



Noble Energy Inc.

Weld County, CO
Sec 22, T8N, R61W 6th PM
Washburn LE22-78HN

Wellbore #1

Survey: MWD Final

DDC Survey Report

24 April, 2012



Company:	Noble Energy Inc.	Local Co-ordinate Reference:	Well Washburn LE22-78HN
Project:	Weld County, CO	TVD Reference:	WELL @ 5015.0usft (H&P #326)
Site:	Sec 22, T8N, R61W 6th PM	MD Reference:	WELL @ 5015.0usft (H&P #326)
Well:	Washburn LE22-78HN	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 22, T8N, R61W 6th PM			
Site Position:		Northing:	1,483,679.49 usft	Latitude:	40° 39' 13.824 N
From:	Lat/Long	Easting:	3,360,633.78 usft	Longitude:	104° 12' 0.792 W
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.84 °

Well	Washburn LE22-78HN					
Well Position	+N-S	0.0 usft	Northing:	1,483,679.48 usft	Latitude:	40° 39' 13.824 N
	+E-W	0.0 usft	Easting:	3,360,633.78 usft	Longitude:	104° 12' 0.792 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	4,985.0 usft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	3/27/2012	8.47	67.32	53,239

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	175.42	

Survey Program		Date	4/24/2012		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
1,369.0	10,777.0	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)
1,067.0	0.00	0.00	1,067.0	0.0	0.0	0.0	0.00	0.00	0.00
Tie In @ 1067' MD / 1067' TVD									
1,067.1	0.00	196.20	1,067.1	0.0	0.0	0.0	0.00	0.00	0.00
1,369.0	2.00	196.20	1,368.9	-5.1	-1.5	4.9	0.66	0.66	0.00
1,648.0	2.00	186.10	1,647.8	-14.6	-3.3	14.3	0.13	0.00	-3.62
1,929.0	0.30	44.40	1,928.7	-18.9	-3.4	18.6	0.80	-0.60	-50.43
2,209.0	0.30	343.40	2,208.7	-17.7	-3.0	17.4	0.11	0.00	-21.79
2,396.0	0.00	62.00	2,395.7	-17.2	-3.2	16.9	0.16	-0.16	0.00
2,489.0	2.70	32.40	2,488.7	-15.4	-2.0	15.2	2.90	2.90	0.00
2,583.0	4.90	55.80	2,582.5	-11.3	2.5	11.4	2.82	2.34	24.89
2,677.0	5.90	55.40	2,676.1	-6.3	9.8	7.0	1.06	1.06	-0.43

