



Dale Pad: Johnston/Jug/Rymer/Sage
 Rymer Unit 4HD
 Plan 8 LP ADJ
 Frontier 32: GL 1017' + KB 32' @ 1049.0usft
 Tyler County WV

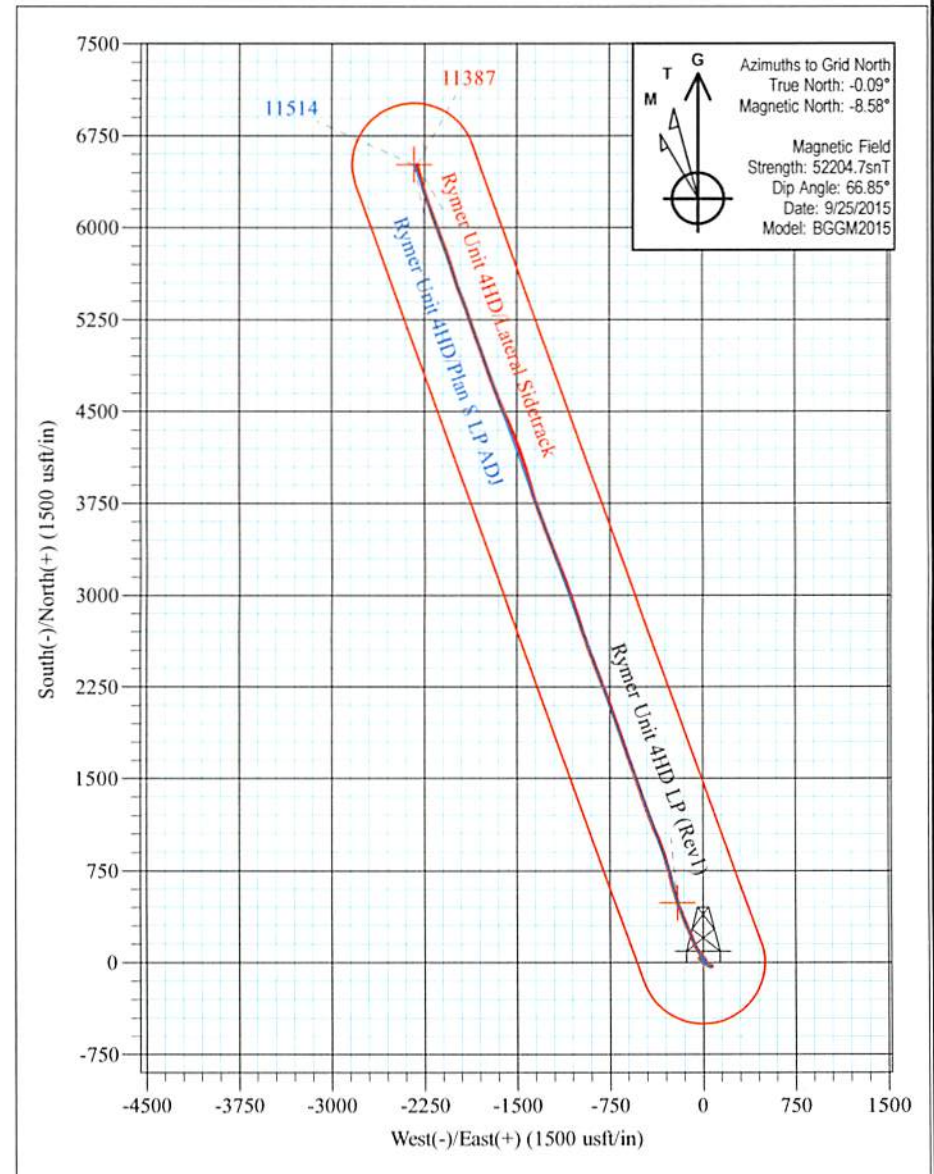
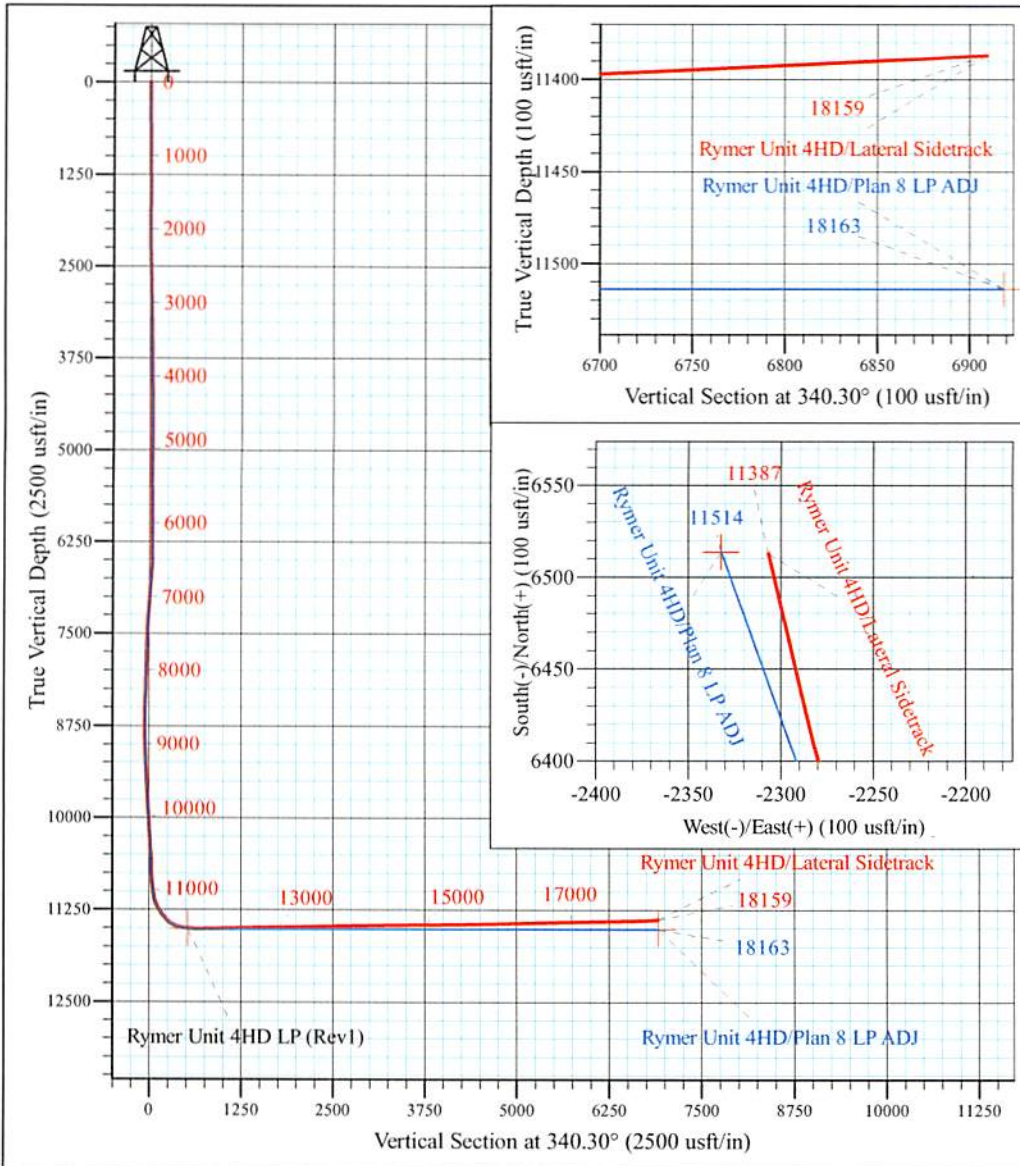
PROJECT DETAILS:
 Geodetic System: Universal Transverse Mercator (US Survey Feet)
 Datum: NAD 1927 (NADCON CONUS)
 Ellipsoid: Clarke 1866
 Zone: 17N (84 W to 78 W)
 System Datum: Mean Sea Level

