



Company: Caza Operating
Lease/Well: Gramma 27/#2H

Rig Name: Patriot 1
State/County: New Mexico/Lea
Latitude: 32.46, Longitude: -103.45
GRID North is 0.47 Degrees East of True North
VS-Azi: 0.00 Degrees



FIELD COPY ONLY (NOT DEFINITIVE)

Depth Reference : RKB= 18.5 Feet

DRILLOG HA GYRO SURVEY CALCULATIONS

Filename: gyro survey.ut
Minimum Curvature Method
Report Date/Time: 6/28/2014 / 15:42

Vaughn Energy Services
West Texas
(432) 563-5444
Adam Gathright

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	****
100.00	0.11	213.17	100.00	-0.08	-0.06	-0.08	0.09	213.17	0.11
200.00	0.38	192.61	200.00	-0.48	-0.18	-0.48	0.51	199.99	0.28
300.00	0.55	177.97	300.00	-1.29	-0.23	-1.29	1.31	190.17	0.21
400.00	0.34	171.94	399.99	-2.06	-0.17	-2.06	2.07	184.80	0.22
500.00	0.56	167.50	499.99	-2.83	-0.03	-2.83	2.83	180.52	0.23
600.00	0.51	160.96	599.99	-3.70	0.29	-3.70	3.71	175.44	0.16
700.00	0.35	162.34	699.98	-4.37	0.60	-4.37	4.42	172.16	0.18
800.00	0.21	172.40	799.98	-4.85	0.72	-4.85	4.90	171.66	0.15
900.00	0.27	140.97	899.98	-5.22	0.89	-5.22	5.29	170.30	0.14
1000.00	0.42	120.17	999.98	-5.58	1.35	-5.58	5.74	166.38	0.19
1100.00	0.41	112.62	1099.98	-5.90	2.00	-5.90	6.23	161.30	0.05
1200.00	0.55	68.11	1199.97	-5.86	2.77	-5.86	6.48	154.68	0.38
1300.00	0.63	81.72	1299.97	-5.60	3.76	-5.60	6.75	146.12	0.16
1400.00	0.41	73.35	1399.96	-5.42	4.65	-5.42	7.14	139.36	0.24
1500.00	0.11	79.07	1499.96	-5.30	5.09	-5.30	7.35	136.17	0.30
1600.00	0.43	49.65	1599.96	-5.04	5.46	-5.04	7.43	132.70	0.34
1700.00	0.60	47.52	1699.96	-4.45	6.13	-4.45	7.58	125.94	0.18
1800.00	0.48	71.50	1799.95	-3.96	6.92	-3.96	7.97	119.79	0.26
1900.00	0.28	50.32	1899.95	-3.67	7.50	-3.67	8.35	116.10	0.24
2000.00	0.44	51.80	1999.95	-3.28	7.99	-3.28	8.63	112.33	0.16
2100.00	0.14	95.20	2099.95	-3.05	8.41	-3.05	8.95	109.96	0.35
2200.00	0.20	165.41	2199.95	-3.23	8.58	-3.23	9.17	110.66	0.20
2300.00	0.10	123.77	2299.95	-3.45	8.70	-3.45	9.36	111.65	0.14
2400.00	0.16	168.36	2399.95	-3.63	8.82	-3.63	9.54	112.38	0.10
2500.00	0.14	193.88	2499.95	-3.88	8.84	-3.88	9.66	113.70	0.09
2600.00	0.11	271.76	2599.95	-4.00	8.72	-4.00	9.59	114.65	0.16
2700.00	0.09	251.98	2699.95	-4.02	8.55	-4.02	9.45	115.18	0.04
2800.00	0.15	273.96	2799.95	-4.03	8.35	-4.03	9.27	115.79	0.08
2900.00	0.14	203.05	2899.94	-4.14	8.17	-4.14	9.16	116.87	0.17
3000.00	0.22	281.34	2999.94	-4.22	7.94	-4.22	8.99	117.99	0.23
3100.00	0.22	303.29	3099.94	-4.08	7.59	-4.08	8.62	118.23	0.08
3200.00	0.30	305.01	3199.94	-3.82	7.22	-3.82	8.16	117.89	0.08
3300.00	0.12	304.14	3299.94	-3.61	6.92	-3.61	7.80	117.57	0.18
3400.00	0.47	351.36	3399.94	-3.15	6.77	-3.15	7.47	114.93	0.40

