March 9, 2015

RECEIVED
MAR 11 2015
WV DEP / DIV OF AIR QUALITY

Antero Resources
1615 Wynkoop Street
Denver, CO 80202
Office 303.357.7310
Fax 303.357.7315

Mr. David Keatley
Division of Air Quality
WV Department of Environmental Protection
601 57th Street, SE
Charleston, WV 25304

Dear Mr. Keatley:

Re: Class I Administrative Update
Kelly Wellpad – Antero Resources Corporation
Permit No. G70-A118

Antero Resources Corporation (Antero) would like to submit an administrative update to the Class II General Permit issued to Antero for the above listed oil and gas facility.

After review of the issued air permit, changes are needed in Section 1.0 Emissions Units Table to accurately reflect the condensate and produced water throughputs to be 3,679,200 gallons/year and 44,150,400 gallons/year respectively.

Enclosed are the following documents:

Application for General Permit Registration – Class I Administrative Update
Application for General Permit Registration – Attachment I: Emissions Calculations

Please let me know if you have any questions or require additional information.

Sincerely,

Barry Schatz

Barry Schatz
Senior Environmental & Regulatory Manager

WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF AIR QUALITY
601 57th Street, SE
Charleston, WV 25304
Phone: (304) 926-0475 • *www.dep.wv.gov/daq*

APPLICATION FOR GENERAL PERMIT REGISTRATION

CONSTRUCT, MODIFY, RELOCATE OR ADMINISTRATIVELY UPDATE

A STATIONARY SOURCE OF AIR POLLUTANTS

☐ CONSTRUCTION ☐ MODIFICATION ☐ RELOCATION ☒ CLASS I ADMINISTRATIVE UPDATE
☐ CLASS II ADMINISTRATIVE UPDATE

CHECK WHICH TYPE OF GENERAL PERMIT REGISTRATION YOU ARE APPLYING FOR:

☐ **G10-D –** Coal Preparation and Handling	☐ **G40-C –** Nonmetallic Minerals Processing
☐ **G20-B –** Hot Mix Asphalt	☐ **G50-B –** Concrete Batch
☐ **G30-D –** Natural Gas Compressor Stations	☐ **G60-C** - Class II Emergency Generator
☐ **G33-A –** Spark Ignition Internal Combustion Engines	☐ **G65-C –** Class I Emergency Generator
☐ **G35-A –** Natural Gas Compressor Stations (Flare/Glycol Dehydration Unit)	☒ **G70-A –** Class II Oil and Natural Gas Production Facility

SECTION I. GENERAL INFORMATION

1. Name of applicant (as registered with the WV Secretary of State's Office): Antero Resources Corporation

2. Federal Employer ID No. **(FEIN):** 80-0162034

3. Applicant's mailing address: 1615 Wynkoop St, Denver, CO 80202

4. Applicant's physical address: 1.7 miles north of the the intersection of WV-74 and McDougal Drive

5. If applicant is a subsidiary corporation, please provide the name of parent corporation:

6. **WV BUSINESS REGISTRATION.** Is the applicant a resident of the State of West Virginia? ☐ **YES** ☒ **NO**

➪ IF **YES,** provide a copy of the Certificate of **Incorporation/ Organization / Limited Partnership** (one page) including any name change amendments or other Business Registration Certificate as **Attachment A**.

➪ IF **NO,** provide a copy of the **Certificate of Authority / Authority of LLC / Registration** (one page) including any name change amendments or other Business Certificate as **Attachment A**.

SECTION II. FACILITY INFORMATION

7. Type of plant or facility (stationary source) to be constructed, modified, relocated or administratively updated (e.g., coal preparation plant, primary crusher, etc.):

8a. Standard Industrial Classification Classification (SIC) code: AND 8b. North American Industry System (NAICS) code:

9. DAQ Plant ID No. (for existing facilities only): 0 8 5 - 0 0 0 4 3

10. List all current 45CSR13 and other General Permit numbers associated with this process (for existing facilities only): G70-A118

Date of Last Application Revision 10/18/2013

A: PRIMARY OPERATING SITE INFORMATION

11A. Facility name of primary operating site:	12A. Address of primary operating site:
Kelly Well Pad	Mailing: NA Physical: From the intersection of WV-74N and McDougal Drive, go north on WV-74 for 17 mi. The entrance to the pad will be on the left.

13A. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? ☒ YES ☐ NO

➪ IF **YES**, please explain:

➪ IF **NO**, YOU ARE NOT ELIGIBLE FOR A PERMIT FOR THIS SOURCE.

14A. ➪ For **Modifications or Administrative Updates** at an existing facility, please provide directions to the present location of the facility from the nearest state road;

➪ For Construction or Relocation permits, please provide directions to the proposed new site location from the nearest state road. Include a **MAP** as **Attachment F**.

From the intersection of WV-74 N and McDougal Drive, go north on WV-74 for 1.7 miles. The entrance to the pad will be on the left.

15A. Nearest city or town:	16A. County:	17A. UTM Coordinates:
Pennsboro	Ritchie	Northing (KM): 4351.6588 Easting (KM): 503.2179 Zone:

18A. Briefly describe the proposed new operation or change (s) to the facility:	19A. Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits):
	Latitude: 39.314322 Longitude: -80.962672

B: 1ST ALTERNATE OPERATING SITE INFORMATION (only available for G20, G40, & G50 General Permits)

11B. Name of 1st alternate operating site:	12B. Address of 1st alternate operating site:
	Mailing: Physical:

13B. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? ☐ YES ☐ NO

➪ IF **YES**, please explain:

➪ IF **NO**, YOU ARE NOT ELIGIBLE FOR A PERMIT FOR THIS SOURCE.

14B. ➪ For **Modifications or Administrative Updates** at an existing facility, please provide directions to the present location of the facility from the nearest state road;

➪ For Construction or Relocation permits, please provide directions to the proposed new site location from the nearest state road. Include a **MAP** as **Attachment F**.

_____

_____

_____

15B. Nearest city or town:	16B. County:	17B. UTM Coordinates: Northing (KM): _____ Easting (KM): _____ Zone: _____
18B. Briefly describe the proposed new operation or change (s) to the facility:		19B. Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits): Latitude: _____ Longitude: _____

C: 2ND ALTERNATE OPERATING SITE INFORMATION (only available for G20, G40, & G50 General Permits):

11C. Name of 2nd alternate operating site:	12C. Address of 2nd alternate operating site: Mailing: _____ Physical: _____

13C. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? ☐ **YES** ☐ **NO**

➪ IF **YES**, please explain: _____

_____

➪ IF **NO**, YOU ARE NOT ELIGIBLE FOR A PERMIT FOR THIS SOURCE.

14C. ➪ For **Modifications or Administrative Updates** at an existing facility, please provide directions to the present location of the facility from the nearest state road;

➪ For Construction or Relocation permits, please provide directions to the proposed new site location from the nearest state road. Include a **MAP** as **Attachment F**.

_____

_____

_____

15C. Nearest city or town:	16C. County:	17C. UTM Coordinates: Northing (KM): _____ Easting (KM): _____ Zone: _____
18C. Briefly describe the proposed new operation or change (s) to the facility:		19C. Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits): Latitude: _____ Longitude: _____

20. Provide the date of anticipated installation or change:	21. Date of anticipated Start-up if registration is granted:
____/____/____ ☐ If this is an **After-The-Fact** permit application, provide the date upon which the proposed change did happen: : ____/____/____	6 / 30 / 2015

22. Provide maximum projected **Operating Schedule** of activity/activities outlined in this application if other than 8760 hours/year. (Note: anything other than 24/7/52 may result in a restriction to the facility's operation).

