Vanguard Natural Resources

Garfield County, CO
MPD 25
CSF 41B-4-791
Wellbore #1

Design: Actual

End of Well Report

05 February, 2018

Company:	Vanguard Natural Resources	**Local Co-ordinate Reference:**	Well CSF 41B-4-791
Project:	Garfield County, CO	**TVD Reference:**	CSF 41B-4-791 @ 6557.4usft (Capstar 321)
Site:	MPD 25	**MD Reference:**	CSF 41B-4-791 @ 6557.4usft (Capstar 321)
Well:	CSF 41B-4-791	**North Reference:**	Grid
Wellbore:	Wellbore #1	**Survey Calculation Method:**	Minimum Curvature
Design:	Actual	**Database:**	EDM 5000.1 Single User Db

Project Garfield County, CO

Map System:	US State Plane 1983	**System Datum:**	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Central Zone		Using geodetic scale factor

Site MPD 25

Site Position:		**Northing:**	1,606,032.98 usft	**Latitude:**	39° 28' 45.253 N
From:	Lat/Long	**Easting:**	2,418,598.16 usft	**Longitude:**	107° 33' 35.748 W
Position Uncertainty:	0.0 usft	**Slot Radius:**	13-3/16 "	**Grid Convergence:**	-1.30 °

Well CSF 41B-4-791

Well Position	**+N/-S**	0.0 usft	**Northing:**	1,606,059.00 usft	**Latitude:**	39° 28' 45.507 N
	+E/-W	0.0 usft	**Easting:**	2,418,583.30 usft	**Longitude:**	107° 33' 35.945 W
Position Uncertainty		0.0 usft	**Wellhead Elevation:**	6,557.4 usft	**Ground Level:**	6,540.4 usft

Wellbore Wellbore #1

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	2/5/2018	9.43	65.64	51,499

Design Actual

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	123.62

Survey Program **Date** 2/5/2018

From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
105.4	8,500.0	Actual (Wellbore #1)	MWD	MWD v3:standard declination

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Well:	CSF 41B-4-791	**North Reference:**	Grid
Wellbore:	Wellbore #1	**Survey Calculation Method:**	Minimum Curvature
Design:	Actual	**Database:**	EDM 5000.1 Single User Db

Survey

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	N/S (usft)	E/W (usft)	DLeg (°/100usft)	Build (°/100usft)	Turn (°/100usft)
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
105.4	0.64	169.62	105.4	0.4	-0.6	0.1	0.61	0.61	0.00
136.4	0.57	183.68	136.4	0.6	-0.9	0.1	0.53	-0.23	45.35
166.4	0.70	169.05	166.4	0.8	-1.2	0.2	0.69	0.43	-48.77
196.4	0.22	135.96	196.4	1.0	-1.5	0.2	1.76	-1.60	-110.30
224.4	0.31	47.15	224.4	1.1	-1.4	0.3	1.34	0.32	-317.18
254.4	0.79	28.43	254.4	1.1	-1.2	0.5	1.69	1.60	-62.40
285.4	0.97	22.14	285.4	1.0	-0.8	0.7	0.66	0.58	-20.29
315.4	1.36	21.61	315.4	0.9	-0.2	0.9	1.30	1.30	-1.77
345.4	1.41	28.38	345.4	0.8	0.4	1.2	0.57	0.17	22.57
376.4	1.80	52.20	376.4	0.9	1.1	1.8	2.47	1.26	76.84
406.4	2.29	74.35	406.3	1.4	1.5	2.7	3.07	1.63	73.83
436.4	2.90	91.66	436.3	2.5	1.7	4.1	3.29	2.03	57.70
467.4	3.43	102.69	467.3	4.0	1.4	5.8	2.60	1.71	35.58
496.4	4.04	111.88	496.2	5.8	0.9	7.5	2.94	2.10	31.69
526.4	4.92	118.60	526.1	8.1	-0.1	9.7	3.41	2.93	22.40
556.4	6.11	123.70	556.0	11.0	-1.6	12.1	4.29	3.97	17.00
586.4	7.29	127.96	585.8	14.5	-3.7	14.9	4.27	3.93	14.20
616.4	8.53	129.59	615.5	18.6	-6.3	18.2	4.20	4.13	5.43
646.4	9.45	130.16	645.1	23.3	-9.3	21.8	3.08	3.07	1.90
676.4	10.50	131.04	674.7	28.4	-12.7	25.7	3.54	3.50	2.93
705.4	11.31	130.09	703.1	33.9	-16.2	29.9	2.86	2.79	-3.28
735.4	12.46	129.43	732.5	40.0	-20.2	34.6	3.86	3.83	-2.20
765.4	13.14	128.45	761.7	46.6	-24.4	39.8	2.38	2.27	-3.27
796.4	14.33	127.70	791.9	54.0	-28.9	45.6	3.88	3.84	-2.42
826.4	15.34	127.61	820.9	61.6	-33.6	51.7	3.37	3.37	-0.30

