



Noble Energy Inc.

Weld County, CO

Sec 2, T9N, R58W

Moses State LD11-77-1AHN

Wellbore #1

Design: Wellbore #1 FINAL

DDC Survey Report

20 January, 2015



Company:	Noble Energy Inc.	Local Co-ordinate Reference:	Well Moses State LD11-77-1AHN
Project:	Weld County, CO	TVD Reference:	well @ 4771.0usft (H&P #326)
Site:	Sec 2, T9N, R58W	MD Reference:	well @ 4771.0usft (H&P #326)
Well:	Moses State LD11-77-1AHN	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 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 2, T9N, R58W					
Site Position:		Northing:	1,529,499.23	usft	Latitude:	40° 46' 29.928 N	
From:	Lat/Long	Easting:	3,461,069.43	usft	Longitude:	103° 50' 6.756 W	
Position Uncertainty:	0.0	usft	Slot Radius:	13-3/16	"	Grid Convergence:	1.08 °

Well	Moses State LD11-77-1AHN					
Well Position	+N/-S	0.0 usft	Northing:	1,529,345.56 usft	Latitude:	40° 46' 28.416 N
	+E/-W	0.0 usft	Easting:	3,461,036.30 usft	Longitude:	103° 50' 7.224 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	0.0 usft	Ground Level:	4,741.0 usft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	1/2/2015	7.90	67.37	53,045

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	178.72	

Survey Program	Date	1/20/2015			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
455.0	1,229.0	Surface (Wellbore #1)	Flexi-Shot	VES Flexi-Shot Tool	
1,301.0	6,023.0	MWD Survey - Vert/Build (Wellbore #1)	MWD default	MWD - Standard	
6,082.0	10,911.0	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	
455.0	1.00	10.12	455.0	3.9	0.7	-3.9	0.22	0.22	0.00	
735.0	0.80	270.02	735.0	6.3	-0.8	-6.3	0.49	-0.07	-35.75	
TIE IN @ 1229' MD / 1229' TVD / END OF SUR HOLE / BEGIN INT HOLE										
1,229.0	0.50	138.42	1,228.9	4.7	-2.8	-4.8	0.24	-0.06	-26.64	
1,301.0	0.35	327.27	1,300.9	4.7	-2.8	-4.7	1.18	-0.21	-237.71	
1,394.0	0.35	327.62	1,393.9	5.1	-3.1	-5.2	0.00	0.00	0.38	
1,488.0	0.53	326.04	1,487.9	5.7	-3.5	-5.8	0.19	0.19	-1.68	
1,581.0	0.35	274.89	1,580.9	6.1	-4.0	-6.2	0.44	-0.19	-55.00	

