



# **Laramie Energy, LLC**

**Mesa County, CO**

**Gunderson 13-11 Pad**

**Gunderson 0994-14-12E**

**Wellbore #1**

**Design: Wellbore #1**

## **QES Survey Report**

**12 April, 2018**





# Survey Report



<b>Company:</b>	Laramie Energy, LLC	<b>Local Co-ordinate Reference:</b>	Well Gunderson 0994-14-12E
<b>Project:</b>	Mesa County, CO	<b>TVD Reference:</b>	well @ 7302.0usft (H&P #522)
<b>Site:</b>	Gunderson 13-11 Pad	<b>MD Reference:</b>	well @ 7302.0usft (H&P #522)
<b>Well:</b>	Gunderson 0994-14-12E	<b>North Reference:</b>	True
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	EDM 5000.1 Single User Db

<b>Project</b>	Mesa County, CO		
<b>Map System:</b>	US State Plane 1983	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b>	North American Datum 1983		
<b>Map Zone:</b>	Colorado Central Zone		

Site		Gunderson 13-11 Pad			
Site Position:		Northing:	1,533,162.26 usft	Latitude:	39.273948
From:	Lat/Long	Easting:	2,339,102.68 usft	Longitude:	-107.834835
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	-1.47 °

Well	Gunderson 0994-14-12E					
Well Position	+N/-S	0.0 usft	Northing:	1,533,130.45 usft	Latitude:	39.273858
	+E/-W	0.0 usft	Easting:	2,339,070.62 usft	Longitude:	-107.834945
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	7,272.0 usft

<b>Wellbore</b>	Wellbore #1				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	User Defined	4/5/2018	9.45	65.41	51,312.40000000

<b>Design</b>	Wellbore #1				
<b>Audit Notes:</b>					
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b>	0.0
<b>Vertical Section:</b>	<b>Depth From (TVD) (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Direction (°)</b>	
	0.0	0.0	0.0	284.75	

<b>Survey Program</b>	<b>Date</b>	4/12/2018			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
472.0	8,330.0	QES MWD Surveys (Wellbore #1)	MWD default	MWD - Standard	

<b>Survey</b>									
<b>Measured Depth (usft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Vertical Section (usft)</b>	<b>Dogleg Rate (°/100usft)</b>	<b>Build Rate (°/100usft)</b>	<b>Turn Rate (°/100usft)</b>
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
<b>First MWD Survey @ 472.0' MD / 469.6' TVD</b>									
472.0	10.10	301.90	469.6	21.9	-35.2	39.6	2.14	2.14	0.00
563.0	12.20	297.90	558.8	30.6	-50.5	56.6	2.46	2.31	-4.40
654.0	14.70	292.60	647.3	39.6	-69.7	77.4	3.06	2.75	-5.82
745.0	15.80	285.30	735.1	47.3	-92.3	101.3	2.43	1.21	-8.02
836.0	17.80	276.30	822.3	52.1	-118.1	127.4	3.60	2.20	-9.89
927.0	21.60	276.50	907.9	55.5	-148.5	157.8	4.18	4.18	0.22
1,018.0	24.40	282.40	991.7	61.4	-183.5	193.1	3.98	3.08	6.48
1,113.0	28.50	280.10	1,076.7	69.6	-225.0	235.4	4.45	4.32	-2.42
1,207.0	32.20	284.10	1,157.8	79.7	-271.4	282.8	4.48	3.94	4.26



