

Azimuths to Grid North
 True North: -0.01°
 Magnetic North: -5.37°
 Magnetic Field
 Strength: 52153.5nT
 Dip Angle: 66.81°
 Declination: 63.920015
 Model: BSGM2014

To convert Magnetic North to Grid, Subtract 5.37°
 To convert True North to Grid, Subtract 0.01°

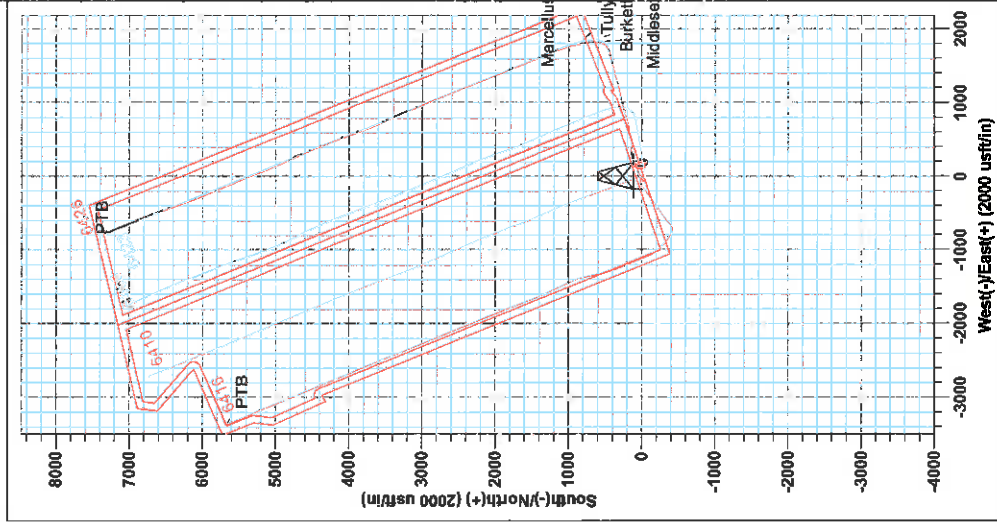


Knoll Unit 2H
Ritchie County WV
Northing: 14270740.34
Easting: 1646582.45
As Drilled

Frontier 22-GL-1143-KB-25 @ 1165.0nurf
 Gc: 1143.0



Genio Lightfoot
 11/29, July 09 2015
 Scientific Drilling
 11220 NW 10th Street
 Yukon OK 73099



South(-)/North(+) (2000 usft/in)
 West(-)/East(+) (2000 usft/in)

True Vertical Depth (1400 usft/in)

Vertical Section at 337.95° (1400 usft/in)

PROJECT DETAILS: Ritchie County WV
 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

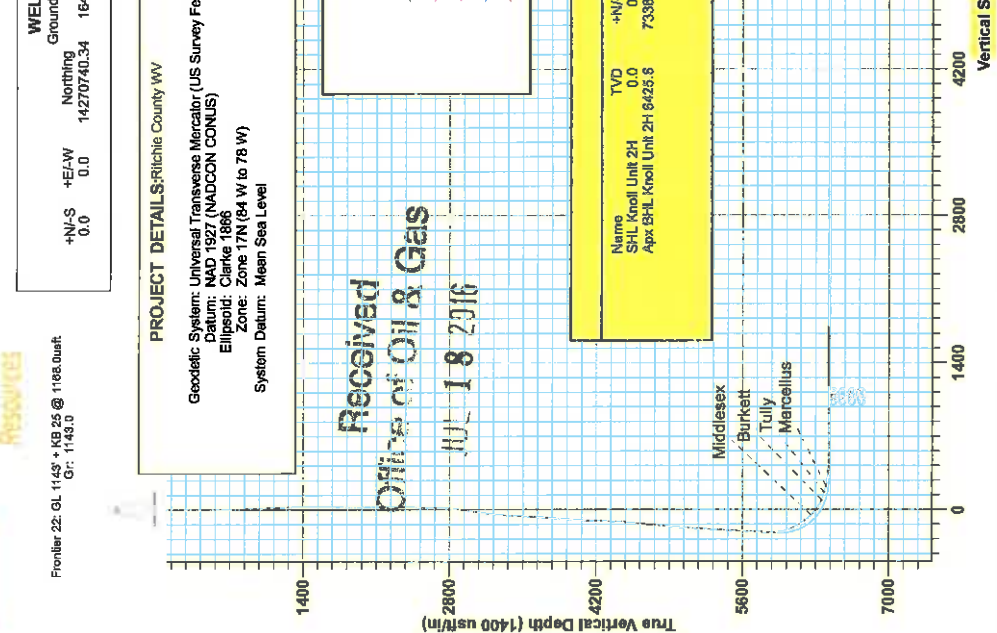
WELL DETAILS: Knoll Unit 2H
 Ground Level: 1143.0
 Northing: 14270740.34
 Easting: 1646582.45
 Longitude: 80° 58' 41.539 W
 Latitude: 39° 17' 55.782 N

SITE DETAILS: Noland Pad: Penns Park/Knoill/Piper/Western
 Site Centre Northing: 14270759.74
 Easting: 1646547.13
 Positional Uncertainty: 0.0
 Convergences: 0.01
 Local North: Grid

LEGEND
 □ Knoll Unit 1H, Original Wellpath, As Drilled V0
 △ Penns Park Unit 1H, Original Wellpath, As Drilled V0
 * Penns Park Unit 2H, Original Wellpath, As Drilled V0
 * Knoll Unit 2H, Original Wellpath, Plan 5 V0
 △ As Drilled

