



# **Laramie Energy, LLC**

**Garfield County, CO**

**CC 604-41-32 Pad**

**CC 0697-04-09E**

**Wellbore #1**

**Design: Wellbore #1**

## **QES Survey Report**

**14 May, 2019**





# Survey Report



<b>Company:</b>	Laramie Energy, LLC	<b>Local Co-ordinate Reference:</b>	Well CC 0697-04-09E
<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 0697-04-09E	<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 0697-04-09E			
<b>Well Position</b>	<b>+N/-S</b>	0.0 usft	<b>Northing:</b>	1,639,396.69 usft
	<b>+E/-W</b>	0.0 usft	<b>Easting:</b>	2,233,523.45 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	5/10/2019	9.58	65.80	51,440.10000000

<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	241.13

<b>Survey Program</b>	<b>Date</b>	5/14/2019		
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>
295.0	9,488.0	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	2.20	217.70	294.9	-4.5	-3.5	5.2	0.75	0.75	0.00
386.0	2.80	230.80	385.8	-7.3	-6.3	9.0	0.91	0.66	14.40
539.0	2.50	264.10	538.7	-10.0	-12.5	15.7	1.01	-0.20	21.76
569.0	2.30	258.90	568.7	-10.2	-13.7	16.9	0.98	-0.67	-17.33
661.0	3.00	256.30	660.6	-11.1	-17.9	21.0	0.77	0.76	-2.83
752.0	3.30	262.10	751.4	-12.0	-22.8	25.7	0.48	0.33	6.37
844.0	3.80	258.70	843.2	-13.0	-28.4	31.1	0.59	0.54	-3.70
936.0	4.00	253.90	935.0	-14.5	-34.5	37.2	0.42	0.22	-5.22
1,027.0	4.30	248.10	1,025.8	-16.6	-40.7	43.6	0.57	0.33	-6.37



