



## **Noble Energy Inc.**

**Weld County, CO  
Sec 8, T7N, R63W  
Kohlhoff AC09-65HN**

**Wellbore #1**

**Survey: MWD Final**

## **DDC Survey Report**

**19 March, 2012**



<b>Company:</b>	Noble Energy Inc.	<b>Local Co-ordinate Reference:</b>	Well Kohlhoff AC09-65HN
<b>Project:</b>	Weld County, CO	<b>TVD Reference:</b>	WELL @ 4903.0usft (H&P #326)
<b>Site:</b>	Sec 8, T7N, R63W	<b>MD Reference:</b>	WELL @ 4903.0usft (H&P #326)
<b>Well:</b>	Kohlhoff AC09-65HN	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	EDM 5000.1 Single User Db

Project	Weld County, CO		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Northern Zone		

Site		Sec 8, T7N, R63W			
Site Position:		Northing:	1,459,053.01 usft	Latitude:	40° 35' 19.608 N
From:	Lat/Long	Easting:	3,290,987.08 usft	Longitude:	104° 27' 8.136 W
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.68 °

Well	Kohlhoff AC09-65HN					
Well Position	+N-S	0.0 usft	Northing:	1,459,053.00 usft	Latitude:	40° 35' 19.608 N
	+E-W	0.0 usft	Easting:	3,290,987.08 usft	Longitude:	104° 27' 8.136 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	4,874.0 usft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	2/13/2012	8.62	67.23	53,192

Design	Wellbore #1				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.0	0.0	0.0	89.60	

Survey Program		Date	3/19/2012		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
1,287.0	11,478.0	MWD (Wellbore #1)	MWD default	MWD - Standard	

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
Tie In									
1,105.0	0.00	0.00	1,105.0	0.0	0.0	0.0	0.00	0.00	0.00
1,287.0	0.10	350.40	1,287.0	0.2	0.0	0.0	0.05	0.05	0.00
1,565.0	0.30	90.40	1,565.0	0.4	0.7	0.7	0.12	0.07	35.97
1,847.0	0.60	86.00	1,847.0	0.5	2.9	2.9	0.11	0.11	-1.56
2,128.0	0.50	346.30	2,128.0	1.8	4.0	4.1	0.30	-0.04	-35.48
2,408.0	0.10	334.40	2,408.0	3.2	3.7	3.7	0.14	-0.14	-4.25
2,501.0	1.50	72.10	2,501.0	3.6	4.8	4.8	1.63	1.51	105.05
2,594.0	2.90	89.00	2,593.9	4.1	8.3	8.3	1.64	1.51	18.17
2,686.0	5.30	85.70	2,685.7	4.4	14.9	14.9	2.62	2.61	-3.59
2,779.0	7.10	94.10	2,778.1	4.3	24.9	24.9	2.16	1.94	9.03

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<b>Site:</b>	Sec 8, T7N, R63W	<b>MD Reference:</b>	WELL @ 4903.0usft (H&P #326)
<b>Well:</b>	Kohlhoff AC09-65HN	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	EDM 5000.1 Single User Db

