



# **Laramie Energy, LLC**

**Mesa County, CO**

**Gunderson 13-11 Pad**

**Gunderson 0994-13-12W**

**Wellbore #1**

**Design: Wellbore #1**

## **QES Survey Report**

**22 March, 2018**





# Survey Report



<b>Company:</b>	Laramie Energy, LLC	<b>Local Co-ordinate Reference:</b>	Well Gunderson 0994-13-12W
<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 0994-13-12W	<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 0994-13-12W					
Well Position	+N/-S	0.0 usft	Northing:	1,533,146.43 usft	Latitude:	39.273903
	+E/-W	0.0 usft	Easting:	2,339,086.61 usft	Longitude:	-107.834890
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	3/6/2018	9.45	65.41	51,321.90000000

<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	353.17	

<b>Survey Program</b>	<b>Date</b>	3/22/2018			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
472.0	7,641.0	QES MWD Surveys (Wellbore #1)	MWD	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 / 471.0' TVD</b>									
472.0	6.40	349.00	471.0	25.9	-5.0	26.3	1.36	1.36	0.00
563.0	7.00	344.00	561.4	36.2	-7.5	36.8	0.92	0.66	-5.49
654.0	7.40	342.50	651.7	47.1	-10.8	48.0	0.49	0.44	-1.65
745.0	7.30	339.60	741.9	58.1	-14.6	59.4	0.42	-0.11	-3.19
836.0	6.80	336.80	832.2	68.5	-18.7	70.2	0.67	-0.55	-3.08
927.0	7.70	357.70	922.5	79.5	-21.1	81.4	3.04	0.99	22.97
1,018.0	7.50	356.90	1,012.7	91.5	-21.7	93.5	0.25	-0.22	-0.88
1,113.0	6.80	354.60	1,107.0	103.3	-22.5	105.3	0.80	-0.74	-2.42
1,207.0	9.20	358.80	1,200.1	116.4	-23.2	118.3	2.63	2.55	4.47



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<b>Site:</b>	Gunderson 13-11 Pad	<b>MD Reference:</b>	well @ 7302.0usft (H&P #522)
<b>Well:</b>	Gunderson 0994-13-12W	<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	9.00	358.50	1,292.9	131.2	-23.6	133.1	0.22	-0.21	-0.32
1,395.0	8.90	359.10	1,385.7	145.9	-23.9	147.7	0.15	-0.11	0.64
1,489.0	8.10	355.20	1,478.7	159.7	-24.5	161.5	1.05	-0.85	-4.15
1,514.0	8.00	355.20	1,503.5	163.2	-24.8	165.0	0.40	-0.40	0.00
1,585.0	7.90	354.40	1,573.8	173.0	-25.7	174.8	0.21	-0.14	-1.13
1,680.0	9.60	356.70	1,667.7	187.4	-26.8	189.3	1.83	1.79	2.42
1,774.0	9.20	356.80	1,760.4	202.7	-27.7	204.6	0.43	-0.43	0.11
1,868.0	8.70	356.80	1,853.3	217.3	-28.5	219.2	0.53	-0.53	0.00
1,963.0	10.70	357.40	1,946.9	233.3	-29.3	235.1	2.11	2.11	0.63
2,057.0	10.40	356.60	2,039.3	250.5	-30.2	252.3	0.36	-0.32	-0.85
2,151.0	10.10	355.20	2,131.8	267.2	-31.4	269.0	0.41	-0.32	-1.49
2,245.0	9.70	355.90	2,224.4	283.3	-32.6	285.2	0.44	-0.43	0.74
2,339.0	9.30	354.10	2,317.1	298.7	-34.0	300.7	0.53	-0.43	-1.91
2,433.0	8.70	353.10	2,410.0	313.4	-35.6	315.4	0.66	-0.64	-1.06
2,527.0	10.00	356.30	2,502.7	328.6	-37.0	330.6	1.49	1.38	3.40
2,621.0	9.70	354.80	2,595.3	344.6	-38.2	346.7	0.42	-0.32	-1.60
2,715.0	9.10	355.40	2,688.1	359.9	-39.6	362.0	0.65	-0.64	0.64
2,810.0	8.80	353.90	2,781.9	374.6	-40.9	376.8	0.40	-0.32	-1.58
2,904.0	10.50	357.80	2,874.6	390.3	-42.0	392.5	1.94	1.81	4.15
2,998.0	10.10	357.80	2,967.1	407.1	-42.7	409.3	0.43	-0.43	0.00
3,092.0	9.70	356.00	3,059.7	423.2	-43.5	425.4	0.54	-0.43	-1.91
3,187.0	9.30	357.10	3,153.4	438.9	-44.5	441.1	0.46	-0.42	1.16
3,281.0	8.60	357.60	3,246.2	453.5	-45.2	455.7	0.75	-0.74	0.53
3,375.0	8.30	357.20	3,339.2	467.3	-45.8	469.4	0.33	-0.32	-0.43
3,469.0	7.60	355.90	3,432.3	480.3	-46.6	482.4	0.77	-0.74	-1.38
3,564.0	10.20	356.30	3,526.1	494.9	-47.6	497.1	2.74	2.74	0.42
3,658.0	9.80	356.40	3,618.7	511.2	-48.6	513.4	0.43	-0.43	0.11
3,752.0	9.30	355.80	3,711.4	526.8	-49.7	529.0	0.54	-0.53	-0.64
3,846.0	8.70	356.00	3,804.3	541.5	-50.7	543.6	0.64	-0.64	0.21
3,941.0	8.20	354.80	3,898.2	555.4	-51.8	557.6	0.56	-0.53	-1.26
4,035.0	7.60	352.30	3,991.3	568.2	-53.3	570.5	0.74	-0.64	-2.66
4,129.0	9.80	352.90	4,084.2	582.3	-55.1	584.7	2.34	2.34	0.64
4,223.0	9.50	352.60	4,176.9	597.9	-57.1	600.5	0.32	-0.32	-0.32
4,317.0	8.80	350.40	4,269.7	612.7	-59.3	615.4	0.83	-0.74	-2.34
4,412.0	9.50	353.30	4,363.5	627.7	-61.4	630.5	0.88	0.74	3.05
4,506.0	9.00	353.10	4,456.3	642.7	-63.2	645.6	0.53	-0.53	-0.21
4,600.0	9.50	357.30	4,549.1	657.7	-64.4	660.7	0.89	0.53	4.47
4,694.0	9.30	356.30	4,641.8	673.1	-65.3	676.0	0.27	-0.21	-1.06
4,789.0	8.20	355.00	4,735.7	687.5	-66.4	690.5	1.18	-1.16	-1.37
4,883.0	7.70	355.30	4,828.8	700.4	-67.5	703.5	0.53	-0.53	0.32
4,977.0	7.90	355.90	4,921.9	713.1	-68.5	716.2	0.23	0.21	0.64
5,071.0	7.20	359.00	5,015.1	725.5	-69.0	728.5	0.86	-0.74	3.30
5,166.0	8.80	2.00	5,109.2	738.7	-68.9	741.6	1.74	1.68	3.16