CONFIDENTIAL



WELL DETAILS: **Rymer Unit 4HD SHL**

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
0.0	0.0	14319219.57	1679131.09	39° 25' 54.840 N	80° 51' 46.413 W



Rymer Unit 4HD
Approx. BHL
 39° 26' 59.270 N 80° 52' 15.704 W

Shane Rhodes
 13:36, October 28 2015
 Scientific Drilling International
 124 Vista Drive
 Charleroi, PA 15022

CONFIDENTIAL



Antero Resources

Tyler County WV
Dale Pad: Johnston/Jug/Rymer/Sage
Rymer Unit 4HD

Lateral Sidetrack

Design: Lateral Sidetrack

Standard Survey Report

28 October, 2015



www.scientificdrilling.com



Company:	Antero Resources	Local Co-ordinate Reference:	Well Rymer Unit 4HD
Project:	Tyler County WV	TVD Reference:	Frontier 32: GL 1017' + KB 32' @ 1049.0usft
Site:	Dale Pad: Johnston/Jug/Rymer/Sage	MD Reference:	Frontier 32: GL 1017' + KB 32' @ 1049.0usft
Well:	Rymer Unit 4HD	North Reference:	Grid
Wellbore:	Lateral Sidetrack	Survey Calculation Method:	Minimum Curvature
Design:	Lateral Sidetrack	Database:	Antero NE

Project	Tyler County WV, Tyler Co West Virginia		
Map System:	Universal Transverse Mercator (US Survey Feet)	System Datum:	Mean Sea Level
Geo Datum:	NAD 1927 (NADCON CONUS)		
Map Zone:	Zone 17N (84 W to 78 W)		

Site	Dale Pad: Johnston/Jug/Rymer/Sage				
Site Position:		Northing:	14,319,219.57 usft	Latitude:	39° 25' 54.840 N
From:	Map	Easting:	1,679,131.09 usft	Longitude:	80° 51' 46.413 W
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.09 °

Well	Rymer Unit 4HD, Deep Well					
Well Position	+N/-S	0.0 usft	Northing:	14,319,219.57 usft	Latitude:	39° 25' 54.840 N
	+E/-W	0.0 usft	Easting:	1,679,131.09 usft	Longitude:	80° 51' 46.413 W
Position Uncertainty	2.0 usft		Wellhead Elevation:	1,049.0 usft	Ground Level:	1,017.0 usft

Wellbore	Lateral Sidetrack				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	BGGM2015	9/25/2015	-8.49	66.85	52,205

Design	Lateral Sidetrack				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	10,720.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.0	0.0	0.0	340.30	

Survey Program	Date	10/28/2015			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
25.0	2,454.0	Survey #1 SDI Gyro (Original Wellpath)	Standard Keeper 104	Standard Wireline Keeper ver 1.0.4	
2,565.0	6,432.0	Survey #2 Extreme MWD (Original Wellpa	Other MWD	MWD Other Company	
6,482.0	10,720.0	Survey #3 SDI MWD (ST1)	SDI MWD	Scientific Drilling Intl. MWD - Standard ver 1.0.1	
10,855.0	18,159.0	Survey #1 MWD Surveys (Lateral Sidetrac	SDI MWD	Scientific Drilling Intl. MWD - Standard ver 1.0.1	

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)
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
25.0	0.04	259.30	25.0	0.0	0.0	0.0	0.16	0.16	0.00
50.0	0.07	259.30	50.0	0.0	0.0	0.0	0.12	0.12	0.00
75.0	0.11	259.30	75.0	0.0	-0.1	0.0	0.16	0.16	0.00
100.0	0.14	259.30	100.0	0.0	-0.1	0.0	0.12	0.12	0.00
125.0	0.17	255.67	125.0	0.0	-0.2	0.0	0.13	0.12	-14.52
150.0	0.18	270.03	150.0	0.0	-0.3	0.0	0.18	0.04	57.44
175.0	0.23	278.64	175.0	0.0	-0.4	0.1	0.23	0.20	34.44



