west virginia department of environmental protection

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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.:	G70-A168
Plant ID No.:	017-00156
Applicant:	Antero Resources Corporation
Facility Name:	Stanley Wellpad
Location:	West Union, Doddridge County, West Virginia
NAICS Code:	211111
Application Type:	Construction
Received Date:	June 29, 2015
Engineer Assigned:	David Keatley
Fee Amount:	$1,500
Date Received:	June 30, 2015
Complete Date:	October 7, 2015
Due Date:	November 21, 2015
Applicant Ad Date:	June 29, 2015
Newspaper:	*The Herald Record*
UTM's:	Easting: 510.403 km Northing: 4,343.069 km Zone: 17
Description:	Installation and operation of: eight (8) 1.5-mmBtu/hr GPU heaters, ten (10) 400-bbl condensate tanks, two (2) 400-bbl produced water tanks, one (1) 24-bhp compressor engine, and two (2) 6.6-mmBtu/hr combustors.

DESCRIPTION OF PROCESS

Operation of a natural gas and condensate production facility. Raw natural gas (natural gas, condensate, and produced water) from eight (8) natural gas wells goes to eight (8) 1.5-mmBtu/hr gas production unit (GPU) heaters (H001 through H008) to help prevent freezing and promote phase separation. Natural gas from the GPUs will be compressed by a flash gas compressor and then exits the facility via the sales gas pipeline. The flash gas compressor is powered by a four-stroke rich-burn 24-bhp Kubota DG972-E2 natural gas fired compressor engine. Condensate from the GPU is sent to ten (10) 400-bbl condensate tanks at a maximum rate of 12,264,000 gallons/year. Produced water from the GPUs is first sent to eight (8) two-phase separators to remove additional natural gas

from the condensate stream and send it back to the GPUs. The liquid from the two-phase separators flows to two (2) produced water tanks at a maximum rate of 73,584,000 gallons/year. Working, breathing, and flash losses from the condensate tanks and produced water tanks will be controlled to a minimum of 98% control efficiency by a 6.6-mmBtu/hr 48" Cimarron enclosed combustor (EC001). Condensate and produced water will be trucked off site.

SITE INSPECTION

James Robertson of DEP DAQ Compliance and Enforcement Section performed a site visit on July 22, 2015. The area is generally remote with only scattered houses. The site is located near the top of a hill overlooking Taylor Drain Road and Cabin Run Road with no nearby residences or structures and should meet the G70-A siting criteria.

From US 50 turn onto Old US 50 E (Sunnyside Rd). Travel on Old US 50 E for approximately 1.9 miles and turn left onto CR 21 (Oxford Rd.). Travel on CR 21 for approximately 2.0 miles and turn right onto CR 21/1 (Cabin Run). Travel on CR 21/1 for approximately 0.4 to the access the road. Follow the access road for approximately 1.4 miles to the site.

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

A representative gas sample and representative liquid sample were taken from Lockhart Heirs Wellpad and both were used in ProMax 3.2 to estimate the emissions from the condensate tanks and produced water tanks. The combustor is considered to have a minimum total control efficiency of 98%. Emissions from EU-H001 through EU-H008 were estimated with AP-42 emission factors. Fugitive emissions were estimated using the EPA's *Protocol for Equipment Leak Emission Estimates*. Condensate and produced water loading emissions were estimated with AP-42.

Table 1: Maximum Controlled Estimated Regulated Air Emissions

Emission Point ID	Emission Unit ID	Emission Source	Pollutant	Maximum Hourly Emissions (lb/hr)	Maximum Annual Emissions (tpy)
EC001 and EC002	TANKCOND 001-010 TANKPW 001-002	48" Cimarron Combustor (Controlling Condensate and Produced Water Tanks)	Carbon Monoxide	0.28	1.23
			Nitrogen Oxides	0.34	1.47
			Volatile Organic Compounds	5.06	22.17
			Toluene	<0.01	0.01
			Ethylbenzene	<0.01	0.01
			Xylenes	<0.01	0.01
			n-Hexane	0.04	0.18
			CO_2e	429	1,878
EP-H001 through EP-H008	EU-H001 through EU-H008	GPU Heaters	Nitrogen Oxides	0.97	4.22
			Carbon Monoxide	0.81	3.54
			Volatile Organic Compounds	0.06	0.24
			PM	0.08	0.33
			PM_{10}	0.08	0.33
			n-Hexane	0.02	0.08
			CO_2e	1,162	5,088
EP-L001 and EP-L002	EU-L001 and EU-L002	Condensate and Produced Water Truck Loading	Volatile Organic Compounds	8.68	5.29
			n-Hexane	0.02	0.02
			CO_2e	4	5
EP-ENG001	ENG001	Compressor Engine Kubota DG972-E2	Nitrogen Oxides	0.32	1.39
			Carbon Monoxide	5.65	24.73
			PM	<0.01	0.01
			Volatile Organic Compounds	<0.01	0.03
			CO_2e	28	120

