



# **Laramie Energy, LLC**

**Garfield County, CO**

**CC 604-41-32 Pad**

**CC Federal 0697-04-02E**

**Wellbore #1**

**Design: Wellbore #1**

## **QES Survey Report**

**24 June, 2019**





# Survey Report



<b>Company:</b>	Laramie Energy, LLC	<b>Local Co-ordinate Reference:</b>	Well CC Federal 0697-04-02E
<b>Project:</b>	Garfield County, CO	<b>TVD Reference:</b>	Well @ 8639.0usft (H&P #522)
<b>Site:</b>	CC 604-41-32 Pad	<b>MD Reference:</b>	Well @ 8639.0usft (H&P #522)
<b>Well:</b>	CC Federal 0697-04-02E	<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>	Garfield 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		

<b>Site</b>	CC 604-41-32 Pad			
<b>Site Position:</b>		<b>Northing:</b>	1,639,464.67 usft	<b>Latitude:</b> 39.557630
<b>From:</b>	Lat/Long	<b>Easting:</b>	2,233,548.14 usft	<b>Longitude:</b> -108.218770
<b>Position Uncertainty:</b>	0.0 usft	<b>Slot Radius:</b>	13-3/16 "	<b>Grid Convergence:</b> -1.71 °

<b>Well</b>	CC Federal 0697-04-02E			
<b>Well Position</b>	<b>+N/-S</b>	0.0 usft	<b>Northing:</b>	1,639,462.30 usft
	<b>+E/-W</b>	0.0 usft	<b>Easting:</b>	2,233,547.42 usft
<b>Position Uncertainty</b>	0.0 usft		<b>Wellhead Elevation:</b>	usft
			<b>Ground Level:</b>	8,609.0 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>
	HDGM	6/18/2019	9.57	65.80	51,427.30000000

<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	345.59

<b>Survey Program</b>	<b>Date</b>	6/24/2019		
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>
295.0	10,368.0	QES MWD Surveys (Wellbore #1)	MWD	OWSG 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 @ 295.0' MD / 294.9' TVD</b>									
295.0	3.00	353.50	294.9	7.7	-0.9	7.6	1.02	1.02	0.00
386.0	5.40	1.00	385.6	14.3	-1.1	14.1	2.70	2.64	8.24
478.0	8.50	4.20	476.9	25.4	-0.5	24.8	3.39	3.37	3.48
569.0	11.60	0.10	566.5	41.3	0.0	40.0	3.49	3.41	-4.51
661.0	13.50	357.10	656.3	61.3	-0.5	59.5	2.18	2.07	-3.26
752.0	14.80	354.70	744.6	83.5	-2.1	81.4	1.57	1.43	-2.64
844.0	13.10	348.90	833.8	105.4	-5.2	103.4	2.39	-1.85	-6.30
935.0	13.20	339.60	922.5	125.2	-10.8	124.0	2.33	0.11	-10.22
1,027.0	14.70	334.90	1,011.8	145.7	-19.4	145.9	2.04	1.63	-5.11