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Well:	CSF 41B-4-791	**North Reference:**	Grid
Wellbore:	Wellbore #1	**Survey Calculation Method:**	Minimum Curvature
Design:	Actual	**Database:**	EDM 5000.1 Single User Db

Survey

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	N/S (usft)	E/W (usft)	DLeg (°/100usft)	Build (°/100usft)	Turn (°/100usft)
871.4	16.70	127.08	864.1	74.0	-41.1	61.5	3.04	3.02	-1.18
Last PZD Surface Survey									
938.0	18.11	126.51	927.7	93.9	-53.1	77.5	2.13	2.12	-0.86
1,024.0	19.16	125.85	1,009.1	121.4	-69.3	99.7	1.25	1.22	-0.77
1,066.0	20.15	126.26	1,048.7	135.5	-77.6	111.1	2.38	2.36	0.98
1,111.0	21.53	125.33	1,090.8	151.5	-86.9	124.1	3.15	3.07	-2.07
1,153.0	22.98	124.49	1,129.6	167.4	-96.0	137.1	3.53	3.45	-2.00
1,197.0	24.92	123.08	1,169.8	185.2	-106.0	152.0	4.60	4.41	-3.20
1,239.0	26.85	123.17	1,207.6	203.6	-116.0	167.3	4.60	4.60	0.21
1,281.0	28.35	123.64	1,244.8	223.0	-126.7	183.6	3.61	3.57	1.12
1,323.0	29.75	123.66	1,281.6	243.4	-138.0	200.6	3.33	3.33	0.05
1,365.0	31.11	123.08	1,317.8	264.7	-149.7	218.3	3.31	3.24	-1.38
1,407.0	32.26	121.24	1,353.5	286.7	-161.4	237.0	3.58	2.74	-4.38
1,450.0	33.57	119.83	1,389.6	310.1	-173.3	257.1	3.53	3.05	-3.28
1,492.0	34.63	120.84	1,424.4	333.6	-185.2	277.4	2.86	2.52	2.40
1,534.0	35.55	122.60	1,458.8	357.7	-197.9	298.0	3.26	2.19	4.19
1,576.0	35.77	123.17	1,492.9	382.2	-211.2	318.5	0.95	0.52	1.36
1,660.0	37.66	123.17	1,560.2	432.4	-238.7	360.6	2.25	2.25	0.00
1,745.0	37.92	122.86	1,627.4	484.5	-267.0	404.2	0.38	0.31	-0.36
1,831.0	37.78	122.88	1,695.3	537.2	-295.7	448.6	0.16	-0.16	0.02
1,915.0	37.57	122.16	1,761.8	588.6	-323.3	491.9	0.58	-0.25	-0.86
2,000.0	37.66	123.39	1,829.1	640.4	-351.4	535.5	0.89	0.11	1.45
2,085.0	37.22	123.24	1,896.6	692.1	-379.7	578.7	0.53	-0.52	-0.18
2,168.0	36.43	123.39	1,963.0	741.9	-407.1	620.2	0.96	-0.95	0.18
2,254.0	38.06	123.92	2,031.5	793.9	-435.9	663.5	1.93	1.90	0.62
2,340.0	37.27	123.74	2,099.6	846.5	-465.2	707.2	0.93	-0.92	-0.21
2,425.0	36.47	123.48	2,167.6	897.5	-493.4	749.7	0.96	-0.94	-0.31

