



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-A123
Plant ID No.: 017-00142
Applicant: Antero Resources Corporation (Antero)
Facility Name: Middle Well Pad
Location: near West Union, Doddridge County
SIC Code: 1311 - Crude Petroleum and Natural Gas
NAICS Code: 211111 - Crude Petroleum and Natural Gas Extraction
Application Type: Construction
Received Date: December 5, 2014
Engineer Assigned: John Legg
Fee Amount: \$1,500
Date Received: December 8, 2014
Complete Date: February 13, 2015 (Received email of 2nd Newspaper Affidavit)
Due Date: March 30, 2015
Applicant Ad Date: December 9, 2014 and January 13, 2015
(Re-run because of omitted subscripts missing from pollutants)
Newspaper: *The Herald Record* (both times)
UTM's: Easting: 516.73 km Northing: 4,352.70 km Zone: 17
Lat/Long Coordinates: Latitude: 39.323522° Longitude: -80.805872°
Description: Installation of: Eight (8) Gas Production Unit (GPU) heaters at 1.5 MM Btu/hr each; six (6) condensate tanks at 400 barrels (bbl) each; two (2) Produced Water (PW) tanks at 400 bbl each; one (1) condensate loading rack at 200 bbl; one (1) water loading rack at 200 bbl; one (1) flare at 138 scfm; and one (1) compressor engine at 24 HP.

DESCRIPTION OF PROCESS

A mixture of condensate and entrained gas from up to eight (8) wells enters the Facility through eight (8) low pressure separators where the gas phase is separated from the liquid phase. Eight (8) Gas Production Unit (GPU) heaters (H001 - H008) 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 a 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 prior to removal from the site: six (6), 400 barrel (16,800 gallon) capacity condensate storage tanks (TANKCOND001 thru TANKCOND006) and two (2), 400 barrel (16,800 gallon) capacity produced water storage tanks (TANKPW001 and TANKPW002). Maximum annual condensate and produced water flow rates are 4.91 MM gal/yr and 58.87 MM gal/yr, respectively.

Flashing, working, and breathing losses from the condensate and process water storage tanks are routed to the flare (FL001) to control the emissions. The flare is a AbuTec -200 with a maximum design heat input of 18.4 MM Btu/hr, and a VOC destruction efficiency of 98%.

Condensate and produced water are transported off site on an as needed basis via tanker truck. Truck loading connections are in place to pump condensate (L001) and produced water (L002) from the storage tanks into 40 ton capacity tanker trucks. Emissions from the loading operations are vented to the atmosphere.

Table 1: Wells Feeding Antero’s Middle Well Pad (Attachment G, Permit Sheet). Applicant: Natural Gas Well Affected Facility Data

47-017-06589-00
47-017-06647-00
Six (6) wells - Not Permitted Yet

Table 2: Technical Information Related to Antero’s Middle Well Pad (Attachment I, Permit Application: Emission Calculations, Table 1).

Technical Information	
Max Condensate Site Throughput (barrels/day; bbl/day) (1 bbl = 42 gallon)	320 (13,440 gal/day)
Max Produced Water Site Throughput (barrels/day; bbl/day) (1 bbl = 42 gallon)	3,840 (161,280 gal/day)
Equipment	

Fact Sheet G70-A123
Antero Resources Corporation
Middle Well Pad, Doddridge County, WV

Table 2: Technical Information Related to Antero's Middle Well Pad (Attachment I, Permit Application: Emission Calculations, Table 1).

IC Engines	1
GPU Heaters	8
Condensate Tanks	6
Produced Water Tanks	2
Loading Jobs/Racks	2
Flares/Vapor Combustors	1

Table 3: Emissions Unit Data Sheet (Attachment G in Permit Application).

