



**west virginia department of environmental protection**

Division of Air Quality  
601 57<sup>th</sup> Street SE  
Charleston, WV 25304  
Phone (304) 926-0475 • FAX: (304) 926-0479

Earl Ray Tomblin, Governor  
Randy C. Huffman, Cabinet Secretary  
[www.dep.wv.gov](http://www.dep.wv.gov)

**ENGINEERING EVALUATION / FACT SHEET**

**BACKGROUND INFORMATION**

Application No.: G70-A118C  
Plant ID No.: 085-00043  
Applicant: Antero Resources Corporation (Antero)  
Facility Name: Kelly Wellpad  
Location: near Pennsboro, Ritchie County, West Virginia  
NAICS Code: 211111  
Application Type: Modification  
Received Date: August 10, 2015  
Engineer Assigned: David Keatley  
Fee Amount: \$1,500  
Date Fees Received: August 11, 2015  
Complete Date: February 9, 2016  
Due Date: March 25, 2016  
Applicant Ad Date: August 7, 2015  
Newspaper: *The Pennsboro News*  
UTM's: Easting: 503.218 km Northing: 4,351.659 km Zone: 17  
Description: Permit registration G70-A118C will supersede and replace G70-A118B. Installation and operation of: two (2) 1.5-mmBtu/hr GPU heaters, eight (8) 2.0-mmBtu/hr line heaters, six (6) 400-bbl condensate tanks, and two (2) 12-mmBtu/hr enclosed combustors.

**DESCRIPTION OF PROCESS**

This facility produces natural gas and condensate. Raw natural gas (natural gas, condensate, and produced water) from eight (8) natural gas wells are heated by eight (8) 2.0-mmBtu/hr line heaters (LH001 through LH008). After being heated by the line heaters the raw natural gas goes to eight (8) 1.5-MMBTU/hr gas producing units (GPU) heaters (H001 through H008). Natural gas from the GPUs exit the facility via sales gas pipeline. The produced water from the GPUs is sent to two (2) 400-bbl produced water tanks (TANKPW001 and TANKPW002). The condensate from the GPUs is sent to low-pressure separators. The vapors from the low-pressure separators is sent to a compressor to raise

the pressure of vapors and will exit the facility via gas sales pipeline. The compressor is powered by a 24-bhp natural gas fired Kubota DG972-E2 compressor engine ENG001.

Produced water will exit the facility via truck at a maximum rate of 27,594,000 gallons/year. Condensate will exit the facility via truck at a maximum rate of 13,797,000. Working, breathing, and flash losses from the condensate tanks and produced water tanks will be controlled by two (2) 12-mmBtu/hr Cimarron 48" enclosed combustors (EC001 and EC002).

### SITE INSPECTION

James Robertson of DEP DAQ Compliance and Enforcement Section performed a site visit on January 28, 2015 and deemed the site suitable for the G70-A with the closest residence over 300' from the proposed site.

From US 50 take WV 74 north. The facility is north of town approximately 1.7 miles north of McDougal Drive. The facility will be on the left.

### ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

Representative samples for the gas and liquid were taken from Lockhart Heirs Pad and both were used in ProMax 3.2 to estimate the emissions from the condensate tanks and produced water tanks. The enclosed combustor is considered to have a 98% efficiency. Emissions from H007 through EU-H008 and LH001 through LH008 were estimated with AP-42. Fugitive emissions were estimated using the EPA's *Protocol for Equipment Leak Emission Estimates using a representative gas sample from Nicholson Unit 2H*. Condensate and produced water loading emissions were estimated with AP-42 Section 5.2-4 equation for submerged loading dedicated service.