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Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	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)
1,674.0	0.44	284.38	1,673.9	6.2	-4.6	-6.3	0.12	0.10	10.20
1,767.0	0.26	282.27	1,766.9	6.4	-5.2	-6.5	0.19	-0.19	-2.27
1,861.0	0.35	320.77	1,860.9	6.6	-5.6	-6.8	0.23	0.10	40.96
1,953.0	0.53	295.98	1,952.9	7.0	-6.1	-7.2	0.28	0.20	-26.95
2,137.0	0.35	256.96	2,136.9	7.3	-7.4	-7.4	0.18	-0.10	-21.21
2,230.0	0.26	262.41	2,229.9	7.2	-7.9	-7.4	0.10	-0.10	5.86
2,324.0	0.18	222.50	2,323.9	7.1	-8.2	-7.2	0.18	-0.09	-42.46
2,416.0	0.35	208.27	2,415.9	6.7	-8.5	-6.9	0.20	0.18	-15.47
2,508.0	0.26	229.71	2,507.9	6.3	-8.7	-6.5	0.16	-0.10	23.30
2,697.0	0.26	212.84	2,696.9	5.7	-9.3	-5.9	0.04	0.00	-8.93
2,791.0	0.35	196.14	2,790.9	5.2	-9.5	-5.4	0.13	0.10	-17.77
2,886.0	0.09	233.75	2,885.9	4.9	-9.6	-5.1	0.30	-0.27	39.59
2,980.0	0.35	225.49	2,979.9	4.7	-9.9	-4.9	0.28	0.28	-8.79
3,170.0	0.79	209.67	3,169.9	3.1	-11.0	-3.4	0.24	0.23	-8.33
3,264.0	0.79	218.11	3,263.9	2.0	-11.7	-2.3	0.12	0.00	8.98
3,358.0	0.88	203.52	3,357.9	0.9	-12.4	-1.1	0.24	0.10	-15.52
3,453.0	0.79	197.89	3,452.9	-0.4	-12.9	0.1	0.13	-0.09	-5.93
3,549.0	1.06	198.60	3,548.9	-1.9	-13.4	1.6	0.28	0.28	0.74
3,643.0	1.32	195.08	3,642.8	-3.8	-13.9	3.5	0.29	0.28	-3.74
CROSSED 460' HARDLINE @ 3687' MD / 3687' TVD									
3,687.0	1.44	195.70	3,686.8	-4.8	-14.2	4.5	0.28	0.27	1.42
3,738.0	1.58	196.31	3,737.8	-6.1	-14.6	5.8	0.28	0.27	1.19
3,832.0	1.67	359.44	3,831.8	-6.0	-14.9	5.6	3.42	0.10	173.54
CROSSED 460' HARDLINE @ 3873' MD / 3873' TVD									
3,873.2	1.55	355.65	3,873.0	-4.8	-15.0	4.5	0.39	-0.29	-9.21
3,927.0	1.41	349.77	3,926.8	-3.4	-15.2	3.1	0.39	-0.26	-10.92
4,021.0	1.23	328.50	4,020.7	-1.4	-15.9	1.1	0.55	-0.19	-22.63
4,116.0	4.57	41.27	4,115.6	2.3	-13.9	-2.6	4.60	3.52	76.60
4,211.0	4.84	37.58	4,210.3	8.3	-9.0	-8.5	0.43	0.28	-3.88
4,305.0	4.92	31.25	4,304.0	14.9	-4.5	-15.0	0.58	0.09	-6.73
4,400.0	4.66	27.74	4,398.6	21.8	-0.6	-21.8	0.41	-0.27	-3.69
4,495.0	4.13	25.28	4,493.3	28.3	2.7	-28.2	0.59	-0.56	-2.59
4,589.0	3.96	18.42	4,587.1	34.5	5.2	-34.3	0.55	-0.18	-7.30
4,684.0	3.61	12.97	4,681.9	40.5	6.9	-40.3	0.53	-0.37	-5.74
4,778.0	2.81	13.68	4,775.8	45.6	8.1	-45.4	0.85	-0.85	0.76
4,873.0	2.55	16.66	4,870.7	49.9	9.2	-49.7	0.31	-0.27	3.14
4,967.0	2.11	1.02	4,964.6	53.6	9.9	-53.4	0.82	-0.47	-16.64
5,062.0	6.95	189.63	5,059.4	49.7	8.9	-49.5	9.52	5.09	-180.41
5,156.0	14.16	168.89	5,151.8	32.8	10.2	-32.5	8.55	7.67	-22.06
5,250.0	17.85	167.13	5,242.1	7.4	15.6	-7.1	3.96	3.93	-1.87
CROSSED 460' HARDLINE @ 5287' MD / 5277' TVD									
5,286.7	18.90	170.16	5,276.9	-3.9	17.9	4.3	3.87	2.87	8.25
5,345.0	20.66	174.34	5,331.8	-23.4	20.5	23.9	3.87	3.02	7.17
5,439.0	25.76	185.24	5,418.2	-60.3	20.3	60.8	7.07	5.43	11.60