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
3500.00	0.39	356.86	3499.94	-2.40	6.69	-2.40	7.11	109.74	0.09
3600.00	0.34	11.10	3699.94	-1.77	6.73	-1.77	6.96	104.77	0.10
3700.00	0.39	106.68	3699.93	-1.68	7.11	-1.68	7.28	102.61	0.53
3800.00	0.29	124.37	3799.93	-1.81	7.66	-1.81	7.86	103.34	0.14
3900.00	0.19	9.92	3899.93	-1.80	7.89	-1.80	8.09	102.84	0.41
4000.00	0.36	104.88	3999.93	-1.72	8.21	-1.72	8.39	101.81	0.41
4100.00	0.34	97.29	4099.93	-1.83	8.80	-1.83	8.99	101.77	0.06
4200.00	0.49	339.12	4199.93	-1.47	8.94	-1.47	9.06	99.33	0.72
4300.00	0.68	297.78	4299.92	-0.79	8.26	-0.79	8.30	96.47	0.46
4400.00	0.41	327.69	4399.92	-0.21	7.64	-0.21	7.56	91.69	0.38
4500.00	0.68	0.94	4499.92	0.61	7.36	0.61	7.38	86.29	0.33
4600.00	0.20	71.81	4699.91	1.17	7.63	1.17	7.63	81.16	0.66
4700.00	0.34	139.49	4699.91	1.00	7.90	1.00	7.96	82.79	0.32
4800.00	0.24	166.93	4799.91	0.68	8.17	0.68	8.20	86.92	0.13
4900.00	0.14	123.36	4899.91	0.33	8.36	0.33	8.37	87.76	0.14
5000.00	0.34	111.18	4999.91	0.16	8.74	0.16	8.74	89.00	0.21
5100.00	0.39	166.47	5099.91	-0.27	9.16	-0.27	9.17	91.68	0.28
5200.00	0.13	29.39	5199.91	-0.48	9.36	-0.48	9.37	92.93	0.48
5300.00	0.22	340.69	5299.91	-0.20	9.36	-0.20	9.36	91.20	0.17
5400.00	0.30	167.41	5399.91	-0.26	9.39	-0.26	9.39	91.66	0.62
5500.00	0.49	136.67	5499.90	-0.80	9.78	-0.80	9.82	94.69	0.24
5600.00	0.47	112.66	5699.90	-1.27	10.46	-1.27	10.53	96.93	0.20
5700.00	0.60	79.03	5699.90	-1.34	11.26	-1.34	11.33	96.81	0.28
5800.00	0.37	137.90	5799.89	-1.50	11.90	-1.50	11.99	97.19	0.44
5900.00	0.19	207.99	5899.89	-1.89	12.04	-1.89	12.18	98.94	0.36
6000.00	0.43	323.39	5999.89	-1.74	11.73	-1.74	11.86	98.44	0.54
6100.00	0.28	314.02	6099.89	-1.27	11.33	-1.27	11.40	96.39	0.16
6200.00	0.17	326.31	6199.89	-0.98	11.07	-0.98	11.12	95.06	0.12
6300.00	0.29	296.16	6299.89	-0.76	10.77	-0.76	10.79	93.97	0.16
6400.00	0.60	326.06	6399.89	-0.20	10.26	-0.20	10.26	91.13	0.38
6500.00	0.26	319.47	6499.88	0.40	9.81	0.40	9.82	87.64	0.36
6600.00	0.41	233.81	6699.88	0.36	9.38	0.36	9.38	87.78	0.47
6700.00	0.36	309.74	6699.88	0.36	8.86	0.36	8.86	87.71	0.48
6800.00	0.46	308.42	6799.88	0.80	8.29	0.80	8.33	84.47	0.10
6900.00	0.17	229.21	6899.88	0.96	7.87	0.96	7.93	83.09	0.46
7000.00	0.21	231.93	6999.88	0.74	7.61	0.74	7.66	84.43	0.04
7100.00	0.24	328.03	7099.88	0.80	7.36	0.80	7.40	83.77	0.33
7200.00	0.26	268.23	7199.87	0.97	7.03	0.97	7.10	82.14	0.24
7300.00	0.19	336.61	7299.87	1.12	6.76	1.12	6.84	80.60	0.26
7400.00	0.10	231.08	7399.87	1.21	6.61	1.21	6.72	79.61	0.24
7500.00	0.13	224.01	7499.87	1.07	6.46	1.07	6.54	80.68	0.03
7600.00	0.27	266.26	7699.87	0.93	6.16	0.93	6.22	81.38	0.17
7700.00	0.31	242.24	7699.87	0.76	5.68	0.76	5.73	82.46	0.08
7800.00	0.29	302.44	7799.87	0.76	5.23	0.76	5.29	81.71	0.30
7900.00	0.82	344.82	7899.87	1.69	4.84	1.69	5.09	71.83	0.64
8000.00	0.91	344.67	7999.86	3.04	4.44	3.04	5.38	66.68	0.09
8100.00	1.06	346.53	8099.84	4.70	4.00	4.70	6.17	40.39	0.16
8200.00	1.19	328.77	8199.82	6.48	3.23	6.48	7.24	26.60	0.36
8300.00	1.22	338.38	8299.80	8.36	2.30	8.36	8.66	16.39	0.20
8400.00	1.12	361.83	8399.78	10.30	1.77	10.30	10.46	9.74	0.29
8500.00	0.90	366.12	8499.76	12.06	1.68	12.06	12.16	7.46	0.23
8600.00	0.70	34.46	8699.76	13.34	1.87	13.34	13.47	7.98	0.66
8700.00	0.80	61.43	8699.76	14.28	2.76	14.28	14.66	10.96	0.24
8800.00	1.61	23.62	8799.73	16.92	3.84	16.92	16.38	13.66	0.88
8900.00	0.86	364.24	8899.70	17.86	4.29	17.86	18.37	13.60	0.87

