



# **Laramie Energy, LLC**

**Mesa County, CO**

**Nichols 24-06A**

**Nichols 0994-24-02W**

**B-5**

**Design: B-5**

## **QES Survey Report**

**12 January, 2018**





# Survey Report



<b>Company:</b>	Laramie Energy, LLC	<b>Local Co-ordinate Reference:</b>	Well Nichols 0994-24-02W
<b>Project:</b>	Mesa County, CO	<b>TVD Reference:</b>	well @ 7161.0usft (H&P #290)
<b>Site:</b>	Nichols 24-06A	<b>MD Reference:</b>	well @ 7161.0usft (H&P #290)
<b>Well:</b>	Nichols 0994-24-02W	<b>North Reference:</b>	True
<b>Wellbore:</b>	B-5	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	B-5	<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		

<b>Site</b>	Nichols 24-06A				
<b>Site Position:</b>		<b>Northing:</b>	1,529,702.08 usft	<b>Latitude:</b>	39.264528
<b>From:</b>	Lat/Long	<b>Easting:</b>	2,340,203.74 usft	<b>Longitude:</b>	-107.830633
<b>Position Uncertainty:</b>	0.0 usft	<b>Slot Radius:</b>	13-3/16 "	<b>Grid Convergence:</b>	-1.47 °

Well	Nichols 0994-24-02W					
Well Position	+N/-S	0.0 usft	Northing:	1,529,753.11 usft	Latitude:	39.264669
	+E/-W	0.0 usft	Easting:	2,340,216.10 usft	Longitude:	-107.830594
Position Uncertainty		0.0 usft	Wellhead Elevation:	0.0 usft	Ground Level:	7,137.0 usft

<b>Wellbore</b>	B-5				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2015	1/6/2018	9.54	65.42	51,354.22865940

<b>Design</b>	B-5				
<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	316.41	

<b>Survey Program</b>	<b>Date</b>	1/12/2018			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
161.0	7,765.0	QES MWD Surveys (B-5)	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 @ 161.0' MD / 161.0' TVD</b>										
161.0	2.20	279.60	161.0	0.5	-3.0	2.5	1.37	1.37	0.00	
292.0	4.40	296.80	291.7	3.2	-10.0	9.2	1.82	1.68	13.13	
382.0	5.30	303.50	381.4	7.1	-16.6	16.5	1.18	1.00	7.44	
472.0	6.50	324.20	470.9	13.5	-23.0	25.6	2.69	1.33	23.00	
564.0	7.20	322.90	562.3	22.3	-29.5	36.5	0.78	0.76	-1.41	
654.0	8.00	319.80	651.5	31.6	-37.0	48.4	1.00	0.89	-3.44	
744.0	10.30	310.70	740.4	41.6	-47.1	62.6	3.01	2.56	-10.11	
835.0	12.90	311.50	829.5	53.7	-60.9	80.8	2.86	2.86	0.88	
933.0	14.70	314.40	924.7	69.6	-78.0	104.2	1.97	1.84	2.96	



