



Noble Energy Inc.

Weld County, CO

Sec 16, T9N, R58W, 6th PM

IGO Creek PC LD16-64HN

Wellbore #1

Survey: MWD FINAL

DDC Survey Report

24 May, 2012



Company:	Noble Energy Inc.	Local Co-ordinate Reference:	Well IGO Creek PC LD16-64HN
Project:	Weld County, CO	TVD Reference:	WELL @ 4733.0usft (H&P #326)
Site:	Sec 16, T9N, R58W, 6th PM	MD Reference:	WELL @ 4733.0usft (H&P #326)
Well:	IGO Creek PC LD16-64HN	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	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 16, T9N, R58W, 6th PM		
Site Position:		Northing:	1,519,245.91 usft
From:	Lat/Long	Easting:	3,454,267.11 usft
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "
		Latitude:	40° 44' 49.884 N
		Longitude:	103° 51' 37.620 W
		Grid Convergence:	1.06 °

Well	IGO Creek PC LD16-64HN		
Well Position	+N-S	0.0 usft	Northing: 1,519,245.91 usft
	+E-W	0.0 usft	Easting: 3,454,267.11 usft
Position Uncertainty	0.0 usft	Wellhead Elevation:	usft
		Latitude:	40° 44' 49.884 N
		Longitude:	103° 51' 37.620 W
		Ground Level:	4,703.0 usft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	5/11/2012	8.27	67.44	53,311

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	279.33	

Survey Program	Date 5/24/2012			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
1,173.0	10,059.0	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)	
1,173.0	1.20	274.80	1,172.9	1.0	-12.2	12.2	0.10	0.10	0.00	
First MWD Survey @ 1173' MD / 1173' TVD										
1,173.1	1.20	274.80	1,173.0	1.0	-12.2	12.2	0.00	0.00	0.00	
1,314.0	1.70	270.70	1,313.9	1.2	-15.8	15.8	0.36	0.35	-2.91	
1,498.0	1.80	278.30	1,497.8	1.6	-21.4	21.4	0.14	0.05	4.13	
1,593.0	2.30	331.00	1,592.7	3.5	-23.8	24.0	1.97	0.53	55.47	
1,686.0	2.50	348.40	1,685.6	7.1	-25.1	25.9	0.81	0.22	18.71	
1,779.0	5.90	21.30	1,778.4	13.6	-23.8	25.7	4.34	3.66	35.38	
1,872.0	8.40	23.40	1,870.7	24.3	-19.3	23.0	2.70	2.69	2.26	
1,965.0	11.20	22.50	1,962.3	38.8	-13.2	19.3	3.02	3.01	-0.97	