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
9000.00	0.39	328.11	8999.70	18.89	4.03	18.89	19.31	12.06	0.63
9100.00	1.08	292.49	9099.69	19.54	2.98	19.54	19.77	8.67	0.80
9200.00	1.17	278.22	9199.67	20.06	1.09	20.06	20.08	3.11	0.29
9300.00	1.27	272.89	9299.65	20.25	-1.03	20.25	20.28	357.10	0.15
9400.00	2.40	260.18	9399.60	19.95	-4.19	19.95	20.39	348.14	1.20
9500.00	3.60	250.66	9499.46	18.55	-9.22	18.55	20.72	333.58	1.30
9600.00	3.68	236.10	9599.26	15.68	-14.82	15.68	21.67	316.62	0.99
9700.00	3.75	221.97	9699.05	11.41	-19.63	11.41	22.71	300.16	0.85
9800.00	3.42	224.20	9798.85	6.84	-23.90	6.84	24.86	285.98	0.36
9900.00	2.65	224.74	9898.71	3.06	-27.60	3.06	27.77	276.33	0.77
10000.00	2.66	208.67	9998.61	-0.62	-30.34	-0.62	30.35	268.84	0.74
10100.00	1.92	211.04	10098.53	-4.09	-32.32	-4.09	32.58	262.78	0.75
10200.00	2.29	226.96	10198.46	-6.89	-34.65	-6.89	35.33	258.75	0.69
10300.00	2.17	226.93	10298.38	-9.55	-37.49	-9.55	38.69	255.71	0.12