Hours per day_____ Days per week _____ Weeks per year _____ Percentage of operation _____

SECTION III. ATTACHMENTS AND SUPPORTING DOCUMENTS

23. Include a check payable to WVDEP – Division of Air Quality with the appropriate **application fee** (per 45CSR22 and 45CSR13).

24. Include a **Table of Contents** as the first page of your application package.

All of the required forms and additional information can be found under the Permitting Section (General Permits) of DAQ's website, or requested by phone.

25. Please check all attachments included with this permit application. Please refer to the appropriate reference document for an explanation of the attachments listed below.

- ☐ ATTACHMENT A : CURRENT BUSINESS CERTIFICATE
- ☐ ATTACHMENT B: PROCESS DESCRIPTION
- ☐ ATTACHMENT C: DESCRIPTION OF FUGITIVE EMISSIONS
- ☐ ATTACHMENT D: PROCESS FLOW DIAGRAM
- ☐ ATTACHMENT E: PLOT PLAN
- ☐ ATTACHMENT F: AREA MAP
- ☐ ATTACHMENT G: EQUIPMENT DATA SHEETS AND REGISTRATION SECTION APPLICABILITY FORM
- ☐ ATTACHMENT H: AIR POLLUTION CONTROL DEVICE SHEETS
- ☒ ATTACHMENT I: EMISSIONS CALCULATIONS
- ☐ ATTACHMENT J: CLASS I LEGAL ADVERTISEMENT
- ☐ ATTACHMENT K: ELECTRONIC SUBMITTAL
- ☐ ATTACHMENT L: GENERAL PERMIT REGISTRATION APPLICATION FEE
- ☐ ATTACHMENT M: SITING CRITERIA WAIVER
- ☐ ATTACHMENT N: MATERIAL SAFETY DATA SHEETS (MSDS)
- ☐ ATTACHMENT O: EMISSIONS SUMMARY SHEETS
- ☐ OTHER SUPPORTING DOCUMENTATION NOT DESCRIBED ABOVE (Equipment Drawings, Aggregation Discussion, etc.)

Please mail an original and two copies of the complete General Permit Registration Application with the signature(s) to the DAQ Permitting Section, at the address shown on the front page of this application. Please DO NOT fax permit applications. For questions regarding applications or West Virginia Air Pollution Rules and Regulations, please refer to the website shown on the front page of the application or call the phone number also provided on the front page of the application.

SECTION IV. CERTIFICATION OF INFORMATION

This General Permit Registration Application shall be signed below by a Responsible Official. A Responsible Official is a President, Vice President, Secretary, Treasurer, General Partner, General Manager, a member of a Board of Directors, or Owner, depending on business structure. A business may certify an Authorized Representative who shall have authority to bind the Corporation, Partnership, Limited Liability Company, Association, Joint Venture or Sole Proprietorship. Required records of daily throughput, hours of operation and maintenance, general correspondence, Emission Inventory, Certified Emission Statement, compliance certifications and all required notifications must be signed by a Responsible Official or an Authorized Representative. If a business wishes to certify an Authorized Representative, the official agreement below shall be checked off and the appropriate names and signatures entered. Any administratively incomplete or improperly signed or unsigned Registration Application will be returned to the applicant.

FOR A CORPORATION (domestic or foreign)

☐ I certify that I am a President, Vice President, Secretary, Treasurer or in charge of a principal business function of the corporation

FOR A PARTNERSHIP

☐ I certify that I am a General Partner

FOR A LIMITED LIABILITY COMPANY

☐ I certify that I am a General Partner or General Manager

FOR AN ASSOCIATION

☐ I certify that I am the President or a member of the Board of Directors

FOR A JOINT VENTURE

☐ I certify that I am the President, General Partner or General Manager

FOR A SOLE PROPRIETORSHIP

☐ I certify that I am the Owner and Proprietor

☐ *I hereby certify that* (please print or type) _____

is an Authorized Representative and in that capacity shall represent the interest of the business (e.g., Corporation, Partnership, Limited Liability Company, Association Joint Venture or Sole Proprietorship) and may obligate and legally bind the business. If the business changes its Authorized Representative, a Responsible Official shall notify the Director of the Office of Air Quality immediately, and/or,

I hereby certify that all information contained in this General Permit Registration Application and any supporting documents appended hereto is, to the best of my knowledge, true, accurate and complete, and that all reasonable efforts have been made to provide the most comprehensive information possible

Signature _____
(please use blue ink) Responsible Official Date

Name & Title Barry Schatz, Senior Environmental and Regulatory Manager
(please print or type)

Signature Barry Schatz 3/9/2015
(please use blue ink) Authorized Representative (if applicable) Date

Applicant's Name Antero Resources Corporation

Phone & Fax 303-357-7276 303-357-7315
Phone Fax

Email bschatz@anteroresources.com

Table 1

Facility Information
Kelly Wellpad
Ritchie County, West Virginia
Antero Resources Corporation

Oil and Gas Site General Information

Administrative Information	
Company Name	Antero Resources Corporation
Facility/Well Name	Kelly Wellpad
Nearest City/Town	Pennsboro
API Number/SIC Code	1311
Latitude/Longitude	39.314322, -80.962672
County	Ritchie County

Technical Information	
Max Condensate Site Throughput (bbl/day):	240
Max Produced Water Site Throughput (bbl/day):	2,880
Are there any sour gas streams at this site?	No
Is this site currently operational/producing?	No

Equipment/Processes at Site	
Equipment/Process Types	**How many for this site?**
Fugitives	6
IC Engines	1
Turbines	0
Diesel Engines	0
Gas Production Unit Heaters	6
Condensate Tanks	4
Produced Water Tanks	2
Miscellaneous Tanks	0
Loading Jobs	2
Glycol Units	0
Amine Units	0
Flares-Vapor Combustors	1

Table 2

Uncontrolled/Controlled Emissions Summary
Kelly Wellpad
Ritchie County, West Virginia
Antero Resources Corporation

