



Noble Energy Inc.

Weld County, CO

Sec 15, T9N, R58W, 6th PM

Castor Federal LD15-75-1HN

Wellbore #1

Design: Wellbore #1 FINAL

DDC Survey Report

11 March, 2014



Company:	Noble Energy Inc.	Local Co-ordinate Reference:	Well Castor Federal LD15-75-1HN
Project:	Weld County, CO	TVD Reference:	WELL @ 4736.0usft (H&P #326)
Site:	Sec 15, T9N, R58W, 6th PM	MD Reference:	WELL @ 4736.0usft (H&P #326)
Well:	Castor Federal LD15-75-1HN	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 15, T9N, R58W, 6th PM					
Site Position:		Northing:	1,522,978.05	usft	Latitude:	40° 45' 26.190 N	
From:	Lat/Long	Easting:	3,457,350.77	usft	Longitude:	103° 50' 56.660 W	
Position Uncertainty:		0.0	usft	Slot Radius:	13-3/16 "	Grid Convergence:	1.07 °

Well		Castor Federal LD15-75-1HN				
Well Position	+N/-S	0.0 usft	Northing:	1,522,926.11 usft	Latitude:	40° 45' 25.668 N
	+E/-W	0.0 usft	Easting:	3,457,399.46 usft	Longitude:	103° 50' 56.040 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	4,706.0 usft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	10/30/2013	8.07	67.40	53,161

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	178.74	

Survey Program	Date	3/11/2014			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
276.0	1,203.0	SURFACE (Wellbore #1)	Flexi-Shot	VES Flexi-Shot Tool	
1,301.0	6,155.0	MWD Surveys- Vert/Build (Wellbore #1)	MWD default	MWD - Standard	
6,259.0	10,055.0	MWD Surveys- 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	
276.0	0.30	3.20	276.0	0.7	0.0	-0.7	0.11	0.11	0.00	
644.0	0.60	299.40	644.0	2.6	-1.6	-2.7	0.15	0.08	-17.34	
1,018.0	0.20	24.40	1,018.0	4.2	-3.0	-4.3	0.16	-0.11	22.73	
TIE IN @ 1203' MD / 1203' TVD										
1,203.0	1.20	301.40	1,203.0	5.5	-4.5	-5.6	0.64	0.54	-44.86	
1,301.0	0.90	328.10	1,301.0	6.7	-5.8	-6.8	0.58	-0.31	27.24	
1,394.0	0.90	326.70	1,393.9	7.9	-6.6	-8.1	0.02	0.00	-1.51	
1,487.0	1.00	324.80	1,486.9	9.2	-7.5	-9.3	0.11	0.11	-2.04	

