



Charlene Pad: Hendershot/Paige/Eppard/Brook/Bow  
 Bow Unit 3H  
 Plan 8 LP ADJ  
 Patterson 347: 1118' GL + 25' KB @ 1143.0usft  
 Ritchie County WV

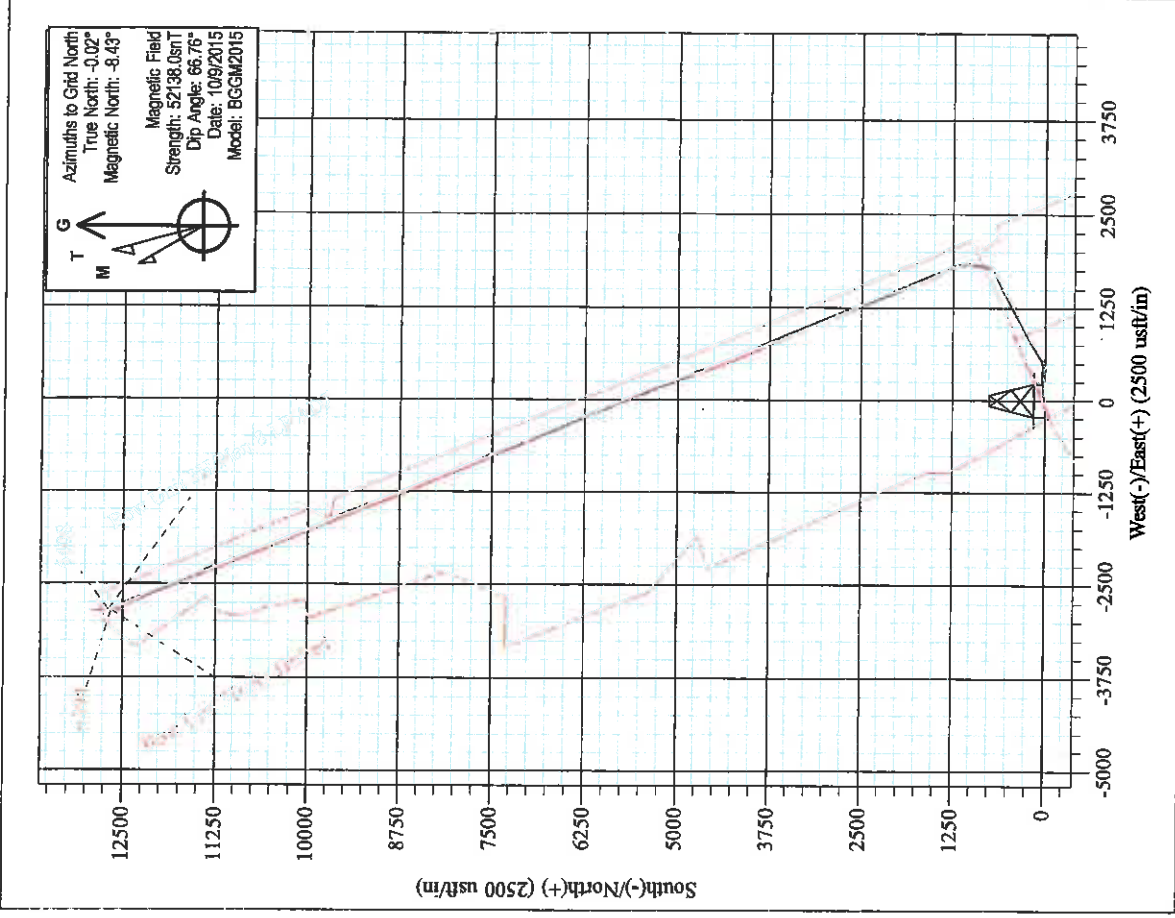
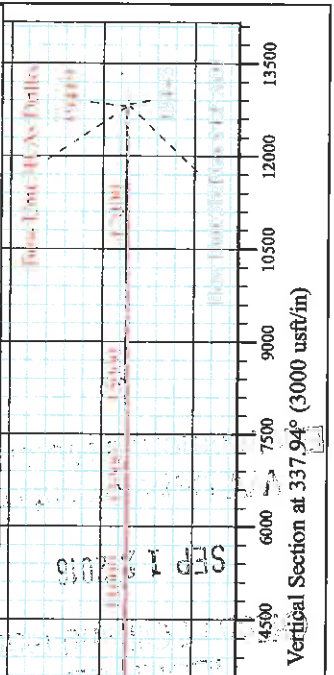
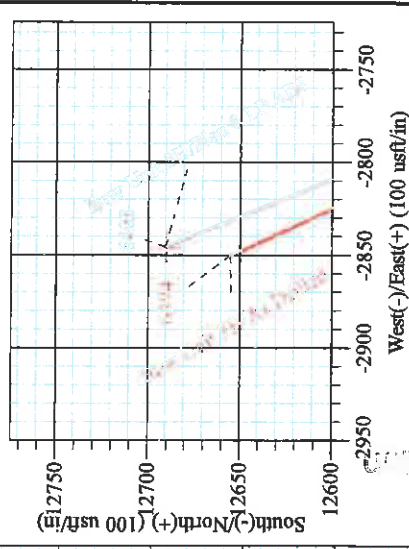
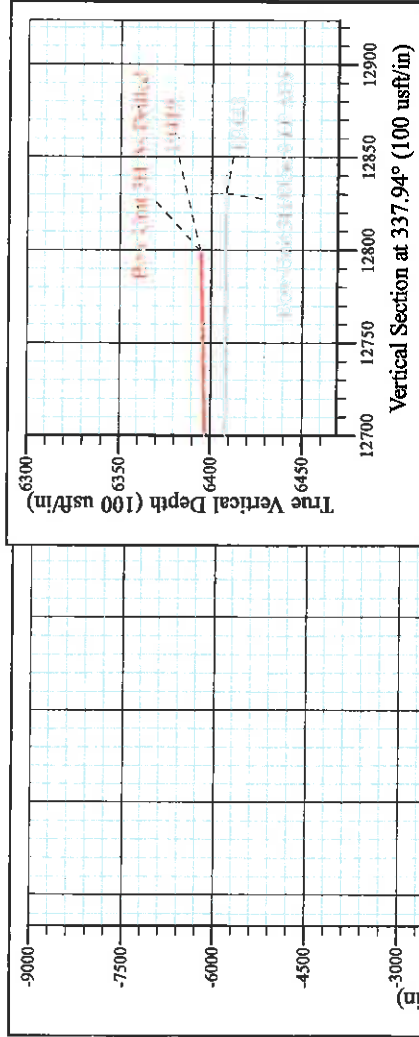
PROJECT DETAILS:  
 Geodetic System: Universal Transverse Mercator (US Survey Feet)  
 Datum: NAD 1927 (NADCON CONUS)  
 Ellipsoid: Clarke 1866  
 Zone: Zone 17N (84 W to 78 W)  
 System Datum: Mean Sea Level

Scientific Drilling



WELL DETAILS: **Bow Unit 3H SHL**

+N/-S	+E/-W	Northing	Latitude	Longitude
0.0	0.0	14271044.41	39° 17' 58.776 N	80° 57' 49.618 W



**Bow Unit 3H**  
**Approx. BHL**  
**39° 20' 3.197 N 80° 58' 25.840 W**

Shane Rhodes  
 13:22, October 23 2015  
 Scientific Drilling International  
 124 Vista Drive  
 Charleroi, PA 15022



# **Antero Resources**

**Ritchie County WV**

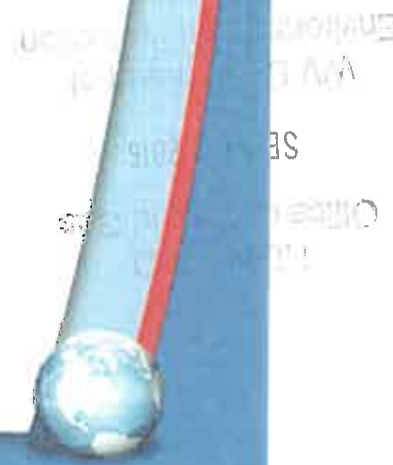
**Charlene Pad: Hendershot/Paige/Eppard/Brook/Bow  
Bow Unit 3H**