Emission Source	VOC		NO_X		CO_{2e}		CO		SO_2		$PM_{2.5}$		PM_{10}		Lead		Total HAPs		Benzene		Xylenes		Formaldehyde	
	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)
UNCONTROLLED (Fugitives, Storage Tanks, Gas Production Unit Heaters)																								
Fugitive Emissions (Component Count, PCV and Hauling)[1]	2.4394	10.6845			52.514	230.01							1.5789	2.2128			0.2858	1.2520	0.0039	0.0171	2.95E-02	1.29E-01		
Flashing, Working and Breathing (F/W/B) Losses[2]	226.00	989.9			887.9	3,889.0											40.516	177.461	0.0760	0.3328	0.1486	0.6508		
Engine Emissions[3]	0.0074	0.0323	0.3158	1.3831	28.86	126.42	5.6445	24.7228	0.0001	0.0006	0.0025	0.0108	0.0024	0.0104			0.0057	0.0251	0.0004	0.0017	0.0000	0.0002	0.0051	0.0224
Gas Production Unit Heater Emissions[4]	0.0382	0.1673	0.6945	3.0421	838.41	3,672.23	0.5834	2.5554	0.0042	0.0183	0.0528	0.2312	0.0528	0.2312	3.47E-06	1.52E-05	1.31E-02	5.73E-02	1.46E-05	6.39E-05			0.0005	0.0023
TOTALS:	**228.4845**	**1000.7622**	**1.0103**	**4.4252**	**1807.6783**	**7917.6309**	**6.2279**	**27.2782**	**0.0043**	**0.0189**	**0.0553**	**0.2420**	**1.6340**	**2.4544**	**3.47E-06**	**1.52E-05**	**40.8207**	**178.7948**	**0.0803**	**0.3517**	**0.1781**	**0.7802**	**0.0056**	**0.0247**
UNCONTROLLED (Truck Loading Emissions)																								
Truck Loading Emissions[5]	9.684	1.771			9.059	3.594											0.1324	0.0242	1.85E-04	3.49E-05	0.0018	0.0003		
CONTROLLED EMISSIONS																								
Flare Emissions (from F/W/B losses)[6]	4.5201	19.7979	0.2988	1.3088	952.6344	4172.5387	0.2510	1.0994	7.56E-06	3.31E-05	0.0170	0.0746	0.0227	9.95E-02	1.49E-06	6.54E-06	0.8103	3.5493	1.52E-03	6.66E-03	0.0030	0.0130	9.45E-07	4.14E-06
Controlled Fugitive Emissions from Hauling													0.7894	1.1064										
TOTALS:	**4.5201**	**19.7979**	**0.2988**	**1.3088**	**952.6344**	**4172.5387**	**0.2510**	**1.0994**	**7.56E-06**	**3.31E-05**	**0.0170**	**0.0746**	**0.8121**	**1.2059**	**1.49E-06**	**6.54E-06**	**0.8103**	**3.5493**	**0.0015**	**0.0067**	**0.0030**	**0.0130**	**9.45E-07**	**4.14E-06**
POTENTIAL TO EMIT[7]	**7.0050**	**32.4527**	**1.3091**	**5.7340**	**1872.4182**	**8204.7859**	**6.4789**	**28.3775**	**0.0043**	**0.0189**	**0.0723**	**0.3166**	**0.8673**	**1.4475**	**4.97E-06**	**2.18E-05**	**1.1150**	**4.9078**	**0.0058**	**0.0256**	**0.0325**	**0.1428**	**0.0056**	**0.0247**

Enter any notes here:	1 - See Tables 4 and 5 for fugitive emission calculations; Table 12 for PM emissions from hauling. 2 - See Tables 6 and 7 for tanks emission calculations 3 - See Table 13 for engine emissions 4 - See Table 9 for gas production unit heater emission calculations 5 - The maximum emission was calculated based on tank truck capacity of 200 barrels and actual fill rate of 50 minutes per tank truck. At a production rate of 240 barrels per day, VOC emissions would be 9.6841 pounds per hour when there is truck loading activity. Average hourly VOC emissions from truck loading per year is 0.4043 pound per hour. 6 - See Table 10 and 11 for flare emission calculations. 7 - The hourly potential to emit is the sum of emissions from gas production unit heaters, engine, storage tanks, fugitives and flare. Does not include emissions from loading (see footnote 5). The total TPY PTE is the sum of all emissions. PM 10 TPY is the sum of uncontrolled hauling and other PM10 sources.

Table 3

Permit Summary
Kelly Wellpad
Ritchie County, West Virginia
Antero Resources Corporation

Pollutant		Emissions			Threshold Exceeded?	
		Uncontrolled	Controlled	Threshold	Uncontrolled	Controlled
VOC	lbs/hr	228.4845	7.0050	6	**Yes**	**Yes**
	tons/yr	1002.5328	32.4527	10	**Yes**	**Yes**
NO_X	lbs/hr	1.0103	1.3091	6		
	tons/yr	4.4252	5.7340	10		
CO	lbs/hr	6.2279	6.4789	6	**Yes**	**Yes**
	tons/yr	27.2782	28.3775	10	**Yes**	**Yes**
SO_2	lbs/hr	0.0043	0.0043	6		
	tons/yr	0.0189	0.0189	10		
$PM_{2.5}$	lbs/hr	5.53E-02	7.23E-02	6		
	tons/yr	2.42E-01	3.17E-01	10		
PM_{10}	lbs/hr	1.6340	0.8673	6		
	tons/yr	2.4544	1.4475	10		
Lead	lbs/hr	3.47E-06	4.97E-06	6		
	tons/yr	1.52E-05	2.18E-05	10		
Total HAPs	lbs/hr	40.8207	1.1150	2	**Yes**	
	tons/yr	178.8190	4.9078	5	**Yes**	
Total TAPs	lbs/hr	0.0859	0.0115	1.14		
n-Hexane	lbs/hr	40.4591	1.1740			
	tons/yr	176.6690	4.6004			
Toluene	lbs/hr	0.1601	0.0160			
	tons/yr	0.6979	0.0669			
Ethylbenzene	lbs/hr	0.0679	0.0113			
	tons/yr	0.2949	0.0472			
Xylenes	lbs/hr	0.1799	0.0343			
	tons/yr	0.7806	0.1428			
Benzene	lbs/hr	0.0805	0.0060			
	tons/yr	0.3518	0.0256			

Enter any notes here:	1. Emissions are based on 98% Flare DRE operating 100% of the time. 2. Please see Attachment C/O- Fugitive Emissions Data Summary Sheet and Attachment O – Emission Points Data Summary Sheet for sitewide sources and breakdown of emission quantities.

Table 4

Fugitive Emissions
Kelly Wellpad
Ritchie County, West Virginia
Antero Resources Corporation

VOC Type:	Condensate VOC
Emission Type:	Steady State (continuous)

Gas Weight Fraction From Analysis:	VOC frac	0.219
	Benzene frac	0.000
	Toluene	0.000
	Ethylbenzene	0.000
	Xylenes	0.000
	n-Hexane	0.041
	Methane	0.586

Gas					
Number	Component	Pollutant	Emission Factor (kg/hr of THC per component)	kg/hr	lb/yr
300	Valves	Gas VOC	0.004500	0.30	5,693.83
		Non VOC	0.004500	1.05	20,323.37
354	Connectors	VOC	0.000200	0.02	298.61
		Non-VOC	0.000200	0.06	1,065.85
78	Flanges	VOC	0.000390	0.01	128.30
		Non-VOC	0.000390	0.02	457.95
			Total VOCs:	0.32	6,120.74
			Total THC:	1.45	27,967.91

Light Liquid Weight Fraction From Analysis:	VOC frac	0.974
	Benzene frac	0.002
	Toluene	0.007
	Ethylbenzene	0.006
	Xylenes	0.017
	n-hexane	0.053
	Methane	0.008

Light Liquid					
Number	Component	Pollutant	Emission Factor (kg/hr of THC per component)	kg/hr	lb/yr
312	Valves	Light Liquid VOC	0.002500	0.76	14,646.55
		Light Liquid Non-VOC		0.02	385.61
			Total VOC:	0.76	14,646.55
			Total THC:	0.78	15,032.16

Fugitive Total Emissions			
	Annual Emissions (lb/yr)	Annual Emissions (lb/hr)	Annual Emissions (tpy)
VOC	20,767.29	2.37	10.38
Ethylbenzene		0.01	0.04
Toluene		0.01	0.05
Xylenes		0.03	0.13
n-Hexane		0.22	0.97
TAPs (Benzene)		0.00	0.02
HAPs		0.28	1.22
CO_{2e}	412,543.19	47.09	206.27

Enter Notes Here:	Fugitive emissions based on an estimated component count Global Warming Potentials from EPA site Reference to Emission factors used: 1. Emission factors are for oil and gas production facilities (not refineries) come from the EPA's "Protocol for Equipment Leak Emission Estimates" November 1995, EPA 4531, R-95-017, Table 2-4. 2. Percent of speciated VOCs used in fugitive calculations are based on the total hydrocarbons, not of the total sample.