DESIGN TARGET DETAILS

Name	TVD	+N/S	+E/W	Northing	Easting	Latitude	Longitude
SHL Knoll Unit 2H	0.0	0.0	0.0	14270740.34	1646582.44	39° 17' 55.782 N	80° 58' 41.539 W
Apx BH-L Knoll Unit 2H	6425.8	7339.8	-781.8	14278079.12	1646800.61	39° 19' 8.347 N	80° 58' 51.468 W



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Antero

Ritchie County WV

Noland Pad: Penns Park/Knoll/Piper/Western

Knoll Unit 2H

Original Wellpath

Design: As Drilled

EOW Completion Report

09 July, 2015

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Company:	Antero	Local Co-ordinate Reference:	Well Knoll Unit 2H
Project:	Ritchie County WV	TVD Reference:	Frontier 22 GL 1143' + KB 25 @ 1168 Ousft
Site:	Noland Pad Penns Park/Knoll/Piper/Western	MD Reference:	Frontier 22 GL 1143' + KB 25 @ 1168 Ousft
Well:	Knoll Unit 2H	North Reference:	Grid
Wellbore:	Original Wellpath	Survey Calculation Method:	Minimum Curvature
Design:	As Drilled	Database:	Antero NE

Project	Ritchie County WV, Ritchie County WV, WV North		
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	Noland Pad Penns Park/Knoll/Piper/Western				
Site Position:		Northing:	14,270,759.74 usft	Latitude:	39° 17' 55.974 N
From:	Map	Easting:	1,646,547.13 usft	Longitude:	80° 58' 41.988 W
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16"	Grid Convergence:	0.01 °

Well	Knoll Unit 2H, Marcellus					
Well Position	+N/-S	0.0 usft	Northing:	14,270,740.34 usft	Latitude:	39° 17' 55.782 N
	+E/-W	0.0 usft	Easting:	1,646,582.45 usft	Longitude:	80° 58' 41.539 W
Position Uncertainty	2.0 usft		Wellhead Elevation:	1,168.0 usft	Ground Level:	1,143.0 usft

Wellbore	Original Wellpath				
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Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	BGGM2014	6/30/2015	-8.36	66.81	52,154

Design	As Drilled				
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Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.0	0.0	0.0	337.95	

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Survey Program	Date 7/9/2015				
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
112.0	5,813.1	Survey #6 Def Gyro to KOP (Original Well)	Standard Keeper 104	Standard Wireline Keeper ver 1.0.4	
5,922.0	13,899.0	Survey #7 SDI MWD (Original Wellpath)	SDI MWD	Scientific Drilling Intl. MWD - Standard ver 1.0.1	

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00
112.0	0.27	214.33	112.0	-0.2	-0.1	-0.1	0.24
137.0	0.25	216.47	137.0	-0.3	-0.2	-0.2	0.09
162.0	0.16	216.20	162.0	-0.4	-0.3	-0.3	0.36
187.0	0.18	199.55	187.0	-0.4	-0.3	-0.3	0.21
212.0	0.08	227.95	212.0	-0.5	-0.3	-0.3	0.46
237.0	0.08	169.22	237.0	-0.5	-0.3	-0.4	0.31
262.0	0.04	294.44	262.0	-0.5	-0.3	-0.4	0.43
287.0	0.08	350.49	287.0	-0.5	-0.4	-0.3	0.27
312.0	0.10	26.48	312.0	-0.5	-0.3	-0.3	0.24
337.0	0.11	76.78	337.0	-0.5	-0.3	-0.3	0.36



Company:	Antero	Local Co-ordinate Reference:	Well Knoll Unit 2H
Project:	Ritchie County WV	TVD Reference:	Frontier 22 GL 1143' + KB 25 @ 1168 Ousft
Site:	Noland Pad Penns Park/Knoll/Piper/Western	MD Reference:	Frontier 22 GL 1143' + KB 25 @ 1168 Ousft
Well:	Knoll Unit 2H	North Reference:	Grid
Wellbore:	Original Wellpath	Survey Calculation Method:	Minimum Curvature
Design:	As Drilled	Database:	Antero NE

