

CAZA OPERATING, LLC

Eddy County, NM (NAD 83) NMEZ

Mad River 13 State

#5H

30.015-44062

ST1

Design: ST1

Standard Survey Report

30 May, 2018

Survey Report

Company: CAZA OPERATING, LLC
Project: Eddy County, NM (NAD 83) NMEZ
Site: Mad River 13 State
Well: #5H
Wellbore: ST1
Design: ST1

Local Co-ordinate Reference: Well #5H
TVD Reference: RKB @ 3114.00usft (Bison 17 - KB=23)
MD Reference: RKB @ 3114.00usft (Bison 17 - KB=23)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.14 Single User Db

Project Eddy County, NM (NAD 83) NMEZ

Map System: US State Plane 1983

System Datum:

Mean Sea Level

Geo Datum: North American Datum 1983

Map Zone: New Mexico Eastern Zone

Site Mad River 13 State

Site Position:		Northing:	442,312.70 usft	Latitude:	32° 12' 57.024 N
From:	Map	Easting:	602,418.80 usft	Longitude:	104° 8' 8.971 W
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.11 °

Well #5H

Well Position	+N/-S	0.00 usft	Northing:	442,461.20 usft	Latitude:	32° 12' 58.495 N
	+E/-W	0.00 usft	Easting:	602,358.50 usft	Longitude:	104° 8' 9.670 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	usft	Ground Level:	3,091.00 usft

Wellbore ST1

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	05/15/18	7.12	59.95	47,782.15108154

Design ST1

Audit Notes:

Version: 1.0 **Phase:** ACTUAL **Tie On Depth:** 9,667.00

Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.00	0.00	0.00	268.85

Survey Program **Date** 05/30/18

From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
100.10	660.00	Survey #1 - Gyros (OH)	GYD_DP_MS	Gyrodata gyro-compassing and drop
770.00	9,667.00	Survey #2 - VON MWD (OH)	MWD	MWD - Standard
9,743.00	14,712.00	Survey #2 - ST1 (ST1)	MWD	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)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SHL(MR13S#5H)									
0.60	0.00	9.96	0.60	0.00	0.00	0.00	0.00	0.00	0.00
SHL(MR#4H)									
100.10	0.34	9.96	100.10	0.29	0.05	-0.07	0.34	0.34	0.00
200.00	0.10	155.15	200.00	0.51	0.14	-0.17	0.43	-0.24	145.34
300.00	0.23	229.42	300.00	0.30	0.02	-0.04	0.22	0.13	74.27
400.00	0.25	227.12	400.00	0.02	-0.29	0.29	0.02	0.02	-2.30

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 Wellbore: ST1
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 MD Reference: RKB @ 3114.00usft (Bison 17 - KB=23)
 North Reference: Grid
 Survey Calculation Method: Minimum Curvature
 Database: EDM 5000.14 Single User Db