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Survey									
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5,534.0	37.28	185.59	5,499.1	-109.7	15.6	110.0	12.13	12.13	0.37
5,628.0	53.90	182.95	5,564.6	-176.4	10.8	176.6	17.79	17.68	-2.81
5,722.0	61.38	184.01	5,614.9	-255.6	6.0	255.7	8.01	7.96	1.13
5,817.0	71.67	182.25	5,652.7	-342.5	1.3	342.4	10.96	10.83	-1.85
5,911.0	87.23	182.07	5,669.8	-434.6	-2.2	434.4	16.55	16.55	-0.19
CROSSED LEASELINE @ 5941' MD / 5671' TVD									
5,941.2	87.71	182.19	5,671.2	-464.7	-3.3	464.5	1.63	1.59	0.38
6,005.0	88.72	182.43	5,673.2	-528.4	-5.9	528.2	1.63	1.59	0.38
6,023.0	88.81	182.25	5,673.5	-546.4	-6.6	546.1	1.12	0.50	-1.00
7" CASING POINT @ 6070' MD / 5674' TVD / END OF INT HOLE / BEGIN LATERAL									
6,070.0	89.23	181.83	5,674.4	-593.4	-8.3	593.0	1.27	0.90	-0.90
6,082.0	89.34	181.72	5,674.5	-605.4	-8.7	605.0	1.27	0.90	-0.90
6,176.0	91.98	179.44	5,673.4	-699.3	-9.6	699.0	3.71	2.81	-2.43
6,269.0	92.42	179.26	5,669.8	-792.3	-8.6	791.9	0.51	0.47	-0.19
6,362.0	91.80	178.91	5,666.4	-885.2	-7.1	884.8	0.77	-0.67	-0.38
CROSSED 460' HARDLINE @ 6402' MD / 5666' TVD									
6,401.7	91.01	177.78	5,665.5	-924.9	-5.9	924.5	3.46	-1.98	-2.84
6,455.0	89.96	176.27	5,665.0	-978.1	-3.2	977.8	3.46	-1.98	-2.84
6,548.0	89.87	175.75	5,665.1	-1,070.9	3.3	1,070.7	0.57	-0.10	-0.56
6,640.0	90.31	175.75	5,665.0	-1,162.6	10.1	1,162.5	0.48	0.48	0.00
6,732.0	90.22	175.04	5,664.6	-1,254.3	17.5	1,254.4	0.78	-0.10	-0.77
6,825.0	88.64	178.21	5,665.5	-1,347.1	23.0	1,347.3	3.81	-1.70	3.41
6,918.0	89.52	179.26	5,667.0	-1,440.1	25.0	1,440.3	1.47	0.95	1.13
7,011.0	89.34	179.09	5,667.9	-1,533.1	26.4	1,533.3	0.27	-0.19	-0.18
7,104.0	89.96	180.14	5,668.5	-1,626.1	27.0	1,626.3	1.31	0.67	1.13
7,196.0	90.22	181.02	5,668.3	-1,718.1	26.1	1,718.2	1.00	0.28	0.96
7,291.0	89.96	181.37	5,668.2	-1,813.0	24.1	1,813.1	0.46	-0.27	0.37
7,385.0	90.13	182.25	5,668.1	-1,907.0	21.1	1,907.0	0.95	0.18	0.94
7,479.0	91.28	182.95	5,667.0	-2,000.9	16.9	2,000.8	1.43	1.22	0.74
7,574.0	88.11	179.26	5,667.5	-2,095.8	15.0	2,095.7	5.12	-3.34	-3.88
7,668.0	88.37	176.62	5,670.3	-2,189.7	18.4	2,189.6	2.82	0.28	-2.81
7,763.0	87.32	176.10	5,673.9	-2,284.5	24.4	2,284.4	1.23	-1.11	-0.55
7,858.0	90.48	176.62	5,675.7	-2,379.2	30.5	2,379.3	3.37	3.33	0.55
7,952.0	90.40	176.62	5,675.0	-2,473.1	36.0	2,473.3	0.09	-0.09	0.00
8,047.0	91.80	176.80	5,673.2	-2,567.9	41.5	2,568.2	1.49	1.47	0.19
8,141.0	91.89	176.27	5,670.2	-2,661.7	47.1	2,662.1	0.57	0.10	-0.56
8,236.0	91.80	175.22	5,667.1	-2,756.4	54.2	2,756.9	1.11	-0.09	-1.11
8,330.0	91.89	174.34	5,664.1	-2,849.9	62.7	2,850.6	0.94	0.10	-0.94
8,425.0	91.98	173.64	5,660.9	-2,944.4	72.7	2,945.2	0.74	0.09	-0.74
8,519.0	91.19	176.80	5,658.3	-3,038.0	80.5	3,039.0	3.46	-0.84	3.36
8,614.0	91.54	179.26	5,656.0	-3,132.9	83.8	3,134.0	2.61	0.37	2.59
8,708.0	92.15	178.73	5,653.0	-3,226.8	85.4	3,227.9	0.86	0.65	-0.56
8,803.0	90.84	180.14	5,650.5	-3,321.8	86.3	3,322.9	2.03	-1.38	1.48
8,897.0	91.45	179.26	5,648.6	-3,415.8	86.8	3,416.8	1.14	0.65	-0.94

