



## **Noble Energy Inc.**

**Weld County, CO**

**Sec 9, T9N, R58W**

**Rohn State LD10-66-1HN**

**Wellbore #1**

**Design: Wellbore #1** FINAL

## **DDC Survey Report**

**20 October, 2014**



<b>Company:</b>	Noble Energy Inc.	<b>Local Co-ordinate Reference:</b>	Well Rohn State LD10-66-1HN
<b>Project:</b>	Weld County, CO	<b>TVD Reference:</b>	WELL @ 4758.0usft (H&P #326)
<b>Site:</b>	Sec 9, T9N, R58W	<b>MD Reference:</b>	WELL @ 4758.0usft (H&P #326)
<b>Well:</b>	Rohn State LD10-66-1HN	<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 Compass

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

<b>Site</b>	Sec 9, T9N, R58W		
<b>Site Position:</b>		<b>Northing:</b>	1,523,890.74 usft
<b>From:</b>	Map	<b>Easting:</b>	3,453,841.03 usft
<b>Position Uncertainty:</b>	0.0 usft	<b>Slot Radius:</b>	13-3/16 "
		<b>Latitude:</b>	40° 45' 35.850 N
		<b>Longitude:</b>	103° 51' 42.040 W
		<b>Grid Convergence:</b>	1.06 °

<b>Well</b>	Rohn State LD10-66-1HN		
<b>Well Position</b>	<b>+N/-S</b>	0.0 usft	<b>Northing:</b>
	<b>+E/-W</b>	0.0 usft	<b>Easting:</b>
<b>Position Uncertainty</b>	0.0 usft	<b>Wellhead Elevation:</b>	0.0 usft
		<b>Latitude:</b>	40° 46' 5.952 N
		<b>Longitude:</b>	103° 51' 40.104 W
		<b>Ground Level:</b>	4,728.0 usft

<b>Wellbore</b>	Wellbore #1		
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination</b>
			(°)
	IGRF2010	10/8/2014	7.95
			<b>Dip Angle</b>
			(°)
			67.37
			<b>Field Strength</b>
			(nT)
			53,065

<b>Design</b>	Wellbore #1		
<b>Audit Notes:</b>			
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL
		<b>Tie On Depth:</b>	0.0
<b>Vertical Section:</b>	<b>Depth From (TVD)</b>	<b>+N/-S</b>	<b>+E/-W</b>
	(usft)	(usft)	(usft)
	0.0	0.0	0.0
			<b>Direction</b>
			(°)
			94.91

<b>Survey Program</b>	<b>Date</b>	10/20/2014		
<b>From</b>	<b>To</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>
(usft)	(usft)			
377.0	1,042.0	Surface Surveys (Wellbore #1)	Flexi-Shot	VES Flexi-Shot Tool
1,121.0	6,400.0	MWD Survey - Vert / Build (Wellbore #1)	MWD default	MWD - Standard
6,469.0	9,815.0	MWD Survey - Lateral (Wellbore #1)	MWD+IFR1+MS_WY Fixed:v2:Rockies, crustal dec + 3-axis correction	

<b>Survey</b>									
<b>Measured</b>	<b>Inclination</b>	<b>Azimuth</b>	<b>Vertical</b>	<b>+N/-S</b>	<b>+E/-W</b>	<b>Vertical</b>	<b>Dogleg</b>	<b>Build</b>	<b>Turn</b>
<b>Depth</b>	<b>(°)</b>	<b>(°)</b>	<b>Depth</b>	<b>(usft)</b>	<b>(usft)</b>	<b>Section</b>	<b>Rate</b>	<b>Rate</b>	<b>Rate</b>
<b>(usft)</b>			<b>(usft)</b>			<b>(usft)</b>	<b>(°/100usft)</b>	<b>(°/100usft)</b>	<b>(°/100usft)</b>
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
377.0	0.50	125.89	377.0	-1.0	1.3	1.4	0.13	0.13	0.00
656.0	0.50	125.89	656.0	-2.4	3.3	3.5	0.00	0.00	0.00
934.0	0.70	95.99	934.0	-3.3	6.0	6.2	0.13	0.07	-10.76
<b>Tie In @ 1042' MD / 1042' TVD</b>									
1,042.0	0.60	345.19	1,042.0	-2.8	6.5	6.7	0.99	-0.09	-102.59
1,121.0	0.20	333.04	1,121.0	-2.3	6.3	6.5	0.51	-0.51	-15.38
1,213.0	0.34	10.15	1,213.0	-1.9	6.3	6.4	0.24	0.15	40.34
1,306.0	2.95	123.89	1,305.9	-2.9	8.3	8.6	3.34	2.81	122.30

