

Noble Energy Inc.

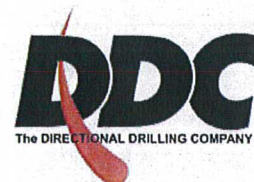
Weld County, CO
Sec 16, T2N, R67W 6th PM
Abbey State V16-77HN

Wellbore #1

Survey: MWD **FINAL**

DDC Survey Report

06 September, 2012



Company:	Noble Energy Inc.	Local Co-ordinate Reference:	Well Abbey State V16-77HN
Project:	Weld County, CO	TVD Reference:	WELL @ 5014.0usft (H&P #323)
Site:	Sec 16, T2N, R67W 6th PM	MD Reference:	WELL @ 5014.0usft (H&P #323)
Well:	Abbey State V16-77HN	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, T2N, R67W 6th PM				
Site Position:		Northing:	1,291,454.89 usft	Latitude:	40° 7' 54.732 N
From:	Lat/Long	Easting:	3,168,257.95 usft	Longitude:	104° 53' 53.664 W
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.39 °

Well	Abbey State V16-77HN					
Well Position	+N/-S	0.0 usft	Northing:	1,291,454.88 usft	Latitude:	40° 7' 54.732 N
	+E/-W	0.0 usft	Easting:	3,168,257.95 usft	Longitude:	104° 53' 53.664 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	4,990.0 usft

Wellbore	Wellbore #1				
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Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	8/17/2012	8.75	66.77	52,851

Design	Wellbore #1				
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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	353.32	

Survey Program	Date 9/6/2012				
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
777.0	11,812.0	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)	
715.0	0.00	0.00	715.0	0.0	0.0	0.0	0.00	0.00	0.00	
TIE IN @ 715' MD / 715' TVD										
715.1	0.00	306.70	715.1	0.0	0.0	0.0	0.00	0.00	0.00	
777.0	1.30	306.70	777.0	0.4	-0.6	0.5	2.10	2.10	0.00	
1,049.0	1.10	318.00	1,048.9	4.2	-4.8	4.7	0.11	-0.07	4.15	
1,329.0	1.50	324.50	1,328.9	9.2	-8.7	10.1	0.15	0.14	2.32	
1,611.0	1.30	318.30	1,610.8	14.6	-13.0	16.0	0.09	-0.07	-2.20	
1,894.0	1.60	304.80	1,893.7	19.2	-18.4	21.2	0.16	0.11	-4.77	
2,177.0	2.10	283.90	2,176.5	22.7	-26.6	25.7	0.29	0.18	-7.39	
2,276.0	3.60	274.40	2,275.4	23.4	-31.5	26.9	1.58	1.52	-9.60	
2,371.0	5.10	255.60	2,370.1	22.6	-38.6	26.9	2.16	1.58	-19.79	