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Well:	IGO Creek PC LD16-64HN	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	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)
2,057.0	13.40	19.30	2,052.2	57.2	-6.2	15.4	2.50	2.39	-3.48
2,150.0	15.40	15.80	2,142.3	79.2	0.7	12.2	2.34	2.15	-3.76
2,244.0	17.50	20.90	2,232.4	104.4	9.1	7.9	2.71	2.23	5.43
2,337.0	19.60	16.70	2,320.6	132.4	18.6	3.1	2.68	2.26	-4.52
2,429.0	21.80	13.40	2,406.6	163.8	27.0	-0.1	2.71	2.39	-3.59
2,521.0	22.60	13.50	2,491.8	197.7	35.1	-2.6	0.87	0.87	0.11
2,615.0	22.70	12.50	2,578.6	232.9	43.2	-4.9	0.42	0.11	-1.06
2,709.0	22.00	10.70	2,665.5	267.9	50.4	-6.3	1.04	-0.74	-1.91
2,801.0	21.70	12.30	2,750.9	301.5	57.2	-7.6	0.72	-0.33	1.74
2,896.0	19.20	12.10	2,839.9	333.9	64.3	-9.3	2.63	-2.63	-0.21
2,991.0	18.50	15.50	2,929.8	363.7	71.6	-11.6	1.37	-0.74	3.58
3,086.0	19.50	14.90	3,019.6	393.6	79.7	-14.8	1.07	1.05	-0.63
3,181.0	21.00	12.80	3,108.8	425.5	87.5	-17.4	1.75	1.58	-2.21
3,276.0	21.10	11.40	3,197.4	458.9	94.7	-19.0	0.54	0.11	-1.47
3,371.0	22.30	11.10	3,285.7	493.3	101.5	-20.2	1.27	1.26	-0.32
3,466.0	23.90	11.40	3,373.1	529.9	108.8	-21.4	1.69	1.68	0.32
3,561.0	22.90	12.70	3,460.3	566.8	116.7	-23.2	1.18	-1.05	1.37
3,656.0	20.10	15.10	3,548.6	600.6	125.0	-26.0	3.09	-2.95	2.53
3,751.0	17.70	17.00	3,638.5	630.1	133.4	-29.5	2.61	-2.53	2.00
3,846.0	15.60	17.00	3,729.5	656.2	141.4	-33.2	2.21	-2.21	0.00
3,941.0	14.30	16.70	3,821.3	679.6	148.5	-36.4	1.37	-1.37	-0.32
4,036.0	13.60	12.00	3,913.5	701.8	154.2	-38.4	1.40	-0.74	-4.95
4,131.0	13.40	14.10	4,005.9	723.4	159.2	-39.8	0.56	-0.21	2.21
4,226.0	13.10	11.30	4,098.4	744.6	164.0	-41.1	0.75	-0.32	-2.95
4,321.0	9.70	18.50	4,191.5	762.8	168.7	-42.8	3.87	-3.58	7.58
4,416.0	9.60	21.10	4,285.1	777.7	174.0	-45.7	0.47	-0.11	2.74
4,511.0	7.30	25.50	4,379.1	790.6	179.5	-48.9	2.51	-2.42	4.63
4,606.0	5.60	26.20	4,473.5	800.2	184.1	-52.0	1.79	-1.79	0.74
4,701.0	3.80	17.40	4,568.2	807.4	187.1	-53.8	2.04	-1.89	-9.26
4,796.0	2.70	12.70	4,663.0	812.5	188.6	-54.3	1.19	-1.16	-4.95
4,891.0	1.90	1.80	4,757.9	816.3	189.1	-54.3	0.96	-0.84	-11.47
4,986.0	1.40	0.50	4,852.9	819.0	189.2	-53.9	0.53	-0.53	-1.37
5,078.0	1.40	343.80	4,944.9	821.2	188.9	-53.2	0.44	0.00	-18.15
5,172.0	10.20	279.10	5,038.3	823.7	180.3	-44.4	10.30	9.36	-68.83
5,217.0	14.50	282.00	5,082.3	825.5	170.8	-34.8	9.65	9.56	6.44
5,267.0	19.10	275.50	5,130.1	827.6	156.6	-20.3	9.92	9.20	-13.00
5,312.0	23.30	271.60	5,172.1	828.5	140.3	-4.2	9.84	9.33	-8.67
5,362.0	26.70	266.80	5,217.4	828.2	119.2	16.6	7.91	6.80	-9.60
5,407.0	28.00	269.80	5,257.4	827.6	98.6	36.9	4.21	2.89	6.67
5,457.0	31.60	265.80	5,300.8	826.6	73.8	61.2	8.22	7.20	-8.00
5,502.0	35.70	264.90	5,338.2	824.5	48.9	85.4	9.18	9.11	-2.00
5,552.0	37.50	265.80	5,378.3	822.1	19.2	114.3	3.76	3.60	1.80
5,597.0	40.40	266.50	5,413.3	820.2	-9.0	141.9	6.52	6.44	1.56
5,647.0	44.70	267.00	5,450.2	818.3	-42.8	174.9	8.63	8.60	1.00