<b>Company:</b>	Noble Energy Inc.	<b>Local Co-ordinate Reference:</b>	Well Rohn State LD10-66-1HN
<b>Project:</b>	Weld County, CO	<b>TVD Reference:</b>	WELL @ 4758.0usft (H&P #326)
<b>Site:</b>	Sec 9, T9N, R58W	<b>MD Reference:</b>	WELL @ 4758.0usft (H&P #326)
<b>Well:</b>	Rohn State LD10-66-1HN	<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 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)
1,400.0	2.12	130.84	1,399.8	-5.4	11.7	12.1	0.94	-0.88	7.39
1,492.0	5.68	130.21	1,491.6	-9.5	16.4	17.2	3.87	3.87	-0.68
1,584.0	7.48	125.11	1,583.0	-15.9	24.8	26.1	2.06	1.96	-5.54
1,677.0	9.01	113.28	1,675.0	-22.2	36.4	38.2	2.45	1.65	-12.72
1,770.0	10.09	111.75	1,766.7	-28.1	50.7	52.9	1.19	1.16	-1.65
1,863.0	9.69	104.95	1,858.4	-33.1	65.8	68.4	1.33	-0.43	-7.31
1,956.0	10.79	106.41	1,949.9	-37.6	81.7	84.7	1.22	1.18	1.57
2,048.0	10.36	117.65	2,040.3	-43.9	97.3	100.7	2.29	-0.47	12.22
2,141.0	13.61	128.09	2,131.3	-54.5	113.4	117.6	4.19	3.49	11.23
2,234.0	13.19	123.43	2,221.8	-67.1	130.8	136.1	1.25	-0.45	-5.01
2,327.0	12.78	121.70	2,312.4	-78.4	148.4	154.6	0.61	-0.44	-1.86
2,512.0	12.43	115.82	2,492.9	-97.8	183.8	191.5	0.72	-0.19	-3.18
2,696.0	11.64	108.66	2,672.9	-112.4	219.2	228.0	0.92	-0.43	-3.89
2,885.0	10.93	118.27	2,858.3	-127.0	253.0	263.0	1.06	-0.38	5.08
2,980.0	10.42	119.18	2,951.6	-135.4	268.5	279.1	0.57	-0.54	0.96
3,074.0	12.43	116.60	3,043.8	-144.1	284.9	296.2	2.21	2.14	-2.74
3,168.0	12.80	114.93	3,135.5	-153.0	303.4	315.4	0.55	0.39	-1.78
3,263.0	12.60	112.13	3,228.2	-161.3	322.6	335.2	0.68	-0.21	-2.95
<b>CROSSED LEASELINE @ 3327' MD / 3291' TVD</b>									
3,327.1	11.91	117.14	3,290.8	-167.0	334.9	348.0	1.98	-1.08	7.82
3,357.0	11.62	119.67	3,320.1	-169.9	340.3	353.6	1.98	-0.97	8.46
3,452.0	12.04	118.70	3,413.1	-179.4	357.3	371.3	0.49	0.44	-1.02
3,546.0	12.16	117.14	3,505.0	-188.6	374.7	389.5	0.37	0.13	-1.66
3,641.0	12.08	114.76	3,597.9	-197.3	392.6	408.1	0.53	-0.08	-2.51
3,735.0	11.32	115.24	3,689.9	-205.4	409.9	426.0	0.82	-0.81	0.51
3,830.0	9.31	124.89	3,783.4	-213.8	424.6	441.4	2.78	-2.12	10.16
3,925.0	9.07	123.71	3,877.1	-222.3	437.2	454.6	0.32	-0.25	-1.24
4,019.0	8.56	120.36	3,970.0	-230.0	449.4	467.4	0.77	-0.54	-3.56
4,114.0	11.51	123.57	4,063.6	-238.8	463.4	482.1	3.16	3.11	3.38
4,208.0	11.22	118.31	4,155.7	-248.3	479.2	498.7	1.14	-0.31	-5.60
4,302.0	12.58	117.19	4,247.7	-257.3	496.4	516.6	1.47	1.45	-1.19
4,396.0	11.56	114.37	4,339.6	-265.9	514.1	535.0	1.25	-1.09	-3.00
4,491.0	11.23	111.83	4,432.8	-273.3	531.3	552.8	0.63	-0.35	-2.67
4,586.0	12.44	119.89	4,525.7	-281.8	548.8	570.9	2.15	1.27	8.48
4,680.0	11.06	116.63	4,617.8	-290.9	565.6	588.5	1.63	-1.47	-3.47
4,775.0	9.61	115.68	4,711.2	-298.4	580.9	604.3	1.54	-1.53	-1.00
4,869.0	10.44	131.59	4,803.8	-307.5	594.4	618.5	3.06	0.88	16.93
4,964.0	13.01	136.53	4,896.8	-320.9	608.2	633.4	2.90	2.71	5.20
5,058.0	12.05	122.29	4,988.6	-333.9	623.8	650.0	3.43	-1.02	-15.15
5,153.0	14.01	111.63	5,081.2	-343.4	642.8	669.9	3.26	2.06	-11.22
5,247.0	25.91	111.33	5,169.4	-355.1	672.6	700.6	12.66	12.66	-0.32
5,342.0	31.54	114.97	5,252.6	-373.2	714.5	743.9	6.20	5.93	3.83
5,437.0	28.96	112.33	5,334.7	-392.4	758.3	789.1	3.05	-2.72	-2.78