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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)
8,992.0	88.46	180.84	5,648.7	-3,510.7	86.7	3,511.8	3.56	-3.15	1.66
9,087.0	88.46	179.44	5,651.3	-3,605.7	86.5	3,606.7	1.47	0.00	-1.47
9,181.0	88.81	178.21	5,653.5	-3,699.7	88.4	3,700.7	1.36	0.37	-1.31
9,276.0	89.16	177.68	5,655.2	-3,794.6	91.9	3,795.7	0.67	0.37	-0.56
9,370.0	88.02	180.67	5,657.5	-3,888.5	93.2	3,889.6	3.40	-1.21	3.18
9,464.0	88.46	181.19	5,660.4	-3,982.5	91.7	3,983.5	0.72	0.47	0.55
9,559.0	88.64	180.67	5,662.8	-4,077.4	90.1	4,078.4	0.58	0.19	-0.55
9,653.0	88.20	179.96	5,665.4	-4,171.4	89.6	4,172.4	0.89	-0.47	-0.76
9,747.0	90.92	177.50	5,666.1	-4,265.4	91.7	4,266.3	3.90	2.89	-2.62
9,842.0	91.63	176.62	5,664.0	-4,360.2	96.6	4,361.3	1.19	0.75	-0.93
9,936.0	92.33	176.27	5,660.7	-4,454.0	102.4	4,455.1	0.83	0.74	-0.37
10,031.0	91.01	178.38	5,658.0	-4,548.8	106.8	4,550.1	2.62	-1.39	2.22
10,125.0	91.89	177.50	5,655.6	-4,642.7	110.2	4,644.0	1.32	0.94	-0.94
10,220.0	89.34	178.73	5,654.6	-4,737.7	113.3	4,739.0	2.98	-2.68	1.29
10,314.0	89.69	178.21	5,655.4	-4,831.6	115.8	4,833.0	0.67	0.37	-0.55
10,409.0	89.96	177.68	5,655.7	-4,926.6	119.2	4,928.0	0.63	0.28	-0.56
10,503.0	88.99	177.15	5,656.5	-5,020.5	123.5	5,022.0	1.18	-1.03	-0.56
10,598.0	88.46	176.45	5,658.6	-5,115.3	128.8	5,116.9	0.92	-0.56	-0.74
10,692.0	89.78	175.57	5,660.1	-5,209.0	135.3	5,210.8	1.69	1.40	-0.94
CROSSED 460' HARDLINE @ 10779' MD / 5660' TVD									
10,779.2	90.83	175.89	5,659.6	-5,296.0	141.8	5,297.8	1.26	1.20	0.37
10,787.0	90.92	175.92	5,659.5	-5,303.8	142.4	5,305.6	1.26	1.20	0.37
10,865.0	91.63	175.92	5,657.8	-5,381.6	147.9	5,383.5	0.91	0.91	0.00
TD @ 10911' MD / 5656' TVD									
10,911.0	91.63	175.92	5,656.4	-5,427.4	151.2	5,429.4	0.00	0.00	0.00