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Well:	Castor Federal LD15-75-1HN	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)
1,580.0	0.90	325.70	1,579.9	10.4	-8.4	-10.6	0.11	-0.11	0.97
1,672.0	0.90	345.40	1,671.9	11.7	-8.9	-11.9	0.33	0.00	21.41
1,765.0	0.70	356.60	1,764.9	13.0	-9.2	-13.2	0.27	-0.22	12.04
1,858.0	2.00	344.80	1,857.9	15.2	-9.6	-15.4	1.42	1.40	-12.69
1,951.0	4.00	347.80	1,950.7	19.9	-10.7	-20.1	2.16	2.15	3.23
2,043.0	5.90	356.10	2,042.4	27.7	-11.7	-28.0	2.20	2.07	9.02
2,135.0	7.10	359.20	2,133.8	38.1	-12.1	-38.4	1.36	1.30	3.37
2,228.0	8.00	359.60	2,226.0	50.4	-12.3	-50.6	0.97	0.97	0.43
2,320.0	8.80	354.00	2,317.0	63.8	-13.0	-64.0	1.24	0.87	-6.09
2,413.0	10.00	352.60	2,408.8	78.8	-14.8	-79.2	1.31	1.29	-1.51
2,506.0	11.70	352.00	2,500.1	96.2	-17.2	-96.5	1.83	1.83	-0.65
2,599.0	13.40	351.90	2,590.9	116.2	-20.0	-116.6	1.83	1.83	-0.11
2,694.0	13.30	351.10	2,683.3	137.9	-23.3	-138.4	0.22	-0.11	-0.84
2,789.0	13.20	348.90	2,775.8	159.3	-27.0	-159.9	0.54	-0.11	-2.32
2,883.0	12.50	346.60	2,867.4	179.8	-31.5	-180.4	0.92	-0.74	-2.45
2,978.0	12.80	348.70	2,960.1	200.1	-35.9	-200.8	0.58	0.32	2.21
3,073.0	13.40	352.60	3,052.6	221.3	-39.4	-222.1	1.12	0.63	4.11
3,167.0	15.10	351.70	3,143.7	244.2	-42.5	-245.1	1.82	1.81	-0.96
3,262.0	15.40	350.60	3,235.4	268.9	-46.4	-269.9	0.44	0.32	-1.16
3,356.0	16.20	351.00	3,325.8	294.2	-50.5	-295.2	0.86	0.85	0.43
3,451.0	17.20	351.50	3,416.8	321.2	-54.6	-322.3	1.06	1.05	0.53
3,545.0	15.40	352.70	3,507.1	347.3	-58.3	-348.5	1.95	-1.91	1.28
3,640.0	14.60	352.60	3,598.8	371.7	-61.4	-372.9	0.84	-0.84	-0.11
3,735.0	11.40	349.20	3,691.4	392.8	-64.7	-394.1	3.46	-3.37	-3.58
3,830.0	9.80	349.40	3,784.7	410.0	-68.0	-411.4	1.68	-1.68	0.21
3,924.0	7.80	354.00	3,877.6	424.2	-70.1	-425.6	2.25	-2.13	4.89
4,019.0	8.10	352.00	3,971.7	437.2	-71.7	-438.7	0.43	0.32	-2.11
4,114.0	8.00	350.60	4,065.8	450.4	-73.7	-451.9	0.23	-0.11	-1.47
4,208.0	6.90	350.30	4,159.0	462.4	-75.7	-463.9	1.17	-1.17	-0.32
4,303.0	6.00	346.90	4,253.4	472.8	-77.8	-474.4	1.03	-0.95	-3.58
4,398.0	5.00	337.80	4,348.0	481.5	-80.5	-483.2	1.39	-1.05	-9.58
4,492.0	4.60	321.80	4,441.6	488.3	-84.4	-490.0	1.48	-0.43	-17.02
4,587.0	3.70	320.20	4,536.4	493.6	-88.7	-495.4	0.96	-0.95	-1.68
4,682.0	2.90	317.80	4,631.2	497.7	-92.3	-499.7	0.85	-0.84	-2.53
4,777.0	1.10	289.80	4,726.2	499.8	-94.8	-501.8	2.10	-1.89	-29.47
4,871.0	1.50	274.00	4,820.1	500.2	-96.8	-502.2	0.57	0.43	-16.81
4,966.0	1.50	269.60	4,915.1	500.3	-99.3	-502.4	0.12	0.00	-4.63
5,061.0	1.40	222.50	5,010.1	499.4	-101.4	-501.5	1.22	-0.11	-49.58
5,155.0	11.60	150.10	5,103.4	490.4	-97.4	-492.4	11.97	10.85	-77.02
5,250.0	17.50	152.90	5,195.3	469.4	-86.1	-471.1	6.25	6.21	2.95
5,344.0	26.00	166.20	5,282.6	436.7	-74.7	-438.2	10.40	9.04	14.15
5,439.0	32.30	172.40	5,365.5	391.3	-66.4	-392.6	7.35	6.63	6.53
5,533.0	40.40	177.60	5,441.2	335.8	-61.8	-337.1	9.21	8.62	5.53