**Original Wellpath**

**Design: As Drilled**

## **Standard Survey Report**

**23 October, 2015**





<b>Company:</b>	Antero Resources	<b>Local Co-ordinate Reference:</b>	Well Bow Unit 3H
<b>Project:</b>	Ritchie County WV	<b>TVD Reference:</b>	Patterson 347: 1118' GL + 25' KB @ 1143.0usft
<b>Site:</b>	Charlene Pad: Hendershot/Paige/Eppard/Brook/Bow	<b>MD Reference:</b>	Patterson 347: 1118' GL + 25' KB @ 1143.0usft
<b>Well:</b>	Bow Unit 3H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Wellpath	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	As Drilled	<b>Database:</b>	Antero NE

<b>Project</b>	Ritchie County WV, Ritchie County WV, WV North		
<b>Map System:</b>	Universal Transverse Mercator (US Survey Feet)	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b>	NAD 1927 (NADCON CONUS)		
<b>Map Zone:</b>	Zone 17N (84 W to 78 W)		

<b>Site</b>	Charlene Pad: Hendershot/Paige/Eppard/Brook/Bow, SHL Hendershot Unit 1H				
<b>Site Position:</b>	<b>Northing:</b>	14,270,988.12 usft	<b>Latitude:</b>	39° 17' 58.219 N	
<b>From:</b> Map	<b>Easting:</b>	1,650,704.41 usft	<b>Longitude:</b>	80° 57' 49.084 W	
<b>Position Uncertainty:</b>	0.0 usft	<b>Slot Radius:</b>	13-3/16 "	<b>Grid Convergence:</b>	0.02 °

<b>Well</b>	Bow Unit 3H, Marcellus			
<b>Well Position</b>	<b>+N/-S</b>	0.0 usft	<b>Northing:</b>	14,271,044.41 usft
	<b>+E/-W</b>	0.0 usft	<b>Easting:</b>	1,650,662.48 usft
<b>Position Uncertainty</b>		2.0 usft	<b>Wellhead Elevation:</b>	1,143.0 usft
			<b>Ground Level:</b>	1,118.0 usft

<b>Wellbore</b>	Original Wellpath				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination</b>	<b>Dip Angle</b>	<b>Field Strength</b>
	BGGM2015	10/9/2015	(°)	(°)	(nT)
			-8.41	66.76	52,138

<b>Design</b>	As Drilled				
<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)</b>	<b>+N/-S</b>	<b>+E/-W</b>	<b>Direction</b>	
	(usft)	(usft)	(usft)	(°)	
	0.0	0.0	0.0	337.94	

<b>Survey Program</b>	Date 10/23/2015				
<b>From</b>	<b>To</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
(usft)	(usft)				
112.0	6,131.0	Survey #6 Final Gyro (Original Wellpath)	Standard Keeper 104	Standard Wireline Keeper ver 1.0.4	
6,288.0	19,419.0	Survey #7 MWD (Original Wellpath)	SDI MWD	Scientific Drilling Intl. MWD - Standard ver 1.0.1	

<b>Survey</b>										
<b>Measured</b>	<b>Inclination</b>	<b>Azimuth</b>	<b>Vertical</b>	<b>+N/-S</b>	<b>+E/-W</b>	<b>Vertical</b>	<b>Dogleg</b>	<b>Build</b>	<b>Turn</b>	
<b>Depth</b>	<b>(°)</b>	<b>(°)</b>	<b>Depth</b>	<b>(usft)</b>	<b>(usft)</b>	<b>Section</b>	<b>Rate</b>	<b>Rate</b>	<b>Rate</b>	
<b>(usft)</b>			<b>(usft)</b>			<b>(usft)</b>	<b>(°/100usft)</b>	<b>(°/100usft)</b>	<b>(°/100usft)</b>	
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00	
112.0	0.15	79.80	112.0	0.0	0.1	0.0	0.13	0.13	0.00	
<b>First SDI Gyro @ 100 MD</b>										
137.0	0.05	118.13	137.0	0.0	0.2	0.0	0.46	-0.40	153.32	
162.0	0.08	144.44	162.0	0.0	0.2	-0.1	0.17	0.12	105.24	
187.0	0.07	184.42	187.0	0.0	0.2	-0.1	0.21	-0.04	159.92	
212.0	0.04	151.67	212.0	0.0	0.2	-0.1	0.17	-0.12	-131.00	
237.0	0.07	307.26	237.0	0.0	0.2	-0.1	0.43	0.12	622.36	
262.0	0.07	300.93	262.0	0.0	0.2	-0.1	0.03	0.00	-25.32	



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**Wellbore:** Original Wellpath  
**Design:** As Drilled

**Local Co-ordinate Reference:** Well Bow Unit 3H  
**TVD Reference:** Patterson 347: 1118' GL + 25' KB @ 1143.0usft  
**MD Reference:** Patterson 347: 1118' GL + 25' KB @ 1143.0usft  
**North Reference:** Grid  
**Survey Calculation Method:** Minimum Curvature  
**Database:** Antero NE

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)
287.0	0.07	325.76	287.0	0.0	0.2	-0.1	0.12	0.00	99.32
312.0	0.07	26.19	312.0	0.0	0.2	0.0	0.28	0.00	241.72
337.0	0.11	42.63	337.0	0.1	0.2	0.0	0.19	0.16	65.76
382.0	0.06	17.86	382.0	0.1	0.2	0.0	0.24	-0.20	-99.08
387.0	0.08	103.82	387.0	0.1	0.2	0.0	0.39	0.08	343.84
412.0	0.35	96.75	412.0	0.1	0.3	0.0	1.08	1.08	-28.28
437.0	0.73	87.98	437.0	0.1	0.6	-0.1	1.55	1.52	-35.08
462.0	1.17	84.13	462.0	0.1	1.0	-0.3	1.78	1.76	-15.40
487.0	1.62	88.18	487.0	0.1	1.6	-0.5	1.84	1.80	16.20
512.0	2.14	95.11	512.0	0.1	2.4	-0.8	2.27	2.08	27.72
537.0	2.38	95.48	537.0	0.0	3.4	-1.2	0.98	0.96	1.48
562.0	2.46	98.66	561.9	-0.1	4.4	-1.8	0.63	0.32	12.72
587.0	2.94	100.35	586.9	-0.3	5.6	-2.4	1.95	1.92	6.76
612.0	3.30	99.92	611.9	-0.5	6.9	-3.1	1.44	1.44	-1.72
637.0	3.36	98.79	636.8	-0.8	8.4	-3.9	0.36	0.24	-4.52
662.0	3.66	98.45	661.8	-1.0	9.9	-4.6	1.20	1.20	-1.36
687.0	4.34	98.02	686.7	-1.3	11.6	-5.5	2.72	2.72	-1.72
712.0	4.71	98.66	711.6	-1.5	13.5	-6.5	1.49	1.48	2.56
737.0	4.85	99.14	736.6	-1.9	15.6	-7.6	0.58	0.58	1.92
762.0	5.28	97.49	761.5	-2.2	17.8	-8.7	1.82	1.72	-8.60
787.0	5.62	96.20	786.3	-2.5	20.1	-9.9	1.45	1.36	-5.16
812.0	5.56	95.03	811.2	-2.7	22.8	-11.0	0.52	-0.24	-4.68
837.0	5.76	93.32	836.1	-2.9	25.0	-12.1	1.05	0.80	-6.84
862.0	6.15	86.39	861.0	-2.9	27.6	-13.0	3.27	1.56	-27.72
887.0	6.50	81.86	885.8	-2.6	30.4	-13.8	2.44	1.40	-18.12
912.0	6.75	79.53	910.6	-2.1	33.2	-14.4	1.47	1.00	-9.32
937.0	6.95	78.70	935.5	-1.6	36.1	-15.0	0.89	0.80	-3.32
962.0	7.68	77.09	960.3	-0.9	39.2	-15.6	3.03	2.92	-6.44
987.0	8.14	76.17	985.0	-0.1	42.6	-16.1	1.91	1.84	-3.68
1,012.0	8.42	76.19	1,009.8	0.8	46.1	-16.6	1.12	1.12	0.08
1,037.0	8.85	76.23	1,034.5	1.7	49.7	-17.1	1.72	1.72	0.16
1,062.0	9.74	75.92	1,059.2	2.6	53.8	-17.7	3.57	3.56	1.24
1,087.0	10.33	76.31	1,083.8	3.7	57.9	-18.3	2.38	2.36	1.56
1,112.0	10.64	76.77	1,108.4	4.7	62.3	-19.0	1.28	1.24	1.84
1,137.0	10.78	77.48	1,132.9	5.8	66.8	-19.7	0.77	0.56	2.84
1,162.0	10.87	78.28	1,157.5	6.8	71.4	-20.6	0.70	0.36	3.20
1,187.0	10.96	78.69	1,182.0	7.7	76.1	-21.4	0.48	0.36	1.64
1,212.0	11.09	78.41	1,206.6	8.7	80.7	-22.3	0.56	0.52	-1.12
1,237.0	11.10	79.60	1,231.1	9.6	85.5	-23.2	0.92	0.04	4.76
1,262.0	11.24	80.12	1,255.6	10.4	90.2	-24.2	0.69	0.56	2.08
1,287.0	11.35	80.05	1,280.1	11.3	95.1	-25.3	0.44	0.44	-0.28
1,312.0	11.50	80.42	1,304.6	12.1	99.9	-26.3	0.67	0.60	1.48