Table 5

Pneumatic Control Valve Emissions
Kelly Wellpad
Ritchie County, West Virginia
Antero Resources Corporation

Number of PCVs	24
Bleed Rate (scf/day/PCV)	6.6
Total Bleed Rate (scf/day)	158.4

Component	Mol%	Molecular Weight (lb/lb-mole)	Component Flow (scf/day)	Component Moles (lb-moles)	Component Emissions (lbs/day)	(lbs/hr)	(tons/year)
H2S	0	34.08	0	0.00	0.00	0.00	0.00
Nitrogen	0.4946	14.01	0.7834464	0.00	0.03	0.00	0.01
Carbon Dioxide	0.1467	44.01	0.2323728	0.00	0.03	0.00	0.00
Methane	77.6927	16.04	123.0652368	0.32	5.20	0.22	0.95
Ethane	14.1987	30.07	22.4907408	0.06	1.78	0.07	0.33
Propane	4.4938	44.1	7.1181792	0.02	0.83	0.03	0.15
Isobutane	0.5666	58.12	0.8974944	0.00	0.14	0.01	0.03
n-Butane	1.1838	58.12	1.8751392	0.00	0.29	0.01	0.05
Isopentane	0.3749	72.15	0.5938416	0.00	0.11	0.00	0.02
n-Pentane	0.2914	72.15	0.4615776	0.00	0.09	0.00	0.02
2-Methylpentane	0	86.18	0	0.00	0.00	0.00	0.00
3-Methylpentane	0	86.18	0	0.00	0.00	0.00	0.00
n-Hexane	0.5451	86.18	0.8634384	0.00	0.20	0.01	0.04
Methylcyclopentane	0	84.16	0	0.00	0.00	0.00	0.00
Benzene	0	78.11	0	0.00	0.00	0.00	0.00
2-Methylhexane	0	100.2	0	0.00	0.00	0.00	0.00
3-Methylhexane	0	100.2	0	0.00	0.00	0.00	0.00
Heptane	0	100.21	0	0.00	0.00	0.00	0.00
Methylcyclohexane	0	98.186	0	0.00	0.00	0.00	0.00
Toluene	0	92.14	0	0.00	0.00	0.00	0.00
Octane	0	114.23	0	0.00	0.00	0.00	0.00
Ethylbenzene	0	106.17	0	0.00	0.00	0.00	0.00
m & p-Xylene	0	106.16	0	0.00	0.00	0.00	0.00
o-Xylene	0	106.16	0	0.00	0.00	0.00	0.00
Nonane	0	128.2	0	0.00	0.00	0.00	0.00
C10+	0	174.28	0	0.00	0.00	0.00	0.00

	lb/hr	tpy
VOC Emissions	0.0687	0.3009
Benzene Emissions	0.0000	0.0000
Toluene Emissions	0.0000	0.0000
Ethylbenzene Emissions	0.0000	0.0000
Xylene Emissions	0.0000	0.0000
n-Hexane Emissions	0.0082	0.0358
HAPs Emissions	0.0082	0.0358
TAPs Emissions	0.0000	0.0000
CO_{2e} emissions	5.4196	23.7380

Enter any notes here:	1. PCV bleed rate obtained from the user manual for PCV http://issuu.com/rmcprocesscontrols/docs/mizer-pilot-operation--parts---installation-manual 2. Emissions per hour= Mol % x no. of PCV x bleed rate x MW / 379.48 / 24

Table 6

Uncontrolled Flashing Emissions
Kelly Wellpad
Ritchie County, West Virginia
Antero Resources Corporation

# Hours Operational	8760

	Condensate Tank Flashing Losses			Produced Water Tank Flashing Losses		
	Vapor Mass Fraction	Flashing Losses		Vapor Mass Fraction	Flashing Losses	
	wt%	lbs/hr	tpy	wt%	lbs/hr	tpy
Water	0.0691	0.2037	0.8923	2.6319	0.0000	0.0000
H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Nitrogen	0.0332	0.0979	0.4288	0.3364	0.0576	0.2523
Carbon Dioxide	0.1523	0.4488	1.9659	2.7246	0.4666	2.0435
Methane	8.6673	25.5402	111.8661	57.3237	9.8161	42.9944
Ethane	16.4966	48.6112	212.9171	21.2520	3.6392	15.9397
Propane	21.9551	64.6959	283.3680	10.7591	1.8424	8.0696
Isobutane	6.4644	19.0488	83.4337	0.5997	0.1027	0.4498
n-Butane	15.9433	46.9807	205.7756	2.5729	0.4406	1.9298
Isopentane	7.9710	23.4884	102.8794	0.6692	0.1146	0.5019
n-Pentane	6.6047	19.4624	85.2455	0.5020	0.0860	0.3765
2-Methylpentane	0.2462	0.7256	3.1782	0.0078	0.0013	0.0058
3-Methylpentane	0.1586	0.4674	2.0470	0.0134	0.0023	0.0100
n-Hexane	13.5684	39.9826	175.1240	0.3333	0.0571	0.2500
Methylcyclopentane	0.0842	0.2480	1.0864	0.0210	0.0036	0.0158
Benzene	0.0237	0.0698	0.3059	0.0354	0.0061	0.0266
2-Methylhexane	0.1966	0.5794	2.5379	0.0055	0.0009	0.0041
3-Methylhexane	0.1521	0.4481	1.9625	0.0044	0.0008	0.0033
Heptane	0.3469	1.0221	4.4770	0.0109	0.0019	0.0081
Methylcyclohexane	0.2493	0.7347	3.2180	0.0389	0.0067	0.0292
Toluene	0.0462	0.1361	0.5959	0.0623	0.0107	0.0467
Octane	0.3992	1.1763	5.1523	0.0068	0.0012	0.0051
Ethylbenzene	0.0181	0.0534	0.2337	0.0242	0.0041	0.0181
m & p-Xylene	0.0241	0.0709	0.3107	0.0315	0.0054	0.0236
o-Xylene	0.0225	0.0664	0.2909	0.0303	0.0052	0.0227
Nonane	0.1048	0.3089	1.3531	0.0027	0.0005	0.0021
C10+	0.0019	0.0057	0.0248	0.0000	0.0000	0.0000
Total VOCs	74.581	219.77	962.6	15.731	2.6938	11.7990
Total CO_{2e}		638.95	2,798.6		245.87	1,076.9
Total TAPs (Benzene)		0.0698	0.3059		0.0061	0.0266
Toluene		0.1361	0.5959		0.0107	0.0467
Ethylbenzene		0.0534	0.2337		0.0041	0.0181
Xylenes		0.1374	0.6016		0.0106	0.0463
n-Hexane		39.983	175.124		0.0571	0.2500
Total HAPs		40.379	176.861		0.0885	0.3877
Total	100.00	294.67	1,290.7	100.00	16.673	73.03

