

Noble Energy

Weld County, CO (NAD 83)

Sec. 17-T6N-R63W (Aggie State AA17)

Aggie State AA17-628

05-123-40901

Plan A

Design: Actual Surveys

Sperry Drilling Services

Final Survey Report

24 February, 2015

Surface UWI : 05-123-40901

Well Coordinates: 1,420,197.35 N, 3,286,995.13 E (40° 28' 56.14" N, 104° 28' 05.74" W)

Ground Level: 4,667.00 usft

Local Coordinate Origin:

Centered on Well Aggie State AA17-628

Viewing Datum:

KB = 24' @ 4691.00usft (H&P 273)

TVDs to System:

N

North Reference:

Grid

Unit System:

Dec-Deg - API - US Survey Feet - Custom

Geodetic Scale Factor Applied

Version: 5000.1 Build: 73

HALLIBURTON

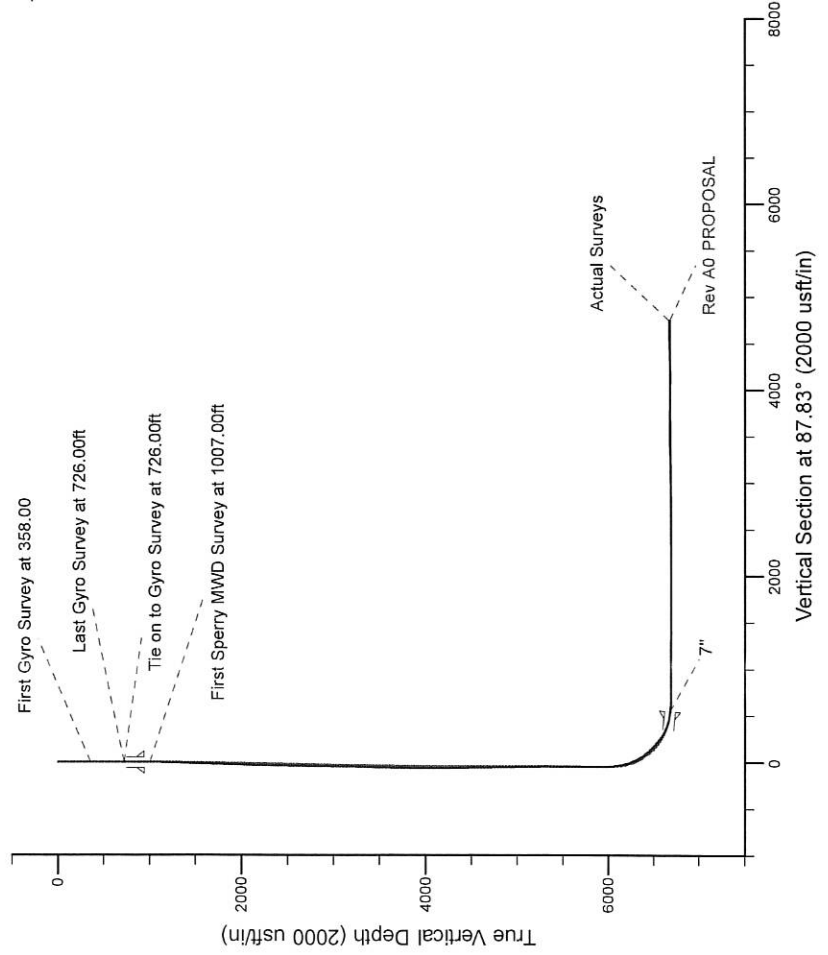
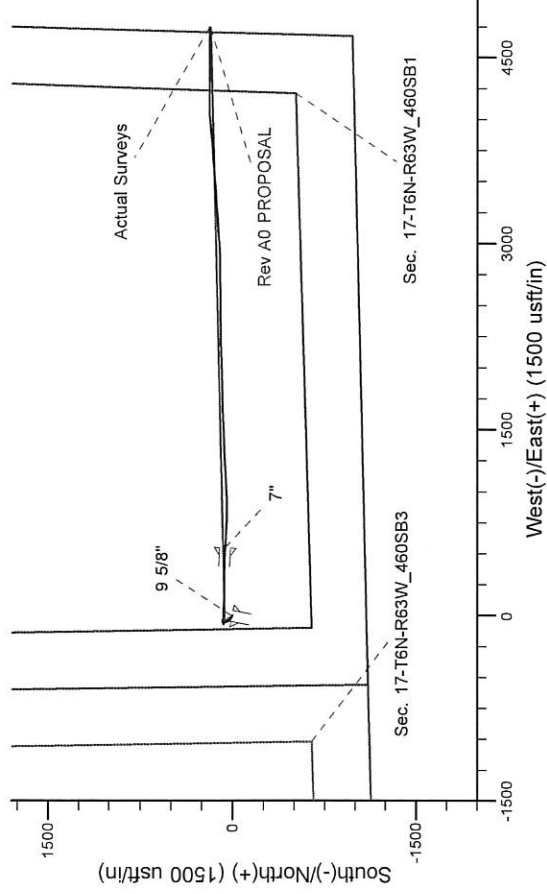
Project: Weld County, CO (NAD 83)
 Site: Sec. 17-T6N-R63W (Aggie State AA17)
 Well: Aggie State AA17-628
 Wellbore: Plan A
 Design: Actual Surveys