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Well:	Washburn LE22-78HN	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)
2,771.0	7.50	59.10	2,769.4	-0.4	19.0	1.9	1.76	1.70	3.94
2,863.0	8.80	65.80	2,860.5	5.6	30.6	-3.1	1.75	1.41	7.28
2,955.0	11.20	69.50	2,951.1	11.6	45.4	-8.0	2.70	2.61	4.02
3,050.0	13.20	68.30	3,043.9	18.9	64.1	-13.7	2.12	2.11	-1.26
3,145.0	15.50	67.60	3,136.0	27.7	85.9	-20.8	2.43	2.42	-0.74
3,240.0	14.60	67.40	3,227.7	37.2	108.7	-28.4	0.95	-0.95	-0.21
3,335.0	15.00	63.50	3,319.5	47.2	130.8	-36.6	1.13	0.42	-4.11
3,430.0	12.10	64.20	3,411.9	57.1	150.8	-44.8	3.06	-3.05	0.74
3,525.0	13.40	65.10	3,504.5	66.0	169.7	-52.3	1.38	1.37	0.95
3,620.0	15.80	68.60	3,596.5	75.4	191.7	-59.8	2.69	2.53	3.68
3,715.0	17.00	68.30	3,687.6	85.2	216.7	-67.7	1.27	1.26	-0.32
3,810.0	17.40	67.20	3,778.4	95.9	242.7	-76.2	0.54	0.42	-1.16
3,905.0	17.60	62.00	3,869.0	108.1	268.5	-86.3	1.66	0.21	-5.47
4,000.0	16.40	60.50	3,959.8	121.5	292.8	-97.7	1.34	-1.26	-1.58
4,095.0	16.80	60.90	4,050.9	134.8	316.5	-109.1	0.44	0.42	0.42
4,190.0	14.50	66.30	4,142.3	146.2	339.4	-118.6	2.86	-2.42	5.68
4,284.0	10.80	62.50	4,234.0	155.0	358.0	-125.9	4.03	-3.94	-4.04
4,380.0	7.60	72.70	4,328.8	161.1	372.0	-130.8	3.73	-3.33	10.63
4,475.0	4.90	58.40	4,423.2	165.1	381.5	-134.1	3.26	-2.84	-15.05
4,569.0	2.20	63.00	4,517.0	168.0	386.5	-136.6	2.89	-2.87	4.89
4,664.0	0.40	65.50	4,612.0	168.9	388.4	-137.4	1.90	-1.89	2.63
4,759.0	0.30	226.60	4,707.0	168.9	388.5	-137.3	0.73	-0.11	169.58
4,854.0	0.50	213.80	4,802.0	168.4	388.1	-136.9	0.23	0.21	-13.47
4,949.0	0.80	238.30	4,897.0	167.7	387.3	-136.2	0.42	0.32	25.79
5,044.0	0.80	278.30	4,992.0	167.4	386.1	-136.1	0.58	0.00	42.11
5,139.0	1.00	286.60	5,087.0	167.8	384.7	-136.5	0.25	0.21	8.74
5,234.0	1.20	289.40	5,182.0	168.3	382.9	-137.2	0.22	0.21	2.95
5,329.0	1.10	310.50	5,276.9	169.3	381.3	-138.3	0.46	-0.11	22.21
5,424.0	1.20	311.60	5,371.9	170.5	379.9	-139.6	0.11	0.11	1.16
5,519.0	1.20	313.50	5,466.9	171.9	378.4	-141.1	0.04	0.00	2.00
5,614.0	1.20	334.60	5,561.9	173.4	377.2	-142.8	0.46	0.00	22.21
5,709.0	0.20	207.00	5,656.9	174.2	376.7	-143.6	1.40	-1.05	-134.32
5,763.0	0.20	296.60	5,710.9	174.2	376.6	-143.5	0.52	0.00	165.93
5,837.0	0.60	135.10	5,784.9	173.9	376.8	-143.3	1.07	0.54	-218.24
5,882.0	5.80	169.00	5,829.8	171.5	377.4	-140.9	11.81	11.56	75.33
5,932.0	11.20	178.80	5,879.2	164.2	378.0	-133.5	11.14	10.80	19.60
5,977.0	15.80	178.30	5,923.0	153.7	378.2	-123.0	10.23	10.22	-1.11
6,027.0	19.40	176.20	5,970.6	138.6	379.0	-107.9	7.31	7.20	-4.20
6,072.0	22.70	177.30	6,012.6	122.5	379.9	-91.7	7.39	7.33	2.44
6,122.0	26.50	179.40	6,058.1	101.7	380.5	-71.0	7.80	7.60	4.20
6,167.0	30.30	179.70	6,097.6	80.3	380.6	-49.6	8.45	8.44	0.67
6,217.0	32.90	182.40	6,140.2	54.1	380.1	-23.6	5.92	5.20	5.40
6,262.0	35.30	181.30	6,177.5	28.9	379.3	1.5	5.51	5.33	-2.44

