



February 23, 2018

Reference No. 082715

Ms. Beverly McKeone  
Division of Air Quality  
WV Department of Environmental Protection  
601 57th Street, SE  
Charleston, West Virginia 25304

Dear Ms. Beverly McKeone:

**Re: General Permit G70-D Modification Application  
Clarence Well Pad  
Antero Resources Corporation**

GHD Services Inc. (GHD) would like to submit this General Permit Modification application that we prepared on behalf of Antero Resources Corporation for an oil and gas facility identified as Clarence Well Pad.

A General Permit Registration Modification is requested due to the following planned operational changes:

1. Increase in produced water throughputs
2. Removal of one Cimarron enclosed combustor

Enclosed are the following documents:

- Original copy of the G70-D General Permit Modification Application.
- Two CD copies of the G70-D General Permit Modification Application.
- The application fee with check no. 512008 in the amount of \$1,500.00.

Please let us know if you have any questions or require additional information.

Sincerely,

GHD Services Inc.

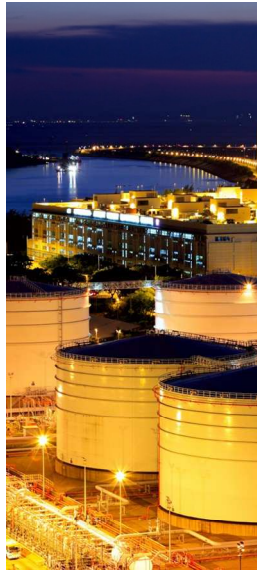
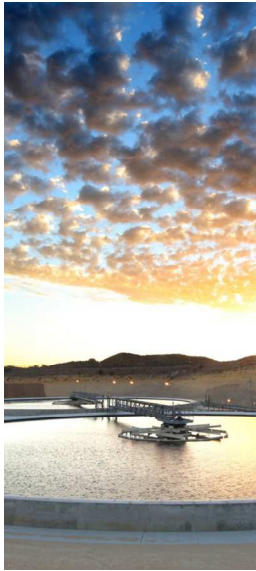
A handwritten signature in black ink, appearing to read 'Manuel Bautista', written in a cursive style.

Manuel Bautista

MB/ma/402

Encl.

cc: Barry Schatz, Antero Resources Corporation  
Elizabeth McLaughlin, Antero Resources Corporation



# G70-D General Permit Modification Application

Increase in produced water throughput; Remove one Cimarron enclosed combustor

Clarence Well Pad

Antero Resources Corporation

**GHD** 6320 Rothway Suite 100 Houston Texas 77040  
082715 | Report No 402 | February 2018

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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  
www.dep.wv.gov

### G70-D GENERAL PERMIT REGISTRATION APPLICATION

PREVENTION AND CONTROL OF AIR POLLUTION IN REGARD TO THE CONSTRUCTION, MODIFICATION, RELOCATION, ADMINISTRATIVE UPDATE AND OPERATION OF NATURAL GAS PRODUCTION FACILITIES LOCATED AT THE WELL SITE

- |  |   |
|--|---|
| <input type="checkbox"/> CONSTRUCTION            | <input type="checkbox"/> CLASS I ADMINISTRATIVE UPDATE  |
| <input checked="" type="checkbox"/> MODIFICATION | <input type="checkbox"/> CLASS II ADMINISTRATIVE UPDATE |
| <input type="checkbox"/> RELOCATION              |   |

#### SECTION 1. GENERAL INFORMATION

Name of Applicant (as registered with the WV Secretary of State's Office): Antero Resources Corporation

Federal Employer ID No. (FEIN): 80-0162034

Applicant's Mailing Address: 1615 Wynkoop Street

City: Denver

State: CO

ZIP Code: 80202

Facility Name: Clarence Well Pad

Operating Site Physical Address: 3762 Miletus Rd

City: Salem

Zip Code: 26426

County: Doddridge

Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits):

Latitude: 39.24469

Longitude: -80.56821

SIC Code: 1311

DAQ Facility ID No. (For existing facilities)

NAICS Code: 211111

017-0092

#### CERTIFICATION OF INFORMATION

This G70-D General Permit Registration Application shall be signed below by a Responsible Official. A Responsible Official is a President, Vice President, Secretary, Treasurer, General Partner, General Manager, a member of the Board of Directors, or Owner, depending on business structure. A business may certify an Authorized Representative who shall have authority to bind the Corporation, Partnership, Limited Liability Company, Association, Joint Venture or Sole Proprietorship. Required records of daily throughput, hours of operation and maintenance, general correspondence, compliance certifications and all required notifications must be signed by a Responsible Official or an Authorized Representative. If a business wishes to certify an Authorized Representative, the official agreement below shall be checked off and the appropriate names and signatures entered. **Any administratively incomplete or improperly signed or unsigned G70-D Registration Application will be returned to the applicant. Furthermore, if the G70-D forms are not utilized, the application will be returned to the applicant. No substitution of forms is allowed.**

I hereby certify that Barry Schatz is an Authorized Representative and in that capacity shall represent the interest of the business (e.g., Corporation, Partnership, Limited Liability Company, Association Joint Venture or Sole Proprietorship) and may obligate and legally bind the business. If the business changes its Authorized Representative, a Responsible Official shall notify the Director of the Division of Air Quality immediately.

I hereby certify that all information contained in this G70-D General Permit Registration Application and any supporting documents appended hereto is, to the best of my knowledge, true, accurate and complete, and that all reasonable efforts have been made to provide the most comprehensive information possible.

Responsible Official Signature: \_\_\_\_\_

Name and Title:

Phone:

Fax:

Email:

Date:

If applicable:

Authorized Representative Signature: Barry Schatz

Name and Title: Barry Schatz/ Senior Environmental & Regulatory Manager Phone: 303-357-7276 Fax: 303-357-7315

Email: bschatz@anteroresources.com

Date: 2/23/2018

If applicable:

Environmental Contact

Name and Title:

Phone:

Fax:

Email:

Date:

**OPERATING SITE INFORMATION**

Briefly describe the proposed new operation and/or any change(s) to the facility:

Modification of a natural gas and oil production facility: Increase produced water throughput; Remove one Cimarron enclosed combustor;

Directions to the facility: From Clarksburg: Drive west on US-50 W for 11 miles. Take exit toward Downtown/Salem. Continue onto Main St/Old Rte 50 for 1.2 miles. Continue straight to South St for 0.5 mile. Continue onto Patterson Fork Rd for 0.2 mile. Continue onto Salem Country Club Rd/Patterson Fork Rd for 1.9 miles. Turn left onto Sherwood-Greenbrier Rd for 0.6 mile. Facility is on the left.

**ATTACHMENTS AND SUPPORTING DOCUMENTS**

**I have enclosed the following required documents:**

Check payable to WVDEP – Division of Air Quality with the appropriate application fee (per 45CSR13 and 45CSR22).

- Check attached to front of application.
- I wish to pay by electronic transfer. Contact for payment (incl. name and email address):
- I wish to pay by credit card. Contact for payment (incl. name and email address):

- \$500 (Construction, Modification, and Relocation)                       \$300 (Class II Administrative Update)
- \$1,000 NSPS fee for 40 CFR60, Subpart IIII, JJJJ, OOOO and/or OOOOa <sup>1</sup>
- \$2,500 NESHAP fee for 40 CFR63, Subpart ZZZZ and/or HH <sup>2</sup>

<sup>1</sup> Only one NSPS fee will apply.  
<sup>2</sup> Only one NESHAP fee will apply. The Subpart ZZZZ NESHAP fee will be waived for new engines that satisfy requirements by complying with NSPS, Subparts IIII and/or JJJJ.  
*NSPS and NESHAP fees apply to new construction or if the source is being modified.*

- Responsible Official or Authorized Representative Signature (if applicable)
- Single Source Determination Form (**must be completed in its entirety**) – Attachment A
- Siting Criteria Waiver (if applicable) – Attachment B                       Current Business Certificate – Attachment C
- Process Flow Diagram – Attachment D                                       Process Description – Attachment E
- Plot Plan – Attachment F     Area Map – Attachment G
- G70-D Section Applicability Form – Attachment H                       Emission Units/ERD Table – Attachment I
- Fugitive Emissions Summary Sheet – Attachment J
- Gas Well Affected Facility Data Sheet (if applicable) – Attachment K
- Storage Vessel(s) Data Sheet (include gas sample data, USEPA Tanks, simulation software (e.g. ProMax, E&P Tanks, HYSYS, etc.), etc. where applicable) – Attachment L
- Natural Gas Fired Fuel Burning Unit(s) Data Sheet (GPU's, Heater Treaters, In-Line Heaters if applicable) – Attachment M
- Internal Combustion Engine Data Sheet(s) (include manufacturer performance data sheet(s) if applicable) – Attachment N
- Tanker Truck Loading Data Sheet (if applicable) – Attachment O
- Glycol Dehydration Unit Data Sheet(s) (include wet gas analysis, GRI- GLYCalc™ input and output reports and information on reboiler if applicable) – Attachment P
- Pneumatic Controllers Data Sheet – Attachment Q
- Pneumatic Pump Data Sheet – Attachment R
- Air Pollution Control Device/Emission Reduction Device(s) Sheet(s) (include manufacturer performance data sheet(s) if applicable) – Attachment S
- Emission Calculations (please be specific and include all calculation methodologies used) – Attachment T
- Facility-wide Emission Summary Sheet(s) – Attachment U
- Class I Legal Advertisement – Attachment V
- One (1) paper copy and two (2) copies of CD or DVD with pdf copy of application and attachments

**Attachment R  
AUTHORITY OF CORPORATION  
OR OTHER BUSINESS ENTITY (DOMESTIC OR FOREIGN)**

TO: The West Virginia Department of Environmental Protection,  
Division of Air Quality

DATE: January 23, 2015

ATTN.: Director

Corporation's / other business entity's Federal Employer I.D. Number 80-0162034

The undersigned hereby files with the West Virginia Department of Environmental Protection, Division of Air Quality, a permit application and hereby certifies that the said name is a trade name which is used in the conduct of an incorporated business or other business entity.

Further, the corporation or the business entity certifies as follows:

(1) Barry Schatz (is/are) the authorized representative(s) and in that capacity may represent the interest of the corporation or the business entity and may obligate and legally bind the corporation or the business entity.

(2) The corporation or the business entity is authorized to do business in the State of West Virginia.

(3) If the corporation or the business entity changes its authorized representative(s), the corporation or the business entity shall notify the Director of the West Virginia Department of Environmental Protection, Division of Air Quality, immediately upon such change.



\_\_\_\_\_  
President or Other Authorized Officer  
(Vice President, Secretary, Treasurer or other  
official in charge of a principal business function of  
the corporation or the business entity)

(If not the President, then the corporation or the business entity must submit certified minutes or bylaws stating legal authority of other authorized officer to bind the corporation or the business entity).

\_\_\_\_\_  
Secretary

\_\_\_\_\_  
Name of Corporation or business entity

# **Attachment A**

## **Single Source Determination Form**

## ATTACHMENT A - SINGLE SOURCE DETERMINATION FORM

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 Source Determination Rule for the oil and gas industry was published in the Federal Register on June 3, 2016 and will become effective on August 2, 2016. EPA defined the term “adjacent” and stated that equipment and activities in the oil and gas sector that are under common control will be considered part of the same source if they are located on the same site or on sites that share equipment and are within ¼ mile of each other.

Is there equipment and activities in the same industrial grouping (defined by SIC code)?

Yes  No

Is there equipment and activities under the control of the same person/people?

Yes  No

Is there equipment and activities located on the same site or on sites that share equipment and are within ¼ mile of each other?

Yes  No

Clarence 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 nearby 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 well pad site identified as Hubert Well Pad. Clarence Well Pad site is located approximately 0.74 miles southwest of the Hubert Well Pad.



# **Attachment B**

## **Siting Criteria Waiver**

**Attachment B**

**Siting Waiver**

**Clarence Well Pad**

**Antero Resources Corporation**

**Doddridge County, West Virginia**

A Siting Waiver form is not required because there are no occupied dwelling structures within 300 feet of Clarence Well Pad.

# **Attachment C**

## **Current Business Certificate**

# State of West Virginia



## Certificate

*I, Natalie E. Tennant, Secretary of State of the State of West Virginia, hereby certify that*

### ANTERO RESOURCES CORPORATION

a corporation formed under the laws of Delaware, which is authorized to transact business in West Virginia by a Certificate of Authority has filed in my office as required by the provisions of the West Virginia Code, a copy of an amendment to its Articles of Incorporation authenticated by the proper office of the state or country of its incorporation and was found to conform to law.

Therefore, I issue this

### CERTIFICATE OF AMENDMENT TO CERTIFICATE OF AUTHORITY



*Given under my hand and the  
Great Seal of the State of  
West Virginia on this day of  
June 10, 2013*

*Natalie E. Tennant*

*Secretary of State*

**FILED**

**JUN 10 2013**

Natalie E. Tennant  
Secretary of State  
1900 Kanawha Blvd E  
Bldg 1, Suite 157-K  
Charleston, WV 25305



Penney Barker, Manager  
IN THE OFFICE OF Corporations Division  
SECRETARY OF STATE Tel: (304)558-8000  
Fax: (304)558-8381

Website: [www.wvsos.com](http://www.wvsos.com)  
E-mail: [business@wvsos.com](mailto:business@wvsos.com)

Office Hours: Monday – Friday  
8:30 a.m. – 5:00 p.m. ET

**APPLICATION FOR  
AMENDED CERTIFICATE  
OF AUTHORITY**

**FILE ONE ORIGINAL**  
(Two if you want a filed  
stamped copy returned to you)  
**FEE: \$25.00**

\*\*\*\* In accordance with the provisions of the West Virginia Code, the undersigned corporation hereby \*\*\*\*  
applies for an Amended Certificate of Authority and submits the following statement:

1. Name under which the corporation was authorized to transact business in WV: Antero Resources Appalachian Corporation
2. Date Certificate of Authority was issued in West Virginia: 6/25/2008
3. Corporate name has been changed to: Antero Resources Corporation  
(Attach one **Certified Copy of Name Change** as filed in home State of Incorporation.)
4. Name the corporation elects to use in WV: Antero Resources Corporation  
(due to home state name not being available)
5. Other amendments: \_\_\_\_\_  
(attach additional pages if necessary)
6. Name and phone number of contact person. (This is optional, however, if there is a problem with the filing, listing a contact person and phone number may avoid having to return or reject the document.)  
Alvyn A. Schopp (303) 367-7310  
Contact Name Phone Number
7. Signature Information (See below **\*Important Legal Notice Regarding Signature**):  
Print Name of Signer: Alvyn A. Schopp Title/Capacity: Authorized Person  
Signature:  Date: June 10, 2013

**\*Important Legal Notice Regarding Signature:** Per West Virginia Code §31D-1-129. Penalty for signing false document. Any person who signs a document he or she knows is false in any material respect and knows that the document is to be delivered to the secretary of state for filing is guilty of a misdemeanor and, upon conviction thereof, shall be fined not more than one thousand dollars or confined in the county or regional jail not more than one year, or both.

# Delaware

PAGE 1

*The First State*

I, JEFFREY W. BULLOCK, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY THE ATTACHED IS A TRUE AND CORRECT COPY OF THE CERTIFICATE OF AMENDMENT OF "ANTERO RESOURCES APPALACHIAN CORPORATION", CHANGING ITS NAME FROM "ANTERO RESOURCES APPALACHIAN CORPORATION" TO "ANTERO RESOURCES CORPORATION", FILED IN THIS OFFICE ON THE TENTH DAY OF JUNE, A.D. 2013, AT 9:37 O'CLOCK A.M.

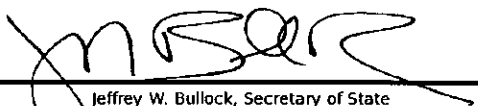
A FILED COPY OF THIS CERTIFICATE HAS BEEN FORWARDED TO THE NEW CASTLE COUNTY RECORDER OF DEEDS.

4520810 8100

130754186



You may verify this certificate online  
at [corp.delaware.gov/authver.shtml](http://corp.delaware.gov/authver.shtml)

  
Jeffrey W. Bullock, Secretary of State  
AUTHENTICATION: 0496546

DATE: 06-10-13

AMENDMENT TO THE  
AMENDED AND RESTATED  
CERTIFICATE OF INCORPORATION  
OF  
ANTERO RESOURCES APPALACHIAN CORPORATION

Antero Resources Appalachian Corporation (the "Corporation"), a corporation organized and existing under the laws of the State of Delaware, hereby certifies as follows:

1. The original Certificate of Incorporation of the Corporation was filed under the name Antero Resources Barnett Corporation with the filing of the original Certificate of Incorporation of the Corporation with the Secretary of State of the State of Delaware on March 18, 2008.

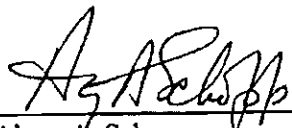
2. This Amendment to the Amended and Restated Certificate of Incorporation has been duly adopted and approved in accordance with Sections 242 of the General Corporation Law of the State of Delaware.

3. Article FIRST of the Amended and Restated Certificate of Incorporation is hereby amended to read in its entirety as follows:

FIRST. The name of the Corporation is Antero Resources Corporation.

IN WITNESS WHEREOF, the Corporation has caused this Certificate of Amendment to be executed by its duly authorized officer on the 10th day of June, 2013.