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Survey Calculation Method: Minimum Curvature  
Database: Antero NE

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)
1,337.0	11.60	83.04	1,329.1	12.8	104.9	-27.5	2.14	0.40	10.48
1,362.0	11.74	83.23	1,353.6	13.4	109.9	-28.8	0.58	0.56	0.76
1,387.0	11.92	83.38	1,378.1	14.0	115.0	-30.2	0.73	0.72	0.60
1,412.0	11.89	84.68	1,402.5	14.6	120.1	-31.6	1.08	-0.12	5.20
1,437.0	11.84	87.92	1,427.0	14.9	125.3	-33.2	2.67	-0.20	12.96
1,462.0	11.89	88.37	1,451.5	15.1	130.4	-35.0	0.42	0.20	1.80
1,487.0	12.03	88.12	1,475.9	15.2	135.6	-36.8	0.60	0.56	-1.00
1,512.0	12.33	88.19	1,500.4	15.4	140.8	-38.6	1.20	1.20	0.28
1,537.0	12.14	88.60	1,524.8	15.5	146.1	-40.5	0.84	-0.76	1.64
1,562.0	12.90	88.15	1,549.2	15.7	151.6	-42.4	3.06	3.04	-1.80
1,587.0	12.69	88.16	1,573.6	15.9	157.1	-44.3	0.84	-0.84	0.04
1,612.0	12.84	88.23	1,598.0	16.0	162.6	-46.2	0.60	0.60	0.28
1,637.0	13.17	88.24	1,622.3	16.2	168.2	-48.2	1.32	1.32	0.04
1,662.0	13.13	88.30	1,646.7	16.4	173.9	-50.1	0.17	-0.16	0.24
1,687.0	13.33	87.88	1,671.0	16.6	179.6	-52.1	0.89	0.80	-1.68
1,712.0	13.60	87.78	1,695.3	16.8	185.5	-54.1	1.08	1.08	-0.40
1,737.0	13.70	87.61	1,719.6	17.0	191.3	-56.1	0.43	0.40	-0.68
1,762.0	13.94	87.59	1,743.9	17.3	197.3	-58.1	0.96	0.96	-0.08
1,787.0	13.93	87.02	1,768.2	17.6	203.3	-60.1	0.55	-0.04	-2.28
1,812.0	14.03	87.01	1,792.4	17.9	209.4	-62.1	0.40	0.40	-0.04
1,837.0	13.84	86.42	1,816.7	18.2	215.4	-64.0	0.95	-0.76	-2.36
1,862.0	14.17	86.05	1,840.9	18.6	221.4	-65.9	1.37	1.32	-1.48
1,887.0	14.38	86.05	1,865.2	19.1	227.6	-67.8	0.84	0.84	0.00
1,912.0	14.61	85.69	1,889.4	19.5	233.8	-69.7	0.99	0.92	-1.44
1,937.0	14.87	85.77	1,913.6	20.0	240.1	-71.7	1.04	1.04	0.32
1,962.0	14.90	85.38	1,937.7	20.5	246.5	-73.6	0.42	0.12	-1.56
1,987.0	14.86	85.18	1,961.9	21.0	252.9	-75.5	0.26	-0.16	-0.80
2,012.0	15.29	85.26	1,986.0	21.5	259.4	-77.5	1.72	1.72	0.32
2,037.0	15.41	85.42	2,010.1	22.1	266.0	-79.4	0.51	0.48	0.64
2,062.0	15.97	85.90	2,034.2	22.6	272.8	-81.5	2.30	2.24	1.92
2,087.0	16.35	86.50	2,058.2	23.1	279.7	-83.7	1.66	1.52	2.40
2,112.0	16.80	86.87	2,082.2	23.5	286.8	-86.0	1.85	1.80	1.48
2,137.0	17.08	87.59	2,106.1	23.8	294.1	-88.4	1.40	1.12	2.88
2,162.0	17.46	88.03	2,130.0	24.1	301.5	-90.9	1.61	1.52	1.76
2,187.0	17.79	88.56	2,153.8	24.3	309.1	-93.5	1.47	1.32	2.12
2,212.0	18.02	88.71	2,177.6	24.5	316.8	-96.3	0.94	0.92	0.60
2,237.0	17.86	88.51	2,201.4	24.7	324.5	-99.0	0.69	-0.64	-0.80
2,262.0	17.60	87.84	2,225.2	24.9	332.1	-101.6	1.32	-1.04	-2.68
2,287.0	17.68	87.87	2,249.0	25.2	339.6	-104.2	0.32	0.32	0.12
2,312.0	17.57	87.57	2,272.8	25.5	347.2	-106.7	0.57	-0.44	-1.20
2,337.0	17.56	88.44	2,296.6	25.8	354.7	-109.3	1.05	-0.04	3.48
2,362.0	17.48	89.30	2,320.5	25.9	362.3	-112.0	1.08	-0.32	3.44
2,387.0	17.41	91.22	2,344.3	25.9	369.8	-114.9	2.32	-0.28	7.68