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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)
6,312.0	38.50	178.30	6,217.5	-1.1	379.4	31.4	7.34	6.40	-6.00
6,357.0	42.00	179.70	6,251.8	-30.2	379.9	60.4	8.03	7.78	3.11
6,407.0	44.80	178.80	6,288.1	-64.5	380.4	94.7	5.73	5.60	-1.80
6,452.0	48.50	178.30	6,319.0	-97.3	381.2	127.4	8.26	8.22	-1.11
6,502.0	52.00	178.30	6,351.0	-135.7	382.4	165.8	7.00	7.00	0.00
6,547.0	55.00	178.70	6,377.8	-171.8	383.3	201.9	6.70	6.67	0.89
6,597.0	57.50	177.40	6,405.5	-213.4	384.7	243.4	5.45	5.00	-2.60
6,642.0	59.60	178.80	6,429.0	-251.7	386.0	281.8	5.37	4.67	3.11
6,692.0	64.20	179.50	6,452.6	-295.8	386.7	325.8	9.28	9.20	1.40
6,737.0	65.80	179.50	6,471.6	-336.6	387.0	366.4	3.56	3.56	0.00
Crossed Hard Line @ 6743' MD / 6474' TVD									
6,743.0	65.94	179.61	6,474.0	-342.1	387.1	371.9	2.91	2.40	1.81
6,787.0	67.00	180.40	6,491.6	-382.4	387.0	412.1	2.91	2.40	1.80
6,832.0	71.30	181.50	6,507.6	-424.5	386.3	454.0	9.82	9.56	2.44
6,882.0	76.90	182.40	6,521.3	-472.5	384.7	501.7	11.33	11.20	1.80
6,923.0	80.70	181.50	6,529.3	-512.7	383.3	541.7	9.52	9.27	-2.20
7,042.0	86.70	180.60	6,542.3	-630.9	381.2	659.3	5.10	5.04	-0.76
7,137.0	88.40	179.50	6,546.4	-725.8	381.1	753.9	2.13	1.79	-1.16
7,232.0	91.40	178.50	6,546.5	-820.8	382.8	848.7	3.33	3.16	-1.05
7,327.0	89.50	179.90	6,545.8	-915.8	384.1	943.5	2.48	-2.00	1.47
7,422.0	89.90	178.70	6,546.3	-1,010.7	385.2	1,038.3	1.33	0.42	-1.26
7,495.0	90.50	178.30	6,546.0	-1,083.7	387.1	1,111.2	0.99	0.82	-0.55
7,590.0	90.40	177.10	6,545.3	-1,178.6	391.0	1,206.1	1.27	-0.11	-1.26
7,685.0	90.50	176.00	6,544.5	-1,273.5	396.7	1,301.1	1.16	0.11	-1.16
7,780.0	91.40	178.00	6,543.0	-1,368.3	401.6	1,396.0	2.31	0.95	2.11
7,875.0	90.10	179.40	6,541.7	-1,463.3	403.8	1,490.8	2.01	-1.37	1.47
7,971.0	90.60	179.90	6,541.1	-1,559.3	404.4	1,586.6	0.74	0.52	0.52
8,066.0	92.20	182.00	6,538.8	-1,654.2	402.8	1,681.1	2.78	1.68	2.21
8,161.0	90.50	181.10	6,536.6	-1,749.2	400.2	1,775.5	2.02	-1.79	-0.95
8,255.0	91.10	179.90	6,535.3	-1,843.1	399.4	1,869.2	1.43	0.64	-1.28
8,350.0	89.20	180.30	6,535.0	-1,938.1	399.3	1,963.8	2.04	-2.00	0.42
8,445.0	87.60	178.30	6,537.7	-2,033.1	400.4	2,058.6	2.70	-1.68	-2.11
8,540.0	90.00	179.70	6,539.7	-2,128.0	402.1	2,153.4	2.92	2.53	1.47
8,635.0	90.80	181.80	6,539.0	-2,223.0	400.8	2,247.9	2.37	0.84	2.21
8,730.0	92.10	180.90	6,536.6	-2,318.0	398.6	2,342.4	1.66	1.37	-0.95
8,825.0	92.30	182.90	6,532.9	-2,412.8	395.4	2,436.7	2.11	0.21	2.11
8,920.0	90.80	181.80	6,530.4	-2,507.7	391.6	2,531.0	1.96	-1.58	-1.16
9,015.0	89.50	181.50	6,530.1	-2,602.7	388.8	2,625.4	1.40	-1.37	-0.32
9,110.0	90.20	181.30	6,530.4	-2,697.6	386.5	2,719.9	0.77	0.74	-0.21
9,205.0	91.50	180.30	6,529.0	-2,792.6	385.2	2,814.5	1.73	1.37	-1.05
9,300.0	91.30	182.00	6,526.6	-2,887.6	383.3	2,909.0	1.80	-0.21	1.79
9,395.0	90.20	182.70	6,525.4	-2,982.5	379.4	3,003.3	1.37	-1.16	0.74
9,490.0	89.70	182.90	6,525.5	-3,077.4	374.7	3,097.5	0.57	-0.53	0.21