Survey

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500.00	0.12	261.58	500.00	-0.15	-0.55	0.56	0.17	-0.13	34.46
600.00	0.36	350.81	600.00	0.15	-0.71	0.70	0.38	0.24	89.23
660.00	0.88	121.49	659.99	0.09	-0.34	0.34	1.91	0.87	217.80
770.00	0.92	22.68	769.99	0.47	0.72	-0.74	1.24	0.04	-89.83
865.00	0.66	118.40	864.98	0.91	1.49	-1.54	1.25	-0.27	100.76
960.00	1.84	178.16	959.96	-0.87	2.02	-1.97	1.70	1.24	62.91
1,055.00	3.28	194.12	1,054.86	-5.03	1.41	-1.13	1.68	1.52	16.80
1,151.00	4.25	194.04	1,150.65	-11.15	-0.12	0.74	1.01	1.01	-0.08
1,246.00	4.00	196.64	1,245.41	-17.74	-1.93	2.90	0.33	-0.26	2.74
1,341.00	3.62	199.93	1,340.20	-23.73	-3.90	5.20	0.46	-0.40	3.46
1,437.00	3.46	203.64	1,436.02	-29.24	-6.09	7.69	0.29	-0.17	3.86
1,533.00	3.95	194.46	1,531.81	-35.09	-8.08	10.00	0.80	0.51	-9.56
1,628.00	3.89	186.26	1,626.59	-41.46	-9.25	11.51	0.59	-0.06	-8.63
1,722.00	3.67	172.11	1,720.39	-47.61	-9.18	11.79	1.02	-0.23	-15.05
1,817.00	5.13	172.64	1,815.11	-54.84	-8.22	11.22	1.54	1.54	0.56
1,912.00	5.37	176.70	1,909.71	-63.49	-7.42	10.90	0.47	0.25	4.27
2,005.00	5.63	166.25	2,002.28	-72.26	-6.09	10.05	1.11	0.28	-11.24
2,101.00	5.86	165.30	2,097.80	-81.58	-3.72	8.20	0.26	0.24	-0.99
2,196.00	5.55	169.25	2,192.33	-90.78	-1.64	6.62	0.53	-0.33	4.16
2,292.00	5.63	191.73	2,287.89	-99.96	-1.73	7.22	2.27	0.08	23.42
2,387.00	5.43	198.07	2,382.45	-108.79	-4.07	10.04	0.68	-0.21	6.67
2,481.00	4.75	199.43	2,476.07	-116.69	-6.74	13.15	0.73	-0.72	1.45
2,577.00	4.74	197.94	2,571.75	-124.21	-9.29	16.10	0.13	-0.01	-1.55
2,672.00	5.22	171.49	2,666.40	-132.22	-9.86	17.11	2.45	0.51	-27.84
2,768.00	5.13	169.14	2,762.01	-140.76	-8.40	16.12	0.24	-0.09	-2.45
2,864.00	4.90	170.84	2,857.64	-149.02	-6.94	15.12	0.29	-0.24	1.77
2,959.00	3.89	156.50	2,952.36	-155.98	-5.01	13.57	1.56	-1.06	-15.09
3,054.00	3.38	151.10	3,047.17	-161.39	-2.37	11.24	0.65	-0.54	-5.68
3,149.00	3.14	153.14	3,142.02	-166.16	0.16	8.97	0.28	-0.25	2.15
3,245.00	3.11	153.34	3,237.87	-170.83	2.51	6.88	0.03	-0.03	0.21
3,340.00	3.05	153.33	3,332.74	-175.39	4.80	4.84	0.06	-0.06	-0.01
3,436.00	3.48	150.94	3,428.58	-180.22	7.37	2.55	0.47	0.45	-2.49
3,531.00	3.94	152.79	3,523.38	-185.65	10.26	-0.04	0.50	0.48	1.95
3,627.00	3.49	148.00	3,619.18	-191.06	13.32	-2.80	0.57	-0.47	-4.99
3,712.00	3.27	148.69	3,704.03	-195.32	15.95	-5.19	0.26	-0.26	0.81
3,816.00	3.04	147.70	3,807.87	-200.19	18.96	-7.93	0.23	-0.22	-0.95
3,911.00	2.93	150.93	3,902.75	-204.44	21.49	-10.22	0.21	-0.12	3.40
4,007.00	3.74	147.04	3,998.58	-209.21	24.38	-12.85	0.88	0.84	-4.05
4,102.00	4.02	145.57	4,093.36	-214.56	27.95	-16.12	0.31	0.29	-1.55
4,197.00	3.95	145.94	4,188.14	-220.01	31.67	-19.53	0.08	-0.07	0.39
4,290.00	3.58	144.18	4,280.93	-225.02	35.16	-22.74	0.42	-0.40	-1.89
4,386.00	3.24	149.95	4,376.76	-229.80	38.27	-25.59	0.50	-0.35	6.01
4,481.00	3.26	145.98	4,471.61	-234.36	41.13	-28.19	0.24	0.02	-4.18
4,576.00	2.83	155.26	4,566.48	-238.73	43.62	-30.44	0.69	-0.45	9.77