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<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	EDM 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)
5,531.0	26.72	111.96	5,417.8	-408.9	799.0	831.1	2.39	-2.38	-0.39
5,626.0	34.29	112.26	5,499.6	-427.1	843.6	877.1	7.97	7.97	0.32
5,720.0	42.27	107.93	5,573.4	-446.9	898.3	933.3	8.95	8.49	-4.61
<b>CROSSED 600' HARDLINE @ 5770' MD / 5609' TVD</b>									
5,769.9	47.76	101.07	5,608.6	-455.6	932.5	968.0	14.66	10.99	-13.74
5,815.0	53.01	95.86	5,637.4	-460.7	966.8	1,002.7	14.66	11.65	-11.56
5,910.0	65.91	92.00	5,685.6	-466.1	1,048.2	1,084.3	14.02	13.58	-4.06
6,005.0	74.01	90.08	5,718.1	-467.7	1,137.4	1,173.3	8.73	8.53	-2.02
6,099.0	74.68	92.98	5,743.5	-470.1	1,227.9	1,263.6	3.05	0.71	3.09
6,194.0	74.40	92.90	5,768.8	-474.8	1,319.3	1,355.1	0.31	-0.29	-0.08
6,289.0	79.26	95.04	5,790.5	-481.2	1,411.6	1,447.6	5.57	5.12	2.25
6,383.0	83.75	93.19	5,804.3	-487.9	1,504.3	1,540.5	5.16	4.78	-1.97
6,400.0	84.12	93.29	5,806.1	-488.8	1,521.1	1,557.4	2.25	2.18	0.59
<b>7" CASING POINT @ 6456' MD / 5811.7' TVD / END OF INT HOLE / BEGIN LATERAL</b>									
6,456.0	84.43	93.14	5,811.7	-491.9	1,576.8	1,613.1	0.61	0.55	-0.26
6,469.0	84.50	93.11	5,813.0	-492.6	1,589.7	1,626.0	0.61	0.55	-0.26
6,531.0	87.69	92.49	5,817.2	-495.7	1,651.5	1,687.8	5.24	5.15	-1.00
6,625.0	90.97	93.16	5,818.3	-500.3	1,745.3	1,781.7	3.56	3.49	0.71
6,720.0	91.72	94.29	5,816.1	-506.5	1,840.1	1,876.7	1.43	0.79	1.19
6,814.0	91.58	94.55	5,813.4	-513.7	1,933.8	1,970.7	0.31	-0.15	0.28
6,908.0	90.92	89.77	5,811.3	-517.2	2,027.7	2,064.5	5.13	-0.70	-5.09
7,003.0	91.30	88.86	5,809.5	-516.1	2,122.6	2,159.0	1.04	0.40	-0.96
7,097.0	90.84	88.42	5,807.7	-513.9	2,216.6	2,252.4	0.68	-0.49	-0.47
7,191.0	90.74	88.15	5,806.4	-511.1	2,310.5	2,345.8	0.31	-0.11	-0.29
7,286.0	91.03	88.04	5,804.9	-507.9	2,405.5	2,440.1	0.33	0.31	-0.12
7,381.0	90.95	87.65	5,803.3	-504.3	2,500.4	2,534.4	0.42	-0.08	-0.41
7,475.0	91.01	88.37	5,801.7	-501.1	2,594.3	2,627.7	0.77	0.06	0.77
7,570.0	90.92	86.69	5,800.1	-497.0	2,689.2	2,721.9	1.77	-0.09	-1.77
7,664.0	90.85	86.97	5,798.6	-491.8	2,783.1	2,814.9	0.31	-0.07	0.30
7,759.0	90.66	86.82	5,797.4	-486.6	2,877.9	2,909.0	0.25	-0.20	-0.16
7,853.0	90.54	85.43	5,796.4	-480.3	2,971.7	3,001.9	1.48	-0.13	-1.48
7,947.0	90.48	85.84	5,795.6	-473.1	3,065.4	3,094.7	0.44	-0.06	0.44
8,041.0	92.10	87.56	5,793.5	-467.7	3,159.2	3,187.7	2.51	1.72	1.83
8,136.0	91.96	86.78	5,790.1	-463.0	3,254.1	3,281.7	0.83	-0.15	-0.82
8,230.0	90.82	89.19	5,787.8	-459.7	3,348.0	3,375.0	2.84	-1.21	2.56
8,324.0	89.78	88.38	5,787.3	-457.7	3,441.9	3,468.5	1.40	-1.11	-0.86
8,418.0	89.51	88.15	5,787.9	-454.9	3,535.9	3,561.9	0.38	-0.29	-0.24
8,513.0	89.45	88.42	5,788.8	-452.0	3,630.8	3,656.2	0.29	-0.06	0.28
8,607.0	89.55	88.38	5,789.6	-449.4	3,724.8	3,749.6	0.11	0.11	-0.04
8,702.0	89.78	87.25	5,790.1	-445.8	3,819.7	3,843.9	1.21	0.24	-1.19
8,796.0	92.70	87.28	5,788.1	-441.3	3,913.6	3,937.0	3.11	3.11	0.03
8,891.0	93.84	89.35	5,782.7	-438.5	4,008.4	4,031.2	2.48	1.20	2.18
8,986.0	91.79	90.46	5,778.0	-438.4	4,103.3	4,125.7	2.45	-2.16	1.17
9,080.0	91.59	89.74	5,775.2	-438.5	4,197.2	4,219.4	0.79	-0.21	-0.77