Survey							
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)
362.0	0.09	74.62	362.0	-0.4	-0.3	-0.3	0.08
387.0	0.16	114.09	387.0	-0.5	-0.2	-0.3	0.43
412.0	0.15	140.97	412.0	-0.5	-0.2	-0.4	0.29
437.0	0.08	138.64	437.0	-0.5	-0.1	-0.4	0.28
462.0	0.19	129.96	462.0	-0.6	-0.1	-0.5	0.45
487.0	0.24	105.16	487.0	-0.6	0.0	-0.6	0.42
512.0	0.26	104.64	512.0	-0.6	0.1	-0.6	0.08
537.0	0.29	89.52	537.0	-0.7	0.2	-0.7	0.31
562.0	0.34	76.77	562.0	-0.6	0.3	-0.7	0.34
587.0	0.62	55.13	587.0	-0.5	0.5	-0.7	1.32
612.0	0.88	47.30	612.0	-0.3	0.8	-0.6	1.12
637.0	1.13	42.13	637.0	0.0	1.1	-0.4	1.06
662.0	1.48	35.35	662.0	0.4	1.4	-0.1	1.53
687.0	1.65	30.47	687.0	1.0	1.8	0.2	0.86
712.0	2.05	24.81	712.0	1.7	2.2	0.8	1.76
737.0	2.48	25.57	736.9	2.6	2.6	1.4	1.72
762.0	2.83	28.74	761.9	3.6	3.1	2.2	1.52
787.0	3.30	30.55	786.9	4.8	3.8	3.0	1.92
812.0	3.45	30.44	811.8	6.1	4.5	3.9	0.60
837.0	3.77	31.75	836.8	7.4	5.4	4.9	1.32
862.0	4.18	31.20	861.7	8.9	6.3	5.9	1.65
887.0	4.67	29.57	886.7	10.6	7.2	7.1	2.02
912.0	5.10	27.84	911.6	12.4	8.3	8.4	1.82
937.0	5.20	28.20	936.5	14.4	9.3	9.9	0.42
962.0	5.64	32.13	961.3	16.4	10.5	11.3	2.30
987.0	5.76	32.60	986.2	18.5	11.8	12.7	0.52
1,012.0	5.89	34.28	1,011.1	20.7	13.2	14.2	0.86
1,037.0	6.32	38.83	1,036.0	22.8	14.8	15.6	2.59
1,062.0	6.70	44.20	1,060.8	24.9	16.7	16.8	2.87
1,087.0	6.73	45.15	1,085.6	27.0	18.7	18.0	0.46
1,112.0	6.97	47.88	1,110.4	29.0	20.9	19.1	1.62
1,137.0	7.17	50.82	1,135.3	31.0	23.2	20.0	1.65
1,162.0	7.47	54.08	1,160.0	33.0	25.8	20.9	2.05
1,187.0	7.52	54.68	1,184.8	34.9	28.4	21.7	0.37
1,212.0	7.74	57.22	1,209.6	36.7	31.2	22.3	1.61
1,237.0	8.00	60.60	1,234.4	38.5	34.1	22.9	2.12
1,262.0	8.20	62.96	1,259.1	40.2	37.2	23.3	1.55
1,287.0	8.26	63.19	1,283.9	41.8	40.4	23.6	0.27
1,312.0	8.88	64.34	1,308.6	43.4	43.7	23.8	2.57
1,337.0	9.48	64.95	1,333.3	45.1	47.3	24.1	2.43
1,362.0	9.94	64.99	1,357.9	46.9	51.2	24.3	1.84
1,387.0	10.25	65.87	1,382.5	48.7	55.2	24.5	1.38
1,412.0	10.57	66.79	1,407.1	50.6	59.3	24.6	1.44
1,437.0	10.65	66.43	1,431.7	52.4	63.5	24.7	0.42

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JUL 18 2016



Company: Antero
Project: Ritchie County WV
Site: Noland Pad. Penns Park/Knoll/Piper/Western
Well: Knoll Unit 2H
Wellbore: Original Wellpath
Design: As Drilled

Local Co-ordinate Reference: Well Knoll Unit 2H
TVD Reference: Frontier 22 GL 1143' + KB 25 @ 1168 Oush
MD Reference: Frontier 22 GL 1143' + KB 25 @ 1168 Oush
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: Antero NE

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 Office of Oil & G

JUL 18 2016

Survey

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)
1,462.0	10.67	66.10	1,456.3	54.2	67.7	24.8	0.26
1,487.0	10.81	65.68	1,480.8	56.1	72.0	25.0	0.64
1,512.0	10.96	66.06	1,505.4	58.1	76.3	25.2	0.67
1,537.0	11.03	66.05	1,529.9	60.0	80.7	25.3	0.28
1,562.0	11.31	65.71	1,554.4	62.0	85.1	25.5	1.15
1,587.0	11.38	65.87	1,578.9	64.0	89.6	25.7	0.31
1,612.0	11.69	67.89	1,603.4	66.0	94.2	25.8	2.04
1,637.0	11.49	65.49	1,627.9	68.0	98.8	25.9	2.09
1,662.0	11.68	65.29	1,652.4	70.0	103.3	26.1	0.78
1,687.0	11.88	65.55	1,676.9	72.2	108.0	26.4	0.83
1,712.0	12.22	66.40	1,701.3	74.3	112.8	26.5	1.53
1,737.0	12.12	65.06	1,725.8	76.5	117.6	26.7	1.20
1,762.0	12.11	64.87	1,750.2	78.7	122.3	27.0	0.16
1,787.0	12.32	68.49	1,774.7	80.8	127.2	27.1	3.18
1,812.0	12.18	68.24	1,799.1	82.7	132.1	27.1	0.60
1,837.0	12.41	69.53	1,823.5	84.6	137.1	27.0	1.43
1,862.0	12.41	69.29	1,847.9	86.5	142.1	26.9	0.21
1,887.0	12.55	69.19	1,872.3	88.4	147.1	26.7	0.57
1,912.0	12.54	68.73	1,896.7	90.4	152.2	26.6	0.40
1,937.0	12.67	68.41	1,921.1	92.4	157.3	26.6	0.59
1,962.0	12.77	68.55	1,945.5	94.4	162.4	26.5	0.42
1,987.0	12.83	67.63	1,969.9	96.5	167.5	26.5	0.85
2,012.0	13.21	68.24	1,994.3	98.6	172.8	26.5	1.62
2,037.0	13.61	67.53	2,018.6	100.8	178.1	26.5	1.73
2,062.0	13.94	67.80	2,042.9	103.0	183.6	26.6	1.34
2,087.0	14.54	67.77	2,067.1	105.4	189.3	26.6	2.40
2,112.0	14.68	66.29	2,091.3	107.8	195.1	26.7	1.59
2,137.0	15.08	66.55	2,115.5	110.4	201.0	26.8	1.62
2,162.0	15.25	66.94	2,139.6	113.0	207.0	27.0	0.79
2,187.0	15.18	65.80	2,163.7	115.6	213.0	27.2	1.23
2,212.0	15.41	66.52	2,187.8	118.3	219.1	27.4	1.19
2,237.0	15.56	68.01	2,211.9	120.8	225.2	27.5	1.70
2,262.0	15.41	69.12	2,236.0	123.3	231.4	27.4	1.33
2,287.0	15.01	69.30	2,260.1	125.6	237.6	27.2	1.61
2,312.0	14.28	71.48	2,284.3	127.7	243.5	27.0	3.66
2,337.0	13.55	74.44	2,308.6	129.5	249.3	26.5	4.08
2,362.0	13.15	75.55	2,332.9	131.0	254.9	25.7	1.90
2,387.0	12.57	75.33	2,357.3	132.4	260.2	25.0	2.33
2,412.0	12.89	77.63	2,381.7	133.7	265.6	24.2	2.40
2,437.0	12.49	78.95	2,406.1	134.8	271.0	23.2	1.98
2,462.0	12.53	78.77	2,430.5	135.8	276.3	22.2	0.22
2,487.0	12.58	78.60	2,454.9	136.9	281.6	21.2	0.25
2,512.0	12.61	78.32	2,479.3	138.0	287.0	20.2	0.27
2,537.0	12.64	77.93	2,503.7	139.1	292.3	19.2	0.36
2,562.0	12.61	77.21	2,528.1	140.3	297.6	18.3	0.64