Company:	Antero Resources	Local Co-ordinate Reference:	Well Rymer Unit 4HD
Project:	Tyler County WV	TVD Reference:	Frontier 32: GL 1017' + KB 32' @ 1049.0usft
Site:	Dale Pad: Johnston/Jug/Rymer/Sage	MD Reference:	Frontier 32: GL 1017' + KB 32' @ 1049.0usft
Well:	Rymer Unit 4HD	North Reference:	Grid
Wellbore:	Lateral Sidetrack	Survey Calculation Method:	Minimum Curvature
Design:	Lateral Sidetrack	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)	
200.0	0.22	288.51	200.0	0.0	-0.4	0.1	0.16	-0.04	39.48	
225.0	0.32	279.48	225.0	0.0	-0.6	0.2	0.43	0.40	-36.12	
250.0	0.34	269.81	250.0	0.0	-0.7	0.3	0.24	0.08	-38.68	
275.0	0.38	272.21	275.0	0.0	-0.9	0.3	0.17	0.16	9.60	
300.0	0.34	292.49	300.0	0.1	-1.0	0.4	0.53	-0.16	81.12	
325.0	0.38	285.27	325.0	0.1	-1.2	0.5	0.24	0.16	-28.88	
350.0	0.44	291.37	350.0	0.2	-1.3	0.6	0.30	0.24	24.40	
375.0	0.37	290.09	375.0	0.2	-1.5	0.7	0.28	-0.28	-5.12	
400.0	0.40	299.51	400.0	0.3	-1.7	0.8	0.28	0.12	37.68	
425.0	0.45	311.26	425.0	0.4	-1.8	1.0	0.40	0.20	47.00	
450.0	0.46	317.28	450.0	0.5	-1.9	1.2	0.20	0.04	24.08	
475.0	0.55	320.47	475.0	0.7	-2.1	1.4	0.38	0.36	12.76	
500.0	0.51	322.93	500.0	0.9	-2.2	1.6	0.18	-0.16	9.84	
525.0	0.45	328.39	525.0	1.1	-2.3	1.8	0.30	-0.24	21.84	
550.0	0.52	328.18	550.0	1.2	-2.5	2.0	0.28	0.28	-0.84	
575.0	0.49	329.92	575.0	1.4	-2.6	2.2	0.13	-0.12	6.96	
600.0	0.41	333.27	600.0	1.6	-2.7	2.4	0.34	-0.32	13.40	
625.0	0.40	345.13	625.0	1.8	-2.7	2.6	0.34	-0.04	47.44	
650.0	0.54	339.78	650.0	2.0	-2.8	2.8	0.59	0.56	-21.40	
675.0	0.50	349.51	675.0	2.2	-2.9	3.0	0.39	-0.16	38.92	
700.0	0.60	348.98	700.0	2.4	-2.9	3.3	0.40	0.40	-2.12	
725.0	0.56	356.79	725.0	2.7	-2.9	3.5	0.35	-0.16	31.24	
750.0	0.53	1.58	750.0	2.9	-2.9	3.7	0.22	-0.12	19.16	
775.0	0.42	9.00	775.0	3.1	-2.9	3.9	0.50	-0.44	29.68	
800.0	0.48	12.47	800.0	3.3	-2.9	4.1	0.26	0.24	13.88	
825.0	0.49	19.70	825.0	3.5	-2.8	4.3	0.25	0.04	28.92	
850.0	0.56	27.46	850.0	3.7	-2.7	4.4	0.40	0.28	31.04	
875.0	0.58	35.67	875.0	3.9	-2.6	4.6	0.34	0.08	32.84	
900.0	0.72	33.38	900.0	4.2	-2.4	4.7	0.57	0.56	-9.16	
925.0	0.87	30.73	925.0	4.5	-2.3	5.0	0.62	0.60	-10.60	
950.0	0.88	37.37	950.0	4.8	-2.0	5.2	0.41	0.04	26.56	
975.0	1.09	35.32	975.0	5.1	-1.8	5.4	0.85	0.84	-8.20	
1,000.0	1.20	36.05	1,000.0	5.5	-1.5	5.7	0.44	0.44	2.92	
1,025.0	1.28	37.52	1,025.0	6.0	-1.2	6.0	0.34	0.32	5.88	
1,050.0	1.47	40.36	1,049.9	6.4	-0.8	6.3	0.81	0.76	11.36	
1,075.0	1.51	41.52	1,074.9	6.9	-0.4	6.6	0.20	0.16	4.64	
1,100.0	1.40	42.35	1,099.9	7.4	0.1	6.9	0.45	-0.44	3.32	
1,125.0	1.50	42.21	1,124.9	7.9	0.5	7.2	0.40	0.40	-0.56	
1,150.0	1.42	45.78	1,149.9	8.3	0.9	7.5	0.48	-0.32	14.28	
1,175.0	1.38	49.10	1,174.9	8.7	1.4	7.8	0.36	-0.16	13.28	
1,200.0	1.28	53.54	1,199.9	9.1	1.8	7.9	0.57	-0.40	17.76	
1,225.0	1.16	50.19	1,224.9	9.4	2.2	8.1	0.56	-0.48	-13.40	
1,250.0	1.19	43.57	1,249.9	9.8	2.6	8.3	0.56	0.12	-26.48	



Company:	Antero Resources	Local Co-ordinate Reference:	Well Rymer Unit 4HD
Project:	Tyler County WV	TVD Reference:	Frontier 32: GL 1017' + KB 32' @ 1049.0usft
Site:	Dale Pad: Johnston/Jug/Rymer/Sage	MD Reference:	Frontier 32: GL 1017' + KB 32' @ 1049.0usft
Well:	Rymer Unit 4HD	North Reference:	Grid
Wellbore:	Lateral Sidetrack	Survey Calculation Method:	Minimum Curvature
Design:	Lateral Sidetrack	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)	
1,275.0	1.15	51.52	1,274.9	10.1	3.0	8.5	0.67	-0.16	31.80	
1,300.0	0.93	59.82	1,299.9	10.4	3.4	8.6	1.06	-0.88	33.20	
1,325.0	0.96	48.20	1,324.9	10.6	3.7	8.7	0.77	0.12	-46.48	
1,350.0	0.84	56.19	1,349.9	10.9	4.0	8.9	0.69	-0.48	31.96	
1,375.0	0.70	60.42	1,374.9	11.0	4.3	8.9	0.60	-0.56	16.92	
1,400.0	0.72	61.95	1,399.9	11.2	4.6	9.0	0.11	0.08	6.12	
1,425.0	0.71	65.11	1,424.9	11.3	4.8	9.0	0.16	-0.04	12.64	
1,450.0	0.59	67.98	1,449.9	11.4	5.1	9.0	0.50	-0.48	11.48	
1,475.0	0.56	71.95	1,474.9	11.5	5.3	9.0	0.20	-0.12	15.88	
1,500.0	0.65	70.05	1,499.9	11.6	5.6	9.0	0.37	0.36	-7.60	
1,525.0	0.45	55.25	1,524.9	11.7	5.8	9.1	0.97	-0.80	-59.20	
1,550.0	0.35	63.84	1,549.9	11.8	5.9	9.1	0.47	-0.40	34.36	
1,575.0	0.27	75.17	1,574.9	11.8	6.1	9.1	0.40	-0.32	45.32	
1,600.0	0.11	96.82	1,599.9	11.9	6.2	9.1	0.69	-0.64	86.60	
1,625.0	0.13	177.87	1,624.9	11.8	6.2	9.1	0.63	0.08	324.20	
1,650.0	0.23	211.61	1,649.9	11.8	6.2	9.0	0.57	0.40	134.96	
1,675.0	0.20	186.15	1,674.9	11.7	6.1	8.9	0.40	-0.12	-101.84	
1,700.0	0.23	167.50	1,699.9	11.6	6.1	8.8	0.30	0.12	-74.60	
1,725.0	0.13	183.94	1,724.9	11.5	6.1	8.8	0.45	-0.40	65.76	
1,750.0	0.26	189.91	1,749.9	11.4	6.1	8.7	0.53	0.52	23.88	
1,775.0	0.34	141.93	1,774.9	11.3	6.2	8.6	1.02	0.32	-191.92	
1,800.0	0.25	165.28	1,799.9	11.2	6.2	8.4	0.59	-0.36	93.40	
1,825.0	0.23	147.96	1,824.9	11.1	6.3	8.3	0.30	-0.08	-69.28	
1,850.0	0.25	176.30	1,849.9	11.0	6.3	8.2	0.48	0.08	113.36	
1,875.0	0.21	193.02	1,874.9	10.9	6.3	8.1	0.31	-0.16	66.88	
1,900.0	0.22	164.30	1,899.9	10.8	6.3	8.1	0.43	0.04	-114.88	
1,925.0	0.17	190.51	1,924.9	10.7	6.3	8.0	0.40	-0.20	104.84	
1,950.0	0.27	145.82	1,949.9	10.6	6.3	7.9	0.76	0.40	-178.76	
1,975.0	0.16	146.55	1,974.9	10.6	6.4	7.8	0.44	-0.44	2.92	
2,000.0	0.38	150.14	1,999.9	10.5	6.4	7.7	0.88	0.88	14.36	
2,025.0	0.14	145.92	2,024.9	10.4	6.5	7.6	0.96	-0.96	-16.88	
2,050.0	0.35	109.92	2,049.9	10.3	6.6	7.5	1.00	0.84	-144.00	
2,075.0	0.23	103.89	2,074.9	10.3	6.7	7.4	0.49	-0.48	-24.12	
2,100.0	0.18	101.91	2,099.9	10.3	6.8	7.4	0.20	-0.20	-7.92	
2,125.0	0.30	98.20	2,124.9	10.2	6.9	7.3	0.48	0.48	-14.84	
2,150.0	0.15	98.62	2,149.9	10.2	7.0	7.3	0.60	-0.60	1.68	
2,175.0	0.15	84.36	2,174.9	10.2	7.1	7.2	0.15	0.00	-57.04	
2,200.0	0.23	32.09	2,199.9	10.3	7.1	7.3	0.73	0.32	-209.08	
2,225.0	0.26	33.48	2,224.9	10.4	7.2	7.3	0.12	0.12	5.56	
2,250.0	0.29	25.85	2,249.9	10.5	7.2	7.4	0.19	0.12	-30.52	
2,275.0	0.36	0.86	2,274.9	10.6	7.3	7.5	0.63	0.28	-99.96	
2,300.0	0.52	354.27	2,299.9	10.8	7.2	7.7	0.67	0.64	-26.36	
2,325.0	0.71	347.69	2,324.9	11.1	7.2	8.0	0.81	0.76	-26.32	
2,350.0	0.88	347.68	2,349.9	11.4	7.1	8.3	0.68	0.68	-0.04	