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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)
5,628.0	48.40	179.20	5,509.0	269.4	-60.0	-270.7	8.50	8.42	1.68
5,722.0	54.30	179.10	5,567.7	196.1	-58.9	-197.3	6.28	6.28	-0.11
5,817.0	59.00	179.10	5,619.9	116.7	-57.7	-118.0	4.95	4.95	0.00
5,912.0	68.30	179.60	5,662.0	31.7	-56.7	-32.9	9.80	9.79	0.53
6,006.0	76.80	180.50	5,690.2	-57.9	-56.8	56.6	9.09	9.04	0.96
6,100.0	82.40	180.10	5,707.2	-150.3	-57.3	149.0	5.97	5.96	-0.43
6,116.0	82.00	179.90	5,709.3	-166.2	-57.3	164.9	2.79	-2.50	-1.25
7" CASING @ 6155' MD / 5714' TVD END OF INT HOLE / BEGIN LATERAL									
6,155.0	84.56	179.57	5,713.9	-204.9	-57.1	203.6	6.62	6.56	-0.85
FIRST LATERAL SURVEY @ 6259' MD / 5718' TVD									
6,259.0	91.40	178.70	5,717.6	-308.7	-55.6	307.4	6.63	6.58	-0.84
6,351.0	88.50	179.10	5,717.6	-400.7	-53.8	399.4	3.18	-3.15	0.43
6,444.0	88.10	178.90	5,720.4	-493.7	-52.2	492.4	0.48	-0.43	-0.22
6,536.0	87.30	178.40	5,724.1	-585.6	-50.0	584.3	1.03	-0.87	-0.54
6,630.0	87.60	179.20	5,728.3	-679.4	-48.0	678.2	0.91	0.32	0.85
6,725.0	88.50	177.80	5,731.5	-774.4	-45.6	773.2	1.75	0.95	-1.47
6,820.0	87.30	177.80	5,735.0	-869.2	-41.9	868.1	1.26	-1.26	0.00
6,914.0	90.30	177.30	5,737.0	-963.1	-37.9	962.0	3.24	3.19	-0.53
7,009.0	88.80	176.80	5,737.7	-1,058.0	-33.0	1,057.0	1.66	-1.58	-0.53
7,103.0	90.50	177.80	5,738.3	-1,151.9	-28.6	1,151.0	2.10	1.81	1.06
7,197.0	90.00	177.30	5,737.9	-1,245.8	-24.6	1,244.9	0.75	-0.53	-0.53
7,292.0	89.70	176.90	5,738.1	-1,340.6	-19.8	1,339.9	0.53	-0.32	-0.42
7,386.0	89.30	177.10	5,738.9	-1,434.5	-14.8	1,433.8	0.48	-0.43	0.21
7,481.0	90.80	176.80	5,738.9	-1,529.4	-9.8	1,528.8	1.61	1.58	-0.32
7,575.0	91.40	178.70	5,737.0	-1,623.3	-6.1	1,622.8	2.12	0.64	2.02
7,670.0	90.30	179.20	5,735.6	-1,718.3	-4.3	1,717.7	1.27	-1.16	0.53
7,765.0	90.00	179.90	5,735.4	-1,813.3	-3.6	1,812.7	0.80	-0.32	0.74
7,860.0	88.00	180.10	5,737.0	-1,908.2	-3.6	1,907.7	2.12	-2.11	0.21
7,954.0	87.60	179.60	5,740.7	-2,002.2	-3.4	2,001.6	0.68	-0.43	-0.53
8,048.0	88.90	177.50	5,743.5	-2,096.1	-1.0	2,095.6	2.63	1.38	-2.23
8,143.0	88.60	177.50	5,745.6	-2,191.0	3.2	2,190.5	0.32	-0.32	0.00
8,238.0	87.70	176.80	5,748.7	-2,285.8	7.9	2,285.4	1.20	-0.95	-0.74
8,332.0	90.10	175.00	5,750.5	-2,379.5	14.6	2,379.3	3.19	2.55	-1.91
8,427.0	91.70	178.00	5,749.0	-2,474.3	20.4	2,474.2	3.58	1.68	3.16
8,521.0	91.20	178.20	5,746.6	-2,568.2	23.5	2,568.1	0.57	-0.53	0.21
8,616.0	90.00	177.80	5,745.6	-2,663.2	26.8	2,663.1	1.33	-1.26	-0.42
8,710.0	90.30	177.60	5,745.4	-2,757.1	30.6	2,757.1	0.38	0.32	-0.21
8,805.0	89.80	177.60	5,745.3	-2,852.0	34.6	2,852.1	0.53	-0.53	0.00
8,900.0	88.80	176.10	5,746.4	-2,946.9	39.8	2,947.0	1.90	-1.05	-1.58
8,994.0	89.10	179.40	5,748.2	-3,040.8	43.5	3,041.0	3.52	0.32	3.51
9,089.0	88.30	178.40	5,750.3	-3,135.7	45.3	3,136.0	1.35	-0.84	-1.05
9,184.0	89.80	178.00	5,751.9	-3,230.7	48.3	3,230.9	1.63	1.58	-0.42
9,278.0	90.30	177.30	5,751.8	-3,324.6	52.2	3,324.9	0.92	0.53	-0.74
9,372.0	89.60	177.50	5,751.9	-3,418.5	56.4	3,418.9	0.77	-0.74	0.21