Enter any notes here:	Vapor mass fractions and Flashing losses from Promax output

Table 7

Uncontrolled Working and Breathing Losses
Kelly Wellpad
Ritchie County, West Virginia
Antero Resources Corporation

Condensate Tank Information	
Number of Tanks	4
Maximum Working Losses (lbs/hr)	2.9282
Maximum Breathing Losses (lbs/hr)	1.9590

	Condensate Tank W/B Losses						
	Vapor Mass Fraction	Working Losses		Breathing Losses		Max W/B Losses	
	wt%	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Nitrogen	0.0019	0.0001	0.0002	0.0000	0.0002	0.0001	0.0004
Carbon Dioxide	0.2056	0.0060	0.0264	0.0040	0.0176	0.0100	0.0440
Methane	2.4088	0.0705	0.3089	0.0472	0.2067	0.1177	0.5156
Ethane	25.0792	0.7344	3.2165	0.4913	2.1519	1.2257	5.3685
Propane	27.5131	0.8056	3.5287	0.5390	2.3608	1.3446	5.8894
Isobutane	7.6506	0.2240	0.9812	0.1499	0.6565	0.3739	1.6377
n-Butane	18.5894	0.5443	2.3842	0.3642	1.5951	0.9085	3.9792
Isopentane	8.7553	0.2564	1.1229	0.1715	0.7513	0.4279	1.8742
n-Pentane	7.1230	0.2086	0.9136	0.1395	0.6112	0.3481	1.5247
2-Methylpentane	0.2589	0.0076	0.0332	0.0051	0.0222	0.0127	0.0554
3-Methylpentane	0.1658	0.0049	0.0213	0.0032	0.0142	0.0081	0.0355
n-Hexane	0.9639	0.0282	0.1236	0.0189	0.0827	0.0471	0.2063
Methylcyclopentane	0.0812	0.0024	0.0104	0.0016	0.0070	0.0040	0.0174
Benzene	0.0014	0.0000	0.0002	0.0000	0.0001	0.0001	0.0003
2-Methylhexane	0.0136	0.0004	0.0017	0.0003	0.0012	0.0007	0.0029
3-Methylhexane	0.1583	0.0046	0.0203	0.0031	0.0136	0.0077	0.0339
Heptane	0.3341	0.0098	0.0428	0.0065	0.0287	0.0163	0.0715
Methylcyclohexane	0.2344	0.0069	0.0301	0.0046	0.0201	0.0115	0.0502
Toluene	0.0059	0.0002	0.0008	0.0001	0.0005	0.0003	0.0013
Octane	0.3534	0.0103	0.0453	0.0069	0.0303	0.0173	0.0757
Ethylbenzene	0.0043	0.0001	0.0005	0.0001	0.0004	0.0002	0.0009
m & p-Xylene	0.0073	0.0002	0.0009	0.0001	0.0006	0.0004	0.0016
o-Xylene	0.0059	0.0002	0.0008	0.0001	0.0005	0.0003	0.0013
Nonane	0.0838	0.0025	0.0107	0.0016	0.0072	0.0041	0.0179
C10+	0.0010	0.0000	0.0001	0.0000	0.0001	0.0001	0.0002
Total VOCs	72.304	2.1172	9.273	1.4165	6.2041	3.5337	15.477
Total CO_{2e}		1.7694	7.7499	1.1838	5.1849	2.9532	12.935
Total TAPs (Benzene)		0.0000	0.0002	0.0000	0.0001	0.0001	0.0003
Toluene		0.0002	0.0008	0.0001	0.0005	0.0003	0.0013
Ethylbenzene		0.0001	0.0005	0.0001	0.0004	0.0002	0.0009
Xylenes		0.0004	0.0017	0.0003	0.0011	0.0006	0.0028
n-Hexane		0.0282	0.1236	0.0189	0.0827	0.0471	0.2063
Total HAPs		0.0289	0.1268	0.0194	0.0848	0.0483	0.2116
Total	100.00	2.9282	12.8254	1.9590	8.5806	4.8872	21.406

Table 7

Uncontrolled Working and Breathing Losses
Kelly Wellpad
Ritchie County, West Virginia
Antero Resources Corporation

Produced Water Tank Information	
Number of Tanks	2
Maximum Working Losses (lbs/hr)	0.1352
Maximum Breathing Losses (lbs/hr)	0.0083

	Produced Water Tank W/B Losses						
	Vapor Mass Fraction	Working Losses		Breathing Losses		Max W/B Losses	
	wt%	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Nitrogen	0.0067	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Carbon Dioxide	3.6561	0.0049	0.0216	0.0003	0.0013	0.0052	0.0230
Methane	3.1726	0.0043	0.0188	0.0003	0.0012	0.0046	0.0199
Ethane	1.0853	0.0015	0.0064	0.0001	0.0004	0.0016	0.0068
Propane	0.1339	0.0002	0.0008	0.0000	0.0000	0.0002	0.0008
Isobutane	0.0009	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
n-Butane	0.0060	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Isopentane	0.0004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
n-Pentane	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2-Methylpentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3-Methylpentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
n-Hexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Methylcyclopentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Benzene	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2-Methylhexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3-Methylhexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Heptane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Methylcyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Toluene	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Octane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Ethylbenzene	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
m & p-Xylene	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
o-Xylene	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Nonane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
C10+	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total VOCs	0.1416	0.0002	0.0008	0.0000	0.0001	0.0002	0.0009
Total CO_{2e}		0.1121	0.4912	0.0069	0.0301	0.1190	0.5213
Total TAPs (Benzene)		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Toluene		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Ethylbenzene		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Xylenes		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
n-Hexane		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total HAPs		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	100.00	0.1352	0.5920	0.0083	0.0363	0.1434	0.6283

Enter any notes here:	Vapor mass fractions, working losses and breathing losses from Promax output

Table 8

Loading Emissions
Kelly Wellpad
Ritchie County, West Virginia
Antero Resources Corporation

Annual Loading	Oil Truck Loading	Water Truck Loading
RVP	3.41	1.0221
Annual Average Temp (F)	72.1	72.1
S (saturation factor)	0.6	0.6
P (true vapor pressure)	2.19	0.45
M (MW of vapor)	43.23	18.44
Collection Efficiency (%)	0	0
Loading Loss (lb/10^3 gal)*	1.33	0.12
Maximum Throughput (gallons/hr)	10,080	10,080
Average Throughput (gallons/yr)	3,679,200	44,150,400
Loading Emissions (lbs/hr)	13.39	1.17
Loading Emissions (tpy)	2.44	2.55