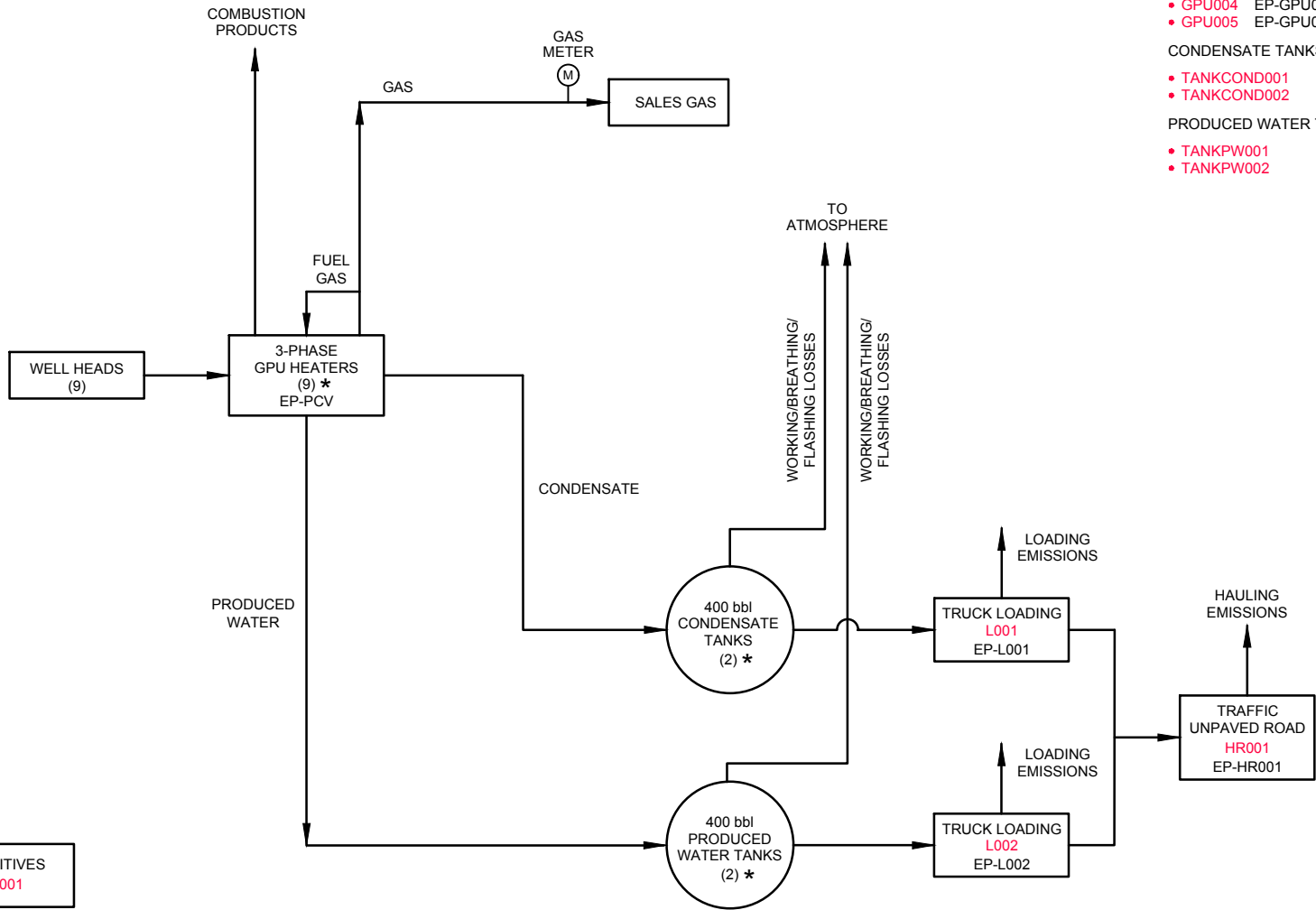
ANTERO RESOURCES APPALACHIAN CORPORATION

By:   
Name: Alwyn A. Schopp  
Title: Vice President of Accounting &  
Administration / Treasurer

# **Attachment D**

## **Process Flow Diagram**





- \* 3-PHASE SEPARATORS WITH HEATERS (9)
  - GPU001 EP-GPU001
  - GPU006 EP-GPU006
  - GPU002 EP-GPU002
  - GPU007 EP-GPU007
  - GPU003 EP-GPU003
  - GPU008 EP-GPU008
  - GPU004 EP-GPU004
  - GPU009 EP-GPU009
  - GPU005 EP-GPU005
- CONDENSATE TANKS (2)
  - TANKCOND001
  - TANKCOND002
- PRODUCED WATER TANKS (2)
  - TANKPW001
  - TANKPW002

FUGITIVES  
F001

Attachment D

PROCESS FLOW DIAGRAM - ANTERO RESOURCES  
CLARENCE WELL PAD  
*Doddridge County, West Virginia*



# **Attachment E**

## **Process Description**

## **Attachment E**

### **Process Description**

#### **Clarence Well Pad**

#### **Antero Resources Corporation**

#### **Doddridge County, West Virginia**

A mixture of condensate, water, and entrained gas from the condensate and gas wells enters the facility through a series of gas production units (GPU001-GPU009) which are 3 phase separators where the gas, condensate, and produced water are separated. The GPUs are fueled by a slip stream of the separated gas. The separated 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 (TANKCOND001-002 and TANKPW001-002).

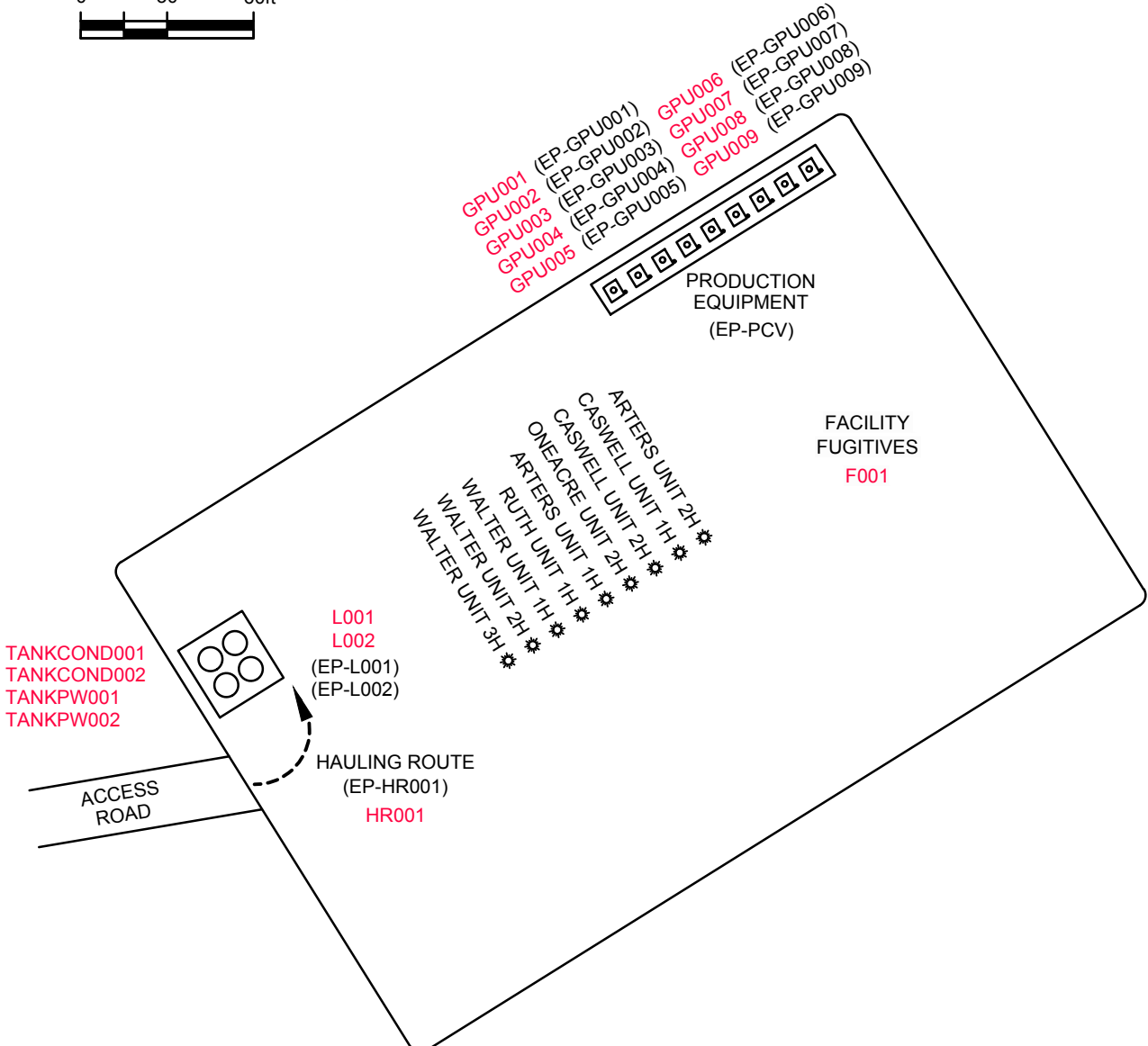
The facility has two (2) tanks (TANKCOND001-002) on site to store condensate and two (2) tanks (TANKPW001-002) to store produced water prior to removal from the site. The flashing, working and breathing losses from the tanks are vented to the atmosphere.

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 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 from Moore 1H, one of the wells in Moore well pad and site specific gas analysis from Ruth 1H. The condensate extended analysis is considered representative of the materials from Clarence Well Pad, being in the same Marcellus rock formation.

# **Attachment F**

## **Plot Plan**



Attachment F

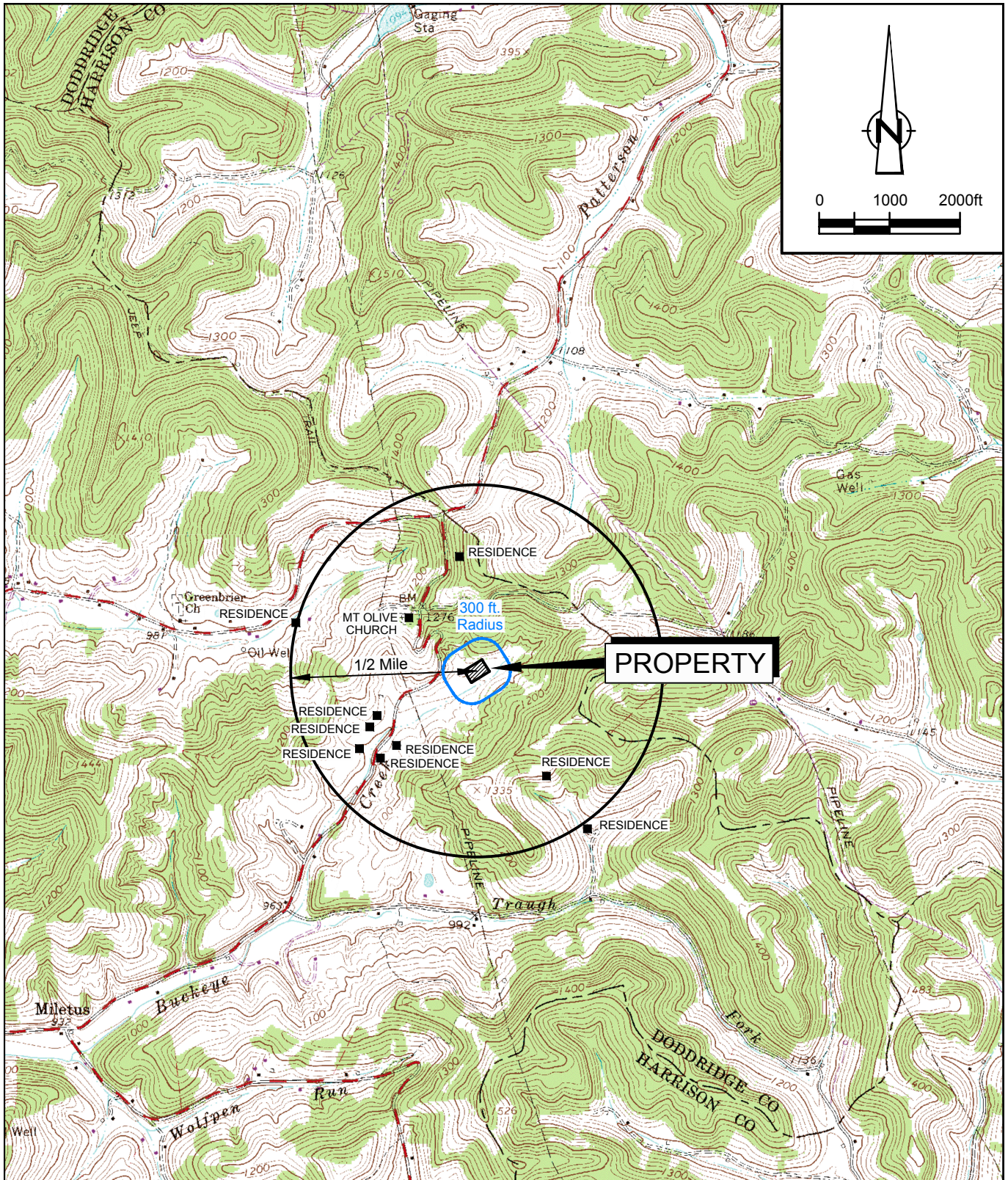
PLOT PLAN  
CLARENCE WELL PAD  
ANTERO RESOURCES

*Doddridge County, West Virginia*



# **Attachment G**

## **Area Map**



SOURCE: USGS QUADRANGLE MAP;  
BIG ISAAC AND SALEM, WEST VIRGINIA

SITE COORDINATES: LAT. 39.244692, LONG. -80.568211  
SITE ELEVATION: 1050 ft AMSL



Attachment G  
AREA MAP  
CLARENCE WELL PAD  
ANTERO RESOURCES  
*Doddridge County, West Virginia*

# **Attachment H**

## **G70-D Section Applicability Form**



**ATTACHMENT H – G70-D SECTION APPLICABILITY FORM**

**General Permit G70-D Registration<sup>1</sup>  
Section Applicability Form**

General Permit G70-D was developed to allow qualified applicants to seek registration for a variety of sources. These sources include gas well affected facilities, storage vessels, gas production units, in-line heaters, heater treaters, glycol dehydration units and associated reboilers, pneumatic controllers, centrifugal compressors, reciprocating compressors, reciprocating internal combustion engines (RICES), tank truck loading, fugitive emissions, completion combustion devices, flares, enclosed combustion devices, and vapor recovery systems. All registered facilities will be subject to Sections 1.0, 2.0, 3.0, and 4.0.

General Permit G70-D allows the registrant to choose which sections of the permit they are seeking registration under. Therefore, please mark which additional sections that you are applying for registration under. If the applicant is seeking registration under multiple sections, please select all that apply. Please keep in mind, that if this registration is approved, the issued registration will state which sections will apply to your affected facility.

<b>GENERAL PERMIT G70-D APPLICABLE SECTIONS</b>	
<input checked="" type="checkbox"/> Section 5.0	Gas Well Affected Facility (NSPS, Subpart OOOO/OOOOa)
<input checked="" type="checkbox"/> Section 6.0	Storage Vessels Containing Condensate and/or Produced Water <sup>1</sup>
<input type="checkbox"/> Section 7.0	Storage Vessel Affected Facility (NSPS, Subpart OOOO/OOOOa)
<input checked="" type="checkbox"/> Section 8.0	Control Devices and Emission Reduction Devices not subject to NSPS Subpart OOOO/OOOOa and/or NESHAP Subpart HH
<input checked="" type="checkbox"/> Section 9.0	Small Heaters and Reboilers not subject to 40CFR60 Subpart Dc
<input type="checkbox"/> Section 10.0	Pneumatic Controllers Affected Facility (NSPS, Subpart OOOO/OOOOa)
<input type="checkbox"/> Section 11.0	Pneumatic Pump Affected Facility (NSPS, Subpart OOOOa)
<input checked="" type="checkbox"/> Section 12.0	Fugitive Emissions GHG and VOC Standards (NSPS, Subpart OOOOa)
<input type="checkbox"/> Section 13.0	Reciprocating Internal Combustion Engines, Generator Engines
<input checked="" type="checkbox"/> Section 14.0	Tanker Truck/Rail Car Loading <sup>2</sup>
<input type="checkbox"/> Section 15.0	Glycol Dehydration Units <sup>3</sup>

- 1 Applicants that are subject to Section 6 may also be subject to Section 7 if the applicant is subject to the NSPS, Subparts OOOO or OOOOa control requirements or the applicable control device requirements of Section 8.*
- 2 Applicants that are subject to Section 14 may also be subject to control device and emission reduction device requirements of Section 8.*
- 3 Applicants that are subject to Section 15 may also be subject to the requirements of Section 9 (reboilers). Applicants that are subject to Section 15 may also be subject to control device and emission reduction device requirements of Section 8.*

# **Attachment I**

## **Emission Units/ ERD Table**

**ATTACHMENT I – EMISSION UNITS / EMISSION REDUCTION DEVICES (ERD) TABLE**

Include ALL emission units and air pollution control devices /ERDs that will be part of this permit application review. This information is required for all sources regardless of whether it is a construction, modification, or administrative update.

Emission Unit ID <sup>1</sup>	Emission Point ID <sup>2</sup>	Emission Unit Description	Year Installed	Manufac. Date <sup>3</sup>	Design Capacity	Type <sup>4</sup> and Date of Change	Control Device(s) <sup>5</sup>	ERD (s) <sup>6</sup>
GPU001, GPU002, GPU003, GPU004, GPU005, GPU006, GPU007, GPU008, GPU009	EP-GPU001, EP-GPU002, EP-GPU003, EP-GPU004, EP-GPU005, EP-GPU006, EP-GPU007, EP-GPU008, EP-GPU009	Gas Production Unit Heater	2014		1 MMBtu/hr	Existing	N/A	
F001	F001	Fugitives	2014		N/A	Existing	N/A	
TANKCOND001-002	EP-TANKCOND001-002	Condensate Tank F/W/B	2014		400 bbl each	Existing	N/A	
TANKPW001-002	EP-TANKPW001-002	PW Tank F/W/B	2014		400 bbl each	Existing	N/A	
L001	EP-L001	Loading (Condensate)	2014		10080 gal/hr 122640 gal/yr	Existing	N/A	
L002	EP-L002	Loading (Produced Water)	2014		10080 gal/hr 3832500 gal/yr	Existing	N/A	
HR001	EP-HR001	Haul Road	2014		Tanker Trucks Condensate: 15 trips per year Tanker Trucks PW: 457 trips per year Pick Up Truck: 730 trips per year	Existing	N/A	
EC001	EP-EC001	Enclosed Combustor	2013		12 MMBtu/hr	Removal - 2018	N/A	
PCV	EP-PCV	Pneumatic CV	2014		6.6 scf/day/PCV	Existing	N/A	

1 For Emission Units (or Sources) use the following numbering system: 1S, 2S, 3S, ... or other appropriate designation.

2 For Emission Points use the following numbering system: 1E, 2E, 3E, ... or other appropriate designation.

3 When required by rule.

4 New, modification, removal, existing.

5 For Control Devices use the following numbering system: 1C, 2C, 3C, ... or other appropriate designation.

6 For ERDs use the following numbering system: 1D, 2D, 3D, ... or other appropriate designation.

# **Attachment J**

## **Fugitive Emissions Summary Sheet**

**ATTACHMENT J – FUGITIVE EMISSIONS SUMMARY SHEET**

Sources of fugitive emissions may include loading operations, equipment leaks, blowdown emissions , etc.  
Use extra pages for each associated source or equipment if necessary.

Source/Equipment:

Leak Detection Method Used		<input type="checkbox"/> Audible, visual, and olfactory (AVO) inspections	<input checked="" type="checkbox"/> Infrared (FLIR) cameras	<input type="checkbox"/> Other (please describe)	<input type="checkbox"/> None required			
Component Type	Closed Vent System	Count	Source of Leak Factors (EPA, other (specify))	Stream type (gas, liquid, etc.)	Estimated Emissions (tpy)			
					VOC	HAP	GHG (methane)	GHG (CO <sub>2</sub> e)
Valves	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	450	EPA	gas	1.610	0.102	14.432	360.789
Valves	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	468	EPA	liquid	11.007	0.628	0.090	2.254
Connections (Not sampling)	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	531	EPA	gas	0.084	0.005	0.757	18.921
Flanges	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	117	EPA	gas	0.036	0.002	0.325	8.130

1) Other equipment types may include compressor seals, relief valves, diaphragms, drains, meters, etc.

Please provide an explanation of the sources of fugitive emissions (e. g. pigging operations, equipment blowdowns, pneumatic controllers, etc.)

Please indicate if there are any closed vent bypasses (include component)

Specify all equipment used in the closed vent system (e. g. VRU, ERD, thief hatches, tanker truck loading, etc.)

# **Attachment K**

## **Gas Well Affected Facility Data Sheet**

**ATTACHMENT K – GAS WELL AFFECTED FACILITY DATA SHEET**

Complete this data sheet if you are the owner or operator of a gas well affected facility for which construction, modification or reconstruction commenced after August 23, 2011. This form must be completed for natural gas well affected facilities regardless of when flowback operations occur (or have occurred).