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<b>Site:</b>	Sec 9, T9N, R58W	<b>MD Reference:</b>	WELL @ 4758.0usft (H&P #326)
<b>Well:</b>	Rohn State LD10-66-1HN	<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 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)	
9,175.0	91.90	89.69	5,772.4	-438.1	4,292.2	4,313.9	0.33	0.33	-0.05	
9,269.0	91.89	89.38	5,769.2	-437.3	4,386.1	4,407.5	0.33	-0.01	-0.33	
9,364.0	92.08	88.89	5,766.0	-435.9	4,481.1	4,501.9	0.55	0.20	-0.52	
9,458.0	89.43	88.89	5,764.7	-434.0	4,575.0	4,595.4	2.82	-2.82	0.00	
9,553.0	88.88	88.14	5,766.1	-431.6	4,670.0	4,689.8	0.98	-0.58	-0.79	
9,647.0	88.77	87.44	5,768.0	-428.0	4,763.9	4,783.0	0.75	-0.12	-0.74	
9,742.0	88.63	87.17	5,770.2	-423.5	4,858.8	4,877.2	0.32	-0.15	-0.28	
9,753.0	88.66	87.43	5,770.5	-423.0	4,869.8	4,888.1	2.38	0.27	2.36	
<b>TD @ 9815' MD / 5772' TVD</b>										
9,815.0	88.66	87.43	5,771.9	-420.2	4,931.7	4,949.5	0.00	0.00	0.00	