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Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
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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)
9,584.0	91.10	182.00	6,524.8	-3,171.3	370.7	3,190.8	1.77	1.49	-0.96
9,679.0	89.30	183.40	6,524.5	-3,266.2	366.2	3,285.0	2.40	-1.89	1.47
9,774.0	89.80	182.70	6,525.2	-3,361.0	361.2	3,379.1	0.91	0.53	-0.74
9,869.0	90.80	182.40	6,524.7	-3,455.9	357.0	3,473.4	1.10	1.05	-0.32
9,964.0	92.10	182.00	6,522.3	-3,550.8	353.3	3,567.7	1.43	1.37	-0.42
10,059.0	91.20	183.60	6,519.6	-3,645.7	348.7	3,661.9	1.93	-0.95	1.68
10,154.0	91.00	182.70	6,517.8	-3,740.5	343.5	3,756.0	0.97	-0.21	-0.95
10,249.0	90.00	180.60	6,517.0	-3,835.5	340.7	3,850.4	2.45	-1.05	-2.21
10,343.0	90.40	180.30	6,516.6	-3,929.5	340.0	3,944.1	0.53	0.43	-0.32
10,438.0	90.10	179.00	6,516.2	-4,024.5	340.6	4,038.8	1.40	-0.32	-1.37
10,533.0	91.30	179.50	6,515.1	-4,119.4	341.8	4,133.6	1.37	1.26	0.53
10,628.0	90.60	179.00	6,513.5	-4,214.4	343.0	4,228.3	0.91	-0.74	-0.53
10,717.0	90.00	177.10	6,513.0	-4,303.4	346.1	4,317.2	2.24	-0.67	-2.13
TD @ 10777' MD / 6513' TVD									
10,777.0	90.00	177.10	6,513.0	-4,363.3	349.1	4,377.2	0.00	0.00	0.00

Survey Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
1,067.1	1,067.1	0.0	0.0	Tie In @ 1067' MD / 1067' TVD
6,743.0	6,474.0	-342.1	387.1	Crossed Hard Line @ 6743' MD / 6474' TVD
10,777.0	6,513.0	-4,363.3	349.1	TD @ 10777' MD / 6513' TVD

Checked By: _____ Approved By: _____ Date: _____



Survey Certification Sheet

Noble Energy
Company

RM-12244
Job Number

4/24/12
Date

Sec 22, T8N, R61W, 6th PM
Lease

Washburn LE22-78HN
Well Name

Weld, CO
County & State

Surveyed from a depth of: 1067 feet to 10777 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.c
om, c=US
Date: 2012.04.25 15:41:43 -05'00'

Larry Wright
MWD General Manager

Company Name: Noble Energy Inc.
Washburn LE22-78HN
Weld County, CO
Rig: H&P #326
Created By: Dina Chance
Date: 4/24/2012



