



# **Laramie Energy, LLC**

**Mesa County, CO  
Gunderson 20-03 Pad  
Gunderson 20-09W**

**Wellbore #1**

**Design: Wellbore #1**

## **QES Survey Report**

**27 July, 2017**





# Survey Report



<b>Company:</b>	Laramie Energy, LLC	<b>Local Co-ordinate Reference:</b>	Well Gunderson 20-09W
<b>Project:</b>	Mesa County, CO	<b>TVD Reference:</b>	well @ 7176.0usft (H&P # 522)
<b>Site:</b>	Gunderson 20-03 Pad	<b>MD Reference:</b>	well @ 7176.0usft (H&P # 522)
<b>Well:</b>	Gunderson 20-09W	<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 20-03 Pad				
Site Position:		Northing:	1,530,258.75 usft	Latitude:	39.266756
From:	Lat/Long	Easting:	2,350,219.97 usft	Longitude:	-107.795317
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	-1.45 °

Well	Gunderson 20-09W					
Well Position	+N/-S	0.0 usft	Northing:	1,530,278.74 usft	Latitude:	39.266811
	+E/-W	0.0 usft	Easting:	2,350,221.32 usft	Longitude:	-107.795314
Position Uncertainty		0.0 usft	Wellhead Elevation:	0.0 usft	Ground Level:	7,146.0 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>
	IGRF2015	10/19/2016	9.65	65.45	51,494.80381179

<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	211.76	

<b>Survey Program</b>	<b>Date</b>	7/27/2017			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
110.0	7,640.0	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 @ 110.0' MD / TVD</b>										
110.0	1.70	230.40	110.0	-1.0	-1.3	1.5	1.55	1.55	0.00	
200.0	2.00	232.50	199.9	-2.8	-3.5	4.3	0.34	0.33	2.33	
291.0	2.20	231.10	290.9	-4.9	-6.2	7.4	0.23	0.22	-1.54	
382.0	2.50	230.80	381.8	-7.3	-9.0	10.9	0.33	0.33	-0.33	
474.0	2.70	225.20	473.7	-10.1	-12.1	14.9	0.35	0.22	-6.09	
566.0	4.90	209.40	565.5	-15.0	-15.6	21.0	2.63	2.39	-17.17	
658.0	5.80	205.30	657.1	-22.6	-19.5	29.5	1.06	0.98	-4.46	
749.0	8.00	206.10	747.4	-32.5	-24.3	40.4	2.42	2.42	0.88	
841.0	11.20	211.60	838.1	-45.8	-31.8	55.7	3.61	3.48	5.98	