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Well:	#5H	North Reference:	Grid
Wellbore:	ST1	Survey Calculation Method:	Minimum Curvature
Design:	ST1	Database:	EDM 5000.14 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)
4,671.00	3.53	150.08	4,661.33	-243.40	46.06	-32.62	0.80	0.74	-5.45
4,765.00	3.48	152.59	4,755.16	-248.44	48.82	-35.09	0.17	-0.05	2.67
4,861.00	3.20	148.33	4,850.99	-253.30	51.57	-37.57	0.39	-0.29	-4.44
4,956.00	3.13	151.16	4,945.85	-257.83	54.21	-39.96	0.18	-0.07	2.98
5,051.00	2.95	151.74	5,040.71	-262.26	56.62	-42.12	0.19	-0.19	0.61
5,147.00	3.55	155.14	5,136.56	-267.13	59.04	-44.27	0.66	0.63	3.54
5,242.00	3.65	160.55	5,231.37	-272.65	61.28	-46.21	0.37	0.11	5.69
5,337.00	4.01	164.98	5,326.16	-278.71	63.15	-47.74	0.49	0.38	4.66
5,433.00	3.78	166.81	5,421.94	-285.03	64.74	-48.98	0.27	-0.24	1.91
5,528.00	4.26	162.26	5,516.70	-291.44	66.53	-50.41	0.61	0.51	-4.79
5,623.00	4.80	160.58	5,611.41	-298.55	68.93	-52.42	0.59	0.57	-1.77
5,719.00	4.71	164.84	5,707.08	-306.14	71.29	-54.36	0.38	-0.09	4.44
5,814.00	4.53	166.12	5,801.77	-313.55	73.21	-55.87	0.22	-0.19	1.35
5,909.00	4.25	170.35	5,896.49	-320.66	74.70	-56.97	0.45	-0.29	4.45
6,005.00	3.02	166.42	5,992.30	-326.63	75.89	-57.83	1.31	-1.28	-4.09
6,100.00	2.61	159.72	6,087.18	-331.09	77.23	-58.92	0.55	-0.43	-7.05
6,196.00	2.08	157.31	6,183.10	-334.75	78.66	-60.15	0.56	-0.55	-2.51
6,291.00	2.44	163.15	6,278.03	-338.27	79.91	-61.20	0.45	0.38	6.15
6,387.00	2.51	169.65	6,373.94	-342.30	80.88	-61.95	0.30	0.07	6.77
6,481.00	1.98	166.54	6,467.86	-345.90	81.63	-62.50	0.58	-0.56	-3.31