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
1,042.0	1,042.0	-2.8	6.5	Tie In @ 1042' MD / 1042' TVD	
3,327.1	3,290.8	-167.0	334.9	CROSSED LEASELINE @ 3327' MD / 3291' TVD	
5,769.9	5,608.6	-455.6	932.5	CROSSED 600' HARDLINE @ 5770' MD / 5609' TVD	
6,456.0	5,811.7	-491.9	1,576.8	7" CASING POINT @ 6456' MD / 5811.7' TVD / END OF INT HOLE / BEGIN L	
9,815.0	5,771.9	-420.2	4,931.7	TD @ 9815' MD / 5772' TVD	

Checked By: \_\_\_\_\_ Approved By: \_\_\_\_\_ Date: \_\_\_\_\_



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## Survey Certification Sheet

Noble Energy Inc  
Company

RM-141041  
Job Number

11/3/14  
Date

Sec9,T9N,R59W  
Lease

Rohn State LD10-66-1HN  
Well Name

Weld, CO  
County & State

API: 05-123-37628

Surveyed from a depth of: 1042' to 9815' 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.

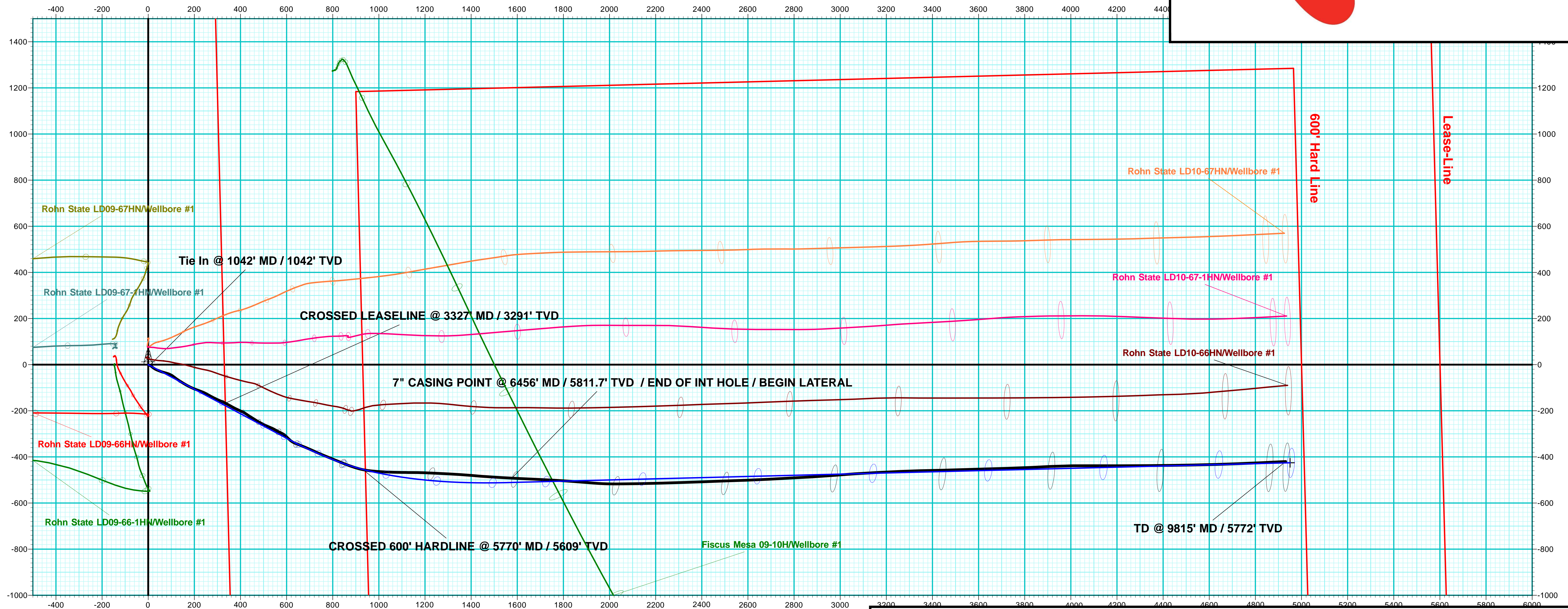
Mike Baldwin  
Gulf Coast District Manager  
Mike  
Baldwin

