

Noble Energy Inc.

**Weld County, CO
Sec 23, T6N, R65W 6th PM
Reliance E23-68-1HN**

Wellbore #1

Design: Wellbore #1 FINAL

DDC Survey Report

10 March, 2015



HP Survey Report



Company:	Noble Energy Inc.	Local Co-ordinate Reference:	Well Reliance E23-68-1HN
Project:	Weld County, CO	TVD Reference:	WELL @ 4762.0usft (H&P #326)
Site:	Sec 23, T6N, R65W 6th PM	MD Reference:	WELL @ 4762.0usft (H&P #326)
Well:	Reliance E23-68-1HN	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Compass

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 23, T6N, R65W 6th PM			
Site Position:		Northing:	1,417,199.77 usft	Latitude:	40° 28' 31.476 N
From:	Lat/Long	Easting:	3,240,005.40 usft	Longitude:	104° 38' 14.208 W
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.56 °

Well	Reliance E23-68-1HN					
Well Position	+N-S	0.0 usft	Northing:	1,417,152.41 usft	Latitude:	40° 28' 31.008 N
	+E-W	0.0 usft	Easting:	3,240,005.86 usft	Longitude:	104° 38' 14.208 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	0.0 usft	Ground Level:	4,732.0 usft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	1/22/2015	8.32	67.01	52,805

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	85.74	

Survey Program	Date	3/10/2015			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
274.0	770.0	Surface (Wellbore #1)	Flexi-Shot	VES Flexi-Shot Tool	
835.0	7,382.0	MWD Survey - Vert / Build (Wellbore #1)	MWD default	MWD - Standard	
7,477.0	11,719.0	MWD - Survey - Lateral (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)
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
274.0	0.20	251.36	274.0	-0.2	-0.5	-0.5	0.07	0.07	0.00
554.0	0.20	251.36	554.0	-0.5	-1.4	-1.4	0.00	0.00	0.00
TIE IN @770' MD / 770' TVD / END OF SUR HOLE / BEGIN INT HOLE									
770.0	0.20	251.36	770.0	-0.7	-2.1	-2.1	0.00	0.00	0.00
835.0	0.35	343.85	835.0	-0.6	-2.3	-2.3	0.63	0.23	142.29
927.0	0.35	350.36	927.0	0.0	-2.4	-2.4	0.04	0.00	7.08
1,022.0	0.44	352.82	1,022.0	0.6	-2.5	-2.4	0.10	0.09	2.59
1,115.0	0.35	334.89	1,115.0	1.3	-2.6	-2.5	0.16	-0.10	-19.28

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Well:	Reliance E23-68-1HN	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Compass