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
2,871.0	9.20	98.80	2,869.2	2.8	37.8	37.8	2.39	2.28	5.11
2,964.0	9.50	97.40	2,960.9	0.7	52.8	52.8	0.40	0.32	-1.51
3,059.0	8.60	98.30	3,054.8	-1.4	67.6	67.6	0.96	-0.95	0.95
3,154.0	8.10	99.00	3,148.7	-3.4	81.2	81.2	0.54	-0.53	0.74
3,249.0	7.60	97.80	3,242.9	-5.3	94.0	94.0	0.55	-0.53	-1.26
3,344.0	6.90	97.10	3,337.1	-6.9	105.9	105.9	0.74	-0.74	-0.74
3,439.0	6.10	96.50	3,431.5	-8.2	116.6	116.6	0.85	-0.84	-0.63
3,534.0	4.40	103.40	3,526.1	-9.6	125.2	125.1	1.91	-1.79	7.26
3,629.0	2.30	107.40	3,620.9	-11.0	130.5	130.5	2.22	-2.21	4.21
3,724.0	0.50	26.80	3,715.9	-11.2	132.5	132.5	2.39	-1.89	-84.84
3,914.0	0.40	318.60	3,905.9	-10.0	132.5	132.4	0.27	-0.05	-35.89
4,199.0	0.30	99.70	4,190.9	-9.3	132.6	132.5	0.23	-0.04	49.51
4,484.0	1.40	174.10	4,475.9	-12.9	133.6	133.6	0.47	0.39	26.11
4,579.0	1.00	232.30	4,570.8	-14.6	133.1	133.0	1.28	-0.42	61.26
4,674.0	1.70	263.20	4,665.8	-15.3	131.1	130.9	1.04	0.74	32.53
4,769.0	2.80	236.80	4,760.7	-16.7	127.7	127.6	1.56	1.16	-27.79
4,864.0	1.10	288.50	4,855.7	-17.7	124.9	124.8	2.41	-1.79	54.42
4,959.0	2.30	14.60	4,950.7	-15.6	124.5	124.4	2.61	1.26	90.63
5,054.0	1.90	22.50	5,045.6	-12.3	125.6	125.5	0.52	-0.42	8.32
5,149.0	1.20	19.00	5,140.6	-9.9	126.5	126.5	0.74	-0.74	-3.68
5,340.0	1.30	26.20	5,331.5	-6.0	128.1	128.1	0.10	0.05	3.77
5,625.0	1.10	345.50	5,616.4	-0.5	128.9	128.9	0.30	-0.07	-14.28
5,910.0	0.80	309.40	5,901.4	3.4	126.7	126.7	0.23	-0.11	-12.67
6,030.0	1.10	292.40	6,021.4	4.4	124.9	125.0	0.34	0.25	-14.17
6,125.0	3.30	71.20	6,116.4	5.6	126.7	126.7	4.41	2.32	146.11
6,170.0	8.70	78.30	6,161.1	6.7	131.3	131.3	12.09	12.00	15.78
6,220.0	13.00	77.40	6,210.2	8.7	140.5	140.5	8.61	8.60	-1.80
6,265.0	17.00	81.30	6,253.6	10.8	151.9	152.0	9.16	8.89	8.67
6,315.0	20.60	87.40	6,301.0	12.3	167.9	168.0	8.19	7.20	12.20
6,365.0	24.90	89.90	6,347.1	12.8	187.2	187.3	8.81	8.60	5.00
6,409.0	29.30	92.20	6,386.2	12.4	207.3	207.4	10.28	10.00	5.23
6,454.0	33.80	92.00	6,424.6	11.5	230.8	230.9	10.00	10.00	-0.44
<b>Crossed Lease Line @ 6479' MD / 6445' TVD</b>									
6,479.0	35.90	92.63	6,445.1	10.9	245.1	245.1	8.52	8.39	2.52
6,504.0	38.00	93.20	6,465.1	10.2	260.1	260.1	8.52	8.41	2.28
6,539.0	41.30	92.80	6,492.0	9.0	282.4	282.4	9.46	9.43	-1.14
6,599.0	43.70	93.90	6,536.2	6.6	322.8	322.9	4.19	4.00	1.83
6,649.0	47.80	94.30	6,571.1	4.0	358.6	358.6	8.22	8.20	0.80
6,694.0	50.90	94.80	6,600.4	1.3	392.6	392.6	6.94	6.89	1.11
6,739.0	52.00	93.60	6,628.5	-1.2	427.7	427.7	3.21	2.44	-2.67
6,788.0	51.00	93.70	6,659.0	-3.7	466.0	465.9	2.05	-2.04	0.20
6,833.0	53.30	93.60	6,686.6	-5.9	501.4	501.4	5.11	5.11	-0.22
6,883.0	57.70	91.10	6,714.9	-7.6	542.6	542.5	9.72	8.80	-5.00

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<b>Design:</b>	Wellbore #1	<b>Database:</b>	EDM 5000.1 Single User Db