<b>API Number</b>	<b>Date of Flowback</b>	<b>Date of Well Completion</b>	<b>Green Completion and/or Combustion Device</b>	<b>Subject to OOOO or OOOOa?</b>
47017063770000	8/25/2014	8/25/2014	Green Completion	OOOO
47017061590000	12/25/2014	12/25/2014	Green Completion	OOOO
47017063690000	12/8/2014	12/8/2014	Green Completion	OOOO
47017063760000	2/1/2015	2/1/2015	Green Completion	OOOO
47017064500000	1/14/2015	1/14/2015	Green Completion	OOOO
47017061640000	8/27/2013	8/27/2013	Green Completion	OOOO
47017061580000	9/16/2013	9/16/2013	Green Completion	OOOO
47017061620000	9/8/2013	9/8/2013	Green Completion	OOOO
47017061430000	9/1/2013	9/1/2013	Green Completion	OOOO

*Note: If future wells are planned and no API number is available please list as PLANNED.*

*If there are existing wells that commenced construction prior to August 23, 2011, please acknowledge as existing.*

*This is the same API (American Petroleum Institute) well number(s) provided in the well completion notification and as provided to the WVDEP, Office of Oil and Gas for the well permit. The API number application without the state code (047).*

*Every oil and gas well permitted in West Virginia since 1929 has been issued an API number. This API is used by agencies to identify and track oil and gas wells.*

*The API number has the following format: 047-001-00001*

*Where,*

*047 = State code. The state code for WV is 047.*

*001 = County Code. County codes are odd numbers, beginning with 001 (Barbour) and continuing to 109 (Wyoming).*

*00001 = Well number. Each well will have a unique well number.*

# **Attachment L**

## **Storage Vessel Data Sheets**



**ATTACHMENT L – STORAGE VESSEL DATA SHEET**

Complete this data sheet if you are the owner or operator of a storage vessel that contains condensate and/or produced water. This form must be completed for each new or modified bulk liquid storage vessel(s) that contains condensate and/or produced water. (If you have more than one (1) identical tank (i.e. 4-400 bbl condensate tanks), then you can list all on one (1) data sheet). **Include gas sample analysis, flashing emissions, working and breathing losses, USEPA Tanks, simulation software (ProMax, E&P Tanks, HYSYS, etc.), and any other supporting documents where applicable.**

**The following information is REQUIRED:**

- Composition of the representative sample used for the simulation
- For each stream that contributes to flashing emissions:
  - Temperature and pressure (inlet and outlet from separator(s))
  - Simulation-predicted composition
  - Molecular weight
  - Flow rate
- Resulting flash emission factor or flashing emissions from simulation
- Working/breathing loss emissions from tanks and/or loading emissions if simulation is used to quantify those emissions

Additional information may be requested if necessary.

**GENERAL INFORMATION (REQUIRED)**

1. Bulk Storage Area Name	Tanks	2. Tank Name:	Condensate Tank 001-002
3. Emission Unit ID number:	TANKCOND001-002	4. Emission Point ID number.	
5. Date Installed, Modified or Relocated (for existing tanks) 2014		6. Type of change:	
Was the tank manufactured after August 23, 2011 and on or before September 18, 2015? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		<input checked="" type="checkbox"/> New construction <input type="checkbox"/> New stored material <input type="checkbox"/> Other	
Was the tank manufactured after September 18, 2015? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		<input type="checkbox"/> Relocation	
7A. Description of Tank Modification (if applicable)			
7B. Will more than one material be stored in this tank? If so, a separate form must be completed for each material. <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
7C. Was USEPA Tanks simulation software utilized? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			

*If Yes, please provide the appropriate documentation and items 8-42 below are not required.*

**TANK INFORMATION**

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. 400bbbls			
9A. Tank Internal Diameter (ft): 12	9B. Tank Internal Height (or Length) (ft):		20
10A. Maximum Liquid Height (ft): 18	10B. Average Liquid Height (ft):		10
11A. Maximum Vapor Space Height (ft): 18	11B. Average Vapor Space Height (ft):		10
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights.: 400bbbls			
13A. Maximum annual throughput (gal/yr):	122,640	13B. Maximum daily throughput (gal/day):	336
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume):	4	15. Maximum tank fill rate (gal/min)	168
16. Tank fill method <input type="checkbox"/> Submerged <input checked="" type="checkbox"/> Splash <input type="checkbox"/> Bottom Loading			
17. Is the tank system a variable vapor space system? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
If yes, (A) What is the volume expansion capacity of the system (gal)? (B) What are the number of transfers into the system per year?			
18. Type of tank (check all that apply):			
<input checked="" type="checkbox"/> Fixed Roof <input checked="" type="checkbox"/> vertical <input type="checkbox"/> horizontal <input checked="" type="checkbox"/> flat roof <input type="checkbox"/> cone roof <input type="checkbox"/> dome roof <input type="checkbox"/> other (describe)			
<input type="checkbox"/> External Floating Roof <input type="checkbox"/> pontoon roof <input type="checkbox"/> double deck roof			
<input type="checkbox"/> Domed External (or Covered) Floating Roof			
<input type="checkbox"/> Internal Floating Roof <input type="checkbox"/> vertical column support <input type="checkbox"/> self-supporting			
<input type="checkbox"/> Variable Vapor Space <input type="checkbox"/> lifter roof <input type="checkbox"/> diaphragm			
<input type="checkbox"/> Pressurized <input type="checkbox"/> spherical <input type="checkbox"/> cylindrical			
<input type="checkbox"/> other			

**ATTACHMENT L – STORAGE VESSEL DATA SHEET**

**PRESSURE/VACUUM CONTROL DATA**

19. Check as many as apply:

- Does Not Apply
- Inert Gas Blanket of
- Vent to Vapor Combustion Device (vapor combustors, flares, thermal oxidizers, enclosed combustors)
- Conservation Vent (psig)
 

Vacuum Setting	Pressure Setting
----------------	------------------
- Emergency relief Valve (psig)
 

Vacuum Setting	Pressure Setting
----------------	------------------
- Thief Hatch Weighted  Yes  No

Complete appropriate Air Pollution Control Device Sheet

20. Expected Emission Rate (submit Test Data or Calculations here or elsewhere in the application).

Material Name	Flashing Loss		Breathing Loss		Working Loss		Total Emission Loss		Estimation Method
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	
<i>Please see Table 6 and Table 7</i>									

**TANK CONSTRUCTION & OPERATION INFORMATION**

21. Tank Shell Construction:

- Riveted  Gunite lined  Epoxy-coated  Other (describe): Steel

21A. Shell Color: Green	21B. Roof Color: Green	21C. Year Last Painted 2014
-------------------------	------------------------	-----------------------------

22. Shell Condition (if metal and unlined):

- No Rust  Light Rust  Dense Rust  Not applicable

22A. Is the tank heated? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	22B. If yes, operating temperature:	22C. If yes, how is heat provided to tank?
---	-------------------------------------	--

23. Operating Pressure Range (psig): 0 psig, atmospheric

**Must be listed for tanks using VRUs with closed vent system**

24. Is the tank a Vertical Fixed Roof Tank? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	24A. If yes, for dome roof provide radius (ft): NA	24B. If yes, for cone roof, provide slop (ft/ft): NA
--	--	--

25. Complete the following section for **Floating Roof Tanks** Does Not Apply

25A. Year Internal Floaters Installed:

25B. Primary Seal Type:	<input type="checkbox"/> Metallic (mechanical) shoe seal <input type="checkbox"/> Liquid mounted resilient seal <input type="checkbox"/> Vapor mounted resilient seal <input type="checkbox"/> Other (describe):	
-------------------------	---	--

25C. Is the Floating Roof equipped with a Secondary Seal?  Yes  No

25D. If YES, how is the secondary seal mounted? (check one)  
 Shoe  Rim  Other (describe)

25E. Is the Floating Roof equipped with a weather shield?  Yes  No

25F. Describe deck fittings

26. Complete the following section for Internal Floating Roof Tanks  Does not apply

26A. Deck Type: <input type="checkbox"/> Bolted <input type="checkbox"/> Welded	26B. For bolted decks, provide deck construction
---	--

26C. Deck seam:  
 5 ft. wide  6 ft. wide  7 ft. wide  5 x 7.5 ft wide  5 x 12 ft wide  Other (describe)

26D. Deck seam length (ft)	26E. Area of deck (ft <sup>2</sup> )	26F. For column supported tanks: Number of columns:	26G. For column supported tanks, Diameter of each column:
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27. Closed Vent System with VRU  Yes  No

28. Closed Vent System with Enclosed Combustor?  Yes  No

**ATTACHMENT L – STORAGE VESSEL DATA SHEET**

**SITE INFORMATION**

29. Provide the city and state on which the data in this section are based.: West Union, WV			
30. Daily Average Ambient Temperature (°F):	72.10	31. Annual Average Maximum Temperature (°F):	75.94
32. Annual Average Minimum Temperature (°F):	46.56	33. Average Wind Speed (miles/hr):	18.5 mph
34. Annual Average Solar Insulation Factor (BTU/(ft <sup>2</sup> -day))	1030.235999	35. Atmospheric Pressure (psia): 14.8 (based off local conditions, could not find annual)	

**LIQUID INFORMATION**

36. Average daily temperature range of bulk liquid (F):	72.10	36A. Minimum (°F):	46.56	36B. Maximum (°F)	75.94
37. Average operating pressure range of tank (psig):	atmosphere	37A. Minimum (psig)	0	37B. Maximum (psig)	atmosphere
38A. Minimum Liquid Surface Temperature (°F)	46.56	38B. Corresponding Vapor Pressure (psia)	0.4462		
39A. Average Liquid Surface Temperature (°F)	72.10	39B. Corresponding Vapor Pressure (psia)	0.8389		
40A. Maximum Liquid Surface Temperature (°F)	75.94	40B. Corresponding Vapor Pressure (psia)	0.9177		

41. Provide the following for each liquid or gas to be stored in tank. Add additional pages if necessary.

41A. Material Name or Composition	Condensate		
41B. CAS Number	mix of HC		
41C. Liquid Density (lb/gal)	5.9800		
41D. Liquid Molecular Weight (lb/lb-mole)	111.40		
41E. Vapor Molecular Weight (lb/lb-mole)	35.5899		
Maximum Vapor Pressure	0.9177		
41F. True (psia)			
41G. Reid (psia)	1.65		
Months Storage per Year	year round		
41H. From - To			
Final maximum gauge pressure and temperature prior to transfer into tank used as inputs into flashing emission calculations	192 psig; 70 F		
42.			

**ATTACHMENT L – STORAGE VESSEL DATA SHEET**

Complete this data sheet if you are the owner or operator of a storage vessel that contains condensate and/or produced water. This form must be completed for each new or modified bulk liquid storage vessel(s) that contains condensate and/or produced water. (If you have more than one (1) identical tank (i.e. 4-400 bbl condensate tanks), then you can list all on one (1) data sheet). **Include gas sample analysis, flashing emissions, working and breathing losses, USEPA Tanks, simulation software (ProMax, E&P Tanks, HYSYS, etc.), and any other supporting documents where applicable.**

**The following information is REQUIRED:**

- Composition of the representative sample used for the simulation
- For each stream that contributes to flashing emissions:
  - Temperature and pressure (inlet and outlet from separator(s))
  - Simulation-predicted composition
  - Molecular weight
  - Flow rate
- Resulting flash emission factor or flashing emissions from simulation
- Working/breathing loss emissions from tanks and/or loading emissions if simulation is used to quantify those emissions

Additional information may be requested if necessary.

**GENERAL INFORMATION (REQUIRED)**

1. Bulk Storage Area Name	Tanks	2. Tank Name:	Produced Water Tank 001-002
3. Emission Unit ID number:	TANKPW001-002	4. Emission Point ID number.	
5. Date Installed , Modified or Relocated (for existing tanks)		6. Type of change:	
2014		<input checked="" type="checkbox"/> New construction <input type="checkbox"/> New stored material <input type="checkbox"/> Other	
Was the tank manufactured after August 23, 2011 and on or before September 18, 2015? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Relocation	
Was the tank manufactured after September 18, 2015? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
7A. Description of Tank Modification (if applicable)			
7B. Will more than one material be stored in this tank? If so, a separate form must be completed for each material. <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
7C. Was USEPA Tanks simulation software utilized? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			

*If Yes, please provide the appropriate documentation and items 8-42 below are not required.*

**TANK INFORMATION**

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. 400bbbls			
9A. Tank Internal Diameter (ft): 12	9B. Tank Internal Height (or Length) (ft):		20
10A. Maximum Liquid Height (ft): 18	10B. Average Liquid Height (ft):		10
11A. Maximum Vapor Space Height (ft): 18	11B. Average Vapor Space Height (ft):		10
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights.: 400bbbls			
13A. Maximum annual throughput (gal/yr):	3,832,500	13B. Maximum daily throughput (gal/day):	10,500
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume):	115	15. Maximum tank fill rate (gal/min)	168
16. Tank fill method <input type="checkbox"/> Submerged <input checked="" type="checkbox"/> Splash <input type="checkbox"/> Bottom Loading			
17. Is the tank system a variable vapor space system? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
If yes, (A) What is the volume expansion capacity of the system (gal)? (B) What are the number of transfers into the system per year?			
18. Type of tank (check all that apply):			
<input checked="" type="checkbox"/> Fixed Roof <input checked="" type="checkbox"/> vertical <input type="checkbox"/> horizontal <input checked="" type="checkbox"/> flat roof <input type="checkbox"/> cone roof <input type="checkbox"/> dome roof <input type="checkbox"/> other (describe)			
<input type="checkbox"/> External Floating Roof <input type="checkbox"/> pontoon roof <input checked="" type="checkbox"/> double deck roof			
<input type="checkbox"/> Domed External (or Covered) Floating Roof			
<input type="checkbox"/> Internal Floating Roof <input type="checkbox"/> vertical column support <input type="checkbox"/> self-supporting			
<input type="checkbox"/> Variable Vapor Space <input type="checkbox"/> lifter roof <input type="checkbox"/> diaphragm			
<input type="checkbox"/> Pressurized <input type="checkbox"/> spherical <input type="checkbox"/> cylindrical			



**ATTACHMENT L – STORAGE VESSEL DATA SHEET**

**SITE INFORMATION**

29. Provide the city and state on which the data in this section are based.: West Union, WV			
30. Daily Average Ambient Temperature (°F):	72.10	31. Annual Average Maximum Temperature (°F):	75.94
32. Annual Average Minimum Temperature (°F):	46.56	33. Average Wind Speed (miles/hr): 5.9 mph	
34. Annual Average Solar Insulation Factor (BTU/(ft <sup>2</sup> -day))	1030.236	35. Atmospheric Pressure (psia): 14.8 (based off local conditions, could not find annual)	

**LIQUID INFORMATION**

36. Average daily temperature range of bulk liquid (F):	72.10	36A. Minimum (°F):	46.56	36B. Maximum (°F)	75.94
37. Average operating pressure range of tank (psig):	atmosphere	37A. Minimum (psig)	0	37B. Maximum (psig)	atmosphere
38A. Minimum Liquid Surface Temperature (°F)	46.56	38B. Corresponding Vapor Pressure (psia)	0.2275		
39A. Average Liquid Surface Temperature (°F)	72.10	39B. Corresponding Vapor Pressure (psia)	0.4515		
40A. Maximum Liquid Surface Temperature (°F)	75.94	40B. Corresponding Vapor Pressure (psia)	0.4978		

41. Provide the following for each liquid or gas to be stored in tank. Add additional pages if necessary.

41A. Material Name or Composition	Produced Water		
41B. CAS Number	mix of HC and water		
41C. Liquid Density (lb/gal)	8.3300		
41D. Liquid Molecular Weight (lb/lb-mole)	18.27		
41E. Vapor Molecular Weight (lb/lb-mole)	18.2702		
Maximum Vapor Pressure	0.4978		
41F. True (psia)			
41G. Reid (psia)	1.0316		
Months Storage per Year	year round		
41H. From - To			
Final maximum gauge pressure and temperature prior to transfer into tank used as inputs into flashing emission calculations	192 psig; 70 F		
42.			

**Attachment M**  
**Natural Gas Fired Fuel Burning Unit(s)**  
**Data Sheet**

**ATTACHMENT M – SMALL HEATERS AND REBOILERS NOT SUBJECT TO  
40CFR60 SUBPART DC  
DATA SHEET**

Complete this data sheet for each small heater and reboiler not subject to 40CFR60 Subpart Dc at the facility. *The Maximum Design Heat Input (MDHI) must be less than 10 MMBTU/hr.*

Emission Unit ID#	Emission Point ID#	Emission Unit Description (Manufacturer, model#)	Year Installed/Modified	Type and Date of Change	Maximum Design Heat Input (MMBTU/hr)	Fuel Heating Value (BTU/scf)
GPU001	EP-GPU001	Gas Production Unit Heater	2014	Existing	1.0	1131.38
GPU002	EP-GPU002	Gas Production Unit Heater	2014	Existing	1.0	1131.38
GPU003	EP-GPU003	Gas Production Unit Heater	2014	Existing	1.0	1131.38
GPU004	EP-GPU004	Gas Production Unit Heater	2014	Existing	1.0	1131.38
GPU005	EP-GPU005	Gas Production Unit Heater	2014	Existing	1.0	1131.38
GPU006	EP-GPU006	Gas Production Unit Heater	2014	Existing	1.0	1131.38
GPU007	EP-GPU007	Gas Production Unit Heater	2014	Existing	1.0	1131.38
GPU008	EP-GPU008	Gas Production Unit Heater	2014	Existing	1.0	1131.38
GPU009	EP-GPU009	Gas Production Unit Heater	2014	Existing	1.0	1131.38

1. Enter the appropriate Emission Unit (or Source) identification number for each fuel burning unit located at the production pad. Gas Producing Unit Burners should be designated GPU-1, GPU-2, etc. Heater Treaters should be designated HT-1, HT-2, etc. Heaters or Line Heaters should be designated LH-1, LH-2, etc. For sources, use 1S, 2S, 3S...or other appropriate designation. Enter glycol dehydration unit Reboiler Vent data on the Glycol Dehydration Unit Data Sheet.
2. Enter the appropriate Emission Point identification numbers for each fuel burning unit located at the production pad. Gas Producing Unit Burners should be designated GPU-1, GPU-2, etc. Heater Treaters should be designated HT-1, HT-2, etc. Heaters or Line Heaters should be designated LH-1, LH-2, etc. For emission points, use 1E, 2E, 3E...or other appropriate designation.
3. New, modification, removal.
4. Enter design heat input capacity in MMBtu/hr.
5. Enter the fuel heating value in BTU/standard cubic foot.



# **Attachment O**

## **Tanker Truck Loading Data Sheet**

## ATTACHMENT O – TANKER TRUCK LOADING DATA SHEET

Complete this data sheet for each new or modified bulk liquid transfer area or loading rack at the facility. This is to be used for bulk liquid transfer operations to tanker trucks. Use extra pages if necessary.

### Truck Loadout Collection Efficiencies

The following applicable capture efficiencies of a truck loadout are allowed:

- For tanker trucks passing the MACT level annual leak test – 99.2%
- For tanker trucks passing the NSPS level annual leak test – 98.7%
- For tanker trucks not passing one of the annual leak tests listed above – 70%

Compliance with this requirement shall be demonstrated by keeping records of the applicable MACT or NSPS Annual Leak Test certification for *every* truck and railcar loaded/unloaded. This requirement can be satisfied if the trucking company provided certification that its entire fleet was compliant. This certification must be submitted in writing to the Director of the DAQ. These additional requirements must be noted in the Registration Application.

Emission Unit ID#: L001, L002	Emission Point ID#: EP-L001, EP-L002	Year Installed/ Modified: 2014
-------------------------------	--------------------------------------	-----------------------------------

Emission Unit Description: **Condensate Loading, Produced Water Loading**

#### Loading Area Data

Number of Pumps: **2**      Number of Liquids Loaded: **2**      Max number of trucks loading at one time: **2**

Are Tanker trucks pressure tested for leaks at this any other location?       Yes       No       Not Required

If Yes, Please Describe: Tank trucks are pressure tested for leaks at the location of the leak testing company. Trucks are tested using EPA Method 27-internal vapor valve test and issued certification that DOT requirements are met.

Provide description of closed vent system and any bypasses

Are any of the following truck loadout systems utilized?      **No**

- Closed System to Tanker Truck passing a MACT level annual leak test?
- Closed System to Tanker Truck passing a NSPS level annual leak test?
- Closed System to Tanker Truck not passing an annual leak test and has vapor return?