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Well:	CSF 41B-4-791	**North Reference:**	Grid
Wellbore:	Wellbore #1	**Survey Calculation Method:**	Minimum Curvature
Design:	Actual	**Database:**	EDM 5000.1 Single User Db

Survey

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	N/S (usft)	E/W (usft)	DLeg (°/100usft)	Build (°/100usft)	Turn (°/100usft)
2,509.0	37.62	124.97	2,234.6	948.1	-521.9	791.5	1.74	1.37	1.77
2,595.0	37.40	124.97	2,302.8	1,000.4	-551.9	834.4	0.26	-0.26	0.00
2,679.0	36.69	124.36	2,369.9	1,051.0	-580.7	876.0	0.95	-0.85	-0.73
2,764.0	38.10	124.71	2,437.4	1,102.6	-609.9	918.6	1.68	1.66	0.41
2,848.0	37.71	125.02	2,503.7	1,154.2	-639.4	960.9	0.52	-0.46	0.37
2,932.0	37.13	125.28	2,570.4	1,205.2	-668.8	1,002.6	0.72	-0.69	0.31
3,018.0	38.10	124.84	2,638.5	1,257.7	-699.0	1,045.6	1.17	1.13	-0.51
3,105.0	38.19	124.09	2,706.9	1,311.4	-729.4	1,089.9	0.54	0.10	-0.86
3,189.0	37.84	123.74	2,773.1	1,363.2	-758.2	1,132.8	0.49	-0.42	-0.42
3,273.0	37.88	124.23	2,839.4	1,414.7	-787.1	1,175.6	0.36	0.05	0.58
3,358.0	37.27	123.57	2,906.8	1,466.6	-816.0	1,218.6	0.86	-0.72	-0.78
3,444.0	36.69	123.26	2,975.5	1,518.3	-844.5	1,261.8	0.71	-0.67	-0.36
3,528.0	37.79	123.57	3,042.4	1,569.1	-872.5	1,304.2	1.33	1.31	0.37
3,616.0	38.23	122.78	3,111.7	1,623.3	-902.1	1,349.6	0.75	0.50	-0.90
3,704.0	38.10	122.56	3,180.9	1,677.7	-931.5	1,395.3	0.21	-0.15	-0.25
3,791.0	38.14	122.07	3,249.4	1,731.4	-960.2	1,440.7	0.35	0.05	-0.56
3,875.0	37.79	122.73	3,315.6	1,783.0	-987.9	1,484.4	0.64	-0.42	0.79
3,959.0	37.22	124.09	3,382.2	1,834.2	-1,016.0	1,527.1	1.20	-0.68	1.62
4,044.0	37.44	123.61	3,449.8	1,885.7	-1,044.7	1,569.9	0.43	0.26	-0.56
4,130.0	37.44	123.66	3,518.1	1,938.0	-1,073.7	1,613.4	0.04	0.00	0.06
4,214.0	37.05	123.61	3,585.0	1,988.8	-1,101.8	1,655.7	0.47	-0.46	-0.06
4,300.0	36.14	122.90	3,654.0	2,040.1	-1,130.0	1,698.6	1.17	-1.06	-0.83
4,385.0	37.01	123.88	3,722.3	2,090.7	-1,157.8	1,740.9	1.23	1.02	1.15
4,469.0	36.34	123.74	3,789.6	2,140.9	-1,185.8	1,782.6	0.80	-0.80	-0.17
4,553.0	35.42	123.61	3,857.7	2,190.2	-1,213.1	1,823.5	1.10	-1.10	-0.15
4,639.0	33.84	124.05	3,928.5	2,239.0	-1,240.3	1,864.1	1.86	-1.84	0.51
4,724.0	34.76	124.09	3,998.7	2,286.9	-1,267.1	1,903.8	1.08	1.08	0.05

