



west virginia department of environmental protection

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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.: G70-A043A
Plant ID No.: 017-00099
Applicant: Antero Resources Corporation (Antero)
Facility Name: Robert Williams Pad
Location: Greenwood, Doddridge County
NAICS Code: 211111
Application Type: Construction
Received Date: July 30, 2015
Engineer Assigned: Roy F Kees, P.E.
Fee Amount: \$1,500.00
Date Received: July 31, 2015
Complete Date: September 2, 2015
Due Date: October 17, 2015
Applicant Ad Date: August 4, 2015
Newspaper: *The Herald Record*
UTM's: Easting: 511.853 km Northing: 4,343.161 km Zone: 17
Description: Modification to increase condensate production, add two (2) gas wells, two (2) gas production units, ten (10) line heaters and to add three (3) enclosed combustors.

DESCRIPTION OF PROCESS

A mixture of condensate and entrained gas from the four wells enters the facility through a number of low pressure separators where the gas phase is separated from the liquid phase. Heater treaters (H001-H010) and line heaters (LH001-LH010) are used in conjunction with the separators to help separate the gas from the liquid phases. These heaters are fueled by a slip stream of the separated gas. The separated gas from the low pressure separators is sent to the sales gas compressor (ENG001). The compressed gas is then metered and sent to the sales gas pipeline. The separated condensate and water from the separators flow to their respective storage tanks (TANKCOND001-010 and TANKPW001-002).

The facility has ten tanks (TANKCOND001-010) on site to store condensate and two tanks (TANKSPW001-002) to store produced water prior to removal from the site. Flashing, working, and breathing losses from the tanks are sent to up to four combustors (EC001-004) to control emissions. The facility will utilize Cimarron Model 48" HV ECD enclosed combustors designed to operate at 8,760 hours per year. The combustor will incorporate an automatic re-ignition system in the event the combustor is extinguished. A thermocouple will be used to monitor the presence of a pilot flame.

Condensate and produced water are transported off-site on an as-needed basis via tanker truck. The maximum annual throughput will be 22,995,000 gallons per year and 45,990,000 gallons per year for condensate and produced water, respectively. Truck loading connections are in place to pump condensate and produced water (L001 & L002) from the storage tanks into tanker trucks. Emissions from the loading operations are vented to the atmosphere.

Emissions from the facility's emission sources were calculated using the extended analysis of the condensate and produced water from Prunty No. 1H, one of the wells in the Lockhart Heirs Pad. These extended analysis are considered representative of the materials from Hamilton, being in the same Marcellus rock formation. The flashing, working & breathing losses from the tanks are sent to vapor recovery units. The combustor that will be used to control tank emissions is designed to achieve a VOC destruction efficiency of 98%.

SITE INSPECTION

A site inspection was conducted on July 18, 2014 by Douglas Hammell of the enforcement section. Mr. Hammell found the site to appropriate for the facility and the G70-A siting criteria was met. The closest residence is approximately 780 feet from the proposed facility.

From Clarksburg, head west on US-50 for 28.5 miles. Turn left onto County Road 50/30/Old US 50 E and continue for 1.9 miles. Turn left onto Oxford Road and continue 2.0 miles. Turn right onto Co. Route 21/1 and the pad will be on the right.

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

Maximum controlled point source emissions listed below were calculated by Antero and reviewed for accuracy by the writer. Heater treater, line heater and enclosed combustor emissions were calculated using EPA AP-42 emission factors. Compressor engine emissions were calculated using manufacturer data as well as AP-42. Storage tank and loading emissions were calculated using ProMax and TANKS 4.0.9. Fugitive emissions were calculated using USEPA Protocol for Equipment Leak Emission Estimates.

The following table indicates which methodology was used in the emissions determination:

Emission Unit ID#	Process Equipment	Calculation Methodology
TANKCOND001-010	Ten (10) 400 bbl (16,800 gal) Condensate Storage Tanks	ProMax, EPA Tanks 4.09d
TANKPW001-002	Two (2) 400 bbl (16,800 gal) Produced Water Storage Tanks	ProMax, EPA Tanks 4.09d
H001 - H010	Ten (10) 1.5 MMBTU/hr Heater Treaters	EPA AP-42 Emission Factors
LH001-LH010	Ten (10) 2.0 MMBTU/hr Line Heaters	
L001	Condensate Truck Loading (22,995,000 gal/yr)	EPA AP-42 Emission Factors
L002	Produced Water Truck Loading (45,990,000 gal/yr)	EPA AP-42 Emission Factors
EC001-004	Four (4) 6.6 MMBTU/hr Enclosed Combustors	EPA AP-42 Emission Factors
ENG001	23.6 HP Kubota DG972-E2 Compressor Engine	Manufacturer's Data EPA AP-42 Emission Factors