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<b>Site:</b>	CC 604-41-32 Pad	<b>MD Reference:</b>	Well @ 8639.0usft (H&P #522)
<b>Well:</b>	CC Federal 0697-04-02E	<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)
1,122.0	15.00	333.40	1,103.6	167.6	-30.1	169.8	0.51	0.32	-1.58
1,216.0	12.90	332.80	1,194.8	187.8	-40.3	191.9	2.24	-2.23	-0.64
1,311.0	12.00	337.40	1,287.6	206.3	-48.9	212.0	1.41	-0.95	4.84
1,406.0	12.10	339.40	1,380.5	224.8	-56.2	231.7	0.45	0.11	2.11
1,500.0	12.00	341.20	1,472.4	243.2	-62.9	251.2	0.41	-0.11	1.91
1,595.0	12.70	343.90	1,565.2	262.6	-68.9	271.5	0.96	0.74	2.84
1,690.0	12.20	343.30	1,658.0	282.3	-74.7	292.0	0.54	-0.53	-0.63
1,784.0	11.00	343.60	1,750.1	300.4	-80.1	310.9	1.28	-1.28	0.32
1,879.0	11.20	347.30	1,843.3	318.1	-84.7	329.2	0.78	0.21	3.89
1,974.0	11.50	348.70	1,936.4	336.4	-88.6	347.8	0.43	0.32	1.47
2,068.0	11.00	347.70	2,028.6	354.3	-92.3	366.2	0.57	-0.53	-1.06
2,163.0	8.90	349.60	2,122.2	370.4	-95.6	382.5	2.24	-2.21	2.00
2,258.0	8.40	351.50	2,216.1	384.5	-97.9	396.8	0.61	-0.53	2.00
2,352.0	8.70	351.10	2,309.1	398.3	-100.0	410.7	0.33	0.32	-0.43
2,447.0	7.50	350.20	2,403.1	411.5	-102.2	424.0	1.27	-1.26	-0.95
2,541.0	7.30	348.40	2,496.3	423.4	-104.5	436.1	0.33	-0.21	-1.91
2,549.0	7.40	346.70	2,504.3	424.4	-104.7	437.1	2.99	1.25	-21.25
2,640.0	6.40	339.50	2,594.6	434.9	-107.8	448.0	1.45	-1.10	-7.91
2,735.0	6.90	333.40	2,689.0	444.9	-112.2	458.9	0.91	0.53	-6.42
2,830.0	9.80	341.10	2,782.9	457.7	-117.4	472.5	3.27	3.05	8.11
2,924.0	11.30	346.50	2,875.4	474.2	-122.1	489.7	1.91	1.60	5.74
3,019.0	12.70	347.30	2,968.3	493.5	-126.6	509.4	1.48	1.47	0.84
3,114.0	13.20	346.80	3,060.9	514.2	-131.4	530.7	0.54	0.53	-0.53
3,208.0	13.40	347.90	3,152.3	535.3	-136.1	552.3	0.34	0.21	1.17
3,303.0	13.60	347.70	3,244.7	557.0	-140.8	574.5	0.22	0.21	-0.21
3,398.0	14.30	347.80	3,336.9	579.4	-145.7	597.4	0.74	0.74	0.11
3,492.0	12.30	345.80	3,428.4	600.4	-150.6	619.0	2.18	-2.13	-2.13
3,587.0	14.60	345.80	3,520.8	621.8	-156.0	641.1	2.42	2.42	0.00
3,682.0	16.90	346.10	3,612.2	646.8	-162.2	666.9	2.42	2.42	0.32
3,776.0	15.90	346.00	3,702.4	672.6	-168.6	693.4	1.06	-1.06	-0.11
3,871.0	14.30	346.70	3,794.1	696.6	-174.5	718.2	1.70	-1.68	0.74
3,966.0	13.70	344.10	3,886.3	718.9	-180.3	741.1	0.91	-0.63	-2.74
4,060.0	13.80	343.80	3,977.6	740.4	-186.4	763.5	0.13	0.11	-0.32
4,155.0	13.20	342.90	4,070.0	761.6	-192.8	785.6	0.67	-0.63	-0.95
4,250.0	13.10	343.50	4,162.5	782.3	-199.0	807.2	0.18	-0.11	0.63
4,345.0	12.90	348.20	4,255.0	803.0	-204.3	828.6	1.13	-0.21	4.95
4,439.0	13.70	347.60	4,346.5	824.1	-208.8	850.2	0.86	0.85	-0.64
4,534.0	12.60	346.60	4,439.0	845.2	-213.6	871.8	1.18	-1.16	-1.05
4,629.0	13.10	347.00	4,531.6	865.8	-218.4	892.9	0.53	0.53	0.42
4,723.0	13.90	346.00	4,623.0	887.1	-223.6	914.8	0.89	0.85	-1.06
4,818.0	12.60	345.80	4,715.5	908.2	-228.9	936.6	1.37	-1.37	-0.21
4,913.0	12.10	347.20	4,808.3	928.0	-233.6	956.9	0.61	-0.53	1.47
5,007.0	13.10	345.60	4,900.0	947.9	-238.5	977.4	1.13	1.06	-1.70