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<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)
5,260.0	8.50	359.60	5,202.1	752.8	-68.7	755.6	0.50	-0.32	-2.55
5,354.0	7.40	358.40	5,295.2	765.8	-68.9	768.6	1.18	-1.17	-1.28
5,448.0	6.40	358.50	5,388.5	777.1	-69.2	779.8	1.06	-1.06	0.11
5,542.0	5.00	0.00	5,482.1	786.4	-69.3	789.1	1.50	-1.49	1.60
5,636.0	3.90	5.00	5,575.8	793.7	-69.1	796.3	1.24	-1.17	5.32
5,731.0	3.30	4.00	5,670.6	799.7	-68.6	802.1	0.64	-0.63	-1.05
5,825.0	2.50	357.50	5,764.5	804.4	-68.5	806.9	0.92	-0.85	-6.91
5,919.0	2.10	357.90	5,858.4	808.2	-68.6	810.6	0.43	-0.43	0.43
6,013.0	1.70	352.40	5,952.3	811.3	-68.9	813.7	0.47	-0.43	-5.85
6,107.0	1.40	337.90	6,046.3	813.7	-69.5	816.2	0.52	-0.32	-15.43
6,201.0	1.20	332.40	6,140.3	815.7	-70.4	818.3	0.25	-0.21	-5.85
6,296.0	1.10	332.60	6,235.3	817.4	-71.3	820.0	0.11	-0.11	0.21
6,390.0	0.80	321.40	6,329.2	818.7	-72.1	821.4	0.37	-0.32	-11.91
6,484.0	0.80	310.00	6,423.2	819.6	-73.0	822.5	0.17	0.00	-12.13
6,578.0	0.70	265.40	6,517.2	820.0	-74.1	823.0	0.61	-0.11	-47.45
6,672.0	0.60	279.50	6,611.2	820.0	-75.1	823.1	0.20	-0.11	15.00
6,767.0	0.80	289.30	6,706.2	820.3	-76.3	823.6	0.24	0.21	10.32
6,861.0	0.90	289.80	6,800.2	820.8	-77.6	824.2	0.11	0.11	0.53
6,955.0	1.30	292.90	6,894.2	821.5	-79.2	825.0	0.43	0.43	3.30
7,049.0	1.10	273.10	6,988.2	821.9	-81.1	825.7	0.49	-0.21	-21.06
7,143.0	1.10	273.00	7,082.1	822.0	-82.9	826.0	0.00	0.00	-0.11
7,238.0	1.00	241.00	7,177.1	821.7	-84.6	825.9	0.62	-0.11	-33.68
7,332.0	1.60	196.70	7,271.1	820.0	-85.7	824.4	1.20	0.64	-47.13
7,426.0	1.80	207.60	7,365.1	817.4	-86.7	822.0	0.40	0.21	11.60
7,520.0	1.50	212.60	7,459.0	815.1	-88.1	819.8	0.35	-0.32	5.32
7,581.0	1.50	212.60	7,520.0	813.7	-88.9	818.5	0.00	0.00	0.00
Projection to TD @ 7641.0' MD / 7580.0' TVD									
7,641.0	1.50	212.60	7,580.0	812.4	-89.8	817.3	0.00	0.00	0.00

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
472.0	471.0	25.9	-5.0	First MWD Survey @ 472.0' MD / 471.0' TVD
7,641.0	7,580.0	812.4	-89.8	Projection to TD @ 7641.0' MD / 7580.0' TVD

Checked By: _____	Approved By: _____	Date: _____
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