HORIZONTAL DISPLACEMENT IS
38.69 FEET AT 255.71 DEGREES

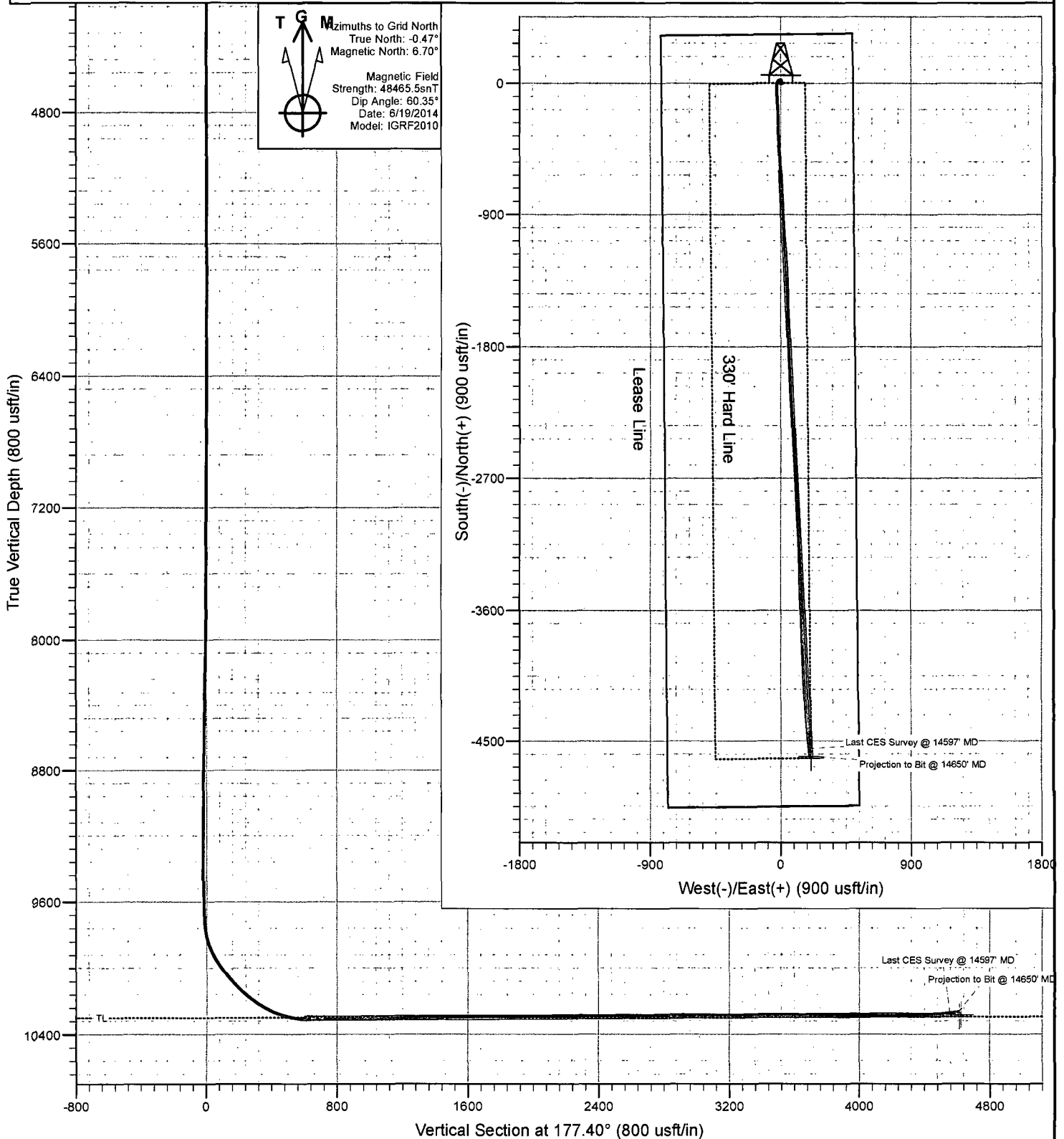


Project: Lea Co. NM
 Site: Gramma 27 State
 Well: Gramma 27 State 2H
 Wellbore: HZ
 Design: Plan #1D



SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect	Target	Annotation
1	10423.0	64.60	177.70	10257.6	-392.7	-12.9	0.00	0.00	391.7		Build 11.95°/100'
2	10638.0	90.28	176.96	10304.0	-600.6	-3.2	11.95	-1.70	599.8		EOB @ 10638' MD
3	14664.1	90.28	176.96	10284.0	-4620.9	210.1	0.00	0.00	4625.7	Gramma 27 PBHL P#1D	PBHL @ 14664.1' MD



Cathedral Energy Services

Survey Report

Company:	Caza Operating, LLC	Local Co-ordinate Reference:	Well Gramma 27 State 2H
Project:	Lea County, NM	TVD Reference:	HZ @ 3706.0usft
Site:	Gramma 27 State	MD Reference:	HZ @ 3706.0usft
Well:	Gramma 27 State 2H	North Reference:	Grid
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi-Users DB

Project:	Lea County, NM		
Map System:	US State Plane 1927 (Exact solution)	System Datum:	Mean Sea Level
Geo Datum:	NAD 1927 (NADCON CONUS)		
Map Zone:	New Mexico East 3001		

Site	Gramma 27 State				
Site Position:		Northing:	530,795.10 usft	Latitude:	32.456172
From:	Map	Easting:	772,365.40 usft	Longitude:	-103.450336
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16"	Grid Convergence:	0.47 °

Well	Gramma 27 State 2H					
Well Position	+N/-S	0.0 usft	Northing:	530,795.10 usft	Latitude:	32.456172
	+E/-W	0.0 usft	Easting:	772,365.40 usft	Longitude:	-103.450336
Position Uncertainty		0.0 usft	Wellhead Elevation:	0.0 usft	Ground Level:	3,688.0 usft

Wellbore	HZ				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	6/19/2014	7.17	60.35	48,465

Design:		FINAL			
Audit Notes:					
Version:		1.0		Phase:	ACTUAL
				Tie On Depth:	0.0
Vertical Section:		Depth From (TVD)		+N/-S	+E/-W
		(usft)		(usft)	(usft)
		0.0		0.0	0.0
					Direction
					(°)
					177.40

Survey Program		Date	7/10/2014		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.0	9,700.0	Survey #1 (HZ)	Gyro	Gyro	
9,727.0	14,650.0	MWD (HZ)	ISCWSA MWD	MWD - ISCWSA	

Survey									
Measured Depth	Inclination	Azimuth	Vertical Depth	+N/-S	+E/-W	Vertical Section	Dogleg Rate	Build Rate	Formations / Comments
(usft)	(°)	(°)	(usft)	(usft)	(usft)	(usft)	(°/100usft)	(°/100u)	
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	
100.0	0.11	213.17	100.0	-0.1	-0.1	0.1	0.11	0.11	
200.0	0.38	192.61	200.0	-0.5	-0.2	0.5	0.28	0.27	
300.0	0.55	177.97	300.0	-1.3	-0.2	1.3	0.21	0.17	
400.0	0.34	171.94	400.0	-2.1	-0.2	2.1	0.21	-0.21	
500.0	0.56	167.50	500.0	-2.8	0.0	2.8	0.22	0.22	
600.0	0.51	150.96	600.0	-3.7	0.3	3.7	0.16	-0.05	
700.0	0.35	162.34	700.0	-4.4	0.6	4.4	0.18	-0.16	
800.0	0.21	172.40	800.0	-4.9	0.7	4.9	0.15	-0.14	
900.0	0.27	140.97	900.0	-5.2	0.9	5.3	0.14	0.06	
1,000.0	0.42	120.17	1,000.0	-5.6	1.4	5.6	0.19	0.15	
1,100.0	0.41	112.62	1,100.0	-5.9	2.0	6.0	0.06	-0.01	