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Well:	Abbey State V16-77HN	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)
2,466.0	5.80	249.20	2,464.7	19.8	-47.1	25.2	0.97	0.74	-6.74
2,561.0	7.60	252.00	2,559.1	16.2	-57.6	22.8	1.93	1.89	2.95
2,656.0	10.30	243.40	2,652.9	10.4	-71.2	18.6	3.16	2.84	-9.05
2,751.0	11.20	238.70	2,746.2	1.8	-86.7	11.9	1.32	0.95	-4.95
2,846.0	12.90	241.00	2,839.1	-8.1	-103.8	4.0	1.86	1.79	2.42
2,941.0	13.50	242.40	2,931.6	-18.4	-122.9	-3.9	0.72	0.63	1.47
3,036.0	14.20	246.80	3,023.9	-28.1	-143.5	-11.2	1.33	0.74	4.63
3,131.0	14.30	248.50	3,115.9	-37.0	-165.1	-17.5	0.45	0.11	1.79
3,226.0	14.60	249.40	3,207.9	-45.5	-187.2	-23.4	0.39	0.32	0.95
3,321.0	14.40	250.30	3,299.9	-53.7	-209.5	-29.0	0.32	-0.21	0.95
3,416.0	13.80	250.50	3,392.1	-61.5	-231.3	-34.1	0.63	-0.63	0.21
3,511.0	14.20	248.50	3,484.2	-69.5	-252.9	-39.6	0.66	0.42	-2.11
3,606.0	13.90	248.30	3,576.4	-78.0	-274.3	-45.6	0.32	-0.32	-0.21
3,701.0	14.30	250.50	3,668.5	-86.1	-296.0	-51.1	0.70	0.42	2.32
3,796.0	13.60	249.40	3,760.7	-94.0	-317.5	-56.4	0.79	-0.74	-1.16
3,891.0	13.20	252.60	3,853.1	-101.2	-338.3	-61.1	0.89	-0.42	3.37
3,986.0	13.30	249.00	3,945.6	-108.3	-358.8	-65.8	0.87	0.11	-3.79
4,081.0	14.20	253.30	4,037.9	-115.6	-380.2	-70.6	1.43	0.95	4.53
4,176.0	13.90	251.70	4,130.1	-122.5	-402.2	-74.9	0.52	-0.32	-1.68
4,271.0	14.30	248.70	4,222.2	-130.4	-424.0	-80.2	0.88	0.42	-3.16
4,366.0	14.10	247.50	4,314.3	-139.1	-445.6	-86.3	0.37	-0.21	-1.26
4,461.0	12.10	246.60	4,406.8	-147.4	-465.4	-92.3	2.12	-2.11	-0.95
4,556.0	10.40	245.40	4,500.0	-155.0	-482.3	-97.8	1.81	-1.79	-1.26
4,651.0	9.90	242.00	4,593.5	-162.4	-497.4	-103.4	0.82	-0.53	-3.58
4,746.0	9.80	244.30	4,687.1	-169.7	-511.8	-109.0	0.43	-0.11	2.42
4,841.0	9.20	248.50	4,780.8	-176.0	-526.2	-113.6	0.96	-0.63	4.42
4,936.0	7.90	258.40	4,874.7	-180.1	-539.7	-116.1	2.06	-1.37	10.42
5,031.0	5.90	263.80	4,969.0	-181.9	-550.9	-116.6	2.21	-2.11	5.68
5,126.0	3.30	269.10	5,063.7	-182.5	-558.5	-116.3	2.77	-2.74	5.58
5,222.0	0.30	63.60	5,159.7	-182.4	-561.0	-115.9	3.72	-3.13	160.94
5,317.0	1.80	68.90	5,254.7	-181.8	-559.4	-115.5	1.58	1.58	5.58
5,412.0	1.50	59.20	5,349.6	-180.6	-557.0	-114.6	0.43	-0.32	-10.21
5,506.0	1.20	55.90	5,443.6	-179.4	-555.1	-113.6	0.33	-0.32	-3.51
5,602.0	1.10	43.50	5,539.6	-178.2	-553.6	-112.6	0.28	-0.10	-12.92
5,697.0	0.70	32.70	5,634.6	-177.0	-552.7	-111.6	0.46	-0.42	-11.37
5,791.0	1.00	28.80	5,728.6	-175.8	-552.0	-110.4	0.32	0.32	-4.15
5,887.0	0.90	19.80	5,824.5	-174.4	-551.3	-109.1	0.19	-0.10	-9.38
5,982.0	0.90	3.50	5,919.5	-173.0	-551.0	-107.7	0.27	0.00	-17.16
6,076.0	1.40	40.60	6,013.5	-171.3	-550.2	-106.2	0.93	0.53	39.47
6,171.0	1.10	20.00	6,108.5	-169.6	-549.2	-104.6	0.56	-0.32	-21.68
6,266.0	1.00	358.90	6,203.5	-167.9	-548.9	-102.9	0.42	-0.11	-22.21
6,361.0	1.20	341.50	6,298.5	-166.1	-549.2	-101.1	0.41	0.21	-18.32
6,456.0	1.10	340.10	6,393.4	-164.3	-549.8	-99.3	0.11	-0.11	-1.47