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Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	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)
5,692.0	48.50	268.30	5,481.1	817.0	-75.4	206.9	8.70	8.44	2.89
5,741.0	54.30	270.20	5,511.6	816.5	-113.7	244.6	12.22	11.84	3.88
5,786.0	58.50	270.70	5,536.5	816.8	-151.2	281.6	9.38	9.33	1.11
5,836.0	62.20	271.10	5,561.3	817.5	-194.6	324.6	7.43	7.40	0.80
5,881.0	63.60	271.10	5,581.8	818.3	-234.7	364.2	3.11	3.11	0.00
5,931.0	67.20	272.10	5,602.6	819.5	-280.1	409.3	7.43	7.20	2.00
5,976.0	70.70	271.80	5,618.7	821.0	-322.1	450.9	7.80	7.78	-0.67
6,026.0	75.20	272.30	5,633.4	822.7	-369.8	498.3	9.05	9.00	1.00
Crossed Hard Line @ 6040' MD / 5636' TVD									
6,040.0	76.57	272.46	5,636.8	823.2	-383.4	511.8	9.84	9.78	1.12
6,071.0	79.60	272.80	5,643.2	824.6	-413.7	541.9	9.84	9.78	1.11
6,121.0	81.90	271.90	5,651.2	826.6	-463.0	590.9	4.93	4.60	-1.80
6,141.0	83.90	270.00	5,653.7	827.0	-482.8	610.5	13.74	10.00	-9.50
6,259.0	87.80	268.80	5,662.3	825.7	-600.5	726.4	3.46	3.31	-1.02
6,354.0	87.80	268.60	5,665.9	823.6	-695.4	819.7	0.21	0.00	-0.21
6,449.0	92.30	269.30	5,665.8	821.8	-790.4	913.1	4.79	4.74	0.74
6,545.0	90.20	268.60	5,663.7	820.1	-886.3	1,007.5	2.31	-2.19	-0.73
6,640.0	91.10	267.50	5,662.6	816.9	-981.2	1,100.7	1.50	0.95	-1.16
6,734.0	89.20	267.50	5,662.4	812.8	-1,075.2	1,192.7	2.02	-2.02	0.00
6,829.0	90.00	268.30	5,663.1	809.3	-1,170.1	1,285.8	1.19	0.84	0.84
6,924.0	90.60	267.50	5,662.6	805.8	-1,265.0	1,378.9	1.05	0.63	-0.84
7,019.0	89.00	268.30	5,662.9	802.3	-1,360.0	1,472.0	1.88	-1.68	0.84
7,114.0	89.20	265.60	5,664.4	797.3	-1,454.8	1,564.8	2.85	0.21	-2.84
7,209.0	89.50	265.10	5,665.5	789.6	-1,549.5	1,657.0	0.61	0.32	-0.53
7,304.0	89.90	268.30	5,666.0	784.1	-1,644.3	1,749.7	3.39	0.42	3.37
7,399.0	89.90	270.40	5,666.1	783.0	-1,739.3	1,843.2	2.21	0.00	2.21
7,493.0	90.90	269.80	5,665.5	783.2	-1,833.3	1,936.0	1.24	1.06	-0.64
7,588.0	89.80	271.10	5,664.9	783.9	-1,928.3	2,029.9	1.79	-1.16	1.37
7,683.0	88.60	271.80	5,666.2	786.3	-2,023.2	2,124.0	1.46	-1.26	0.74
7,778.0	89.50	271.20	5,667.8	788.8	-2,118.2	2,218.1	1.14	0.95	-0.63
7,873.0	90.70	271.20	5,667.6	790.8	-2,213.2	2,312.1	1.26	1.26	0.00
7,968.0	89.30	270.40	5,667.6	792.1	-2,308.2	2,406.0	1.70	-1.47	-0.84
8,063.0	90.20	270.50	5,668.0	792.9	-2,403.2	2,499.9	0.95	0.95	0.11
8,158.0	89.90	269.10	5,668.0	792.5	-2,498.2	2,593.6	1.51	-0.32	-1.47
8,253.0	88.90	268.80	5,669.0	790.8	-2,593.1	2,687.0	1.10	-1.05	-0.32
8,348.0	89.50	268.80	5,670.3	788.8	-2,688.1	2,780.4	0.63	0.63	0.00
8,443.0	89.40	267.40	5,671.2	785.7	-2,783.0	2,873.6	1.48	-0.11	-1.47
8,538.0	90.00	267.00	5,671.7	781.0	-2,877.9	2,966.5	0.76	0.63	-0.42
8,633.0	90.20	266.10	5,671.5	775.3	-2,972.7	3,059.1	0.97	0.21	-0.95
8,728.0	90.30	266.10	5,671.1	768.8	-3,067.5	3,151.6	0.11	0.11	0.00
8,822.0	89.50	265.60	5,671.3	762.0	-3,161.3	3,243.0	1.00	-0.85	-0.53
8,918.0	89.60	268.30	5,672.0	756.9	-3,257.1	3,336.8	2.81	0.10	2.81
9,012.0	89.30	266.70	5,672.9	752.8	-3,351.0	3,428.8	1.73	-0.32	-1.70