Cathedral Energy Services

Survey Report

Company:	Caza Operating, LLC	Local Co-ordinate Reference:	Well Gramma 27 State 2H
Project:	Lea County, NM	TVD Reference:	HZ @ 3706.0usft
Site:	Gramma 27 State	MD Reference:	HZ @ 3706.0usft
Well:	Gramma 27 State 2H	North Reference:	Grid
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100u)	Formations / Comments
1,200.0	0.55	68.11	1,200.0	-5.9	2.8	6.0	0.39	0.14	
1,300.0	0.63	81.72	1,300.0	-5.6	3.8	5.8	0.16	0.08	
1,400.0	0.41	73.35	1,400.0	-5.4	4.7	5.6	0.23	-0.22	
1,500.0	0.11	79.07	1,500.0	-5.3	5.1	5.5	0.30	-0.30	
1,600.0	0.43	49.65	1,600.0	-5.0	5.5	5.3	0.34	0.32	
1,700.0	0.60	47.52	1,700.0	-4.4	6.1	4.7	0.17	0.17	
1,800.0	0.48	71.50	1,799.9	-4.0	6.9	4.3	0.25	-0.12	
1,900.0	0.28	50.32	1,899.9	-3.7	7.5	4.0	0.24	-0.20	
2,000.0	0.44	51.80	1,999.9	-3.3	8.0	3.6	0.16	0.16	
2,100.0	0.14	95.20	2,099.9	-3.0	8.4	3.4	0.35	-0.30	
2,200.0	0.20	165.41	2,199.9	-3.2	8.6	3.6	0.20	0.06	
2,300.0	0.10	123.77	2,299.9	-3.4	8.7	3.8	0.14	-0.10	
2,400.0	0.16	158.36	2,399.9	-3.6	8.8	4.0	0.10	0.06	
2,500.0	0.14	193.88	2,499.9	-3.9	8.9	4.3	0.09	-0.02	
2,600.0	0.11	271.76	2,599.9	-4.0	8.7	4.4	0.16	-0.03	
2,700.0	0.09	251.98	2,699.9	-4.0	8.6	4.4	0.04	-0.02	
2,800.0	0.15	273.96	2,799.9	-4.0	8.4	4.4	0.07	0.06	
2,900.0	0.14	203.05	2,899.9	-4.1	8.2	4.5	0.17	-0.01	
3,000.0	0.22	281.34	2,999.9	-4.2	7.9	4.6	0.24	0.08	
3,100.0	0.22	303.29	3,099.9	-4.1	7.6	4.4	0.08	0.00	
3,200.0	0.30	305.01	3,199.9	-3.8	7.2	4.1	0.08	0.08	
3,300.0	0.12	304.14	3,299.9	-3.6	6.9	3.9	0.18	-0.18	
3,400.0	0.47	351.36	3,399.9	-3.1	6.8	3.4	0.40	0.35	
3,500.0	0.39	356.86	3,499.9	-2.4	6.7	2.7	0.09	-0.08	
3,600.0	0.34	11.10	3,599.9	-1.8	6.7	2.1	0.10	-0.05	
3,700.0	0.39	105.68	3,699.9	-1.6	7.1	1.9	0.54	0.05	
3,800.0	0.29	124.37	3,799.9	-1.8	7.6	2.1	0.15	-0.10	
3,900.0	0.19	9.92	3,899.9	-1.8	7.9	2.1	0.41	-0.10	
4,000.0	0.35	104.88	3,999.9	-1.7	8.2	2.1	0.41	0.16	
4,100.0	0.34	97.29	4,099.9	-1.8	8.8	2.2	0.05	-0.01	
4,200.0	0.49	339.12	4,199.9	-1.4	8.9	1.8	0.72	0.15	
4,300.0	0.68	297.78	4,299.9	-0.8	8.3	1.1	0.45	0.19	
4,400.0	0.41	327.69	4,399.9	-0.2	7.5	0.5	0.38	-0.27	
4,500.0	0.58	0.94	4,499.9	0.6	7.4	-0.3	0.33	0.17	
4,600.0	0.20	71.81	4,599.9	1.2	7.5	-0.8	0.55	-0.38	
4,700.0	0.34	139.49	4,699.9	1.0	7.9	-0.7	0.32	0.14	
4,800.0	0.24	155.93	4,799.9	0.6	8.2	-0.2	0.13	-0.10	
4,900.0	0.14	123.35	4,899.9	0.3	8.4	0.0	0.14	-0.10	
5,000.0	0.34	111.18	4,999.9	0.2	8.7	0.2	0.21	0.20	
5,100.0	0.39	155.47	5,099.9	-0.3	9.2	0.7	0.28	0.05	
5,200.0	0.13	29.39	5,199.9	-0.5	9.4	0.9	0.48	-0.26	
5,300.0	0.22	340.59	5,299.9	-0.2	9.3	0.6	0.17	0.09	
5,400.0	0.30	157.41	5,399.9	-0.2	9.4	0.7	0.52	0.08	
5,500.0	0.49	136.67	5,499.9	-0.8	9.8	1.2	0.23	0.19	
5,600.0	0.47	112.65	5,599.9	-1.3	10.5	1.7	0.20	-0.02	
5,700.0	0.50	79.03	5,699.9	-1.3	11.3	1.9	0.28	0.03	
5,800.0	0.37	137.90	5,799.9	-1.5	11.9	2.0	0.44	-0.13	
5,900.0	0.19	207.99	5,899.9	-1.9	12.0	2.4	0.35	-0.18	
6,000.0	0.43	323.39	5,999.9	-1.7	11.7	2.3	0.54	0.24	
6,100.0	0.28	314.02	6,099.9	-1.3	11.3	1.8	0.16	-0.15	
6,200.0	0.17	325.31	6,199.9	-1.0	11.1	1.5	0.12	-0.11	
6,300.0	0.29	296.15	6,299.9	-0.7	10.8	1.2	0.16	0.12	
6,400.0	0.60	326.06	6,399.9	-0.2	10.2	0.7	0.38	0.31	