T

G

M

Azimuths to Grid North

True North: -0.84°

Magnetic North: 7.63°

Magnetic Field

Strength: 53239.0snT

Dip Angle: 67.32°

Date: 3/27/2012

Model: IGRF2010

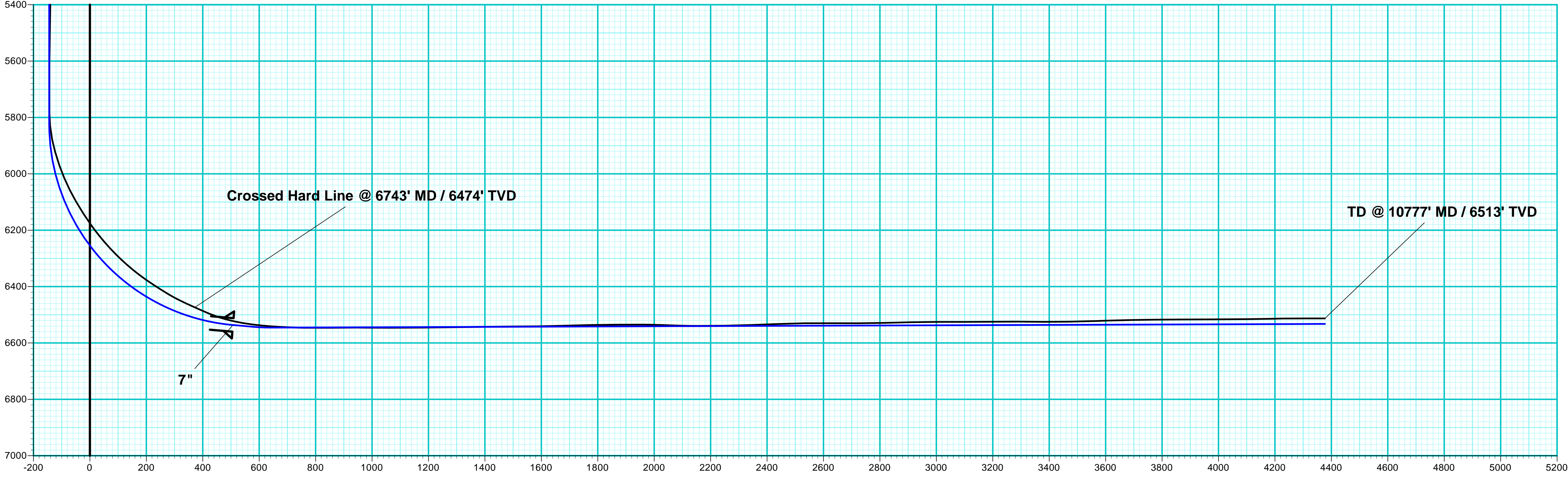
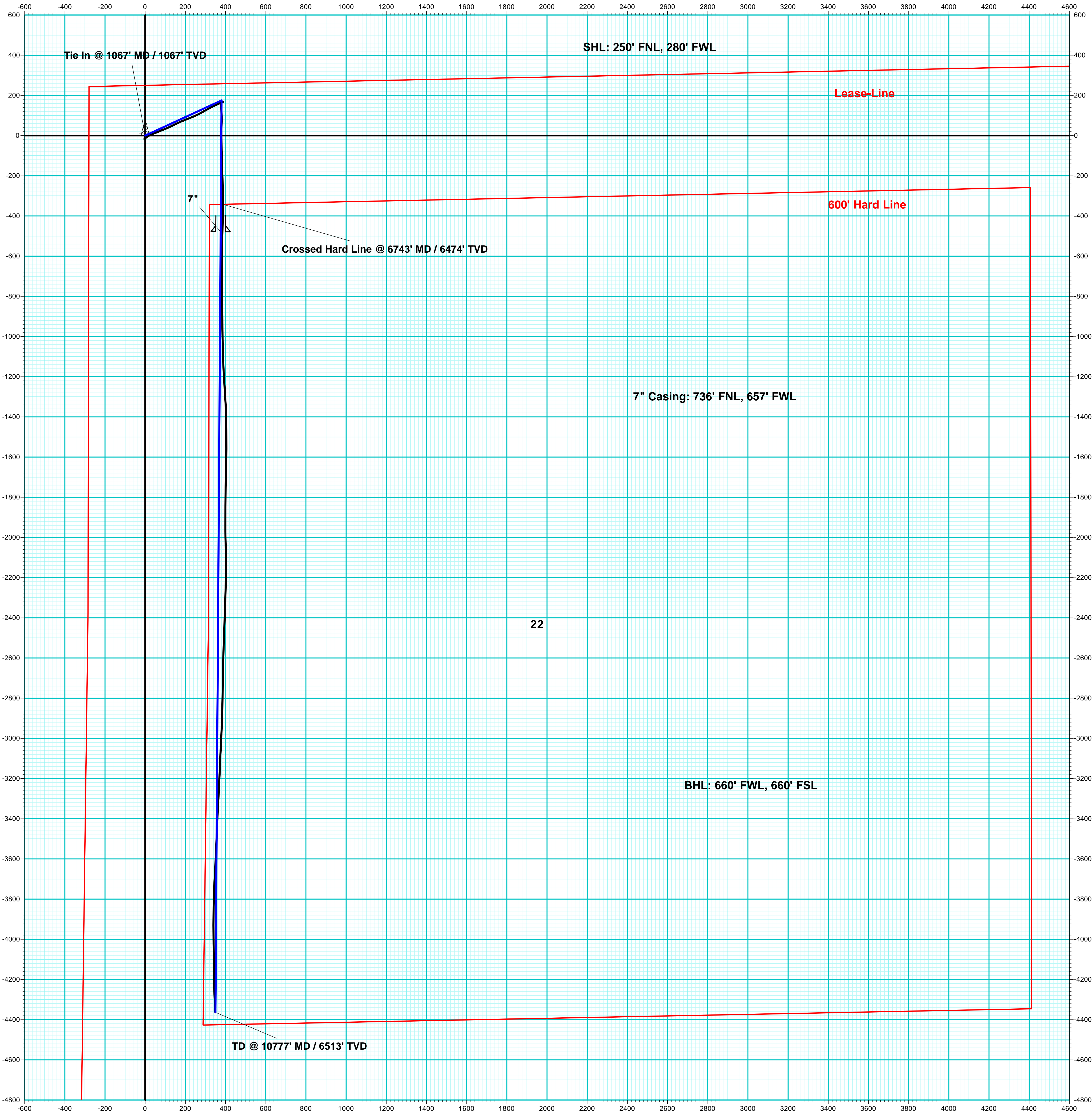
Washburn LE22-78HN
Weld County, CO
Q120250 & RM-12244