	Condensate Tank Loading Losses			Produced Water Tank Loading Losses		
	Vapor Mass Fraction	Loading Losses		Vapor Mass Fraction	Loading Losses	
	wt%	lbs/hr	tpy	wt%	lbs/hr	tpy
H2S	0.0000	0.00	0.00	0.0000	0.00E+00	0.00E+00
Nitrogen	0.0019	0.00	0.00	0.0067	7.81E-05	1.71E-04
Carbon Dioxide	0.2056	0.03	0.01	3.6561	4.26E-02	9.33E-02
Methane	2.4088	0.32	0.06	3.1726	3.70E-02	8.10E-02
Ethane	25.0792	3.36	0.61	1.0853	1.26E-02	2.77E-02
Propane	27.5131	3.68	0.67	0.1339	1.56E-03	3.42E-03
Isobutane	7.6506	1.02	0.19	0.0009	1.09E-05	2.39E-05
n-Butane	18.5894	2.49	0.45	0.0060	7.03E-05	1.54E-04
Isopentane	8.7553	1.17	0.21	0.0004	4.58E-06	1.00E-05
n-Pentane	7.1230	0.95	0.17	0.0002	2.51E-06	5.49E-06
2-Methylpentane	0.2589	0.03	0.01	0.0000	7.42E-09	1.62E-08
3-Methylpentane	0.1658	0.02	0.00	0.0000	3.09E-08	6.77E-08
n-Hexane	0.9639	0.13	0.02	0.0000	1.23E-08	2.70E-08
Methylcyclopentane	0.0812	0.01	0.00	0.0000	1.05E-07	2.29E-07
Benzene	0.0014	0.00	0.00	0.0000	5.42E-07	1.19E-06
2-Methylhexane	0.0136	0.00	0.00	0.0000	8.58E-11	1.88E-10
3-Methylhexane	0.1583	0.02	0.00	0.0000	1.03E-09	2.26E-09
Heptane	0.3341	0.04	0.01	0.0000	1.87E-09	4.09E-09
Methylcyclohexane	0.2344	0.03	0.01	0.0000	4.13E-08	9.05E-08
Toluene	0.0059	0.00	0.00	0.0000	4.58E-07	1.00E-06
Octane	0.3534	0.05	0.01	0.0000	2.28E-10	5.00E-10
Ethylbenzene	0.0043	0.00	0.00	0.0000	1.00E-07	2.19E-07
m & p-Xylene	0.0073	0.00	0.00	0.0000	1.45E-07	3.18E-07
o-Xylene	0.0059	0.00	0.00	0.0000	1.46E-07	3.20E-07
Nonane	0.0838	0.01	0.00	0.0000	4.31E-11	9.44E-11
C10+	0.0010	0.00	0.00	0.0000	2.37E-17	5.19E-17
Total VOCs	72.3044	9.682	1.767	0.1416	1.65E-03	3.61E-03
Total CO_{2e}		8.092	1.4768		0.9670	2.1177
Total TAPs (Benzene)		0.0002	0.0000		0.0000	0.0000
Toluene		0.0008	0.0001		0.0000	0.0000
Ethylbenzene		0.0006	0.0001		0.0000	0.0000
Xylenes		0.0018	0.0003		0.0000	0.0000
n-Hexane		0.1291	0.0236		0.0000	0.0000
Total HAPs		0.1324	0.0242		0.0000	0.0000
Total	100.0000	13.3912	2.4439	100.0000	1.1654	2.5523

Enter any notes here

Vapor mass fractions and loading losses from Promax output

Using equation L_L = 12.46 SPM/T from AP-42, Chapter 5, Section 5.2-4

MW was obtained by Promax; RVP was taken from laboratory reports

Annual Average Temp (F) obtained from Charleston, WV (preset in Promax)

S (saturation factor) is based on submerged loading, dedicated service as it was most representative

True vapor pressure (TVP) equation from AP-42, Chapter 7, Figure 7.1-13b

Loading emissions are vented to the atmosphere.

Table 9

Gas Production Unit Heater Emissions
Kelly Wellpad
Ritchie County, West Virginia
Antero Resources Corporation

Number of Units	6
GPU Heater Rating (MMBtu/hr)	1.50
Operating hours/year	8760
Fuel Heat Value (Btu/scf)	1,296

Pollutant	Emission Factors (lb/MMscf)	lb/hr	tpy
NOx	100	0.695	3.042
CO	84	0.583	2.555
CO_2	120,000	833.455	3650.533
Lead	0.0005	3.47E-06	1.52E-05
N_2O	2.2	0.015	0.067
PM (Total)	7.6	0.053	0.231
SO_2	0.6	0.004	0.018
TOC	11	0.076	0.335
Methane	2.3	0.016	0.070
VOC	5.5	0.038	0.167
HAPS			
2-Methylnaphthalene	2.40E-05	1.67E-07	7.30E-07
Benzene	2.10E-03	1.46E-05	6.39E-05
Dichlorobenzene	1.20E-03	8.33E-06	3.65E-05
Fluoranthene	3.00E-06	2.08E-08	9.13E-08
Fluorene	2.80E-06	1.94E-08	8.52E-08
Formaldehyde	7.50E-02	5.21E-04	2.28E-03
Hexane	1.80E+00	1.25E-02	5.48E-02
Naphthalene	6.10E-04	4.24E-06	1.86E-05
Phenanathrene	1.70E-05	1.18E-07	5.17E-07
Toluene	3.40E-03	2.36E-05	1.03E-04

	lb/hr	tpy
TOTAL Uncontrolled VOC	0.038	0.167
TOTAL Uncontrolled HAPs	0.013	0.057
TOTAL Uncontrolled TAPs (Benzene)	0.000	0.000
TOTAL Uncontrolled TAPs (Formaldehyde)	0.001	0.002
TOTAL CO_{2e} Emissions	838.41	3,672.23

Enter any notes here:
All Emission Factors based off AP-42 Sec 1.4 Natural Gas Combustion

Table 10

Flare Emissions
Kelly Wellpad
Ritchie County, West Virginia
Antero Resources Corporation

General Information	
Unit Name:	FL001

Pollutant	Emission Factor (lb/MMscf)
NOx	100
CO	84
PM10	7.6
PM2.5	5.7
SO_2	0.6
CO_2	120,000
VOC	5.5
benzene	2.10E-03
Hexane	1.80E+00
Toluene	3.40E-03
Formaldehyde	7.50E-02
N_2O	2.20
Lead	5.00E-04

Constants	
Btu/MMBtu	1,000,000
scf/MMscf	1,000,000
lb/ton	2,000
H_2S molecular weight	34.08
SO_2 molecular weight	64.06
seconds/hour	3,600
inches/ft	12

Destruction Efficiency	
VOC percent destruction efficiency (%)	98
H_2S percent destruction efficiency (%)	98

Flare operating hours	8760

Stream Information							
	1	2	3	4	5	6	Total
Stream Sent to Flare/Vapor Combustor (Enter Name of Each Stream Here)	pilot(s)	added fuel stream(s)	Oil Tank Flash Emissions	Water Tank Flash Emissions	Oil Tank W/B Emissions	Water Tank W/B Emissions	-
Maximum Expected Hourly Volumetric Flow Rate of Stream (scf/hr)	12.6	--	2,586.41	343.17	42.90	2.95	2,988.02
Maximum Expected Annual Volumetric Flow Rate of Stream (scf/yr)	110,376.00	--	22,656,957.59	3,006,132.29	375,769.22	25,861.64	26,175,096.74
Heating Content (Btu/ft3)	1,296		2,218.25	1,081.36	2,218.25	1,081.36	2,077.20