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<b>Well:</b>	Gunderson 0994-14-12E	<b>North Reference:</b>	True
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	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)
1,301.0	34.50	284.60	1,236.4	92.5	-321.5	334.4	2.46	2.45	0.53
1,395.0	35.30	284.50	1,313.5	106.0	-373.5	388.2	0.85	0.85	-0.11
1,489.0	35.60	283.70	1,390.0	119.3	-426.4	442.7	0.59	0.32	-0.85
1,506.0	35.50	283.50	1,403.9	121.6	-436.0	452.6	0.90	-0.59	-1.18
1,603.0	35.40	284.00	1,482.9	135.0	-490.7	508.9	0.32	-0.10	0.52
1,698.0	35.30	282.90	1,560.4	147.8	-544.1	563.8	0.68	-0.11	-1.16
1,792.0	35.30	282.50	1,637.1	159.7	-597.1	618.1	0.25	0.00	-0.43
1,886.0	35.20	282.20	1,713.8	171.3	-650.1	672.3	0.21	-0.11	-0.32
1,980.0	34.90	281.70	1,790.8	182.5	-702.9	726.2	0.44	-0.32	-0.53
2,074.0	35.50	284.80	1,867.6	194.9	-755.7	780.4	2.01	0.64	3.30
2,168.0	34.90	283.90	1,944.4	208.3	-808.1	834.6	0.84	-0.64	-0.96
2,262.0	34.50	283.80	2,021.7	221.2	-860.1	888.1	0.43	-0.43	-0.11
2,357.0	35.60	285.00	2,099.5	234.7	-912.9	942.6	1.37	1.16	1.26
2,451.0	34.90	284.80	2,176.2	248.7	-965.4	996.9	0.75	-0.74	-0.21
2,545.0	33.90	283.60	2,253.8	261.7	-1,016.8	1,050.0	1.29	-1.06	-1.28
2,639.0	34.80	284.10	2,331.4	274.4	-1,068.3	1,103.0	1.00	0.96	0.53
2,734.0	33.90	283.30	2,409.8	287.1	-1,120.4	1,156.6	1.06	-0.95	-0.84
2,828.0	34.60	285.30	2,487.5	300.2	-1,171.7	1,209.5	1.41	0.74	2.13
2,922.0	33.80	284.70	2,565.3	313.9	-1,222.7	1,262.3	0.92	-0.85	-0.64
3,017.0	36.20	285.90	2,643.1	328.3	-1,275.3	1,316.8	2.63	2.53	1.26
3,111.0	35.70	285.20	2,719.2	343.0	-1,328.4	1,372.0	0.69	-0.53	-0.74
3,205.0	35.20	284.90	2,795.8	357.2	-1,381.1	1,426.5	0.56	-0.53	-0.32
3,299.0	34.80	284.20	2,872.8	370.8	-1,433.3	1,480.4	0.60	-0.43	-0.74
3,393.0	34.20	283.80	2,950.2	383.6	-1,484.9	1,533.7	0.68	-0.64	-0.43
3,487.0	33.50	283.20	3,028.3	395.9	-1,535.8	1,586.0	0.83	-0.74	-0.64
3,582.0	34.90	284.50	3,106.9	408.7	-1,587.7	1,639.4	1.66	1.47	1.37
3,676.0	34.50	285.00	3,184.2	422.3	-1,639.4	1,692.9	0.52	-0.43	0.53
3,770.0	33.70	284.50	3,262.0	435.7	-1,690.4	1,745.6	0.90	-0.85	-0.53
3,864.0	35.10	287.40	3,339.6	450.3	-1,741.4	1,798.7	2.29	1.49	3.09
3,959.0	34.60	287.70	3,417.5	466.7	-1,793.2	1,852.9	0.56	-0.53	0.32
4,053.0	34.20	287.20	3,495.1	482.6	-1,843.8	1,905.9	0.52	-0.43	-0.53
4,147.0	34.80	288.30	3,572.6	498.8	-1,894.5	1,959.1	0.92	0.64	1.17
4,242.0	34.20	287.70	3,650.8	515.5	-1,945.7	2,012.8	0.73	-0.63	-0.63
4,336.0	35.30	286.70	3,728.1	531.3	-1,996.9	2,066.4	1.32	1.17	-1.06
4,430.0	34.80	286.50	3,805.0	546.7	-2,048.6	2,120.3	0.55	-0.53	-0.21
4,524.0	34.30	286.90	3,882.5	562.0	-2,099.7	2,173.6	0.58	-0.53	0.43
4,618.0	36.50	286.30	3,959.1	577.6	-2,151.9	2,228.0	2.37	2.34	-0.64
4,712.0	36.00	285.20	4,034.9	592.7	-2,205.4	2,283.6	0.87	-0.53	-1.17
4,807.0	36.00	284.30	4,111.7	606.9	-2,259.4	2,339.4	0.56	0.00	-0.95
4,901.0	36.10	285.30	4,187.7	621.0	-2,312.8	2,394.7	0.64	0.11	1.06
4,995.0	35.00	284.30	4,264.2	635.0	-2,365.7	2,449.4	1.32	-1.17	-1.06
5,089.0	32.70	284.80	4,342.3	648.1	-2,416.4	2,501.8	2.46	-2.45	0.53
5,183.0	31.30	285.90	4,422.0	661.3	-2,464.4	2,551.6	1.61	-1.49	1.17