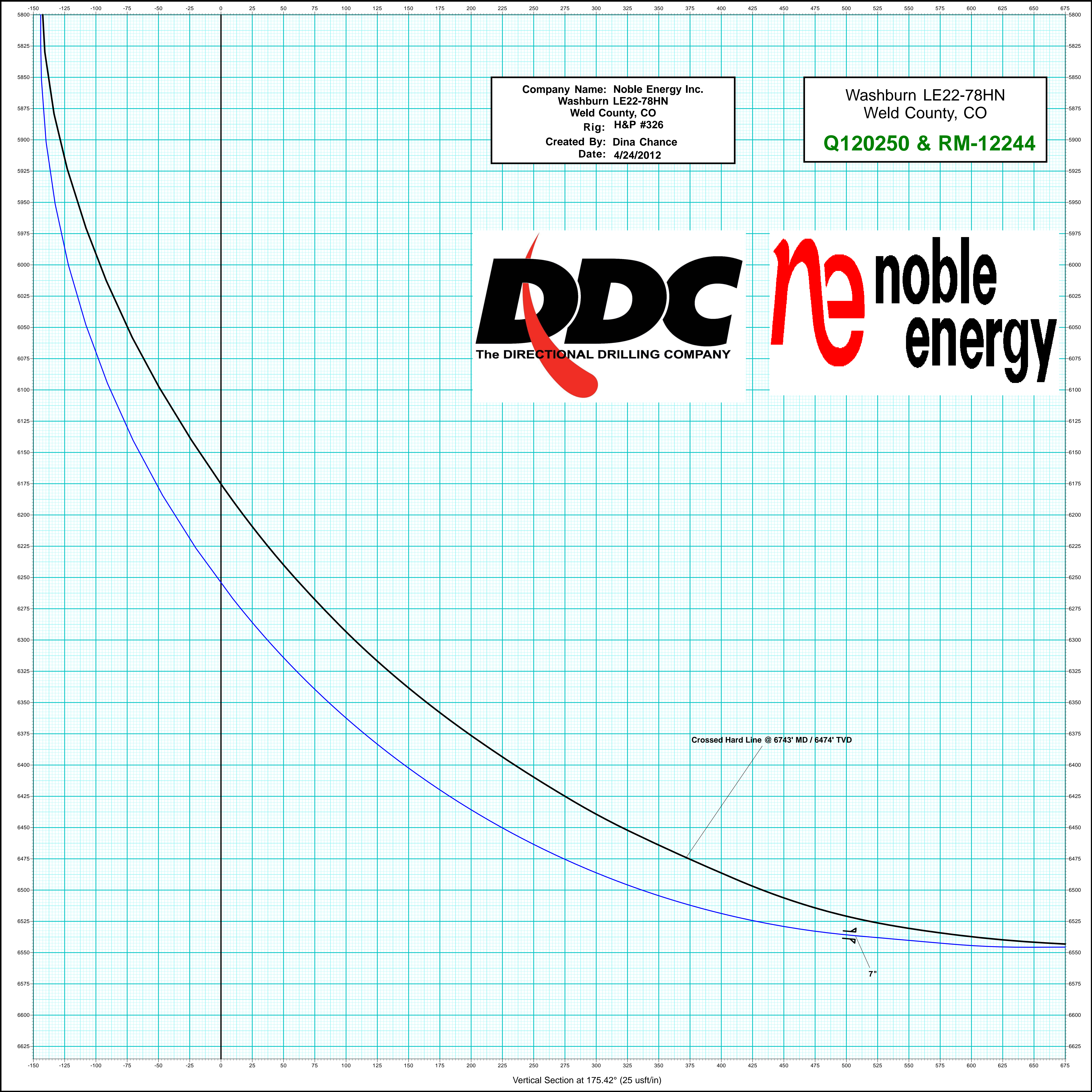
PROJECT DETAILS:		Weld County, CO
Geodetic System:	US State Plane 1983	
Datum:	North American Datum 1983	
Ellipsoid:	GRS 1980	
Zone:	Colorado Northern Zone	
System Datum:	Mean Sea Level	