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4,811.0	33.93	124.14	4,070.5	2,336.0	-1,294.6	1,944.4	0.95	-0.95	0.06
4,895.0	32.39	124.18	4,140.8	2,381.9	-1,320.4	1,982.5	1.83	-1.83	0.05
4,980.0	31.16	124.05	4,213.1	2,426.7	-1,345.5	2,019.5	1.45	-1.45	-0.15
5,064.0	31.33	123.74	4,284.9	2,470.3	-1,369.8	2,055.7	0.28	0.20	-0.37
5,148.0	28.87	123.66	4,357.6	2,512.4	-1,393.2	2,090.7	2.93	-2.93	-0.10
5,232.0	27.69	123.13	4,431.5	2,552.2	-1,415.1	2,124.0	1.44	-1.40	-0.63
5,319.0	26.37	122.86	4,509.0	2,591.7	-1,436.6	2,157.1	1.52	-1.52	-0.31
5,404.0	24.00	123.93	4,585.9	2,627.9	-1,456.5	2,187.3	2.84	-2.79	1.26
5,488.0	21.23	124.58	4,663.5	2,660.2	-1,474.7	2,214.0	3.31	-3.30	0.77
5,575.0	19.20	122.29	4,745.1	2,690.2	-1,491.3	2,239.1	2.50	-2.33	-2.63
5,659.0	16.39	123.08	4,825.1	2,715.9	-1,505.1	2,260.7	3.36	-3.35	0.94
5,743.0	13.62	123.44	4,906.2	2,737.7	-1,517.1	2,278.9	3.30	-3.30	0.43
5,830.0	11.60	119.30	4,991.1	2,756.6	-1,527.0	2,295.1	2.54	-2.32	-4.76
5,914.0	9.40	120.89	5,073.7	2,771.9	-1,534.6	2,308.3	2.64	-2.62	1.89
5,998.0	7.08	120.84	5,156.8	2,783.9	-1,540.8	2,318.6	2.76	-2.76	-0.06
6,079.8	3.64	135.41	5,238.3	2,791.5	-1,545.2	2,324.8	4.48	-4.20	17.80
41B-4-791 TGT									
6,083.0	3.52	136.53	5,241.5	2,791.7	-1,545.4	2,324.9	4.48	-3.90	35.38
6,167.0	0.88	138.11	5,325.4	2,794.8	-1,547.7	2,327.1	3.14	-3.14	1.88
6,253.0	1.01	159.82	5,411.4	2,796.1	-1,548.9	2,327.8	0.44	0.15	25.24
6,338.0	0.48	12.83	5,496.4	2,796.6	-1,549.3	2,328.2	1.69	-0.62	-172.93
6,425.0	0.88	331.08	5,583.4	2,795.8	-1,548.4	2,327.9	0.70	0.46	-47.99
6,509.0	1.54	14.54	5,667.4	2,794.9	-1,546.7	2,327.9	1.29	0.79	51.74
6,593.0	1.58	14.01	5,751.3	2,794.1	-1,544.5	2,328.5	0.05	0.05	-0.63
6,679.0	0.99	350.19	5,837.3	2,793.2	-1,542.6	2,328.6	0.91	-0.69	-27.70
6,764.0	1.89	40.73	5,922.3	2,792.9	-1,540.8	2,329.4	1.73	1.06	59.46
6,848.0	1.85	48.25	6,006.2	2,793.4	-1,538.9	2,331.3	0.30	-0.05	8.95