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
1,229.0	1,228.9	4.7	-2.8	TIE IN @ 1229' MD / 1229' TVD / END OF SUR HOLE / BEGIN INT HOLE
3,687.0	3,686.8	-4.8	-14.2	CROSSED 460' HARDLINE @ 3687' MD / 3687' TVD
3,873.2	3,873.0	-4.8	-15.0	CROSSED 460' HARDLINE @ 3873' MD / 3873' TVD
5,286.7	5,276.9	-3.9	17.9	CROSSED 460' HARDLINE @ 5287' MD / 5277' TVD
5,941.2	5,671.2	-464.7	-3.3	CROSSED LEASELINE @ 5941' MD / 5671' TVD
6,070.0	5,674.4	-593.4	-8.3	7" CASING POINT @ 6070' MD / 5674' TVD / END OF INT HOLE / BEGIN LAT
6,401.7	5,665.5	-924.9	-5.9	CROSSED 460' HARDLINE @ 6402' MD / 5666' TVD
10,779.2	5,659.6	-5,296.0	141.8	CROSSED 460' HARDLINE @ 10779' MD / 5660' TVD
10,911.0	5,656.4	-5,427.4	151.2	TD @ 10911' MD / 5656' TVD

Checked By: _____ Approved By: _____ Date: _____



Survey Certification Sheet

Noble Energy Inc
Company

RM-150010
Job Number

1/27/15
Date

Sec2,T9N,R58W
Lease

Moses State
LD11-77-1AHN
Well Name

Weld, CO
County & State

API: 05-123-39844

Surveyed from a depth of: 1229' to 6023' MD DDC Certified Survey
Data

6023' to 10911' 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: 2015.01.27 09:53:25
-06'00'

Company Name: Noble Energy Inc.
Moses State LD11-77-1AHN
Weld County, CO
Rig: H&P #326
Created By: Jerry Arsenault
Date: 1/20/2015