Company:	Antero Resources	Local Co-ordinate Reference:	Well Rymer Unit 4HD
Project:	Tyler County WV	TVD Reference:	Frontier 32: GL 1017' + KB 32' @ 1049.0usft
Site:	Dale Pad: Johnston/Jug/Rymer/Sage	MD Reference:	Frontier 32: GL 1017' + KB 32' @ 1049.0usft
Well:	Rymer Unit 4HD	North Reference:	Grid
Wellbore:	Lateral Sidetrack	Survey Calculation Method:	Minimum Curvature
Design:	Lateral Sidetrack	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)
2,375.0	1.13	342.70	2,374.8	11.8	7.0	8.8	1.06	1.00	-19.92
2,400.0	1.40	341.11	2,399.8	12.3	6.8	9.3	1.09	1.08	-6.36
2,425.0	1.76	339.88	2,424.8	13.0	6.6	10.0	1.45	1.44	-4.92
2,450.0	2.09	340.52	2,449.8	13.8	6.3	10.8	1.32	1.32	2.56
2,454.0	2.14	340.60	2,453.8	13.9	6.3	11.0	1.25	1.24	1.99
2,565.0	2.52	340.30	2,564.7	18.2	4.8	15.5	0.34	0.34	-0.27
2,659.0	1.81	340.61	2,658.7	21.5	3.6	19.0	0.76	-0.76	0.33
2,755.0	1.28	332.81	2,754.6	23.9	2.6	21.6	0.59	-0.55	-8.13
2,850.0	1.02	331.53	2,849.6	25.6	1.7	23.5	0.27	-0.27	-1.35
2,944.0	0.80	324.92	2,943.6	26.9	0.9	25.0	0.26	-0.23	-7.03
3,039.0	0.71	314.03	3,038.6	27.8	0.1	26.1	0.18	-0.09	-11.46
3,136.0	0.62	302.71	3,135.6	28.5	-0.8	27.1	0.16	-0.09	-11.67
3,232.0	0.49	301.13	3,231.6	29.0	-1.5	27.8	0.14	-0.14	-1.65
3,327.0	0.49	300.42	3,326.6	29.4	-2.2	28.5	0.01	0.00	-0.75
3,422.0	0.49	301.13	3,421.6	29.8	-2.9	29.1	0.01	0.00	0.75
3,518.0	0.40	305.14	3,517.6	30.2	-3.6	29.7	0.10	-0.09	4.18
3,613.0	0.40	296.10	3,612.6	30.6	-4.1	30.2	0.07	0.00	-9.52
3,709.0	0.40	301.22	3,708.6	30.9	-4.7	30.7	0.04	0.00	5.33
3,803.0	0.49	296.10	3,802.6	31.2	-5.4	31.2	0.10	0.10	-5.45
3,899.0	0.49	279.62	3,898.6	31.5	-6.1	31.7	0.15	0.00	-17.17
3,993.0	0.49	274.91	3,992.5	31.6	-6.9	32.1	0.04	0.00	-5.01
4,087.0	0.71	277.24	4,086.5	31.7	-7.9	32.5	0.24	0.23	2.48
4,183.0	0.71	276.32	4,182.5	31.8	-9.1	33.0	0.01	0.00	-0.96
4,278.0	0.71	278.03	4,277.5	32.0	-10.3	33.6	0.02	0.00	1.80
4,374.0	0.71	269.93	4,373.5	32.1	-11.4	34.1	0.10	0.00	-8.44
4,469.0	0.71	271.73	4,468.5	32.1	-12.6	34.5	0.02	0.00	1.89
4,659.0	0.71	263.40	4,658.5	32.0	-15.0	35.2	0.05	0.00	-4.38
4,753.0	0.62	262.21	4,752.5	31.9	-16.0	35.4	0.10	-0.10	-1.27
4,849.0	0.62	262.13	4,848.5	31.7	-17.1	35.6	0.00	0.00	-0.08
4,944.0	0.49	263.62	4,943.5	31.6	-18.0	35.8	0.14	-0.14	1.57
5,039.0	0.62	266.84	5,038.5	31.5	-18.9	36.1	0.14	0.14	3.39
5,133.0	0.62	270.32	5,132.5	31.5	-19.9	36.4	0.04	0.00	3.70
5,229.0	0.71	269.31	5,228.5	31.5	-21.0	36.7	0.09	0.09	-1.05
5,326.0	0.71	269.84	5,325.5	31.5	-22.2	37.1	0.01	0.00	0.55
5,420.0	0.62	273.10	5,419.5	31.5	-23.3	37.5	0.10	-0.10	3.47
5,515.0	0.62	272.61	5,514.4	31.6	-24.4	37.9	0.01	0.00	-0.52
5,611.0	0.49	281.91	5,610.4	31.7	-25.3	38.3	0.16	-0.14	9.69
5,706.0	0.49	286.10	5,705.4	31.9	-26.1	38.8	0.04	0.00	4.41
5,895.0	0.40	291.30	5,894.4	32.3	-27.5	39.7	0.05	-0.05	2.75
5,991.0	0.40	301.30	5,990.4	32.6	-28.1	40.2	0.07	0.00	10.42
6,086.0	0.40	298.31	6,085.4	33.0	-28.6	40.7	0.02	0.00	-3.15
6,137.0	0.38	298.46	6,136.4	33.1	-28.9	40.9	0.05	-0.05	0.30

