.7	0.19	
First MWD								
632.0	0.40	65.10	632.0	1.1	1.2	0.8	0.95	
724.0	0.40	92.90	724.0	1.3	1.8	0.8	0.21	
817.0	0.50	79.40	817.0	1.3	2.5	0.6	0.16	
911.0	0.40	88.50	911.0	1.4	3.3	0.5	0.13	
1,004.0	0.50	84.10	1,004.0	1.4	4.0	0.4	0.11	
1,097.0	0.50	87.50	1,097.0	1.5	4.8	0.3	0.03	
1,189.0	0.50	91.70	1,189.0	1.5	5.6	0.1	0.04	

<b>Company:</b>	Noble Energy, Inc	<b>Local Co-ordinate Reference:</b>	Well Crow Creek State AC36-75HN
<b>Project:</b>	Weld County, CO (NAD 83)	<b>TVD Reference:</b>	WELL @ 4871.0usft (H&P 277)
<b>Site:</b>	Crow Creek State Pad	<b>MD Reference:</b>	WELL @ 4871.0usft (H&P 277)
<b>Well:</b>	Crow Creek State AC36-75HN	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	OH	<b>Database:</b>	EDM 5000.1 Single User Db

Survey								
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	
1,282.0	0.70	326.50	1,282.0	2.0	5.7	0.5	1.15	
1,376.0	1.20	313.30	1,376.0	3.1	4.7	1.9	0.58	
1,469.0	1.10	306.30	1,468.9	4.3	3.2	3.4	0.19	
1,564.0	1.20	292.60	1,563.9	5.2	1.6	4.7	0.31	
1,659.0	1.10	305.10	1,658.9	6.2	-0.1	6.0	0.28	
1,754.0	1.20	313.50	1,753.9	7.4	-1.5	7.5	0.21	
1,849.0	1.20	304.70	1,848.9	8.6	-3.1	9.1	0.19	
1,945.0	0.90	312.50	1,944.9	9.7	-4.5	10.5	0.35	
2,040.0	1.40	293.50	2,039.8	10.7	-6.1	11.8	0.66	
2,135.0	4.20	272.00	2,134.7	11.2	-10.6	13.5	3.10	
2,230.0	5.50	267.60	2,229.4	11.2	-18.6	15.4	1.42	
2,325.0	5.60	269.00	2,323.9	10.9	-27.8	17.4	0.18	
2,420.0	7.70	260.20	2,418.3	9.7	-38.7	19.0	2.45	
2,515.0	7.70	260.20	2,512.4	7.6	-51.3	20.0	0.00	
2,610.0	9.90	262.90	2,606.3	5.5	-65.7	21.5	2.36	