Company:	Antero	Local Co-ordinate Reference:	Well Knoll Unit 2H
Project:	Ritchie County WV	TVD Reference:	Frontier 22 GL 1143' + KB 25 @ 1168.0usft
Site:	Noland Pad: Penns Park/Knoll/Piper/Western	MD Reference:	Frontier 22 GL 1143' + KB 25 @ 1168.0usft
Well:	Knoll Unit 2H	North Reference:	Grid
Wellbore:	Original Wellpath	Survey Calculation Method:	Minimum Curvature
Design:	As Drilled	Database:	Antero NE

Survey							
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)
2,587.0	12.44	76.09	2,552.5	141.6	302.9	17.5	1.19
2,612.0	11.98	74.26	2,576.9	142.9	308.0	16.8	2.40
2,637.0	11.70	73.37	2,601.4	144.3	313.0	16.3	1.34
2,662.0	11.38	72.85	2,625.9	145.8	317.7	15.8	1.35
2,687.0	11.10	71.83	2,650.4	147.3	322.4	15.5	1.37
2,712.0	10.73	70.90	2,674.9	148.8	326.9	15.2	1.64
2,737.0	10.41	70.31	2,699.5	150.3	331.2	15.0	1.35
2,762.0	10.12	71.87	2,724.1	151.7	335.4	14.7	1.61
2,787.0	9.84	78.16	2,748.7	152.9	339.6	14.2	4.50
2,812.0	9.94	84.33	2,773.4	153.5	343.8	13.2	4.26
2,837.0	10.59	91.13	2,798.0	153.7	348.3	11.7	5.50
2,862.0	11.38	96.00	2,822.5	153.4	353.0	9.6	4.87
2,887.0	12.26	99.99	2,847.0	152.7	358.1	7.1	4.80
2,912.0	12.94	102.22	2,871.4	151.6	363.4	4.1	3.34
2,937.0	13.94	103.48	2,895.7	150.3	369.1	0.8	4.17
2,962.0	14.96	102.97	2,919.9	148.9	375.2	-2.8	4.11
2,987.0	15.77	101.98	2,944.0	147.5	381.6	-6.6	3.41
3,012.0	16.53	100.69	2,968.0	146.1	388.5	-10.4	3.36
3,037.0	17.01	100.12	2,991.9	144.8	395.5	-14.3	2.03
3,062.0	17.57	99.26	3,015.8	143.5	402.9	-18.2	2.46
3,087.0	18.18	98.16	3,039.6	142.4	410.5	-22.1	2.79
3,112.0	18.74	96.94	3,063.3	141.3	418.3	-26.0	2.72
3,137.0	19.14	95.58	3,087.0	140.5	426.4	-29.9	2.38
3,162.0	19.67	93.83	3,110.5	139.8	434.6	-33.6	3.15
3,187.0	20.27	91.80	3,134.0	139.4	443.2	-37.2	3.67
3,212.0	20.43	89.55	3,157.5	139.3	451.9	-40.6	3.19
3,237.0	20.30	88.50	3,180.9	139.4	460.6	-43.7	1.55
3,262.0	19.96	87.48	3,204.4	139.7	469.2	-46.6	1.95
3,287.0	19.54	86.11	3,227.9	140.2	477.6	-49.4	2.50
3,312.0	19.38	84.04	3,251.5	140.9	485.9	-51.8	2.83
3,337.0	19.19	82.07	3,275.1	141.9	494.1	-54.0	2.71
3,362.0	19.13	80.80	3,298.7	143.1	502.2	-55.9	1.68
3,387.0	18.81	79.15	3,322.4	144.5	510.2	-57.6	2.50
3,412.0	18.35	76.82	3,346.0	146.2	518.0	-59.0	3.49
3,437.0	18.33	74.94	3,369.8	148.1	525.6	-60.1	2.37
3,462.0	18.34	74.21	3,393.5	150.2	533.2	-61.0	0.92
3,487.0	18.48	74.01	3,417.2	152.4	540.8	-61.8	0.61
3,512.0	18.40	74.15	3,440.9	154.5	548.4	-62.7	0.37
3,537.0	18.60	74.02	3,464.7	156.7	556.0	-63.5	0.82
3,562.0	18.65	73.84	3,488.3	158.9	563.7	-64.3	0.30
3,587.0	18.89	73.88	3,512.0	161.2	571.4	-65.2	0.96
3,612.0	18.92	74.12	3,535.7	163.4	579.2	-66.0	0.33
3,637.0	19.12	74.88	3,559.3	165.6	587.1	-66.9	1.27
3,662.0	19.26	76.86	3,582.9	167.6	595.0	-68.1	2.66

Received
Office of Oil & Gas
JUL 18 2016



EOW Completion Report



Company:	Antero	Local Co-ordinate Reference:	Well Knoll Unit 2H
Project:	Ritchie County WV	TVD Reference:	Frontier 22 GL 1143' + KB 25 @ 1168.0usft
Site:	Noland Pad Penns Park/Knoll/Piper/Western	MD Reference:	Frontier 22 GL 1143' + KB 25 @ 1168.0usft
Well:	Knoll Unit 2H	North Reference:	Grid
Wellbore:	Original Wellpath	Survey Calculation Method:	Minimum Curvature
Design:	As Drilled	Database:	Antero NE