Sycamore @ 6137 MD



Company:	Antero Resources	Local Co-ordinate Reference:	Well Rymer Unit 4HD
Project:	Tyler County WV	TVD Reference:	Frontier 32: GL 1017' + KB 32' @ 1049.0usft
Site:	Dale Pad: Johnston/Jug/Rymer/Sage	MD Reference:	Frontier 32: GL 1017' + KB 32' @ 1049.0usft
Well:	Rymer Unit 4HD	North Reference:	Grid
Wellbore:	Lateral Sidetrack	Survey Calculation Method:	Minimum Curvature
Design:	Lateral Sidetrack	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)	
6,277.0	0.31	299.01	6,276.4	33.5	-29.7	41.6	0.05	-0.05	0.39	
6,339.0	0.31	303.95	6,338.4	33.7	-30.0	41.8	0.04	0.00	7.97	
Middlesex @ 6339 MD										
6,345.0	0.31	304.43	6,344.4	33.7	-30.0	41.9	0.04	0.00	7.96	
6,432.0	0.22	288.04	6,431.4	33.9	-30.3	42.1	0.13	-0.10	-18.84	
6,468.0	0.41	198.59	6,467.4	33.8	-30.4	42.1	1.30	0.54	-248.47	
Tully @ 6468 MD										
6,482.0	0.58	190.11	6,481.4	33.7	-30.5	42.0	1.30	1.19	-60.59	
6,501.0	0.91	169.60	6,500.4	33.4	-30.5	41.7	2.22	1.75	-107.92	
Marcellus @ 6501 MD										
6,547.0	1.87	154.38	6,546.4	32.4	-30.1	40.6	2.22	2.09	-33.10	
Onondaga @ 6547 MD										
6,574.0	2.46	151.10	6,573.4	31.5	-29.6	39.6	2.22	2.17	-12.15	
6,670.0	4.09	143.95	6,669.2	26.9	-26.6	34.3	1.75	1.70	-7.45	
6,764.0	4.64	136.60	6,763.0	21.5	-22.0	27.6	0.83	0.59	-7.82	
6,795.0	4.73	136.40	6,793.8	19.6	-20.3	25.3	0.30	0.30	-0.64	
Oriskany @ 6795 MD										
6,834.0	4.85	136.16	6,832.7	17.3	-18.0	22.3	0.30	0.30	-0.62	
6,929.0	4.53	135.22	6,927.4	11.7	-12.6	15.3	0.35	-0.34	-0.99	
7,023.0	4.95	135.87	7,021.1	6.2	-7.1	8.2	0.45	0.45	0.69	
7,117.0	5.22	135.50	7,114.7	0.2	-1.3	0.6	0.29	0.29	-0.39	
7,213.0	5.17	130.11	7,210.3	-5.7	5.0	-7.1	0.51	-0.05	-5.61	
7,219.0	5.13	129.83	7,216.3	-6.1	5.5	-7.5	0.78	-0.66	-4.65	
Bass Islands @ 7219 MD										
7,307.0	4.57	125.20	7,304.0	-10.6	11.3	-13.8	0.78	-0.64	-5.26	
7,312.0	4.55	125.04	7,309.0	-10.8	11.7	-14.1	0.55	-0.49	-3.14	
Salina @ 7312 MD										
7,403.0	4.11	121.87	7,399.7	-14.6	17.4	-19.6	0.55	-0.48	-3.49	
7,498.0	4.11	113.32	7,494.5	-17.8	23.4	-24.6	0.64	0.00	-9.00	
7,593.0	3.86	108.77	7,589.2	-20.1	29.6	-28.9	0.42	-0.26	-4.79	
7,688.0	2.95	101.40	7,684.1	-21.7	35.0	-32.2	1.06	-0.96	-7.76	
7,785.0	2.72	99.09	7,780.9	-22.5	39.7	-34.6	0.26	-0.24	-2.38	
7,879.0	2.63	96.69	7,874.8	-23.1	44.1	-36.6	0.15	-0.10	-2.55	
7,975.0	2.60	99.37	7,970.7	-23.7	48.4	-38.6	0.13	-0.03	2.79	
8,068.0	2.55	107.83	8,063.6	-24.7	52.4	-40.9	0.41	-0.05	9.10	
8,129.0	2.65	108.26	8,124.6	-25.6	55.1	-42.6	0.16	0.16	0.70	
Willis Creek @ 8129 MD										
8,163.0	2.70	108.48	8,158.5	-26.1	56.6	-43.6	0.16	0.16	0.66	
8,259.0	2.55	112.31	8,254.4	-27.6	60.7	-46.4	0.24	-0.16	3.99	
8,354.0	2.53	117.02	8,349.3	-29.3	64.5	-49.4	0.22	-0.02	4.96	
8,375.0	2.36	119.87	8,370.3	-29.8	65.3	-50.0	1.01	-0.83	13.55	
Lockport @ 8375 MD										
8,450.0	1.80	134.29	8,445.3	-31.4	67.5	-52.3	1.01	-0.74	19.23	
8,545.0	1.20	159.58	8,540.2	-33.3	68.9	-54.6	0.93	-0.63	26.62	
8,585.0	1.02	166.87	8,580.2	-34.1	69.1	-55.4	0.58	-0.46	18.21	