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Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Single User Db

Survey										
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9,107.0	87.80	264.70	5,675.3	745.7	-3,445.7	3,521.0	2.63	-1.58	-2.11	
9,202.0	89.30	266.30	5,677.7	738.3	-3,540.4	3,613.3	2.31	1.58	1.68	
9,297.0	89.30	266.50	5,678.9	732.3	-3,635.2	3,705.8	0.21	0.00	0.21	
9,392.0	90.60	267.20	5,679.0	727.1	-3,730.1	3,798.6	1.55	1.37	0.74	
9,487.0	90.40	266.70	5,678.2	722.0	-3,824.9	3,891.4	0.57	-0.21	-0.53	
9,582.0	90.80	267.40	5,677.2	717.1	-3,919.8	3,984.2	0.85	0.42	0.74	
9,677.0	88.60	263.70	5,677.7	709.8	-4,014.5	4,076.4	4.53	-2.32	-3.89	
9,772.0	90.80	266.30	5,678.2	701.5	-4,109.1	4,168.5	3.58	2.32	2.74	
9,867.0	90.50	264.40	5,677.1	693.8	-4,203.8	4,260.6	2.02	-0.32	-2.00	
9,962.0	90.50	264.50	5,676.2	684.6	-4,298.3	4,352.5	0.11	0.00	0.11	
10,004.0	90.30	263.50	5,676.0	680.2	-4,340.1	4,393.0	2.43	-0.48	-2.38	
TD @ 10059' MD / 5675' TVD										
10,059.0	90.30	263.50	5,675.7	674.0	-4,394.7	4,445.9	0.00	0.00	0.00	

Survey Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
1,173.1	1,173.0	1.0	-12.2	First MWD Survey @ 1173' MD / 1173' TVD	
6,040.0	5,636.8	823.2	-383.4	Crossed Hard Line @ 6040' MD / 5636' TVD	
10,059.0	5,675.7	674.0	-4,394.7	TD @ 10059' MD / 5675' TVD	