Emission			Year Installed	Design Capacity	Type of Change	Control Device
Unit ID	Point ID	Description				
H001 thru H008	EP-H001 thru EP-H008	Eight (8) Gas Production Unit (GPU) Heaters	2015	1.5 MM Btu/hr each	New	None
TANKCOND001 thru TANKCOND006	FL001	Six (6) Condensate Tanks (collective throughput all six tanks: gal/hr; 13,440 gal/day; 4,905,600 gal/yr)	2015	400 barrel ⁽¹⁾ (bbl) each	New	FL001
TANKPW001 and TANKPW002	FL001	Two (2) Produced Water Tanks (collective throughput both tanks: 6,720 gal/hr; 161,280 gal/day; 58,867,200 gal/yr)	2015	400 bbl ⁽¹⁾ each	New	FL001
L001	EP-L001	Condensate Loading	2015	200 bbl ⁽¹⁾	New	None
L002	EP-L001	Water Loading	2015	200 bbl ⁽¹⁾	New	None
HR001	EP-HR001	Haul Road Emissions	2015	40 ton Tank Truck Capacity	New	None
FL001	FL001	Flare	2015	138.8 scf/min	New	None

Fact Sheet G70-A123
 Antero Resources Corporation
 Middle Well Pad, Doddridge County, WV

Emission			Year Installed	Design Capacity	Type of Change	Control Device
Unit ID	Point ID	Description				
PCV	EP-PCV	Pneumatic Control Valve	2015	6.6 scf/day	New	None
ENG001	EP-ENG001	Compressor Engine	2015	24 HP	New	None

(1) 1 barrel = 42 gallons.

Table 4: Information in Attachment G on Antero's Middle Pad Compressor Engine (ENG001).

Emission Unit (Source) ID No.	ENG001
Emission Point ID No.	EP-ENG001
Engine Manufacturer and Model	Kubota DG972-E2
Manufacturer's Rated bhp/rpm	24 HP @ 3600 rpm
Source Status	New Source
Installation Date	2015
Engine Manufactured	2013
Is this engine subject to 40 CFR 60, Subpart JJJJ?	Yes
Is this a Certified Stationary Spark Ignition Engine according to 40 CFR 60, Subpart JJJJ?	Yes
Is this engine subject to 40 CFR 63, Subpart ZZZZ?	Yes
Engine Type	Rich Burn Four Stroke (RB4S)
Air Pollution Control Device	---
Fuel Type	Natural Gas
H ₂ S (gr/100 scf)	0
Operating bhp/rpm	16.5 hp /2400 rpm
Brake Specific Fuel Consumption (BSFC) (Btu/bhp-hr)	9,773
Fuel Throughput (ft ³ /hr)	193
Fuel Throughput (MM ft ³ /yr)	1.6907
Operating Hours	8,760 hr/yr

Fact Sheet G70-A123
Antero Resources Corporation
Middle Well Pad, Doddridge County, WV

MATERIAL SAFETY DATA SHEETS (MSDS)

Antero developed and submitted three (3) generic MSDS of their own in Attachment N to the application:

Natural Gas - Dry Field Natural Gas. The MSDS for natural gas reflects pipeline quality odorized gas. This is essentially the same as the material delivered to the metering and downstream gathering lines from the Antero well pad.

95% methane; 4% ethane; 0.3% propane; 0.4% nitrogen; 0.2% carbon dioxide. Composition can vary greatly.

Condensate - Natural Gas Condensate; Drips; Gas Well Condensate; High Pressure Inlet Liquids; Lease Condensate; NG Liquids; Pipeline Liquids. The hydrocarbon liquid that has been separated from raw natural gas through the well pad gas production unit. The liquid is often characterized as having gasoline-like odor and consistency.

25 - 95% Octanes or Heptanes or n-Hexanes; 5 - 70% n-Pentanes; 0 - 45% N-butane; 0 - 15% Propane. Composition can vary greatly.

Produced Water - Produced Brine Water; Brine; Brine Water; Formation Water. Primarily groundwater with residual trace hydrocarbons that has been withdrawn from the ground during the gas extraction process and then separated from the natural gas and condensate in the gas production units.

80% Water; 20% Sodium Chloride. Composition can vary greatly.

SITE INSPECTION

James Robertson of WVDEP DAQ Compliance and Enforcement Section performed a site visit on January 13, 2015. The closest residential dwelling was approximately 1,000 feet from the proposed site.

Directions as given in the "Application for General Permit Registration," 12A, page 2 of 5:

From the intersection of WV-18S and Slaughter Run Road, head southeast on WV-18 S for 0.3 miles. The entrance to the facility will be towards the left.