F001	F001	Fugitive Emissions	Volatile Organic Compounds	3.05	13.33
			Ethylbenzene	0.02	0.06
			n-Hexane	0.22	0.96
			Toluene	0.02	0.07
			Xylenes	0.05	0.24
			CO_2e	65	283

Table 2: Summarized Estimated Maximum Controlled Regulated Facility Wide PTE

Pollutant	Maximum Annual Facility Wide Emissions (tons/year)
Nitrogen Oxides	7.06
Carbon Monoxide	29.49
Volatile Organic Compounds	41.45
Total Particulate Matter	2.98
PM_{10}	2.98
Sulfur Dioxide	0.03
Benzene	0.06
Ethylbenzene	0.07
Toluene	0.06
Xylenes	0.20
n-Hexane	1.84
Formaldehyde	0.02
Total HAP Emissions	2.29
CO_2e	11,485

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 (EU-H001 through EU-H008) 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 has one (1) vapor combustor at this facility. The vapor combustor is subject to section 4, emission standards for incinerators. The vapor combustor has a maximum capacity of 142 lb/hr and an allowable emission rate of 0.38 pounds of particulate matter per hour. The vapor combustor has an hourly particulate matter emissions rate which is negligible as can be seen in Table 1. Therefore, the facility's vapor combustor should demonstrate compliance with this section. The facility will demonstrate compliance by maintaining records of the amount of natural gas consumed by the vapor combustor and the hours of operation. 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 (EU-H001 through EU-H008) 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)

The uncontrolled VOC PTE (257 lb/hr and 1,123 tons/year) exceed the thresholds of 6 lb/hr and 10 tons/year and therefore this facility requires a permit.

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 the regulations this facility is subject to are exempt from the obligation to obtain a permit under 40 CFR part 70 or 40 CFR part 71. This facility has a maximum horsepower capacity less than 1,000 hp and 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 JJJJ (Standards of Performance for Stationary Spark Ignition Internal Combustion Engines (SI ICE))

40CFR60 Subpart JJJJ sets forth emission limits, fuel requirements, installation requirements, and monitoring requirements based on the date of construction, date of manufacture, and horsepower (hp) of the spark ignition internal combustion engine. All proposed engines will commence construction after June 12, 2006.

ENG001 is subject to this subpart due to the manufacturers date of the engine. ENG001 is a certified engine and the Certificate on Conformity will be available in the file. To keep the designation of certified this engine must be operated and maintained to the manufacturer's emission-related written instructions and must keep records of conducted maintenance to demonstrate compliance.

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 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.

The condensate tanks TANKCOND located at this facility would emit more than 6 tpy of VOC per tank uncontrolled (108.96 tpy) and so does the produced water tanks TANKPW (9.40 tpy). Antero has proposed installing a combustor to control 98% of the VOC emissions from the storage tanks, which makes this facility not subject to this section of this regulation.

40CFR63 Subpart ZZZZ (National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines)

Subpart ZZZZ establishes national emission limitations and operating limitations for hazardous air pollutants (HAP) emitted from stationary reciprocating internal combustion engines (RICE) located at major and area sources of HAP emissions. This subpart also establishes requirements to demonstrate initial and continuous compliance with the emission limitations and operating limitations.

The facility is a minor source of hazardous air pollutants (HAPS < 10 tpy of an individual HAP and < 25 tpy of aggregate HAPs) as can be seen in Table 2. The facility is therefore considered an area source (§63.6585(c)). The engine is considered new stationary RICE (§63.6590(a)(2)(iii)) due to the installation date of the engine (ENG001) being after June 12, 2006.

Stationary RICE subject to Regulations under 40 CFR Part 60 must meet the requirements of those subparts that apply (40 CFR 60 Subpart JJJJ, for spark ignition engines) if the engine is a new stationary RICE located at an area source (§63.6590(c)(1)). No additional requirements apply for this engine under this subpart.

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 vapor combustor that Antero has proposed is not used to comply with one of these regulations. The purpose of the vapor combustor 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

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 (at least 20 pounds (0.01 tons) per year) in their emissions estimate: Benzene, n-Hexane, Toluene, and Xylenes. The following table lists each HAP's carcinogenic risk (as based on analysis provided in the Integrated Risk Information System (IRIS)):

Table 3: Potential HAPs - Carcinogenic Risk

HAPs	Type	Known/Suspected Carcinogen	Classification
n-Hexane	VOC	No	Inadequate Data
Benzene	VOC	Yes	Category A - Known Human Carcinogen
Toluene	VOC	No	Inadequate Data
Ethylbenzene	VOC	No	Inadequate Data
Xylenes	VOC	No	Inadequate Data

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*. This facility is a minor source of HAPs as can be seen in Table 2. 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 construct and operate its Stanley Wellpad natural gas production facility is recommended to the Director of Air Quality.

David Keatley

David Keatley
Permit Writer - NSR Permitting

October 13, 2015

Date