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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)
2,412.0	17.04	83.08	2,368.2	25.6	377.2	-117.9	2.65	-1.48	7.44
2,437.0	16.94	93.49	2,392.1	25.2	384.5	-121.0	0.62	-0.40	1.64
2,462.0	16.82	94.03	2,416.1	24.7	391.7	-124.2	0.79	-0.48	2.16
2,487.0	16.85	94.22	2,440.0	24.2	398.9	-127.4	0.25	0.12	0.76
2,512.0	16.85	94.40	2,463.9	23.7	406.1	-130.6	0.21	0.00	0.72
2,537.0	16.75	94.60	2,487.8	23.1	413.3	-133.8	0.46	-0.40	0.80
2,562.0	16.83	94.75	2,511.8	22.5	420.5	-137.1	0.36	0.32	0.60
2,587.0	16.41	94.74	2,535.7	21.9	427.7	-140.3	1.68	-1.68	-0.04
2,612.0	15.94	94.40	2,559.7	21.4	434.6	-143.4	1.92	-1.88	-1.36
2,637.0	15.68	93.31	2,583.8	20.9	441.4	-146.4	1.58	-1.04	-4.36
2,662.0	15.75	92.52	2,607.9	20.6	448.2	-149.3	0.90	0.28	-3.16
2,687.0	16.05	91.35	2,631.9	20.3	455.0	-152.1	1.76	1.20	-4.68
2,712.0	16.61	89.59	2,655.9	20.3	462.0	-154.7	2.99	2.24	-7.04
2,737.0	17.15	88.33	2,679.8	20.4	469.3	-157.3	2.61	2.16	-5.04
2,762.0	17.87	86.49	2,703.7	20.7	476.8	-159.9	3.63	2.88	-7.36
2,787.0	18.48	84.61	2,727.4	21.4	484.6	-162.2	3.38	2.44	-7.52
2,812.0	19.04	83.01	2,751.1	22.2	492.6	-164.4	3.04	2.24	-6.40
2,837.0	19.43	81.63	2,774.7	23.3	500.7	-166.5	2.40	1.56	-5.52
2,862.0	19.98	78.63	2,798.2	24.8	509.0	-168.2	4.60	2.20	-12.00
2,887.0	20.47	75.96	2,821.7	26.7	517.5	-169.6	4.18	1.96	-10.68
2,912.0	21.00	73.38	2,845.1	29.0	526.0	-170.7	4.22	2.12	-10.32
2,937.0	21.28	70.94	2,868.4	31.8	534.6	-171.3	3.69	1.12	-9.76
2,962.0	21.60	68.16	2,891.7	35.0	543.1	-171.6	4.26	1.28	-11.12
2,987.0	21.88	65.15	2,914.9	38.6	551.6	-171.4	4.60	1.12	-12.04
3,012.0	22.15	62.88	2,938.1	42.7	560.1	-170.7	3.57	1.08	-9.08
3,037.0	22.43	61.87	2,961.2	47.1	568.5	-169.8	1.90	1.12	-4.04
3,062.0	22.57	61.17	2,984.3	51.7	576.9	-168.7	1.21	0.56	-2.80
3,087.0	22.92	60.45	3,007.3	56.4	585.3	-167.5	1.79	1.40	-2.88
3,112.0	23.44	59.79	3,030.3	61.3	593.8	-166.2	2.33	2.08	-2.64
3,137.0	23.58	59.56	3,053.2	66.4	602.5	-164.8	0.67	0.56	-0.92
3,162.0	23.42	58.80	3,076.2	71.5	611.0	-163.2	1.37	-0.64	-3.04
3,187.0	23.50	58.66	3,099.1	76.6	619.5	-161.7	0.39	0.32	-0.56
3,212.0	23.92	58.54	3,122.0	81.9	628.1	-160.0	1.69	1.68	-0.48
3,237.0	24.01	58.39	3,144.8	87.2	636.8	-158.4	0.43	0.36	-0.60
3,262.0	24.28	58.41	3,167.7	92.5	645.5	-156.7	1.08	1.08	0.08
3,287.0	24.42	58.38	3,190.4	97.9	654.2	-154.9	0.56	0.56	-0.12
3,312.0	24.46	58.37	3,213.2	103.4	663.1	-153.2	0.16	0.16	-0.04
3,337.0	24.47	58.73	3,235.9	108.8	671.9	-151.5	0.60	0.04	1.44
3,362.0	24.52	59.09	3,258.7	114.1	680.8	-149.9	0.63	0.20	1.44
3,387.0	24.64	59.16	3,281.4	119.5	689.7	-148.3	0.49	0.48	0.28
3,412.0	24.69	59.06	3,304.1	124.8	698.6	-146.7	0.26	0.20	-0.40
3,437.0	24.39	57.97	3,326.9	130.2	707.5	-145.0	2.17	-1.20	-4.36



Scientific Drilling International  
Survey Report



**Company:** Antero Resources  
**Project:** Ritchie County WV  
**Site:** Charlene Pad:  
 Hendershot/Paige/Eppard/Brook/Bow  
**Well:** Bow Unit 3H  
**Wellbore:** Original Wellpath  
**Design:** As Drilled

**Local Co-ordinate Reference:** Well Bow Unit 3H  
**TVD Reference:** Patterson 347: 1118' GL + 25' KB @ 1143.0usft  
**MD Reference:** Patterson 347: 1118' GL + 25' KB @ 1143.0usft  
**North Reference:** Grid  
**Survey Calculation Method:** Minimum Curvature  
**Database:** Antero NE

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)
3,462.0	24.34	57.57	3,349.7	135.7	716.2	-143.2	0.69	-0.20	-1.60
3,487.0	24.05	56.70	3,372.5	141.3	724.8	-141.3	1.84	-1.16	-3.48
3,512.0	23.80	56.06	3,395.3	146.9	733.3	-139.2	1.44	-1.00	-2.56
3,537.0	23.86	55.94	3,418.2	152.6	741.6	-137.2	0.31	0.24	-0.48
3,562.0	23.93	55.49	3,441.0	158.3	750.0	-135.0	0.78	0.28	-1.80
3,587.0	24.04	55.50	3,463.9	164.0	758.4	-132.8	0.44	0.44	0.04
3,612.0	24.16	55.54	3,486.7	169.8	766.8	-130.6	0.48	0.48	0.16
3,637.0	24.27	55.25	3,509.5	175.6	775.2	-128.4	0.65	0.44	-1.16
3,662.0	23.90	54.77	3,532.3	181.5	783.6	-126.1	1.67	-1.48	-1.92
3,687.0	23.78	55.22	3,555.2	187.3	791.9	-123.9	0.87	-0.48	1.80
3,712.0	23.76	57.19	3,578.1	192.9	800.2	-121.8	3.18	-0.08	7.88
3,737.0	23.91	56.38	3,600.9	198.3	808.8	-120.0	2.01	0.60	4.76
3,762.0	24.09	59.25	3,623.8	203.5	817.5	-118.4	1.59	0.72	3.48
3,787.0	24.62	61.10	3,646.6	208.6	826.4	-117.0	3.72	2.12	7.40
3,812.0	25.48	62.72	3,669.2	213.6	835.8	-115.9	4.40	3.44	6.48
3,837.0	25.89	63.54	3,691.7	218.5	845.4	-115.0	2.17	1.64	3.28
3,862.0	26.02	64.23	3,714.2	223.3	855.3	-114.2	1.32	0.52	2.76
3,887.0	26.23	64.64	3,736.7	228.1	865.2	-113.6	1.11	0.84	1.64
3,912.0	26.07	64.69	3,759.1	232.8	875.2	-112.9	0.65	-0.64	0.20
3,937.0	25.56	64.31	3,781.6	237.5	885.0	-112.3	2.14	-2.04	-1.52
3,962.0	25.40	64.14	3,804.2	242.2	894.7	-111.6	0.70	-0.64	-0.68
3,987.0	25.16	64.18	3,826.8	246.8	904.3	-110.9	0.96	-0.96	0.16
4,012.0	24.78	63.57	3,849.4	251.5	913.8	-110.1	1.84	-1.52	-2.44
4,037.0	24.65	63.36	3,872.2	256.1	923.1	-109.3	0.63	-0.52	-0.84
4,062.0	24.43	62.62	3,894.9	260.9	932.4	-108.4	1.51	-0.88	-2.96
4,087.0	24.44	62.14	3,917.7	265.6	941.5	-107.4	0.80	0.04	-1.92
4,112.0	24.09	61.77	3,940.4	270.5	950.6	-106.3	1.53	-1.40	-1.48
4,137.0	23.65	61.39	3,963.3	275.3	959.5	-105.2	1.86	-1.76	-1.52
4,162.0	23.12	61.19	3,986.3	280.1	968.2	-104.1	2.14	-2.12	-0.80
4,187.0	22.72	61.12	4,009.3	284.8	976.7	-102.9	1.60	-1.60	-0.28
4,212.0	22.72	61.64	4,032.3	289.4	985.2	-101.8	0.80	0.00	2.08
4,237.0	22.70	62.40	4,055.4	293.9	993.7	-100.8	1.18	-0.08	3.04
4,262.0	22.83	63.02	4,078.5	298.3	1,002.3	-99.9	1.09	0.52	2.48
4,287.0	22.69	64.24	4,101.5	302.6	1,011.0	-99.2	1.97	-0.56	4.88
4,312.0	22.46	64.44	4,124.6	306.8	1,019.6	-98.6	0.97	-0.92	0.80
4,337.0	21.93	64.34	4,147.7	310.9	1,028.1	-98.0	2.13	-2.12	-0.40
4,362.0	21.48	64.19	4,171.0	314.9	1,036.5	-97.4	1.81	-1.80	-0.60
4,387.0	21.61	64.22	4,194.2	318.9	1,044.7	-96.8	0.52	0.52	0.12
4,412.0	21.70	63.97	4,217.5	322.9	1,053.0	-96.2	0.52	0.36	-1.00
4,437.0	21.80	63.49	4,240.7	327.0	1,061.3	-95.5	0.82	0.40	-1.92
4,462.0	21.82	62.84	4,263.9	331.2	1,069.6	-94.8	0.97	0.08	-2.60
4,487.0	21.89	62.22	4,287.1	335.5	1,077.9	-93.9	0.96	0.28	-2.48
4,512.0	22.13	62.07	4,310.3	339.9	1,086.2	-92.9	0.99	0.96	-0.60