#### Projected Maximum Operating Schedule (for rack or transfer point as a whole)

Time	Jan - Mar	Apr - Jun	Jul - Sept	Oct - Dec
Hours/day	4	4	4	4
Days/week	1	1	1	1

#### Bulk Liquid Data (use extra pages as necessary)

Liquid Name	Condensate	Produced Water	
Max. Daily Throughput (1000 gal/day)	0.34	10.50	
Max. Annual Throughput (1000 gal/yr)	123	3,833	
Loading Method	BF	BF	
Max. Fill Rate (gal/min)	168	168	
Average Fill Time (min/loading)	50	50	
Max. Bulk Liquid Temperature (F)	72.1	72.1	
True Vapor Pressure	0.8	0.5	
Cargo Vessel Condition	U	U	
Control Equipment or Method	None	None	
Max. Collection Efficiency (%)	0	0	
Max. Control Efficiency (%)	0	0	
Max VOC Emission Rate	Loading (lb/hr)	2.5932	0.0005
	Annual (ton/yr)	0.0158	0.0001
Max HAP Emission Rate	Loading (lb/hr)	0.2127	1.52E-06
	Annual (ton/yr)	0.0013	2.89E-07
Estimation Method	Promax	Promax	

- 1 BF Bottom Fill      SP Splash Fill      SUB Submerged Fill
- 2 At maximum bulk liquid temperature
- 3 B Ballasted Vessel      C Cleaned      U Uncleaned (dedicated servi      O Other (describe)
- 4 List as many as apply (complete and submit appropriate Air Pollution Control Device Sheets)
- CA Carbon Adsorption      VB Dedicated Vapor Balance (closed system)
- ECD Enclosed Combustion Device      F Flare
- TO Thermal Oxidization or Incineration
- 5 EPA EPA Emission Factor in AP-42      MB Material Balance
- TM Test Measurement based upon test data submittal      O Other (describe)

# **Attachment Q**

## **Pneumatic Controllers Data Sheet**

**ATTACHMENT Q – PNEUMATIC CONTROLLERS  
DATA SHEET**

**Are there any continuous bleed natural gas driven pneumatic controllers at this facility that commenced construction, modification or reconstruction after August 23, 2011, and on or before September 18, 2015?**

Yes     No

Please list approximate number.

**Are there any continuous bleed natural gas driven pneumatic controllers at this facility that commenced construction, modification or reconstruction after September 18, 2015?**

Yes     No

Please list approximate number.

**Are there any continuous bleed natural gas driven pneumatic controllers at this facility with a bleed rate greater than 6 standard cubic feet per hour that are required based on functional needs, including but not limited to response time, safety and positive actuation that commenced construction, modification or reconstruction after August 23, 2011, and on or before September 18, 2015?**

Yes     No

Please list approximate number.

**Are there any continuous bleed natural gas driven pneumatic controllers at this facility with a bleed rate greater than 6 standard cubic feet per hour that are required based on functional needs, including but not limited to response time, safety and positive actuation that commenced construction, modification or reconstruction after September 18, 2015?**

Yes     No

Please list approximate number.

# **Attachment R**

## **Pneumatic Pump Data Sheet**



# **Attachment T**

## **Emissions Calculations**

**Table 1**

**Facility Information  
Clarence Well Pad  
Doddridge County, West Virginia  
Antero Resources Corporation**

**Oil and Gas Site General Information**

<b>Administrative Information</b>	
Company Name	Antero Resources Corporation
Facility/Well Name	Clarence Well Pad
Nearest City/Town	Salem
API Number/SIC Code	1311
Latitude/Longitude	39.244692, -80.568211
County	Doddridge County

<b>Technical Information</b>	
Max Condensate Site Throughput (bbl/day):	8
Max Produced Water Site Throughput (bbl/day):	250
Are there any sour gas streams at this site?	No
Is this site currently operational/producing?	Yes

<b>Equipment/Processes at Site</b>	
<b>Equipment/Process Types</b>	<b>How many for this site?</b>
Fugitives	9
Gas Production Unit Heaters	9
Condensate Tanks	2
Produced Water Tanks	2
Loading Jobs	2



Table 2

Uncontrolled/Controlled Emissions Summary  
 Clarence Well Pad  
 Doddridge County, West Virginia  
 Antero Resources Corporation

Emission Source	VOC		NO <sub>x</sub>		CH <sub>4</sub>		CO <sub>2e</sub>		CO		SO <sub>2</sub>		PM <sub>2.5</sub>		PM <sub>10</sub>		Lead		Total HAPs		Benzene		Xylenes		Formaldehyde			
	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)
<b>UNCONTROLLED (Fugitives, Storage Tanks, Gas Production Unit Heaters)</b>																												
Fugitive Emissions (Component Count, PCV and Hauling) <sup>1</sup>	2.9381	12.8691			3.8308	16.7790	95.771	419.48							1.8162	0.2216			0.1704	0.7464	0.0012	0.0051	0.0631	0.2762				
Flashing, Working and Breathing (F/NW/B) Losses <sup>2</sup>	1.3963	6.1160			1.4793	6.4793	37.0102	162.1048											0.1235	0.5408	0.0001	0.0002	0.0021	0.0091				
Gas Production Unit Heater Emissions <sup>3</sup>	0.0438	0.1916	0.7955	3.4842	0.0183	0.0801	954.59	4,181.09	0.6682	2.9268	0.0048	0.0209	0.0605	0.2648	0.0605	0.2648	3.98E-06	1.74E-05	0.015	0.066	1.67E-05	7.32E-05			0.0006	0.0026		
<b>TOTALS:</b>	<b>4.3782</b>	<b>19.1767</b>	<b>0.7955</b>	<b>3.4842</b>	<b>5.3284</b>	<b>23.3384</b>	<b>1087.3680</b>	<b>4762.6720</b>	<b>0.6682</b>	<b>2.9268</b>	<b>0.0048</b>	<b>0.0209</b>	<b>0.0605</b>	<b>0.2648</b>	<b>1.8766</b>	<b>0.4864</b>	<b>3.98E-06</b>	<b>1.74E-05</b>	<b>0.3089</b>	<b>1.3528</b>	<b>0.0012</b>	<b>0.0054</b>	<b>0.0651</b>	<b>0.2853</b>	<b>0.0006</b>	<b>0.0026</b>		
<b>UNCONTROLLED (Truck Loading Emissions)</b>																												
Truck Loading Emissions <sup>4</sup>	2.5938	0.0159			0.2175	0.0088	5.4676	0.2235											0.2127	0.0013	0.0000	2.92E-07	0.0020	0.0000				
<b>CONTROLLED EMISSIONS</b>																												
Controlled Fugitive Emissions from Hauling															0.9081	0.1108												
<b>TOTALS:</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.00E+00</b>	<b>0.00E+00</b>	<b>0.000</b>	<b>0.000</b>	<b>0.908</b>	<b>0.111</b>	<b>0.00E+00</b>	<b>0.00E+00</b>	<b>0.000</b>	<b>0.000</b>	<b>0.00E+00</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.000</b>	<b>0.00E+00</b>	<b>0.00E+00</b>		
<b>POTENTIAL TO EMIT<sup>5</sup></b>	<b>6.9720</b>	<b>19.1926</b>	<b>0.7955</b>	<b>3.4842</b>	<b>5.5460</b>	<b>23.3472</b>	<b>1092.8357</b>	<b>4762.8955</b>	<b>0.6682</b>	<b>2.9268</b>	<b>0.0048</b>	<b>0.0209</b>	<b>0.0605</b>	<b>0.2648</b>	<b>0.9685</b>	<b>0.3756</b>	<b>3.98E-06</b>	<b>1.74E-05</b>	<b>0.5216</b>	<b>1.3541</b>	<b>0.0013</b>	<b>0.0054</b>	<b>0.0671</b>	<b>0.2854</b>	<b>0.0006</b>	<b>0.0026</b>		
<b>POTENTIAL TO EMIT(Excluding Fugitives)</b>	<b>4.0339</b>	<b>6.3235</b>	<b>0.7955</b>	<b>3.4842</b>	<b>1.7151</b>	<b>6.5682</b>	<b>997.0643</b>	<b>4343.4170</b>	<b>0.6682</b>	<b>2.9268</b>	<b>0.0048</b>	<b>0.0209</b>	<b>0.0605</b>	<b>0.2648</b>	<b>0.0605</b>	<b>0.2648</b>	<b>3.98E-06</b>	<b>1.74E-05</b>	<b>0.3512</b>	<b>0.6077</b>	<b>0.0001</b>	<b>0.0003</b>	<b>0.0041</b>	<b>0.0091</b>	<b>0.0006</b>	<b>0.0026</b>		

**Enter any notes here:**

1 - See Tables 4 and 5 for fugitive emission calculations; Table 10 for PM emissions from hauling.  
 2 - See Tables 6 and 7 for tanks emission calculations  
 3 - See Table 9 for gas production unit heater emissions calculations.  
 4 - The maximum emission was calculated based on actual filling rate of 4 barrels per minute. At a production rate of 8 barrels per day, VOC emissions would be 2.5938 pounds per hour when there are truck loading activities. Average hourly VOC emissions from truck loading is 0.0036 pound per hour.  
 5 - The maximum hourly potential to emit is the sum of emissions from gas production unit heaters, storage tanks, loading, and fugitives.  
 PM 10 TPY is the sum of hauling and other PM10 sources.

**Table 3**

**Permits Summary  
Clarence Well Pad  
Doddridge County, West Virginia  
Antero Resources Corporation**

Pollutant		Emissions		Threshold Exceeded?		
		Uncontrolled	Controlled	Threshold	Uncontrolled	Controlled
VOC	lbs/hr	6.9720		6	<b>Yes</b>	
	tons/yr	19.1926		10	<b>Yes</b>	
NO <sub>x</sub>	lbs/hr	0.7955		6		
	tons/yr	3.4842		10		
CH <sub>4</sub>	lbs/hr	5.5460				
	tons/yr	23.3472				
CO	lbs/hr	0.6682		6		
	tons/yr	2.9268		10		
SO <sub>2</sub>	lbs/hr	0.0048		6		
	tons/yr	0.0209		10		
PM <sub>2.5</sub>	lbs/hr	0.0605		6		
	tons/yr	0.2648		10		
PM <sub>10</sub>	lbs/hr	1.8766	0.9685	6		
	tons/yr	0.4864	0.3756	10		
Lead	lbs/hr	3.98E-06		6		
	tons/yr	1.74E-05		10		
Total HAPs	lbs/hr	0.5216		2		
	tons/yr	1.3541		5		
Total TAPs	lbs/hr	0.0019		1.14		
n-Hexane	lbs/hr	0.4131				
	tons/yr	0.8932				
Toluene	lbs/hr	0.0129				
	tons/yr	0.0546				
Ethylbenzene	lbs/hr	0.0266				
	tons/yr	0.1129				
Xylenes	lbs/hr	0.0671				
	tons/yr	0.2854				
Benzene	lbs/hr	0.0013				
	tons/yr	0.0054				

<b>Enter any notes here:</b>	Please see Attachment J - Fugitive Emissions Data Summary Sheet and Attachment T - Emission Points Summary Sheet for sitewide sources and breakdown of emission quantities.
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Table 4

Fugitive Emissions  
 Clarence Well Pad  
 Doddridge County, West Virginia  
 Antero Resources Corporation

VOC Type:	Condensate VOC
Emission Type:	Steady State (continuous)

Gas Weight Fraction From Analysis:	VOC frac	0.083
	Benzene frac	0.000
	Toluene	0.000
	Ethylbenzene	0.000
	Xylenes	0.000
	n-Hexane	0.005
	HAPs	0.005
	Methane	0.740

Gas					
Number	Component	Pollutant	Emission Factor (kg/hr of THC per component)	kg/hr	lb/yr
450	Valves	Gas VOC	0.004500	0.17	3,219.76
		Non VOC	0.004500	1.86	35,806.04
		HAPs	0.004500	0.01	204.58
		CO2e	0.004500	37.44	721,577.70
531	Connectors	VOC	0.000200	0.01	168.86
		Non-VOC	0.000200	0.10	1,877.83
		HAPs	0.000200	0.00	10.73
		CO2e	0.000200	1.96	37,842.74
117	Flanges	VOC	0.000390	0.00	72.55
		Non-VOC	0.000390	0.04	806.83
		HAPs	0.000390	0.00	4.61
		CO2e	0.000390	0.843688	16259.550745
<b>Total VOCs:</b>				0.18	3461.17
<b>Total THC:</b>				2.18	41951.87
<b>Total CH4:</b>				1.61	31027.20

Light Liquid Weight Fraction From Analysis:	VOC frac	0.976
	Benzene frac	0.000
	Toluene	0.005
	Ethylbenzene	0.010
	Xylenes	0.025
	n-hexane	0.016
	HAPs	0.056
	Methane	0.008

Light Liquid					
Number	Component	Pollutant	Emission Factor (kg/hr of THC per component)	kg/hr	lb/yr
468	Valves	Light Liquid VOC	0.002500	1.14	22,014.81
		Light Liquid Non-VOC	0.002500	0.03	533.43
		Light Liquid HAPs	0.002500	0.07	1,256.28
		CO2e	0.002500	0.23	4508.48
<b>Total VOC:</b>				1.14	22,014.81
<b>Total THC:</b>				1.17	22,548.24
<b>Total CH4:</b>				0.01	180.34

Fugitive Total Emissions			
	Annual Emissions (lb/yr)	Annual Emissions (lb/hr)	Annual Emissions (tpy)
VOC	25,475.98	2.91	12.74
Ethylbenzene		0.02	0.11
Toluene		0.01	0.05
Xylenes		0.06	0.28
n-Hexane		0.07	0.30
TAPs (Benzene)		0.00	0.01
HAPs		0.17	0.74
CH <sub>4</sub> <sup>3</sup>		3.56	15.60
CO <sub>2e</sub>	780,188.47	89.06	390.09

**Enter Notes Here:** Fugitive emissions based on an estimated component count  
 Global Warming Potentials from EPA site  
 Reference to Emission factors used:  
 1. Emission factors are for oil and gas production facilities (not refineries) come from the EPA's "Protocol for Equipment Leak Emission Estimates" November 1995, EPA 4531, R-95-017, Table 2-4.  
 2. Percent of speciated VOCs used in fugitive calculations are based on the total hydrocarbons, not of the total sample.  
 3. CH<sub>4</sub> emissions are based on percent of CH<sub>4</sub> of the total hydrocarbons

Table 5

**Pneumatic Control Valve Emissions  
Clarence Well Pad  
Doddridge County, West Virginia  
Antero Resources Corporation**

Number of PCVs	27
Bleed Rate (scf/day/PCV)	6.6
Total Bleed Rate (scf/day)	178.2

Component	Mol%	Molecular Weight (lb/lb-mole)	Component Flow (scf/day)	Component Moles (lb-moles)	Component Emissions		
					(lbs/day)	(lbs/hr)	(tons/year)
H2S	0.00E+00	34.08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrogen	0.3529	28.01	0.6289	1.66E-03	0.0464	0.0019	0.0085
Carbon Dioxide	0.0894	44.01	0.1593	4.20E-04	0.0185	0.0008	0.0034
Methane	85.4948	16.04	152.3517	0.4015	6.4397	0.2683	1.1752
Ethane	10.9701	30.07	19.5487	0.0515	1.5490	0.0645	0.2827
Propane	2.1423	44.10	3.8176	0.0101	0.4436	0.0185	0.0810
Isobutane	0.2734	58.12	0.4872	1.28E-03	0.0746	0.0031	0.0136
n-Butane	0.3611	58.12	0.6435	0.0017	0.0986	0.0041	0.0180
2,2 Dimethylpropane	0.00E+00	72.15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Isopentane	0.1083	72.15	0.1930	0.0005	0.0367	0.0015	0.0067
n-Pentane	0.0568	72.15	0.1012	0.0003	0.0192	0.0008	0.0035
2,2 Dimethylbutane	0.00E+00	86.18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cyclopentane	0.00E+00	70.10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,3 Dimethylbutane	0.00E+00	86.18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2-Methylpentane	0.00E+00	86.18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3-Methylpentane	0.00E+00	86.18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
n-Hexane	0.1128	86.17	0.2010	0.0005	0.0456	0.0019	0.0083
Methylcyclopentane	0.00E+00	84.16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	0.00E+00	78.11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cyclohexane	0.00E+00	84.16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2-Methylhexane	0.00E+00	100.20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3-Methylhexane	0.00E+00	100.20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,2,4 Trimethylpentane	0.00E+00	114.23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Heptane	0.00E+00	100.20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methylcyclohexane	0.00E+00	98.19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Toluene	0.00E+00	92.14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Octane	0.00E+00	114.23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ethylbenzene	0.00E+00	106.17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
m & p-Xylene	0.00E+00	106.17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
o-Xylene	0.00E+00	106.17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nonane	0.00E+00	128.26	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C10+	0.00E+00	159.20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

	lb/hr	tpy
VOC Emissions	0.0299	0.1311
Benzene Emissions	0.00E+00	0.00E+00
Toluene Emissions	0.00E+00	0.00E+00
Ethylbenzene Emissions	0.00E+00	0.00E+00
Xylene Emissions	0.00E+00	0.00E+00
n-Hexane Emissions	0.0019	0.0083
HAPs Emissions	0.0019	0.0083
TAPs Emissions	0.00E+00	0.00E+00
CH <sub>4</sub> Emissions	0.2683	1.1752
CO <sub>2e</sub> emissions	6.7087	29.3843

<b>Enter any notes here:</b>	1. PCV bleed rate obtained from the user manual for PCV <a href="http://issuu.com/rmcprocesscontrols/docs/mizer-pilot-operation--parts---installation-manual">http://issuu.com/rmcprocesscontrols/docs/mizer-pilot-operation--parts---installation-manual</a>
	2. Emissions per hour= Mol % x no. of PCV x bleed rate x MW / 379.48 / 24

Table 6

**Uncontrolled Flashing Emissions  
Clarence Well Pad  
Doddridge County, West Virginia  
Antero Resources Corporation**

# Hours Operational	8760
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	Condensate Tank Flashing Losses			Produced Water Tank Flashing Losses		
	Vapor Mass Fraction wt%	Flashing Losses		Vapor Mass Fraction wt%	Flashing Losses	
		lbs/hr	tpy		lbs/hr	tpy
Water	0.4553	0.0107	0.0469	2.8619	0.0375	0.1642
H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Nitrogen	0.0656	0.0015	0.0068	0.2525	0.0033	0.0145
Carbon Dioxide	0.1941	0.0046	0.0200	1.6975	0.0222	0.0974
Methane	24.7908	0.5835	2.5556	66.8391	0.8756	3.8350
Ethane	30.4901	0.7176	3.1432	22.1602	0.2903	1.2715
Propane	21.4052	0.5038	2.2066	4.3626	0.0571	0.2503
Isobutane	5.1862	0.1221	0.5346	0.5137	0.0067	0.0295
n-Butane	7.5464	0.1776	0.7779	0.8391	0.0110	0.0481
2,2 Dimethylpropane	0.0016	0.0000	0.0002	0.0001	0.0000	0.0000
Isopentane	3.1278	0.0736	0.3224	0.2164	0.0028	0.0124
n-Pentane	1.7102	0.0403	0.1763	0.0448	0.0006	0.0026
2,2 Dimethylbutane	0.0033	0.0001	0.0003	0.0001	0.0000	0.0000
Cyclopentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2,3 Dimethylbutane	0.0056	0.0001	0.0006	0.0003	0.0000	0.0000
2-Methylpentane	0.0285	0.0007	0.0029	0.0010	0.0000	0.0001
3-Methylpentane	0.0208	0.0005	0.0021	0.0017	0.0000	0.0001
n-Hexane	4.1016	0.0965	0.4228	0.0686	0.0009	0.0039
Methylcyclopentane	0.0122	0.0003	0.0013	0.0016	0.0000	0.0001
Benzene	0.0011	0.0000	0.0001	0.0014	0.0000	0.0001
Cyclohexane	0.0095	0.0002	0.0010	0.0026	0.0000	0.0002
2-Methylhexane	0.0420	0.0010	0.0043	0.0010	0.0000	0.0001
3-Methylhexane	0.0347	0.0008	0.0036	0.0010	0.0000	0.0001
2,2,4 Trimethylpentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Heptane	0.0625	0.0015	0.0064	0.0008	0.0000	0.0000
Methylcyclohexane	0.0471	0.0011	0.0049	0.0061	0.0001	0.0003
Toluene	0.0110	0.0003	0.0011	0.0130	0.0002	0.0007
Octane	0.2131	0.0050	0.0220	0.0011	0.0000	0.0001
Ethylbenzene	0.0198	0.0005	0.0020	0.0229	0.0003	0.0013
m & p-Xylene	0.0164	0.0004	0.0017	0.0172	0.0002	0.0010
o-Xylene	0.0318	0.0007	0.0033	0.0382	0.0005	0.0022
Nonane	0.1654	0.0039	0.0171	0.0009	0.0000	0.0001
C10+	0.2003	0.0047	0.0207	0.0326	0.0004	0.0019
Total VOCs	44.004	1.04	4.5	6.189	0.0811	0.3551
Total CO <sub>2e</sub>		14.59	63.9		21.91	96.0
CH <sub>4</sub>		0.58	2.56		0.88	3.83
Total TAPs (Benzene)		0.0000	0.0001		0.0000	0.0001
Toluene		0.0003	0.0011		0.0002	0.0007
Ethylbenzene		0.0005	0.0020		0.0003	0.0013
Xylenes		0.0011	0.0050		0.0007	0.0032
n-Hexane		0.097	0.423		0.0009	0.0039
Total HAPs		0.098	0.431		0.0021	0.0093
Total	100.00	2.35	10.3	100.00	1.310	5.74