# Survey Report



<b>Company:</b>	Laramie Energy, LLC	<b>Local Co-ordinate Reference:</b>	Well Gunderson 20-09W
<b>Project:</b>	Mesa County, CO	<b>TVD Reference:</b>	well @ 7176.0usft (H&P # 522)
<b>Site:</b>	Gunderson 20-03 Pad	<b>MD Reference:</b>	well @ 7176.0usft (H&P # 522)
<b>Well:</b>	Gunderson 20-09W	<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)
933.0	11.90	210.70	928.3	-61.6	-41.3	74.1	0.79	0.76	-0.98
1,024.0	11.60	206.70	1,017.4	-77.8	-50.2	92.6	0.95	-0.33	-4.40
1,118.0	14.30	213.00	1,109.0	-96.0	-60.8	113.6	3.24	2.87	6.70
1,213.0	14.40	218.10	1,201.0	-115.2	-74.5	137.1	1.33	0.11	5.37
1,307.0	15.60	216.10	1,291.8	-134.6	-89.1	161.3	1.39	1.28	-2.13
1,401.0	15.30	213.50	1,382.4	-155.1	-103.4	186.3	0.80	-0.32	-2.77
1,505.0	16.00	214.30	1,482.6	-178.4	-119.1	214.4	0.70	0.67	0.77
1,585.0	17.10	213.50	1,559.2	-197.3	-131.8	237.1	1.40	1.38	-1.00
1,679.0	17.20	211.40	1,649.1	-220.7	-146.6	264.9	0.67	0.11	-2.23
1,773.0	16.20	210.40	1,739.1	-243.9	-160.5	291.9	1.11	-1.06	-1.06
1,868.0	15.10	211.40	1,830.6	-265.9	-173.7	317.5	1.19	-1.16	1.05
1,962.0	15.50	209.90	1,921.2	-287.2	-186.3	342.3	0.60	0.43	-1.60
2,056.0	16.10	210.30	2,011.7	-309.4	-199.1	367.9	0.65	0.64	0.43
2,150.0	15.30	209.80	2,102.2	-331.4	-211.9	393.3	0.86	-0.85	-0.53
2,244.0	16.10	209.80	2,192.7	-353.5	-224.5	418.7	0.85	0.85	0.00
2,339.0	15.20	210.00	2,284.2	-375.7	-237.3	444.3	0.95	-0.95	0.21
2,433.0	16.30	210.50	2,374.6	-397.7	-250.1	469.8	1.18	1.17	0.53
2,527.0	15.10	210.90	2,465.1	-419.6	-263.1	495.3	1.28	-1.28	0.43
2,621.0	16.50	213.30	2,555.6	-441.2	-276.7	520.8	1.64	1.49	2.55
2,715.0	16.10	211.60	2,645.8	-463.5	-290.9	547.2	0.66	-0.43	-1.81
2,810.0	15.50	212.10	2,737.2	-485.5	-304.6	573.1	0.65	-0.63	0.53
2,904.0	16.30	211.10	2,827.6	-507.4	-318.0	598.8	0.90	0.85	-1.06
2,998.0	15.50	210.40	2,918.0	-529.5	-331.2	624.6	0.88	-0.85	-0.74
3,092.0	17.00	210.30	3,008.2	-552.2	-344.5	650.9	1.60	1.60	-0.11
3,187.0	16.50	209.20	3,099.2	-576.0	-358.1	678.2	0.62	-0.53	-1.16
3,281.0	15.60	208.40	3,189.5	-598.8	-370.6	704.2	0.99	-0.96	-0.85
3,375.0	17.10	210.70	3,279.7	-621.8	-383.7	730.6	1.74	1.60	2.45
3,469.0	16.30	210.00	3,369.8	-645.1	-397.3	757.6	0.88	-0.85	-0.74
3,563.0	15.50	209.10	3,460.2	-667.5	-410.0	783.4	0.89	-0.85	-0.96
3,657.0	16.70	212.50	3,550.5	-689.9	-423.4	809.4	1.62	1.28	3.62
3,752.0	16.10	212.80	3,641.6	-712.4	-437.9	836.2	0.64	-0.63	0.32
3,846.0	17.00	216.30	3,731.7	-734.5	-453.1	863.0	1.43	0.96	3.72
3,940.0	16.20	214.20	3,821.8	-756.4	-468.6	889.8	1.06	-0.85	-2.23
4,035.0	16.00	214.30	3,913.1	-778.2	-483.4	916.1	0.21	-0.21	0.11
4,129.0	15.20	213.80	4,003.6	-799.1	-497.6	941.4	0.86	-0.85	-0.53
4,223.0	16.70	215.70	4,094.0	-820.3	-512.3	967.1	1.69	1.60	2.02
4,317.0	16.60	216.00	4,184.1	-842.2	-528.1	994.0	0.14	-0.11	0.32
4,411.0	15.90	215.20	4,274.3	-863.5	-543.4	1,020.3	0.78	-0.74	-0.85
4,505.0	16.50	217.40	4,364.6	-884.7	-558.9	1,046.4	0.91	0.64	2.34
4,600.0	15.90	216.30	4,455.8	-905.9	-574.8	1,072.8	0.71	-0.63	-1.16
4,694.0	15.10	216.30	4,546.4	-926.1	-589.7	1,097.8	0.85	-0.85	0.00
4,788.0	14.30	215.30	4,637.3	-945.5	-603.6	1,121.6	0.89	-0.85	-1.06
4,882.0	13.30	215.50	4,728.6	-963.7	-616.6	1,144.0	1.07	-1.06	0.21