Survey

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)
3,687.0	19.46	77.13	3,606.5	169.4	603.1	-69.4	0.88
3,712.0	19.60	77.50	3,630.1	171.3	611.3	-70.7	0.75
3,737.0	20.08	78.47	3,653.6	173.0	619.6	-72.2	2.33
3,762.0	20.53	79.41	3,677.0	174.7	628.1	-73.9	2.22
3,787.0	21.08	80.09	3,700.4	176.3	636.8	-75.7	2.40
3,812.0	21.36	80.19	3,723.7	177.8	645.7	-77.6	1.13
3,837.0	21.71	79.89	3,747.0	179.4	654.8	-79.5	1.47
3,862.0	21.90	79.67	3,770.2	181.1	663.9	-81.4	0.83
3,887.0	22.14	79.30	3,793.3	182.8	673.1	-83.3	1.11
3,912.0	22.19	78.05	3,816.5	184.6	682.4	-85.1	1.90
3,937.0	22.37	78.03	3,839.6	186.6	691.6	-86.7	0.72
3,962.0	22.44	77.74	3,862.7	188.6	701.0	-88.4	0.52
3,987.0	22.82	77.49	3,885.8	190.6	710.4	-90.0	1.57
4,012.0	23.14	77.58	3,908.8	192.8	719.9	-91.6	1.29
4,037.0	23.24	78.49	3,931.8	194.8	729.5	-93.3	1.49
4,062.0	23.57	78.22	3,954.8	196.8	739.2	-95.1	1.39
4,087.0	24.33	78.00	3,977.6	198.9	749.2	-96.9	3.06
4,112.0	24.99	76.90	4,000.3	201.2	759.4	-98.6	3.22
4,137.0	25.94	75.58	4,022.9	203.7	769.8	-100.2	4.43
4,162.0	27.13	74.18	4,045.3	206.6	780.6	-101.5	5.38
4,187.0	28.44	72.61	4,067.4	210.0	791.7	-102.6	6.00
4,212.0	29.11	72.03	4,089.3	213.6	803.2	-103.5	2.90
4,237.0	29.37	71.81	4,111.1	217.4	814.8	-104.4	1.13
4,262.0	29.29	71.58	4,132.9	221.3	826.4	-105.2	0.55
4,287.0	28.26	70.72	4,154.8	225.1	837.8	-105.9	4.44
4,312.0	28.19	70.42	4,176.8	229.1	849.0	-106.4	0.63
4,337.0	28.45	70.44	4,198.8	233.1	860.2	-106.9	1.04
4,362.0	28.19	70.34	4,220.9	237.0	871.3	-107.4	1.06
4,387.0	27.46	71.01	4,243.0	240.9	882.3	-108.0	3.18
4,412.0	26.44	71.81	4,265.2	244.5	893.1	-108.7	4.33
4,437.0	26.17	72.27	4,287.7	247.9	903.6	-109.4	1.35
4,462.0	26.11	72.96	4,310.1	251.2	914.1	-110.3	1.24
4,487.0	26.39	74.49	4,332.5	254.3	924.7	-111.5	2.93
4,512.0	26.60	75.78	4,354.9	257.2	935.5	-112.8	2.45
4,537.0	26.60	76.82	4,377.3	259.8	946.4	-114.5	1.86
4,562.0	27.10	77.45	4,399.6	262.3	957.4	-116.3	2.30
4,587.0	27.38	77.48	4,421.8	264.8	968.6	-118.2	1.12
4,612.0	27.76	77.45	4,443.9	267.3	979.9	-120.1	1.52
4,637.0	28.06	77.20	4,466.0	269.9	991.3	-122.0	1.29
4,662.0	28.30	76.18	4,488.1	272.6	1,002.8	-123.8	2.15
4,687.0	28.64	75.78	4,510.1	275.5	1,014.3	-125.4	1.56
4,712.0	28.99	75.53	4,532.0	278.5	1,026.0	-127.1	1.48
4,737.0	29.06	74.93	4,553.8	281.6	1,037.7	-128.6	1.20
4,762.0	29.08	74.64	4,575.7	284.8	1,049.5	-130.0	0.57

Received
Office of Oil & Gas
JUL 18 2016



Company:	Antero	Local Co-ordinate Reference:	Well Knoll Unit 2H
Project:	Ritchie County WV	TVD Reference:	Frontier 22' GL 1143' + KB 25 @ 1168.0usft
Site:	Noland Pad Penns Park/Knoll/Piper/Western	MD Reference:	Frontier 22' GL 1143' + KB 25 @ 1168.0usft
Well:	Knoll Unit 2H	North Reference:	Grid
Wellbore:	Original Wellpath	Survey Calculation Method:	Minimum Curvature
Design:	As Drilled	Database:	Antero NE