<b>Enter any notes here:</b>	Vapor mass fractions and Flashing losses from Promax output
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Table 7

**Uncontrolled Working and Breathing Losses**  
**Clarence Well Pad**  
**Doddridge County, West Virginia**  
**Antero Resources Corporation**

Condensate Tank Information	
Number of Tanks	2
Maximum Working Losses (lbs/hr)	0.0852
Maximum Breathing Losses (lbs/hr)	0.3709
# Hours Operational	8760

	Condensate Tank W/B Losses						
	Vapor Mass Fraction wt%	Working Losses		Breathing Losses		Max W/B Losses	
		lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
H2S	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrogen	0.0035	2.98E-06	1.31E-05	0.0000	0.0001	0.0000	0.0001
Carbon Dioxide	0.1013	0.0001	0.0004	0.0004	0.0016	0.0005	0.0020
Methane	4.1874	0.0036	0.0156	0.0155	0.0680	0.0191	0.0837
Ethane	34.4167	0.0293	0.1285	0.1277	0.5591	0.1570	0.6876
Propane	31.9313	0.0272	0.1192	0.1184	0.5188	0.1457	0.6380
Isobutane	7.1832	0.0061	0.0268	0.0266	0.1167	0.0328	0.1435
n-Butane	10.3984	0.0089	0.0388	0.0386	0.1689	0.0474	0.2078
2,2 Dimethylpropane	0.0020	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Isopentane	3.8326	0.0033	0.0143	0.0142	0.0623	0.0175	0.0766
n-Pentane	2.0625	0.0018	0.0077	0.0077	0.0335	0.0094	0.0412
2,2 Dimethylbutane	0.0040	0.0000	0.0000	0.0000	0.0001	0.0000	0.0001
Cyclopentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2,3 Dimethylbutane	0.0066	0.0000	0.0000	0.0000	0.0001	0.0000	0.0001
2-Methylpentane	0.0334	0.0000	0.0001	0.0001	0.0005	0.0002	0.0007
3-Methylpentane	0.0244	0.0000	0.0001	0.0001	0.0004	0.0001	0.0005
n-Hexane	4.9508	0.0042	0.0185	0.0184	0.0804	0.0226	0.0989
Methylcyclopentane	0.0131	0.0000	0.0000	0.0000	0.0002	0.0001	0.0003
Benzene	0.0010	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Cyclohexane	0.0106	0.0000	0.0000	0.0000	0.0002	0.0000	0.0002
2-Methylhexane	0.0142	0.0000	0.0001	0.0001	0.0002	0.0001	0.0003
3-Methylhexane	0.0428	0.0000	0.0002	0.0002	0.0007	0.0002	0.0009
2,2,4 Trimethylpentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Heptane	0.0745	0.0001	0.0003	0.0003	0.0012	0.0003	0.0015
Methylcyclohexane	0.0560	0.0000	0.0002	0.0002	0.0009	0.0003	0.0011
Toluene	0.0099	8.42E-06	3.69E-05	0.0000	0.0002	0.0000	0.0002
Octane	0.2344	0.0002	0.0009	0.0009	0.0038	0.0011	0.0047
Ethylbenzene	0.0193	1.64E-05	7.19E-05	0.0001	0.0003	0.0001	0.0004
m & p-Xylene	0.0212	1.81E-05	7.92E-05	0.0001	0.0003	0.0001	0.0004
o-Xylene	0.0261	2.22E-05	0.0001	0.0001	0.0004	0.0001	0.0005
Nonane	0.1758	0.0001	0.0007	0.0007	0.0029	0.0008	0.0035
C10+	0.1625	1.38E-04	0.0006	0.0006	0.0026	0.0007	0.0032
Total VOCs	61.290	0.0522	0.229	0.2273	0.9957	0.2796	1.225
Total CO <sub>2e</sub>		0.0893	0.3912	0.3887	1.7024	0.4780	2.094
CH <sub>4</sub>		0.0036	0.0156	0.0155	0.0680	0.0191	0.0837
Total TAPs (Benzene)		8.15E-07	3.57E-06	0.0000	0.0000	0.0000	0.0000
Toluene		8.42E-06	3.69E-05	0.0000	0.0002	0.0000	0.0002
Ethylbenzene		1.64E-05	7.19E-05	0.0001	0.0003	0.0001	0.0004
Xylenes		4.03E-05	0.0002	0.0002	0.0008	0.0002	0.0009
n-Hexane		0.0042	0.0185	0.0184	0.0804	0.0226	0.0989
Total HAPs		0.0043	0.0188	0.0187	0.0817	0.0229	0.1005
Total	100.00	0.0852	0.3733	0.3709	1.6246	0.4561	1.998

Table 7

**Uncontrolled Working and Breathing Losses**  
**Clarence Well Pad**  
**Doddridge County, West Virginia**  
**Antero Resources Corporation**

Produced Water Tank Information	
Number of Tanks	2
Maximum Working Losses (lbs/hr)	0.0251
Maximum Breathing Losses (lbs/hr)	0.0082

	Produced Water Tank W/B Losses						
	Vapor Mass Fraction wt%	Working Losses		Breathing Losses		Max W/B Losses	
		lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
Water	93.0302	0.0233	0.1021	0.0076	0.0334	0.0309	0.1355
H2S	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrogen	0.0047	1.17E-06	5.15E-06	3.84E-07	1.68E-06	1.56E-06	6.83E-06
Carbon Dioxide	2.1161	0.0005	0.0023	0.0002	0.0008	0.0007	0.0031
Methane	3.4534	0.0009	0.0038	0.0003	0.0012	0.0011	0.0050
Ethane	1.3509	0.0003	0.0015	0.0001	0.0005	0.0004	0.0020
Propane	0.0414	1.04E-05	0.0000	3.39E-06	1.49E-05	1.38E-05	0.0001
Isobutane	0.0012	3.06E-07	1.34E-06	1.00E-07	4.38E-07	4.06E-07	1.78E-06
n-Butane	0.0018	4.51E-07	1.97E-06	1.47E-07	6.45E-07	5.98E-07	2.62E-06
2,2 Dimethylpropane	0.0000	1.51E-11	6.62E-11	4.94E-12	2.16E-11	2.01E-11	8.79E-11
Isopentane	0.0001	3.00E-08	1.32E-07	9.82E-09	4.30E-08	3.99E-08	1.75E-07
n-Pentane	0.0000	1.83E-09	8.03E-09	5.99E-10	2.62E-09	2.43E-09	1.07E-08
2,2 Dimethylbutane	0.0000	1.82E-12	7.95E-12	5.93E-13	2.60E-12	2.41E-12	1.06E-11
Cyclopentane	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,3 Dimethylbutane	0.0000	1.11E-11	4.86E-11	3.63E-12	1.59E-11	1.47E-11	6.45E-11
2-Methylpentane	8.80E-08	2.20E-11	9.66E-11	7.20E-12	3.16E-11	2.93E-11	1.28E-10
3-Methylpentane	3.42E-07	8.57E-11	3.75E-10	2.80E-11	1.23E-10	1.14E-10	4.98E-10
n-Hexane	2.17E-06	5.43E-10	2.38E-09	1.77E-10	7.77E-10	7.20E-10	3.15E-09
Methylcyclopentane	3.86E-07	9.67E-11	4.24E-10	3.16E-11	1.38E-10	1.28E-10	5.62E-10
Benzene	2.05E-05	5.13E-09	2.25E-08	1.68E-09	7.34E-09	6.80E-09	2.98E-08
Cyclohexane	1.02E-06	2.55E-10	1.12E-09	8.34E-11	3.65E-10	3.39E-10	1.48E-09
2-Methylhexane	5.27E-09	1.32E-12	5.78E-12	4.31E-13	1.89E-12	1.75E-12	7.67E-12
3-Methylhexane	2.05E-08	5.14E-12	2.25E-11	1.68E-12	7.36E-12	6.82E-12	2.99E-11
2,2,4 Trimethylpentane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Heptane	5.12E-09	1.28E-12	5.62E-12	4.19E-13	1.84E-12	1.70E-12	7.45E-12
Methylcyclohexane	4.64E-07	1.16E-10	5.10E-10	3.80E-11	1.66E-10	1.54E-10	6.76E-10
Toluene	3.99E-05	9.99E-09	4.38E-08	3.26E-09	1.43E-08	1.33E-08	5.81E-08
Octane	8.96E-10	2.25E-13	9.84E-13	7.34E-14	3.21E-13	2.98E-13	1.31E-12
Ethylbenzene	2.10E-05	5.25E-09	2.30E-08	1.72E-09	7.51E-09	6.97E-09	3.05E-08
m & p-Xylene	1.21E-05	3.04E-09	1.33E-08	9.92E-10	4.34E-09	4.03E-09	1.76E-08
o-Xylene	3.43E-05	8.60E-09	3.77E-08	2.81E-09	1.23E-08	1.14E-08	5.00E-08
Nonane	2.27E-10	5.68E-14	2.49E-13	1.86E-14	8.13E-14	7.54E-14	3.30E-13
C10+	1.82E-08	4.55E-12	1.99E-11	1.49E-12	6.52E-12	6.04E-12	2.65E-11
Total VOCs	0.0447	1.12E-05	0.0000	3.66E-06	1.60E-05	1.49E-05	0.0001
Total CO <sub>2e</sub>		0.0222	0.0971	0.0072	0.0317	0.0294	0.1288
CH <sub>4</sub>		0.0009	0.0038	0.0003	0.0012	0.0011	0.0050
Total TAPs (Benzene)		5.13E-09	2.25E-08	1.68E-09	7.34E-09	6.80E-09	2.98E-08
Toluene		9.99E-09	4.38E-08	3.26E-09	1.43E-08	1.33E-08	5.81E-08
Ethylbenzene		5.25E-09	2.30E-08	1.72E-09	7.51E-09	6.97E-09	3.05E-08
Xylenes		1.16E-08	5.10E-08	3.80E-09	1.66E-08	1.54E-08	6.76E-08
n-Hexane		5.43E-10	2.38E-09	1.77E-10	7.77E-10	7.20E-10	3.15E-09
Total HAPs		3.25E-08	1.43E-07	1.06E-08	4.66E-08	4.32E-08	1.89E-07
Total	100.00	0.0251	0.1098	0.0082	0.0359	0.0332	0.1456

**Enter any notes here:** Vapor mass fractions, working losses and breathing losses from Promax output

Table 8

**Loading Emissions**  
**Clarence Well Pad**  
**Doddridge County, West Virginia**  
**Antero Resources Corporation**

Annual Loading	Oil Truck Loading	Water Truck Loading
RVP	1.65	1.0316
Annual Average Temp (F)	72.1	72.1
S (saturation factor)	0.6	0.6
P (true vapor pressure)	0.84	0.45
M (MW of vapor)	35.59	18.27
Collection Efficiency (%)	0.00	0.00
Total Hydrocarbon Loading Loss (lb/10 <sup>3</sup> gal)*	0.42	0.12
Maximum Throughput (gallons/hr)**	10,080	10,080
Average Throughput (gallons/yr)	122,640	3,832,500
Total Hydrocarbon Loading Emissions (lbs/hr)	4.23	1.17
Total Hydrocarbon Loading Emissions (tpy)	0.03	0.22

	Condensate Tank Loading Losses			Produced Water Tank Loading Losses		
	Vapor Mass Fraction wt%	Loading Losses		Vapor Mass Fraction wt%	Loading Losses	
		lbs/hr	tpy		lbs/hr	tpy
H2S	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrogen	0.0035	1.48E-04	9.00E-07	0.0047	5.48E-05	1.04E-05
Carbon Dioxide	0.1013	0.0043	2.61E-05	2.1161	2.47E-02	4.70E-03
Methane	4.1874	0.1772	1.08E-03	3.4534	4.04E-02	7.67E-03
Ethane	34.4167	1.4562	0.0089	1.3509	1.58E-02	3.00E-03
Propane	31.9313	1.3510	8.22E-03	0.0414	4.84E-04	9.21E-05
Isobutane	7.1832	0.3039	1.85E-03	0.0012	1.43E-05	2.72E-06
n-Butane	10.3984	0.4400	2.68E-03	0.0018	2.10E-05	4.00E-06
2,2 Dimethylpropane	0.0020	0.0001	5.08E-07	0.0000	7.06E-10	1.34E-10
Isopentane	3.8326	0.1622	9.86E-04	0.0001	1.40E-06	2.66E-07
n-Pentane	2.0625	0.0873	5.31E-04	0.0000	8.56E-08	1.63E-08
2,2 Dimethylbutane	0.0040	0.0002	1.02E-06	0.0000	8.47E-11	1.61E-11
Cyclopentane	0.0000	0.0000	0.00E+00	0.0000	0.00E+00	0.00E+00
2,3 Dimethylbutane	0.0066	0.0003	1.69E-06	0.0000	5.18E-10	9.85E-11
2-Methylpentane	0.0334	0.0014	8.60E-06	8.80E-08	1.03E-09	1.96E-10
3-Methylpentane	0.0244	0.0010	6.27E-06	3.42E-07	4.00E-09	7.60E-10
n-Hexane	4.9508	0.2095	1.27E-03	2.17E-06	2.53E-08	4.81E-09
Methylcyclopentane	0.0131	0.0006	3.36E-06	3.86E-07	4.51E-09	8.58E-10
Benzene	0.0010	0.0000	2.46E-07	0.0000	2.39E-07	4.55E-08
Cyclohexane	0.0106	0.0004	2.73E-06	0.0000	1.19E-08	2.26E-09
2-Methylhexane	0.0142	0.0006	3.65E-06	0.0000	6.16E-11	1.17E-11
3-Methylhexane	0.0428	0.0018	1.10E-05	0.0000	2.40E-10	4.56E-11
2,2,4 Trimethylpentane	0.0000	0.0000	0.00E+00	0.0000	0.00E+00	0.00E+00
Heptane	0.0745	0.0032	1.92E-05	5.12E-09	5.98E-11	1.14E-11
Methylcyclohexane	0.0560	0.0024	1.44E-05	4.64E-07	5.43E-09	1.03E-09
Toluene	0.0099	0.0004	2.54E-06	0.0000	4.66E-07	8.86E-08
Octane	0.2344	0.0099	6.03E-05	8.96E-10	1.05E-11	1.99E-12
Ethylbenzene	0.0193	0.0008	4.96E-06	2.10E-05	2.45E-07	4.66E-08
m & p-Xylene	0.0212	0.0009	5.46E-06	1.21E-05	1.42E-07	2.69E-08
o-Xylene	0.0261	0.0011	6.71E-06	3.43E-05	4.01E-07	7.62E-08
Nonane	0.1758	0.0074	4.53E-05	2.27E-10	2.65E-12	5.04E-13
C10+	0.1625	0.0069	4.18E-05	1.82E-08	2.12E-10	4.04E-11
Total VOCs	61.2904	2.5932	0.0158	0.0447	0.0005	0.0001
Total CH <sub>4</sub>		0.1772	0.0011		0.0404	0.0077
Total CO <sub>2e</sub>		4.4336	0.0270		1.0340	0.1966
Total TAPs (Benzene)		0.0000	0.0000		2.39E-07	4.55E-08
Toluene		0.0004	0.0000		4.66E-07	8.86E-08
Ethylbenzene		0.0008	0.0000		2.45E-07	4.66E-08
Xylenes		0.0020	0.0000		5.43E-07	1.03E-07
n-Hexane		0.2095	0.0013		2.53E-08	4.81E-09
Total HAPs		0.2127	0.0013		1.52E-06	2.89E-07
Total	100.0000	4.2311	0.0257	100.0000	1.1691	0.2222

**Enter any notes here**

Vapor mass fractions and loading losses from Promax output

\*Using equation  $L_1 = 12.46 * SPM/T$  from AP-42, Chapter 5, Section 5.2-4

MW was obtained by Promax; RVP was taken from laboratory reports

Annual Average Temp (F) obtained from Charleston, WV (preset in Promax)

S (saturation factor) is based on submerged loading, dedicated service as it was most representative

True vapor pressure (TVP) equation from AP-42, Chapter 7, Figure 7.1-13a

\*\* Maximum condensate throughput in gallons per hour is based on actual filling rate of 4 barrels per minute. (10080 gal/hr = 4 bbl/ min x 42 gal/bbl x 60 min/hr)

Loading emissions are vented to the atmosphere.