Company:	Antero Resources	Local Co-ordinate Reference:	Well Rymer Unit 4HD
Project:	Tyler County WV	TVD Reference:	Frontier 32: GL 1017' + KB 32' @ 1049.0usft
Site:	Dale Pad: Johnston/Jug/Rymer/Sage	MD Reference:	Frontier 32: GL 1017' + KB 32' @ 1049.0usft
Well:	Rymer Unit 4HD	North Reference:	Grid
Wellbore:	Lateral Sidetrack	Survey Calculation Method:	Minimum Curvature
Design:	Lateral Sidetrack	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)
McKenzie @ 8585 MD									
8,641.0	0.80	182.31	8,636.2	-34.9	69.2	-56.2	0.58	-0.39	27.58
8,712.0	1.32	254.62	8,707.2	-35.7	68.4	-56.6	1.86	0.74	101.84
Rose Hill @ 8712 MD									
8,735.0	1.69	263.02	8,730.2	-35.8	67.8	-56.5	1.86	1.60	36.53
8,831.0	2.34	267.43	8,826.2	-36.0	64.5	-55.6	0.70	0.68	4.59
8,926.0	2.19	267.59	8,921.1	-36.2	60.7	-54.5	0.16	-0.16	0.17
9,022.0	2.17	272.33	9,017.0	-36.2	57.1	-53.3	0.19	-0.02	4.94
9,118.0	2.46	289.31	9,112.9	-35.4	53.3	-51.3	0.77	0.30	17.69
9,211.0	2.71	296.30	9,205.8	-33.8	49.4	-48.5	0.43	0.27	7.52
9,219.0	2.72	296.99	9,213.8	-33.6	49.1	-48.2	0.43	0.13	8.58
Tuscarora @ 9219 MD									
9,306.0	2.86	304.08	9,300.7	-31.5	45.5	-45.0	0.43	0.16	8.15
9,401.0	2.59	306.29	9,395.6	-28.9	41.8	-41.3	0.30	-0.28	2.33
9,459.0	2.85	310.80	9,453.6	-27.2	39.6	-38.9	0.58	0.45	7.78
Queenston @ 9459 MD									
9,495.0	3.02	313.20	9,489.5	-25.9	38.3	-37.3	0.58	0.47	6.67
9,591.0	3.63	325.41	9,585.3	-21.7	34.7	-32.1	0.97	0.64	12.72
9,686.0	4.31	334.60	9,680.1	-16.0	31.4	-25.7	0.98	0.72	9.67
9,781.0	4.33	338.16	9,774.8	-9.4	28.6	-18.5	0.28	0.02	3.75
9,875.0	3.92	336.83	9,868.6	-3.2	26.0	-11.8	0.45	-0.44	-1.41
9,970.0	3.82	339.84	9,963.4	2.8	23.6	-5.4	0.24	-0.11	3.17
10,066.0	3.64	337.42	10,059.2	8.6	21.4	0.9	0.25	-0.19	-2.52
10,161.0	3.51	335.51	10,154.0	14.0	19.0	6.8	0.19	-0.14	-2.01
10,257.0	3.45	330.45	10,249.8	19.2	16.3	12.6	0.33	-0.06	-5.27
10,274.0	3.44	328.92	10,266.8	20.1	15.8	13.6	0.54	-0.07	-9.00
Reedsville @ 10274 MD									
10,321.0	3.42	324.65	10,313.7	22.4	14.3	16.3	0.54	-0.04	-9.09
10,466.0	3.28	320.81	10,458.5	29.2	9.2	24.4	0.18	-0.10	-2.65
10,560.0	2.32	310.66	10,552.3	32.5	6.0	28.6	1.15	-1.02	-10.80
10,625.0	2.01	321.62	10,617.3	34.2	4.3	30.8	0.79	-0.48	16.86
10,720.0	1.45	332.27	10,712.3	36.6	2.7	33.6	0.68	-0.59	11.21
10,855.0	3.89	315.37	10,847.1	41.4	-1.3	39.4	1.88	1.81	-12.52
10,886.0	5.54	315.82	10,878.0	43.2	-3.1	41.7	5.32	5.32	1.45
10,917.0	7.13	323.08	10,908.8	45.8	-5.3	44.9	5.73	5.13	23.42
10,949.0	7.96	325.89	10,940.5	49.2	-7.7	49.0	2.84	2.59	8.78
10,980.0	8.06	324.79	10,971.2	52.8	-10.2	53.1	0.59	0.32	-3.55
11,012.0	7.89	323.95	11,002.9	56.4	-12.7	57.4	0.64	-0.53	-2.63
11,044.0	7.83	321.56	11,034.6	59.9	-15.4	61.6	1.04	-0.19	-7.47
11,075.0	8.18	318.35	11,065.3	63.2	-18.2	65.6	1.83	1.13	-10.35
11,106.0	11.55	322.13	11,095.9	67.3	-21.5	70.6	11.06	10.87	12.19
11,138.0	15.70	324.43	11,126.9	73.3	-26.0	77.8	13.08	12.97	7.19
11,169.0	20.27	325.71	11,156.4	81.2	-31.5	87.1	14.80	14.74	4.13
11,201.0	24.12	326.31	11,186.0	91.2	-38.2	98.8	12.05	12.03	1.88