2,705.0	10.40	262.20	2,699.8	3.3	-82.3	23.5	0.54	
2,800.0	12.10	269.60	2,793.0	2.1	-100.7	26.8	2.34	
2,896.0	12.00	270.40	2,886.9	2.1	-120.7	31.7	0.20	
2,991.0	11.40	271.70	2,979.9	2.4	-140.0	36.8	0.69	
3,086.0	11.60	271.00	3,073.0	2.9	-158.9	41.9	0.26	
3,181.0	11.60	271.10	3,166.1	3.2	-178.0	47.0	0.02	
3,276.0	12.00	270.40	3,259.0	3.5	-197.5	52.0	0.45	
3,371.0	12.00	266.90	3,352.0	3.0	-217.2	56.4	0.77	
3,467.0	10.70	269.00	3,446.1	2.3	-236.1	60.4	1.42	
3,562.0	11.30	270.10	3,539.3	2.2	-254.2	64.7	0.67	
3,657.0	10.70	269.00	3,632.6	2.0	-272.3	69.0	0.67	
3,752.0	10.70	274.50	3,726.0	2.6	-289.9	73.9	1.07	
3,848.0	13.00	271.00	3,819.9	3.5	-309.6	79.6	2.51	
3,943.0	13.90	273.60	3,912.3	4.4	-331.7	85.9	1.14	
4,038.0	14.60	272.70	4,004.4	5.6	-355.0	92.9	0.77	
4,133.0	14.40	271.80	4,096.3	6.6	-378.8	99.6	0.32	
4,228.0	14.10	272.70	4,188.4	7.5	-402.2	106.3	0.39	
4,323.0	13.50	269.90	4,280.7	8.0	-424.8	112.4	0.94	
4,419.0	12.70	270.60	4,374.2	8.1	-446.6	117.8	0.85	
4,514.0	12.00	267.30	4,467.0	7.8	-466.9	122.5	1.05	
4,609.0	11.80	265.70	4,559.9	6.6	-486.4	126.1	0.41	
4,704.0	10.90	263.90	4,653.1	4.9	-505.1	129.1	1.02	
4,799.0	10.70	266.00	4,746.4	3.3	-522.8	131.9	0.46	
4,895.0	10.20	266.20	4,840.8	2.1	-540.2	135.0	0.52	
4,990.0	10.60	267.50	4,934.2	1.2	-557.3	138.4	0.49	
5,085.0	10.20	266.40	5,027.7	0.3	-574.4	141.7	0.47	
5,180.0	10.90	272.60	5,121.1	0.2	-591.8	145.9	1.40	
5,275.0	11.60	270.30	5,214.3	0.6	-610.3	150.9	0.88	
5,370.0	10.60	266.80	5,307.5	0.2	-628.6	154.9	1.27	
5,465.0	10.90	273.60	5,400.8	0.2	-646.3	159.4	1.37	