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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 0697-04-09E	<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	4.20	246.10	1,120.5	-19.3	-47.2	50.6	0.19	-0.11	-2.11
1,217.0	4.20	236.00	1,215.3	-22.7	-53.2	57.6	0.78	0.00	-10.63
1,311.0	4.80	234.60	1,309.0	-26.9	-59.3	64.9	0.65	0.64	-1.49
1,406.0	5.60	234.20	1,403.6	-31.9	-66.3	73.5	0.84	0.84	-0.42
1,500.0	4.50	239.00	1,497.2	-36.5	-73.2	81.7	1.25	-1.17	5.11
1,595.0	4.20	233.20	1,592.0	-40.5	-79.1	88.9	0.56	-0.32	-6.11
1,690.0	4.50	227.60	1,686.7	-45.1	-84.7	95.9	0.55	0.32	-5.89
1,784.0	4.40	232.60	1,780.4	-49.8	-90.3	103.1	0.43	-0.11	5.32
1,879.0	4.00	245.50	1,875.2	-53.4	-96.2	110.0	1.08	-0.42	13.58
1,974.0	3.80	245.30	1,969.9	-56.1	-102.0	116.4	0.21	-0.21	-0.21
2,068.0	3.70	242.20	2,063.7	-58.8	-107.6	122.6	0.24	-0.11	-3.30
2,163.0	2.70	251.90	2,158.6	-60.9	-112.4	127.8	1.19	-1.05	10.21
2,258.0	2.70	238.30	2,253.5	-62.8	-116.4	132.3	0.67	0.00	-14.32
2,352.0	3.80	232.90	2,347.3	-65.8	-120.8	137.6	1.21	1.17	-5.74
2,447.0	3.70	230.40	2,442.1	-69.7	-125.7	143.7	0.20	-0.11	-2.63
2,522.0	3.40	227.70	2,517.0	-72.7	-129.2	148.2	0.46	-0.40	-3.60
2,634.0	2.30	233.90	2,628.8	-76.3	-133.5	153.7	1.02	-0.98	5.54
2,729.0	2.20	228.40	2,723.8	-78.6	-136.4	157.4	0.25	-0.11	-5.79
2,824.0	3.70	243.80	2,818.6	-81.2	-140.5	162.2	1.77	1.58	16.21
2,919.0	3.40	243.50	2,913.5	-83.8	-145.7	168.1	0.32	-0.32	-0.32
3,013.0	3.40	241.90	3,007.3	-86.3	-150.7	173.6	0.10	0.00	-1.70
3,108.0	3.00	237.70	3,102.1	-89.0	-155.3	178.9	0.49	-0.42	-4.42
3,203.0	2.80	251.70	3,197.0	-91.0	-159.6	183.7	0.77	-0.21	14.74
3,297.0	2.40	247.20	3,290.9	-92.5	-163.6	187.9	0.48	-0.43	-4.79
3,392.0	2.70	243.90	3,385.8	-94.3	-167.4	192.1	0.35	0.32	-3.47
3,486.0	2.60	242.80	3,479.7	-96.2	-171.3	196.5	0.12	-0.11	-1.17
3,581.0	3.00	240.60	3,574.6	-98.4	-175.4	201.1	0.44	0.42	-2.32
3,676.0	2.80	246.70	3,669.5	-100.6	-179.7	205.9	0.39	-0.21	6.42
3,771.0	2.50	246.90	3,764.4	-102.3	-183.7	210.3	0.32	-0.32	0.21
3,865.0	3.40	241.50	3,858.3	-104.4	-188.1	215.1	1.00	0.96	-5.74
3,960.0	3.10	238.70	3,953.1	-107.1	-192.7	220.5	0.36	-0.32	-2.95
4,055.0	2.50	234.00	4,048.0	-109.7	-196.6	225.1	0.68	-0.63	-4.95
4,149.0	4.10	245.10	4,141.8	-112.3	-201.3	230.5	1.83	1.70	11.81
4,244.0	4.40	245.90	4,236.6	-115.2	-207.7	237.5	0.32	0.32	0.84
4,339.0	4.30	244.20	4,331.3	-118.2	-214.2	244.7	0.17	-0.11	-1.79
4,434.0	4.40	243.50	4,426.0	-121.4	-220.7	251.9	0.12	0.11	-0.74
4,528.0	3.90	243.30	4,519.8	-124.5	-226.8	258.7	0.53	-0.53	-0.21
4,623.0	3.60	240.40	4,614.6	-127.4	-232.3	264.9	0.37	-0.32	-3.05
4,718.0	3.50	240.60	4,709.4	-130.3	-237.4	270.8	0.11	-0.11	0.21
4,812.0	3.20	242.10	4,803.2	-132.9	-242.2	276.3	0.33	-0.32	1.60
4,907.0	3.20	244.20	4,898.1	-135.3	-246.9	281.6	0.12	0.00	2.21
5,001.0	3.00	237.90	4,992.0	-137.8	-251.4	286.7	0.42	-0.21	-6.70
5,096.0	3.10	242.10	5,086.8	-140.3	-255.8	291.7	0.26	0.11	4.42