The following table indicates the control device efficiencies that are required for this facility:

Emission Unit	Pollutant	Control Device	Control Efficiency
Ten (10) Condensate Storage Tanks (TANKCOND001-010)	Volatile Organic Compounds	Enclosed Combustor	98 %
	Total HAPs		98 %
Two (2) Produced Water Storage Tanks (TANKPW001-002)	Volatile Organic Compounds	Enclosed Combustor	98 %
	Total HAPs		98 %

The total facility potential to emit (PTE) for the Robert Williams Pad is shown in the following table:

Pollutant	Facility Wide PTE (tons/year)
Nitrogen Oxides	16.10
Carbon Monoxide	37.08
Volatile Organic Compounds	69.96
Particulate Matter-10/2.5	1.48
Sulfur Dioxide	0.07
Total HAPs	3.52
Carbon Dioxide Equivalent	24,306.97

Maximum detailed controlled point source emissions were calculated by Antero and checked for accuracy by the writer and are summarized in the table on the next page.

Emission Unit	Pollutant	Maximum Hourly Emissions (lb/hr)	Maximum Annual Emissions (tpy)
H001-H010 (10) 1.50 MMBtu/hr Heater Treaters (Combined)	Nitrogen Oxides	1.20	5.27
	Carbon Monoxide	1.01	4.43
	Volatile Organic Compounds	0.07	0.29
	Sulfur Dioxide	0.01	0.03
	Particulate Matter-10	0.09	0.40
LH001-LH010 (10) 2.00 MMBtu/hr Line Heaters (Combined)	Nitrogen Oxides	1.60	7.03
	Carbon Monoxide	1.35	5.90
	Volatile Organic Compounds	0.09	0.39
	Sulfur Dioxide	0.01	0.04
	Particulate Matter-10	0.12	0.53
	CO ₂ e (Total All Above Heaters)	3,387.94	14,839.16

E001 23.6 hp Compressor Engine Kubota DG972-E2	Nitrogen Oxides	0.32	1.38
	Carbon Monoxide	5.64	24.72
	Volatile Organic Compounds	0.01	0.03
	Sulfur Dioxide	<0.01	<0.01
	Particulate Matter - 10	<0.01	0.01
	Formaldehyde	<0.01	0.02
	CO ₂ e	28	122
L001 Cond. Loading	Volatile Organic Compounds	10.14	11.56
	Total HAPs	0.03	0.03
L002 PW Loading	Volatile Organic Compounds	<0.01	<0.01
	Total HAPs	<0.01	<0.01
Enclosed Combustors EC001-004 TANKCOND0 01-010 & TANK PW 001-002	Nitrogen Oxides	0.55	2.42
	Carbon Monoxide	0.46	2.03
	Volatile Organic Compounds	9.25	40.53
	CO ₂ e	2,064.33	9,041.78
Fugitives F001	Volatile Organic Compounds	3.92	17.16
	Total HAPs	0.38	1.66
	CO ₂ e	89.76	393.14

REGULATORY APPLICABILITY

The proposed Antero natural gas production facility is subject to substantive requirements in the state and federal air quality rules and regulations listed. Each applicable rule (and ones that have reasoned non-applicability) are reviewed below.

45CSR2: To Prevent and Control 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 the proposed fuel burning units (H001 - H010) & (LH001-LH010) are below 10 MMBTU/hr. Therefore, these units are exempt from the aforementioned sections of 45CSR2. However, Antero would be subject to the opacity requirements in 45CSR2, which is 10% opacity based on a six minute block average.

45CSR6: To Prevent and Control Air Pollution from the Combustion of Refuse

45CSR6 prohibits open burning, establishes emission limitations for particulate matter, and establishes opacity requirements. Sources subject to 45CSR6 include completion combustion devices, enclosed combustion devices, and flares.

The facility-wide requirements of the general permit include the open burning limitations §§45-6-3.1 and 3.2.

All completion combustion devices, enclosed combustion devices, and flares are subject to the particulate matter weight emission standard set forth in §45-6-4.1; the opacity requirements in §§45-6-4-3 and 4-4; the visible emission standard in §45-6-4.5; the odor standard in §45-6-4.6; and the testing standard in §§45-6-7.1 and 7.2. Sections 5.0, 6.0 and 14.0 of the G70-A general permit include requirements for 45CSR6.