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
6,929.0	60.80	90.70	6,738.4	-8.2	582.1	582.0	6.78	6.74	-0.87
6,978.0	63.20	90.70	6,761.4	-8.8	625.3	625.3	4.90	4.90	0.00
7,028.0	67.30	91.60	6,782.4	-9.7	670.7	670.7	8.36	8.20	1.80
<b>Crossed Hard Line @ 7069' MD / 6797' TVD</b>									
7,068.5	70.63	92.59	6,796.9	-11.1	708.5	708.4	8.53	8.22	2.45
7,073.0	71.00	92.70	6,798.4	-11.3	712.7	712.7	8.53	8.23	2.39
7,120.0	75.40	93.20	6,812.0	-13.6	757.7	757.6	9.42	9.36	1.06
7,168.0	80.30	94.40	6,822.1	-16.7	804.5	804.3	10.50	10.21	2.50
7,213.0	84.20	96.00	6,828.1	-20.7	848.9	848.7	9.36	8.67	3.56
7,308.0	86.70	95.30	6,835.7	-30.0	943.1	942.9	2.73	2.63	-0.74
7,403.0	88.60	94.80	6,839.6	-38.4	1,037.7	1,037.4	2.07	2.00	-0.53
7,498.0	89.70	93.60	6,841.0	-45.4	1,132.4	1,132.0	1.71	1.16	-1.26
7,593.0	90.00	89.70	6,841.2	-48.1	1,227.3	1,227.0	4.12	0.32	-4.11
7,688.0	90.90	90.60	6,840.5	-48.3	1,322.3	1,322.0	1.34	0.95	0.95
7,782.0	92.60	89.00	6,837.6	-48.0	1,416.3	1,415.9	2.48	1.81	-1.70
7,877.0	92.00	87.60	6,833.8	-45.2	1,511.1	1,510.8	1.60	-0.63	-1.47
7,972.0	90.70	89.70	6,831.5	-43.0	1,606.1	1,605.8	2.60	-1.37	2.21
8,067.0	89.80	87.80	6,831.1	-40.9	1,701.1	1,700.7	2.21	-0.95	-2.00
8,162.0	89.00	86.50	6,832.1	-36.2	1,795.9	1,795.6	1.61	-0.84	-1.37
8,257.0	90.00	86.50	6,833.0	-30.4	1,890.8	1,890.5	1.05	1.05	0.00
8,352.0	88.90	86.70	6,833.9	-24.7	1,985.6	1,985.4	1.18	-1.16	0.21
8,447.0	88.00	88.80	6,836.4	-21.0	2,080.5	2,080.3	2.40	-0.95	2.21
8,542.0	89.10	89.20	6,838.8	-19.3	2,175.4	2,175.2	1.23	1.16	0.42
8,637.0	90.60	89.30	6,839.1	-18.1	2,270.4	2,270.2	1.58	1.58	0.11
8,732.0	89.20	88.30	6,839.3	-16.1	2,365.4	2,365.2	1.81	-1.47	-1.05
8,827.0	90.10	87.60	6,839.8	-12.7	2,460.3	2,460.2	1.20	0.95	-0.74
8,922.0	89.10	88.30	6,840.5	-9.3	2,555.3	2,555.1	1.28	-1.05	0.74
9,017.0	89.40	87.90	6,841.7	-6.2	2,650.2	2,650.1	0.53	0.32	-0.42
9,112.0	90.20	87.10	6,842.1	-2.0	2,745.1	2,745.0	1.19	0.84	-0.84
9,207.0	90.80	87.10	6,841.2	2.8	2,840.0	2,839.9	0.63	0.63	0.00
9,302.0	90.60	87.80	6,840.1	7.0	2,934.9	2,934.9	0.77	-0.21	0.74
9,397.0	90.70	88.30	6,839.0	10.2	3,029.8	3,029.8	0.54	0.11	0.53
9,492.0	91.30	88.50	6,837.3	12.9	3,124.8	3,124.8	0.67	0.63	0.21
9,587.0	92.30	88.10	6,834.4	15.7	3,219.7	3,219.7	1.13	1.05	-0.42
9,682.0	92.10	88.30	6,830.7	18.7	3,314.6	3,314.6	0.30	-0.21	0.21
9,777.0	91.30	89.20	6,827.9	20.8	3,409.5	3,409.5	1.27	-0.84	0.95
9,872.0	91.10	90.00	6,825.9	21.4	3,504.5	3,504.5	0.87	-0.21	0.84
9,967.0	90.20	90.40	6,824.8	21.1	3,599.5	3,599.5	1.04	-0.95	0.42
10,062.0	89.70	90.60	6,824.9	20.3	3,694.5	3,694.5	0.57	-0.53	0.21
10,157.0	88.60	91.60	6,826.3	18.4	3,789.4	3,789.5	1.56	-1.16	1.05
10,252.0	87.70	89.50	6,829.4	17.5	3,884.4	3,884.4	2.40	-0.95	-2.21
10,347.0	87.50	90.00	6,833.4	17.9	3,979.3	3,979.3	0.57	-0.21	0.53
10,442.0	87.40	89.50	6,837.6	18.4	4,074.2	4,074.2	0.54	-0.11	-0.53
10,537.0	87.80	89.00	6,841.6	19.6	4,169.1	4,169.1	0.67	0.42	-0.53