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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)	
5,191.0	1.90	249.90	5,181.7	-142.0	-259.5	295.8	1.31	-1.26	8.21	
5,285.0	1.30	253.80	5,275.7	-142.9	-262.0	298.4	0.65	-0.64	4.15	
5,380.0	1.10	268.20	5,370.7	-143.2	-264.0	300.3	0.38	-0.21	15.16	
5,475.0	1.60	251.70	5,465.6	-143.6	-266.1	302.4	0.66	0.53	-17.37	
5,569.0	2.20	243.60	5,559.6	-144.8	-269.0	305.5	0.70	0.64	-8.62	
5,664.0	2.40	241.60	5,654.5	-146.6	-272.4	309.3	0.23	0.21	-2.11	
5,758.0	2.40	242.10	5,748.4	-148.5	-275.8	313.2	0.02	0.00	0.53	
5,853.0	2.20	244.20	5,843.4	-150.2	-279.2	317.0	0.23	-0.21	2.21	
5,948.0	2.10	237.80	5,938.3	-151.9	-282.4	320.6	0.27	-0.11	-6.74	
6,042.0	2.10	235.70	6,032.2	-153.8	-285.2	324.0	0.08	0.00	-2.23	
6,137.0	2.10	243.10	6,127.2	-155.6	-288.2	327.5	0.29	0.00	7.79	
6,232.0	0.80	212.30	6,222.1	-156.9	-290.1	329.8	1.55	-1.37	-32.42	
6,326.0	0.70	214.40	6,316.1	-157.9	-290.8	330.9	0.11	-0.11	2.23	
6,421.0	0.70	245.90	6,411.1	-158.7	-291.7	332.0	0.40	0.00	33.16	
6,516.0	1.50	245.10	6,506.1	-159.4	-293.3	333.8	0.84	0.84	-0.84	
6,611.0	0.40	196.80	6,601.1	-160.3	-294.5	335.3	1.34	-1.16	-50.84	
6,705.0	0.40	164.90	6,695.1	-160.9	-294.6	335.6	0.23	0.00	-33.94	
6,800.0	0.70	192.00	6,790.1	-161.8	-294.6	336.1	0.41	0.32	28.53	
6,895.0	1.30	202.60	6,885.1	-163.3	-295.1	337.3	0.66	0.63	11.16	
6,989.0	1.50	211.80	6,979.0	-165.4	-296.2	339.2	0.32	0.21	9.79	
7,084.0	2.10	213.80	7,074.0	-167.9	-297.8	341.8	0.63	0.63	2.11	
7,179.0	1.10	225.60	7,168.9	-170.0	-299.4	344.3	1.10	-1.05	12.42	
7,273.0	0.10	11.20	7,262.9	-170.5	-300.1	345.1	1.26	-1.06	154.89	
7,368.0	0.00	208.50	7,357.9	-170.4	-300.0	345.0	0.11	-0.11	0.00	
7,462.0	0.60	229.30	7,451.9	-170.7	-300.4	345.5	0.64	0.64	0.00	
7,557.0	1.50	237.00	7,546.9	-171.8	-301.8	347.2	0.96	0.95	8.11	
7,652.0	2.30	246.00	7,641.9	-173.2	-304.6	350.4	0.90	0.84	9.47	
7,746.0	1.40	255.30	7,735.8	-174.3	-307.4	353.4	1.01	-0.96	9.89	
7,841.0	2.10	259.10	7,830.8	-174.9	-310.3	356.2	0.75	0.74	4.00	
7,936.0	1.10	244.00	7,925.7	-175.6	-312.8	358.7	1.13	-1.05	-15.89	
8,031.0	0.70	231.30	8,020.7	-176.4	-314.1	360.2	0.47	-0.42	-13.37	
8,125.0	1.10	233.60	8,114.7	-177.3	-315.3	361.7	0.43	0.43	2.45	
8,220.0	0.70	234.80	8,209.7	-178.1	-316.5	363.1	0.42	-0.42	1.26	
8,315.0	1.60	219.70	8,304.7	-179.5	-317.8	365.0	0.99	0.95	-15.89	
8,410.0	2.10	235.00	8,399.6	-181.5	-320.1	367.9	0.74	0.53	16.11	
8,504.0	2.80	239.20	8,493.5	-183.7	-323.4	371.9	0.77	0.74	4.47	
8,599.0	3.00	235.70	8,588.4	-186.3	-327.5	376.7	0.28	0.21	-3.68	
8,694.0	3.40	232.40	8,683.3	-189.4	-331.8	382.0	0.46	0.42	-3.47	
8,788.0	3.40	244.70	8,777.1	-192.3	-336.5	387.5	0.77	0.00	13.09	
8,883.0	3.30	255.30	8,872.0	-194.2	-341.7	393.0	0.66	-0.11	11.16	
8,978.0	3.80	255.50	8,966.8	-195.7	-347.4	398.7	0.53	0.53	0.21	
9,073.0	4.50	258.40	9,061.5	-197.2	-354.1	405.3	0.77	0.74	3.05	
9,167.0	4.50	248.40	9,155.2	-199.3	-361.1	412.5	0.83	0.00	-10.64	



## Survey Report



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Survey										
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9,262.0	5.00	256.10	9,249.9	-201.7	-368.6	420.2	0.85	0.53	8.11	
9,357.0	5.00	257.00	9,344.5	-203.6	-376.7	428.1	0.08	0.00	0.95	
9,428.0	5.20	257.10	9,415.3	-205.0	-382.8	434.2	0.28	0.28	0.14	
<b>TD @ 9488.0' MD / 9475.0' TVD</b>										
9,488.0	5.20	257.10	9,475.0	-206.2	-388.1	439.4	0.00	0.00	0.00	

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
295.0	294.9	-4.5	-3.5	First MWD Survey @ 295.0' MD / 294.9' TVD	
9,488.0	9,475.0	-206.2	-388.1	TD @ 9488.0' MD / 9475.0' TVD	

Checked By: \_\_\_\_\_ Approved By: \_\_\_\_\_ Date: \_\_\_\_\_