Fact Sheet G70-A123
Antero Resources Corporation
Middle Well Pad, Doddridge County, WV

UTM (per entry 17A, page 2 of 5) and Latitude & Longitude Coordinates (19A, page 2 of 5):

4352.6971 -	Northing (KM)	39.323522 Latitude
516.7331 -	Easting (KM)	-80.805872 Longitude
17N -	Zone	

AGGREGATION

Antero states in their "Process Description" given in Attachment B:

Middle Well Pad calculation of potential to emit included all of the emission sources that:

- belong to the same industrial grouping,
- are located on contiguous or adjacent properties, and
- are under the control of the same person.

The nearest emission source that belongs to the same industrial grouping and under the control of the same person but not located on contiguous or adjacent property is the Rock Run Pad. This operates independently and is approximately 1.2 miles southwest of the Facility.

For further discussion on aggregation, see **REGULATORY NON-APPLICABILITY, 45CSR14 - "Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution for the Prevention of Significant Deterioration."**

BACKGROUND INFORMATION RELATED TO CALCULATING EMISSIONS

Antero states in their "Process Description" given in Attachment B:

Emissions from the Middle Well Pad's emission sources were calculated using the extended analysis of the condensate and gas from Prunty Unit No. 1H, one of the wells in the Lockhart Heirs pad. These extended analyses are considered representative of the materials from Middle Well Pad, being in the same Marcellus rock formation.

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

Maximum controlled point source emissions for the Middle Well Pad are listed below in Tables 5 thru 7, and were calculated by Antero and reviewed (by the writer) for accuracy.

Fact Sheet G70-A123
Antero Resources Corporation
Middle Well Pad, Doddridge County, WV

- Emissions from the eight (8) heater treaters [gas production unit (GPU) heaters: EU-H001 thru H008] and flare were calculated using USEPA AP-42 emission factors Section 1.4 Natural Gas Combustion. The flare is considered to have a 98% efficiency.
- Emissions from the 24 hp natural gas-fired compressor engine (ENG001) were calculated using manufacturer data as well as AP-42, Section 3.2 "Natural Gas-fired Reciprocating Engines," Table 3.2-3.
- Storage tank and loading emissions were calculated using AP-42, ProMax 3.2 and TANKS 4.0.9.
- Fugitive emissions were calculated based on an estimated component count and from using emission factors for oil and gas production from the USEPA's "Protocol for Equipment Leak Emission Estimates," November 1995, EPA 4531, R-95-017, Table 2-4.

The rightmost column in Table 5 gives the annual controlled PTE for the Middle Well Pad facility as listed in Antero's January 13, 2015 legal advertisement appearing in *The Herald Record*:

Table 5: PTE Middle Well Pad, West Union (see Permit Application, Attachment I, Table 3).

Pollutant	PTE Facility Wide			
	Hourly (lb/hr)		Annual (ton/yr)	
	Uncontrolled ⁽¹⁾	Controlled ⁽²⁾	Uncontrolled ⁽¹⁾	Controlled ⁽²⁾ (As Advertised)
Nitrogen Oxide	1.28	1.69	5.60	7.37
Carbon Monoxide	6.46	6.80	28.27	29.75
Volatile Organic Compounds	309.46	9.33	1,357.79	43.20
Particulate Matter- 2.5	0.08	0.10	0.34	0.44
Particulate Matter- 10	1.73	0.94	3.36	1.98
Sulfur Dioxide	0.01	0.01	0.03	0.03
Lead	<0.01	<0.01	<0.01	<0.01

Fact Sheet G70-A123
 Antero Resources Corporation
 Middle Well Pad, Doddridge County, WV

Table 5: PTE Middle Well Pad, West Union (see Permit Application, Attachment I, Table 3).

Pollutant	PTE Facility Wide			
	Hourly (lb/hr)		Annual (ton/yr)	
	Uncontrolled ⁽¹⁾	Controlled ⁽²⁾	Uncontrolled ⁽¹⁾	Controlled ⁽²⁾ (As Advertised)
Total HAPs	54.46	1.39	238.55	6.12
Benzene	0.11	0.01	0.46	0.04
Formaldehyde	---	---	---	0.03
Xylenes	0.24	0.05	1.01	0.19
Carbon Dioxide Equivalent (CO _{2e})	---	---	---	11,353.20

(1) Found in Application, Attachment I, Emission Calculations, Table 3, "Permit Summary."
(2) Emissions based on 98% Flare DRE operating 100% of the time.