**Table 1: Maximum Estimated Controlled New/Modified PTE**

Emission Point ID	Emission Unit ID	Emission Source	Pollutant	Maximum Hourly Emissions (lb/hr)	Maximum Annual Emissions (tpy)
EP-EC001 and EP-EC002	TANKCOND 001-010, TANKPW 001-002, and EC001 or EC002	Cimarron 48" Enclosed Combustor  (Controlling Condensate and Produced Water Tanks)  Emissions per Unit	Carbon Monoxide	0.28	1.23
			Nitrogen Oxides	0.34	1.47
			Volatile Organic Compounds	5.65	24.75
			Benzene	0.01	0.04
			Ethylbenzene	<0.01	0.01
			Toluene	0.01	0.03
			Xylenes	<0.01	0.02
			n-Hexane	0.19	0.84
			Total Particulate Matter	0.03	0.11
			CO <sub>2</sub> e	1,131	4,952
EP-H007 through EP-H008	H007 through H008	GPU Heaters  (Emissions per Unit)	Nitrogen Oxides	0.12	0.53
			Carbon Monoxide	0.10	0.44
			Volatile Organic Compounds	0.01	0.03
			PM	0.01	0.04
			PM <sub>10</sub>	0.01	0.04
			n-Hexane	<0.01	0.01
			CO <sub>2</sub> e	145	633
EP-LH001 through EP-LH008	LH001 through LH008	Line Heaters  (Emissions per Unit)	Nitrogen Oxides	0.16	0.70
			Carbon Monoxide	0.13	0.59
			Volatile Organic Compounds	0.01	0.04
			PM	0.01	0.05
			PM <sub>10</sub>	0.01	0.05
			n-Hexane	<0.01	0.01
			CO <sub>2</sub> e	193	843

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EP-L001	L001	Condensate Truck Loading	Volatile Organic Compounds	10.14	6.94
			n-Hexane	0.02	0.02
			CO <sub>2</sub> e	3	2
EP-L002	L002	Produced Water Truck Loading	Volatile Organic Compounds	<0.01	<0.01
			CO <sub>2</sub> e	1	2
EP-FUG	EU-FUG	Fugitive Emissions	Volatile Organic Compounds	3.04	13.33
			Benzene	<0.01	0.02
			Ethylbenzene	0.01	0.06
			n-Hexane	0.22	0.96
			Toluene	0.02	0.07
			Xylenes	0.04	0.17
			CO <sub>2</sub> e	65	283

Table 2: Summarized Estimated Maximum Controlled Total PTE

Pollutant	Maximum Annual Facility Wide Emissions (tons/year)
Nitrogen Oxides	5.74
Carbon Monoxide	28.38
Volatile Organic Compounds	70.77
Total Particulate Matter	1.94
PM <sub>10</sub>	1.94
Sulfur Dioxide	0.06
Benzene	0.10
Ethylbenzene	0.08
Toluene	0.14
Xylenes	0.22
n-Hexane	2.89
Formaldehyde	0.03
Total HAP Emissions	3.44
CO <sub>2</sub> e	22,137

## REGULATORY APPLICABILITY

The following rules and regulations apply to the facility:

### **45CSR2 (Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers)**

The purpose of 45CSR2 (Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers) is to establish emission limitations for smoke and particulate matter which are discharged from fuel burning units.

45CSR2 states that any fuel burning unit that has a heat input under ten (10) million B.T.U.'s per hour is exempt from sections 4 (weight emission standard), 5 (control of fugitive particulate matter), 6 (registration), 8 (testing, monitoring, recordkeeping, reporting) and 9 (startups, shutdowns, malfunctions). However, failure to attain acceptable air quality in parts of some urban areas may require the mandatory control of these sources at a later date.

The individual heat input of all of the proposed fuel burning units (H007 through H008 and LH001 through LH008) are below 10 MMBTU/hr. Therefore, these units are exempt from the aforementioned sections of 45CSR2. However this facility would be subject to the opacity requirements in 45CSR2, which is 10% opacity based on a six minute block average.

### **45CSR4 (To Prevent and Control the Discharge of Air Pollutants into the Open Air which Causes or Contributes to an Objectionable Odor or Odors)**

This facility shall not cause the discharge of air pollutants which cause or contribute to an objectionable odor at any location occupied by the public. 45CSR4 states that an objectionable odor is an odor that is deemed objectionable when in the opinion of a duly authorized representative of the Air Pollution Control Commission (Division of Air Quality), based upon their investigations and complaints, such odor is objectionable.

### **45CSR6 (To Prevent and Control Air Pollution from the Combustion of Refuse)**

The purpose of this rule is to prevent and control air pollution from combustion of refuse.

Antero will have two (2) enclosed combustors at this facility. The enclosed combustors are subject to section 4, emission standards for incinerators. The vapor combustor has a maximum capacity of 376 lb/hr and an allowable emission rate of 1.02 pounds of particulate matter per hour. The enclosed combustor has an estimated hourly particulate matter emissions rate of 0.03 lb/hr as can be seen in Table 1. Therefore, the facility's enclosed combustors should demonstrate compliance with this allowable emission rate.