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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)	
5,102.0	13.30	346.10	4,992.5	968.9	-243.8	999.1	0.24	0.21	0.53	
5,197.0	12.90	342.70	5,085.1	989.7	-249.5	1,020.6	0.91	-0.42	-3.58	
5,291.0	12.10	334.20	5,176.8	1,008.6	-256.9	1,040.8	2.13	-0.85	-9.04	
5,386.0	11.70	326.30	5,269.8	1,025.5	-266.6	1,059.6	1.76	-0.42	-8.32	
5,480.0	11.40	329.70	5,361.9	1,041.5	-276.6	1,077.6	0.79	-0.32	3.62	
5,575.0	12.40	337.60	5,454.9	1,059.0	-285.2	1,096.7	2.01	1.05	8.32	
5,670.0	14.20	348.80	5,547.3	1,079.9	-291.4	1,118.4	3.30	1.89	11.79	
5,764.0	15.00	351.80	5,638.3	1,103.3	-295.3	1,142.0	1.17	0.85	3.19	
5,859.0	13.80	351.70	5,730.3	1,126.6	-298.7	1,165.5	1.26	-1.26	-0.11	
5,953.0	15.20	353.10	5,821.3	1,150.0	-301.8	1,188.9	1.54	1.49	1.49	
6,048.0	15.30	353.50	5,913.0	1,174.8	-304.7	1,213.7	0.15	0.11	0.42	
6,143.0	14.80	352.70	6,004.7	1,199.3	-307.7	1,238.1	0.57	-0.53	-0.84	
6,238.0	14.80	351.20	6,096.6	1,223.3	-311.1	1,262.2	0.40	0.00	-1.58	
6,332.0	13.60	351.80	6,187.7	1,246.1	-314.5	1,285.2	1.29	-1.28	0.64	
6,427.0	13.80	356.70	6,280.0	1,268.5	-316.8	1,307.4	1.24	0.21	5.16	
6,522.0	12.70	355.20	6,372.5	1,290.2	-318.3	1,328.8	1.21	-1.16	-1.58	
6,616.0	13.10	357.90	6,464.1	1,311.1	-319.5	1,349.4	0.77	0.43	2.87	
6,711.0	13.50	357.50	6,556.5	1,333.0	-320.4	1,370.8	0.43	0.42	-0.42	
6,804.0	13.50	358.20	6,647.0	1,354.7	-321.2	1,392.0	0.18	0.00	0.75	
6,901.0	12.40	356.20	6,741.5	1,376.4	-322.3	1,413.3	1.22	-1.13	-2.06	
6,995.0	12.20	354.80	6,833.3	1,396.3	-323.9	1,433.0	0.38	-0.21	-1.49	
7,090.0	11.30	357.30	6,926.4	1,415.6	-325.2	1,452.0	1.09	-0.95	2.63	
7,184.0	11.60	355.90	7,018.5	1,434.3	-326.3	1,470.3	0.44	0.32	-1.49	
7,279.0	11.20	354.50	7,111.6	1,453.0	-327.9	1,488.8	0.51	-0.42	-1.47	
7,374.0	9.30	351.90	7,205.1	1,469.7	-329.8	1,505.6	2.06	-2.00	-2.74	
7,468.0	8.00	356.40	7,298.0	1,483.8	-331.3	1,519.6	1.56	-1.38	4.79	
7,563.0	7.90	9.00	7,392.1	1,496.8	-330.7	1,532.1	1.83	-0.11	13.26	
7,658.0	7.00	11.50	7,486.3	1,509.0	-328.5	1,543.3	1.01	-0.95	2.63	
7,752.0	4.90	9.30	7,579.8	1,518.5	-326.8	1,552.1	2.25	-2.23	-2.34	
7,847.0	3.80	7.10	7,674.5	1,525.7	-325.7	1,558.7	1.17	-1.16	-2.32	
7,942.0	1.80	5.50	7,769.4	1,530.3	-325.2	1,563.1	2.11	-2.11	-1.68	
8,036.0	1.10	354.70	7,863.4	1,532.6	-325.1	1,565.3	0.80	-0.74	-11.49	
8,131.0	0.90	315.20	7,958.4	1,534.1	-325.7	1,566.9	0.74	-0.21	-41.58	
8,226.0	1.50	276.90	8,053.3	1,534.8	-327.5	1,568.0	1.02	0.63	-40.32	
8,321.0	1.90	239.40	8,148.3	1,534.1	-330.1	1,568.0	1.22	0.42	-39.47	
8,416.0	1.60	224.70	8,243.3	1,532.4	-332.4	1,566.9	0.57	-0.32	-15.47	
8,510.0	0.10	263.90	8,337.2	1,531.4	-333.4	1,566.2	1.62	-1.60	41.70	
8,605.0	0.20	130.50	8,432.2	1,531.3	-333.3	1,566.1	0.29	0.11	-140.42	
8,700.0	0.40	201.10	8,527.2	1,530.9	-333.3	1,565.7	0.40	0.21	74.32	
8,794.0	1.00	238.90	8,621.2	1,530.2	-334.1	1,565.2	0.77	0.64	40.21	
8,889.0	1.50	252.60	8,716.2	1,529.4	-336.0	1,564.9	0.61	0.53	14.42	
8,984.0	2.40	240.30	8,811.2	1,528.0	-339.0	1,564.3	1.04	0.95	-12.95	
9,078.0	1.80	226.60	8,905.1	1,526.0	-341.7	1,563.0	0.83	-0.64	-14.57	