Digitally signed by Mike Baldwin  
DN: cn=Mike Baldwin, o=Directional  
Drilling Company, ou,  
email=mike.baldwin@directionaldrill  
rs.com, c=US  
Date: 2014.11.04 09:50:01 -06'00'



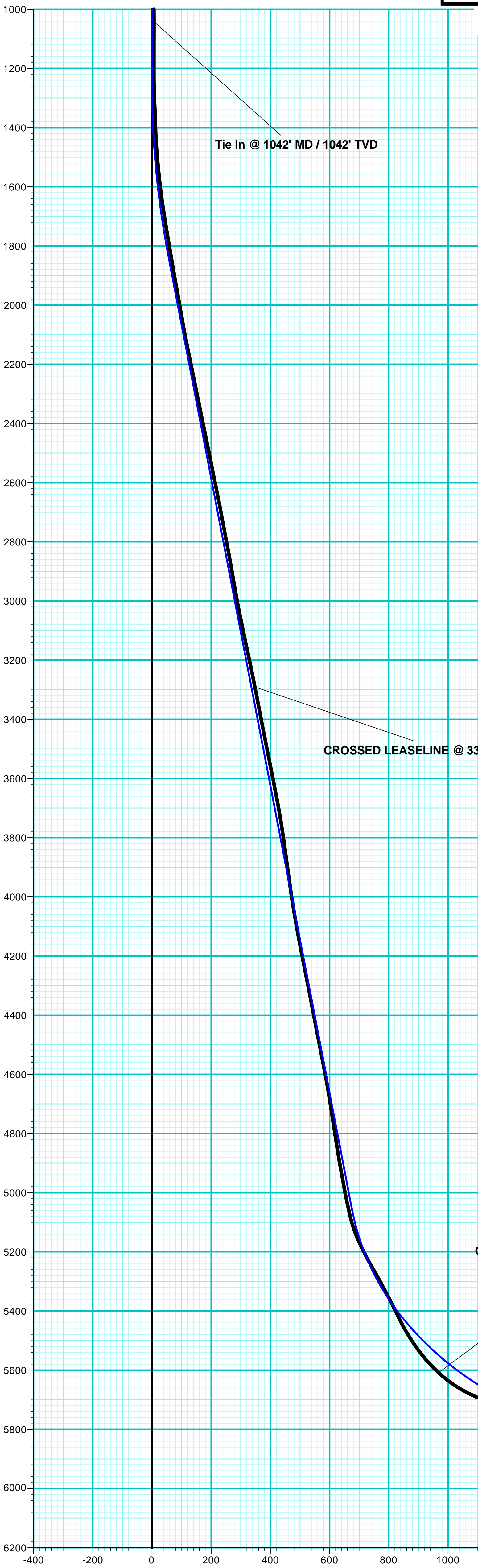
Company Name: Noble Energy Inc.  
Rohn State LD10-66-1HN  
Weld County, CO  
Rig: H&P #326  
Created By: Jerry Arsenault  
Date: 10/20/2014