**Table 9**

**Gas Production Unit Heater Emissions  
Clarence Well Pad  
Doddridge County, West Virginia  
Antero Resources Corporation**

**Gas Production Unit Heater Emissions**

Number of Units	9
GPU Heater Rating (MMBtu/hr)	1.00
Operating hours/year	8760
Fuel Heat Value (Btu/scf)	1,131.38

Pollutant	Emission Factors (lb/MMscf)	lb/hr	tpy
NOx	100	0.795	3.484
CO	84	0.668	2.927
CO <sub>2</sub>	120,000	954.586	4181.089
Lead	0.0005	3.98E-06	1.74E-05
N <sub>2</sub> O	2.2	0.018	0.077
PM (Total)	7.6	0.060	0.265
SO <sub>2</sub>	0.6	0.005	0.021
TOC	11	0.088	0.383
Methane	2.3	0.018	0.080
VOC	5.5	0.044	0.192
<b>HAPS</b>			
2-Methylnaphthalene	2.40E-05	1.91E-07	8.36E-07
Benzene	2.10E-03	1.67E-05	7.32E-05
Dichlorobenzene	1.20E-03	9.55E-06	4.18E-05
Fluoranthene	3.00E-06	2.39E-08	1.05E-07
Fluorene	2.80E-06	2.23E-08	9.76E-08
Formaldehyde	7.50E-02	5.97E-04	2.61E-03
Hexane	1.80E+00	1.43E-02	6.27E-02
Naphthalene	6.10E-04	4.85E-06	2.13E-05
Phenanathrene	1.70E-05	1.35E-07	5.92E-07
Toluene	3.40E-03	2.70E-05	1.18E-04

	lb/hr	tpy
TOTAL Uncontrolled VOC	0.044	0.192
TOTAL Uncontrolled HAPs	0.015	0.066
TOTAL Uncontrolled TAPs (Benzene)	1.67E-05	7.32E-05
TOTAL Uncontrolled Toluene	2.70E-05	1.18E-04
TOTAL Uncontrolled Hexane	0.014	0.063
TOTAL Uncontrolled TAPs (Formaldehyde)	0.001	0.003
TOTAL CH <sub>4</sub>	0.018	0.080
TOTAL CO <sub>2e</sub> Emissions	960.26	4,205.93

**Enter any notes here:**  
All Emission Factors based off AP-42 Sec 1.4 Natural Gas Combustion

**Table 10**

**Haul Road Emissions  
Clarence Well Pad  
Doddridge County, West Virginia  
Antero Resources Corporation**

	PM	PM10
Particle Size Multiplier (k)	0.8	0.36
Silt Content of Road Surface Material (s) (%)	5.1	5.1
Days per Year with Precipitation > 0.01 in (p)	150	150
Control Efficiency for Watering <sup>1</sup> (%)	50	50

Tanker Truck Trip Calculation	
Condensate Production (bbl/day)	8
PW Production (bbl/day)	250
Condensate Truck Capacity (bbl)	200
PW Truck Capacity (bbl)	200

Pick Up Truck Trip Calculation	
No of Trips Per day	2
Trips Per Year	730

	# of Wheels	Mean Vehicle Weight (W) (tons)	Mean Vehicle Speed (S) (mph)	Miles Per Trip (miles)	Maximum Trips per Hour	Maximum Trips per Year	Vehicle Miles Travelled		PM (lbs/VMT)	PM10 (lbs/VMT)
							(miles/hr)	(miles/year)		
Tanker Trucks Condensate	10	40	10	0.5200	1	15	0.5200	7.8000	3.8175	1.7179
Tanker Trucks PW	10	40	10	0.5200	1	457	0.5200	237.6400	3.8175	1.7179
Pick Up Truck	4	3	10	0.1894	1	730	0.1894	138.2620	0.3467	0.1560

	Uncontrolled Emissions						Controlled Emissions					
	PM (lbs/hr)	PM (lbs/year)	PM10 (tpy)	PM10 (lbs/hr)	PM10 (lbs/year)	PM10 (tpy)	PM (lbs/hr)	PM (lbs/year)	PM10 (tpy)	PM (lbs/hr)	PM10 (lbs/year)	PM10 (tpy)
Tanker Trucks Condensate	1.9851	29.7767	0.0149	0.8933	13.3995	0.0067	0.9926	14.8884	0.0074	0.4467	6.6998	0.0033
Tanker Trucks PW	1.9851	907.1977	0.4536	0.8933	408.2390	0.2041	0.9926	453.5988	0.2268	0.4467	204.1195	0.1021
Pick Up Truck	0.0657	47.9326	0.0240	0.0295	21.5697	0.0108	0.0328	23.9663	0.0120	0.0148	10.7848	0.0054
<b>Total Emissions</b>	<b>4.0359</b>	<b>984.9070</b>	<b>0.4925</b>	<b>1.8162</b>	<b>443.2082</b>	<b>0.2216</b>	<b>2.0179</b>	<b>492.4535</b>	<b>0.2462</b>	<b>0.9081</b>	<b>221.6041</b>	<b>0.1108</b>

<b>Enter any notes here:</b>	1 EPA, AP-42, Volume I, Section 13.2.2 Unpaved Roads (11/06); assume 2:1 moisture ratio Section 13.2.2 Unpaved Roads (11/06) Source: Attachment L, Fugitive Emissions from Unpaved Haul Roads, Rev 03/2007, West Virginia Department of Environmental Protection
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Bryan Research & Engineering, Inc.

ProMax<sup>®</sup> 4.0

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## Simulation Report

**Project: PROMAX SCENARIO 3.pmx**

**Licensed to GHD Limited and Affiliates**

**Client Name: Antero Resources Corporation**  
**Location: West Virginia**  
**Job: Clarence**

**ProMax Filename: I:\Air Quality\6-chars\08----\0827--\082715\ANTERO RESOURCES\01-ProMax\Model 2017-2018\HP\PROMAX SCENARIO 3.pmx**  
**ProMax Version: 4.0.16071.0**  
**Simulation Initiated: 2/16/2018 11:18:39 AM**

**Bryan Research & Engineering, Inc.**

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Report Navigator can be activated via the ProMax Navigator Toolbar.

An asterisk (\*), throughout the report, denotes a user specified value.

A question mark (?) after a value, throughout the report, denotes an extrapolated or approximate value.

Names	Units	Oil	Water
Std Liquid Volumetric Flow	bbl/d	15.861#	256.28#

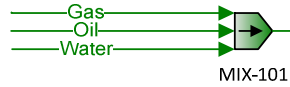
Names	Units	Gas
Std Vapor Volumetric Flow	MMSCFD	24.949#

Properties	HP Separator Gas
Pressure(Total)	192* psig
Temperature(Total)	70* °F

Properties	Total gas to sale
Pressure(Total)	192 psig
Temperature(Total)	70 °F
Std Vapor Volumetric Flow (Total)	25 MMSCFD

Stream Total gas to sale C3+ Mass Flow = 1.868E+04 ton/yr

Names	Units	Sales Oil	Produced Water
Std Liquid Volumetric Flow	bbl/d	7.9998	250
Reid Vapor Pressure	psi	5.5208	1.0316



HP Separator Gas

Q-3 Phase Separator

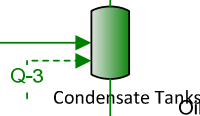
HP Separator Water

Oil Tanks: 2

Water Tanks: 2



"OT Flash Gas" C3+ Mass Flow = 4.536 ton/yr



Annual tank loss calculations for "Sales Oil".  
Total working and breathing losses from the Vertical Cylinder are 1.998 ton/yr.  
\* All components are reported.  
Vapor adjusted to ensure mass balance

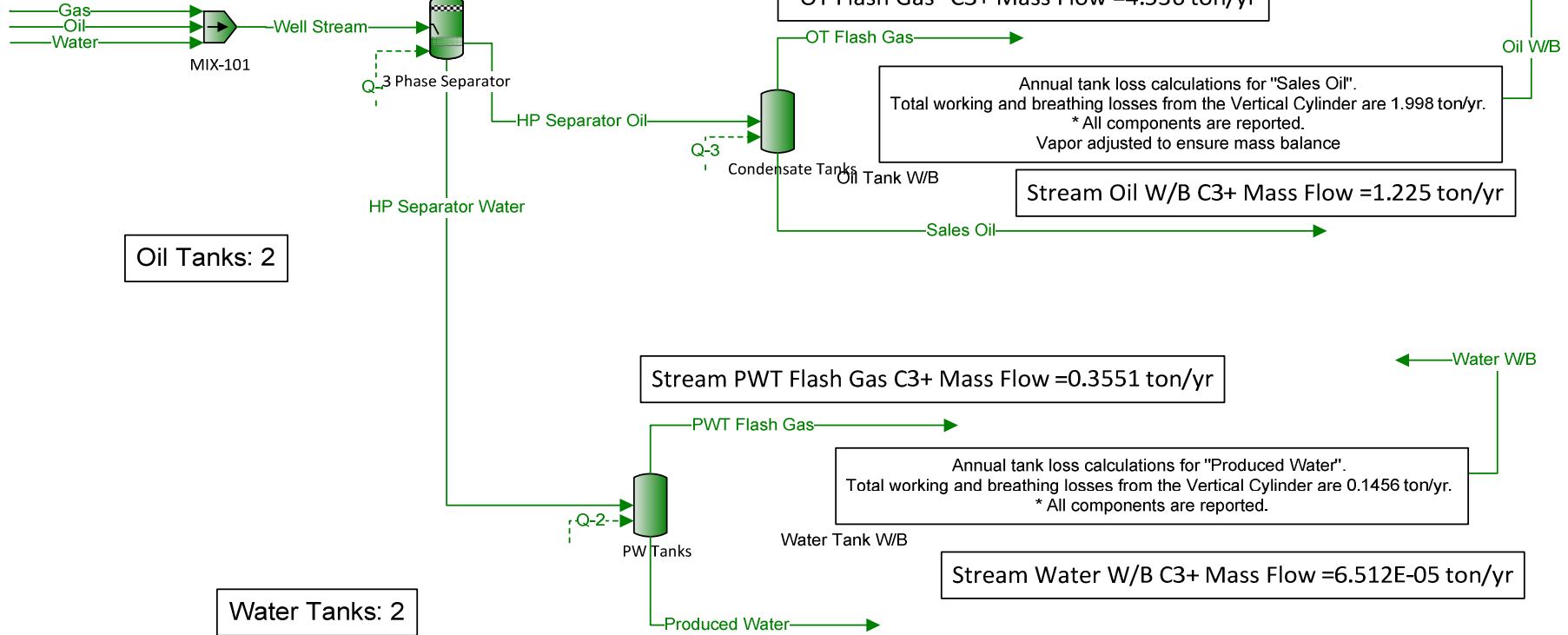
Stream Oil W/B C3+ Mass Flow = 1.225 ton/yr

Stream PWT Flash Gas C3+ Mass Flow = 0.3551 ton/yr



Annual tank loss calculations for "Produced Water".  
Total working and breathing losses from the Vertical Cylinder are 0.1456 ton/yr.  
\* All components are reported.

Stream Water W/B C3+ Mass Flow = 6.512E-05 ton/yr



Process Streams	Gas	HP Separator Gas	HP Separator Oil	HP Separator Water	Oil	Oil W/B	OT Flash Gas	Produced Water	PWT Flash Gas	Sales Oil	Total gas to sale	Water	Water W/B	Well Stream
Composition	Status: Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: Total	From Block: --	3 Phase Separator	3 Phase Separator	3 Phase Separator	--	--	Condensate Tanks	PW Tanks	PW Tanks	Condensate Tanks	MIX-100	--	--	MIX-101
Mole Fraction	To Block: MIX-101	MIX-100	Condensate Tanks	PW Tanks	MIX-101	--	--	--	--	--	--	MIX-101	--	3 Phase Separator
	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water	0	0.185778	0.116280	99.9643	0	0.00159000*	0.739325	99.9971	3.03294	0.0345276	0.185778	100	94.3465	7.03942
H2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	0.353035*	0.352287	0.00804380	6.03109E-05	0.013	0.00483415*	0.0685126	2.01470E-06	0.172076	0.000109470	0.352287	0	0.00305739*	0.328012
Carbon Dioxide	0.0894341*	0.0891957	0.000606231	0.000606231	0	0.0891034*	0.129034	0.000356863	0.736423	0.00174758	0.0891957	0	0.00787472*	0.0830935
Methane	85.5274*	85.3456	5.42591	0.0288642	5.429*	10.1091*	45.2049	0.00191599	79.5457	0.206336	85.3456	0	3.93295*	79.4665
Ethane	10.9743*	10.9526	4.20077	0.00527245	5.67*	44.3292*	29.6623	0.000505734	14.0705	0.859850	10.9526	0	0.820845*	10.1991
Propane	2.14312*	2.14039	3.06072	0.000687858	4.895*	28.0454*	14.2001	4.79510E-05	1.88888	1.59908	2.14039	0	0.0171690*	1.99364
Isobutane	0.273504*	0.273401	0.972947	6.01564E-05	1.346*	4.78645*	2.61020	2.98556E-06	0.168756	0.758115	0.273401	0	0.000384227*	0.254790
n-Butane	0.361238*	0.361766	1.85793	9.97984E-05	3.278*	6.92893*	3.79808	6.41887E-06	0.275637	1.60335	0.361766	0	0.000565256*	0.337275
2,2-Dimethylpropane	0	6.03837E-05	0.000385055	7.87807E-09	0.112*	0.00105912*	0.000651078	2.48015E-10	2.25221E-05	0.000350149	6.03837E-05	0	1.52847E-08*	5.63129E-05
Isopentane	0.108341*	0.108927	1.29751	2.03412E-05	2.12*	2.05734*	1.26817	9.42861E-07	0.0572595	1.30136	0.108927	0	0.30622E-05*	0.101726
n-Pentane	0.0568216*	0.0576520	0.920846	4.09768E-06	2.192*	1.10714*	0.693391	7.81282E-08	0.0118647	0.950692	0.0576520	0	1.85318E-06*	0.0538953
2,2-Dimethylbutane	0	9.17534E-05	0.00232891	6.08415E-09	0.171*	0.00178661*	0.00112328	1.05019E-10	1.76489E-05	0.00248710	9.17534E-05	0	1.53644E-09*	8.59777E-05
Cyclopentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2,3-Dimethylbutane	0	0.000152581	0.000522870	2.31399E-08	0.285*	0.00295662*	0.00188499	8.84366E-10	6.56930E-06	0.00566744	0.000152581	0	9.39588E-09*	0.000143296
2-Methylhexane	0	0.000780924	0.0296464	7.55405E-08	1.46*	0.0150205*	0.00966221	1.96767E-09	0.000217169	0.00232686	0.000780924	0	1.86531E-08*	0.000734079
3-Methylpentane	0	0.000567957	0.0240135	1.37417E-07	1.063*	0.0109506*	0.00704642	8.52836E-09	0.000380453	0.0262398	0.000567957	0	7.24823E-08*	0.000534470
n-Hexane	0.112843*	0.112175	6.13167	5.22015E-06	2.076*	2.22500*	1.39232	6.84284E-08	0.0152066	6.75354	0.112175	0	4.59110E-07*	0.105887
Methylcyclopentane	0	0.000335059	0.0182025	1.38401E-07	0.629*	0.00609091*	0.00423337	1.37226E-08	0.000368030	0.0200354	0.000335059	0	8.38151E-08*	0.000316257
Benzene	0	3.33920E-05	0.00211547	1.27849E-06	0.063*	0.000473977*	0.000427736	1.15897E-06	0.000353934	0.00233692	3.33920E-05	0	4.78701E-06*	3.16760E-05
Cyclohexane	0	0.000262537	0.0209410	2.53646E-07	0.496*	0.00487703*	0.00329857	5.17816E-08	0.000595363	0.0232560	0.000262537	0	2.21141E-07*	0.000249386
2-Methylhexane	0	0.00100970	0.124452	6.65681E-08	1.928*	0.00548402*	0.0122647	1.19700E-09	0.000192959	0.00110970	0.00100970	0	9.60519E-10*	0.000969386
3-Methylhexane	0	0.000830892	0.114001	6.62160E-08	1.592*	0.0165524*	0.0101265	1.41646E-09	0.000191272	0.127631	0.000830892	0	3.74088E-09*	0.000800448
2,2,4-Trimethylpentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heptane	0.00151430	0.00151430	4.98834E-08	2.931*	0.0288050*	0.0182349	4.84066E-10	0.000145814	0.304194	0.000145814	0.00151430	0	9.33437E-10*	0.00147369
Methylcyclohexane	0	0.00113541	0.0203867	4.45035E-07	2.198*	0.0221046*	0.0140186	4.39033E-08	0.00118408	0.00228778	0.00113541	0	8.63831E-08*	0.00110514
Toluene	0	0.000279898	0.0633662	7.56912E-06	0.549*	0.00415399*	0.00349979	6.65695E-06	0.00269844	0.0712215	0.000279898	0	7.90651E-08*	0.000276034
Octane	0	0.00469119	2.51937	6.06166E-08	9.866*	0.0794903*	0.0545743	2.51790E-10	0.000178181	2.84279	0.00469119	0	1.43367E-10*	0.00469056
Ethylbenzene	0	0.000454903	0.318829	1.04559E-05	0.993*	0.00702965*	0.00544698	9.06614E-06	0.00411140	0.359949	0.000454903	0	6.60557E-06*	0.000499274
m-Xylene	0	0.000380327	0.294855	5.45285E-06	0.843*	0.00773581*	0.00453041	4.40562E-06	0.00309554	0.332950	0.000380327	0	2.80445E-06*	0.000423855
o-Xylene	0	0.000734445	0.655165	2.48726E-05	1.67*	0.00951376*	0.00876506	2.25510E-05	0.00687537	0.739982	0.000734445	0	0.59410E-06*	0.000839666
Nonane	0	0.00337296	5.67412	4.51144E-08	8.901*	0.0531000*	0.0377322	1.91555E-10	0.000132600	6.41370	0.00337296	0	3.22951E-11*	0.00447537
C10+	0	0.00351740	65.6489	1.49335E-06	37.231*	0.0388402*	0.0361725	1.92423E-07	0.00384017	74.2583	0.00351740	0	2.04951E-09*	0.0187195
Molar Flow	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h
Water	0	5.09998	0.00806564	202.451	0	1.87265E-07*	0.000594847	202.449	0.00208096	0.000211717	5.09998	207.552*	0.00171685*	207.552
H2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	9.67097	9.67098	5.57953E-05	0.000122144	0.000192718*	5.69350E-07*	5.51240E-05	4.07895E-06	0.000118065	6.71252E-07	9.67098	0	5.56361E-08*	9.67116
Carbon Dioxide	2.44994*	2.44860	0.000114534	0.00122776	0	1.04943E-05*	0.000103818	0.000722486	0.000505273	1.07159E-05	2.44860	0	1.59858E-05*	2.44994
Methane	2342.92*	2342.91	0.0376362	0.0584568	0.0804820*	0.0119062*	0.00387901	0.0545778	0.00126521	0.2342.91	2342.91	0	7.15689E-05*	2343.00
Ethane	300.628*	300.672	0.0291382	0.0106779	0.0840547*	0.00522094*	0.0238658	0.00102388	0.00965405	0.00527244	300.672	0	1.49371E-05*	300.712
Propane	58.7082*	58.7581	0.0212304	0.00139307	0.0725657*	0.00330309*	0.0114125	9.70790E-05	0.00129599	0.00980526	58.7581	0	3.12429E-07*	58.7808
Isobutane	7.49233*	7.50541	0.00674874	0.000121831	0.0199537*	0.000563733*	0.00210012	6.04441E-06	0.00015786	0.00464862	7.50541	0	6.99187E-09*	7.51228
n-Butane	9.89568*	9.93119	0.0128873	0.000202115	0.0485946*	0.000816066*	0.00305587	1.29953E-05	0.000189120	0.00983146	9.93119	0	1.02861E-08*	9.94428
2,2-Dimethylpropane	0	0.00165765	2.67089E-06	1.59549E-08	0.00166034*	1.24739E-07*	5.23845E-07	5.02118E-10	1.54528E-08	2.14705E-06	0.00165765	0	7.28139E-13*	0.00166034
Isopentane	2.96788*	2.99027	0.00900007	4.11956E-05	0.0314279*	0.000242307*	0.00102035	1.90887E-06	0.000797972	0.00299027	2.99027	0	5.52509E-10*	2.99031
n-Pentane	1.55656*	1.58266	0.00638735	8.29876E-06	0.0024952*	0.000130396*	0.000557889	1.58174E-07	8.14058E-06	0.00582946	1.58266	0	3.7229E-11*	1.58906
2,2-Dimethylbutane	0	0.00251882	1.61542E-05	1.23218E-08	0.00253498*	2.10421E-07*	9.03772E-07	1.12616E-10	1.12092E-08	1.52504E-05	0.00251882	0	2.78590E-14*	0.00253498
Cyclopentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2,3-Dimethylbutane	0	0.00418866	3.62683E-05	4.68636E-08	0.00422497*	3.48221E-07*	1.51662E-06	1.79044E-09	4.50732E-08	3.47517E-05	0.00418866	0	1.70979E-13*	0.00422497
2-Methylhexane	0	0.0214379	0.000205639	1.52987E-07	0.0216437*	1.76907E-06*	7.77403E-06	3.98364E-09	1.49003E-07	0.000197865	0.0214379	0	3.39434E-13*	0.0216437
3-Methylpentane	0	0.0155916	0.000166567	2.78301E-07	0.0157584*	1.28973E-06*	5.66942E-06	1.72661E-08	2.61035E-07	0.000160898	0.0155916	0	1.31898E-12*	0.0157584
n-Hexane	3.09120*	3.07944	0.0425317	1.05720E-05	0.0307756*	0.000262053*	0.00112023	1.38536E-07	1.04335E-05	0.0414114	3.07944	0	8.35454E-12*	3.12198
Methylcyclopentane	0	0.00919805	0.000126259	2.80294E-07	0.00932459*	7.07721E-07*	3.40609E-06	2.77820E-08	5.25212E-07	0.000122853	0.00919805	0	1.52521E-12*	0.00932459
Benzene	0	0.000916678	1.46737E-05	2.58923E-06	0.00093941*	5.58234E-08*	3.44148E-07	2.34639E-06	2.42841E-07	1.43296E-05	0.000916678	0	8.71105E-11*	0.00093941
Cyclohexane	0	0.000145255	0.000145255	5.13323E-07	0.00735293*	5.74400E-07*	2.65397E-06	1.04834E-07	4.08489E-07	0.000142601	0.000145255	0	4.02416E-12*	0.00735293
2-Methylhexane	0	0.0277182	0.000863247	1.34816E-07	0.0285816*	6.45890E-07*	9.86795E-06	2.42338E-09	1.32393E-07	0.000853380	0.0277182	0	1.74788E-14*	0.0285816
3-Methylhexane	0	0.000790758	0.000790758</											