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)
1,301.0	0.44	317.66	1,301.0	2.3	-3.4	-3.2	0.08	0.05	-9.26
1,402.0	0.18	318.54	1,402.0	2.7	-3.7	-3.5	0.26	-0.26	0.87
1,494.0	0.35	281.45	1,494.0	2.9	-4.1	-3.9	0.25	0.18	-40.32
1,589.0	0.44	289.01	1,589.0	3.0	-4.7	-4.5	0.11	0.09	7.96
1,682.0	0.44	270.20	1,682.0	3.2	-5.4	-5.2	0.15	0.00	-20.23
1,774.0	0.26	230.65	1,774.0	3.0	-5.9	-5.7	0.32	-0.20	-42.99
1,868.0	3.87	308.70	1,867.9	4.9	-8.6	-8.2	4.07	3.84	83.03
1,960.0	2.81	293.76	1,959.7	7.7	-13.1	-12.5	1.48	-1.15	-16.24
2,054.0	5.63	301.31	2,053.5	11.1	-19.1	-18.2	3.05	3.00	8.03
2,146.0	7.21	287.25	2,144.9	15.1	-28.5	-27.3	2.41	1.72	-15.28
2,239.0	9.41	290.06	2,236.9	19.4	-41.2	-39.6	2.40	2.37	3.02
2,424.0	8.18	281.98	2,419.8	27.4	-68.3	-66.1	0.94	-0.66	-4.37
2,515.0	10.99	291.12	2,509.5	31.8	-82.7	-80.1	3.50	3.09	10.04
2,699.0	10.11	286.02	2,690.4	42.6	-114.6	-111.1	0.70	-0.48	-2.77
2,791.0	10.64	298.50	2,780.9	48.9	-129.8	-125.8	2.50	0.58	13.57
2,884.0	10.90	297.62	2,872.2	57.1	-145.2	-140.5	0.33	0.28	-0.95
2,978.0	10.20	294.99	2,964.7	64.7	-160.6	-155.3	0.90	-0.74	-2.80
3,073.0	9.85	295.69	3,058.2	71.8	-175.5	-169.7	0.39	-0.37	0.74
3,167.0	9.50	293.76	3,150.9	78.4	-189.9	-183.5	0.51	-0.37	-2.05
3,355.0	8.18	291.12	3,336.6	89.5	-216.6	-209.3	0.73	-0.70	-1.40
3,450.0	7.83	298.15	3,430.7	95.0	-228.6	-220.9	1.09	-0.37	7.40
3,544.0	7.21	292.88	3,523.9	100.3	-239.6	-231.5	0.99	-0.66	-5.61
3,639.0	6.68	292.00	3,618.2	104.7	-250.3	-241.8	0.57	-0.56	-0.93
3,733.0	9.23	298.15	3,711.3	110.3	-262.0	-253.1	2.86	2.71	6.54
3,828.0	11.52	297.27	3,804.7	118.2	-277.1	-267.6	2.42	2.41	-0.93
3,922.0	11.78	294.81	3,896.8	126.5	-294.2	-284.0	0.60	0.28	-2.62
CROSSED 460' HARDLINE @ 3949' MD / 3924' TVD									
3,949.4	11.83	294.34	3,923.6	128.9	-299.3	-288.9	0.40	0.19	-1.70
4,016.0	11.96	293.23	3,988.8	134.4	-311.8	-301.0	0.40	0.19	-1.67
4,110.0	11.70	291.82	4,080.8	141.8	-329.6	-318.2	0.41	-0.28	-1.50
4,205.0	11.08	290.59	4,173.9	148.6	-347.1	-335.1	0.70	-0.65	-1.29
4,299.0	10.82	290.06	4,266.2	154.8	-363.9	-351.4	0.30	-0.28	-0.56
4,394.0	10.55	295.87	4,359.6	161.6	-380.1	-367.0	1.17	-0.28	6.12
4,489.0	10.20	295.34	4,453.0	169.0	-395.5	-381.9	0.38	-0.37	-0.56
4,583.0	9.15	295.51	4,545.7	175.8	-409.8	-395.6	1.12	-1.12	0.18
4,678.0	8.44	294.99	4,639.6	182.0	-422.9	-408.2	0.75	-0.75	-0.55
4,772.0	7.74	295.16	4,732.6	187.6	-434.9	-419.7	0.75	-0.74	0.18
4,867.0	9.85	299.73	4,826.5	194.4	-447.7	-432.1	2.34	2.22	4.81
4,961.0	8.62	299.73	4,919.3	201.8	-460.8	-444.6	1.31	-1.31	0.00
5,055.0	8.44	301.31	5,012.2	208.9	-472.8	-456.0	0.31	-0.19	1.68
5,149.0	9.50	294.81	5,105.1	215.8	-485.8	-468.4	1.56	1.13	-6.91
5,244.0	8.79	290.06	5,198.9	221.5	-499.7	-481.9	1.09	-0.75	-5.00
5,338.0	7.65	285.49	5,291.9	225.7	-512.5	-494.3	1.40	-1.21	-4.86

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Design:	Wellbore #1	Database:	Compass