Moses State LD11-77-1AHN
Weld County, CO
Q150004 & RM-150010
Design #1

The DIRECTIONAL DRILLING COMPANY

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

Azimuths to Grid North

Magnetic North: 6.82°

Magnetic Field

Strength: 53045.3snT

Dip Angle: 67.37°

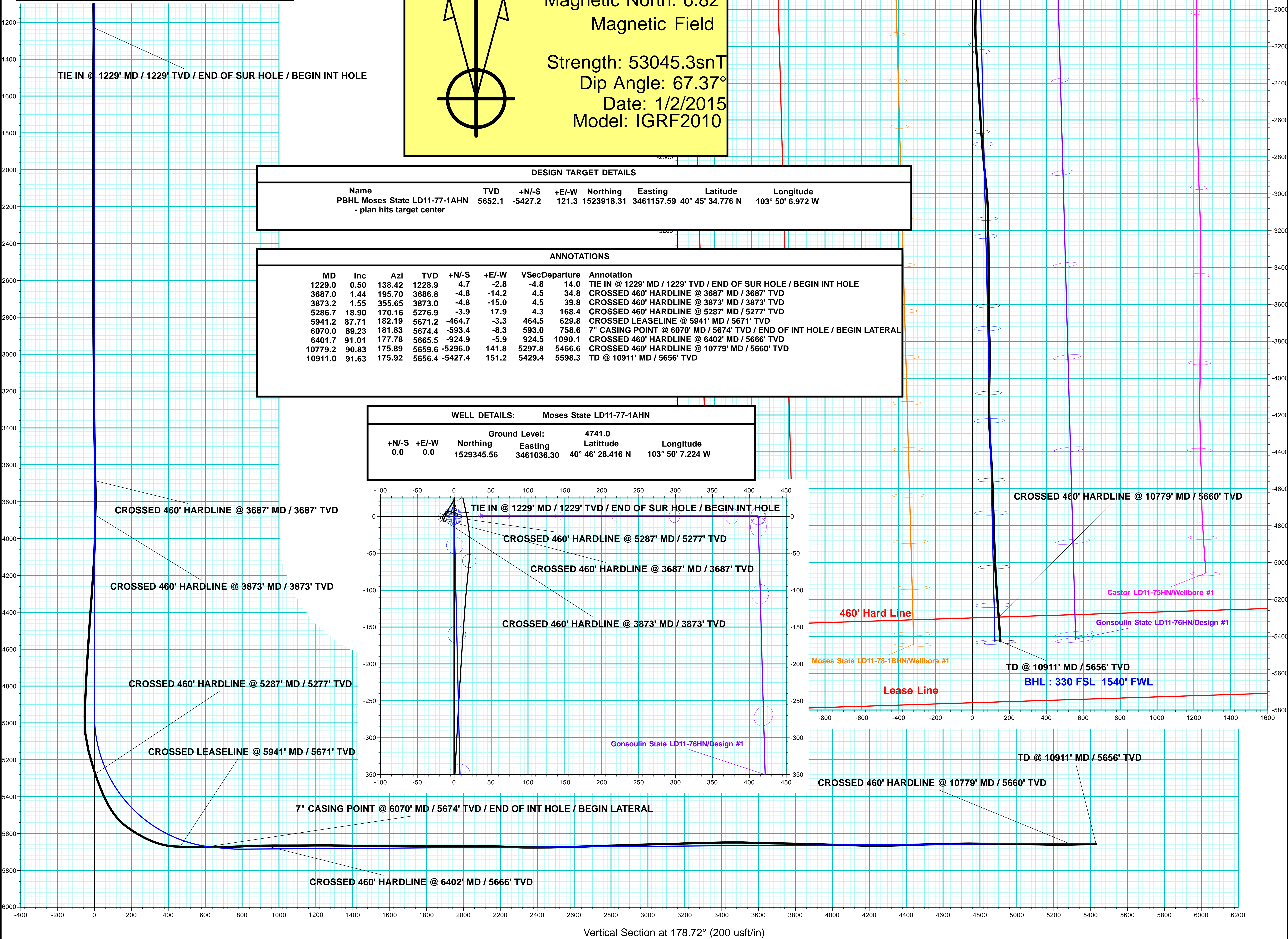
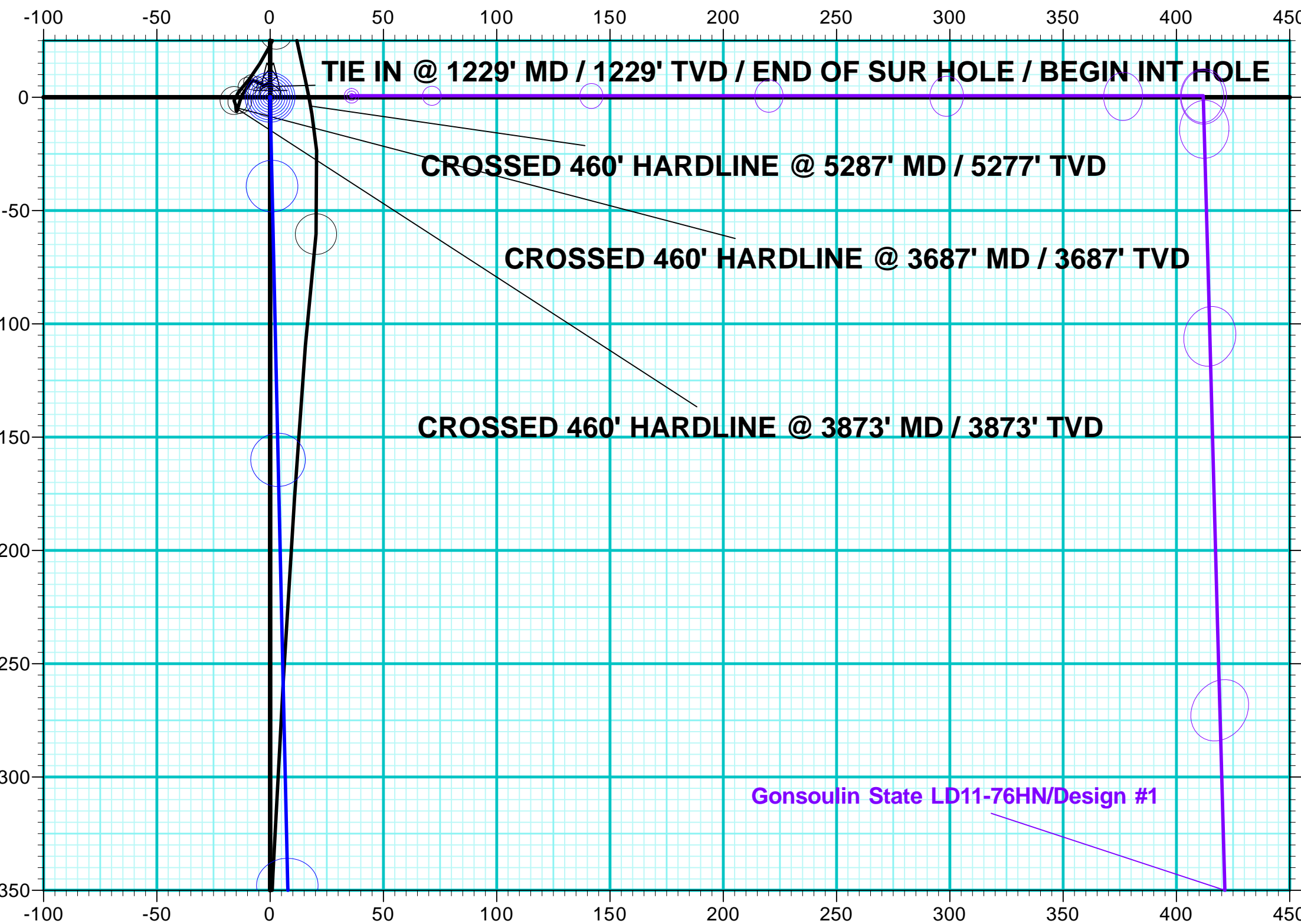
Date: 1/2/2015