Isopentane	0.418247*	0.420044	0.715956	8.14613E-05	1.36788*	3.83262*	3.12782	3.77600E-06	0.216381	0.651699	0.420044	0*	0.000119900*	0.392723
n-Pentane	0.219358*	0.222317	0.508115	1.64102E-05	1.41433*	2.06250*	1.71018	3.12890E-07	0.0448362	0.476089	0.222317	0*	7.31821E-06*	0.208067
2,2-Dimethylbutane	0*	0.000422605	0.00153490	6.57309E-08	0.131783*	0.00397532*	0.00330907	5.02349E-10	7.96603E-05	0.00148763	0.000422605	0*	7.24697E-09*	0.000396455
Cyclopentane	0*	0	0	0	0*	0*	0	0	0	0	0	0*	0*	0
2,3-Dimethylbutane	0*	0.000702770	0.00344606	1.10685E-07	0.219639*	0.00657867*	0.00555297	4.23029E-09	0.000296514	0.00338992	0.000702770	0*	4.43177E-08*	0.000660758
2-Methylpentane	0*	0.00359684	0.0195389	3.61334E-07	1.12517*	0.0334216*	0.0284638	9.41220E-09	0.000980218	0.0193012	0.00359684	0*	8.79813E-08*	0.00338493
3-Methylpentane	0*	0.00261594	0.0158265	6.57309E-07	0.819215*	0.0243658*	0.0207580	4.07947E-08	0.00171722	0.0156951	0.00261594	0*	3.41879E-07*	0.00246451
n-Hexane	0.520317*	0.516665	4.04117	2.49697E-05	1.59990*	4.95078*	4.10162	3.27321E-07	0.0686367	0.43956	0.516665	0*	2.16549E-06*	0.488257
Methylcyclopentane	0*	0.00150714	0.01217160	6.46529E-07	0.473408*	0.0130577*	0.0121793	6.41052E-08	0.00162229	0.0117036	0.00150714	0*	3.86085E-07*	0.00142419
Benzene	0*	0.000139408	0.00126377	5.54319E-06	0.0440087*	0.000955947*	0.00114216	5.02510E-06	0.00144805	0.00126701	0.000139408	0*	2.04663E-05*	0.000132395
Cyclohexane	0*	0.00134787	0.0134787	1.18404E-06	0.373307*	0.0105979*	0.00948993	2.41899E-07	0.00262438	0.0135849	0.00134787	0*	1.01866E-06*	0.00112305
2-Methylhexane	0*	0.00540749	0.0953725	3.70245E-07	1.72769*	0.0141884*	0.0420114	6.65770E-09	0.00101271	0.0967942	0.00540749	0*	5.26792E-09*	0.00519753
3-Methylhexane	0*	0.00444990	0.0873638	3.68286E-07	1.42660*	0.0428249*	0.0346872	7.87836E-09	0.00100385	0.0887672	0.00444990	0*	2.05167E-08*	0.00429174
2,2,4-Trimethylpentane	0*	0	0	0	0*	0*	0	0	0	0	0	0*	0*	0
Heptane	0*	0.00810991	0.207697	2.77446E-07	2.62648*	0.0745252*	0.0624617	2.69238E-09	0.000765275	0.211566	0.00810991	0*	5.11939E-09*	0.00790144
Methylcyclohexane	0*	0.00595841	0.153089	2.25444E-06	1.93001*	0.0560392*	0.0470532	2.39277E-07	0.00608937	0.159914	0.00595841	0*	4.64233E-07*	0.00580620
Toluene	0*	0.00137838	0.0446523	3.87108E-05	0.452371*	0.00988247*	0.0110234	3.40459E-05	0.0130274	0.0455482	0.00137838	0*	3.98733E-05*	0.00136090
Octane	0*	0.00286409	2.20096	3.84337E-07	10.0785*	0.234449*	0.213106	1.59643E-09	0.00106605	2.25392	0.00286409	0*	8.96337E-10*	0.00302300
Ethylbenzene	0*	0.00258124	0.258871	6.16156E-05	0.942784*	0.0192697*	0.0197684	5.34267E-05	0.0228620	0.265242	0.00258124	0*	2.09513E-05*	0.00283625
m-Xylene	0*	0.00215808	0.239406	3.21330E-05	0.800370*	0.0212054*	0.0164419	2.59623E-05	0.0172132	0.245347	0.00215808	0*	1.11224E-05*	0.00240782
o-Xylene	0*	0.00416745	0.531959	0.000146571	1.58555*	0.0260792*	0.0318105	0.000132893	0.0382314	0.545284	0.00416745	0*	3.23077E-05*	0.00476993
Nonane	0*	0.0231214	5.56569	3.21171E-07	10.2093*	0.175844*	0.165433	1.36372E-09	0.000890762	5.70956	0.0231214	0*	2.67079E-10*	0.0307134
C10+	0*	0.0304555	81.3370	1.34284E-05	53.9388*	0.162463*	0.200321	1.73032E-06	0.0325843	83.4987	0.0304555	0*	1.81728E-08*	0.162268
Mass Flow	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h
Water	0*	91.8776	0.0145305	3647.21	0*	3.37364E-06*	0.0107163	3647.17	0.0374890	0.00381414	91.8776	3739.10*	0.0309295*	3739.10
H2S	0*	0	0	0	0*	0*	0	0	0	0	0	0*	0*	0
Nitrogen	270.917*	270.917	0.00156301	0.00342166	0.00539869*	1.59494E-05*	0.00154421	0.000114262	0.00330739	1.88041E-05	270.917	0*	1.55856E-06*	270.922
Carbon Dioxide	107.821*	107.762	0.00504058	0.0540330	0*	0.000461849*	0.00456898	0.0317962	0.0222368	0.000471599	107.762	0*	0.000703526*	107.821
Methane	37586.3*	37586.0	0.603778	0.937790	1.29113*	0.0191005*	0.593480	0.0622288	0.675561	0.0202971	37586.0	0*	0.00114814*	37587.5
Ethane	9039.59*	9040.92	0.876157	0.321075	2.52744*	0.156989*	0.717620	0.0307872	0.290288	0.904092	9040.92	0*	0.000449145*	9042.11
Propane	2588.77*	2590.98	0.936166	0.0614284	3.19883*	0.145652*	0.503797	0.00428076	0.0571477	0.158537	2590.98	0*	1.37767E-05*	2591.97
Isobutane	435.471*	436.231	0.392252	0.00708106	1.15975*	0.0327654*	0.122064	0.000351314	0.00672975	0.270188	436.231	0*	4.06383E-07*	436.630
n-Butane	575.159*	577.223	0.749040	0.0117474	2.82442*	0.0474316*	0.177614	0.000755316	0.0109820	0.571246	577.223	0*	5.97852E-07*	577.983
2,2-Dimethylpropane	0*	0.119598	0.000192702	1.15113E-06	0.119791*	8.99978E-06*	3.77948E-05	3.62272E-08	0.11490E-06	0.000154907	0.119598	0*	2.00674E-11*	0.119791
Isopentane	214.129*	215.744	0.649344	0.00297221	2.26748*	0.0174822*	0.0736169	0.000137722	0.00283449	0.575727	215.744	0*	3.98628E-08*	216.397
n-Pentane	112.304*	114.187	0.468040	0.000598745	2.34449*	0.00940790*	0.0402510	1.14121E-05	0.000857333	0.420589	114.187	0*	2.43306E-09*	114.649
2,2-Dimethylbutane	0*	0.217060	0.00139209	1.06184E-06	0.218453*	1.81331E-05*	7.78828E-05	1.83222E-08	1.04351E-06	0.00131421	0.217060	0*	2.40938E-12*	0.218453
Cyclopentane	0*	0	0	0	0*	0*	0	0	0	0	0	0*	0*	0
2,3-Dimethylbutane	0*	0.360959	0.00312543	4.03849E-06	0.364088*	0.30080E-05*	0.000130696	1.54292E-07	3.88420E-06	0.00299474	0.360959	0*	1.47342E-11*	0.364088
2-Methylpentane	0*	1.84742	0.0177210	1.31837E-05	1.86515*	0.000152450*	0.000669930	3.43292E-07	1.28404E-05	0.0170511	1.84742	0*	2.92509E-11*	1.86515
3-Methylpentane	0*	1.34361	0.0143540	2.39827E-05	1.35799*	0.000111143*	0.000488564	1.48791E-06	2.24948E-05	0.0138654	1.34361	0*	1.33663E-10*	1.35799
n-Hexane	266.385*	265.371	3.66518	0.000911048	2.65210*	0.0225825*	0.965365	1.19384E-05	0.00098109	3.56865	265.371	0*	7.19956E-10*	269.308
Methylcyclopentane	0*	0.774103	0.0106259	2.35894E-05	0.784752*	5.95615E-05*	0.000286655	2.33812E-06	2.12513E-05	0.0103393	0.774103	0*	1.23860E-10*	0.784752
Benzene	0*	0.0716034	0.00114619	0.000202250	0.0729519*	4.36047E-05*	2.68821E-05	0.000183281	1.89687E-05	0.00111931	0.0716034	0*	6.80436E-09*	0.0729519
Cyclohexane	0*	0.606551	0.0122246	4.32010E-05	0.618819*	4.83412E-05*	0.000223357	8.82279E-06	3.43782E-05	0.0120013	0.606551	0*	3.38671E-10*	0.618819
2-Methylhexane	0*	2.77742	0.0864991	1.35088E-05	2.86393*	6.47194E-05*	0.000988788	2.42827E-07	1.32660E-05	0.0855103	2.77742	0*	1.75141E-12*	2.86393
3-Methylhexane	0*	2.28557	0.0792355	1.34373E-05	2.36482*	0.000195342*	0.000816403	2.87348E-07	1.31500E-05	0.0784191	2.28557	0*	6.82113E-12*	2.36482
2,2,4-Trimethylpentane	0*	0	0	0	0*	0*	0	0	0	0	0	0*	0*	0
Heptane	0*	4.16544	0.188373	1.01229E-05	4.35382*	0.000339940*	0.00147011	9.81993E-08	1.00247E-05	0.186903	4.16544	0*	1.70203E-12*	4.35382
Methylcyclohexane	0*	3.06038	0.138845	8.84951E-05	3.19931*	0.000255618*	0.00110745	8.72719E-06	7.97679E-05	0.137738	3.06038	0*	1.54342E-10*	3.19931
Toluene	0*	0.070790	0.0404979	0.00141241	0.749880*	4.50781E-05*	0.000259449	0.00124176	0.000170653	0.0402384	0.070790	0*	1.32566E-08*	0.749880
Octane	0*	1.47107	1.19618	1.40230E-05	1.67069*	0.00106942*	0.00501571	5.82269E-08	1.39648E-05	1.99117	1.47107	0*	2.98009E-13*	1.67069
Ethylbenzene	0*	1.32579	0.234786	0.00224812	1.56282*	8.78971E-05*	0.000465272	0.00194864	0.000299481	0.234321	1.32579	0*	6.9564E-09*	1.56282
m-Xylene	0*	1.10844	0.217132	0.00117241	1.32675*	9.67267E-05*	0.000386980	0.000946925	0.000225485	0.216745	1.10844	0*	4.02697E-09*	1.32675
o-Xylene	0*	2.14050	0.482465	0.00534782	2.62831*	0.000118958*	0.000748697	0.00484701	0.000500813	0.481717	2.14050	0*	1.14062E-08*	2.62831
Nonane	0*	11.8757	5.04786	1.17183E-05	16.9236*	0.000802100*	0.00389365	4.97390E-08	1.16686E-05	5.04397	11.8757	0*	7.53733E-14*	16.9236
C10+	0*	15.6426	73.7694	0.000489950	89.4126*	0.000741063*	0.00471480	6.31102E-05	0.000426839	73.7647	15.6426	0*	6.04185E-12*	89.4126

Process Streams	Gas	HP Separator Gas	HP Separator Oil	HP Separator Water	Oil	Oil W/B	OT Flash Gas	Produced Water	PWT Flash Gas	Sales Oil	Total gas to sale	Water	Water W/B	Well Stream
<b>Properties</b>	Status:	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: Total	From Block:	--	3 Phase Separator	3 Phase Separator	3 Phase Separator	--	--	Condensate Tanks	PW Tanks	PW Tanks	Condensate Tanks	MIX-100	--	MIX-101
	To Block:	MIX-101	MIX-100	Condensate Tanks	PW Tanks	MIX-101	--	--	--	--	--	--	--	3 Phase Separator
<b>Property</b>	Units													
Temperature	°F	85*	70*	70	70	85*	75.9425*	75.94*	75.94	75.94*	75.94	70	85*	75.9425*
Pressure	psig	1000*	192*	192	192	1000*	-2.34830	0*	0	0*	0	192	1000*	-14.2254
Mole Fraction Vapor	%	100	100	0	0	100*	100*	100	0	100	0	100	0	100*
Mole Fraction Light Liquid	%	0	0	100	100	0	0	0	100	0	100	0	100	0
Mole Fraction Heavy Liquid	%	0	0	0	0	0	0	0	0	0	0	0	0	0
Molecular Weight	lb/lbmol	18.6892	18.7099	130.754	18.0158	111.820	38.7294	29.2527	18.0155	19.0923	144.072	18.7099	18.0153	18.2702
Mass Density	lb/ft³	3.90997	0.710823	62.2651	45.3485	0.0841161	0.0753483	62.2224	0.0489657	47.0284	0.710823	62.1852	0.00149646	4.20541
Molar Flow	lbmol/h	2739.38	2745.20	0.693639	20									

Dynamic Viscosity	cP	0.0129850	0.0109501	0.767854	0.995416	0.544862	0.00873853	0.00962340	0.924439	0.0108727	0.912911	0.0109501	0.840378	0.0102182	
Kinematic Viscosity	cSt	0.207323	0.961690	1.02607	0.998019	0.750071	6.48542	7.97323	0.927493	13.8620	1.21185	0.961690	0.843659	426.273	
Thermal Conductivity	Btu/(h*ft <sup>2</sup> *F)	0.0228001	0.0185148	0.0679121	0.346529	0.0673824	0.0114183	0.0142622	0.349785	0.0177363	0.0682214	0.0185148	0.353848	0.0123296	
Surface Tension	lbf/ft			0.001582277	0.005029727	0.000891165			0.004987677		0.00171411		0.00492045		
Net Ideal Gas Heating Value	Btu/ft <sup>3</sup>	1035.24	1034.40	6547.31	0.372298	5618.55	2044.33	1560.25	0.0291799	1012.82	7201.69	1034.40	0	49.4841	964.669
Net Liquid Heating Value	Btu/lb	20980.9	20938.5	18847.7	-1051.53	18900.6	19881.1	20119.2	-1059.11	20056.5	18813.8	20938.5	-1059.76	38.2484	19479.0
Gross Ideal Gas Heating Value	Btu/ft <sup>3</sup>	1144.62	1143.74	7012.34	50.7034	6028.93	2225.90	1707.29	50.3407	1120.83	7708.44	1143.74	50.3101	102.181	1070.04
Gross Liquid Heating Value	Btu/lb	23201.9	23156.3	20197.3	8.64490	20292.4	21660.2	22026.7	0.673562	22203.3	20148.5	23156.3	0	1132.79	21618.7

Process Streams	Gas	HP Separator Gas	HP Separator Oil	HP Separator Water	Oil	Oil W/B	OT Flash Gas	Produced Water	PWT Flash Gas	Sales Oil	Total gas to sale	Water	Water W/B	Well Stream
Composition	Status: Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: Vapor	From Block: --	3 Phase Separator	3 Phase Separator	3 Phase Separator	--	--	Condensate Tanks	PW Tanks	PW Tanks	Condensate Tanks	MIX-100	--	--	MIX-101
	To Block: MIX-101	MIX-100	Condensate Tanks	PW Tanks	MIX-101	--	--	--	--	--	--	--	--	3 Phase Separator

Mole Fraction	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water	0	0.185778			0.00159000	0.739325		3.03294		0.185778		94.3465	0.0732326	
H2S	0	0			0	0		0		0		0	0	
Nitrogen	0.353035	0.352287			0.00483415	0.0685126		0.172076		0.352287		0.00305739	0.352657	
Carbon Dioxide	0.0894341	0.0891957			0.0891034	0.129034		0.736423		0.0891957		0.878472	0.0891901	
Methane	85.5274	85.3456			10.1091	45.2049		79.5457		85.3456		3.93295	85.4317	
Ethane	10.9743	10.9526			44.3292	29.6623		14.0705		10.9526		0.820845	10.9633	
Propane	2.14312	2.14039			28.0454	14.2001		1.88888		2.14039		0.0171690	2.14247	
Isobutane	0.273504	0.273401			4.78645	2.61020		0.168756		0.273401		0.000384227	0.273696	
n-Butane	0.361238	0.361766			6.92893	3.79808		0.275637		0.361766		0.000565256	0.362184	
2,2-Dimethylpropane	0	6.03837E-05			0.00105912	0.000651078		2.25221E-05		6.03837E-05		1.52847E-05	6.04644E-05	
Isopentane	0.108341	0.108927			2.05734	1.26817		0.0572595		0.108927		3.03622E-05	0.109140	
n-Pentane	0.0568216	0.0576520			1.10714	0.693391		0.0118647		0.0576520		1.85318E-06	0.0577863	
2,2-Dimethylbutane	0	9.17534E-05			0.00178661	0.00112328		1.76489E-05		9.17534E-05		1.53644E-09	9.20685E-05	
Cyclopentane	0	0			0	0		0		0		0	0	
2,3-Dimethylbutane	0	0.000152581			0.00295662	0.00188499		6.56930E-05		0.000152581		9.39588E-09	0.000153281	
2-Methylpentane	0	0.000780924			0.0150205	0.00962221		0.000217169		0.000780924		1.86531E-08	0.000784960	
3-Methylpentane	0	0.000567957			0.0109506	0.00704642		0.000380453		0.000567957		7.24823E-08	0.000571198	
n-Hexane	0.112843	0.112175			2.22500	1.39232		0.0152066		0.112175		4.59110E-07	0.113039	
Methylcyclopentane	0	0.000335059			0.0060901	0.00423337		0.000368030		0.000335059		8.38151E-08	0.000337380	
Benzene	0	3.33920E-05			0.000473977	0.000427736		0.000353934		3.33920E-05		4.78701E-06	3.36480E-05	
Cyclohexane	0	0.000262537			0.00487703	0.0029867		0.000595363		0.000262537		2.21141E-07	0.000265365	
2-Methylhexane	0	0.00100970			0.00548402	0.0122647		0.00192959		0.00100970		9.60519E-10	0.00102893	
3-Methylhexane	0	0.000830892			0.0165524	0.0101265		0.000191272		0.000830892		3.74088E-09	0.000848559	
2,2,4-Trimethylpentane	0	0			0	0		0		0		0	0	
Heptane	0	0.00151430			0.0288050	0.0182349		0.000145814		0.00151430		9.33437E-10	0.00155811	
Methylcyclohexane	0	0.00113541			0.0221046	0.0140186		0.00118408		0.00113541		8.63831E-08	0.00116620	
Toluene	0	0.000279898			0.00415399	0.00349979		0.00269944		0.000279898		7.90651E-06	0.000289354	
Octane	0	0.00469119			0.0794903	0.0545743		0.000178181		0.00469119		1.43367E-10	0.00513766	
Ethylbenzene	0	0.000454903			0.00702965	0.00544698		0.00411140		0.000454903		3.60557E-06	0.000509076	
m-Xylene	0	0.000380327			0.00773581	0.00453041		0.00309554		0.000380327		2.08445E-06	0.000430632	
o-Xylene	0	0.000734445			0.00951376	0.00876506		0.00687537		0.000734445		5.90410E-06	0.000846214	
Nonane	0	0.00337296			0.0531000	0.0377322		0.000132600		0.00337296		3.22951E-11	0.00442509	
C10+	0	0.00351740			0.0388402	0.0361725		0.00384017		0.00351740		2.04951E-09	0.0131424	