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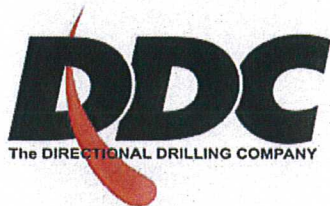
Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
6,551.0	1.10	348.20	6,488.4	-162.6	-550.3	-97.5	0.16	0.00	8.53
6,638.0	1.10	348.20	6,575.4	-161.0	-550.7	-95.8	0.00	0.00	0.00
6,677.0	1.10	346.60	6,614.4	-160.2	-550.8	-95.1	0.08	0.00	-4.10
6,722.0	1.30	356.60	6,659.4	-159.3	-551.0	-94.1	0.64	0.44	22.22
6,772.0	4.60	3.50	6,709.3	-156.7	-550.9	-91.6	6.63	6.60	13.80
6,817.0	7.60	357.30	6,754.1	-152.0	-550.9	-86.8	6.82	6.67	-13.78
6,867.0	10.90	354.70	6,803.4	-143.9	-551.5	-78.8	6.65	6.60	-5.20
6,912.0	13.40	355.70	6,847.4	-134.5	-552.3	-69.4	5.58	5.56	2.22
6,962.0	16.10	356.80	6,895.7	-121.8	-553.1	-56.6	5.43	5.40	2.20
7,007.0	16.90	358.90	6,938.9	-109.0	-553.6	-43.9	2.22	1.78	4.67
7,057.0	19.60	5.80	6,986.4	-93.4	-552.9	-28.5	6.91	5.40	13.80
7,095.0	21.70	7.30	7,021.9	-80.1	-551.3	-15.4	5.70	5.53	3.95
7,152.0	24.90	3.80	7,074.3	-57.7	-549.2	6.6	6.11	5.61	-6.14
7,197.0	28.30	0.80	7,114.5	-37.6	-548.4	26.5	8.12	7.56	-6.67
7,247.0	33.60	0.50	7,157.4	-11.9	-548.1	52.0	10.60	10.60	-0.60
7,292.0	38.00	1.40	7,193.9	14.5	-547.7	78.1	9.85	9.78	2.00
7,342.0	42.80	2.80	7,231.9	46.8	-546.5	110.1	9.77	9.60	2.80
7,387.0	47.10	4.40	7,263.8	78.6	-544.5	141.4	9.88	9.56	3.56
7,437.0	51.70	4.20	7,296.3	116.4	-541.6	178.6	9.21	9.20	-0.40
7,482.0	56.80	1.50	7,322.6	152.9	-539.8	214.6	12.33	11.33	-6.00
7,532.0	62.00	0.80	7,348.0	195.9	-539.0	257.2	10.47	10.40	-1.40
CROSSED HARD LINE @ 7545' MD / 7354' TVD									
7,544.7	63.10	1.58	7,353.9	207.1	-538.7	268.4	10.21	8.63	6.15
7,577.0	65.90	3.50	7,367.8	236.3	-537.4	297.2	10.21	8.68	5.94
7,627.0	71.30	5.60	7,386.0	282.6	-533.7	342.8	11.49	10.80	4.20
7,672.0	76.20	5.40	7,398.6	325.6	-529.6	385.0	10.90	10.89	-0.44
7,722.0	81.30	3.00	7,408.4	374.5	-526.0	433.2	11.23	10.20	-4.80
7,801.0	83.80	1.90	7,418.6	452.8	-522.7	510.5	3.45	3.16	-1.39
7,923.0	87.30	0.70	7,428.1	574.4	-519.9	630.9	3.03	2.87	-0.98
8,019.0	87.00	0.01	7,432.9	670.2	-519.3	726.1	0.79	-0.31	-0.72
8,113.0	86.80	359.10	7,437.9	764.1	-520.1	819.4	0.98	-0.21	-0.96
8,209.0	90.00	0.01	7,440.6	860.0	-520.8	914.8	3.46	3.33	0.94
8,304.0	90.00	359.10	7,440.6	955.0	-521.5	1,009.2	0.95	0.00	-0.95
8,399.0	90.30	358.00	7,440.4	1,050.0	-524.0	1,103.8	1.20	0.32	-1.16
8,494.0	90.80	357.30	7,439.5	1,144.9	-527.8	1,198.5	0.91	0.53	-0.74
8,589.0	90.80	359.40	7,438.1	1,239.9	-530.6	1,293.2	2.21	0.00	2.21
8,685.0	90.00	0.80	7,437.5	1,335.9	-530.4	1,388.5	1.68	-0.83	1.46
8,780.0	89.30	0.80	7,438.0	1,430.8	-529.1	1,482.7	0.74	-0.74	0.00
8,875.0	90.00	0.30	7,438.6	1,525.8	-528.2	1,576.9	0.91	0.74	-0.53
8,970.0	90.40	2.10	7,438.3	1,620.8	-526.2	1,671.0	1.94	0.42	1.89
9,065.0	89.70	2.30	7,438.2	1,715.7	-522.5	1,764.9	0.77	-0.74	0.21
9,160.0	89.30	1.70	7,439.0	1,810.7	-519.2	1,858.8	0.76	-0.42	-0.63
9,255.0	89.30	1.50	7,440.2	1,905.6	-516.6	1,952.8	0.21	0.00	-0.21