Survey							
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)
4,787.0	28.82	74.65	4,597.5	288.0	1,061.1	-131.5	1.04
4,812.0	29.17	74.74	4,619.4	291.2	1,072.8	-132.9	1.41
4,837.0	29.42	75.11	4,641.2	294.4	1,084.6	-134.4	1.23
4,862.0	29.52	76.43	4,663.0	297.4	1,096.5	-136.0	2.63
4,887.0	29.63	77.40	4,684.7	300.2	1,108.6	-138.0	1.96
4,912.0	29.69	77.99	4,706.4	302.8	1,120.7	-140.1	1.19
4,937.0	29.52	78.21	4,728.2	305.4	1,132.7	-142.2	0.81
4,962.0	30.00	78.46	4,749.9	307.9	1,144.9	-144.5	1.98
4,987.0	29.83	78.58	4,771.6	310.3	1,157.1	-146.8	0.72
5,012.0	29.85	78.58	4,793.2	312.8	1,169.3	-149.0	0.08
5,037.0	30.21	78.25	4,814.9	315.3	1,181.6	-151.3	1.58
5,062.0	30.64	78.00	4,836.4	317.9	1,193.9	-153.6	1.79
5,087.0	30.58	77.96	4,858.0	320.6	1,206.4	-155.8	0.25
5,112.0	29.96	77.42	4,879.5	323.3	1,218.7	-157.9	2.71
5,137.0	29.68	76.81	4,901.2	326.0	1,230.8	-159.9	1.65
5,162.0	29.68	76.43	4,923.0	328.9	1,242.9	-161.8	0.75
5,187.0	29.54	76.20	4,944.7	331.8	1,254.9	-163.5	0.72
5,212.0	29.87	76.13	4,966.4	334.8	1,266.9	-165.3	1.33
5,237.0	29.55	75.83	4,988.1	337.8	1,278.9	-167.0	1.41
5,262.0	29.68	75.47	5,009.9	340.8	1,290.9	-168.7	0.88
5,287.0	29.64	75.28	5,031.6	344.0	1,302.9	-170.3	0.41
5,312.0	29.34	75.20	5,053.3	347.1	1,314.8	-171.9	1.21
5,337.0	28.89	74.55	5,075.2	350.3	1,326.5	-173.3	2.20
5,362.0	28.84	74.33	5,097.1	353.5	1,338.1	-174.7	0.47
5,387.0	29.15	74.35	5,118.9	356.8	1,349.8	-176.0	1.24
5,412.0	29.24	74.14	5,140.8	360.1	1,361.5	-177.4	0.55
5,437.0	28.83	73.90	5,162.6	363.4	1,373.2	-178.7	1.70
5,462.0	28.27	73.50	5,184.6	366.8	1,384.7	-179.9	2.37
5,487.0	28.05	73.43	5,206.6	370.2	1,396.0	-181.0	0.89
5,512.0	27.88	73.13	5,228.7	373.5	1,407.2	-182.1	0.88
5,537.0	27.83	72.64	5,250.8	377.0	1,418.4	-183.1	0.94
5,562.0	27.53	72.26	5,272.9	380.5	1,429.4	-184.0	1.39
5,587.0	27.51	72.45	5,295.1	384.0	1,440.5	-184.9	0.36
5,612.0	27.45	73.04	5,317.3	387.4	1,451.5	-185.9	1.12
5,637.0	27.63	73.68	5,339.5	390.7	1,462.5	-186.9	1.39
5,662.0	27.57	74.79	5,361.6	393.8	1,473.7	-188.2	2.07
5,687.0	27.61	75.54	5,383.8	396.8	1,484.9	-189.7	1.40
5,712.0	27.39	76.03	5,406.0	399.6	1,496.1	-191.2	1.26
5,737.0	27.18	75.71	5,428.2	402.4	1,507.2	-192.8	1.02
5,762.0	27.07	75.47	5,450.4	405.3	1,518.2	-194.3	0.62
5,787.0	26.63	74.93	5,472.7	408.2	1,529.1	-195.8	2.01
5,812.0	26.03	74.96	5,495.1	411.0	1,539.9	-197.1	2.40
5,813.1	26.10	74.96	5,496.1	411.2	1,540.3	-197.2	6.48
5,922.0	27.14	75.18	5,593.5	423.7	1,587.5	-203.2	0.96

Received
Office of Oil & Gas

JUL 18 2016



Company: Antero
Project: Ritchie County WV
Site: Noland Pad Penns Park/Knoll/Piper/Western
Well: Knoll Unit 2H
Wellbore: Original Wellpath
Design: As Drilled

Local Co-ordinate Reference: Well Knoll Unit 2H
TVD Reference: Frontier 22. GL 1143' + KB 25 @ 1168.0usft
MD Reference: Frontier 22. GL 1143' + KB 25 @ 1168.0usft
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: Antero NE