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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)	
5,277.0	29.80	285.60	4,502.9	674.3	-2,510.4	2,599.3	1.60	-1.60	-0.32	
5,372.0	27.60	286.00	4,586.3	686.7	-2,554.3	2,644.9	2.32	-2.32	0.42	
5,466.0	25.40	285.30	4,670.4	698.0	-2,594.7	2,686.9	2.36	-2.34	-0.74	
5,560.0	22.40	285.40	4,756.3	708.1	-2,631.4	2,725.0	3.19	-3.19	0.11	
5,654.0	21.00	283.00	4,843.7	716.7	-2,665.1	2,759.7	1.76	-1.49	-2.55	
5,748.0	17.90	281.50	4,932.3	723.3	-2,695.6	2,791.0	3.34	-3.30	-1.60	
5,842.0	15.70	278.90	5,022.3	728.2	-2,722.4	2,818.0	2.47	-2.34	-2.77	
5,937.0	13.00	279.60	5,114.3	731.9	-2,745.6	2,841.5	2.85	-2.84	0.74	
6,031.0	9.80	281.00	5,206.4	735.2	-2,763.9	2,860.0	3.42	-3.40	1.49	
6,125.0	7.20	284.90	5,299.4	738.3	-2,777.4	2,873.9	2.83	-2.77	4.15	
6,219.0	4.40	305.00	5,392.9	741.9	-2,786.1	2,883.1	3.64	-2.98	21.38	
6,314.0	2.80	321.40	5,487.7	745.8	-2,790.5	2,888.4	1.99	-1.68	17.26	
6,408.0	1.40	13.00	5,581.7	748.7	-2,791.7	2,890.3	2.36	-1.49	54.89	
6,502.0	1.30	22.80	5,675.6	750.8	-2,791.0	2,890.2	0.27	-0.11	10.43	
6,596.0	1.20	23.90	5,769.6	752.7	-2,790.2	2,889.9	0.11	-0.11	1.17	
6,690.0	1.40	8.90	5,863.6	754.7	-2,789.6	2,889.8	0.42	0.21	-15.96	
6,784.0	1.30	347.40	5,957.6	756.9	-2,789.7	2,890.5	0.55	-0.11	-22.87	
6,879.0	1.50	338.90	6,052.5	759.1	-2,790.4	2,891.7	0.30	0.21	-8.95	
6,973.0	1.50	316.50	6,146.5	761.1	-2,791.7	2,893.4	0.62	0.00	-23.83	
7,067.0	2.10	309.30	6,240.5	763.1	-2,793.8	2,896.1	0.68	0.64	-7.66	
7,161.0	2.10	309.20	6,334.4	765.3	-2,796.5	2,899.2	0.00	0.00	-0.11	
7,256.0	2.30	297.10	6,429.3	767.3	-2,799.5	2,902.6	0.53	0.21	-12.74	
7,350.0	2.50	283.30	6,523.2	768.6	-2,803.2	2,906.5	0.65	0.21	-14.68	
7,444.0	2.80	281.00	6,617.1	769.5	-2,807.5	2,910.9	0.34	0.32	-2.45	
7,538.0	2.90	283.70	6,711.0	770.5	-2,812.0	2,915.5	0.18	0.11	2.87	
7,633.0	3.10	290.80	6,805.9	772.0	-2,816.8	2,920.5	0.44	0.21	7.47	
7,727.0	3.10	293.70	6,899.8	773.9	-2,821.5	2,925.5	0.17	0.00	3.09	
7,821.0	3.60	291.70	6,993.6	776.0	-2,826.5	2,931.0	0.55	0.53	-2.13	
7,915.0	3.60	288.40	7,087.4	778.0	-2,832.1	2,936.8	0.22	0.00	-3.51	
8,009.0	4.00	285.70	7,181.2	779.9	-2,838.0	2,943.1	0.47	0.43	-2.87	
8,104.0	3.90	283.80	7,276.0	781.5	-2,844.4	2,949.6	0.17	-0.11	-2.00	
8,198.0	4.10	285.50	7,369.7	783.2	-2,850.7	2,956.2	0.25	0.21	1.81	
8,275.0	3.60	280.30	7,446.6	784.4	-2,855.7	2,961.3	0.79	-0.65	-6.75	
Projection to TD @ 8330.0' MD / 7501.5' TVD										
8,330.0	3.60	280.30	7,501.5	785.0	-2,859.1	2,964.8	0.00	0.00	0.00	

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
472.0	469.6	21.9	-35.2	First MWD Survey @ 472.0' MD / 469.6' TVD	
8,330.0	7,501.5	785.0	-2,859.1	Projection to TD @ 8330.0' MD / 7501.5' TVD	



## Survey Report



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