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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)
9,350.0	89.40	1.40	7,441.3	2,000.6	-514.2	2,046.8	0.15	0.11	-0.11
9,445.0	89.80	0.50	7,441.9	2,095.6	-512.6	2,141.0	1.04	0.42	-0.95
9,540.0	89.80	359.80	7,442.3	2,190.6	-512.3	2,235.3	0.74	0.00	-0.74
9,635.0	90.30	359.10	7,442.2	2,285.6	-513.3	2,329.8	0.91	0.53	-0.74
9,730.0	92.20	358.50	7,440.1	2,380.5	-515.2	2,424.3	2.10	2.00	-0.63
9,825.0	90.40	359.60	7,438.0	2,475.5	-516.8	2,518.8	2.22	-1.89	1.16
9,920.0	90.20	359.10	7,437.5	2,570.5	-517.9	2,613.3	0.57	-0.21	-0.53
10,015.0	89.20	359.10	7,438.0	2,665.5	-519.4	2,707.8	1.05	-1.05	0.00
10,110.0	89.10	358.70	7,439.4	2,760.4	-521.2	2,802.3	0.43	-0.11	-0.42
10,205.0	89.00	358.50	7,440.9	2,855.4	-523.5	2,896.9	0.24	-0.11	-0.21
10,300.0	90.70	359.30	7,441.2	2,950.4	-525.4	2,991.5	1.98	1.79	0.84
10,395.0	90.70	358.90	7,440.0	3,045.4	-526.9	3,086.0	0.42	0.00	-0.42
10,490.0	90.60	0.50	7,439.0	3,140.3	-527.3	3,180.4	1.69	-0.11	1.68
10,585.0	90.60	359.60	7,438.0	3,235.3	-527.3	3,274.7	0.95	0.00	-0.95
10,680.0	90.30	1.00	7,437.2	3,330.3	-526.8	3,369.0	1.51	-0.32	1.47
10,775.0	90.80	0.30	7,436.3	3,425.3	-525.7	3,463.2	0.91	0.53	-0.74
10,838.0	91.00	0.70	7,435.3	3,488.3	-525.1	3,525.7	0.71	0.32	0.63
10,870.0	91.50	0.80	7,434.6	3,520.3	-524.7	3,557.4	1.59	1.56	0.31
10,901.0	91.20	1.70	7,433.9	3,551.3	-524.0	3,588.1	3.06	-0.97	2.90
10,964.0	89.30	2.30	7,433.6	3,614.2	-521.8	3,650.4	3.16	-3.02	0.95
11,028.0	89.20	2.40	7,434.4	3,678.2	-519.2	3,713.6	0.22	-0.16	0.16
11,059.0	89.00	2.30	7,434.9	3,709.1	-518.0	3,744.2	0.72	-0.65	-0.32
11,154.0	88.60	1.70	7,436.9	3,804.1	-514.6	3,838.1	0.76	-0.42	-0.63
11,249.0	88.40	1.00	7,439.4	3,899.0	-512.4	3,932.1	0.77	-0.21	-0.74
11,344.0	89.40	0.80	7,441.2	3,994.0	-510.9	4,026.3	1.07	1.05	-0.21
11,439.0	90.00	0.50	7,441.7	4,089.0	-509.8	4,120.5	0.71	0.63	-0.32
11,535.0	87.80	0.30	7,443.6	4,184.9	-509.2	4,215.8	2.30	-2.29	-0.21
11,630.0	87.50	359.60	7,447.5	4,279.9	-509.2	4,310.0	0.80	-0.32	-0.74
11,725.0	87.10	359.10	7,451.9	4,374.8	-510.3	4,404.4	0.67	-0.42	-0.53
11,756.0	87.20	359.10	7,453.5	4,405.7	-510.8	4,435.2	0.32	0.32	0.00
TD @ 11812' MD / 7456' TVD									
11,812.0	87.20	359.10	7,456.2	4,461.6	-511.7	4,490.9	0.00	0.00	0.00