WELL DETAILS:		Washburn LE22-78HN				
+N/-S	+E/-W	Ground Level:	4985.0			
0.0	0.0	Northing	Easting	Latitude	Longitude	
		1483679.48	3360633.78	40° 39' 13.824 N	104° 12' 0.792 W	

DESIGN TARGET DETAILS							
Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
Tie In @ 1067' MD / 1067' TVD	1067.0	0.0	0.0	1483679.49	3360633.78	40° 39' 13.824 N	104° 12' 0.792 W
- plan hits target center							
PBHL Washburn LE22-78HN Design #2	6532.7	-4363.5	349.8	1479315.95	3360983.62	40° 38' 30.660 N	104° 11' 57.084 W
- plan hits target center							

ANNOTATIONS									
MD	Inc	Azi	TVD	+N/-S	+E/-W	VSect	Departure	Annotation	
6743.0	65.94	179.61	6474.0	-342.1	387.1	371.9	990.9	Crossed Hard Line @ 6743' MD / 6474' TVD	
10777.0	90.00	177.10	6513.0	-4363.3	349.1	4377.2	5014.1	TD @ 10777' MD / 6513' TVD	





Company Name: Noble Energy Inc.
Washburn LE22-78HN
Weld County, CO
Rig: H&P #326
Created By: Dina Chance
Date: 4/24/2012

Washburn LE22-78HN
Weld County, CO
Q120250 & RM-12244