<b>Company:</b>	Noble Energy, Inc	<b>Local Co-ordinate Reference:</b>	Well Crow Creek State AC36-75HN
<b>Project:</b>	Weld County, CO (NAD 83)	<b>TVD Reference:</b>	WELL @ 4871.0usft (H&P 277)
<b>Site:</b>	Crow Creek State Pad	<b>MD Reference:</b>	WELL @ 4871.0usft (H&P 277)
<b>Well:</b>	Crow Creek State AC36-75HN	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	OH	<b>Database:</b>	EDM 5000.1 Single User Db

Survey							
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)
5,561.0	12.00	270.40	5,494.9	0.9	-665.3	164.7	1.32
5,656.0	10.90	268.70	5,588.0	0.8	-684.2	169.2	1.21
5,751.0	11.40	278.40	5,681.2	1.9	-702.4	174.8	2.04
5,846.0	12.30	271.10	5,774.2	3.5	-721.8	181.1	1.84
5,941.0	13.40	275.00	5,866.8	4.6	-742.9	187.4	1.47
6,036.0	12.50	272.40	5,959.4	6.0	-764.2	194.0	1.13
6,126.0	14.10	272.00	6,047.0	6.8	-784.8	199.9	1.78
6,174.0	14.40	274.60	6,093.5	7.5	-796.6	203.4	1.47
6,221.0	17.90	286.50	6,138.7	10.0	-809.4	209.0	10.21
6,269.0	21.20	294.30	6,183.9	15.7	-824.4	218.2	8.75
6,316.0	23.70	299.60	6,227.3	23.9	-840.4	230.0	6.84
6,364.0	29.40	305.10	6,270.3	35.4	-858.4	245.7	12.92
6,412.0	34.90	311.20	6,310.9	51.2	-878.4	265.9	13.29
6,459.0	40.50	320.00	6,348.1	71.8	-898.3	290.8	16.50
6,507.0	42.20	321.60	6,384.1	96.4	-918.4	319.6	4.17
6,554.0	43.60	322.20	6,418.6	121.6	-938.1	348.8	3.10
6,602.0	49.00	325.30	6,451.7	149.6	-958.6	381.0	12.18
6,639.0	55.86	327.35	6,474.3	174.0	-974.8	408.6	19.04
<b>Crosses HL @ 6639' MD / 6474' TVD</b>							
6,650.0	57.90	327.90	6,480.3	181.8	-979.8	417.4	19.04
6,697.0	62.00	329.80	6,503.8	216.6	-1,000.8	456.3	9.40
6,745.0	62.30	329.80	6,526.2	253.2	-1,022.1	497.1	0.62
6,792.0	62.90	331.20	6,547.9	289.6	-1,042.7	537.4	2.94
6,840.0	63.60	334.80	6,569.5	327.8	-1,062.1	579.2	6.85
6,887.0	65.00	338.30	6,589.9	366.6	-1,079.0	621.0	7.34
6,935.0	68.70	343.80	6,608.7	408.3	-1,093.3	664.9	13.05
6,983.0	74.10	348.40	6,624.1	452.5	-1,104.2	710.4	14.46
7,030.0	76.20	352.90	6,636.1	497.3	-1,111.5	755.6	10.28
7,078.0	77.80	356.20	6,646.9	543.8	-1,116.0	801.8	7.48
7,125.0	79.10	355.50	6,656.3	589.7	-1,119.3	847.2	3.13
7,157.0	81.00	355.50	6,661.8	621.2	-1,121.8	878.2	5.94
7,211.0	85.20	357.90	6,668.3	674.7	-1,124.8	930.9	8.94
<b>7" Csg @ 7211' MD / 6668' TVD / 964' FSL &amp; 2655' FWL Sec 36</b>							
7,223.0	83.60	357.60	6,669.5	686.6	-1,125.3	942.5	13.56
7,318.0	84.10	359.70	6,679.7	781.0	-1,127.5	1,034.6	2.26
7,413.0	86.70	1.10	6,687.3	875.7	-1,126.9	1,126.2	3.11
7,509.0	91.00	1.70	6,689.2	971.6	-1,124.5	1,218.6	4.52
7,604.0	91.00	359.40	6,687.6	1,066.6	-1,123.6	1,310.4	2.42
7,699.0	91.80	0.10	6,685.2	1,161.6	-1,124.0	1,402.6	1.12
7,794.0	89.90	0.30	6,683.8	1,256.6	-1,123.7	1,494.6	2.01
7,889.0	90.30	359.90	6,683.7	1,351.6	-1,123.5	1,586.6	0.60
7,985.0	91.00	0.60	6,682.6	1,447.6	-1,123.1	1,679.5	1.03
8,080.0	92.20	359.40	6,679.9	1,542.5	-1,123.1	1,771.6	1.79
8,175.0	90.40	0.80	6,677.8	1,637.5	-1,123.0	1,863.6	2.40