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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)	
9,436.0	89.70	177.50	5,752.3	-3,482.4	59.2	3,482.9	0.16	0.16	0.00	
9,467.0	90.00	177.60	5,752.4	-3,513.4	60.5	3,513.9	1.02	0.97	0.32	
9,562.0	89.10	176.40	5,753.1	-3,608.3	65.5	3,608.8	1.58	-0.95	-1.26	
9,657.0	88.80	175.40	5,754.9	-3,703.0	72.3	3,703.7	1.10	-0.32	-1.05	
9,751.0	89.10	175.50	5,756.6	-3,796.7	79.8	3,797.5	0.34	0.32	0.11	
9,846.0	88.60	174.70	5,758.5	-3,891.3	87.9	3,892.3	0.99	-0.53	-0.84	
9,940.0	88.20	175.00	5,761.1	-3,984.9	96.3	3,986.1	0.53	-0.43	0.32	
10,002.0	88.60	174.30	5,762.8	-4,046.6	102.1	4,047.9	1.30	0.65	-1.13	
TD @ 10055' MD / 5764.1' TVD										
10,055.0	88.60	174.30	5,764.1	-4,099.3	107.3	4,100.7	0.00	0.00	0.00	

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
1,203.0	1,203.0	5.5	-4.5	TIE IN @ 1203' MD / 1203' TVD	
6,155.0	5,713.9	-204.9	-57.1	7" CASING @ 6155' MD / 5714' TVD END OF INT HOLE / BEGIN LATERAL	
6,259.0	5,717.6	-308.7	-55.6	FIRST LATERAL SURVEY @ 6259' MD / 5718' TVD	
10,055.0	5,764.1	-4,099.3	107.3	TD @ 10055' MD / 5764.1' TVD	

Checked By: _____ Approved By: _____ Date: _____



Survey Certification Sheet

Noble Energy Inc
Company

RM-140026
Job Number

2/3/14
Date

Sec15, T9N, R58W, 6th PM
Lease

Castor Federal LD 15-75-1HN
Well Name

Weld, CO
County & State

API: 05-123-37484

Surveyed from a depth of: 1203 feet to 10055 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@directionaldrillers.
com, c=US
Date: 2014.02.03 16:29:12 -06'00'

Larry Wright
MWD General Manager

Company Name: Noble Energy Inc.
Castor Federal LD15-75-1HN
Weld County, CO
Rig: H&P #326
Created By: TIFFANI MIZELL
Date: 1/28/2014