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

Noble Energy
Company

RM-12348
Job Number

5/24/12
Date

Sec 16, T9N, R58W, 6th PM
Lease

IGO Creek PC LD16-64HN
Well Name

Weld, CO
County & State

Surveyed from a depth of: 1173 feet to 10059 feet MD

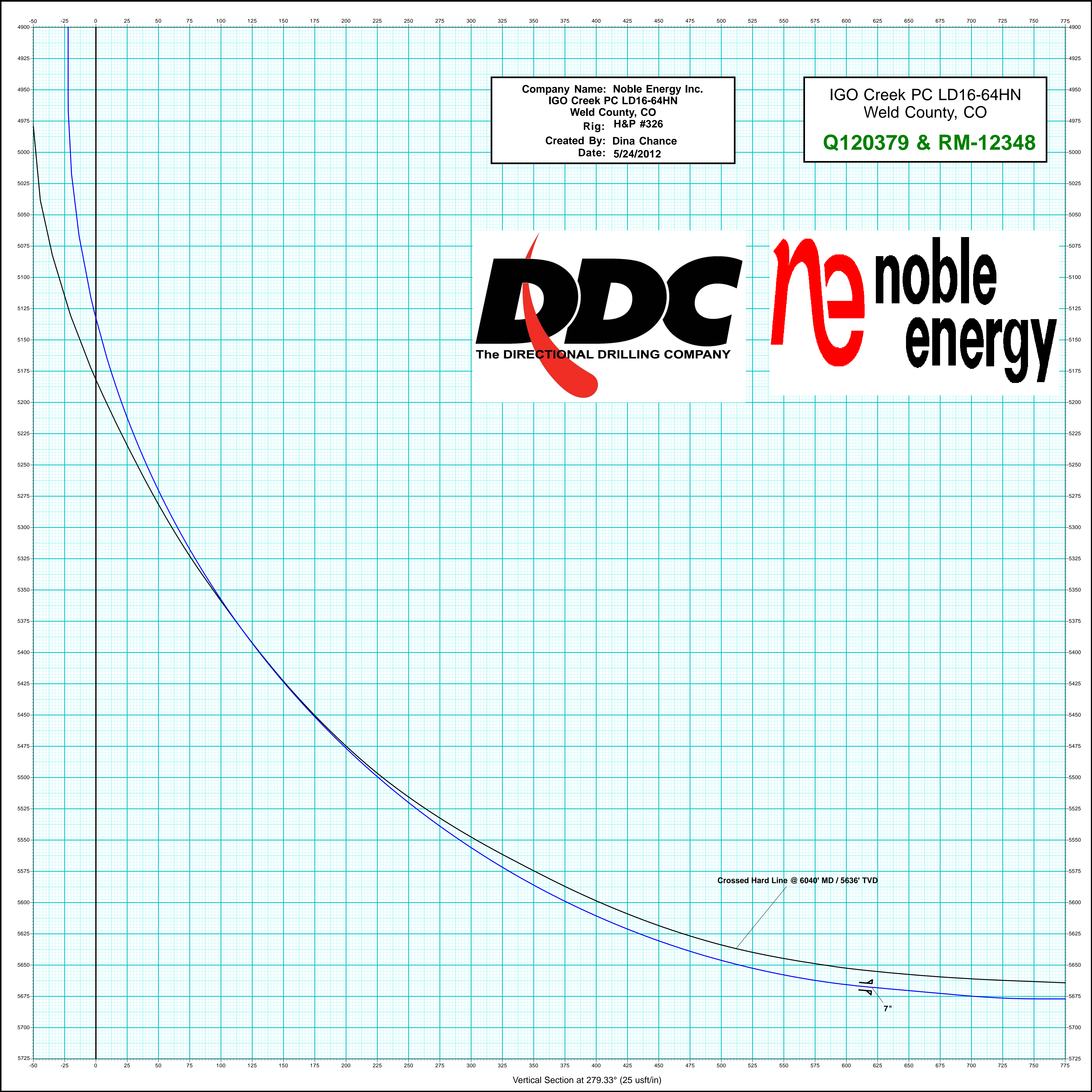
Type of Survey: MWD

Directional Supervisor/Surveyor: Worth Barham

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.