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)
5,433.0	7.65	296.92	5,386.1	230.2	-524.2	-505.7	1.60	0.00	12.03
5,528.0	7.12	296.04	5,480.3	235.7	-535.2	-516.2	0.57	-0.56	-0.93
5,622.0	6.51	296.92	5,573.6	240.6	-545.1	-525.8	0.66	-0.65	0.94
5,717.0	6.16	295.34	5,668.0	245.3	-554.5	-534.8	0.41	-0.37	-1.66
5,811.0	5.36	293.93	5,761.6	249.2	-563.1	-543.0	0.86	-0.85	-1.50
5,906.0	5.01	288.13	5,856.2	252.3	-571.1	-550.8	0.66	-0.37	-6.11
6,000.0	4.48	291.82	5,949.9	254.9	-578.4	-557.9	0.65	-0.56	3.93
6,095.0	3.96	288.83	6,044.6	257.4	-585.0	-564.2	0.59	-0.55	-3.15
6,190.0	3.52	292.00	6,139.4	259.5	-590.8	-569.9	0.51	-0.46	3.34
6,284.0	3.34	292.88	6,233.2	261.7	-596.0	-574.9	0.20	-0.19	0.94
6,378.0	2.73	285.32	6,327.1	263.3	-600.7	-579.4	0.77	-0.65	-8.04
6,473.0	3.17	100.22	6,422.1	263.5	-600.3	-579.0	6.20	0.46	184.11
6,567.0	12.84	93.72	6,515.0	262.3	-587.2	-566.1	10.32	10.29	-6.91
6,662.0	17.85	90.20	6,606.6	261.6	-562.1	-541.2	5.36	5.27	-3.71
6,755.0	25.76	84.58	6,692.9	263.4	-527.7	-506.7	8.79	8.51	-6.04
6,850.0	37.81	81.41	6,773.5	269.8	-478.2	-456.8	12.80	12.68	-3.34
6,944.0	52.06	78.25	6,839.9	281.7	-413.1	-391.0	15.34	15.16	-3.36
7,039.0	67.01	81.76	6,887.9	295.7	-332.6	-309.7	16.05	15.74	3.69
CROSSED 460' HARDLINE @ 7070' MD / 6900' TVD									
7,070.3	69.35	85.22	6,899.6	298.9	-303.8	-280.7	12.70	7.47	11.07
7,134.0	74.30	91.96	6,919.5	300.4	-243.3	-220.3	12.70	7.78	10.57
7,229.0	75.53	89.15	6,944.2	299.5	-151.6	-128.9	3.14	1.29	-2.96
7,269.0	79.14	89.50	6,952.9	300.0	-112.6	-90.0	9.07	9.03	0.88
7" CASING POING @ 7325' MD / 6961' TVD / END OF INT HOLE / BEGIN LATERAL									
7,325.0	84.80	89.59	6,960.8	300.4	-57.2	-34.7	10.12	10.12	0.15
TIE ON @ 7382' MD / 6963' TVD									
7,382.0	90.57	89.67	6,963.1	300.8	-0.2	22.1	10.12	10.12	0.15
7,477.0	91.36	88.80	6,961.5	302.0	94.7	116.9	1.24	0.83	-0.92
7,571.0	90.48	90.55	6,960.0	302.6	188.7	210.7	2.08	-0.94	1.86
7,666.0	88.29	91.61	6,961.0	300.8	283.7	305.3	2.56	-2.31	1.12
7,761.0	89.08	91.08	6,963.2	298.6	378.6	399.8	1.00	0.83	-0.56
7,855.0	89.96	90.90	6,963.9	296.9	472.6	493.4	0.96	0.94	-0.19
7,949.0	90.40	91.08	6,963.6	295.3	566.6	587.0	0.51	0.47	0.19
8,044.0	91.19	90.38	6,962.3	294.1	661.6	681.6	1.11	0.83	-0.74
8,138.0	89.43	90.73	6,961.8	293.2	755.6	775.3	1.91	-1.87	0.37
8,233.0	89.08	90.73	6,963.1	292.0	850.6	869.9	0.37	-0.37	0.00
8,327.0	89.52	90.38	6,964.2	291.1	944.6	963.6	0.60	0.47	-0.37
8,422.0	90.22	90.03	6,964.4	290.7	1,039.6	1,058.3	0.82	0.74	-0.37
8,517.0	90.40	89.50	6,963.9	291.1	1,134.5	1,153.0	0.59	0.19	-0.56
8,611.0	90.75	89.32	6,963.0	292.1	1,228.5	1,246.8	0.42	0.37	-0.19
8,705.0	91.36	88.80	6,961.2	293.6	1,322.5	1,340.7	0.85	0.65	-0.55
8,800.0	92.15	88.44	6,958.3	295.9	1,417.4	1,435.5	0.91	0.83	-0.38
8,895.0	89.43	90.73	6,957.0	296.6	1,512.4	1,530.3	3.74	-2.86	2.41
9,084.0	89.25	91.43	6,959.2	293.0	1,701.4	1,718.4	0.38	-0.10	0.37