Company:	Antero Resources	Local Co-ordinate Reference:	Well Rymer Unit 4HD
Project:	Tyler County WV	TVD Reference:	Frontier 32: GL 1017' + KB 32' @ 1049.0usft
Site:	Dale Pad: Johnston/Jug/Rymer/Sage	MD Reference:	Frontier 32: GL 1017' + KB 32' @ 1049.0usft
Well:	Rymer Unit 4HD	North Reference:	Grid
Wellbore:	Lateral Sidetrack	Survey Calculation Method:	Minimum Curvature
Design:	Lateral Sidetrack	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)
11,232.0	27.00	327.55	11,214.0	102.4	-45.5	111.8	9.45	9.29	4.00
11,264.0	30.59	330.15	11,242.0	115.6	-53.5	126.9	11.88	11.22	8.13
11,279.0	32.04	331.63	11,254.9	122.4	-57.3	134.6	10.94	9.67	9.87
11,310.0	34.39	334.80	11,280.8	137.6	-64.9	151.4	9.42	7.58	10.23
11,342.0	35.55	335.97	11,307.0	154.3	-72.6	169.7	4.19	3.63	3.66
11,349.0	36.24	336.11	11,312.7	158.0	-74.2	173.8	9.87	9.80	1.98
Utica @ 11349 MD									
11,373.0	38.59	336.55	11,331.8	171.4	-80.1	188.3	9.87	9.81	1.84
11,405.0	39.58	338.00	11,356.6	190.0	-87.9	208.5	4.21	3.09	4.53
11,436.0	40.92	338.08	11,380.3	208.6	-95.4	228.5	4.33	4.32	0.26
11,467.0	44.20	337.65	11,403.1	228.0	-103.3	249.4	10.62	10.58	-1.39
11,499.0	49.65	337.52	11,424.9	249.6	-112.2	272.8	17.03	17.03	-0.41
11,501.0	50.07	337.51	11,426.2	251.0	-112.8	274.3	21.20	21.19	-0.53
Point Pleasant Shale @ 11501 MD									
11,530.0	56.22	337.37	11,443.6	272.4	-121.7	297.5	21.20	21.19	-0.48
11,562.0	63.70	337.50	11,459.6	298.0	-132.3	325.1	23.38	23.38	0.41
11,593.0	70.92	337.28	11,471.6	324.4	-143.3	353.7	23.30	23.29	-0.71
11,616.0	73.67	337.70	11,478.6	344.6	-151.6	375.6	12.09	11.97	1.82
Trenton @ 11616 MD									
11,624.0	74.63	337.84	11,480.7	351.7	-154.6	383.2	12.09	11.97	1.78
11,656.0	75.75	338.30	11,488.9	380.4	-166.1	414.2	3.77	3.50	1.44
11,687.0	78.89	339.67	11,495.7	408.6	-177.0	444.4	11.01	10.13	4.42
11,719.0	82.51	341.02	11,500.9	438.4	-187.6	476.0	12.05	11.31	4.22
11,750.0	84.23	342.13	11,504.5	467.6	-197.3	506.7	6.59	5.55	3.58
11,781.0	85.14	342.98	11,507.3	497.0	-206.6	537.6	4.01	2.94	2.74
11,812.0	85.75	343.35	11,509.8	526.6	-215.5	568.4	2.30	1.97	1.19
11,844.0	87.25	343.65	11,511.8	557.2	-224.6	600.3	4.78	4.69	0.94
11,875.0	88.93	344.66	11,512.8	587.0	-233.0	631.2	6.32	5.42	3.26
11,918.0	89.73	346.19	11,513.3	628.7	-243.9	674.1	4.01	1.86	3.56
11,937.0	89.80	346.29	11,513.4	647.1	-248.4	693.0	0.64	0.37	0.53
12,032.0	91.14	346.34	11,512.6	739.4	-270.9	787.4	1.41	1.41	0.05
12,127.0	90.94	342.82	11,510.9	831.0	-296.1	882.1	3.71	-0.21	-3.71
12,221.0	91.04	339.93	11,509.2	920.0	-326.1	976.1	3.08	0.11	-3.07
12,315.0	90.87	339.35	11,507.7	1,008.1	-358.8	1,070.1	0.64	-0.18	-0.62
12,409.0	91.14	339.08	11,506.0	1,096.0	-392.2	1,164.1	0.41	0.29	-0.29
12,504.0	90.90	338.49	11,504.3	1,184.5	-426.5	1,259.0	0.67	-0.25	-0.62
12,598.0	91.11	339.16	11,502.7	1,272.2	-460.5	1,353.0	0.75	0.22	0.71
12,692.0	90.60	339.56	11,501.3	1,360.1	-493.6	1,446.9	0.69	-0.54	0.43
12,787.0	92.11	341.79	11,499.0	1,449.8	-525.0	1,541.9	2.83	1.59	2.35
12,881.0	91.44	341.47	11,496.1	1,538.9	-554.7	1,635.8	0.79	-0.71	-0.34
12,975.0	90.91	341.66	11,494.2	1,628.1	-584.4	1,729.8	0.60	-0.56	0.20
13,129.0	90.40	341.90	11,492.4	1,774.4	-632.5	1,883.7	0.37	-0.33	0.16
13,163.0	91.31	340.39	11,491.9	1,806.5	-643.5	1,917.7	5.18	2.68	-4.44
13,257.0	90.97	340.89	11,490.1	1,895.2	-674.7	2,011.7	0.64	-0.36	0.53