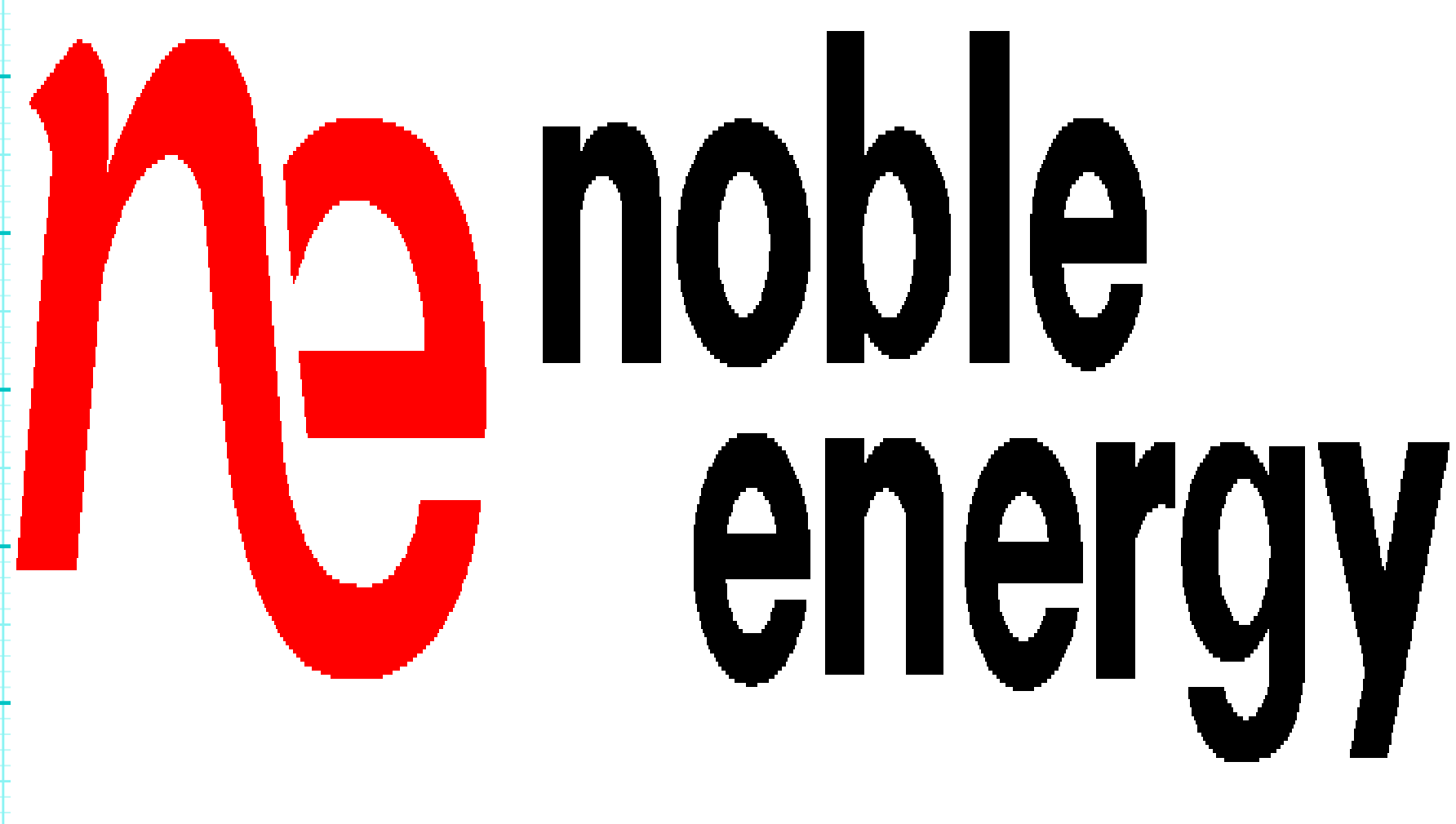
Digitally signed by Larry Wright
DN: cn=Larry Wright, o=The
Directional Drilling Company,
ou=GM of Guidance Services,
email=larryw@directionaldrillers
.com, c=US
Date: 2012.05.25 12:24:32 -05'00'

Larry Wright
MWD General Manager



Company Name: Noble Energy Inc.
IGO Creek PC LD16-64HN
Weld County, CO
Rig: H&P #326
Created By: Dina Chance
Date: 5/24/2012

IGO Creek PC LD16-64HN
Weld County, CO
Q120379 & RM-12348



Crossed Hard Line @ 6040' MD / 5636' TVD

7P
7"

Vertical Section at 279.33° (25 usft/in)

Company Name: Noble Energy Inc.
IGO Creek PC LD16-64HN
Weld County, CO
Rig: H&P #326
Created By: Dina Chance
Date: 5/24/2012