Model: IGRF2010

DESIGN TARGET DETAILS							
Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
PBHL Moses State LD11-77-1AHN - plan hits target center	5652.1	-5427.2	121.3	1523918.31	3461157.59	40° 45' 34.776 N	103° 50' 6.972 W

ANNOTATIONS										
MD	Inc	Azi	TVD	+N/-S	+E/-W	VSec	Departure	Annotation		
1229.0	0.50	138.42	1228.9	4.7	-2.8	-4.8	14.0	TIE IN @ 1229' MD / 1229' TVD / END OF SUR HOLE / BEGIN INT HOLE		
3687.0	1.44	195.70	3686.8	-4.8	-14.2	4.5	34.8	CROSSED 460' HARDLINE @ 3687' MD / 3687' TVD		
3873.2	1.55	355.65	3873.0	-4.8	-15.0	4.5	39.8	CROSSED 460' HARDLINE @ 3873' MD / 3873' TVD		
5286.7	18.90	170.16	5276.9	-3.9	17.9	4.3	168.4	CROSSED 460' HARDLINE @ 5287' MD / 5277' TVD		
5941.2	87.71	182.19	5671.2	-464.7	-3.3	464.5	629.8	CROSSED LEASELINE @ 5941' MD / 5671' TVD		
6070.0	89.23	181.83	5674.4	-593.4	-8.3	593.0	758.6	7" CASING POINT @ 6070' MD / 5674' TVD / END OF INT HOLE / BEGIN LATERAL		
6401.7	91.01	177.78	5665.5	-924.9	-5.9	924.5	1090.1	CROSSED 460' HARDLINE @ 6402' MD / 5666' TVD		
10779.2	90.83	175.89	5659.6	-5296.0	141.8	5297.8	5466.6	CROSSED 460' HARDLINE @ 10779' MD / 5660' TVD		
10911.0	91.63	175.92	5656.4	-5427.4	151.2	5429.4	5598.3	TD @ 10911' MD / 5656' TVD		

WELL DETAILS: Moses State LD11-77-1AHN						
+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	
0.0	0.0	1529345.56	3461036.30	40° 46' 28.416 N	103° 50' 7.224 W	



Vertical Section at 178.72° (200 usft/in)