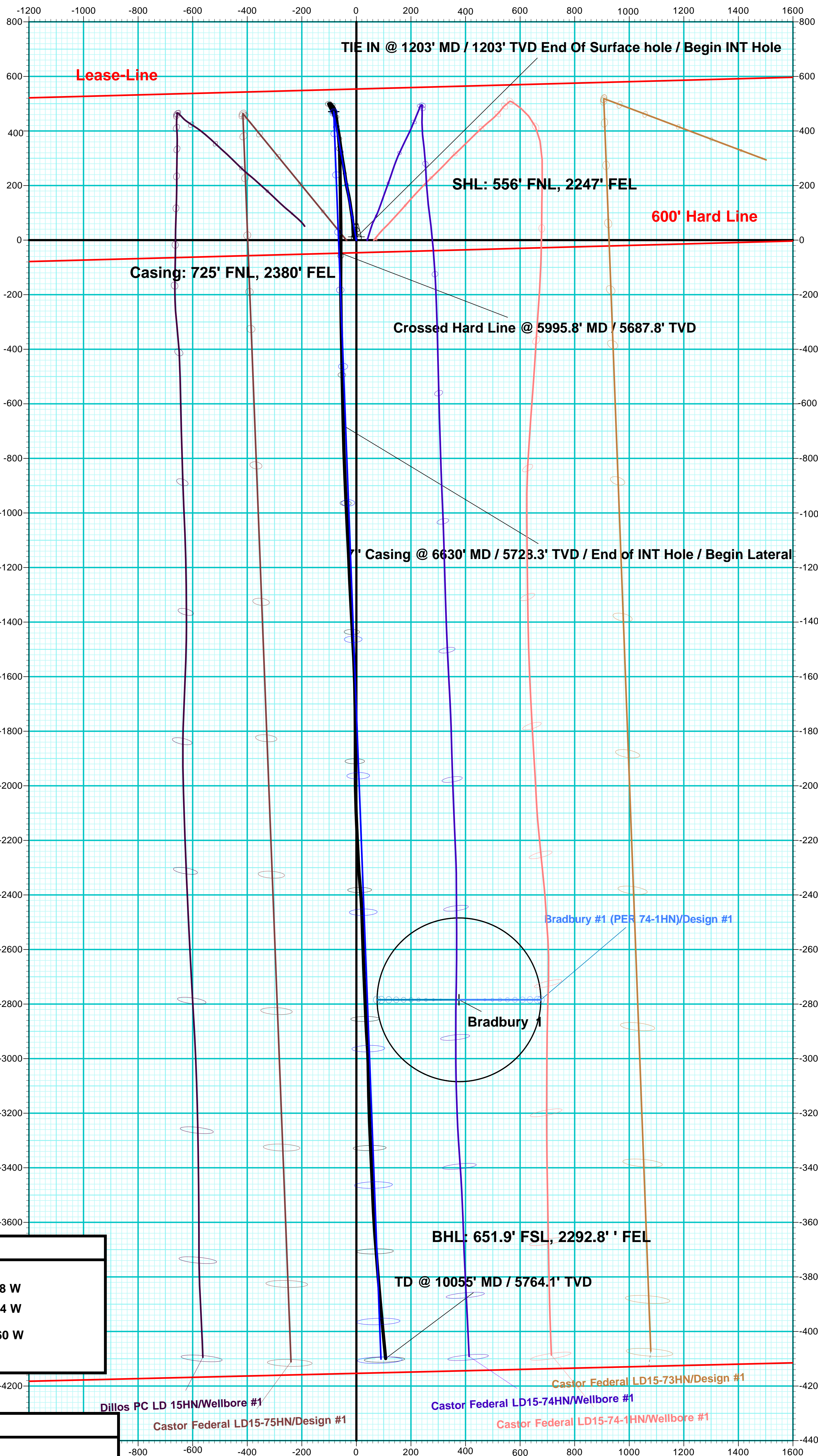
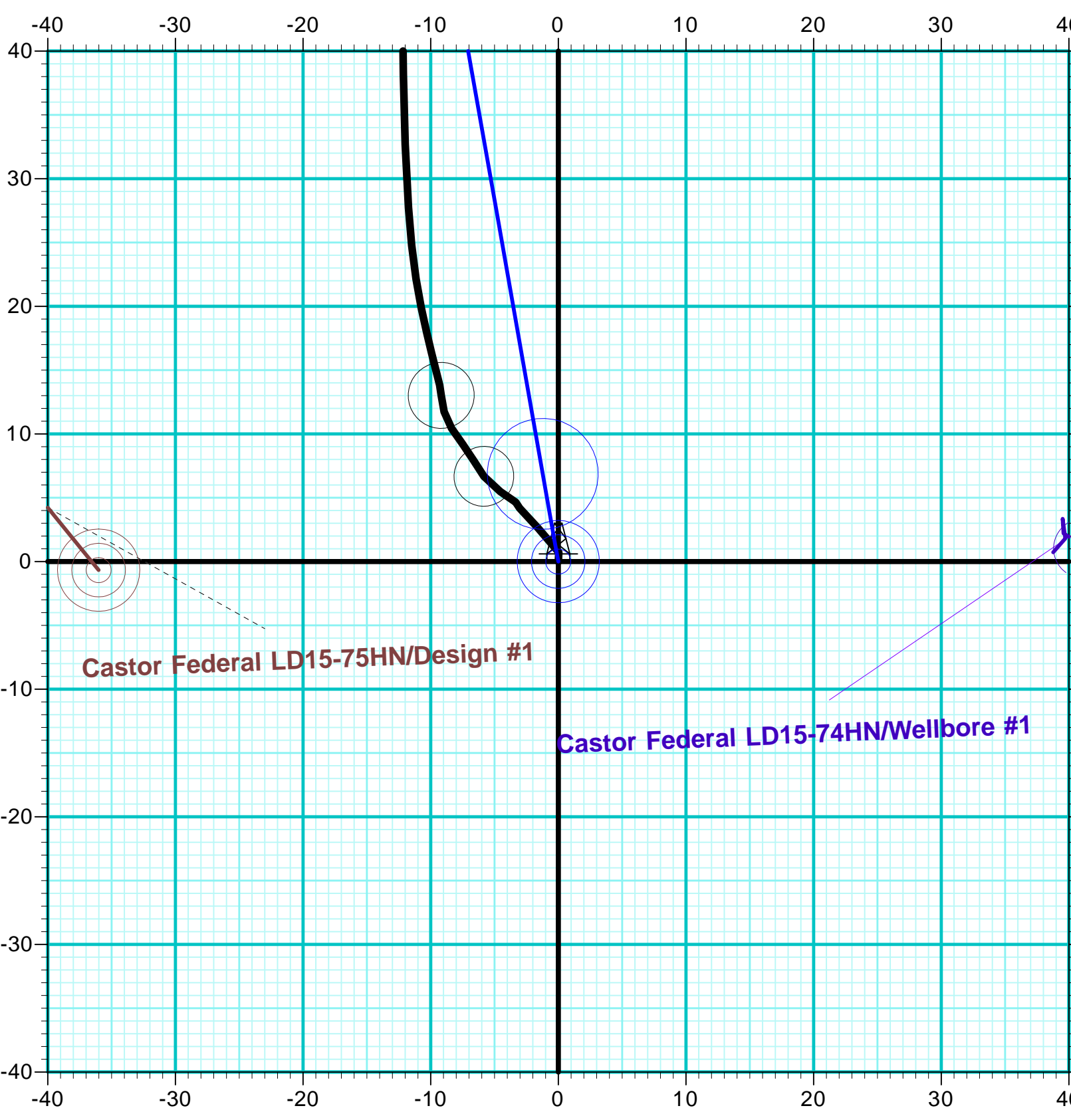
Castor Federal LD15-75-1HN
Weld County, CO
Q130941 & RM-140026
Design #2