Survey

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)
6,017.0	23.18	73.07	5,679.4	434.7	1,626.3	-207.6	4.27
6,049.0	22.86	72.14	5,708.9	438.5	1,638.3	-208.6	1.51
6,081.0	24.45	73.19	5,738.2	442.3	1,650.5	-209.7	5.14
6,113.0	25.87	74.25	5,767.2	446.1	1,663.6	-211.1	4.66
6,145.0	26.91	75.21	5,795.8	449.8	1,677.3	-212.7	3.51
6,177.0	27.08	74.07	5,824.4	453.7	1,691.3	-214.4	1.70
6,209.0	27.22	73.54	5,852.8	457.8	1,705.3	-215.9	0.87
6,245.0	28.05	69.50	5,884.7	463.1	1,721.1	-217.0	5.69
6,273.0	29.19	62.65	5,909.3	468.5	1,733.4	-216.5	12.40
6,306.0	30.77	59.04	5,937.9	476.5	1,747.8	-214.5	7.26
6,338.0	31.92	53.21	5,965.2	485.8	1,761.6	-211.0	10.13
6,370.0	32.27	46.47	5,992.3	496.8	1,774.5	-205.7	11.24
6,402.0	33.09	40.33	6,019.3	509.3	1,786.4	-198.6	10.67
6,434.0	33.94	32.56	6,046.0	523.5	1,796.9	-189.3	13.66
6,466.0	34.08	25.32	6,072.5	539.2	1,805.5	-178.1	12.66
6,498.0	34.26	19.33	6,099.0	555.8	1,812.3	-165.3	10.53
6,530.0	35.26	13.95	6,125.3	573.2	1,817.5	-151.0	10.08
6,562.0	36.87	9.62	6,151.2	591.7	1,821.4	-135.4	9.42
6,594.0	38.10	5.35	6,176.6	611.0	1,823.9	-118.4	8.98
6,626.0	39.99	0.36	6,201.4	631.1	1,824.9	-100.2	11.46
6,658.0	42.69	356.57	6,225.5	652.2	1,824.3	-80.4	11.50
6,690.0	44.99	354.18	6,248.5	674.3	1,822.5	-59.2	8.85
6,700.0	45.74	354.04	6,255.6	681.4	1,821.8	-52.4	7.60
Middlesex							
6,722.0	47.40	353.74	6,270.7	697.3	1,820.1	-37.0	7.60
6,754.0	50.54	353.88	6,291.7	721.3	1,817.5	-13.8	9.82
6,787.0	53.81	353.01	6,311.9	747.1	1,814.5	11.3	10.13
6,819.0	57.77	351.72	6,329.9	773.4	1,811.0	36.9	12.82
6,851.0	62.78	350.58	6,345.8	800.8	1,806.7	64.0	15.96
6,880.0	66.34	349.81	6,358.2	826.6	1,802.2	89.6	12.51
Burkett							
6,883.0	66.71	349.73	6,359.4	829.3	1,801.7	92.3	12.51
6,914.0	70.00	349.34	6,370.9	857.7	1,796.5	120.5	10.68
6,946.0	73.04	348.43	6,381.0	887.4	1,790.6	150.3	9.88
6,955.0	73.82	347.97	6,383.6	895.9	1,788.9	158.8	9.95
Tully							
6,978.0	75.82	346.82	6,389.6	917.5	1,784.0	180.7	9.95
7,009.0	77.72	345.55	6,396.7	946.8	1,776.8	210.5	7.31
7,021.0	78.31	345.49	6,399.2	958.2	1,773.9	222.2	7.31
Marcellus							
7,041.0	79.30	345.38	6,403.1	977.2	1,769.0	240.5	4.96
7,073.0	81.79	344.31	6,408.3	1,007.7	1,760.7	273.0	8.45
7,105.0	83.67	343.15	6,412.4	1,038.1	1,751.8	304.5	6.89
7,137.0	83.58	340.28	6,415.9	1,068.3	1,741.8	336.3	8.92
7,170.0	84.66	338.34	6,419.3	1,099.0	1,730.2	369.1	6.70

Received
Office of Oil & Gas
JUL 18 2016



Company:	Antero	Local Co-ordinate Reference:	Well Knoll Unit 2H
Project:	Ritchie County WV	TVD Reference:	Frontier 22 GL 1143' + KB 25 @ 1168.0usft
Site:	Noland Pad Penns Park/Knoll/Piper/Western	MD Reference:	Frontier 22 GL 1143' + KB 25 @ 1168.0usft
Well:	Knoll Unit 2H	North Reference:	Grid
Wellbore:	Original Wellpath	Survey Calculation Method:	Minimum Curvature
Design:	As Drilled	Database:	Antero NE

Survey

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)
7,202.0	86.51	338.26	6,421.8	1,128.7	1,718.4	401.0	5.79
7,234.0	88.73	338.57	6,423.1	1,158.4	1,706.7	433.0	7.00
7,266.0	88.99	338.69	6,423.7	1,188.2	1,695.0	464.9	0.89
7,362.0	90.34	339.09	6,424.3	1,277.7	1,660.4	560.9	1.47
7,459.0	89.70	339.21	6,424.2	1,368.4	1,625.9	657.9	0.67
7,554.0	90.20	339.22	6,424.3	1,457.2	1,592.2	752.9	0.53
7,651.0	90.10	338.50	6,424.1	1,547.7	1,557.2	849.9	0.75
7,747.0	89.87	337.94	6,424.1	1,636.8	1,521.6	945.9	0.63
7,843.0	89.40	337.46	6,424.7	1,725.6	1,485.2	1,041.9	0.70
7,939.0	90.64	337.54	6,424.7	1,814.3	1,448.4	1,137.9	1.29
8,036.0	90.70	337.68	6,423.5	1,904.0	1,411.5	1,234.9	0.16
8,132.0	89.63	337.98	6,423.3	1,992.9	1,375.3	1,330.9	1.16
8,228.0	90.84	338.68	6,422.9	2,082.1	1,339.8	1,426.8	1.46
8,324.0	90.23	338.18	6,422.0	2,171.4	1,304.5	1,522.8	0.82
8,420.0	89.60	336.32	6,422.1	2,259.9	1,267.4	1,618.8	2.05
8,515.0	90.20	339.30	6,422.3	2,347.9	1,231.5	1,713.8	3.20
8,610.0	88.86	337.98	6,423.1	2,436.4	1,196.9	1,808.8	1.98
8,706.0	89.90	338.04	6,424.1	2,525.4	1,161.0	1,904.8	1.09
8,802.0	88.99	338.41	6,425.0	2,614.5	1,125.4	2,000.8	1.02
8,898.0	88.89	338.94	6,426.8	2,703.9	1,090.5	2,096.8	0.56
8,993.0	89.13	339.50	6,428.5	2,792.7	1,056.8	2,191.7	0.64
9,089.0	89.43	337.61	6,429.7	2,882.1	1,021.7	2,287.7	1.99
9,185.0	89.33	335.93	6,430.7	2,970.3	983.8	2,383.7	1.75
9,281.0	90.07	335.91	6,431.2	3,057.9	944.7	2,479.6	0.77
9,377.0	89.50	335.96	6,431.6	3,145.6	905.5	2,575.6	0.60
9,472.0	89.93	336.55	6,432.0	3,232.5	867.3	2,670.5	0.77
9,569.0	90.64	336.28	6,431.6	3,321.4	828.4	2,767.5	0.78
9,664.0	89.06	336.73	6,431.8	3,408.5	790.6	2,862.4	1.73
9,760.0	89.90	337.27	6,432.7	3,496.9	753.1	2,958.4	1.04
9,856.0	90.91	338.26	6,432.0	3,585.8	716.7	3,054.4	1.47
9,952.0	90.27	337.26	6,431.0	3,674.6	680.4	3,150.4	1.24
10,049.0	90.74	336.60	6,430.2	3,763.9	642.4	3,247.4	0.84
10,143.0	90.90	340.77	6,428.8	3,851.4	608.2	3,341.4	4.44
10,239.0	90.80	339.93	6,427.4	3,941.8	576.0	3,437.3	0.88
10,333.0	90.34	340.60	6,426.4	4,030.3	544.2	3,531.2	0.86
10,429.0	89.90	340.89	6,426.2	4,120.9	512.6	3,627.1	0.55
10,526.0	89.73	338.84	6,426.6	4,212.0	479.2	3,724.0	2.12
10,621.0	90.71	338.32	6,426.2	4,300.4	444.5	3,819.0	1.17
10,717.0	89.77	336.75	6,425.8	4,389.1	407.8	3,915.0	1.91
10,813.0	89.90	336.16	6,426.1	4,477.1	369.5	4,010.9	0.63
10,908.0	89.63	336.83	6,426.5	4,564.2	331.6	4,105.9	0.76
11,004.0	90.40	335.63	6,426.4	4,652.1	292.9	4,201.9	1.49
11,101.0	89.83	335.92	6,426.2	4,740.5	253.1	4,298.8	1.63
11,197.0	90.60	337.17	6,425.9	4,828.6	214.9	4,394.8	1.63