Platted SHL: 1088' FSL, 574' FWL
 Platted Lat/Long: 40.482260 N, 104.468260 W
 Location: Sec. 17-T6N-R63W

~7" Casing: 1135' FSL, 1129' FWL
 Lat/Long: 40.482408 N, 104.466295 W
 State Planes - CO Northern: 1,420,257.46 N, 3,287,541.11 E
 Location: Sec. 17-T6N-R63W

Platted BHL: 1155' FSL, 50' FWL
 Platted Lat/Long: 40.4826 N, 104.4512W
 State Planes - CO Northern: 1,420,385.54 N, 3,291,671.66 E
 Location: Sec. 16-T6N-R63W



LEGEND

- Aggie State AA17-628, Plan A, Rev A0 PROPOSAL V0
- Actual Surveys

WELL DETAILS: Aggie State AA17-628	
Ground Level:	4667.00
KB = 24' @ 4691.00usft (H&P 273)	
Created By:	Tatiana Gomez
Created On:	2/24/2015

Design Report for Aggie State AA17-628 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.00	0.00	299.64	1.00	0.00	0.00	0.00	0.17
Aggie State AA17-628_SHL							
358.00	0.60	299.64	357.99	0.93	-1.63	-1.59	0.17
First Gyro Survey at 358.00							
726.00	0.20	340.24	725.98	2.48	-3.52	-3.42	0.13
Last Gyro Survey at 726.00ft - Tie on to Gyro Survey at 726.00ft							
945.00	0.26	10.90	944.98	3.32	-3.56	-3.43	0.06
9 5/8"							
1,007.00	0.28	16.82	1,006.98	3.60	-3.49	-3.35	0.06
First Sperry MWD Survey at 1007.00ft							
1,100.00	0.31	352.07	1,099.98	4.07	-3.46	-3.30	0.14
1,192.00	2.37	303.93	1,191.95	5.38	-5.07	-4.86	2.36
1,284.00	2.04	297.60	1,283.88	7.20	-8.10	-7.82	0.45
1,470.00	2.01	296.44	1,469.77	10.18	-13.95	-13.56	0.03
1,653.00	2.04	296.58	1,652.65	13.07	-19.74	-19.23	0.02
1,838.00	1.81	295.94	1,837.55	15.82	-25.31	-24.70	0.12
1,930.00	1.81	302.47	1,929.50	17.24	-27.84	-27.17	0.22
2,022.00	1.60	293.31	2,021.46	18.53	-30.25	-29.53	0.37
2,114.00	1.39	290.71	2,113.43	19.43	-32.47	-31.72	0.24