HP Survey Report



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Project:	Weld County, CO	TVD Reference:	WELL @ 4762.0usft (H&P #326)
Site:	Sec 23, T6N, R65W 6th PM	MD Reference:	WELL @ 4762.0usft (H&P #326)
Well:	Reliance E23-68-1HN	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Compass

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)
9,178.0	89.52	91.26	6,960.2	290.8	1,795.3	1,812.0	0.34	0.29	-0.18
9,273.0	89.60	90.90	6,960.9	289.0	1,890.3	1,906.6	0.39	0.08	-0.38
9,367.0	90.31	90.90	6,961.0	287.6	1,984.3	2,000.2	0.76	0.76	0.00
9,462.0	91.36	90.55	6,959.6	286.4	2,079.3	2,094.8	1.17	1.11	-0.37
9,651.0	87.85	91.26	6,960.9	283.4	2,268.2	2,283.0	1.89	-1.86	0.38
9,746.0	88.72	91.08	6,963.8	281.4	2,363.2	2,377.5	0.94	0.92	-0.19
9,840.0	89.87	88.62	6,964.9	281.7	2,457.1	2,471.3	2.89	1.22	-2.62
10,029.0	86.88	89.15	6,970.3	285.4	2,646.0	2,659.9	1.61	-1.58	0.28
10,124.0	90.04	87.04	6,972.8	288.5	2,740.9	2,754.8	4.00	3.33	-2.22
10,218.0	90.40	86.69	6,972.5	293.7	2,834.8	2,848.7	0.53	0.38	-0.37
10,313.0	90.31	85.81	6,971.9	299.9	2,929.6	2,943.7	0.93	-0.09	-0.93
10,408.0	90.66	85.81	6,971.1	306.8	3,024.3	3,038.7	0.37	0.37	0.00
10,503.0	91.45	85.46	6,969.3	314.0	3,119.0	3,133.7	0.91	0.83	-0.37
10,597.0	91.01	88.44	6,967.3	319.0	3,212.8	3,227.7	3.20	-0.47	3.17
10,692.0	89.52	90.38	6,966.9	320.0	3,307.8	3,322.5	2.57	-1.57	2.04
10,786.0	89.87	89.85	6,967.4	319.8	3,401.8	3,416.2	0.68	0.37	-0.56
10,881.0	89.43	91.26	6,968.0	318.9	3,496.8	3,510.8	1.55	-0.46	1.48
10,975.0	90.57	91.08	6,968.0	317.0	3,590.8	3,604.4	1.23	1.21	-0.19
11,070.0	86.53	92.13	6,970.4	314.3	3,685.7	3,698.9	4.39	-4.25	1.11
11,164.0	87.23	92.31	6,975.5	310.7	3,779.5	3,792.1	0.77	0.74	0.19
11,259.0	88.20	91.78	6,979.3	307.3	3,874.4	3,886.5	1.16	1.02	-0.56
11,353.0	88.37	91.08	6,982.1	305.0	3,968.3	3,980.0	0.77	0.18	-0.74
11,448.0	88.90	90.90	6,984.3	303.3	4,063.2	4,074.6	0.59	0.56	-0.19
CROSSED 460' HARDLINE @ 11483' MD / 6895' TVD									
11,482.7	89.13	90.71	6,984.9	302.8	4,097.9	4,109.1	0.85	0.65	-0.55
11,543.0	89.52	90.38	6,985.6	302.3	4,158.2	4,169.2	0.85	0.65	-0.55
11,637.0	89.87	90.03	6,986.1	301.9	4,252.2	4,262.9	0.53	0.37	-0.37
11,658.0	89.87	89.85	6,986.2	301.9	4,273.2	4,283.8	0.86	0.00	-0.86
TD @ 11719' MD / 6986' TVD									
11,719.0	89.87	89.85	6,986.3	302.1	4,334.2	4,344.7	0.00	0.00	0.00

