west virginia department of environmental protection

Division of Air Quality
601 57th 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

ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.:	G70-A136B
Plant ID No.:	085-00046
Applicant:	Antero Resources Corporation (Antero)
Facility Name:	Buck Run Wellpad
Location:	near Pennsboro, Ritchie County
NAICS Code:	211111
Application Type:	Modification
Received Date:	October 26, 2015
Engineer Assigned:	David Keatley
Fee Amount:	$1,500
Date Fees Received:	October 27, 2016
Complete Date:	March 15, 2016
Due Date:	April 29, 2016
Applicant Ad Date:	February 3, 2016
Newspaper:	*The Pennsboro News*
UTM's:	Easting: 504.556 km Northing: 4,351.837 km Zone: 17
Description:	Permit registration G70-A136B will supersede and replace permit registration G70-A136A. With this permitting action the registrant proposes to install and operate: ten (10) 2.0-mmBtu/hr line heaters, one (1) 12-mmBtu/hr enclosed combustor, and an increase in the condensate throughput.

DESCRIPTION OF PROCESS

Installation and operation of natural gas and condensate production facility. Raw natural gas (natural gas, condensate, and produced water) from ten (10) natural gas wells go to ten (10) 2.0-mmBtu/hr natural gas fired line heaters (LH001 through LH010). The line heaters warm the raw natural gas from the natural gas wells to encourage phase separation. The heated natural gas from line heaters go to ten (10) 1.5-MMBTU/hr gas production units (GPU) heaters (H001 through H010) to be heated to further encourage phase separation. The gas from the GPUs exits the facility via gas sales pipeline. The

condensate from the GPUs is sent to low-pressure separators. Gas from the low-pressure separators is sent to a compressor to raise the pressure of the gas stream. The compressor is powered by a 24-bhp natural gas fired Kubota DG972-E2 compressor engine ENG001. After compression the natural gas stream exits the facility via the sales gas pipeline. Condensate from the low-pressure separators is sent to ten (10) 400-bbl condensate tanks. Produced water from the GPUs is sent to two (2) 400-bbl produced water tanks. 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. Condensate and produced water will be loaded in to trucks and trucked off site at the following respective maximum rates 15,330,000 and 30,660,000 gallons/year.

SITE INSPECTION

Douglas Hammell of DAQ's Compliance and Enforcement Section performed a site visit on February 16, 2016. The facility was deemed in compliance.

Directions. From the intersection of US 50 and WV 74. Travel north on WV 74 until you reach CR 74-9 (Gnat Run Rd.). Turn right onto CR 74-9 and travel east for approximately 1.6 miles. The facility will be on a hill on the left.

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

A representative gas sample and representative liquid sample 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 minimum control efficiency of 98%. Emissions from LH-001 through LH-010 were estimated with AP-42. Fugitive emissions were estimated using the EPA's *Protocol for Equipment Leak Emission Estimates*. Condensate and produced water loading emissions were estimated with the equation in AP-42 Chapter 5 based on submerged loading dedicated service.

Table 1: Maximum Controlled Estimated Air Emissions

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	Cimarron 48" Combustor (Controlling Condensate Tanks and Produced Water Tanks) Emission per Combustor	Carbon Monoxide	0.31	1.37
			Nitrogen Oxides	0.37	1.63
			Volatile Organic Compounds	6.25	27.39
			Benzene	0.01	0.04
			Ethylbenzene	<0.01	0.01
			Toluene	0.01	0.04
			Xylenes	<0.01	0.02
			n-Hexane	0.21	0.94
			Total Particulate Matter	0.03	0.12
			CO_2e	1,252	5,481
EP-LH001 through EP-LH010	LH001 through LH010	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_{10}	0.01	0.05
			n-Hexane	<0.01	0.01
			CO_2e	193	843
EP-L001	L001	Truck Loading (Condensate)	Volatile Organic Compounds	10.14	7.71
			n-Hexane	0.02	0.02
			CO_2e	3	2
EP-L002	L002	Truck Loading (Produced Water)	Volatile Organic Compounds	<0.01	<0.01
			CO_2e	1	2

F001	F001	Fugitive Emissions	Volatile Organic Compounds	3.80	16.66
			Benzene	0.01	0.03
			Ethylbenzene	0.02	0.07
			n-Hexane	0.27	1.20
			Toluene	0.02	0.09
			Xylenes	0.05	0.22
			CO_2e	81	354

Table 2: Summarized Estimated Maximum Controlled Facility Wide PTE

Pollutant	Maximum Annual Facility Wide PTE (tons/year)
Nitrogen Oxides	16.94
Carbon Monoxide	37.79
Volatile Organic Compounds	80.36
Total Particulate Matter	2.04
PM_{10}	2.04
Sulfur Dioxide	0.08
Benzene	0.12
Ethylbenzene	0.09
Toluene	0.16
Xylenes	0.03
n-Hexane	3.38
Total HAP Emissions	4.04
CO_2e	26,225

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 (LH001 through LH010) 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 combustor is subject to section 4, emission standards for incinerators. The enclosed combustors have a maximum capacity of 417 lb/hr and an allowable emission rate of 1.13 pounds of particulate matter per hour per enclosed combustor. The vapor combustor has an estimated hourly particulate matter emissions rate which is 0.03 lb/hr as can be seen in Table 1. Therefore this facility's enclosed combustors should demonstrate compliance

with this rule. This facility will also monitor the flame of the enclosed combustors 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 (LH001 through LH010) 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 and CO are above the 6lb/hr and 10 tons/year thresholds (even after being controlled) and this facility requires a permit. This permitting action was a modification due to 40CFR60 Subpart OOOO.

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 for the NSPS and NESHAPs the facility is subject to. This facility is not a natural gas compressor station, is a 9M source, and 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_2) 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:

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

The ten (10) 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.

Antero has proposed installing enclosed combustors to control 98% of the VOC emissions from condensate and produced water tanks, which makes this facility not subject to 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 combustor is to control emissions from the tanks that are routed to it. 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_x), Ozone, Particulate Matter (PM), Particulate Matter less than 10 microns (PM_{10}), Particulate Matter less than 2.5 microns ($PM_{2.5}$), and Sulfur Dioxide (SO_2). 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.

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
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***.

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 a natural gas production facility Buck Run Wellpad is recommended to the Director of Air Quality.

David Keatley
Permit Writer - NSR Permitting

March 16, 2015

Date