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<b>Design:</b>	Wellbore #1	<b>Database:</b>	EDM 5000.1 Single User Db

Survey										
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9,173.0	1.10	181.60	9,000.1	1,524.1	-342.8	1,561.4	1.35	-0.74	-47.37	
9,268.0	1.40	236.10	9,095.0	1,522.5	-343.8	1,560.2	1.24	0.32	57.37	
9,363.0	2.40	235.30	9,190.0	1,520.7	-346.4	1,559.1	1.05	1.05	-0.84	
9,457.0	3.20	239.80	9,283.9	1,518.3	-350.3	1,557.7	0.88	0.85	4.79	
9,552.0	3.50	240.00	9,378.7	1,515.5	-355.1	1,556.2	0.32	0.32	0.21	
9,646.0	3.80	242.90	9,472.5	1,512.7	-360.4	1,554.8	0.37	0.32	3.09	
9,741.0	3.90	240.90	9,567.3	1,509.7	-366.0	1,553.2	0.18	0.11	-2.11	
9,836.0	4.40	234.40	9,662.1	1,506.0	-371.8	1,551.1	0.72	0.53	-6.84	
9,930.0	5.00	231.60	9,755.7	1,501.3	-377.9	1,548.1	0.68	0.64	-2.98	
10,025.0	6.00	230.70	9,850.3	1,495.6	-385.0	1,544.4	1.06	1.05	-0.95	
10,120.0	6.10	232.90	9,944.8	1,489.4	-392.9	1,540.3	0.27	0.11	2.32	
10,215.0	6.50	232.10	10,039.2	1,483.1	-401.2	1,536.2	0.43	0.42	-0.84	
10,308.0	7.20	231.40	10,131.5	1,476.2	-409.9	1,531.8	0.76	0.75	-0.75	
TD @ 10368.0' MD / 10191.1' TVD										
10,368.0	7.20	231.40	10,191.1	1,471.5	-415.7	1,528.7	0.00	0.00	0.00	

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment	
		+N/-S (usft)	+E/-W (usft)		
295.0	294.9	7.7	-0.9	First MWD Survey @ 295.0' MD / 294.9' TVD	
10,368.0	10,191.1	1,471.5	-415.7	TD @ 10368.0' MD / 10191.1' TVD	

Checked By: _____	Approved By: _____	Date: _____
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