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The facility will also monitor the flame of the vapor combustor and record any malfunctions that may cause no flame to be present during operation.

**45CSR10 (To Prevent and Control Air Pollution from the Emissions of Sulfur Oxides)**

45CSR10 states that any fuel burning unit that has a heat input under ten (10) million B.T.U.'s per hour is exempt from sections 3 (weight emission standard), 6 (registration), 7 (permits), and 8 (testing, monitoring, recordkeeping, reporting). However, failure to attain acceptable air quality in parts of some urban areas may require the mandatory control of these sources at a later date.

The individual heat input of all of the proposed fuel burning units (H007 through H008 and LH001 through LH008) are below 10 MMBTU/hr. Therefore, these units are exempt from the aforementioned sections of 45CSR10.

**45CSR13 (Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, and Procedures for Evaluation)**

As can be seen from Table 2, VOCs are above the 6lb/hr and 10 tons/year thresholds and this facility requires a permit. In addition this permitting action is a modification because this action triggered 40CSR6 which has substantive requirements.

**45CSR22 (Air Quality Management Fee Program)**

This facility is a minor source as can be seen in Table 2 and not subject to 45CSR30 since they are exempt from the obligation to obtain a permit under 40 CFR part 70 or 40 CFR part 71. This facility is not a natural gas compressor station and is a 9M source which is required to pay a \$200 annual fee. Antero is required to keep their Certificate to Operate current.

**40CFR60 Subpart OOOO (Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution)**

EPA published in the Federal Register new source performance standards (NSPS) and air toxics rules for the oil and gas sector on August 16, 2012. 40CFR60 Subpart OOOO establishes emission standards and compliance schedules for the control of volatile organic compounds (VOC) and sulfur dioxide (SO<sub>2</sub>) emissions from affected facilities that commence construction, modification or reconstruction after August 23, 2011. The following affected sources which commence construction, modification or reconstruction after August 23, 2011 are subject to the applicable provisions of this subpart:

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- a. Each gas well affected facility, which is a single natural gas well.

*The eight (8) gas wells were drilled principally for the production of natural gas and condensate and were done so after August 23, 2011. Therefore, these wells would be considered affected facilities under this subpart. The compliance date for these hydraulically fractured wells is October 15, 2012. Antero is required under §60.5410 to submit an initial notification, initial annual report, maintain a log of records for each well completion, and maintain records of location and method of compliance. §60.5420 requires Antero demonstrate continuous compliance by submitting reports and maintaining records for each completion operation.*

- b. Each storage vessel affected facility, which is a single storage vessel, located in the oil and natural gas production segment, natural gas processing segment or natural gas transmission and storage segment.

40CFR60 Subpart OOOO defines a storage vessel as a unit that is constructed primarily of nonearthen materials (such as wood, concrete, steel, fiberglass, or plastic) which provides structural support and is designed to contain an accumulation of liquids or other materials. The following are not considered storage vessels:

- Vessels that are skid-mounted or permanently attached to something that is mobile (such as trucks, railcars, barges or ships), and are intended to be located at a site for less than 180 consecutive days. If the source does not keep or are not able to produce records, as required by §60.5420(c)(5)(iv), showing that the vessel has been located at a site for less than 180 consecutive days, the vessel described herein is considered to be a storage vessel since the original vessel was first located at the site.
- Process vessels such as surge control vessels, bottoms receivers or knockout vessels.
- Pressure vessels designed to operate in excess of 204.9 kilopascals and without emissions to the atmosphere.

This rule requires that the permittee determine the VOC emission rate for each storage vessel affected facility utilizing a generally accepted model or calculation methodology within 30 days of startup, and minimize emissions to the extent practicable during the 30 day period using good engineering practices. For each storage vessel affected facility that emits more than 6 tpy of VOC, the permittee must reduce VOC emissions by 95% or greater within 60 days of startup. The compliance date for applicable storage vessels is October 15, 2013.