Cathedral Energy Services

Survey Report

Company:	Caza Operating, LLC	Local Co-ordinate Reference:	Well Gramma 27 State 2H
Project:	Lea County, NM	TVD Reference:	HZ @ 3706.0usft
Site:	Gramma 27 State	MD Reference:	HZ @ 3706.0usft
Well:	Gramma 27 State 2H	North Reference:	Grid
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100u)	Formations / Comments
6,500.0	0.26	319.47	6,499.9	0.4	9.8	0.0	0.34	-0.34	
6,600.0	0.41	233.81	6,599.9	0.4	9.4	0.0	0.47	0.15	
6,700.0	0.36	309.74	6,699.9	0.4	8.8	0.0	0.48	-0.05	
6,800.0	0.46	308.42	6,799.9	0.8	8.3	-0.4	0.10	0.10	
6,900.0	0.17	229.21	6,899.9	1.0	7.9	-0.6	0.46	-0.29	
7,000.0	0.21	231.93	6,999.9	0.8	7.6	-0.4	0.04	0.04	
7,100.0	0.24	328.03	7,099.9	0.8	7.3	-0.5	0.34	0.03	
7,200.0	0.25	268.23	7,199.9	1.0	7.0	-0.7	0.24	0.01	
7,300.0	0.19	335.51	7,299.9	1.1	6.7	-0.8	0.25	-0.06	
7,400.0	0.10	231.08	7,399.9	1.2	6.6	-0.9	0.24	-0.09	
7,500.0	0.13	224.01	7,499.9	1.1	6.4	-0.8	0.03	0.03	
7,600.0	0.27	256.25	7,599.9	1.0	6.1	-0.7	0.17	0.14	
7,700.0	0.31	242.24	7,699.9	0.8	5.7	-0.5	0.08	0.04	
7,800.0	0.29	302.44	7,799.9	0.8	5.2	-0.6	0.30	-0.02	
7,900.0	0.82	344.82	7,899.9	1.6	4.8	-1.4	0.64	0.53	
8,000.0	0.91	344.57	7,999.8	3.1	4.4	-2.9	0.09	0.09	
8,100.0	1.05	345.53	8,099.8	4.7	4.0	-4.5	0.14	0.14	
8,200.0	1.19	328.77	8,199.8	6.5	3.2	-6.4	0.35	0.14	
8,300.0	1.22	338.38	8,299.8	8.4	2.3	-8.3	0.20	0.03	
8,400.0	1.12	351.83	8,399.8	10.3	1.8	-10.2	0.29	-0.10	
8,500.0	0.90	356.12	8,499.7	12.1	1.6	-12.0	0.23	-0.22	
8,600.0	0.70	34.45	8,599.7	13.4	1.9	-13.3	0.56	-0.20	
8,700.0	0.80	51.43	8,699.7	14.3	2.7	-14.2	0.24	0.10	
8,800.0	1.51	23.62	8,799.7	16.0	3.8	-15.8	0.88	0.71	
8,900.0	0.85	354.24	8,899.7	17.9	4.3	-17.7	0.88	-0.66	
9,000.0	0.39	328.11	8,999.7	18.9	4.0	-18.7	0.53	-0.46	
9,100.0	1.08	292.49	9,099.7	19.6	3.0	-19.4	0.80	0.69	
9,200.0	1.17	278.22	9,199.7	20.1	1.1	-20.0	0.29	0.09	
9,300.0	1.27	272.89	9,299.6	20.3	-1.0	-20.3	0.15	0.10	
9,400.0	2.40	260.18	9,399.6	20.0	-4.2	-20.2	1.19	1.13	
9,500.0	3.60	250.66	9,499.4	18.6	-9.2	-19.0	1.30	1.20	
9,600.0	3.68	235.10	9,599.2	15.7	-14.8	-16.4	0.99	0.08	
9,700.0	3.75	221.97	9,699.0	11.4	-19.6	-12.3	0.85	0.07	
9,727.0	4.60	211.70	9,726.0	9.9	-20.8	-10.8	4.18	3.15	
9,756.0	6.90	198.10	9,754.8	7.2	-22.0	-8.2	9.17	7.93	
9,788.0	10.20	191.40	9,786.5	2.6	-23.1	-3.7	10.75	10.31	
9,819.0	14.70	188.80	9,816.7	-4.0	-24.3	2.9	14.62	14.52	
9,851.0	18.90	187.30	9,847.4	-13.1	-25.5	11.9	13.19	13.12	
9,883.0	22.90	185.20	9,877.3	-24.5	-26.8	23.2	12.72	12.50	
9,915.0	25.50	180.90	9,906.4	-37.6	-27.4	36.3	9.81	8.12	
9,947.0	29.20	178.40	9,934.9	-52.3	-27.3	51.0	12.10	11.56	
9,978.0	31.90	176.90	9,961.6	-68.0	-26.7	66.7	9.05	8.71	
10,010.0	34.80	175.40	9,988.3	-85.5	-25.5	84.3	9.42	9.06	
10,042.0	37.80	175.20	10,014.1	-104.4	-23.9	103.2	9.38	9.37	
10,070.0	39.90	175.70	10,035.9	-121.9	-22.5	120.8	7.58	7.50	
10,105.0	41.50	177.20	10,062.4	-144.7	-21.1	143.6	5.36	4.57	
10,147.0	43.40	177.40	10,093.4	-173.0	-19.8	171.9	4.54	4.52	
10,169.0	44.10	177.60	10,109.3	-188.2	-19.1	187.2	3.24	3.18	
10,201.0	46.40	177.60	10,131.8	-210.9	-18.2	209.9	7.19	7.19	
10,232.0	49.10	177.80	10,152.7	-233.9	-17.3	232.8	8.72	8.71	
10,264.0	51.30	178.40	10,173.1	-258.4	-16.4	257.4	7.02	6.87	
10,296.0	53.90	178.40	10,192.6	-283.8	-15.7	282.8	8.12	8.12	
10,327.0	56.60	178.70	10,210.2	-309.3	-15.1	308.3	8.75	8.71	