Table 6: Estimated Maximum Controlled Emissions for Antero's Middle Well Pad Facility listed by Emission Point.

Emission Point ID	Emission Unit ID	Emission Source	Pollutant	Maximum Emissions After Controls	
				(lb/hr)	(tpy)
FL001	TANKCOND 001-006	AbuTec Combustor (Used to Control Emissions from Condensate and Produced Water Tanks)	Nitrogen Oxides	0.41	1.77
			Carbon Monoxide	0.34	1.49
	Volatile Organic Compounds		6.13	26.83	
	Total HAP		1.09	4.75	
	PM10		0.04	0.14	
EP-H001 thru EP-H008	H001 thru H008	GPU Heaters	Nitrogen Oxides	0.97	4.22
			Carbon Monoxide	0.81	3.54
			Volatile Organic Compounds	0.06	0.24
			PM10	0.08	0.32

Fact Sheet G70-A123
Antero Resources Corporation
Middle Well Pad, Doddridge County, WV

Table 6: Estimated Maximum Controlled Emissions for Antero's Middle Well Pad Facility listed by Emission Point.

Emission Point ID	Emission Unit ID	Emission Source	Pollutant	Maximum Emissions After Controls	
				(lb/hr)	(tpy)
EP-L001 and EP-L002	L001 and L002	⁽¹⁾ Condensate and Produced Water Tanker Truck Loading	Volatile Organic Compounds	9.70	2.37
			Total HAP	0.14	0.04
EP-FUG	FUG	⁽²⁾ Fugitive Emissions	Volatile Organic Compounds	3.14	13.75
			Total HAP	0.29	1.24
			PM10	1.65	3.03
EP-ENG001	ENG001	Compressor Engine	Nitrogen Oxides	0.32	1.39
			Carbon Monoxide	5.65	24.73
			Volatile Organic Compounds	0.01	0.04
			PM10	0.01	0.01
<p>(1) Loading emissions occur when condensate and produced water are transferred out of the well site via tanker trucks. Fugitive emissions were estimated using AP-42 loading loss formula: $L=12.46 * SPM/T$, and Bryan & Engineering (BR&E) software known as Promax.</p> <p>(2) Fugitive Emissions include:</p> <p>Equipment Component Leaks - Leaks from valves, flanges, and connectors installed in various process equipment such as gas production unit heaters, compressor, pipelines, and separators. Emission are assumed to be occurring throughout the year.</p> <p>Pneumatic Control Valve Leaks - Pneumatic control valves are part of the gas production unit heaters. They are intermittent low bleed valves and their emissions are assumed to be occurring throughout the year.</p> <p>Haul Road Emissions - Haul road emissions are emitted when tanker trucks or service vehicles enter the Facility. The Facility is flat and unpaved.</p>					

Table 7: Estimated Maximum Controlled Emissions from Antero's Middle Well Pad, West Union, Doddridge County, WV.

Emission Point ID	Emission Unit ID	Emission Source	Controlled Annual Emission Rate (ton/yr)				
			NOx	CO	VOC	Total HAP	PM10
FL001	TANKCOND 001-006 TANKPW 001-002	AbuTec Combustor (Used to Control Emissions from Condensate and Produced Water Tanks)	1.77	1.49	26.83	4.75	0.14
EP-H001 thru EP-H008	H001 thru H008	GPU Heaters	4.22	3.54	0.24	0.08	0.32
EP-L001 and EP-L002	L001 and L002	Condensate and Produced Water Tanker Truck Loading	---	---	2.37	0.04	---
EP-FUG	FUG	Fugitive Emissions	---	---	13.75	1.24	1.52
EP-ENG001	ENG001	Compressor Engine	1.39	24.73	0.032	0.03	0.01
Total			7.37	29.75	43.20	6.12	1.89

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 below. Each applicable rule (and ones that have reasoned non-applicability) are reviewed below.

45CSR2 - "Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers"

The purpose of 45CSR2 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:

- Section 4 - weight emission standard,
- Section 5 - control of fugitive particulate matter,
- Section 6 - registration,
- Section 8 - testing, monitoring, record keeping, reporting and
- Section 9 - startups, shutdowns, malfunctions.