*Condensate tanks (TANKCOND001-010) located at this facility would emit more than 6 tpy of VOC per tank uncontrolled (123.12 tpy each). Produced water tanks (TANKPW001-002) located at this facility will not emit more than 6 tpy of VOC per tank uncontrolled (3.51 tpy each). Antero has proposed controlling 98% of the VOC vapors from both condensate and produced water tanks with enclosed combustors, which makes this facility not subject to this section of this section of this regulation.*

The following rules and regulations do not apply to the facility:

**40CFR60 Subpart A §60.18 (General Control Device and Work Practice Requirements)**

40CFR60 Subpart A §60.18 contains requirements for control devices when they are used to comply with applicable subparts of 40CFR60 and 40CFR61. The enclosed combustors that Antero has proposed is not used to comply with one of these regulations. The purpose of the enclosed combustors is to control emissions from the tanks that are routed to it. However, these tanks are not subject to 40CFR60 Subpart Kb due to their size. In addition 40CFR60.18 refers to flares but makes no mention of enclosed combustion devices. Therefore, Antero is not subject to this regulation.

**40CFR60 Subpart Kb (Standards of Performance for VOC Liquid Storage Vessels)**

40CFR60 Subpart Kb does not apply to storage vessels with a capacity less than 75 cubic meters. The tanks that Antero has proposed to install are 63.60 cubic meters each. Therefore, Antero would not be subject to this regulation.

**TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS**

This section provides an analysis for those regulated pollutants that may be emitted from this facility and that are not classified as “criteria pollutants.” Criteria pollutants are defined as Carbon Monoxide (CO), Lead (Pb), Oxides of Nitrogen (NO<sub>x</sub>), Ozone, Particulate Matter (PM), Particulate Matter less than 10 microns (PM<sub>10</sub>), Particulate Matter less than 2.5 microns (PM<sub>2.5</sub>), and Sulfur Dioxide (SO<sub>2</sub>). These pollutants have National Ambient Air Quality Standards (NAAQS) set for each that are designed to protect the public health and welfare. Other pollutants of concern, although designated as non-criteria and without national concentration standards, are regulated through various federal programs designed to limit their emissions and public exposure. These programs include federal source-specific Hazardous Air Pollutants (HAPs) standards promulgated under 40 CFR 61 (NESHAPS) and 40 CFR 63 (MACT). Any potential applicability to these programs were discussed above under REGULATORY APPLICABILITY.

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The majority of non-criteria regulated pollutants fall under the definition of HAPs which, with some revision since, were 188 compounds identified under Section 112(b) of the Clean Air Act (CAA) as pollutants or groups of pollutants that EPA knows or suspects may cause cancer or other serious human health effects. Antero included the following HAPs as emitted in substantive amounts in their emissions estimate: Benzene, n-Hexane, Toluene, Xylene, and Ethylbenzene. The following table lists each HAP's carcinogenic risk (as based on analysis provided in the Integrated Risk Information System (IRIS)):

**Potential HAPs - Carcinogenic Risk**

HAPs	Type	Known/Suspected Carcinogen	Classification
n-Hexane	HAP	No	Inadequate Data
Benzene	TAP	Yes	Category A - Known Human Carcinogen
Toluene	HAP	No	Inadequate Data
Xylene	HAP	No	Inadequate Data
Formaldehyde	TAP	Yes	Category B1 - Probable Human Carcinogen
Ethylbenzene	HAP	No	Category D - Not classifiable as to human carcinogenicity

All HAPs have other non-carcinogenic chronic and acute effects. These adverse health affects may be associated with a wide range of ambient concentrations and exposure times and are influenced by source-specific characteristics such as emission rates and local meteorological conditions. Health impacts are also dependent on multiple factors that affect variability in humans such as genetics, age, health status (e.g., the presence of pre-existing disease) and lifestyle. As stated previously, *there are no federal or state ambient air quality standards for these specific chemicals*. For a complete discussion of the known health effects of each compound refer to the IRIS database located at [www.epa.gov/iris](http://www.epa.gov/iris).

## RECOMMENDATION TO DIRECTOR

The information provided in the permit application indicates compliance with all state and federal air quality requirements will be satisfied and this facility is expected to meet the requirements of General Permit G70-A. Therefore Antero Resources Corporation's request to modify and operate Kelly Wellpad natural gas production facility is recommended to the Director of Air Quality.



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David Keatley  
Permit Writer - NSR Permitting

February 16, 2016

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Date

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