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: Castor Federal LD15-75-1HN
Ground Level: 4706.0
+N/-S 0.0 +E/-W 0.0 Northing 1522926.11 Easting 3457399.46 Latitude 40° 45' 25.668 N Longitude 103° 50' 56.040 W

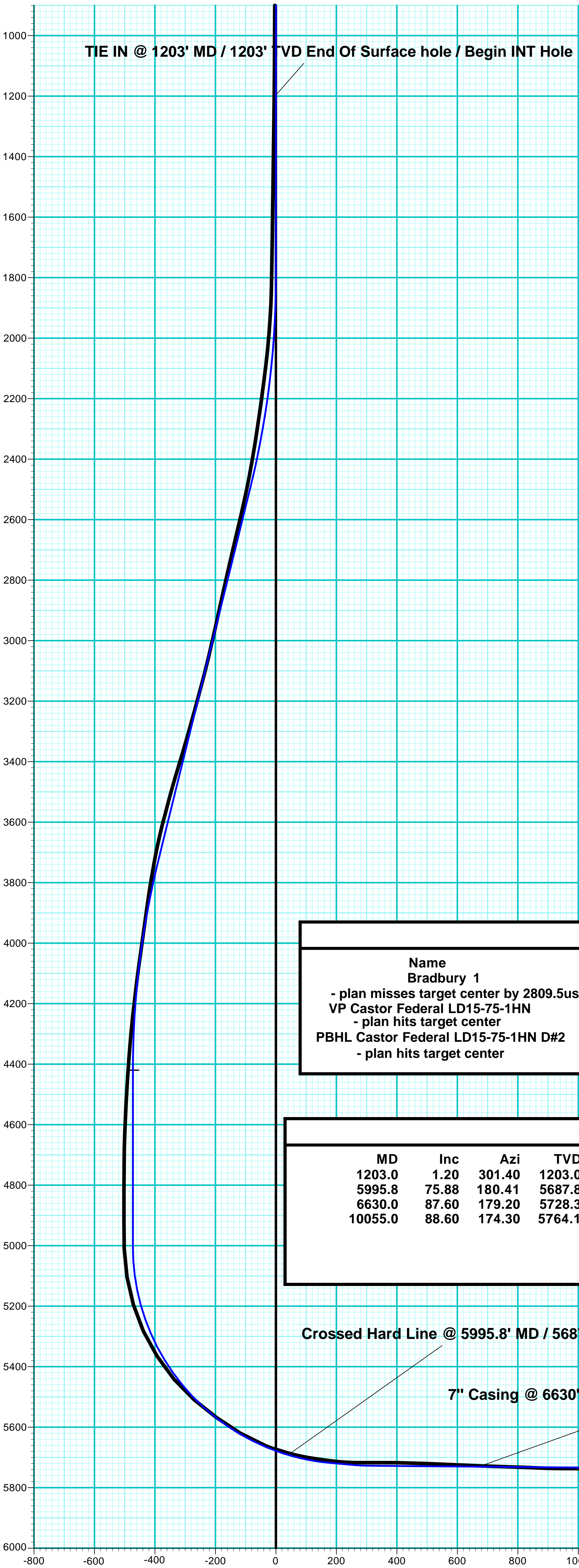


T G M Azimuths to Grid North
Correction: 7.00°
Magnetic Field
Strength: 53160.5snT
Dip Angle: 67.40°
Date: 12/20/2013
Model: IGRF2010



DESIGN TARGET DETAILS							
Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
Bradbury 1	0.0	-2784.3	376.1	1520141.85	3457775.54	40° 44' 58.092 N	103° 50' 51.828 W
- plan misses target center by 2809.5usft at 0.0usft MD (0.0 TVD, 0.0 N, 0.0 E)							
VP Castor Federal LD15-75-1HN	4420.0	471.0	-83.0	1523397.11	3457316.46	40° 45' 30.336 N	103° 50' 57.004 W
- plan hits target center							
PBHL Castor Federal LD15-75-1HN D#2	5760.8	-4101.4	90.2	1518824.71	3457489.69	40° 44' 45.132 N	103° 50' 55.860 W
- plan hits target center							

ANNOTATIONS									
MD	Inc	Azi	TVD	+N/-S	+E/-W	V Sect	Departure	Annotation	
1203.0	1.20	301.40	1203.0	5.5	-4.5	-5.6	8.5	TIE IN @ 1203' MD / 1203' TVD End Of Surface hole / Begin INT Hole	
5995.8	75.88	180.41	5687.8	-48.0	-56.7	46.7	1077.9	Crossed Hard Line @ 5995.8' MD / 5687.8' TVD	
6630.0	87.60	179.20	5728.3	-679.4	-48.0	678.2	1709.3	7" Casing @ 6630' MD / 5728.3' TVD / End of INT Hole / Begin Lateral	
10055.0	88.60	174.30	5764.1	-4099.3	107.3	4100.7	5133.6	TD @ 10055' MD / 5764.1' TVD	



Vertical Section at 178.74° (200 usft/in)