6,576.00	0.90	155.34	6,562.83	-348.18	82.32	-63.07	1.17	-1.14	-11.79
6,671.00	0.96	153.29	6,657.82	-349.56	82.99	-63.66	0.07	0.06	-2.16
6,766.00	1.13	154.51	6,752.80	-351.12	83.75	-64.33	0.18	0.18	1.28
6,861.00	1.32	188.38	6,847.78	-353.05	84.00	-64.47	0.78	0.20	35.65
6,955.00	1.26	191.55	6,941.76	-355.13	83.63	-63.99	0.10	-0.06	3.37
7,050.00	1.18	195.84	7,036.74	-357.10	83.15	-63.41	0.13	-0.08	4.52
7,146.00	1.71	195.41	7,132.71	-359.43	82.50	-62.63	0.55	0.55	-0.45
7,241.00	1.89	186.22	7,227.66	-362.35	81.96	-61.92	0.36	0.19	-9.67
7,336.00	1.99	187.93	7,322.61	-365.54	81.56	-61.35	0.12	0.11	1.80
7,431.00	2.01	182.53	7,417.55	-368.84	81.26	-60.87	0.20	0.02	-5.68
7,524.00	2.18	178.19	7,510.49	-372.24	81.24	-60.67	0.25	0.18	-4.67
7,620.00	2.51	180.42	7,606.41	-376.17	81.29	-60.49	0.38	0.34	2.32
7,715.00	2.44	184.25	7,701.32	-380.26	81.12	-60.10	0.19	-0.07	4.03
7,810.00	2.50	183.33	7,796.23	-384.35	80.85	-59.61	0.08	0.06	-0.97
7,858.00	2.40	182.77	7,844.19	-386.40	80.74	-59.39	0.21	-0.21	-1.17
7,939.00	2.41	185.18	7,925.11	-389.79	80.51	-58.96	0.13	0.01	2.98
8,033.00	2.10	182.46	8,019.04	-393.48	80.25	-58.51	0.35	-0.33	-2.89
8,128.00	0.48	209.99	8,114.01	-395.56	79.98	-58.12	1.78	-1.71	28.98
8,223.00	1.90	8.75	8,209.00	-394.35	80.02	-58.23	2.48	1.49	167.12
8,318.00	1.89	16.58	8,303.95	-391.29	80.71	-59.08	0.27	-0.01	8.24
8,413.00	1.64	21.97	8,398.90	-388.53	81.66	-60.19	0.32	-0.26	5.67
8,508.00	1.09	8.66	8,493.88	-386.37	82.31	-60.95	0.66	-0.58	-14.01
8,603.00	0.63	3.62	8,588.87	-384.96	82.48	-61.20	0.49	-0.48	-5.31