Mass Flow Rates of the Vapors Sent to this Control Device, Hourly Basis (lb/hr)							
	1	2	3	4	5	6	Total
Stream Sent to Flare/Vapor Combustor	pilot(s)	added fuel stream(s)	Oil Tank Flash Emissions	Water Tank Flash Emissions	Oil Tank W/B Emissions	Water Tank W/B Emissions	-
H2S	-	-	0.000	0.000	0.000	0.000	0.000
Total VOC	-	-	219.772	2.694	3.534	0.000	226.00
Benzene	-	-	0.070	0.006	0.000	0.000	0.076
Toluene	-	-	0.136	0.011	0.000	0.000	0.147
Ethylbenzene	-	-	0.053	0.004	0.000	0.000	0.058
Xylenes	-	-	0.137	0.011	0.001	0.000	0.149
n-Hexane	-	-	39.983	0.057	0.047	0.000	40.087
HAPs	-	-	40.379	0.089	0.048	0.000	40.516
Total Mass Flow	-	-	294.674	16.673	4.887	0.143	316.378
Mass Flow Rates of the Vapors Sent to this Control Device, Annual Basis (tpy)							
H2S	-	-	0.000	0.000	0.000	0.000	0.000
Total VOC	-	-	962.601	11.799	15.477	0.001	989.878
Benzene	-	-	0.306	0.027	0.000	0.000	0.333
Toluene	-	-	0.596	0.047	0.001	0.000	0.644
Ethylbenzene	-	-	0.234	0.018	0.001	0.000	0.253
Xylenes	-	-	0.602	0.046	0.003	0.000	0.651
n-Hexane	-	-	175.124	0.250	0.206	0.000	175.580
HAP	-	-	176.861	0.388	0.212	0.000	177.461
Total Mass Flow	-	-	1290.671	73.029	21.406	0.628	1385.734

Table 10

Flare Emissions
Kelly Wellpad
Ritchie County, West Virginia
Antero Resources Corporation

Controlled Emissions							
Hourly (lb/hr)							
	1	2	3	4	5	6	Total
Stream Sent to Flare/Vapor Combustor	pilot(s)	added fuel stream(s)	Oil Tank Flash Emissions	Water Tank Flash Emissions	Oil Tank W/B Emissions	Water Tank W/B Emissions	-
NOx	0.001	-	0.259	0.034	0.004	0.000	0.30
CO	0.001	-	0.217	0.029	0.004	0.000	0.25
PM2.5	0.000	-	0.015	0.002	0.000	0.000	0.02
PM10	0.000	-	0.020	0.003	0.000	0.000	0.02
H2S	0.000	-	0.000	0.000	0.000	0.000	0.00
SO_2	0.000	-	0.000	0.000	0.000	0.000	0.00
CO_2	1.512	-	-	-	-	-	1.51
Total VOC	0.000	-	4.395	0.054	0.071	0.000	4.52
Benzene	0.000	-	0.001	0.000	0.000	0.000	0.00
Toluene	0.000	-	0.003	0.000	0.000	0.000	0.00
Ethylbenzene	0.000	-	0.001	0.000	0.000	0.000	0.00
Xylenes	0.000	-	0.003	0.000	0.000	0.000	0.00
n-Hexane	0.000	-	0.800	0.001	0.001	0.000	0.80
HAP	0.000	-	0.808	0.002	0.001	0.000	0.81
N_2O	0.000	-	0.006	0.001	0.000	0.000	0.01
Lead	0.000	-	0.000	0.000	0.000	0.000	0.00
Formaldehyde	0.000	-	-	-	-	-	0.00
Annual (tpy)							
	1	2	3	4	5	6	Total
Stream Sent to Flare/Vapor Combustor	pilot(s)	added fuel stream(s)	Oil Tank Flash Emissions	Water Tank Flash Emissions	Oil Tank W/B Emissions	Water Tank W/B Emissions	-
NOx	0.006	-	1.133	0.150	0.019	0.001	1.31
CO	0.005	-	0.952	0.126	0.016	0.001	1.10
PM2.5	0.000	-	0.065	0.009	0.001	0.000	0.07
PM10	0.000	-	0.086	0.011	0.001	0.000	0.10
H_2S	0.000	-	0.000	0.000	0.000	0.000	0.00
SO_2	0.000	-	0.000	0.000	0.000	0.000	0.00
CO_2	6.623	-	-	-	-	-	6.62
Total VOC	0.000	-	19.252	0.236	0.310	0.000	19.80
Benzene	0.000	-	0.006	0.001	0.000	0.000	0.01
Toluene	0.000	-	0.012	0.001	0.000	0.000	0.01
Ethylbenzene	0.000	-	0.005	0.000	0.000	0.000	0.01
Xylenes	0.000	-	0.012	0.001	0.000	0.000	0.01
n-Hexane	0.000	-	3.502	0.005	0.004	0.000	3.51
HAP	0.000	-	3.537	0.008	0.004	0.000	3.55
N_2O	0.000	-	0.025	0.003	0.000	0.000	0.03
Lead	0.000	-	0.000	0.000	0.000	0.000	0.00
Formaldehyde	0.000	-	-	-	-	-	0.00

Flare/Vapor Combustor Total Emissions		
	Hourly Emissions (lb/hr)	Annual Emissions (tpy)
Total VOC	4.52	19.80
NOx	2.99E-01	1.31E+00
CO	2.51E-01	1.10E+00
PM2.5	1.70E-02	7.46E-02
PM10	2.27E-02	9.95E-02
H_2S	4.02E-06	1.76E-05
SO_2	7.56E-06	3.31E-05
Benzene (TAPs)	1.52E-03	6.66E-03
Formaldehyde (TAPs)	9.45E-07	4.14E-06
HAPs	0.81	3.55
CO_2e	952.63	4172.54
N_2O	6.57E-03	2.88E-02
Lead	1.49E-06	6.54E-06

Enter any notes here as needed
1. Emission Factors from AP-42 Tables 1.4-1, 1.4-2, and 1.4.3

Table 11

Flare GHG Emissions
Kelly Wellpad
Ritchie County, West Virginia
Antero Resources Corporation

Flare CO_2 and CH_4 Emissions

Components	Mole fraction of oil flash gas constituents[a]	Volume of oil flash gas sent to flare *scf/year*	Mole fraction of water flash gas constituents[a]	Volume of water flash gas sent to flare *scf/year*	Mole fraction of oil tank vapors constituents[a]	Volume of oil tank vapor sent to flare *scf/year*	Mole fraction of water tank vapors constituents[a]	Volume of water tank vapors sent to flare *scf/year*	Component volume of gas sent to flare *scf/year*	Number of carbon atoms	Combustion Efficiency	Combusted CO_2 Volume[b] *scf/year*	Uncombusted CO_2 and CH_4 Volume[b] *scf/year*	Volume GHGs Emitted *scf/year*
CO_2	0.001	22,656,958	0.0133	3,006,132	0.0020	375,769	0.015	25,862	74,185	1	0	--	74,185	68,683,588
Methane	0.229	22,656,958	0.7650	3,006,132	0.0649	375,769	0.036	25,862	7,507,397	1	0.98	7,357,249	150,148	150,148
Ethane	0.232	22,656,958	0.1513	3,006,132	0.3606	375,769	0.007	25,862	5,851,961	2	0.98	11,469,843	--	
Propane	0.211	22,656,958	0.0522	3,006,132	0.2698	375,769	0.001	25,862	5,033,060	3	0.98	14,797,198	--	
i-Butane	0.047	22,656,958	0.0022	3,006,132	0.0569	375,769	0.000	25,862	1,094,740	4	0.98	4,291,380	--	
n-Butane	0.116	22,656,958	0.0095	3,006,132	0.1383	375,769	0.000	25,862	2,711,328	4	0.98	10,628,406	--	
Pentane	0.086	22,656,958	0.0035	3,006,132	0.0952	375,769	0.000	25,862	1,983,704	5	0.98	9,720,150	--	
Hexane	0.069	22,656,958	0.0009	3,006,132	0.0070	375,769	0.000	25,862	1,560,300	6	0.98	9,174,563	--	
Benzene	0.000	22,656,958	0.0001	3,006,132	0.0000	375,769	0.000	25,862	3,205	6	0.98	18,846	--	
Heptanes	0.003	22,656,958	0.0001	3,006,132	0.0026	375,769	0.000	25,862	77,436	7	0.98	531,210	--	
Toluene	0.000	22,656,958	0.0001	3,006,132	0.0000	375,769	0.000	25,862	5,251	7	0.98	36,024	--	
Octane	0.003	22,656,958	0.0001	3,006,132	0.0024	375,769	0.000	25,862	59,054	8	0.98	462,987	--	
Ethyl benzene	0.000	22,656,958	0.0000	3,006,132	0.0000	375,769	0.000	25,862	1,789	8	0.98	14,026	--	
Xylenes	0.000	22,656,958	0.0001	3,006,132	0.0001	375,769	0.000	25,862	4,606	8	0.98	36,109	--	
Nonane	0.000	22,656,958	0.0000	3,006,132	0.0003	375,769	0.000	25,862	7,963	9	0.98	70,231	--	
Decane plus	0.000	22,656,958	0.0000	3,006,132	0.0000	375,769	0.000	25,862	121	10	0.98	1,182	--	
											Subtotal	**68,609,403**	--	