IGO Creek PC LD16-64HN
Weld County, CO
Q120379 & RM-12348



T

G

M

Azimuths to Grid North

Magnetic North: 7.21°

Magnetic Field Strength: 53311.0snT

Dip Angle: 67.44°

Date: 5/11/2012

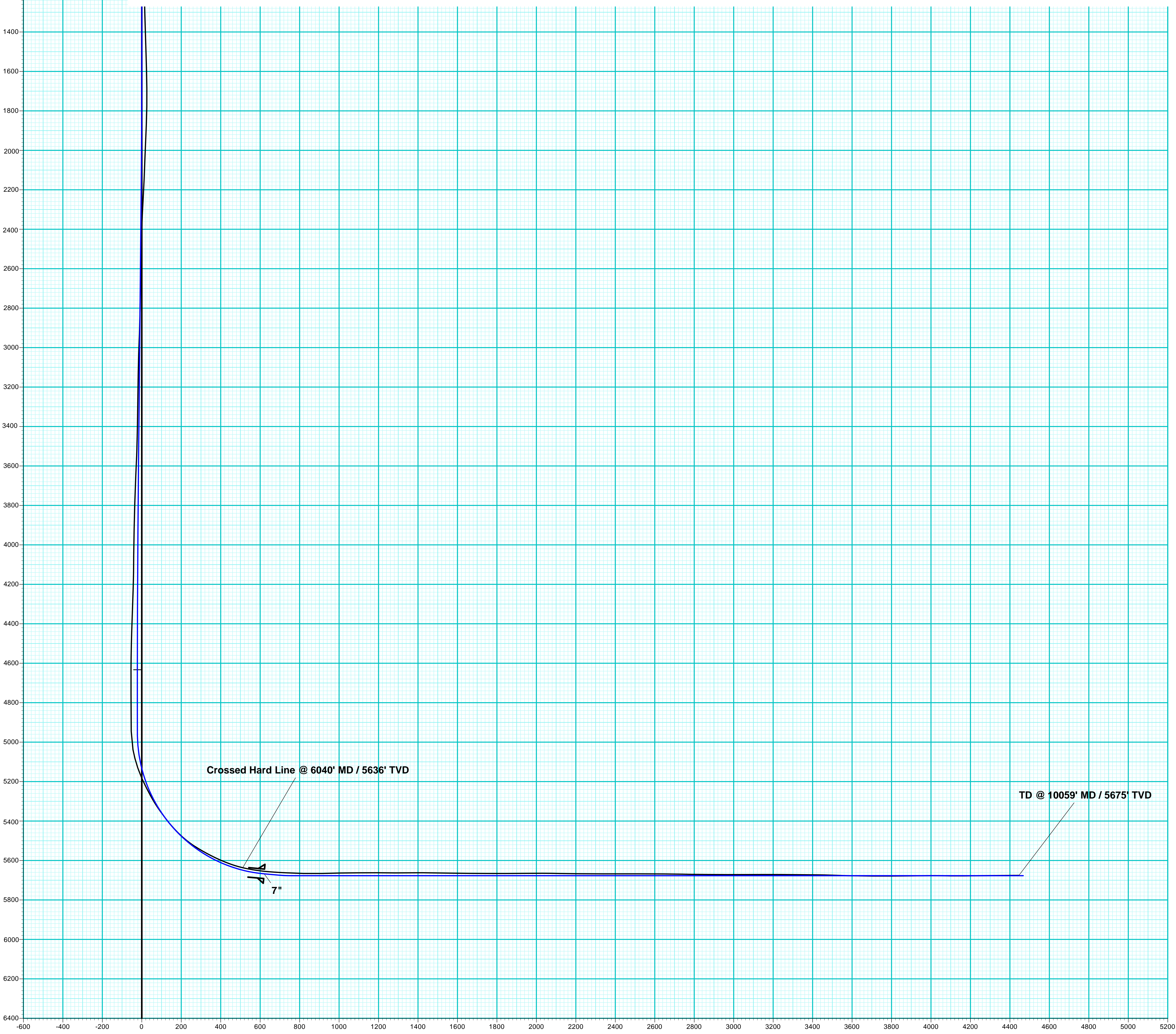
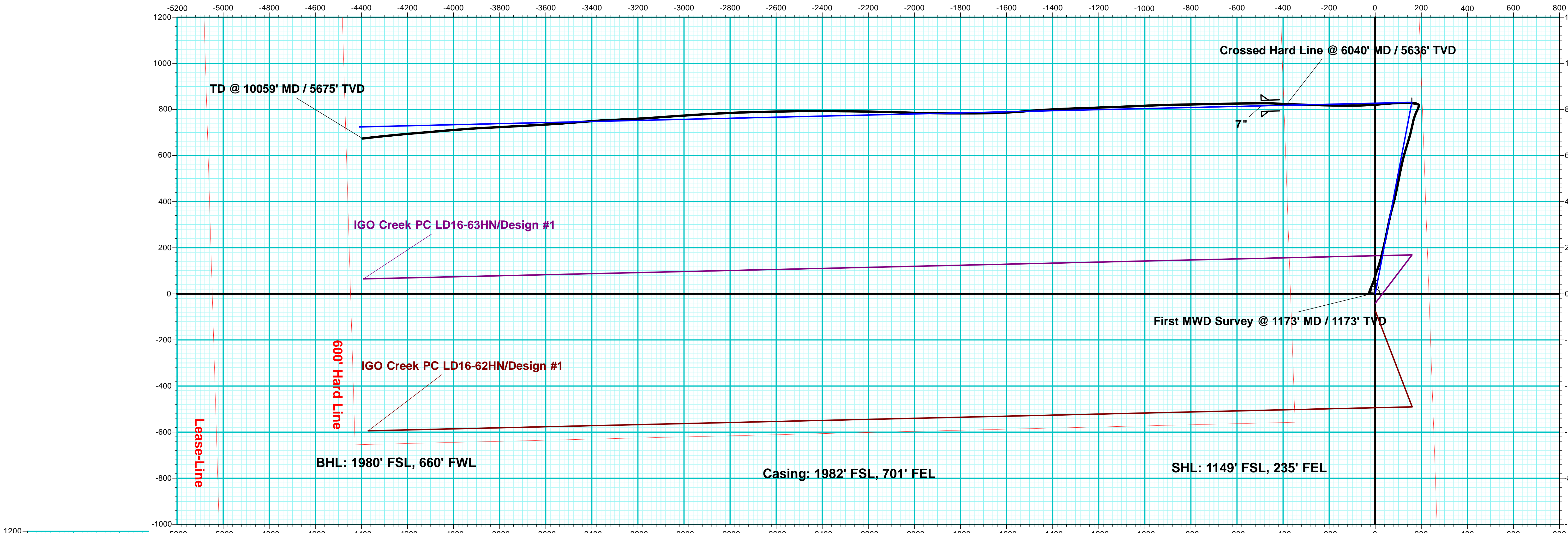
Model: IGRF2010