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<b>Site:</b>	Sec 8, T7N, R63W	<b>MD Reference:</b>	WELL @ 4903.0usft (H&P #326)
<b>Well:</b>	Kohlhoff AC09-65HN	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	EDM 5000.1 Single User Db

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
10,632.0	89.40	89.20	6,843.9	21.1	4,264.0	4,264.1	1.70	1.68	0.21
10,727.0	90.30	88.10	6,844.1	23.3	4,359.0	4,359.1	1.50	0.95	-1.16
10,822.0	91.20	87.90	6,842.9	26.6	4,453.9	4,454.0	0.97	0.95	-0.21
10,917.0	91.60	89.30	6,840.6	29.0	4,548.9	4,549.0	1.53	0.42	1.47
11,012.0	91.10	89.30	6,838.3	30.1	4,643.9	4,644.0	0.53	-0.53	0.00
11,107.0	90.10	90.70	6,837.3	30.1	4,738.8	4,738.9	1.81	-1.05	1.47
11,201.0	89.90	90.70	6,837.3	29.0	4,832.8	4,832.9	0.21	-0.21	0.00
11,296.0	90.80	90.20	6,836.8	28.2	4,927.8	4,927.9	1.08	0.95	-0.53
11,392.0	91.90	90.20	6,834.5	27.9	5,023.8	5,023.9	1.15	1.15	0.00
11,421.0	92.70	89.00	6,833.3	28.1	5,052.8	5,052.9	4.97	2.76	-4.14
<b>TD @ 11478' MD / 6831' TVD</b>									
11,478.0	92.70	89.00	6,830.7	29.1	5,109.7	5,109.8	0.00	0.00	0.00

Survey Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
1,105.0	1,105.0	0.0	0.0	Tie In
6,479.0	6,445.1	10.9	245.1	Crossed Lease Line @ 6479' MD / 6445' TVD
7,068.5	6,796.9	-11.1	708.5	Crossed Hard Line @ 7069' MD / 6797' TVD
11,478.0	6,830.7	29.1	5,109.7	TD @ 11478' MD / 6831' TVD

Checked By: _____	Approved By: _____	Date: _____
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## Survey Certification Sheet

Noble Energy  
Company

RM-12173  
Job Number

3/19/12  
Date

Sec 8, T7N, R63W  
Lease

Kohlhoff AC #09-65HN  
Well Name

Weld, CO  
County & State

Surveyed from a depth of: 1105 feet to 11478 feet MD

Type of Survey: MWD

Directional Supervisor/Surveyor: Jesse Herring

The data and calculations for this survey have been checked by me and conform to the standards and procedures set forth by **The Directional Drilling Company (DDC)**. This report represents a true and correct Directional survey of this well based on the original data obtained at the well site. Wellbore Coordinates are calculated using minimum curvature.

Digitally signed by Larry Wright  
DN: cn=Larry Wright, o=The  
Directional Drilling Company,  
ou=GM of Guidance Services,  
email=larryw@directionaldrillers.  
com, c=US  
Date: 2012.03.19 14:37:49 -05'00'

Larry Wright  
MWD General Manager

Company Name: Noble Energy Inc.  
Kohlhoff AC09-65HN  
Weld County, CO  
Rig: H&P #326  
Created By: Dina Chance  
Date: 3/19/2012

Kohlhoff AC09-65HN  
Weld County, CO  
Q120110 & RM-12173

WELL DETAILS:						Kohlhoff AC09-65HN	
+N/-S 0.0	+E/-W 0.0	Ground Level:		4874.0			
		Northing	Easting	Latitude	Longitude		
		1459053.00	3290987.07	40° 35' 19.608 N	104° 27' 8.136 W		

PROJECT DETAILS:		Weld County, CO
Geodetic System:	US State Plane 1983	
Datum:	North American Datum 1983	
Ellipsoid:	GRS 1980	
Zone:	Colorado Northern Zone	
System Datum:	Mean Sea Level	