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6,936.0	1.41	54.62	6,094.2	2,794.2	-1,537.3	2,333.3	0.54	-0.50	7.24
7,021.0	0.26	53.78	6,179.2	2,794.6	-1,536.6	2,334.3	1.35	-1.35	-0.99
7,107.0	1.27	10.45	6,265.2	2,794.3	-1,535.5	2,334.6	1.27	1.17	-50.38
7,191.0	0.57	9.97	6,349.2	2,793.8	-1,534.2	2,334.9	0.83	-0.83	-0.57
7,276.0	0.57	264.54	6,434.2	2,793.3	-1,533.8	2,334.5	1.07	0.00	-124.04
7,362.0	0.92	233.30	6,520.2	2,792.7	-1,534.3	2,333.5	0.61	0.41	-36.33
7,446.0	0.66	225.87	6,604.1	2,792.4	-1,535.0	2,332.6	0.33	-0.31	-8.85
7,533.0	0.70	222.84	6,691.1	2,792.2	-1,535.8	2,331.9	0.06	0.05	-3.48
7,619.0	1.49	227.37	6,777.1	2,791.8	-1,536.9	2,330.7	0.92	0.92	5.27
7,703.0	0.97	191.68	6,861.1	2,791.8	-1,538.3	2,329.8	1.07	-0.62	-42.49
7,789.0	1.63	106.56	6,947.1	2,793.3	-1,539.4	2,330.8	2.12	0.77	-98.98
7,874.0	1.63	100.54	7,032.1	2,795.5	-1,540.0	2,333.2	0.20	0.00	-7.08
7,960.0	1.93	87.44	7,118.0	2,797.8	-1,540.1	2,335.8	0.59	0.35	-15.23
8,044.0	1.85	111.26	7,202.0	2,800.3	-1,540.5	2,338.5	0.93	-0.10	28.36
8,128.0	1.89	147.48	7,285.9	2,802.9	-1,542.2	2,340.5	1.38	0.05	43.12
8,213.0	1.76	174.32	7,370.9	2,805.0	-1,544.7	2,341.4	1.01	-0.15	31.58
8,297.0	2.42	196.72	7,454.8	2,806.3	-1,547.7	2,341.0	1.24	0.79	26.67
8,381.0	2.11	189.71	7,538.8	2,807.5	-1,550.9	2,340.2	0.49	-0.37	-8.35
8,445.0	2.24	192.69	7,602.7	2,808.4	-1,553.3	2,339.8	0.27	0.20	4.66
Last PZD Survey									
8,500.0	2.24	192.69	7,657.7	2,809.2	-1,555.4	2,339.3	0.00	0.00	0.00
Straightline Projection to TD									

Company:	Vanguard Natural Resources	**Local Co-ordinate Reference:**	Well CSF 41B-4-791
Project:	Garfield County, CO	**TVD Reference:**	CSF 41B-4-791 @ 6557.4usft (Capstar 321)
Site:	MPD 25	**MD Reference:**	CSF 41B-4-791 @ 6557.4usft (Capstar 321)
Well:	CSF 41B-4-791	**North Reference:**	Grid
Wellbore:	Wellbore #1	**Survey Calculation Method:**	Minimum Curvature
Design:	Actual	**Database:**	EDM 5000.1 Single User Db

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Comment
871.4	864.1	-41.1	61.5	Last PZD Surface Survey
8,445.0	7,602.7	-1,553.3	2,339.8	Last PZD Survey
8,500.0	7,657.7	-1,555.4	2,339.3	Straightline Projection to TD