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8,698.00	0.90	51.68	8,683.86	-383.98	83.09	-61.87	0.71	0.28	50.59
8,793.00	1.11	79.24	8,778.84	-383.34	84.58	-63.39	0.55	0.22	29.01
8,888.00	1.14	100.21	8,873.83	-383.34	86.42	-65.22	0.43	0.03	22.07
8,982.00	1.10	108.50	8,967.81	-383.79	88.19	-66.97	0.18	-0.04	8.82
9,076.00	1.33	107.18	9,061.79	-384.40	90.09	-68.83	0.25	0.24	-1.40
9,171.00	0.72	41.98	9,156.77	-384.28	91.54	-70.29	1.28	-0.64	-68.63
9,267.00	0.58	40.54	9,252.77	-383.46	92.26	-71.05	0.15	-0.15	-1.50
9,362.00	0.33	109.57	9,347.76	-383.19	92.83	-71.64	0.58	-0.26	72.66
9,457.00	0.52	96.53	9,442.76	-383.33	93.52	-72.31	0.22	0.20	-13.73
9,552.00	0.61	97.44	9,537.76	-383.44	94.45	-73.24	0.10	0.09	0.96
9,647.00	0.66	130.93	9,632.75	-383.87	95.36	-74.13	0.39	0.05	35.25
9,667.00	0.70	166.68	9,652.75	-384.06	95.48	-74.23	2.10	0.20	178.75
9,743.00	4.97	313.76	9,728.66	-382.23	93.21	-72.06	7.33	5.62	193.53
9,787.00	9.15	315.83	9,772.32	-378.41	89.39	-68.46	9.52	9.50	4.70
9,838.00	14.22	312.92	9,822.25	-371.23	81.97	-61.45	10.01	9.94	-5.71
9,883.00	18.23	303.80	9,865.45	-363.54	72.07	-51.99	10.53	8.91	-20.27
9,933.00	22.64	297.88	9,912.30	-354.69	57.06	-37.48	9.73	8.82	-11.84
9,978.00	26.72	291.60	9,953.19	-346.91	39.98	-20.86	10.77	9.07	-13.96
10,028.00	31.09	287.27	9,996.95	-338.93	17.19	1.46	9.69	8.74	-8.66
10,073.00	35.26	284.41	10,034.61	-332.25	-6.50	24.74	9.90	9.27	-8.36
10,123.00	39.54	281.91	10,074.33	-325.37	-36.06	53.89	9.08	8.56	-5.00
10,168.00	44.68	279.55	10,107.70	-319.78	-65.70	83.17	11.95	11.42	-5.24
10,218.00	49.88	278.81	10,141.61	-313.93	-101.95	119.05	10.46	10.40	-1.48
10,263.00	54.59	276.73	10,169.17	-309.15	-137.19	153.97	11.09	10.47	-4.62
10,312.00	58.80	275.41	10,196.07	-304.83	-177.90	194.38	8.88	8.59	-2.69
10,321.18	59.75	275.23	10,200.76	-304.10	-185.76	202.19	10.48	10.35	-1.92
FTP(MR13S#5H)									
10,363.00	64.08	274.47	10,220.44	-300.98	-222.51	238.72	10.48	10.35	-1.83
10,408.00	70.48	269.81	10,237.82	-299.47	-263.96	280.02	17.13	14.22	-10.36
10,453.00	78.64	265.96	10,249.79	-301.10	-307.26	323.34	19.92	18.13	-8.56
10,500.00	86.69	265.61	10,255.79	-304.53	-353.71	369.91	17.14	17.13	-0.74
10,547.00	87.25	265.63	10,258.27	-308.11	-400.51	416.83	1.19	1.19	0.04
10,643.00	88.65	268.35	10,261.71	-313.15	-496.30	512.76	3.18	1.46	2.83
10,738.00	92.81	271.37	10,260.50	-313.38	-591.26	607.59	5.41	4.38	3.18
10,834.00	93.37	271.52	10,255.32	-310.96	-687.09	703.14	0.60	0.58	0.16
10,930.00	92.47	272.77	10,250.43	-307.37	-782.90	798.60	1.60	-0.94	1.30
11,025.00	90.73	273.61	10,247.78	-302.09	-877.71	892.98	2.03	-1.83	0.88
11,120.00	89.10	274.54	10,247.92	-295.34	-972.46	987.22	1.98	-1.72	0.98
11,214.00	88.88	274.38	10,249.58	-288.03	-1,068.16	1,080.38	0.29	-0.23	-0.17
11,309.00	89.05	274.57	10,251.29	-280.62	-1,160.86	1,174.52	0.27	0.18	0.20
11,404.00	89.72	275.04	10,252.31	-272.66	-1,255.52	1,268.60	0.86	0.71	0.49
11,500.00	89.78	275.71	10,252.73	-263.67	-1,351.09	1,363.54	0.70	0.06	0.70
11,595.00	87.47	275.47	10,255.01	-254.42	-1,445.61	1,457.41	2.44	-2.43	-0.25