T

G

M

Azimuths to Grid North

Correction: 7.95°

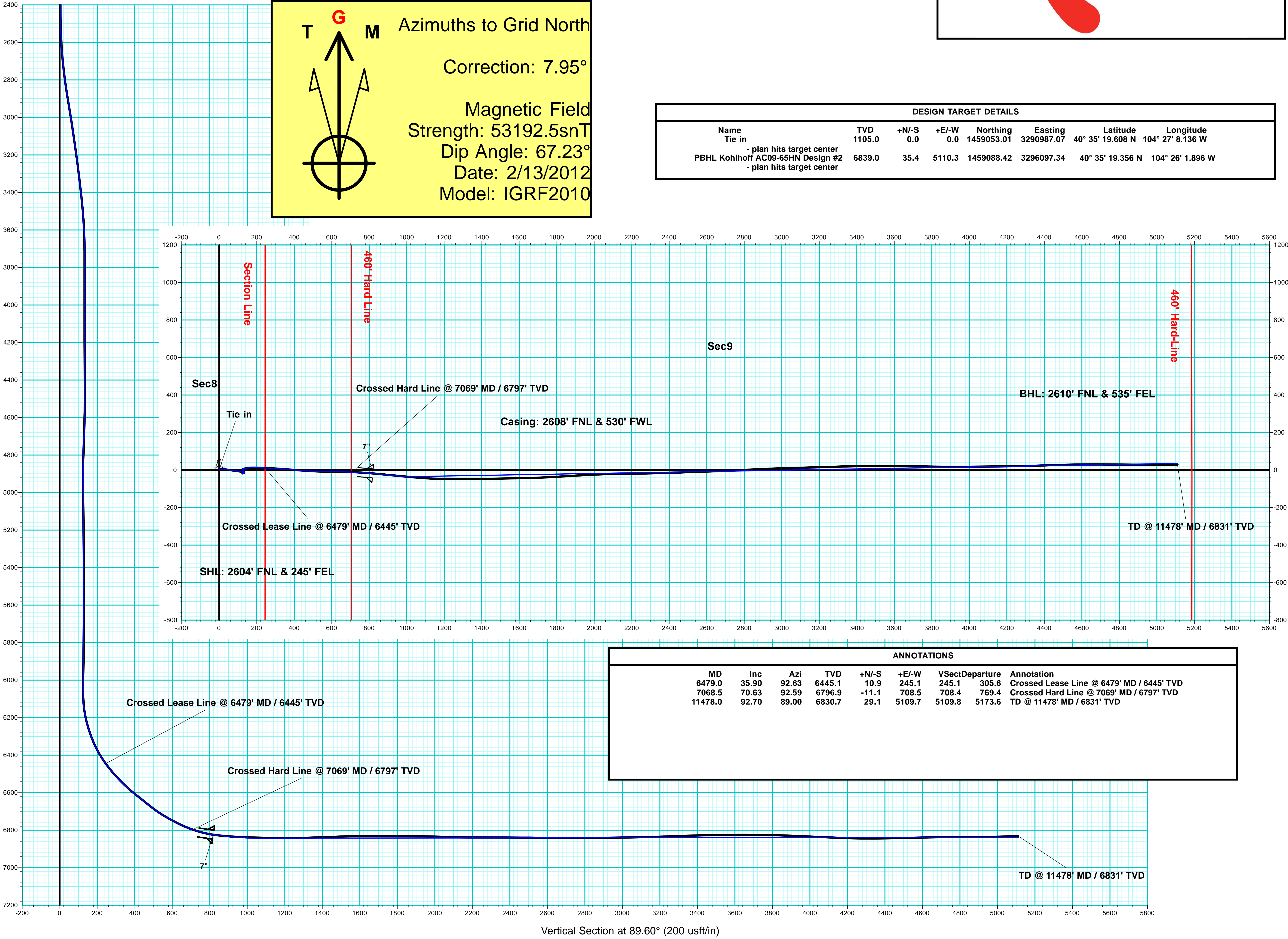
Magnetic Field Strength: 53192.5snT

Dip Angle: 67.23°

Date: 2/13/2012

Model: IGRF2010

DESIGN TARGET DETAILS						
Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude
Tie in	1105.0	0.0	0.0	1459053.01	3290987.07	40° 35' 19.608 N
- plan hits target center						
PBHL Kohlhoff AC09-65HN Design #2	6839.0	35.4	5110.3	1459088.42	3296097.34	40° 35' 19.356 N
- plan hits target center						104° 26' 1.896 W



ANNOTATIONS							
MD	Inc	Azi	TVD	+N/-S	+E/-W	VSectDeparture	Annotation
6479.0	35.90	92.63	6445.1	10.9	245.1	245.1	305.6
7068.5	70.63	92.59	6796.9	-11.1	708.5	708.4	769.4
11478.0	92.70	89.00	6830.7	29.1	5109.7	5109.8	5173.6
							Crossed Lease Line @ 6479' MD / 6445' TVD
							Crossed Hard Line @ 7069' MD / 6797' TVD
							TD @ 11478' MD / 6831' TVD