2,207.00	1.14	287.91	2,206.41	20.11	-34.41	-33.62	0.28
2,487.00	2.15	309.02	2,486.29	24.28	-41.14	-40.19	0.41
2,676.00	2.99	346.25	2,675.11	31.30	-45.07	-43.85	0.96
2,960.00	3.29	348.32	2,958.69	46.47	-48.48	-46.68	0.11
3,054.00	3.40	346.13	3,052.53	51.82	-49.69	-47.70	0.18
3,243.00	3.76	333.03	3,241.16	62.78	-53.85	-51.43	0.47
3,338.00	2.60	328.96	3,336.01	67.41	-56.37	-53.78	1.24
3,433.00	2.26	315.90	3,430.93	70.60	-58.78	-56.07	0.68
3,621.00	2.20	296.45	3,618.79	74.87	-64.59	-61.72	0.40
3,905.00	0.45	206.15	3,902.71	76.29	-69.97	-67.03	0.79
3,999.00	0.37	232.29	3,996.71	75.78	-70.37	-67.45	0.21
4,093.00	0.07	3.21	4,090.71	75.65	-70.61	-67.69	0.45
4,188.00	1.85	94.50	4,185.70	75.59	-69.07	-66.17	1.95
4,282.00	1.66	97.77	4,279.65	75.28	-66.21	-63.32	0.23
4,377.00	1.14	81.88	4,374.62	75.23	-63.91	-61.02	0.68
4,471.00	1.41	71.88	4,468.60	75.72	-61.89	-58.98	0.37
4,565.00	0.99	53.84	4,562.58	76.56	-60.13	-57.20	0.60
4,659.00	0.77	59.79	4,656.57	77.36	-58.93	-55.96	0.25
4,753.00	0.83	66.63	4,750.56	77.95	-57.76	-54.77	0.12
4,848.00	0.28	356.92	4,845.55	78.45	-57.14	-54.13	0.82
4,943.00	0.39	31.90	4,940.55	78.96	-56.98	-53.96	0.24
5,226.00	0.79	67.58	5,223.54	80.52	-54.67	-51.59	0.19
5,415.00	0.85	60.12	5,412.52	81.71	-52.25	-49.12	0.06
5,510.00	0.79	87.12	5,507.51	82.10	-50.99	-47.85	0.41
5,699.00	0.65	243.05	5,696.50	81.68	-50.64	-47.52	0.75
5,794.00	0.16	271.93	5,791.50	81.44	-51.25	-48.14	0.54
5,888.00	0.21	55.61	5,885.50	81.54	-51.24	-48.12	0.37
5,954.00	0.31	359.32	5,951.50	81.79	-51.15	-48.02	0.39
6,078.00	7.03	91.72	6,075.19	81.89	-43.55	-40.43	5.69
6,126.00	8.84	104.72	6,122.73	80.87	-37.05	-33.97	5.29