Fact Sheet G70-A123
Antero Resources Corporation
Middle Well Pad, Doddridge County, WV

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/GPU Heaters (EU-H001 through EU-H008) are below 10 MM BTU/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.

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”

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, record keeping and reporting requirements of

Fact Sheet G70-A123
Antero Resources Corporation
Middle Well Pad, Doddridge County, WV

the NSPS regulation that meet or exceed the requirements of 45CSR6.

Antero has one (1) flare at the Middle Well Pad. The flare has negligible particulate matter emissions. Therefore, the facility's flare should demonstrate compliance with this section. The facility will demonstrate compliance by maintaining records of the amount of natural gas consumed by the flare and the hours of operation. The facility will also monitor the flame of the flare 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, record keeping, 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/GPU Heaters (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 construction of Antero's 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

Fact Sheet G70-A123
Antero Resources Corporation
Middle Well Pad, Doddridge County, WV

published on January 13, 2015 in *The Herald Record*.

45CSR22 - "Air Quality Management Fee Program"

Antero's Middle Well Pad is not subject to 45CSR30. The facility is subject to 40CFR60 Subpart OOOO, however it is exempt from the obligation to obtain a permit under 40 CFR part 70 or 40 CFR part 71, provided it is not required to obtain a permit for a reason other than its 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) 24 HP SI ICE. Since the SI ICEs that Antero will install were manufactured in 2013, Antero is subject to this rule. Antero submitted an EPA Certificate of Conformity's for the engine.

40CFR60 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 Middle Well Pad began operation after August 23, 2011 it is subject to the requirements of Subpart OOOO.

The tanks at the Middle Well Pad will utilize a flare 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. There are thirty two (32) PCVs located at the facility. Each PCV emits only 6.6 scf/day of natural gas, much less than the 6 scf/hr of natural gas triggering

Fact Sheet G70-A123
Antero Resources Corporation
Middle Well Pad, Doddridge County, WV

Subpart OOOO. The PCV natural gas emissions were viewed as being fugitive emissions.

The gas wells at the Middle Well Pad will also be affected facilities subject to Subpart OOOO.

REGULATORY NON-APPLICABILITY

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

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 Middle Well 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 Middle Well Pad shares the same SIC code as several other well pads owned by Antero in the area. Therefore, the potential classification of the Middle Well Pad as one stationary source with another 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

Fact Sheet G70-A123
Antero Resources Corporation
Middle Well Pad, Doddridge County, WV

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 Middle Well Pad is not located contiguous with, or directly adjacent to any other Antero facility. The nearest emission source that belongs to the same industrial grouping and under the control of the same person but not located on contiguous or adjacent property is the Rock Run pad. This facility operates independently and is approximately 1.2 miles southwest of the Middle Well Pad.

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

The Middle Well 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 Middle Well Pad should not be aggregated with other facilities in determining major source or PSD status.

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 Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage

Fact Sheet G70-A123
Antero Resources Corporation
Middle Well Pad, Doddridge County, WV

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.

40CFR60 Subpart Kb does not apply to storage vessels with a capacity less than 75 cubic meters. The tanks that Antero have proposed to install are 21.35 cubic meters each and therefore, 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 Anterio’s Brooks Well Pad 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.

Fact Sheet G70-A123
Antero Resources Corporation
Middle Well Pad, Doddridge County, WV

Antero included the following HAPs as emitted in substantive amounts in their emissions estimate: Benzene, Ethylbenzene, 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)):

Potential HAPs - Carcinogenic Risk

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

All HAPs have other non-carcinogenic chronic and acute effects. These adverse health effects 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 Brooks Well 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 limits for the production of condensate and produced water as 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 and produced water (in gallons) produced. Monitoring and recording the monthly and rolling twelve month total of condensate and produced water (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 GPU heaters 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 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.

Fact Sheet G70-A123
Antero Resources Corporation
Middle Well Pad, Doddridge County, WV

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's request to construct and operate its Middle Well Pad natural gas production facility is recommended to the Director of Air Quality.

John Legg
Permit Writer - NSR Permitting

March 2, 2015

Date

Fact Sheet G70-A123
Antero Resources Corporation
Middle Well Pad, Doddridge County, WV