Survey Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
715.1	715.1	0.0	0.0	TIE IN @ 715' MD / 715' TVD
7,544.7	7,353.9	207.1	-538.7	CROSSED HARD LINE @ 7545' MD / 7354' TVD
11,812.0	7,456.2	4,461.6	-511.7	TD @ 11812' MD / 7456' TVD

Checked By: _____ Approved By: _____ Date: _____



Survey Certification Sheet

Noble Energy
Company

RM-12637
Job Number

9/20/2012
Date

Sec 16,T2N,R67W,6thPM
Lease

Abbey State V16-77HN
Well Name

Weld,CO
County & State

Surveyed from a depth of: 715 feet to 11812 feet MD

Type of Survey: MWD

Directional Supervisor/Surveyor: Bob Kubistek

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.

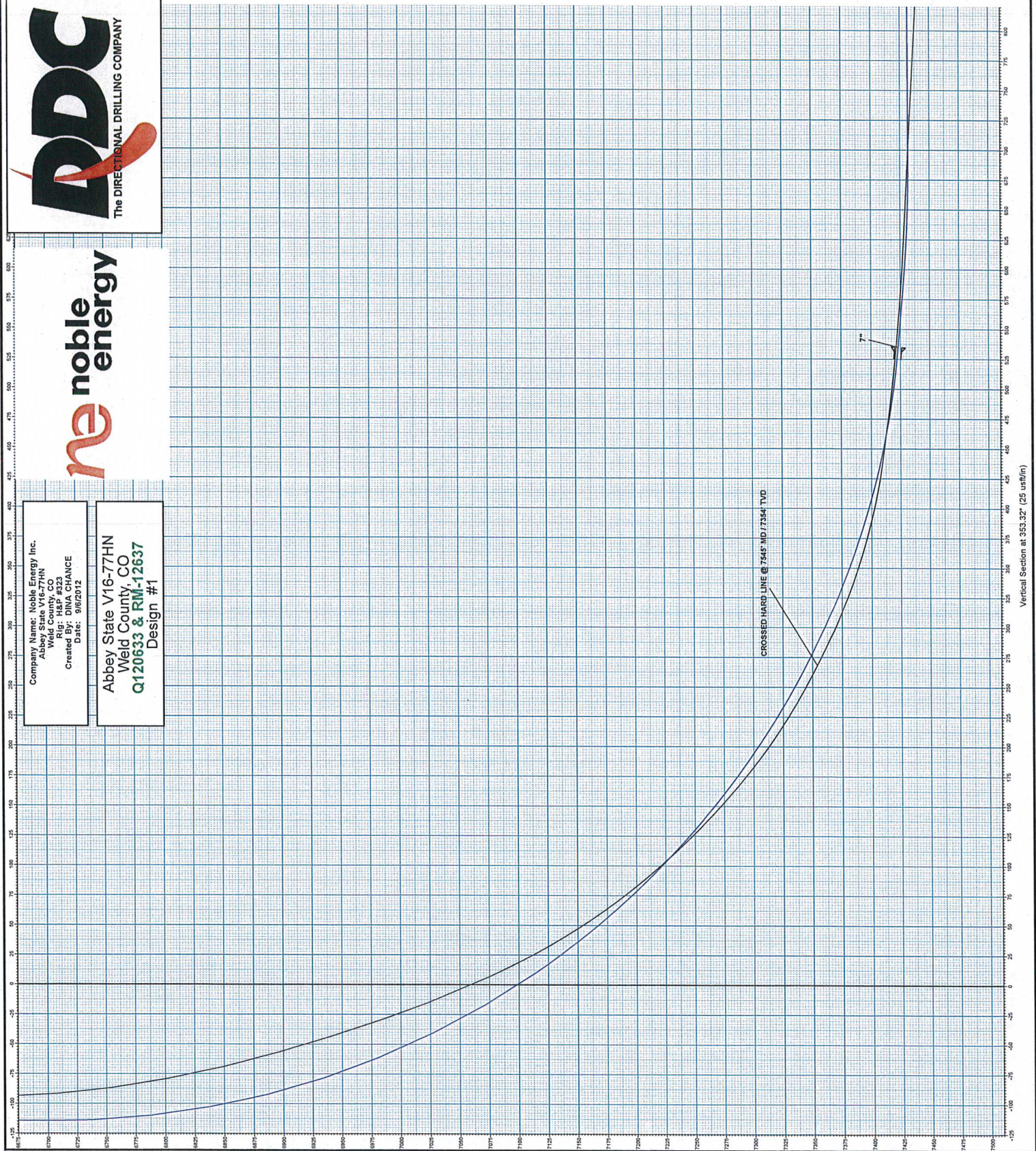
Digitally signed by Larry
Wright
DN: cn=Larry Wright, o=The
Directional Drilling Company,
ou=GM of Guidance Services,
email=larryw@directionaldrill
ers.com, c=US
Date: 2012.09.21 12:23:51
-05'00'