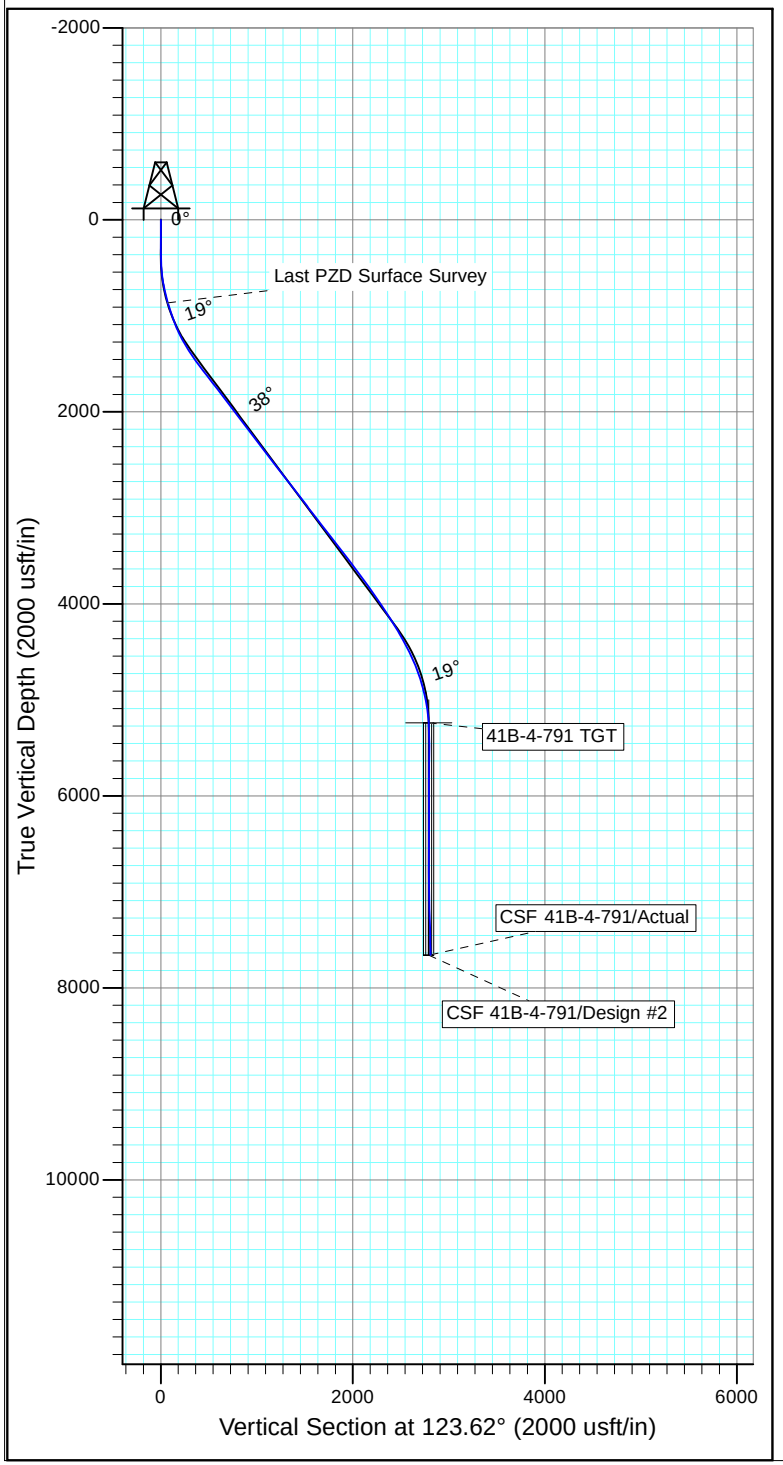
Checked By: _____ Approved By: _____ Date: _____