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	

WELL DETAILS:		IGO Creek PC LD16-64HN				
		Ground Level: 4703.0				
+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	
0.0	0.0	1519245.90	3454267.12	40° 44' 49.884 N	103° 51' 37.620 W	

DESIGN TARGET DETAILS							
Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
VP IGO Creek PC LD16-64HN	4633.0	831.0	159.0	1520076.90	3454426.12	40° 44' 58.065 N	103° 51' 35.355 W
- plan hits target center							
PBHL IGO Creek PC LD16-64HN	677.0	724.2	-4408.6	1519970.09	3449858.57	40° 44' 57.840 N	103° 52' 34.716 W
- plan hits target center							

ANNOTATIONS									
MD	Inc	Azi	TVD	+N/-S	+E/-W	VSec	Departure	Annotation	
1173.1	1.20	274.80	1173.0	1.0	-12.2	12.2	12.3	First MWD Survey @ 1173' MD / 1173' TVD	
6040.0	76.57	272.46	5636.8	823.2	-383.4	511.8	1446.9	Crossed Hard Line @ 6040' MD / 5636' TVD	
10059.0	90.30	263.50	5675.7	674.0	-4394.7	4445.9	5463.7	TD @ 10059' MD / 5675' TVD	



Vertical Section at 279.33° (200 usf/in)