Larry Wright
MWD General Manager



Company Name: Noble Energy Inc.
Abbey State V16-77HN
Weld County, CO
Rig: H&P #323
Created By: DINA CHANCE
Date: 9/6/2012

Abbey State V16-77HN
Weld County, CO
Q120633 & RM-12637
Design #1



Vertical Section at 353.32' (25 usft/in)

Company Name: Noble Energy Inc.
 Abbey State V16-77HN
 Weld County, CO
 Created By: DINA CHANCE
 Date: 9/6/2012

Abbey State V16-77HN
 Weld County, CO
 Q120633 & RM-12637
 Design #1

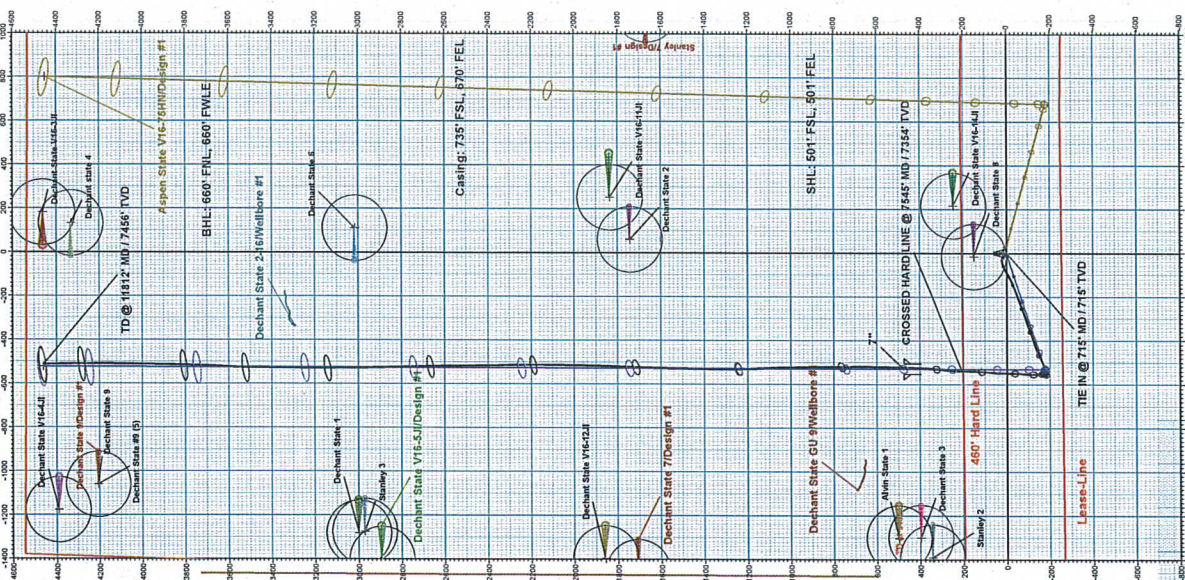
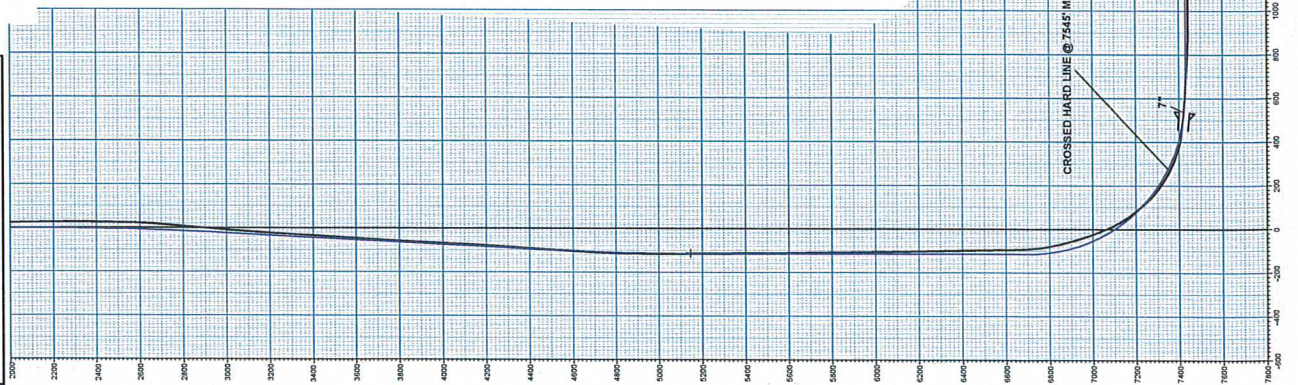


PROJECT DETAILS: Weld County, CO
 Geodetic System: US State Plane 1983
 Datum: North American Datum 1983
 Ellipsoid: GRS 1980 Northern Zone
 System Datum: Mean Sea Level

WELL DETAILS: Abbey State V16-77HN
 Ground Level: 4990.0
 +NLS -E/W 1291454.89 318257.95 40° 7' 54.722 N04° 53' 53.664 W
 0.0 0.0 318257.95 40° 7' 54.722 N04° 53' 53.664 W

DESIGN TARGET DETAILS
 Name: TIE IN @ 715' MD / 715' TVD
 +NLS -E/W 1291454.89 318257.95 40° 7' 54.722 N04° 53' 53.664 W
 -plan this target center
 VP Allen State V16-77HN 516.0 -177.0 -530.0 1291277.89 318772.95 40° 7' 53.018 N104° 54' 0.503 W
 PBHL Abbey State V16-77HN 7423.6 4462.6 -522.3 1295917.52 3187735.62 40° 8' 38.888 N104° 54' 0.000 W
 -plan this target center

ANNOTATIONS
 MD Inc Adj +NLS -E/W Vis-Depth Annotation
 7544.7 65.10 1.58 7353.9 207.1 -538.7 288.4 1088.2 CROSSED HARD LINE @ 7545' MD / 7354' TVD
 11812.0 87.20 355.10 7465.2 4461.6 -511.7 4493.9 5264.1 TD @ 11812' MD / 7458' TVD



Azimuths to Grid North
 Magnetic North: 8.37°
 Magnetic Field
 Strength: 52850.9snT
 Dip Angle: 66.77°
 Date: 8/17/2012
 Model: IGRF2010