# Survey Report



<b>Company:</b>	Laramie Energy, LLC	<b>Local Co-ordinate Reference:</b>	Well Gunderson 20-09W
<b>Project:</b>	Mesa County, CO	<b>TVD Reference:</b>	well @ 7176.0usft (H&P # 522)
<b>Site:</b>	Gunderson 20-03 Pad	<b>MD Reference:</b>	well @ 7176.0usft (H&P # 522)
<b>Well:</b>	Gunderson 20-09W	<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)
4,977.0	12.40	213.60	4,821.2	-981.1	-628.6	1,165.1	1.05	-0.95	-2.00
5,071.0	11.60	212.60	4,913.2	-997.5	-639.3	1,184.6	0.88	-0.85	-1.06
5,165.0	10.80	212.30	5,005.4	-1,012.9	-649.1	1,202.9	0.85	-0.85	-0.32
5,260.0	10.60	210.20	5,098.7	-1,028.0	-658.2	1,220.5	0.46	-0.21	-2.21
5,354.0	9.80	208.70	5,191.2	-1,042.5	-666.4	1,237.2	0.90	-0.85	-1.60
5,448.0	8.40	205.00	5,284.0	-1,055.7	-673.2	1,252.0	1.61	-1.49	-3.94
5,542.0	6.10	199.10	5,377.3	-1,066.7	-677.7	1,263.7	2.57	-2.45	-6.28
5,637.0	4.00	189.70	5,471.9	-1,074.7	-679.9	1,271.7	2.37	-2.21	-9.89
5,731.0	3.60	188.90	5,565.7	-1,080.8	-680.9	1,277.4	0.43	-0.43	-0.85
5,825.0	2.70	194.80	5,659.6	-1,085.9	-682.0	1,282.2	1.02	-0.96	6.28
5,919.0	2.20	184.20	5,753.5	-1,089.8	-682.7	1,286.0	0.72	-0.53	-11.28
6,014.0	2.40	189.00	5,848.4	-1,093.6	-683.1	1,289.4	0.29	0.21	5.05
6,108.0	2.20	193.40	5,942.3	-1,097.3	-683.8	1,292.9	0.28	-0.21	4.68
6,202.0	1.60	196.40	6,036.3	-1,100.3	-684.6	1,295.9	0.65	-0.64	3.19
6,296.0	1.30	190.70	6,130.2	-1,102.6	-685.2	1,298.2	0.35	-0.32	-6.06
6,391.0	1.50	196.50	6,225.2	-1,104.9	-685.7	1,300.4	0.26	0.21	6.11
6,485.0	1.50	193.90	6,319.2	-1,107.3	-686.4	1,302.7	0.07	0.00	-2.77
6,579.0	1.80	188.40	6,413.1	-1,109.9	-686.9	1,305.3	0.36	0.32	-5.85
6,673.0	1.90	198.00	6,507.1	-1,112.9	-687.6	1,308.1	0.35	0.11	10.21
6,767.0	1.60	195.30	6,601.1	-1,115.6	-688.4	1,310.9	0.33	-0.32	-2.87
6,861.0	1.00	187.80	6,695.0	-1,117.7	-688.9	1,312.9	0.66	-0.64	-7.98
6,956.0	1.00	187.00	6,790.0	-1,119.3	-689.1	1,314.4	0.01	0.00	-0.84
7,050.0	1.20	215.30	6,884.0	-1,120.9	-689.8	1,316.2	0.61	0.21	30.11
7,145.0	1.90	241.90	6,979.0	-1,122.5	-691.7	1,318.5	1.04	0.74	28.00
7,239.0	2.40	248.50	7,072.9	-1,124.0	-694.9	1,321.4	0.59	0.53	7.02
7,333.0	3.20	259.20	7,166.8	-1,125.2	-699.3	1,324.8	1.01	0.85	11.38
7,428.0	4.70	249.90	7,261.6	-1,127.0	-705.6	1,329.6	1.71	1.58	-9.79
7,522.0	4.70	250.90	7,355.2	-1,129.6	-712.9	1,335.7	0.09	0.00	1.06
7,616.0	4.40	253.00	7,448.9	-1,131.9	-719.9	1,341.4	0.37	-0.32	2.23
Projection to TD @ 7640'MD / 7472'TVD									
7,640.0	4.30	251.00	7,472.9	-1,132.5	-721.7	1,342.7	0.76	-0.42	-8.33

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
110.0	110.0	-1.0	-1.3	First MWD Survey @ 110.0' MD / TVD
7,640.0	7,472.9	-1,132.5	-721.7	Projection to TD @ 7640'MD / 7472'TVD