Enclosed combustion control devices and flares that are used to comply with emission standards of NSPS, Subpart OOOO are subject to design, operational, performance, recordkeeping and reporting requirements of the NSPS regulation that meet or exceed the requirements of 45CSR6.

Antero has four (4) enclosed combustors at the Robert Williams Pad. The combustor has negligible particulate matter emissions. Therefore, the facility's enclosed combustor should demonstrate compliance with this section. The facility will demonstrate compliance by maintaining records of the amount of natural gas consumed by the enclosed combustor and the hours of operation. The facility will also monitor the flame of the 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 the proposed fuel burning units (H001 - H010) & (LH001-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

The construction of the Robert Williams natural gas production facility has a potential to emit a regulated pollutant in excess of six (6) lbs/hour and ten (10) TPY and, therefore, pursuant to §45-13-2.24, the facility is defined as a "stationary source" under 45CSR13. Pursuant to §45-13-5.1, "[n]o person shall cause, suffer, allow or permit the construction . . . and operation of any stationary source to be commenced without . . . obtaining a permit to construct." Therefore, Antero is required to obtain a permit registration under 45CSR13 for the construction and operation of the natural gas production facility.

As required under §45-13-8.3 ("Notice Level A"), Antero placed a Class I legal advertisement in a "newspaper of general circulation in the area where the source is . . . located." The Class I legal advertisement was published on August 4, 2015 in *The Herald Record*.

45CSR16: Standards of Performance for New Stationary Sources Pursuant to 40 CFR Part 60

45CSR16 applies to this source because they are subject to 40CFR60 Subpart JJJJ and OOOO.

45CSR22 Air Quality Management Fee Program

The Robert Williams Pad is not subject to 45CSR30. The facility is subject to 40CFR60 Subpart OOOO, however they are exempt from the obligation to obtain a permit under 40 CFR part 70 or 40 CFR part 71, provided they are not required to obtain a permit for a reason other than their status as an area source, therefore, the facility is not subject and will pay its annual fees through the Rule 22 program.

40CFR60 Subpart JJJJ (Standards of Performance for Stationary Spark Ignition Internal Combustion Engines (SI ICE))

40CFR60.4230 states that a source that commenced construction after June 12, 2006 whose SI ICE was less than 500 hp and was manufactured on or after July 1, 2008 is subject to this rule. Antero has proposed to install one (1) 23.6 HP SI ICE. Since the SI ICEs that Antero will install were manufactured in June, 2013, Antero is subject to this rule. Antero submitted EPA Certificate of Conformity's for the engine.

40 CFR 60, Subpart OOOO Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution

Subpart OOOO applies to facilities that commence construction, reconstruction, or modification after August 23, 2011 (October 15, 2012 for well completions). Since the Robert Williams Pad began operation after August 23, 2011 it is subject to the requirements of Subpart OOOO. The tanks at the Robert Williams Pad will utilize a enclosed combustor to control emissions, therefore the tanks will not have the potential to emit more than 6 tpy of VOC's, and will not be subject to the rule. The site will also include pneumatic controllers that were ordered and installed after August 23, 2011, therefore the controllers will be subject to the applicable provisions of Subpart OOOO. The proposed controllers have a bleed rate of 0.275scf/hr. The gas wells at the Robert Williams Pad will also be affected facilities subject to Subpart OOOO.

Non Applicability Determinations

45CSR14: Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution for the Prevention of Significant Deterioration.

The facility-wide potential-to-emit of the Robert Williams Pad is below the levels that would define the source as "major" under 45CSR14 and, therefore, the construction evaluated herein is not subject to the provisions of 45CSR14.

Classifying multiple facilities as one "stationary source" under 45CSR13, 45CSR14, and 45CSR19 is based on the definition of "Building, structure, facility, or installation" as given in §45-14-2.13 and §45-19-2.12. The definition states:

“Building, Structure, Facility, or Installation” means all of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control). Pollutant-emitting activities are a part of the same industrial grouping if they belong to the same “Major Group” (i.e., which have the same two (2)-digit code) as described in the Standard Industrial Classification Manual, 1987 (United States Government Printing Office stock number GPO 1987 0-185-718:QL 3).

The Robert Williams Pad shares the same SIC code as several other well pads owned by Antero in the area. Therefore, the potential classification of the Robert Williams Pad as one stationary source any other facility depends on the determination if these stations are considered “contiguous or adjacent properties.”