Survey Report

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 Wellbore: ST1
 Design: ST1

Local Co-ordinate Reference: Well #5H
 TVD Reference: RKB @ 3114.00usft (Bison 17 - KB=23)
 MD Reference: RKB @ 3114.00usft (Bison 17 - KB=23)
 North Reference: Grid
 Survey Calculation Method: Minimum Curvature
 Database: EDM 5000.14 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)
11,690.00	89.33	275.05	10,257.66	-245.71	-1,540.17	1,551.34	2.01	1.96	-0.44
11,785.00	92.75	276.43	10,255.94	-236.22	-1,634.66	1,645.17	3.88	3.60	1.45
11,880.00	89.55	273.93	10,254.03	-227.64	-1,729.23	1,739.13	4.27	-3.37	-2.63
11,975.00	90.17	273.12	10,254.27	-221.80	-1,824.05	1,833.48	1.07	0.65	-0.85
12,070.00	91.63	272.15	10,252.77	-217.44	-1,918.94	1,927.98	1.85	1.54	-1.02
12,165.00	88.99	270.34	10,252.26	-215.37	-2,013.90	2,022.69	3.37	-2.78	-1.91
12,259.00	89.33	270.22	10,253.64	-214.91	-2,107.89	2,116.51	0.38	0.36	-0.13
12,354.00	89.16	270.08	10,254.89	-214.66	-2,202.88	2,211.35	0.23	-0.18	-0.15
12,449.00	88.71	269.19	10,256.65	-215.27	-2,297.86	2,306.22	1.05	-0.47	-0.94
12,544.00	88.65	269.06	10,258.84	-216.72	-2,392.82	2,401.12	0.15	-0.06	-0.14
12,638.00	89.10	268.44	10,260.69	-218.77	-2,486.78	2,495.05	0.81	0.48	-0.66
12,734.00	89.27	267.54	10,262.05	-222.14	-2,582.71	2,591.02	0.95	0.18	-0.94
12,829.00	91.35	269.40	10,261.54	-224.67	-2,677.67	2,685.97	2.94	2.19	1.96
12,924.00	91.80	269.98	10,258.93	-225.19	-2,772.63	2,780.82	0.77	0.47	0.61
13,020.00	89.94	268.84	10,257.47	-226.17	-2,868.61	2,876.70	2.27	-1.94	-1.19
13,114.00	91.52	270.64	10,256.27	-226.60	-2,962.59	2,970.57	2.55	1.68	1.91
13,209.00	95.45	272.75	10,250.50	-223.80	-3,057.35	3,065.03	4.69	4.14	2.22
13,304.00	91.23	272.50	10,244.97	-219.46	-3,152.07	3,159.37	4.45	-4.44	-0.26
13,382.00	92.75	273.53	10,242.26	-215.36	-3,229.91	3,236.87	2.35	1.95	1.32
13,477.00	92.69	273.66	10,237.75	-209.41	-3,324.62	3,331.10	0.15	-0.06	0.14
13,573.00	89.44	272.84	10,235.97	-203.97	-3,420.43	3,426.47	3.49	-3.39	-0.85
13,668.00	88.82	271.32	10,237.41	-200.52	-3,515.36	3,521.06	1.73	-0.65	-1.60
13,763.00	89.10	270.06	10,239.13	-199.38	-3,610.33	3,615.83	1.36	0.29	-1.33
13,858.00	90.39	269.85	10,239.55	-199.45	-3,705.33	3,710.69	1.38	1.36	-0.22
13,953.00	89.55	269.56	10,239.60	-199.94	-3,800.33	3,805.57	0.94	-0.88	-0.31
14,048.00	90.34	269.86	10,239.70	-200.42	-3,895.32	3,900.45	0.89	0.83	0.32
14,143.00	90.90	269.58	10,238.67	-200.89	-3,990.32	3,995.33	0.66	0.59	-0.29
14,237.00	93.03	268.86	10,235.44	-202.16	-4,084.25	4,089.19	2.39	2.27	-0.77
14,333.00	90.84	268.60	10,232.20	-204.29	-4,180.16	4,185.07	2.30	-2.28	-0.27
14,428.00	90.45	268.04	10,231.13	-207.08	-4,275.12	4,280.03	0.72	-0.41	-0.59
14,523.00	91.63	266.89	10,229.41	-211.28	-4,370.00	4,375.01	1.73	1.24	-1.21
14,617.00	91.80	267.19	10,226.60	-216.13	-4,463.84	4,468.97	0.37	0.18	0.32
14,712.00	92.02	266.88	10,223.43	-221.04	-4,558.66	4,563.91	0.40	0.23	-0.33

Last MWD Survey: 14712.00' MD, 92.02°INC, 266.88°AZ - BHL(MR13S#5H) - BHL_NEW(MR13S#5H)

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates	Comment
+N/-S (usft)	+E/-W (usft)		
14,712.00	10,223.43	-221.04	-4,558.66
Last MWD Survey: 14712.00' MD, 92.02°INC, 266.88°AZ			

Checked By: _____ Approved By: _____ Date: _____