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**Survey Calculation Method:** Minimum Curvature  
**Database:** Antero NE

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)
4,537.0	22.41	61.90	4,333.4	344.3	1,094.5	-92.0	1.15	1.12	-0.68
4,562.0	22.46	61.19	4,356.5	348.9	1,102.9	-90.9	1.10	0.20	-2.84
4,587.0	22.37	60.27	4,379.6	353.5	1,111.2	-89.7	1.45	-0.36	-3.68
4,612.0	22.29	59.54	4,402.8	358.3	1,119.5	-88.4	1.15	-0.32	-2.92
4,637.0	22.42	59.46	4,425.9	363.1	1,127.6	-87.0	0.53	0.52	-0.32
4,662.0	22.03	58.83	4,449.0	368.0	1,135.8	-85.5	1.83	-1.56	-2.52
4,687.0	21.94	58.62	4,472.2	372.8	1,143.8	-84.0	0.48	-0.36	-0.84
4,712.0	22.04	59.05	4,495.4	377.7	1,151.8	-82.6	0.76	0.40	1.72
4,737.0	22.25	60.21	4,518.5	382.4	1,159.9	-81.2	1.94	0.84	4.64
4,762.0	22.46	60.57	4,541.7	387.1	1,168.2	-79.9	1.00	0.84	1.44
4,787.0	22.84	61.27	4,564.7	391.8	1,176.6	-78.8	1.86	1.52	2.80
4,812.0	23.75	62.40	4,587.7	396.5	1,185.3	-77.7	4.06	3.64	4.52
4,837.0	24.70	62.96	4,610.5	401.2	1,194.4	-76.8	3.91	3.80	2.24
4,862.0	25.64	63.44	4,633.1	406.0	1,203.9	-75.9	3.85	3.76	1.92
4,887.0	26.09	63.46	4,655.6	410.9	1,213.7	-75.0	1.80	1.80	0.08
4,912.0	27.20	63.09	4,678.0	415.9	1,223.7	-74.1	4.49	4.44	-1.48
4,937.0	27.64	62.80	4,700.1	421.1	1,233.9	-73.1	1.84	1.76	-1.16
4,962.0	27.84	62.39	4,722.3	426.5	1,244.3	-72.0	1.11	0.80	-1.64
4,987.0	28.06	61.33	4,744.4	432.0	1,254.6	-70.8	2.17	0.88	-4.24
5,012.0	28.52	60.75	4,766.4	437.8	1,265.0	-69.4	2.14	1.84	-2.32
5,037.0	28.81	60.44	4,788.3	443.6	1,275.4	-67.8	1.30	1.16	-1.24
5,062.0	28.50	59.54	4,810.2	449.6	1,285.8	-66.2	2.13	-1.24	-3.60
5,087.0	28.50	59.22	4,832.2	455.7	1,296.1	-64.4	0.61	0.00	-1.28
5,112.0	28.35	58.93	4,854.2	461.8	1,306.3	-62.6	0.82	-0.60	-1.16
5,137.0	28.19	58.75	4,876.2	468.0	1,316.4	-60.7	0.73	-0.64	-0.72
5,162.0	28.10	59.05	4,898.3	474.1	1,326.5	-58.9	0.67	-0.36	1.20
5,187.0	28.08	59.52	4,920.3	480.1	1,336.6	-57.1	0.89	-0.08	1.88
5,212.0	27.91	59.95	4,942.4	486.0	1,346.7	-55.4	1.06	-0.68	1.72
5,237.0	27.74	60.48	4,964.5	491.8	1,356.9	-53.8	1.20	-0.68	2.12
5,262.0	27.76	61.08	4,986.6	497.5	1,367.0	-52.4	1.12	0.08	2.40
5,287.0	27.82	62.42	5,008.7	503.0	1,377.3	-51.1	2.51	0.24	5.36
5,312.0	27.77	62.92	5,030.9	508.3	1,387.7	-50.1	0.95	-0.20	2.00
5,337.0	27.36	63.07	5,053.0	513.6	1,398.0	-49.1	1.66	-1.64	0.60
5,362.0	26.90	63.21	5,075.3	518.7	1,408.1	-48.1	1.86	-1.84	0.56
5,387.0	26.44	63.04	5,097.6	523.8	1,418.1	-47.2	1.87	-1.84	-0.68
5,412.0	26.05	62.77	5,120.0	528.8	1,428.0	-46.2	1.63	-1.56	-1.08
5,437.0	25.75	62.61	5,142.5	533.8	1,437.7	-45.2	1.23	-1.20	-0.64
5,462.0	25.64	62.59	5,165.0	538.8	1,447.3	-44.2	0.44	-0.44	-0.08
5,487.0	26.04	62.57	5,187.5	543.9	1,457.0	-43.2	1.60	1.60	-0.08
5,512.0	26.36	62.74	5,210.0	548.9	1,466.8	-42.2	1.31	1.28	0.68
5,537.0	26.59	63.53	5,232.4	554.0	1,476.7	-41.2	1.68	0.92	3.16
5,562.0	26.81	63.69	5,254.7	559.0	1,486.8	-40.4	0.93	0.88	0.64

WV DEPARTMENT OF ENVIRONMENT & NATURAL RESOURCES  
 STATE GEOLOGICAL SURVEY  
 SEP 1 2015  
 OFFICE





Scientific Drilling International  
Survey Report



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**Site:** Charlene Pad:  
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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)	
5,587.0	26.81	63.95	5,277.0	563.9	1,496.9	-39.6	0.47	0.00	1.04	
5,612.0	26.67	64.50	5,299.3	568.8	1,507.0	-38.8	1.14	-0.56	2.20	
5,637.0	26.47	65.15	5,321.7	573.6	1,517.2	-38.2	1.41	-0.80	2.60	
5,662.0	26.28	65.72	5,344.1	578.2	1,527.3	-37.7	1.27	-0.76	2.28	
5,687.0	26.19	66.18	5,366.5	582.7	1,537.4	-37.4	0.89	-0.36	1.84	
5,712.0	25.81	66.17	5,389.0	587.1	1,547.4	-37.0	1.52	-1.52	-0.04	
5,737.0	25.12	65.51	5,411.6	591.5	1,557.2	-36.6	2.98	-2.76	-2.64	
5,762.0	24.37	64.24	5,434.3	596.0	1,566.7	-36.1	3.68	-3.00	-5.08	
5,787.0	23.69	62.90	5,457.1	600.5	1,575.8	-35.3	3.49	-2.72	-5.36	
5,812.0	23.37	62.16	5,480.0	605.1	1,584.6	-34.4	1.74	-1.28	-2.96	
5,837.0	23.32	61.84	5,503.0	609.7	1,593.4	-33.3	0.55	-0.20	-1.28	
5,862.0	23.29	61.63	5,525.9	614.4	1,602.1	-32.3	0.35	-0.12	-0.84	
5,887.0	22.90	60.69	5,548.9	619.2	1,610.7	-31.1	2.15	-1.56	-3.76	
5,912.0	22.79	60.23	5,572.0	623.9	1,619.1	-29.8	0.84	-0.44	-1.84	
5,937.0	22.99	59.73	5,595.0	628.8	1,627.5	-28.5	1.12	0.80	-2.00	
5,962.0	23.37	60.30	5,618.0	633.7	1,636.1	-27.1	1.77	1.52	2.28	
5,987.0	23.75	61.31	5,640.9	638.6	1,644.8	-25.9	2.22	1.52	4.04	
6,012.0	24.18	62.45	5,663.7	643.4	1,653.7	-24.8	2.53	1.72	4.56	
6,037.0	24.63	63.51	5,686.5	648.1	1,662.9	-23.9	2.51	1.80	4.24	
6,062.0	25.23	64.89	5,709.2	652.7	1,672.4	-23.2	3.34	2.40	5.52	
6,087.0	26.00	65.97	5,731.7	657.2	1,682.3	-22.8	3.60	3.08	4.32	
6,112.0	26.36	66.00	5,754.2	661.6	1,692.3	-22.4	1.44	1.44	0.12	
6,131.0	26.42	65.72	5,771.2	665.1	1,700.0	-22.1	0.73	0.32	-1.47	
<b>Last SDI Gyro @ 6119 MD</b>										
6,288.0	26.17	56.33	5,912.0	698.7	1,760.7	-13.8	2.65	-0.16	-5.96	
<b>First SDI MWD @ 6288 MD</b>										
6,319.0	26.09	54.18	5,939.8	706.5	1,771.9	-10.8	3.07	-0.26	-6.94	
6,351.0	25.48	48.06	5,968.6	715.2	1,782.8	-6.8	8.53	-1.91	-19.13	
6,382.0	25.22	38.19	5,996.7	724.8	1,791.8	-1.2	13.64	-0.84	-31.84	
6,414.0	26.17	27.71	6,025.5	736.4	1,799.3	6.7	14.49	2.97	-32.75	
6,445.0	27.97	21.46	6,053.1	749.3	1,805.2	16.4	10.85	5.81	-20.16	
6,477.0	29.46	17.36	6,081.2	763.8	1,810.3	27.9	7.72	4.66	-12.81	
6,508.0	31.75	15.03	6,107.9	778.9	1,814.6	40.3	8.32	7.39	-7.52	
6,539.0	34.23	13.56	6,133.9	795.3	1,818.8	53.9	8.41	8.00	-4.74	
6,602.0	39.89	9.20	6,184.1	832.5	1,826.2	85.6	9.90	8.98	-6.92	
6,634.0	40.88	8.51	6,208.5	853.0	1,829.4	103.4	3.39	3.09	-2.16	
6,665.0	41.91	8.21	6,231.8	873.2	1,832.4	121.1	3.38	3.32	-0.97	
6,666.0	42.25	8.19	6,234.0	875.2	1,832.7	122.8	11.30	11.29	-0.62	
<b>Middlesex @ 6668 MD</b>										
6,696.0	45.41	8.03	6,254.2	894.4	1,835.4	139.6	11.30	11.29	-0.58	
6,728.0	49.56	7.55	6,275.8	917.8	1,838.6	160.1	13.02	12.97	-1.50	
6,759.0	52.98	7.06	6,295.2	941.8	1,841.7	181.1	11.10	11.03	-1.58	
6,790.0	56.36	6.54	6,313.1	966.9	1,844.6	203.3	10.99	10.90	-1.68	