Cathedral Energy Services

Survey Report

Company:	Caza Operating, LLC	Local Co-ordinate Reference:	Well: Gramma 27 State 2H
Project:	Lea County, NM	TVD Reference:	HZ @ 3706.0usft
Site:	Gramma 27 State	MD Reference:	HZ @ 3706.0usft
Well:	Gramma 27 State 2H	North Reference:	Grid
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100u)	Formations / Comments
10,359.0	58.90	179.00	10,227.3	-336.3	-14.5	335.3	7.23	7.19	
10,391.0	61.70	178.40	10,243.2	-364.1	-13.9	363.1	8.90	8.75	
10,423.0	64.60	177.70	10,257.6	-392.7	-12.9	391.7	9.27	9.06	
10,454.0	67.90	177.30	10,270.1	-421.0	-11.7	420.0	10.71	10.65	
10,486.0	71.60	176.80	10,281.2	-451.0	-10.2	450.1	11.66	11.56	
10,517.0	74.90	177.00	10,290.1	-480.6	-8.6	479.7	10.66	10.65	
10,549.0	77.60	177.80	10,297.7	-511.7	-7.1	510.8	8.78	8.44	
10,581.0	80.80	177.60	10,303.7	-543.1	-5.9	542.2	10.02	10.00	
10,613.0	84.10	176.90	10,307.9	-574.8	-4.4	574.0	10.54	10.31	
10,644.0	87.40	176.30	10,310.2	-605.6	-2.5	604.9	10.82	10.65	
10,676.0	90.40	176.20	10,310.8	-637.5	-0.4	636.9	9.38	9.37	
10,708.0	91.20	176.20	10,310.4	-669.5	1.7	668.8	2.50	2.50	
10,740.0	91.90	175.70	10,309.5	-701.4	3.9	700.8	2.69	2.19	
10,835.0	91.00	176.00	10,307.1	-796.1	10.8	795.8	1.00	-0.95	
10,930.0	89.30	175.90	10,306.9	-890.8	17.5	890.7	1.79	-1.79	
11,025.0	90.50	176.10	10,307.0	-985.6	24.2	985.7	1.28	1.26	
11,120.0	90.60	177.10	10,306.1	-1,080.4	29.8	1,080.7	1.06	0.11	
11,215.0	92.60	176.10	10,303.5	-1,175.2	35.4	1,175.6	2.35	2.11	
11,310.0	91.30	176.40	10,300.2	-1,270.0	41.6	1,270.5	1.40	-1.37	
11,405.0	91.10	177.20	10,298.2	-1,364.8	46.9	1,365.5	0.87	-0.21	
11,500.0	90.40	179.10	10,297.0	-1,459.7	50.0	1,460.5	2.13	-0.74	
11,595.0	90.30	180.00	10,296.4	-1,554.7	50.7	1,555.4	0.95	-0.11	
11,690.0	90.40	179.60	10,295.8	-1,649.7	51.1	1,650.3	0.43	0.11	
11,786.0	90.00	177.80	10,295.5	-1,745.7	53.3	1,746.3	1.92	-0.42	
11,881.0	91.40	176.80	10,294.3	-1,840.6	57.7	1,841.3	1.81	1.47	
11,976.0	90.00	177.60	10,293.2	-1,935.5	62.4	1,936.3	1.70	-1.47	
12,071.0	90.90	177.60	10,292.4	-2,030.4	66.3	2,031.3	0.95	0.95	
12,166.0	90.20	176.80	10,291.5	-2,125.3	71.0	2,126.3	1.12	-0.74	
12,261.0	89.60	176.50	10,291.7	-2,220.1	76.5	2,221.3	0.71	-0.63	
12,356.0	91.30	175.80	10,290.9	-2,314.9	82.9	2,316.2	1.94	1.79	
12,452.0	90.50	175.40	10,289.4	-2,410.6	90.3	2,412.2	0.93	-0.83	
12,547.0	89.90	175.90	10,289.1	-2,505.3	97.5	2,507.1	0.82	-0.63	
12,641.0	90.50	176.40	10,288.8	-2,599.1	103.8	2,601.1	0.83	0.64	
12,737.0	90.20	177.10	10,288.2	-2,694.9	109.2	2,697.1	0.79	-0.31	
12,832.0	92.20	176.90	10,286.2	-2,789.8	114.2	2,792.1	2.12	2.11	
12,927.0	90.20	177.60	10,284.2	-2,884.6	118.8	2,887.1	2.23	-2.11	
13,022.0	89.50	178.20	10,284.5	-2,979.6	122.2	2,982.0	0.97	-0.74	
13,118.0	89.30	177.60	10,285.5	-3,075.5	125.8	3,078.0	0.66	-0.21	
13,213.0	89.50	178.50	10,286.5	-3,170.4	129.0	3,173.0	0.97	0.21	
13,308.0	91.20	179.00	10,285.9	-3,265.4	131.1	3,268.0	1.87	1.79	
13,403.0	91.00	178.50	10,284.1	-3,360.4	133.1	3,363.0	0.57	-0.21	
13,499.0	90.50	178.00	10,282.8	-3,456.3	136.1	3,458.9	0.74	-0.52	
13,594.0	90.10	177.60	10,282.3	-3,551.2	139.7	3,553.9	0.60	-0.42	
13,689.0	88.80	178.30	10,283.2	-3,646.2	143.1	3,648.9	1.55	-1.37	
13,784.0	88.10	178.50	10,285.8	-3,741.1	145.8	3,743.8	0.77	-0.74	
13,879.0	89.70	177.30	10,287.6	-3,836.0	149.2	3,838.8	2.11	1.68	
13,974.0	89.70	176.90	10,288.1	-3,930.9	154.1	3,933.8	0.42	0.00	
14,069.0	90.40	177.60	10,288.0	-4,025.8	158.6	4,028.8	1.04	0.74	
14,165.0	90.00	177.20	10,287.7	-4,121.7	163.0	4,124.8	0.59	-0.42	
14,260.0	90.50	176.90	10,287.3	-4,216.5	167.9	4,219.8	0.61	0.53	
14,355.0	90.70	175.90	10,286.3	-4,311.3	173.8	4,314.8	1.07	0.21	
14,451.0	92.10	175.20	10,283.9	-4,407.0	181.3	4,410.7	1.63	1.46	
14,546.0	94.50	174.60	10,278.5	-4,501.5	189.7	4,505.4	2.60	2.53	