Design Report for Aggie State AA17-628 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
6,173.00	12.97	100.53	6,168.87	78.99	-28.37	-25.36	8.94
6,221.00	17.00	96.09	6,215.23	77.26	-16.09	-13.16	8.72
6,267.00	21.59	92.18	6,258.64	76.22	-0.94	1.95	10.36
6,315.00	25.87	90.20	6,302.57	75.85	18.37	21.22	9.07
6,362.00	30.67	90.70	6,343.95	75.67	40.62	43.45	10.23
6,410.00	34.92	93.18	6,384.30	74.75	66.59	69.37	9.28
6,456.00	39.97	94.39	6,420.81	72.89	94.49	97.18	11.09
6,504.00	43.45	94.32	6,456.63	70.47	126.33	128.90	7.25
6,551.00	45.72	92.01	6,490.11	68.66	159.27	161.75	5.93
6,646.00	49.83	88.61	6,553.95	68.35	229.58	232.00	5.07
6,740.00	59.68	89.38	6,608.13	69.66	306.24	308.66	10.50
6,835.00	69.67	92.55	6,648.72	68.12	391.97	394.27	10.94
6,948.00	82.80	93.15	6,675.55	62.66	501.35	503.36	11.63
6,993.00	84.53	93.36	6,680.52	60.12	546.00	547.89	3.87
7"							
7,097.00	88.52	93.85	6,686.82	53.59	649.58	651.15	3.87
7,192.00	90.65	91.83	6,687.51	48.88	744.45	745.77	3.09
7,287.00	90.80	88.89	6,686.31	48.28	839.43	840.66	3.10
7,382.00	91.02	89.23	6,684.80	49.84	934.41	935.63	0.43
7,477.00	90.03	86.94	6,683.93	53.02	1,029.35	1,030.61	2.63
7,571.00	88.67	87.16	6,684.99	57.85	1,123.21	1,124.60	1.47
7,665.00	88.37	87.39	6,687.42	62.32	1,217.07	1,218.56	0.40
7,760.00	87.72	87.04	6,690.66	66.93	1,311.91	1,313.50	0.78
7,855.00	90.12	87.19	6,692.45	71.72	1,406.76	1,408.47	2.53
7,950.00	89.94	87.73	6,692.40	75.93	1,501.67	1,503.47	0.60
8,045.00	90.46	87.93	6,692.07	79.52	1,596.60	1,598.46	0.59
8,140.00	90.25	88.45	6,691.48	82.52	1,691.55	1,693.46	0.59
8,235.00	90.40	88.32	6,690.94	85.20	1,786.51	1,788.45	0.21
8,330.00	90.80	88.85	6,689.95	87.55	1,881.48	1,883.44	0.70
8,425.00	90.15	88.55	6,689.16	89.70	1,976.45	1,978.43	0.75
8,519.00	90.18	88.56	6,688.89	92.07	2,070.42	2,072.42	0.03
8,614.00	89.48	88.84	6,689.17	94.23	2,165.39	2,167.41	0.79
8,709.00	89.54	88.97	6,689.98	96.04	2,260.37	2,262.39	0.15
8,804.00	89.48	89.23	6,690.80	97.53	2,355.36	2,357.36	0.28
8,899.00	89.38	89.45	6,691.74	98.63	2,450.34	2,452.32	0.25
8,993.00	89.29	88.90	6,692.83	99.98	2,544.33	2,546.29	0.59
9,088.00	90.74	88.16	6,692.81	102.42	2,639.29	2,641.28	1.71
9,182.00	90.86	89.33	6,691.50	104.48	2,733.26	2,735.26	1.25
9,276.00	90.80	90.54	6,690.13	104.58	2,827.25	2,829.18	1.29
9,371.00	91.60	87.70	6,688.14	106.04	2,922.21	2,924.13	3.11
9,466.00	92.19	86.37	6,685.00	110.95	3,017.02	3,019.06	1.53
9,561.00	88.49	86.36	6,684.44	116.98	3,111.82	3,114.01	3.89
9,655.00	90.99	85.86	6,684.87	123.35	3,205.59	3,207.96	2.71
9,750.00	91.45	85.84	6,682.84	130.23	3,300.32	3,302.88	0.48
9,844.00	91.48	86.55	6,680.44	136.46	3,394.08	3,396.81	0.76
9,938.00	89.72	85.85	6,679.46	142.69	3,487.86	3,490.77	2.01
10,033.00	89.94	85.56	6,679.74	149.80	3,582.60	3,585.70	0.38
10,127.00	90.49	85.36	6,679.38	157.25	3,676.30	3,679.62	0.62
10,222.00	90.46	86.84	6,678.60	163.71	3,771.08	3,774.57	1.56
10,317.00	88.21	83.66	6,679.70	171.57	3,865.72	3,869.45	4.10
10,411.00	87.96	83.92	6,682.84	181.73	3,959.12	3,963.16	0.38