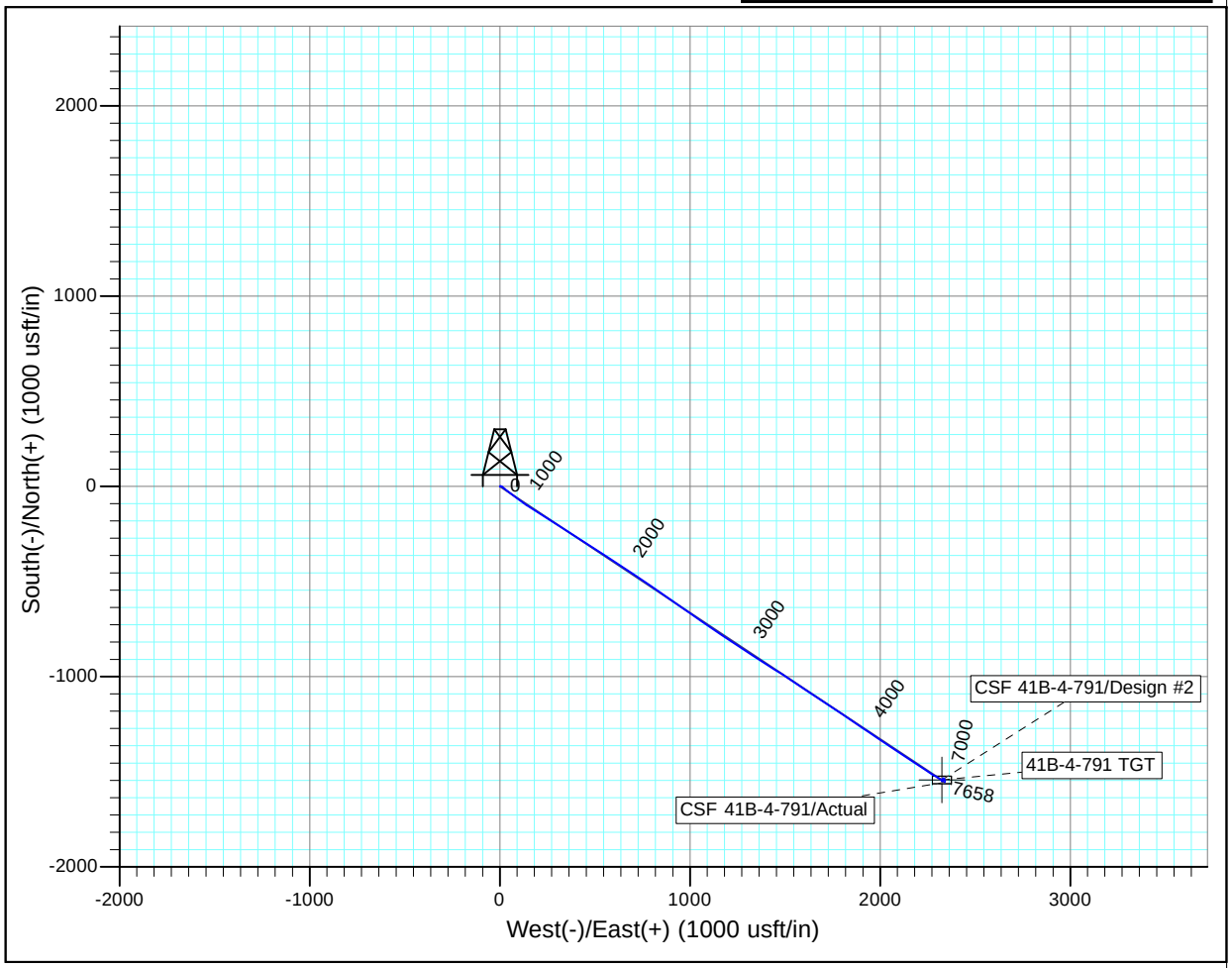
VANGUARD NATURAL RESOURCES, INC.

Project: Garfield County, CO
Site: MPD 25
Well: CSF 41B-4-791
Wellbore: Wellbore #1
Design: Actual

Azimuths to Grid North
True North: 1.30°
Magnetic North: 10.73°

Magnetic Field
Strength: 51499.2snT
Dip Angle: 65.64°
Date: 2/5/2018
Model: IGRF2015





PAYZONE DIRECTIONAL

Design: Actual (CSF 41B-4-791/Wellbore #1)

Created By: Derek Stephens Date: 10:15, February 05 2018

THIS SURVEY IS CORRECT TO THE BEST OF MY KNOWLEDGE AND IS SUPPORTED BY ACTUAL FIELD DATA