Cathedral Energy Services

Survey Report

Company:	Caza Operating, LLC	Local Co-ordinate Reference:	Well: Gramma 27- State 2H
Project:	Lea County, NM	TVD Reference:	HZ @ 3706.0usft
Site:	Gramma 27 State	MD Reference:	HZ @ 3706.0usft
Well:	Gramma 27- State 2H	North Reference:	Grid
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100u)	Formations / Comments
14,597.0	96.20	174.10	10,273.7	-4,552.0	194.7	4,556.2	3.47	3.33	Last CES Survey @ 14597' MD
14,650.0	96.20	174.10	10,268.0	-4,604.4	200.1	4,608.8	0.00	0.00	Projection to Bit @ 14650' MD - Gramma 27 Stat

Targets									
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
- hit/miss target									
- Shape									
Gramma 2H PBHL P#1A	0.00	0.00	10,290.0	-4,620.9	210.1	526,174.20	772,575.50	32.443466	-103.449778
- actual wellpath misses target center by 29.3usft at 14650.0usft MD (10268.0 TVD, -4604.4 N, 200.1 E)									
- Point									
Gramma 27 State 2H HZ	0.00	0.00	10,295.0	-4,610.9	209.6	526,184.19	772,575.05	32.443494	-103.449780
- actual wellpath misses target center by 29.4usft at 14650.0usft MD (10268.0 TVD, -4604.4 N, 200.1 E)									
- Point									
Gramma 27 PBHL P#1D	89.72	176.96	10,284.0	-4,620.9	210.1	526,174.20	772,575.50	32.443466	-103.449778
- actual wellpath misses target center by 25.1usft at 14650.0usft MD (10268.0 TVD, -4604.4 N, 200.1 E)									
- Rectangle (sides W24.0 H24.0 D4,026.1)									

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
14,597.0	10,273.7	-4,552.0	194.7	Last CES Survey @ 14597' MD
14,650.0	10,268.0	-4,604.4	200.1	Projection to Bit @ 14650' MD

Checked By: _____ Approved By: _____ Date: _____