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Comment
770.0	770.0	-0.7	-2.1	TIE IN @770' MD / 770' TVD / END OF SUR HOLE / BEGIN INT HOLE
3,949.4	3,923.6	128.9	-299.3	CROSSED 460' HARDLINE @ 3949' MD / 3924' TVD
7,070.3	6,899.6	298.9	-303.8	CROSSED 460' HARDLINE @ 7070' MD / 6900' TVD
7,325.0	6,960.8	300.4	-57.2	7" CASING POINT @ 7325' MD / 6961' TVD / END OF INT HOLE / BE
7,382.0	6,963.1	300.8	-0.2	TIE ON @ 7382' MD / 6963' TVD
11,482.7	6,984.9	302.8	4,097.9	CROSSED 460' HARDLINE @ 11483' MD / 6895' TVD
11,719.0	6,986.3	302.1	4,334.2	TD @ 11719' MD / 6986' TVD

HP
Survey Report



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Project:	Weld County, CO	TVD Reference:	WELL @ 4762.0usft (H&P #326)
Site:	Sec 23, T6N, R65W 6th PM	MD Reference:	WELL @ 4762.0usft (H&P #326)
Well:	Reliance E23-68-1HN	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Compass

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

Noble Energy Inc
Company

RM-150093
Job Number

2/10/15
Date

Sec23,T6N,R65W,6TH PM
Lease

Reliance E23-68-1HN
Well Name

Weld, CO
County & State

API: 05-123-38142

Surveyed from a depth of: 770' to 7382' MD-DDC Certified Survey Data
7382' to 11719' MD-DDC Certified Survey Data

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.

Bryon Reed
MWD General Manager

Bryon Reed

Digitally signed by Bryon Reed
DN: cn=Bryon Reed, o=DDC, ou,
email=Bryon.reed@directionaldrillers.
com, c=US
Date: 2015.02.13 15:01:05 -06'00'

Company Name: Noble Energy Inc.
Reliance E23-68-1HN
Weld County, CO
Rig: H&P #326
Created By: Jerry Arsenault
Date: 2/6/2015