# IDS Final Survey Report



<b>Company:</b>	Noble Energy, Inc	<b>Local Co-ordinate Reference:</b>	Well Crow Creek State AC36-75HN
<b>Project:</b>	Weld County, CO (NAD 83)	<b>TVD Reference:</b>	WELL @ 4871.0usft (H&P 277)
<b>Site:</b>	Crow Creek State Pad	<b>MD Reference:</b>	WELL @ 4871.0usft (H&P 277)
<b>Well:</b>	Crow Creek State AC36-75HN	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	OH	<b>Database:</b>	EDM 5000.1 Single User Db

Survey								
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	
8,270.0	89.00	2.20	6,678.3	1,732.4	-1,120.5	1,955.0	2.08	
8,365.0	89.40	5.70	6,679.6	1,827.2	-1,113.9	2,045.2	3.71	
8,460.0	89.40	7.70	6,680.6	1,921.5	-1,102.8	2,133.9	2.11	
8,556.0	89.90	2.20	6,681.2	2,017.1	-1,094.6	2,224.5	5.75	
8,651.0	89.00	356.90	6,682.1	2,112.1	-1,095.3	2,316.8	5.66	
8,746.0	89.40	355.90	6,683.4	2,206.9	-1,101.3	2,410.1	1.13	
8,841.0	90.10	353.80	6,683.8	2,301.5	-1,109.8	2,503.9	2.33	
8,937.0	89.70	356.60	6,684.0	2,397.2	-1,117.8	2,598.6	2.95	
9,032.0	89.60	358.20	6,684.6	2,492.1	-1,122.1	2,691.6	1.69	
9,127.0	89.60	1.00	6,685.2	2,587.0	-1,122.8	2,783.9	2.95	
9,222.0	89.40	1.10	6,686.1	2,682.0	-1,121.1	2,875.5	0.24	
9,317.0	89.60	4.80	6,686.9	2,776.9	-1,116.2	2,966.2	3.90	
9,412.0	89.00	5.20	6,688.1	2,871.5	-1,107.9	3,055.9	0.76	
9,508.0	89.90	2.20	6,689.0	2,967.3	-1,101.7	3,147.2	3.26	
9,603.0	88.50	359.90	6,690.3	3,062.3	-1,100.0	3,238.8	2.83	
9,698.0	89.20	355.90	6,692.2	3,157.2	-1,103.4	3,331.6	4.27	
9,793.0	91.00	353.80	6,692.1	3,251.8	-1,112.0	3,425.4	2.91	
9,888.0	91.80	353.80	6,689.7	3,346.2	-1,122.2	3,519.5	0.84	
9,984.0	91.10	355.20	6,687.3	3,441.7	-1,131.4	3,614.3	1.63	
10,079.0	91.10	352.70	6,685.5	3,536.2	-1,141.4	3,708.3	2.63	
10,174.0	90.10	356.40	6,684.5	3,630.7	-1,150.5	3,802.2	4.03	
10,269.0	87.40	357.50	6,686.6	3,725.5	-1,155.5	3,895.3	3.07	
10,365.0	87.10	359.60	6,691.2	3,821.4	-1,157.9	3,988.8	2.21	
10,460.0	87.10	359.40	6,696.0	3,916.3	-1,158.8	4,081.0	0.21	
10,555.0	89.00	2.60	6,699.2	4,011.2	-1,157.1	4,172.6	3.92	
10,650.0	90.40	1.30	6,699.7	4,106.1	-1,153.9	4,263.8	2.01	
10,745.0	91.50	1.10	6,698.1	4,201.1	-1,151.9	4,355.4	1.18	
10,840.0	90.60	3.30	6,696.4	4,296.0	-1,148.2	4,446.4	2.50	
10,935.0	89.70	2.40	6,696.1	4,390.9	-1,143.5	4,537.2	1.34	
Last MWD @ 10935' MD / 6696' TVD								
11,030.0	89.70	2.40	6,696.6	4,485.8	-1,139.5	4,628.3	0.00	
PTD @ 11030' MD / 6697' TVD / 539' FNL & 2171' FWL Sec 36								

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
6,639.0	6,474.3	174.0	-974.8	Crosses HL @ 6639' MD / 6474' TVD
7,211.0	6,668.3	674.7	-1,124.8	7" Csg @ 7211' MD / 6668' TVD / 964' FSL & 2655' FWL Sec 36
10,935.0	6,696.1	4,390.9	-1,143.5	Last MWD @ 10935' MD / 6696' TVD
11,030.0	6,696.6	4,485.8	-1,139.5	PTD @ 11030' MD / 6697' TVD / 539' FNL & 2171' FWL Sec 36

Checked By: _____	Approved By: _____	Date: _____
-------------------	--------------------	-------------