Received
Office of Oil & Gas



Company: Antero	Local Co-ordinate Reference: Well Knoll Unit 2H
Project: Ritchie County WV	TVD Reference: Frontier 22 GL 1143' + KB 25 @ 1168.0usft
Site: Noland Pad Penns Park/Knoll/Piper/Western	MD Reference: Frontier 22 GL 1143' + KB 25 @ 1168.0usft
Well: Knoll Unit 2H	North Reference: Grid
Wellbore: Original Wellpath	Survey Calculation Method: Minimum Curvature
Design: As Drilled	Database: Antero NE

Survey

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)
11,292.0	90.13	337.49	6,425.3	4,916.3	178.2	4,489.8	0.60
11,389.0	89.73	336.36	6,425.4	5,005.5	140.2	4,586.7	1.24
11,485.0	90.13	338.90	6,425.5	5,094.3	103.7	4,682.7	2.68
11,581.0	90.03	339.66	6,425.4	5,184.1	69.7	4,778.7	0.80
11,678.0	89.63	338.71	6,425.7	5,274.7	35.3	4,875.7	1.06
11,774.0	90.03	337.73	6,425.9	5,363.9	-0.4	4,971.7	1.10
11,870.0	89.60	336.15	6,426.3	5,452.2	-38.0	5,067.7	1.71
11,966.0	90.10	336.78	6,426.5	5,540.2	-76.3	5,163.6	0.84
12,061.0	89.80	339.46	6,426.6	5,628.4	-111.7	5,258.6	2.84
12,156.0	90.07	338.34	6,426.7	5,717.0	-145.9	5,353.6	1.21
12,252.0	89.97	336.45	6,426.7	5,805.6	-182.8	5,449.6	1.97
12,347.0	89.26	334.02	6,427.3	5,891.9	-222.6	5,544.5	2.66
12,442.0	90.22	337.48	6,427.7	5,978.5	-261.6	5,639.4	3.78
12,538.0	90.77	340.96	6,426.9	6,068.2	-295.6	5,735.3	3.67
12,634.0	91.17	341.30	6,425.3	6,159.0	-326.7	5,831.2	0.55
12,730.0	89.56	340.74	6,424.7	6,249.8	-357.9	5,927.0	1.78
12,826.0	89.93	340.72	6,425.1	6,340.4	-389.6	6,022.9	0.39
12,922.0	89.60	340.38	6,425.5	6,431.0	-421.6	6,118.8	0.49
13,017.0	90.34	340.14	6,425.5	6,520.4	-453.6	6,213.8	0.82
13,113.0	90.70	340.19	6,424.7	6,610.7	-486.2	6,309.7	0.38
13,208.0	89.83	338.83	6,424.2	6,699.7	-519.5	6,404.6	1.70
13,304.0	89.66	339.26	6,424.7	6,789.3	-553.8	6,500.6	0.48
13,399.0	90.13	338.56	6,424.8	6,877.9	-588.0	6,595.6	0.89
13,496.0	90.54	336.95	6,424.3	6,967.7	-624.7	6,692.6	1.71
13,592.0	90.03	335.87	6,423.8	7,055.7	-663.1	6,788.6	1.24
13,688.0	89.60	336.95	6,424.1	7,143.7	-701.5	6,884.5	1.21
13,784.0	89.56	337.30	6,424.8	7,232.1	-738.9	6,980.5	0.37
13,836.0	89.63	338.27	6,425.2	7,280.3	-758.5	7,032.5	1.87
13,899.0	89.63	338.27	6,425.6	7,338.8	-781.8	7,095.5	0.00

PTB

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
6,700.0	6,255.6	681.4	1,821.8	Middlesex
6,880.0	6,358.2	826.6	1,802.2	Burkett
6,955.0	6,383.6	895.9	1,788.9	Tully
7,021.0	6,399.2	958.2	1,773.9	Marcellus
13,899.0	6,425.6	7,338.8	-781.8	PTB

Received
Office of Oil & Gas
JUL 18 2016

Checked By: _____ Approved By: _____ Date: _____