Scientific Drilling International  
Survey Report



**Company:** Antero Resources  
**Project:** Ritchie County WV  
**Site:** Charlene Pad:  
 Hendershot/Paige/Eppard/Brook/Bow  
**Well:** Bow Unit 3H  
**Wellbore:** Original Wellpath  
**Design:** As Drilled

**Local Co-ordinate Reference:** Well Bow Unit 3H  
**TVD Reference:** Patterson 347: 1118' GL + 25' KB @ 1143.0usft  
**MD Reference:** Patterson 347: 1118' GL + 25' KB @ 1143.0usft  
**North Reference:** Grid  
**Survey Calculation Method:** Minimum Curvature  
**Database:** Antero NE

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)	
6,822.0	60.17	5.26	6,330.0	993.9	1,847.4	227.3	12.38	11.91	-4.00	
6,848.0	63.21	2.84	6,342.3	1,016.8	1,849.0	247.9	14.28	11.69	-9.31	
<b>Burket @ 6848 MD</b>										
6,853.0	63.80	2.39	6,344.5	1,021.2	1,849.2	251.9	14.28	11.79	-9.00	
6,885.0	68.69	358.84	6,357.4	1,050.5	1,849.5	279.0	18.34	15.28	-11.09	
6,916.0	72.92	355.71	6,367.6	1,079.7	1,848.1	306.6	16.65	13.65	-10.10	
<b>Tully @ 6916 MD</b>										
6,947.0	75.69	351.55	6,376.0	1,109.4	1,844.8	335.3	15.71	8.94	-13.42	
6,979.0	78.73	347.77	6,383.1	1,140.1	1,839.2	365.8	14.93	9.50	-11.81	
6,991.0	79.25	346.66	6,385.4	1,151.6	1,836.6	377.5	10.10	4.36	-9.28	
<b>Marcellus @ 6991 MD</b>										
7,010.0	80.09	344.90	6,388.8	1,169.7	1,832.0	396.0	10.10	4.40	-9.24	
7,042.0	80.19	341.51	6,394.3	1,199.9	1,822.9	427.4	10.44	0.31	-10.59	
7,073.0	80.44	340.66	6,399.5	1,228.8	1,813.0	457.9	2.82	0.81	-2.74	
7,104.0	82.29	338.90	6,404.1	1,257.5	1,802.4	488.5	8.19	5.97	-5.68	
7,131.0	85.67	337.60	6,407.0	1,282.5	1,792.5	515.4	13.40	12.52	-4.81	
7,163.0	89.73	336.17	6,408.2	1,311.9	1,779.9	547.3	13.45	12.69	-4.47	
7,257.0	89.73	335.17	6,408.7	1,397.5	1,741.2	641.3	1.06	0.00	-1.06	
7,351.0	89.77	334.55	6,409.1	1,482.6	1,701.3	735.1	0.66	0.04	-0.66	
7,445.0	88.63	337.37	6,410.4	1,568.4	1,663.0	829.0	3.24	-1.21	3.00	
7,539.0	88.69	337.96	6,412.6	1,655.4	1,627.3	923.0	0.63	0.06	0.63	
7,633.0	88.33	337.38	6,415.0	1,742.3	1,591.6	1,017.0	0.73	-0.38	-0.62	
7,727.0	90.13	339.54	6,416.3	1,829.7	1,557.0	1,111.0	2.99	1.91	2.30	
7,821.0	89.20	338.52	6,416.9	1,917.5	1,523.4	1,204.9	1.47	-0.99	-1.09	
7,916.0	90.57	336.77	6,417.0	2,005.9	1,488.8	1,299.9	1.47	1.44	0.26	
8,010.0	90.10	336.07	6,416.5	2,093.4	1,454.2	1,393.9	0.90	-0.50	-0.74	
8,105.0	90.17	339.68	6,416.3	2,182.0	1,420.0	1,488.9	1.70	0.07	1.69	
8,199.0	89.87	336.16	6,416.2	2,269.7	1,386.2	1,582.9	1.65	-0.32	-1.62	
8,293.0	89.36	338.18	6,416.9	2,356.9	1,351.2	1,676.9	0.54	-0.54	0.02	
8,387.0	89.26	336.49	6,418.0	2,444.3	1,316.5	1,770.9	0.35	-0.11	0.33	
8,480.0	88.99	337.96	6,419.4	2,530.6	1,282.1	1,863.9	0.64	-0.29	-0.57	
8,574.0	89.43	337.05	6,420.7	2,617.5	1,246.1	1,957.9	1.08	0.47	-0.97	
8,668.0	89.23	336.88	6,421.8	2,704.0	1,209.3	2,051.8	0.28	-0.21	-0.18	
8,762.0	89.03	337.03	6,423.3	2,790.5	1,172.5	2,145.8	0.27	-0.21	0.16	
8,857.0	89.50	336.00	6,424.5	2,877.6	1,134.7	2,240.8	1.19	0.49	-1.08	
8,951.0	89.46	337.03	6,425.3	2,963.8	1,097.2	2,334.7	1.10	-0.04	1.10	
9,045.0	89.67	335.86	6,426.0	3,050.0	1,059.6	2,428.7	1.26	0.22	-1.24	
9,139.0	89.56	336.10	6,426.7	3,136.5	1,022.9	2,522.7	2.39	-0.12	2.38	
9,233.0	90.03	339.05	6,427.0	3,224.0	988.6	2,616.7	1.13	0.50	1.01	
9,327.0	89.53	337.22	6,427.4	3,311.2	953.5	2,710.7	2.02	-0.53	-1.95	
9,421.0	91.24	339.00	6,426.7	3,398.4	918.5	2,804.7	2.63	1.82	1.89	
9,515.0	91.91	337.50	6,424.1	3,485.7	883.7	2,898.6	1.75	0.71	-1.60	
9,609.0	91.71	338.11	6,421.2	3,572.7	848.2	2,992.6	0.68	-0.21	0.65	