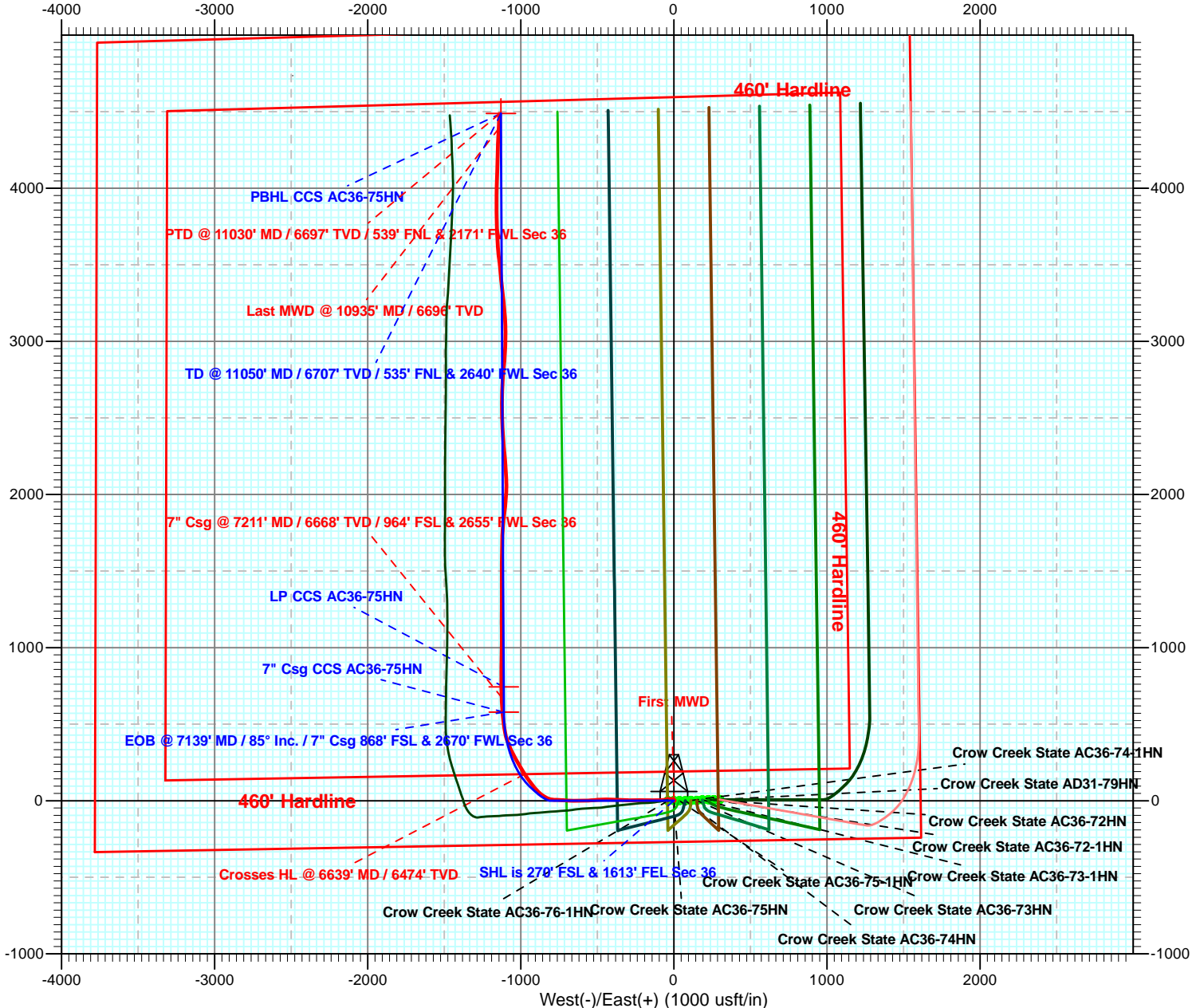
Weld County, CO (NAD 83)  
Crow Creek State Pad  
Crow Creek State AC36-75HN  
H&P 277



Azimuths to Grid North  
True North:  $-0.72^\circ$   
Magnetic North:  $7.65^\circ$   
  
Magnetic Field  
Strength: 53008.7snT  
Dip Angle:  $67.14^\circ$   
Date: 8/10/2013  
Model: IGRF2010

# LEGEND

- ✕ Crow Creek State AC36-72-1HN, Wellbore #1, Plan #1 V0
- Crow Creek State AC36-72HN, Wellbore #1, Plan #1 V0
- ◇ Crow Creek State AC36-74-1HN, Wellbore #1, Plan #1 V0
- Crow Creek State AC36-73HN, Wellbore #1, Plan #1 V0
- ✚ Crow Creek State AC36-73-1HN, Wellbore #1, Plan #1 V0
- ◇ Crow Creek State AC36-74HN, Wellbore #1, Plan #1 V0
- ◇ Crow Creek State AC36-75-1HN, Wellbore #1, Plan #1 V0
- Crow Creek State AC36-75HN, Wellbore #1, OH V0
- Crow Creek State AC36-76-1HN, Wellbore #1, OH V0
- ◇ Crow Creek State AD31-79HN, Wellbore #1, Plan #1 V0
- Plan #1