Design Report for Aggie State AA17-628 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
10,506.00	89.66	89.43	6,684.82	187.24	4,053.90	4,058.08	6.07
10,600.00	91.57	90.01	6,683.81	187.70	4,147.89	4,152.02	2.12
10,695.00	91.82	90.23	6,681.00	187.50	4,242.85	4,246.90	0.35
10,789.00	91.79	90.13	6,678.04	187.20	4,336.80	4,340.78	0.11
10,883.00	92.22	90.02	6,674.75	187.08	4,430.74	4,434.65	0.47
10,978.00	90.80	90.19	6,672.24	186.91	4,525.71	4,529.54	1.51
11,072.00	90.12	89.21	6,671.49	187.40	4,619.70	4,623.48	1.27
11,129.00	90.74	89.18	6,671.06	188.20	4,676.69	4,680.46	1.09
Final Sperry MWD Survey at 11126.00ft							
11,195.00	90.74	89.18	6,670.21	189.14	4,742.68	4,746.44	0.00
Straight Line Projection to TD at 11195.00ft - Aggie State AA17-628_BHL							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
358.00	357.99	0.93	-1.63	First Gyro Survey at 358.00
726.00	725.98	2.48	-3.52	Last Gyro Survey at 726.00ft
726.00	725.98	2.48	-3.52	Tie on to Gyro Survey at 726.00ft
1,007.00	1,006.98	3.60	-3.49	First Sperry MWD Survey at 1007.00ft
11,129.00	6,671.06	188.20	4,676.69	Final Sperry MWD Survey at 11126.00ft
11,195.00	6,670.21	189.14	4,742.68	Straight Line Projection to TD at 11195.00ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	+N/-S (usft)	+E/-W (usft)	Start TVD (usft)
Target	Aggie State AA17-628_BHL	87.83	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
358.00	726.00	Surface Surveys	Flexi-Shot
1,007.00	6,948.00	Intermediate Surveys	MWD+IFR1+MS_WY
7,097.00	11,195.00	Production Surveys	MWD+IFR1+MS_WY

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
945.00	944.98	9 5/8"	9-5/8	13-3/4
6,993.00	6,680.52	7"	7	8-3/4

Design Report for Aggie State AA17-628 - Actual Surveys

Wellbore Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
Aggie State AA17-628 - actual wellpath misses target center by 0.01usft at 1.00usft MD (1.00 TVD, 0.00 N, 0.00 E) - Point	0.00	0.00	1.00	0.01	0.00	1,420,197.36	3,286,995.13	40.482260	-104.468260
Aggie State AA17-628 - actual wellpath misses target center by 13.78usft at 11195.00usft MD (6670.21 TVD, 189.14 N, 4742.68 E) - Point	0.00	0.00	6,680.00	179.54	4,744.00	1,420,376.89	3,291,738.96	40.482600	-104.451200

Directional Difficulty Index

Average Dogleg over Survey:	1.52 °/100usft	Maximum Dogleg over Survey:	11.63 °/100usft at 6,948.00 usft
Net Tortosity applicable to Plans:	0.68 °/100usft	Directional Difficulty Index:	6.149

Audit Info

North Reference Sheet for Sec. 17-T6N-R63W (Aggie State AA17) - Aggie State AA17-628 - Plan A

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to Grid North Reference.

Vertical Depths are relative to KB = 24' @ 4691.00usft (H&P 273). Northing and Easting are relative to Aggie State AA 17-628

Coordinate System is US State Plane 1983, Colorado Northern Zone using datum North American Datum 1983, ellipsoid GRS 1980

Projection method is Lambert Conformal Conic (2 parallel)

Central Meridian is -105.500000°, Longitude Origin:0.000000°, Latitude Origin:40.783333°

False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99996499

Grid Coordinates of Well: 1,420,197.35 usft N, 3,286,995.13 usft E

Geographical Coordinates of Well: 40° 28' 56.14" N, 104° 28' 05.74" W

Grid Convergence at Surface is: 0.67°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,195.00usft

the Bottom Hole Displacement is 4,746.45usft in the Direction of 87.72° (Grid).

Magnetic Convergence at surface is: -7.66° (28 January 2015, , BGGM2014)