Scientific Drilling International  
Survey Report



<b>Company:</b>	Antero Resources	<b>Local Co-ordinate Reference:</b>	Well Bow Unit 3H
<b>Project:</b>	Ritchie County WV	<b>TVD Reference:</b>	Patterson 347: 1118' GL + 25' KB @ 1143.0usft
<b>Site:</b>	Charlene Pad: Hendershot/Paige/Eppard/Brook/Bow	<b>MD Reference:</b>	Patterson 347: 1118' GL + 25' KB @ 1143.0usft
<b>Well:</b>	Bow Unit 3H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Wellpath	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	As Drilled	<b>Database:</b>	Antero NE

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)
9,703.0	89.97	337.88	6,419.8	3,659.8	813.0	3,086.6	1.87	-1.85	-0.24
9,797.0	89.66	336.88	6,420.1	3,746.6	776.8	3,180.5	1.11	-0.33	-1.06
9,891.0	89.46	336.04	6,420.8	3,832.8	739.3	3,274.5	0.92	-0.21	-0.89
9,985.0	90.13	338.12	6,421.2	3,919.3	702.7	3,368.5	2.32	0.71	2.21
10,079.0	90.57	338.67	6,420.6	4,006.7	668.1	3,462.5	0.75	0.47	0.59
10,174.0	90.57	337.86	6,419.6	4,095.0	632.9	3,557.5	0.85	0.00	-0.85
10,268.0	90.34	334.75	6,418.9	4,181.0	595.1	3,651.4	3.32	-0.24	-3.31
10,362.0	89.60	337.36	6,418.9	4,266.9	557.0	3,745.4	2.89	-0.79	2.78
10,456.0	89.63	336.49	6,419.6	4,353.4	520.1	3,839.4	0.93	0.03	-0.93
10,550.0	88.78	339.02	6,420.9	4,440.4	484.6	3,933.3	2.84	-0.89	2.69
10,644.0	90.74	340.00	6,421.3	4,528.4	451.7	4,027.3	2.32	2.07	1.04
10,739.0	90.81	339.73	6,420.0	4,617.6	419.0	4,122.2	0.29	0.07	-0.28
10,833.0	91.07	337.44	6,418.4	4,705.1	384.6	4,216.2	2.45	0.28	-2.44
10,927.0	89.30	340.34	6,418.1	4,792.8	350.8	4,310.2	3.61	-1.88	3.09
11,021.0	88.86	340.14	6,419.6	4,881.3	319.0	4,404.1	0.51	-0.47	-0.21
11,115.0	89.46	339.17	6,421.0	4,969.4	286.3	4,498.0	1.21	0.64	-1.03
11,210.0	89.29	340.37	6,422.1	5,058.5	253.5	4,593.0	1.28	-0.18	1.26
11,304.0	90.27	340.78	6,422.4	5,147.2	222.2	4,686.9	1.13	1.04	0.44
11,398.0	90.00	339.43	6,422.2	5,235.5	190.2	4,780.8	1.46	-0.29	-1.44
11,492.0	89.83	339.19	6,422.3	5,323.5	157.0	4,874.8	0.31	-0.18	-0.26
11,586.0	90.07	339.59	6,422.4	5,411.5	123.9	4,968.7	0.50	0.26	0.43
11,680.0	89.53	336.68	6,422.7	5,499.3	90.5	5,062.7	1.13	-0.57	-0.97
11,774.0	89.60	338.49	6,423.5	5,586.8	56.1	5,156.7	0.22	0.07	-0.20
11,869.0	89.80	336.71	6,424.0	5,674.6	19.9	5,251.7	1.89	0.21	-1.87
11,963.0	89.93	335.95	6,424.2	5,760.7	-17.8	5,345.7	0.82	0.14	-0.81
12,057.0	90.27	336.72	6,424.0	5,846.8	-55.5	5,439.6	0.90	0.36	0.82
12,151.0	90.37	337.24	6,423.5	5,933.3	-92.3	5,533.6	0.56	0.11	0.55
12,245.0	90.27	337.51	6,423.0	6,020.1	-128.4	5,627.6	0.31	-0.11	0.29
12,339.0	89.26	338.08	6,423.3	6,107.1	-164.0	5,721.6	1.23	-1.07	0.61
12,433.0	89.83	337.87	6,424.1	6,194.3	-199.2	5,815.6	0.65	0.61	-0.22
12,527.0	90.23	338.48	6,424.0	6,281.5	-234.2	5,909.6	0.78	0.43	0.65
12,622.0	89.14	336.14	6,424.6	6,369.2	-270.8	6,004.6	2.72	-1.15	-2.46
12,716.0	87.99	336.20	6,426.9	6,455.1	-308.8	6,098.5	1.23	-1.22	0.06
12,810.0	90.50	336.83	6,428.2	6,541.3	-346.2	6,192.5	2.75	2.67	0.67
12,904.0	90.80	336.46	6,427.1	6,627.6	-383.5	6,286.4	0.51	0.32	-0.39
12,998.0	89.73	337.57	6,426.7	6,714.1	-420.2	6,380.4	1.64	-1.14	1.18
13,091.0	89.97	337.58	6,426.9	6,800.1	-455.7	6,473.4	0.26	0.26	0.01
13,185.0	90.17	336.87	6,426.8	6,886.8	-492.1	6,567.4	0.78	0.21	-0.76
13,279.0	90.50	336.05	6,426.2	6,973.0	-529.6	6,661.4	0.94	0.35	-0.87
13,374.0	89.93	338.23	6,425.9	7,060.5	-566.5	6,756.4	2.37	-0.60	2.29
13,468.0	90.23	336.03	6,425.7	7,147.7	-601.5	6,850.4	0.38	0.32	-0.21
13,562.0	90.47	338.85	6,425.2	7,235.1	-636.1	6,944.4	0.91	0.26	0.87
13,656.0	90.60	336.35	6,424.3	7,322.7	-670.4	7,038.3	0.55	0.14	-0.53



Scientific Drilling International  
Survey Report



**Company:** Antero Resources  
**Project:** Ritchie County WV  
**Site:** Charlene Pad:  
 Hendershot/Paige/Eppard/Brook/Bow  
**Well:** Bow Unit 3H  
**Wellbore:** Original Wellpath  
**Design:** As Drilled

**Local Co-ordinate Reference:** Well Bow Unit 3H  
**TVD Reference:** Patterson 347: 1118' GL + 25' KB @ 1143.0usft  
**MD Reference:** Patterson 347: 1118' GL + 25' KB @ 1143.0usft  
**North Reference:** Grid  
**Survey Calculation Method:** Minimum Curvature  
**Database:** Antero NE