Reliance E23-68-1HN
Weld County, CO
Q150100 & RM-150093
Design #1

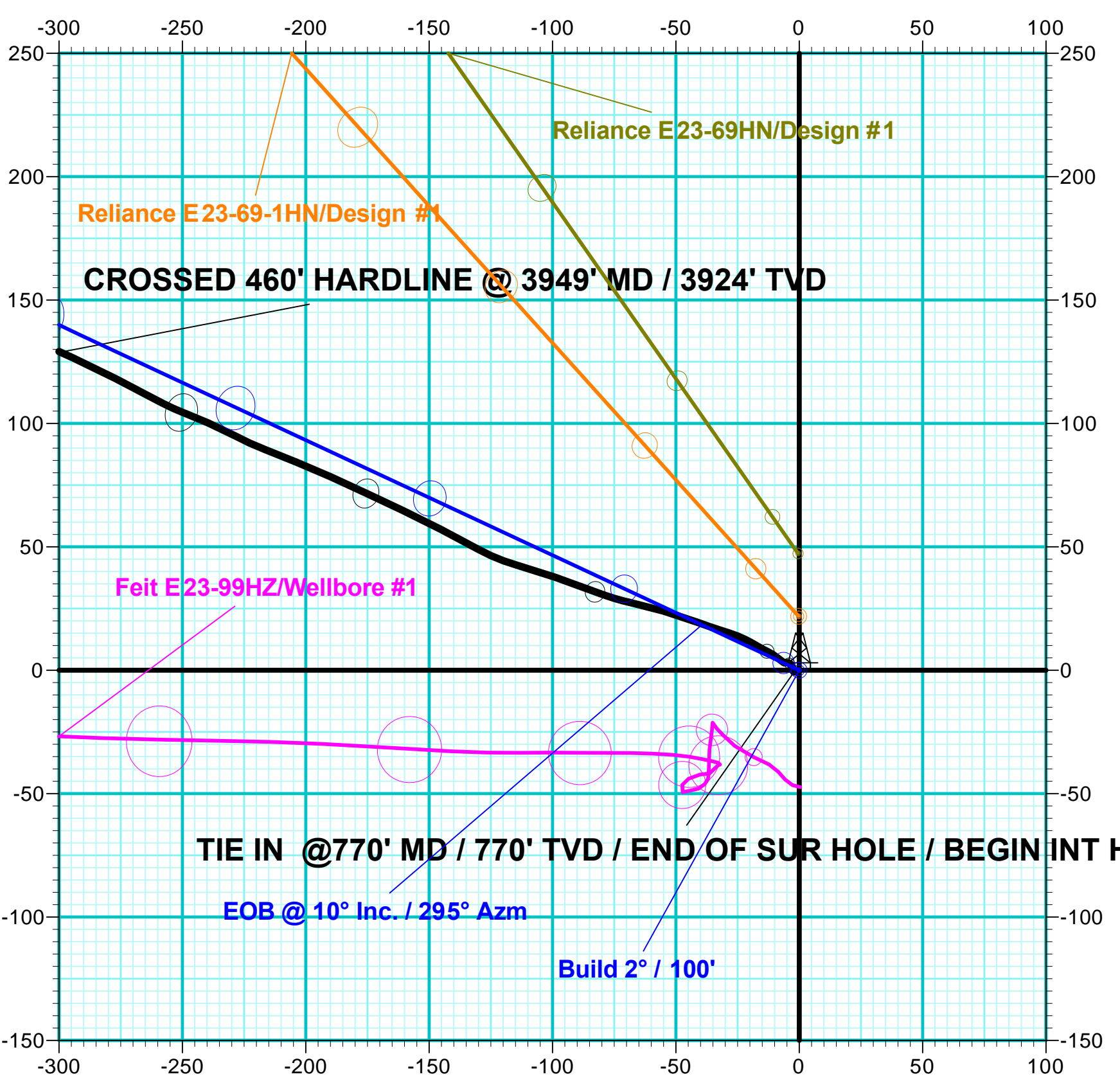
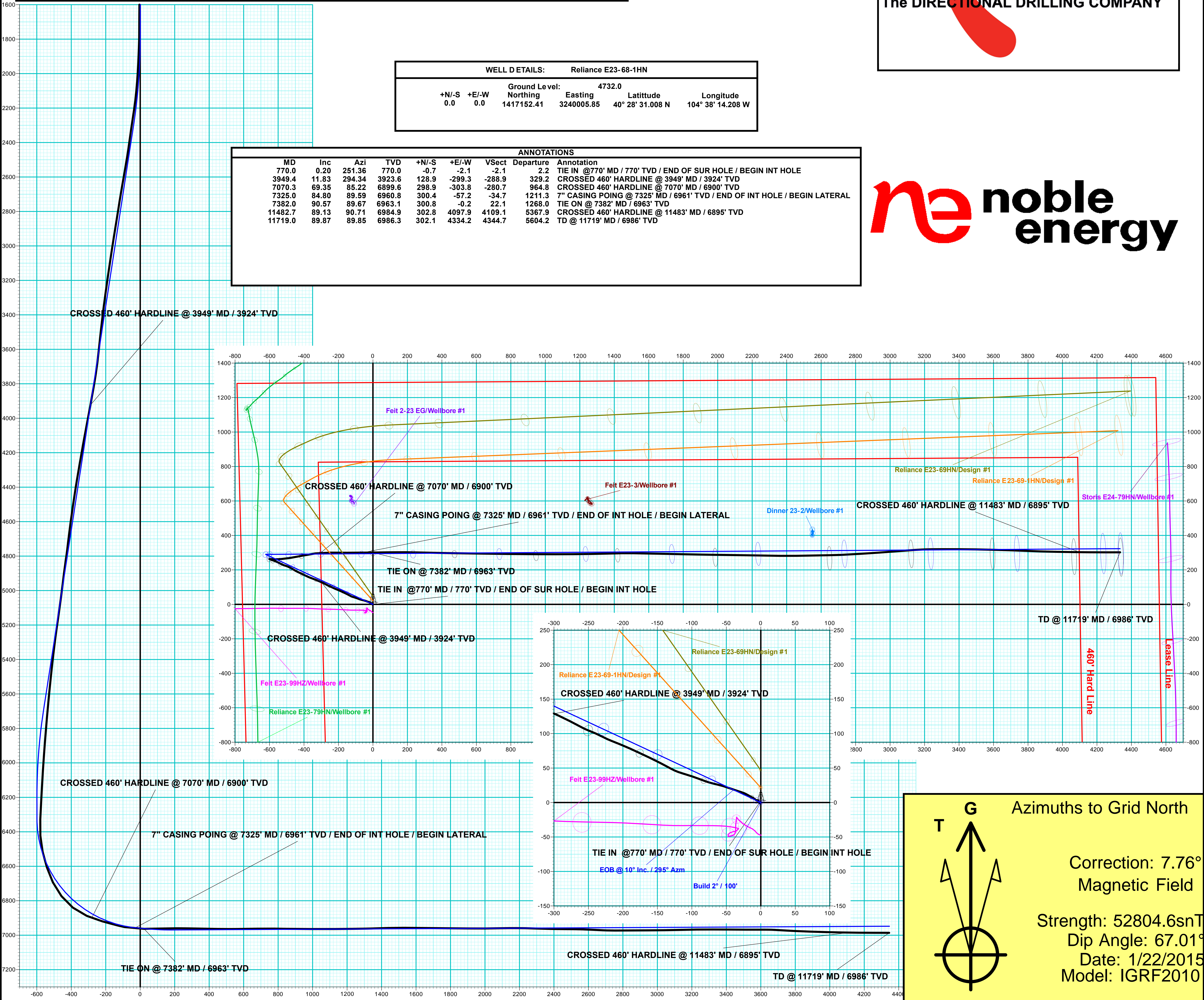
PROJECT DETAILS: Weld County, CO	
Geodetic System:	US State Plane 1983
Datum:	North American Datum 1983
Ellipsoid:	GRS 1980
Zone:	Colorado Northern Zone
System Datum:	Mean Sea Level