Rohn State LD10-66-1HN  
Weld County, CO  
Q140858 & RM-141041  
Design #3



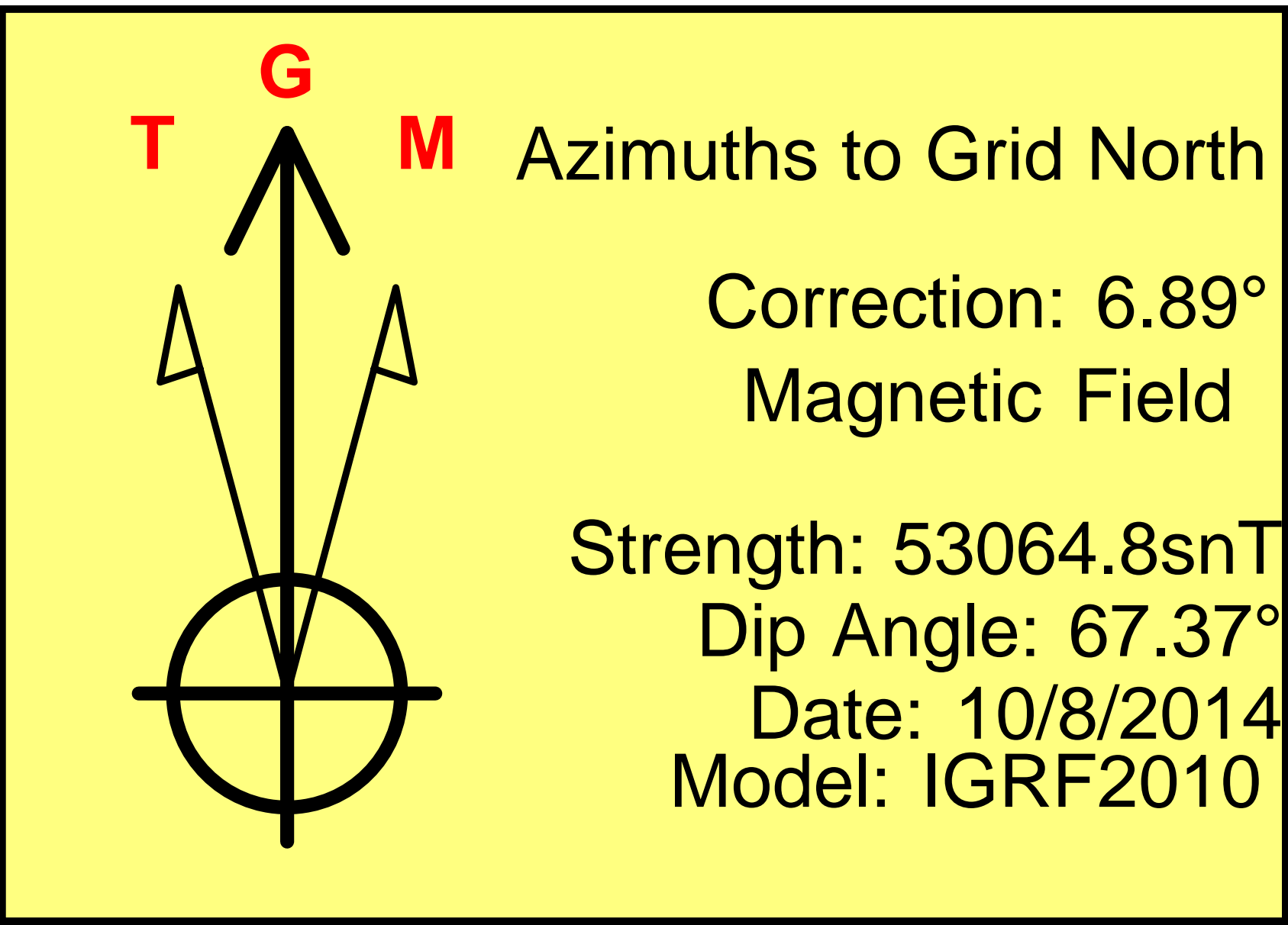
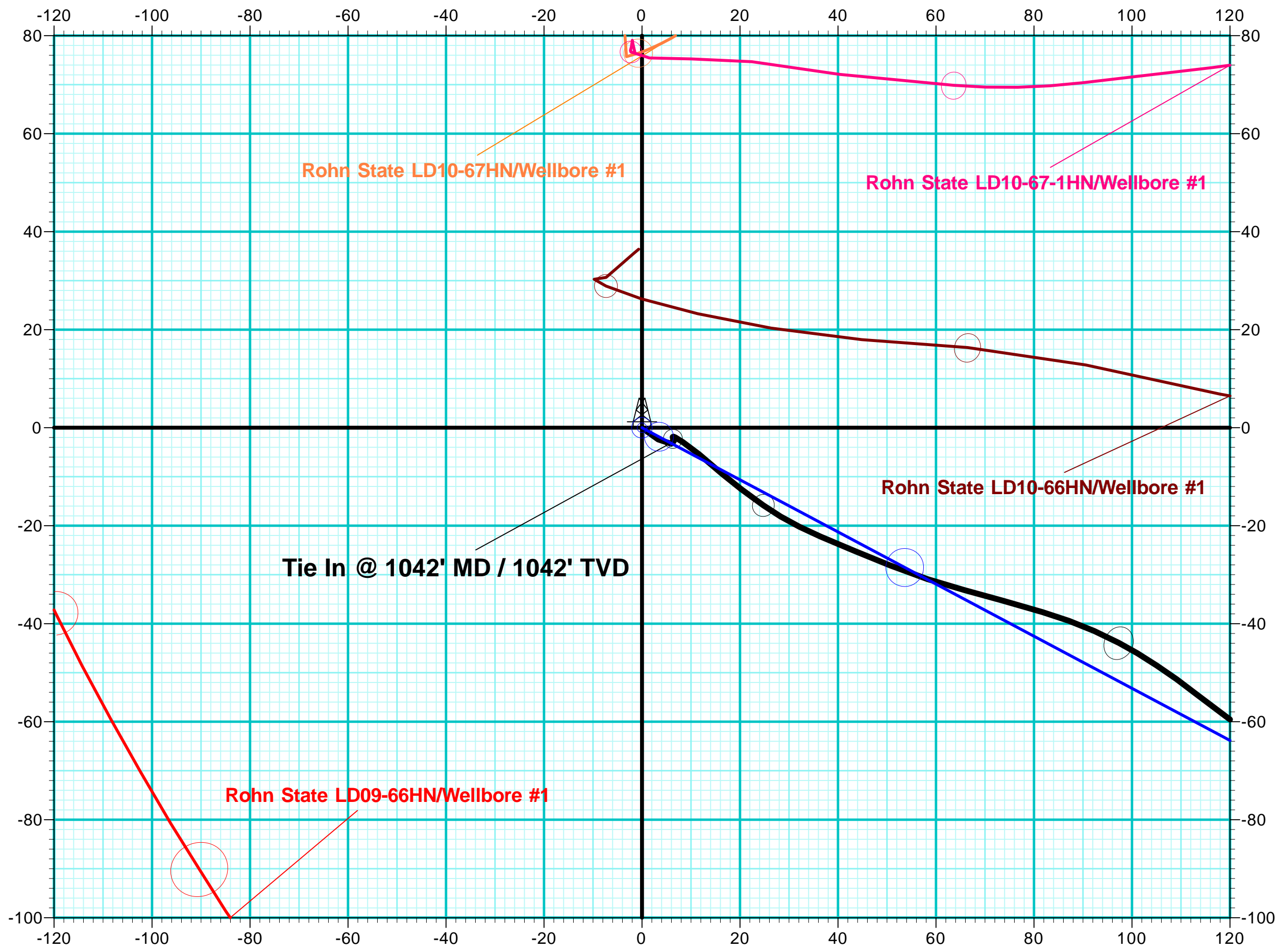
WELL DETAILS: Rohn State LD10-66-1HN					
		Ground Level:	4728.0		
+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
0.0	0.0	1526939.40	3453933.69	40° 46' 5.952 N	103° 51' 40.104 W

DESIGN TARGET DETAILS						
Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude
PBHL Rohn State LD10-66-1HN	5790.6	-425.4	4950.5	1526514.00	3458884.19	40° 46' 0.840 N
- plan hits target center						
Longitude 103° 50' 35.879 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	

ANNOTATIONS									
MD	Inc	Azi	TVD	+N/-S	+E/-W	VSect	Departure	Annotation	
1042.0	0.60	345.19	1042.0	-2.8	6.5	6.7	8.2	Tie In @ 1042' MD / 1042' TVD	
3327.1	11.91	117.14	3290.8	-167.0	334.9	348.0	379.5	CROSSED LEASELINE @ 3327' MD / 3291' TVD	
5769.9	47.76	101.07	5608.6	-455.6	932.5	968.0	1049.2	CROSSED 600' HARDLINE @ 5770' MD / 5609' TVD	
6456.0	84.43	93.14	5811.7	-491.9	1576.8	1613.1	1693.5	7" CASING POINT @ 6456' MD / 5811.7' TVD / END OF INT HOLE / BEGIN LATERAL	
9815.0	88.66	87.43	5771.9	-420.2	4931.7	4949.5	5051.3	TD @ 9815' MD / 5772' TVD	



Vertical Section at 94.91° (200 usf/in)