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<b>Site:</b>	Nichols 24-06A	<b>MD Reference:</b>	well @ 7161.0usft (H&P #290)
<b>Well:</b>	Nichols 0994-24-02W	<b>North Reference:</b>	True
<b>Wellbore:</b>	B-5	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	B-5	<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)
1,027.0	17.00	315.60	1,015.1	87.8	-96.1	129.8	2.47	2.45	1.28
1,122.0	19.10	317.60	1,105.4	109.2	-116.3	159.3	2.30	2.21	2.11
1,216.0	20.00	318.00	1,194.0	132.5	-137.4	190.7	0.97	0.96	0.43
1,311.0	22.80	318.60	1,282.4	158.4	-160.5	225.4	2.96	2.95	0.63
1,405.0	24.00	318.80	1,368.7	186.4	-185.1	262.7	1.28	1.28	0.21
1,488.0	23.40	318.70	1,444.7	211.5	-207.1	296.0	0.72	-0.72	-0.12
1,587.0	23.00	317.10	1,535.7	240.4	-233.3	335.0	0.75	-0.40	-1.62
1,681.0	22.40	317.30	1,622.4	267.0	-257.9	371.2	0.64	-0.64	0.21
1,775.0	22.90	316.60	1,709.1	293.5	-282.6	407.4	0.60	0.53	-0.74
1,870.0	22.30	316.50	1,796.9	320.0	-307.7	443.9	0.63	-0.63	-0.11
1,964.0	23.30	317.30	1,883.5	346.6	-332.6	480.4	1.11	1.06	0.85
2,059.0	24.50	318.30	1,970.4	375.1	-358.5	518.8	1.33	1.26	1.05
2,153.0	23.80	317.70	2,056.1	403.7	-384.2	557.3	0.79	-0.74	-0.64
2,248.0	25.00	317.90	2,142.6	432.8	-410.6	596.5	1.27	1.26	0.21
2,342.0	24.20	317.30	2,228.1	461.7	-436.9	635.6	0.89	-0.85	-0.64
2,437.0	23.00	317.30	2,315.2	489.6	-462.7	673.7	1.26	-1.26	0.00
2,531.0	24.50	315.70	2,401.2	517.1	-488.8	711.5	1.74	1.60	-1.70
2,626.0	23.60	315.10	2,488.0	544.6	-516.0	750.2	0.98	-0.95	-0.63
2,721.0	24.40	315.90	2,574.7	572.2	-543.1	788.9	0.91	0.84	0.84
2,815.0	23.80	315.70	2,660.5	599.7	-569.8	827.2	0.64	-0.64	-0.21
2,910.0	25.30	315.60	2,747.0	627.9	-597.4	866.7	1.58	1.58	-0.11
3,005.0	24.80	315.10	2,833.0	656.6	-625.7	906.9	0.57	-0.53	-0.53
3,099.0	24.40	314.20	2,918.5	684.1	-653.5	946.0	0.58	-0.43	-0.96
3,194.0	24.10	313.90	3,005.1	711.2	-681.6	985.0	0.34	-0.32	-0.32
3,289.0	24.70	316.70	3,091.6	739.1	-709.1	1,024.3	1.37	0.63	2.95
3,383.0	24.00	316.50	3,177.3	767.2	-735.8	1,063.0	0.75	-0.74	-0.21
3,478.0	23.40	315.00	3,264.3	794.6	-762.4	1,101.2	0.90	-0.63	-1.58
3,573.0	24.20	317.50	3,351.2	822.3	-788.9	1,139.5	1.36	0.84	2.63
3,667.0	23.80	316.90	3,437.0	850.3	-814.9	1,177.7	0.50	-0.43	-0.64
3,762.0	23.20	316.30	3,524.2	877.9	-840.9	1,215.6	0.68	-0.63	-0.63
3,857.0	24.30	314.50	3,611.1	905.1	-867.8	1,253.9	1.39	1.16	-1.89
3,951.0	24.30	317.10	3,696.8	932.8	-894.7	1,292.6	1.14	0.00	2.77
4,046.0	23.60	316.00	3,783.6	960.8	-921.3	1,331.1	0.87	-0.74	-1.16
4,140.0	24.70	317.30	3,869.4	988.8	-947.6	1,369.6	1.30	1.17	1.38
4,235.0	24.00	315.90	3,955.9	1,017.3	-974.6	1,408.7	0.96	-0.74	-1.47
4,329.0	23.30	316.10	4,042.0	1,044.4	-1,000.7	1,446.4	0.75	-0.74	0.21
4,424.0	23.30	315.50	4,129.3	1,071.3	-1,026.9	1,484.0	0.25	0.00	-0.63
4,519.0	22.70	315.70	4,216.7	1,097.8	-1,052.9	1,521.1	0.64	-0.63	0.21
4,613.0	23.00	316.50	4,303.4	1,124.1	-1,078.2	1,557.6	0.46	0.32	0.85
4,708.0	23.00	315.80	4,390.8	1,150.9	-1,103.9	1,594.8	0.29	0.00	-0.74
4,802.0	22.90	316.00	4,477.4	1,177.2	-1,129.4	1,631.4	0.13	-0.11	0.21
4,897.0	21.40	315.60	4,565.4	1,202.9	-1,154.4	1,667.2	1.59	-1.58	-0.42
4,991.0	20.60	317.50	4,653.1	1,227.4	-1,177.6	1,700.9	1.12	-0.85	2.02