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)
13,750.0	89.30	337.18	6,424.4	7,409.7	-705.9	7,132.3	1.86	-1.38	-1.24
13,844.0	89.83	336.94	6,425.1	7,496.2	-742.6	7,226.3	0.62	0.56	-0.26
13,938.0	90.13	336.09	6,425.1	7,582.4	-780.0	7,320.3	0.96	0.32	-0.90
14,032.0	89.53	334.03	6,425.4	7,667.7	-819.7	7,414.2	2.28	-0.64	-2.19
14,127.0	91.00	337.24	6,425.0	7,754.2	-858.8	7,509.1	3.72	1.55	3.38
14,221.0	90.74	336.28	6,423.5	7,840.6	-895.9	7,603.0	1.06	-0.28	-1.02
14,315.0	90.97	338.09	6,422.1	7,927.2	-932.4	7,697.0	1.94	0.24	1.93
14,409.0	91.81	339.82	6,419.9	8,014.9	-966.1	7,791.0	2.05	0.89	1.84
14,503.0	89.56	339.06	6,418.7	8,102.9	-999.1	7,884.9	2.53	-2.39	-0.81
14,597.0	89.87	338.83	6,419.2	8,190.6	-1,033.0	7,978.9	0.56	0.33	-0.46
14,692.0	90.37	339.12	6,419.0	8,279.2	-1,067.3	8,073.9	0.74	0.53	0.52
14,786.0	90.60	337.78	6,418.2	8,366.6	-1,101.8	8,167.9	1.45	0.24	-1.43
14,880.0	89.73	336.61	6,417.9	8,453.2	-1,138.2	8,261.9	1.55	-0.93	-1.24
14,974.0	91.24	337.26	6,417.1	8,539.7	-1,175.1	8,355.9	1.75	1.61	0.69
15,068.0	90.23	334.84	6,415.9	8,625.6	-1,213.2	8,449.8	2.79	-1.07	-2.57
15,162.0	89.73	337.97	6,416.0	8,711.7	-1,250.8	8,543.8	3.37	-0.53	3.33
15,257.0	91.07	337.82	6,415.3	8,799.8	-1,286.6	8,638.7	1.42	1.41	-0.16
15,350.0	91.04	336.30	6,413.6	8,885.4	-1,322.8	8,731.7	1.63	-0.03	-1.63
15,444.0	90.87	339.64	6,412.2	8,972.5	-1,358.1	8,825.7	3.57	-0.39	3.55
15,538.0	90.70	340.76	6,411.1	9,060.9	-1,389.9	8,919.6	1.19	0.03	1.19
15,632.0	88.59	339.49	6,411.6	9,149.3	-1,421.9	9,013.5	2.62	-2.24	-1.35
15,726.0	88.59	339.05	6,414.0	9,237.2	-1,455.1	9,107.5	0.47	0.00	-0.47
15,820.0	89.56	337.99	6,415.5	9,324.7	-1,489.5	9,201.5	1.53	1.03	-1.13
15,914.0	89.73	337.70	6,416.1	9,411.7	-1,525.0	9,295.5	0.36	0.18	-0.31
16,008.0	90.74	338.43	6,415.7	9,498.9	-1,560.1	9,389.5	1.33	1.07	0.78
16,101.0	91.21	337.89	6,414.1	9,585.2	-1,594.7	9,482.4	0.77	0.51	-0.56
16,195.0	89.16	338.01	6,413.8	9,672.4	-1,630.0	9,576.4	2.18	-2.18	0.13
16,289.0	89.33	337.18	6,415.0	9,759.2	-1,665.8	9,670.4	0.90	0.18	-0.86
16,384.0	90.07	337.91	6,415.5	9,847.0	-1,702.1	9,765.4	1.09	0.78	0.77
16,478.0	89.80	336.07	6,415.6	9,933.6	-1,738.8	9,859.4	1.98	-0.29	-0.96
16,572.0	90.67	336.36	6,415.2	10,020.2	-1,775.2	9,953.4	2.61	0.93	2.44
16,666.0	91.41	338.00	6,413.5	10,107.5	-1,810.2	10,047.4	0.88	0.79	-0.38
16,760.0	91.28	337.12	6,411.3	10,194.3	-1,846.0	10,141.3	0.95	-0.14	-0.94
16,854.0	90.30	337.02	6,410.0	10,280.9	-1,882.7	10,235.3	1.05	-1.04	-0.11
16,948.0	90.27	336.76	6,409.6	10,367.3	-1,919.6	10,329.3	0.28	-0.03	-0.28
17,042.0	89.33	338.04	6,409.9	10,454.1	-1,955.7	10,423.3	1.69	-1.00	1.36
17,136.0	89.40	337.36	6,410.9	10,541.1	-1,991.3	10,517.3	0.73	0.07	-0.72
17,230.0	89.53	339.15	6,411.8	10,628.4	-2,026.2	10,611.3	1.91	0.14	1.90
17,325.0	90.20	339.51	6,412.0	10,717.3	-2,059.7	10,706.3	0.80	0.71	0.38
17,419.0	91.04	338.18	6,411.0	10,804.9	-2,093.6	10,800.2	1.67	0.89	-1.41
17,513.0	90.34	339.04	6,409.9	10,892.5	-2,127.9	10,894.2	1.18	-0.74	0.91
17,607.0	90.57	338.24	6,409.1	10,980.0	-2,162.1	10,988.2	0.89	0.24	-0.85

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 11/11/2015  
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 10/23/2015  
 10:12 AM



**Company:** Antero Resources  
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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)	
17,701.0	90.37	335.69	6,408.4	11,066.5	-2,198.9	11,082.2	2.72	-0.21	-2.71	
17,796.0	89.87	337.03	6,408.2	11,153.5	-2,237.0	11,177.1	1.51	-0.53	1.41	
17,890.0	89.80	340.43	6,408.4	11,241.1	-2,271.1	11,271.1	3.62	-0.07	3.62	
17,984.0	90.30	340.52	6,408.4	11,329.7	-2,302.5	11,365.0	0.54	0.53	0.10	
18,078.0	91.38	340.03	6,407.0	11,418.2	-2,334.2	11,458.9	1.26	1.15	-0.52	
18,172.0	89.53	339.67	6,406.2	11,506.4	-2,366.6	11,552.9	2.00	-1.97	-0.38	
18,266.0	89.93	338.61	6,406.7	11,594.2	-2,400.1	11,646.9	1.21	0.43	-1.13	
18,360.0	90.74	338.24	6,406.1	11,681.8	-2,434.7	11,740.8	0.95	0.86	-0.39	
18,454.0	89.33	338.43	6,406.1	11,769.0	-2,469.4	11,834.8	1.51	-1.50	0.20	
18,548.0	90.03	338.29	6,406.6	11,856.4	-2,504.0	11,928.8	0.76	0.74	-0.15	
18,642.0	90.64	337.27	6,406.0	11,943.4	-2,539.6	12,022.8	1.26	0.65	-1.09	
18,736.0	89.70	337.80	6,405.8	12,030.3	-2,575.5	12,116.8	1.15	-1.00	0.56	
18,830.0	89.97	336.96	6,406.0	12,117.0	-2,611.6	12,210.8	0.94	0.29	-0.89	
18,925.0	90.47	336.55	6,405.7	12,204.3	-2,649.1	12,305.8	0.68	0.53	-0.43	
19,019.0	90.90	336.67	6,404.6	12,290.6	-2,686.4	12,399.8	0.47	0.46	0.13	
19,112.0	91.44	336.71	6,402.7	12,376.0	-2,723.2	12,492.7	0.58	0.58	0.04	
19,207.0	91.85	335.60	6,399.9	12,462.8	-2,761.6	12,587.6	1.25	0.43	-1.17	
19,302.0	91.41	335.24	6,397.2	12,549.2	-2,801.1	12,682.5	0.60	-0.46	-0.38	
19,361.0	91.51	335.29	6,395.7	12,602.8	-2,825.8	12,741.4	0.19	0.17	0.08	
<b>Last SDI MWD @ 19361 MD</b>										
19,419.0	91.45	335.12	6,394.2	12,655.4	-2,850.1	12,799.3	0.31	-0.10	-0.29	
<b>Projection To Bit @ 19419 MD / 6394 TVD</b>										

**Formations**

Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
6,668.0	6,234.0	Middlesex @ 6668 MD		0.00	
6,848.0	6,342.3	Burket @ 6848 MD		0.00	
6,916.0	6,367.6	Tully @ 6916 MD		0.00	
6,991.0	6,385.4	Marcellus @ 6991 MD		0.00	

**Design Annotations**

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N-S (usft)	+E-W (usft)	
112.0	112.0	0.0	0.1	First SDI Gyro @ 100 MD
6,131.0	5,771.2	665.1	1,700.0	Last SDI Gyro @ 6119 MD
6,288.0	5,912.0	698.7	1,760.7	First SDI MWD @ 6288 MD
19,361.0	6,395.7	12,602.8	-2,825.8	Last SDI MWD @ 19361 MD
19,419.0	6,394.2	12,655.4	-2,850.1	Projection To Bit @ 19419 MD / 6394 TVD





Scientific Drilling International  
Survey Report



**Company:** Antero Resources  
**Project:** Ritchie County WV  
**Site:** Charlene Pad:  
Hendershot/Paige/Eppard/Brook/Bow  
**Well:** Bow Unit 3H  
**Wellbore:** Original Wellpath  
**Design:** As Drilled

**Local Co-ordinate Reference:** Well Bow Unit 3H  
**TVD Reference:** Patterson 347: 1118' GL + 25' KB @ 1143.0usft  
**MD Reference:** Patterson 347: 1118' GL + 25' KB @ 1143.0usft  
**North Reference:** Grid  
**Survey Calculation Method:** Minimum Curvature  
**Database:** Antero NE

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

Environmental Protection  
WV Department of  
SEP 12 2016  
Office of Environmental  
Protection