"Contiguous or Adjacent" determinations are made on a case by case basis. These determinations are proximity-based, and it is important to focus on this and whether or not it meets the common sense notion of one stationary source. The terms "contiguous" or "adjacent" are not defined by USEPA. Contiguous has a dictionary definition of being in actual contact; *touching along a boundary or at a point*. Adjacent has a dictionary definition of not distant; nearby; *having a common endpoint or border*.

The Robert Williams Pad is not located contiguous with, or directly adjacent to any other Antero facility. The nearest Antero facility is the Primm Pad which is approximately 0.6 miles away.

The Robert Williams Pad is under common control with other like Antero facilities in the area. However, there are no co-located facilities with the Robert Williams Pad.

The Robert Williams Pad does share the same industrial grouping with other nearby facilities. However, the facilities are not located on contiguous or adjacent properties. Therefore, the emissions from the Robert Williams Pad should not be aggregated with other facilities in determining major source or PSD status.

40 CFR 60 Subpart Kb *Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984*

Pursuant to §60.110b, 40 CFR 60, Subpart Kb applies to “each storage vessel with a capacity greater than or equal to 75 cubic meters (m³) that is used to store volatile organic liquids (VOL) for which construction, reconstruction, or modification is commenced after July 23, 1984.” The largest storage tanks located at the Robert Williams Pad are each 16,800 gallons, or 63.5 m³. Therefore, Subpart Kb does not apply to any of the storage tanks.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

This section provides an analysis for those regulated pollutants that may be emitted from the Pierpoint natural gas production 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 (PM₁₀), Particulate Matter less than 2.5 microns (PM_{2.5}), and Sulfur Dioxide (SO₂). 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, 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	VOC	No	Inadequate Data
Benzene	VOC	Yes	Category A - Known Human Carcinogen
Toluene	VOC	No	Inadequate Data
Xylene	VOC	No	Inadequate Data
Trimethylpentane	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*. For a complete discussion of the known health effects of each compound refer to the IRIS database located at www.epa.gov/iris.

AIR QUALITY IMPACT ANALYSIS

The estimated maximum emissions from the proposed Robert Williams Pad are less than applicability thresholds that would define the proposed facility as a “major stationary source” under 45CSR14 and, therefore, no air quality impacts modeling analysis was required. Additionally, based on the nature of the proposed construction, modeling was not required under 45CSR13, Section 7.

MONITORING OF OPERATIONS

The following substantive monitoring, compliance demonstration, and record-keeping requirements (MRR) shall be required:

- For the purposes of demonstrating compliance with maximum limit for the aggregate production of condensate/liquids from the wells set forth in Section 4.0 of the general permit registration, Antero shall be required to monitor and record the monthly and rolling twelve month total of condensate/liquids (in gallons) produced in the wells. Monitoring and recording the monthly and rolling twelve month total of condensate/liquids (in gallons) unloaded from the storage tanks can be used to show compliance with this requirement.
- For the purposes of demonstrating compliance with visible emissions limitations set forth in Section 7.0 of the G70-A general permit, Antero shall be required to:
 - (1) Conduct an initial Method 22 visual emission observation on the heater treaters to determine the compliance with the visible emission provisions. Antero shall be required to take a minimum of two (2) hours of visual emissions observations on the line heaters.
 - (2) Conduct monthly Method 22 visible emission observations of the heater treater stack to ensure proper operation for a minimum of ten (10) minutes each month the line heaters are in operation.
 - (3) In the event visible emissions are observed in excess of the limitations given under Section 7.5 of the G70-A general permit, Antero shall be required to take immediate corrective action.
- Antero shall be required to maintain records of all visual emission observations pursuant to the monitoring required under Section 7.2 of the G70-A general permit including any corrective action taken.
- Antero shall be required to report any deviation(s) from the allowable visible emission requirement for any emission source discovered during observations using 40CFR Part 60, Appendix A, Method 9 or 22 to the Director of the Division of Air Quality as soon as practicable, but in any case within ten (10) calendar days of the occurrence and shall

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include at least the following information: the results of the visible determination of opacity of emissions, the cause or suspected cause of the violation(s), and any corrective measures taken or planned.

RECOMMENDATION TO DIRECTOR

The information provided in the registration application indicates Antero's Robert Williams Pad meets all the requirements of applicable regulations. Therefore, impact on the surrounding area should be minimized and it is recommended that the Doddridge County location should be granted a G70-A Registration for this proposed permitting action.



Roy F. Kees, P.E.
Engineer - NSR Permitting

10/6/15

Date