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<b>Wellbore:</b>	B-5	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	B-5	<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)	
5,086.0	19.30	315.00	4,742.4	1,250.8	-1,200.0	1,733.3	1.64	-1.37	-2.63	
5,180.0	18.00	318.70	4,831.5	1,272.7	-1,220.6	1,763.3	1.87	-1.38	3.94	
5,275.0	16.80	322.20	4,922.1	1,294.6	-1,238.7	1,791.7	1.68	-1.26	3.68	
5,369.0	14.30	325.00	5,012.7	1,314.8	-1,253.6	1,816.7	2.78	-2.66	2.98	
5,464.0	11.90	324.80	5,105.2	1,332.4	-1,266.0	1,838.0	2.53	-2.53	-0.21	
5,558.0	10.40	326.00	5,197.4	1,347.4	-1,276.3	1,855.9	1.61	-1.60	1.28	
5,653.0	8.70	323.10	5,291.1	1,360.2	-1,285.5	1,871.5	1.86	-1.79	-3.05	
5,747.0	7.00	319.10	5,384.2	1,370.2	-1,293.5	1,884.3	1.90	-1.81	-4.26	
5,842.0	7.10	333.20	5,478.5	1,379.9	-1,299.9	1,895.7	1.82	0.11	14.84	
5,936.0	6.00	330.20	5,571.9	1,389.3	-1,305.0	1,906.0	1.23	-1.17	-3.19	
6,031.0	4.10	342.30	5,666.5	1,396.8	-1,308.5	1,913.9	2.28	-2.00	12.74	
6,125.0	2.80	8.80	5,760.4	1,402.3	-1,309.1	1,918.3	2.15	-1.38	28.19	
6,220.0	1.90	48.00	5,855.3	1,405.7	-1,307.6	1,919.7	1.88	-0.95	41.26	
6,314.0	1.30	47.20	5,949.3	1,407.4	-1,305.7	1,919.7	0.64	-0.64	-0.85	
6,409.0	0.97	57.80	6,044.2	1,408.6	-1,304.2	1,919.5	0.41	-0.35	11.16	
6,504.0	0.62	73.62	6,139.2	1,409.2	-1,303.0	1,919.1	0.43	-0.37	16.65	
6,598.0	0.35	90.15	6,233.2	1,409.3	-1,302.3	1,918.7	0.32	-0.29	17.59	
6,693.0	0.48	248.35	6,328.2	1,409.2	-1,302.3	1,918.6	0.86	0.14	166.53	
6,787.0	0.66	267.07	6,422.2	1,409.0	-1,303.2	1,919.1	0.27	0.19	19.91	
6,882.0	0.88	246.24	6,517.2	1,408.7	-1,304.5	1,919.7	0.37	0.23	-21.93	
6,976.0	1.19	251.78	6,611.2	1,408.1	-1,306.1	1,920.4	0.35	0.33	5.89	
7,071.0	1.54	244.04	6,706.2	1,407.2	-1,308.1	1,921.2	0.42	0.37	-8.15	
7,166.0	1.85	244.04	6,801.1	1,406.0	-1,310.7	1,922.0	0.33	0.33	0.00	
7,260.0	1.76	244.57	6,895.1	1,404.7	-1,313.3	1,922.9	0.10	-0.10	0.56	
7,355.0	1.71	237.45	6,990.0	1,403.3	-1,315.8	1,923.7	0.23	-0.05	-7.49	
7,450.0	1.54	243.60	7,085.0	1,402.0	-1,318.2	1,924.3	0.26	-0.18	6.47	
7,544.0	1.40	250.70	7,179.0	1,401.0	-1,320.4	1,925.2	0.24	-0.15	7.55	
7,639.0	1.67	254.20	7,273.9	1,400.3	-1,322.8	1,926.3	0.30	0.28	3.68	
7,711.0	1.53	251.40	7,345.9	1,399.7	-1,324.7	1,927.2	0.22	-0.19	-3.89	
Projection to TD @ 7765.0' MD / 7399.9' TVD										
7,765.0	1.53	251.40	7,399.9	1,399.2	-1,326.1	1,927.8	0.00	0.00	0.00	

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment	
		+N/-S (usft)	+E/-W (usft)		
161.0	161.0	0.5	-3.0	First MWD Survey @ 161.0' MD / 161.0' TVD	
7,765.0	7,399.9	1,399.2	-1,326.1	Projection to TD @ 7765.0' MD / 7399.9' TVD	

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