Company:	Antero Resources	Local Co-ordinate Reference:	Well Rymer Unit 4HD
Project:	Tyler County WV	TVD Reference:	Frontier 32: GL 1017' + KB 32' @ 1049.0usft
Site:	Dale Pad: Johnston/Jug/Rymer/Sage	MD Reference:	Frontier 32: GL 1017' + KB 32' @ 1049.0usft
Well:	Rymer Unit 4HD	North Reference:	Grid
Wellbore:	Lateral Sidetrack	Survey Calculation Method:	Minimum Curvature
Design:	Lateral Sidetrack	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)	
13,352.0	90.70	340.76	11,488.7	1,984.9	-705.9	2,106.7	0.32	-0.28	-0.14	
13,446.0	91.34	339.75	11,487.0	2,073.4	-737.6	2,200.7	1.27	0.68	-1.07	
13,541.0	90.91	339.90	11,485.1	2,162.5	-770.4	2,295.6	0.48	-0.45	0.16	
13,635.0	90.57	339.57	11,483.9	2,250.7	-802.9	2,389.6	0.50	-0.36	-0.35	
13,730.0	91.64	339.51	11,482.1	2,339.7	-836.1	2,484.6	1.13	1.13	-0.06	
13,824.0	90.74	339.25	11,480.1	2,427.6	-869.2	2,578.6	1.00	-0.96	-0.28	
13,919.0	90.94	340.28	11,478.8	2,516.8	-902.1	2,673.5	1.10	0.21	1.08	
14,013.0	90.37	339.55	11,477.7	2,605.0	-934.4	2,767.5	0.99	-0.61	-0.78	
14,107.0	91.51	341.96	11,476.1	2,693.8	-965.3	2,861.5	2.84	1.21	2.56	
14,201.0	90.94	342.15	11,474.1	2,783.2	-994.3	2,955.4	0.64	-0.61	0.20	
14,295.0	90.70	341.25	11,472.8	2,872.4	-1,023.8	3,049.4	0.99	-0.26	-0.96	
14,390.0	91.68	341.18	11,470.8	2,962.3	-1,054.4	3,144.4	1.03	1.03	-0.07	
14,484.0	91.27	339.90	11,468.4	3,050.9	-1,085.7	3,238.3	1.43	-0.44	-1.36	
14,578.0	90.67	339.49	11,466.8	3,139.1	-1,118.3	3,332.3	0.77	-0.64	-0.44	
14,672.0	90.84	339.60	11,465.6	3,227.1	-1,151.2	3,426.3	0.22	0.18	0.12	
14,768.0	90.70	339.20	11,464.3	3,317.0	-1,184.9	3,522.3	0.44	-0.15	-0.42	
14,863.0	90.30	339.60	11,463.4	3,405.9	-1,218.4	3,617.3	0.60	-0.42	0.42	
14,958.0	90.71	338.86	11,462.6	3,494.7	-1,252.0	3,712.2	0.89	0.43	-0.78	
15,053.0	90.90	338.67	11,461.3	3,583.3	-1,286.4	3,807.2	0.28	0.20	-0.20	
15,146.0	90.90	339.40	11,459.8	3,670.1	-1,319.7	3,900.2	0.78	0.00	0.78	
15,240.0	91.11	341.67	11,458.2	3,758.7	-1,351.0	3,994.1	2.42	0.22	2.41	
15,334.0	90.87	344.41	11,456.5	3,848.6	-1,378.4	4,088.0	2.93	-0.26	2.91	
15,429.0	90.67	345.74	11,455.3	3,940.4	-1,402.9	4,182.7	1.42	-0.21	1.40	
15,523.0	88.26	343.95	11,456.1	4,031.1	-1,427.5	4,276.4	3.19	-2.56	-1.90	
15,617.0	90.47	341.12	11,457.2	4,120.8	-1,455.7	4,370.3	3.82	2.35	-3.01	
15,711.0	91.31	338.93	11,455.7	4,209.1	-1,487.8	4,464.3	2.50	0.89	-2.33	
15,806.0	91.98	337.79	11,453.0	4,297.4	-1,522.8	4,559.2	1.39	0.71	-1.20	
15,901.0	91.21	337.71	11,450.3	4,385.2	-1,558.8	4,654.0	0.81	-0.81	-0.08	
15,995.0	92.31	335.72	11,447.5	4,471.5	-1,595.9	4,747.8	2.42	1.17	-2.12	
16,090.0	92.55	338.02	11,443.4	4,558.8	-1,633.2	4,842.5	2.43	0.25	2.42	
16,184.0	91.61	339.64	11,440.0	4,646.4	-1,667.1	4,936.4	1.99	-1.00	1.72	
16,278.0	91.17	339.35	11,437.7	4,734.4	-1,700.0	5,030.4	0.56	-0.47	-0.31	
16,373.0	91.64	341.01	11,435.4	4,823.8	-1,732.2	5,125.4	1.82	0.49	1.75	
16,467.0	90.90	340.24	11,433.3	4,912.4	-1,763.4	5,219.3	1.14	-0.79	-0.82	
16,560.0	91.91	340.68	11,431.0	5,000.0	-1,794.5	5,312.3	1.18	1.09	0.47	
16,655.0	91.51	341.45	11,428.2	5,089.9	-1,825.3	5,407.3	0.91	-0.42	0.81	
16,749.0	90.57	341.30	11,426.5	5,178.9	-1,855.3	5,501.2	1.01	-1.00	-0.16	
16,843.0	91.78	341.08	11,424.6	5,267.9	-1,885.6	5,595.2	1.31	1.29	-0.23	
16,937.0	90.87	337.92	11,422.4	5,355.9	-1,918.5	5,689.1	3.50	-0.97	-3.36	
17,032.0	91.04	339.67	11,420.8	5,444.4	-1,952.9	5,784.1	1.85	0.18	1.84	
17,126.0	91.47	339.95	11,418.8	5,532.6	-1,985.3	5,878.1	0.55	0.46	0.30	
17,220.0	92.28	342.33	11,415.7	5,621.5	-2,015.7	5,972.0	2.67	0.86	2.53	
17,315.0	91.74	342.07	11,412.3	5,711.9	-2,044.7	6,066.9	0.63	-0.57	-0.27	



Company:	Antero Resources	Local Co-ordinate Reference:	Well Rymer Unit 4HD
Project:	Tyler County WV	TVD Reference:	Frontier 32: GL 1017' + KB 32' @ 1049.0usft
Site:	Dale Pad: Johnston/Jug/Rymer/Sage	MD Reference:	Frontier 32: GL 1017' + KB 32' @ 1049.0usft
Well:	Rymer Unit 4HD	North Reference:	Grid
Wellbore:	Lateral Sidetrack	Survey Calculation Method:	Minimum Curvature
Design:	Lateral Sidetrack	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)	
17,411.0	91.48	341.60	11,409.7	5,803.1	-2,074.6	6,162.8	0.56	-0.27	-0.49	
17,505.0	90.33	340.30	11,408.2	5,892.0	-2,105.3	6,256.8	1.85	-1.22	-1.38	
17,599.0	91.21	338.90	11,406.9	5,980.1	-2,138.1	6,350.8	1.76	0.94	-1.49	
17,693.0	91.74	338.80	11,404.5	6,067.7	-2,172.0	6,444.7	0.57	0.56	-0.11	
17,788.0	90.80	341.14	11,402.4	6,156.9	-2,204.5	6,539.7	2.65	-0.99	2.46	
17,882.0	92.18	343.02	11,399.9	6,246.3	-2,233.4	6,633.6	2.48	1.47	2.00	
17,976.0	92.58	342.33	11,396.0	6,336.0	-2,261.4	6,727.4	0.85	0.43	-0.73	
18,070.0	92.95	346.74	11,391.5	6,426.4	-2,286.4	6,821.0	4.70	0.39	4.69	
Last SDI MWD @ 18070 MD										
18,159.0	92.95	346.74	11,386.9	6,513.0	-2,306.8	6,909.4	0.00	0.00	0.00	
Projection To Bit @ 18159 MD / 11386 TVD										

Formations						
Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)	
6,137.0	6,136.4	Sycamore @ 6137 MD				
6,339.0	6,338.4	Middlesex @ 6339 MD				
6,468.0	6,467.4	Tully @ 6468 MD				
6,501.0	6,500.4	Marcellus @ 6501 MD				
6,547.0	6,546.4	Onondaga @ 6547 MD				
6,795.0	6,793.8	Oriskany @ 6795 MD				
7,219.0	7,216.3	Bass Islands @ 7219 MD				
7,312.0	7,309.0	Salina @ 7312 MD				
8,129.0	8,124.6	Willis Creek @ 8129 MD				
8,375.0	8,370.3	Lockport @ 8375 MD				
8,585.0	8,580.2	McKenzie @ 8585 MD				
8,712.0	8,707.2	Rose Hill @ 8712 MD				
9,219.0	9,213.8	Tuscarora @ 9219 MD				
9,459.0	9,453.6	Queenston @ 9459 MD				
10,274.0	10,266.8	Reedsville @ 10274 MD				
11,349.0	11,312.7	Utica @ 11349 MD				
11,501.0	11,426.2	Point Pleasant Shale @ 11501 MD				
11,616.0	11,478.6	Trenton @ 11616 MD				

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment	
		+N/-S (usft)	+E/-W (usft)		
18,070.0	11,391.5	6,426.4	-2,286.4	Last SDI MWD @ 18070 MD	
18,159.0	11,386.9	6,513.0	-2,306.8	Projection To Bit @ 18159 MD / 11386 TVD	

Checked By: _____ Approved By: _____ Date: _____