Pollutant	Volume Emitted *scf/year*	Density of GHG[c] *lb/scf*	Conversion Factor *lb/ton*	GWF	Emissions[c] *lbs/hr*	*(tons/yr)*
CO_2	68,683,588	0.12	2000	1	909.22	3,982.38
CH_4	150,148	0.09	2000	25	1.59	6.98
				CO_2e Emissions	**949.1**	**4156.99**

GHG Emissions Summary

Notes

a Flashing/Working/Breathing Losses from ProMax output reports

b 40 CFR 98.233 (n)(4): Eqns: W-19, W-20 and W-21

c 40 CFR 98.233(v) Eqn W-36 - density at 60F and 14.7 psia

Table 12

Haul Road Emissions
Kelly Wellpad
Ritchie County, West Virginia
Antero Resources Corporation

	PM	PM10
Particle Size Multiplier (k)	0.8	0.36
Silt Content of Road Surface Material (s) (%)	5.1	5.1
Days per Year with Precipitation > 0.01 in (p)	150	150
Control Efficiency for Watering [1] (%)	50	50

Tanker Truck Trip Calculation	
Condensate Production (bbl/day)	240
PW Production (bbl/day)	2,880
Truck Capacity (bbl)	200

Pick Up Truck Trip Calculation	
No of Trips Per day	2
Trips Per Year	730

	# of Wheels	Mean Vehicle Weight (W)	Mean Vehicle Speed (S)	Miles Per Trip	Maximum Trips per Hour	Maximum Trips per Year	Vehicle Miles Travelled		PM	PM10
		(tons)	(mph)	(miles)			(miles/hr)	(miles/year)	(lbs/VMT)	(lbs/VMT)
Tanker Trucks Condensate	10	40	10	0.4500	1	438	0.4500	197.1000	3.8175	1.7179
Tanker Trucks PW	10	40	10	0.4500	1	5256	0.4500	2365.2000	3.8175	1.7179
Pick Up Truck	4	3	10	0.2100	1	730	0.2100	153.3000	0.3467	0.1560

	Uncontrolled Emissions						Controlled Emissions					
	PM			PM10			PM			PM10		
	(lbs/hr)	(lbs/year)	(tpy)	(lbs/hr)	(lbs/year)	(tpy)	(lbs/hr)	(lbs/year)	(tpy)	(lbs/hr)	(lbs/year)	(tpy)
Tanker Trucks Condensate	1.7179	752.4350	0.3762	0.7730	338.5958	0.1693	0.8589	376.2175	0.1881	0.3865	169.2979	0.0846
Tanker Trucks PW	1.7179	9029.2205	4.5146	0.7730	4063.1492	2.0316	0.8589	4514.6103	2.2573	0.3865	2031.5746	1.0158
Pick Up Truck	0.0728	53.1460	0.0266	0.0328	23.9157	0.0120	0.0364	26.5730	0.0133	0.0164	11.9578	0.0060
Total Emissions	3.5086	9,834.8016	4.9174	1.5789	4,425.6607	2.2128	1.7543	4,917.4008	2.4587	0.7894	2,212.8303	1.1064

Enter any notes here:	1 EPA, AP-42, Volume I, Section 13.2.2 Unpaved Roads (11/06); assume 2:1 moisture ratio Section 13.2.2 Unpaved Roads (11/06) Source: Attachment L, Fugitive Emissions from Unpaved Haul Roads, Rev 03/2007, West Virginia Department of Environmental Protection

Table 13

Engine Emissions
Kelly Wellpad
Ritchie County, West Virginia
Antero Resources Corporation

Kubota DG972-E2

Power (hp)	24
Fuel consumption (lbs/BHP-hr) [1]	0.449
Heat Content of Fuel (Btu/scf)	1295.8109
Density of NG (lb/scf)	0.056
Operating Hours/year	8760

Pollutant	Emission Factors (g/hp-hr)	Emission Factors (lb/MMBtu)	lb/hr	tpy
NOx[1]	5.97		0.3158	1.3831
CO[2]	106.7		5.6445	24.7228
CO_2		110.000	27.4286	120.14
$PM_{2.5}$		9.910E-03	0.0025	0.0108
PM_{10}		9.500E-03	0.0024	0.0104
PM (Total)		9.910E-03	0.0025	0.0108
SO_2		5.880E-04	0.0001	0.0006
TOC		0.358	0.0893	0.3910
Methane		0.230	0.0574	0.2512
VOC[3]		0.0296	0.0074	0.0323
HAPS				
Benzene		1.58E-03	3.94E-04	1.73E-03
Ethylbenzene		2.48E-05	6.18E-06	2.71E-05
Formaldehyde		2.05E-02	5.11E-03	2.24E-02
Naphthalene		9.71E-05	2.42E-05	1.06E-04
Toluene		5.58E-04	1.39E-04	6.09E-04
Xylene		1.95E-04	4.86E-05	2.13E-04

	lb/hr	tpy
TOTAL Uncontrolled VOC	0.007	0.032
TOTAL Uncontrolled NOx	0.316	1.383
TOTAL Uncontrolled HAPs	0.006	0.025
TOTAL Uncontrolled TAPs (Benzene)	0.000	0.002
TOTAL Uncontrolled TAPs (Formaldehyde)	0.005	0.022
TOTAL CO_{2e} Emissions	28.86	126.4

Enter Any Notes Here:

1. Emission factor used for the 24 HP engine's Nox is the 40 CFR 1054 standard indicated on the EPA's Certificate of Conformity. See Appendix P.

2. Emission factor for CO was the Certification CO level taken from EPA's Non-Road Small SI 2013 Certification issued by Office of Transportation and Air Quality, March 2014.

3. Emission factors for all other contaminants including VOCs were obtained from AP-42, Section 3.2 "Natural Gas-fired Reciprocating Engines", Table 3.2-3.