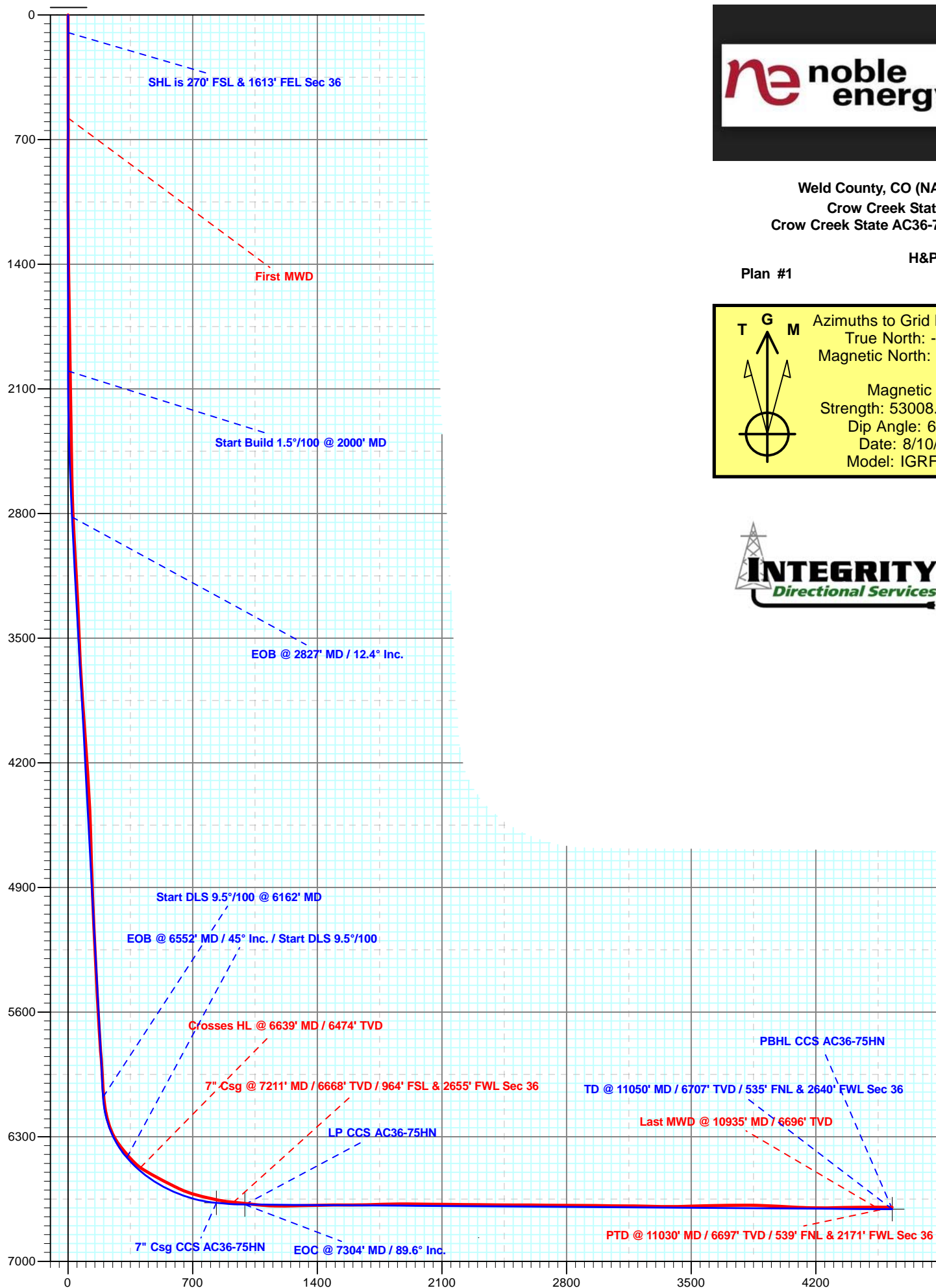
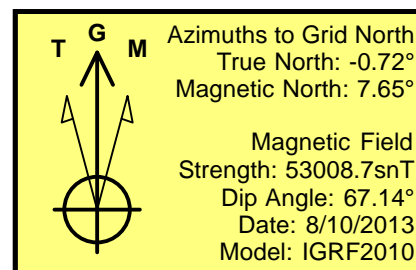




Weld County, CO (NAD 83)  
Crow Creek State Pad  
Crow Creek State AC36-75HN

H&P 277

Plan #1



Vertical Section at  $345.87^\circ$  (700 usft/in)