DESIGN TARGET DETAILS							
Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
PBHL Reliance E23-68-1HN - plan hits target center	6948.0	323.1	4334.3	1417475.50	3244340.17	40° 28' 33.780 N	104° 37' 18.082 W

WELL DETAILS: Reliance E23-68-1HN					
Ground Level: 4732.0					
+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
0.0	0.0	1417152.41	3240005.85	40° 28' 31.008 N	104° 38' 14.208 W

ANNOTATIONS									
MD	Inc	Azi	TVD	+N/-S	+E/-W	Vsect	Departure	Annotation	
770.0	0.20	251.36	770.0	-0.7	-2.1	-2.1	2.2	TIE IN @770' MD / 770' TVD / END OF SUR HOLE / BEGIN INT HOLE	
3949.4	11.83	294.34	3923.6	128.9	-299.3	-288.9	329.2	CROSSED 460' HARDLINE @ 3949' MD / 3924' TVD	
7070.3	69.35	85.22	6899.6	298.9	-303.8	-280.7	964.8	CROSSED 460' HARDLINE @ 7070' MD / 6900' TVD	
7325.0	84.80	89.59	6960.8	300.4	-57.2	-34.7	1211.3	7" CASING POING @ 7325' MD / 6961' TVD / END OF INT HOLE / BEGIN LATERAL	
7382.0	90.57	89.67	6963.1	300.8	-0.2	22.1	1268.0	TIE ON @ 7382' MD / 6963' TVD	
11482.7	89.13	90.71	6984.9	302.8	4097.9	4109.1	5367.9	CROSSED 460' HARDLINE @ 11483' MD / 6895' TVD	
11719.0	89.87	89.85	6986.3	302.1	4334.2	4344.7	5604.2	TD @ 11719' MD / 6986' TVD	



Azimuths to Grid North

Correction: 7.76°
Magnetic Field

Strength: 52804.6snT
Dip Angle: 67.01°
Date: 1/22/2015
Model: IGRF2010

Vertical Section at 85.74° (200 usft/in)