Molar Flow	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h
Water	0	5.09998			1.87265E-07	0.000594847		0.00208096		5.09998		0.00171685	2.0815	
H2S	0	0			0	0		0		0		0	0	
Nitrogen	9.67097	9.67098			5.69350E-07	5.51240E-05		0.000118065		9.67098		5.56361E-08	9.67040	
Carbon Dioxide	2.44994	2.44860			1.04943E-05	0.000103818		0.000505273		2.44860		1.59858E-05	2.44573	
Methane	2342.92	2342.91			0.00119062	0.0363710		0.0545778		2342.91		7.15689E-05	2342.67	
Ethane	300.628	300.672			0.00522094	0.0238658		0.00965405		300.672		1.49371E-05	300.630	
Propane	58.7082	58.7581			0.00330309	0.0114251		0.00129599		58.7581		3.12429E-07	58.7499	
Isobutane	7.49233	7.50541			0.000563733	0.00210012		0.000115786		7.50541		6.99187E-09	7.50518	
n-Butane	9.89568	9.93119			0.000816066	0.00305587		0.000189120		9.93119		1.02861E-08	9.93165	
2,2-Dimethylpropane	0	0.00165765			1.24739E-07	5.23845E-07		1.54528E-08		0.00165765		2.78139E-13	0.00165803	
Isopentane	2.96788	2.99027			0.000242307	0.00102035		3.92868E-05		2.99027		5.52509E-10	2.99280	
n-Pentane	1.55656	1.58266			0.000130396	0.000557889		8.14058E-06		1.58266		3.37229E-11	1.58459	
2,2-Dimethylbutane	0	0.00251882			2.10421E-07	9.03772E-07		1.21092E-08		0.00251882		2.79590E-14	0.00252466	
Cyclopentane	0	0			0	0		0		0		0	0	
2,3-Dimethylbutane	0	0.00418866			3.48221E-07	1.51662E-06		4.50732E-08		0.00418866		1.70979E-13	0.00420321	
2-Methylpentane	0	0.0214379			1.76907E-06	7.77403E-06		1.49003E-07		0.0214379		3.39434E-13	0.0215248	
3-Methylpentane	0	0.0155916			1.28973E-06	5.66942E-06		2.61035E-07		0.0155916		1.31898E-12	0.0156632	
n-Hexane	3.09120	3.07944			0.000262053	0.00112023		1.04335E-05		3.07944		8.35454E-12	3.09970	
Methylcyclopentane	0	0.00919805			7.07721E-07	3.40609E-06		2.52512E-07		0.00919805		1.52521E-12	0.00925151	
Benzene	0	0.000916678			5.58234E-08	3.44148E-07		2.42841E-07		0.000916678		8.71105E-11	0.000922682	
Cyclohexane	0	0.00720716			5.74400E-07	2.65397E-06		4.08489E-07		0.00720716		4.02416E-12	0.00727672	
2-Methylhexane	0	0.0277182			6.45890E-07	9.86795E-06		1.32393E-07		0.0277182		1.74788E-14	0.0282149	
3-Methylhexane	0	0.0228097			1.94948E-06	8.14758E-06		1.31235E-07		0.0228097		6.80738E-14	0.0232688	
2,2,4-Trimethylpentane	0	0			0	0		0		0		0	0	
Heptane	0	0.0415705			3.39255E-06	1.46715E-05		1.00045E-07		0.0415705		1.69860E-14	0.0427258	
Methylcyclohexane	0	0.0311692			2.60341E-06	1.12791E-05		8.12416E-07		0.0311692		1.57194E-12	0.0319792	
Toluene	0	0.00768377			4.89243E-07	2.81587E-06		1.85213E-06		0.00768377		1.43877E-10	0.00793455	
Octane	0	0.128783			9.36211E-06	4.39095E-05		1.2253E-07		0.128783		2.60889E-15	0.140883	
Ethylbenzene	0	0.0124880			8.27930E-07	4.382								





Std Vapor Volumetric Flow	MMSCFD	24.9493	25.0022	0.000107266	0.000732782	0.000624890	25.0022	1.65734E-05	24.9745
Std Liquid Volumetric Flow	sgpm	317.791	318.184	0.00202744	0.0116927	0.00790832	318.184	7.37876E-05	318.172
Compressibility		0.829765	0.987134	0.989080	0.992609	0.996899	0.995134	0.999551	0.827488
Specific Gravity		0.645286	0.646001	1.33722	1.01002	0.659204	0.646001	0.630820	0.646587
API Gravity									
Enthalpy	Btu/h	-9.23544E+07	-9.17237E+07	-500.530	-3109.64	-2481.75	-9.17237E+07	-184.067	-9.26872E+07
Mass Enthalpy	Btu/lb	-1803.91	-1785.82	-1097.31	-1321.22	-1894.53	-1785.82	-536.39	-1804.94
Mass Cp	Btu/(lb*°F)	0.657226	0.520605	0.412059	0.438384	0.490012	0.520605	0.446110	0.658345
Ideal Gas CpCv Ratio		1.26926	1.27299	1.14305	1.18434	1.27062	1.27299	1.32229	1.26911
Dynamic Viscosity	cP	0.0129850	0.0109501	0.00873853	0.00962340	0.0108727	0.0109501	0.0102182	0.0129815
Kinematic Viscosity	cSt	0.207323	0.961690	6.48542	7.97323	13.8620	0.961690	426.273	0.205819
Thermal Conductivity	Btu/(h*ft*°F)	0.0228001	0.0185148	0.0114183	0.0142622	0.0177363	0.0185148	0.0123296	0.0227650
Surface Tension	lbf/ft								
Net Ideal Gas Heating Value	Btu/ft³	1035.24	1034.40	2044.33	1560.25	1012.82	1034.40	49.4841	1036.36
Net Liquid Heating Value	Btu/lb	20980.9	20938.5	19881.1	20119.2	20056.5	20938.5	38.2484	20960.3
Gross Liquid Gas Heating Value	Btu/ft³	1144.62	1143.74	2225.90	1707.29	1120.83	1143.74	102.181	1145.82
Gross Liquid Heating Value	Btu/lb	23201.9	23156.3	21660.2	22026.7	22203.3	23156.3	1132.79	23178.5

Process Streams	Gas	HP Separator Gas	HP Separator Oil	HP Separator Water	Oil	Oil W/B	OT Flash Gas	Produced Water	PWT Flash Gas	Sales Oil	Total gas to sale	Water	Water W/B	Well Stream
Composition	Status: Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: Light Liquid	From Block: --	3 Phase Separator	3 Phase Separator	3 Phase Separator	--	--	Condensate Tanks	PW Tanks	PW Tanks	Condensate Tanks	MIX-100	--	--	MIX-101
	To Block:	MIX-101	MIX-100	Condensate Tanks	PW Tanks	MIX-101	--	--	--	--	--	MIX-101	--	3 Phase Separator
Mole Fraction	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water			0.116280		99.9643				99.9971		0.0345276		100	0.129628
H2S			0		0				0		0		0	0
Nitrogen			0.00804384		6.03109E-05		0.013		2.01470E-06		0.000109470		0	0.0420062
Carbon Dioxide			0.0165120		0.000606231		0		0.000356863		0.00174758		0	0.0556437
Methane			5.42591		0.0288642		5.429		0.00191599		0.206336		0	22.8812
Ethane			4.20077		0.00527245		5.67		0.000505734		0.859850		0	11.7816
Propane			3.06072		0.000687858		4.895		4.79510E-05		1.59908		0	6.19329
Isobutane			0.972947		6.01564E-05		1.346		2.98556E-06		0.758115		0	1.53439
n-Butane			1.85793		9.97984E-05		3.278		6.41887E-06		1.60335		0	2.72946
2,2-Dimethylpropane			0.000385055		7.87807E-09		0.112		2.48015E-10		0.000350149		0	0.000507835
Isopentane			1.29751		2.03412E-05		2.12		9.42861E-07		1.30136		0	1.43343
n-Pentane			0.920846		4.09768E-06		2.192		7.81282E-08		0.950692		0	0.988564
2,2-Dimethylbutane			0.00232891		6.08415E-09		0.171		1.05019E-10		0.00248710		0	0.00228716
Cyclopentane			0		0		0		0		0		0	0
2,3-Dimethylbutane			0.00522870		2.31399E-08		0.285		8.84366E-10		0.00566744		0	0.00481837
2-Methylpentane			0.0296464		7.55405E-08		1.46		1.96767E-09		0.0322686		0	0.0263428
3-Methylpentane			0.0240135		1.37417E-07		1.063		8.52836E-09		0.0262398		0	0.0210720
n-Hexane			6.13167		5.22015E-06		2.076		6.84284E-08		6.75354		0	4.94166
Methylcyclopentane			0.0182025		1.38401E-07		0.629		1.37226E-08		0.0200354		0	0.0161506
Benzene			0.00211547		1.27849E-06		0.063		1.15897E-08		0.00233692		0	0.00188746
Cyclohexane			0.0209410		2.53464E-07		0.496		5.17816E-08		0.0232560		0	0.0168020
2-Methylhexane			0.124452		6.65681E-08		1.928		1.19700E-09		0.139172		0	0.0813458
3-Methylhexane			0.114001		6.62160E-08		1.592		1.41646E-09		0.127631		0	0.0735878
2,2,4-Trimethylpentane			0		0		0		0		0		0	0
Heptane			0.271024		4.98834E-08		2.931		4.84066E-10		0.304194		0	1.60812
Methylcyclohexane			0.203867		4.45035E-07		2.198		4.39033E-08		0.228778		0	0.134095
Toluene			0.0633662		7.56912E-06		0.549		6.65685E-06		0.0712215		0	0.0423323
Octane			2.51937		6.06166E-08		9.866		2.51780E-10		2.84279		0	1.19287
Ethylbenzene			0.318829		1.04559E-05		0.993		9.06614E-06		0.359949		0	0.165765
m-Xylene			0.294855		5.45285E-06		0.843		4.40562E-06		0.332950		0	0.151063
o-Xylene			0.655165		2.48726E-05		1.67		2.25510E-05		0.739982		0	0.336944
Nonane			5.67412		4.51144E-08		8.901		1.91555E-10		6.41370		0	2.35443
C10+			65.6489		1.49335E-06		37.231		1.92423E-07		74.2583		0	42.5060
Molar Flow	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h
Water			0.00806564		202.451		0		202.449		0.000211717		207.552	0.000584130
H2S			0		0		0		0		0		0	0
Nitrogen			5.57953E-05		0.000122144		0.000192718		4.07885E-06		6.71252E-07		0	0.000189289
Carbon Dioxide			0.000114534		0.00122776		0		0.000722486		1.07159E-05		0	0.000250742
Methane			0.0376362		0.0584568		0.0804820		0.00387901		0.00126521		0	0.103108
Ethane			0.0291382		0.0106779		0.0840547		0.00102388		0.00527244		0	0.0530902
Propane			0.0212304		0.00139307		0.0725657		9.70790E-05		0.00980526		0	0.0279083
Isobutane			0.00674874		0.000121831		0.0199537		6.04441E-06		0.00464862		0	0.00691428
n-Butane			0.0128873		0.000202115		0.0485946		1.29953E-05		0.00983146		0	0.0122995
2,2-Dimethylpropane			2.67089E-06		1.59549E-08		0.00166034		5.02118E-10		2.14705E-06		0	2.28841E-06
Isopentane			0.00900007		4.11956E-05		0.0314279		1.90887E-06		0.00797972		0	0.00645934
n-Pentane			0.00638735		8.29876E-06		0.0324952		1.58174E-07		0.00582946		0	0.00445468
2,2-Dimethylbutane			1.61542E-05		1.23218E-08		0.00253498		1.22616E-10		1.52504E-05		0	1.30306E-05
Cyclopentane			0		0		0		0		0		0	0
2,3-Dimethylbutane			3.62683E-05		4.68636E-08		0.00422497		1.79044E-09		3.47517E-05		0	2.17126E-05
2-Methylpentane			0.000205639		1.52987E-07		0.0216437		3.98364E-09		0.000197865		0	0.000118706
3-Methylpentane			0.000166567		2.78301E-07		0.0157584		1.72661E-08		0.000160898		0	9.49548E-05
n-Hexane			0.0425317		1.05720E-05		0.0307756		1.38536E-07		0.0414114		0	0.0222682
Methylcyclopentane			0.000126259		2.80294E-07		0.00932459		2.77820E-08		0.000122853		0	7.27781E-05
Benzene			1.46737E-05		2.58923E-06		0.000933941		2.34639E-06		1.43296E-05		0	8.50527E-06
Cyclohexane			0.000145255		5.13323E-07		0.00735293		1.04834E-07		0.000142601		0	7.57133E-05
2-Methylhexane			0.000863247		1.34816E-07		0.0285816		2.42338E-09		0.000853390		0	0.000366561
3-Methylhexane			0.000790758		1.34103E-07		0.0236005		2.86769E-09		0.000782610		0	0.000331602
2,2,4-Trimethylpentane			0		0		0		0		0		0	0
Heptane			0.00187993		1.01025E-07		0.0434505		9.80014E-10		0.00186526		0	0.000724653
Methylcyclohexane			0.00141410		9.01300E-07		0.0325842		8.88842E-08		0.00140282		0	0.000604261

Toluene	0.000439533	1.53292E-05	0.00813863	1.34771E-05	0.000436717	0	0.000190758
Octane	0.0174754	1.22763E-07	0.146258	5.09740E-10	0.0174315	0	0.00537531
Ethylbenzene	0.00221152	2.11757E-05	0.0147207	1.83548E-05	0.00220714	0	0.000746971
m-Xylene	0.00204523	1.10433E-05	0.0124970	8.91937E-06	0.00204159	0	0.000880720
o-Xylene	0.00454448	5.03727E-05	0.0247569	4.56554E-05	0.00453743	0	0.00151834
Nonane	0.0393580	9.13672E-08	0.131953	3.87813E-10	0.0393276	0	0.0106095
C10+	0.455367	3.02438E-06	0.551930	3.89569E-07	0.455338	0	0.191541

Mass Fraction	%	%	%	%	%	%	%
Water	0.0160211	99.9613	0	99.9962	0.00431745	100	0.0251138
H2S	0	0	0	0	0	0	0
Nitrogen	0.00172336	9.37795E-05	0.00325680	3.13279E-06	2.12854E-05	0	0.0126547
Carbon Dioxide	0.00555766	0.00148092	0	0.000871772	0.000533832	0	0.0263352
Methane	0.665716	0.0257026	0.778883	0.00170616	0.0229755	0	3.94752
Ethane	0.966037	0.00879990	1.52470	0.000844106	0.179458	0	3.80975
Propane	1.03220	0.00168361	1.93032	0.000117368	0.489424	0	2.93691
Isobutane	0.432491	0.000194075	0.699630	9.63215E-06	0.305842	0	0.959073
n-Butane	0.825880	0.000321967	1.70385	2.07088E-05	0.646831	0	1.70605
2,2-Dimethylpropane	0.000212470	3.15497E-08	0.0722651	9.93258E-10	0.000175348	0	0.000394027
Isopentane	0.715956	8.14613E-05	1.36788	3.77600E-06	0.651699	0	1.11219
n-Pentane	0.508115	1.64102E-05	1.41433	3.12890E-07	0.476089	0	0.767022
2,2-Dimethylbutane	0.00153490	2.91024E-08	0.131783	5.02349E-10	0.00148763	0	0.00211960
Cyclopentane	0	0	0	0	0	0	0
2,3-Dimethylbutane	0.00344606	1.10685E-07	0.219639	4.23029E-09	0.00338992	0	0.00446537
2-Methylpentane	0.0195389	3.61334E-07	1.12517	9.41220E-09	0.0193012	0	0.0244129
3-Methylpentane	0.0158265	6.57309E-07	0.819215	4.07947E-08	0.0156951	0	0.0195282
n-Hexane	4.04117	2.49697E-05	1.59990	3.27321E-07	4.03956	0	4.57963
Methylcyclopentane	0.0117160	6.46529E-07	0.473408	6.41052E-08	0.0117036	0	0.0146173
Benzene	0.00126377	5.54319E-06	0.0440087	5.02510E-06	0.00126701	0	0.00158551
Cyclohexane	0.0134787	1.18404E-06	0.373307	2.41899E-07	0.0135849	0	0.0152068
2-Methylhexane	0.0953725	3.70245E-07	1.72769	6.65770E-09	0.0967942	0	0.0876568
3-Methylhexane	0.0873638	3.68286E-07	1.42660	7.87836E-09	0.0887672	0	0.0792969
2,2,4-Trimethylpentane	0	0	0	0	0	0	0
Heptane	0.207897	2.77448E-07	2.62648	2.69238E-09	0.211566	0	0.173288
Methylcyclohexane	0.153089	2.42544E-06	1.93001	2.39277E-07	0.155914	0	0.141591
Toluene	0.0446523	3.87108E-05	0.452371	3.40459E-05	0.0455482	0	0.0419456
Octane	2.20096	3.84337E-07	10.0785	1.59643E-09	2.25392	0	1.46535
Ethylbenzene	0.258871	6.16156E-05	0.942784	5.34267E-05	0.265242	0	0.189255
m-Xylene	0.239406	3.21330E-05	0.800370	2.59623E-05	0.245347	0	0.172470
o-Xylene	0.531959	0.000146571	1.58555	0.000132893	0.545284	0	0.384692
Nonane	5.56569	3.21171E-07	10.2093	1.36372E-09	5.70956	0	3.24739
C10+	81.3370	1.34284E-05	53.9388	1.73032E-06	83.4987	0	74.0525

Mass Flow	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h
Water	0.0145305	3647.21	0	3647.17	0.00361414	3739.10	0.0105233
H2S	0	0	0	0	0	0	0
Nitrogen	0.00156301	0.00342166	0.00539869	0.000114262	1.88041E-05	0	0.00530262
Carbon Dioxide	0.00504058	0.0540330	0	0.0317962	0.000471599	0	0.0110350
Methane	0.603778	0.937790	1.29113	0.0622288	0.0202971	0	1.65410
Ethane	0.876157	0.321075	2.52744	0.0307872	0.158537	0	1.59637
Propane	0.936166	0.0614284	3.19983	0.00428076	0.432369	0	1.23063
Isobutane	0.392252	0.00708106	1.15975	0.000351314	0.270188	0	0.401873
n-Butane	0.749040	0.0117474	2.82442	0.000755316	0.571426	0	0.714874
2,2-Dimethylpropane	0.000192702	1.15113E-06	0.119791	3.62272E-08	0.000154907	0	0.000165106
Isopentane	0.649344	0.00297221	2.26748	0.000137722	0.575277	0	0.466033
n-Pentane	0.460840	0.000598745	2.34449	1.14121E-05	0.420589	0	0.321399
2,2-Dimethylbutane	0.00139209	1.06184E-06	0.218453	1.83222E-08	0.00131421	0	0.000888159
Cyclopentane	0	0	0	0	0	0	0
2,3-Dimethylbutane	0.00312543	4.03849E-06	0.364088	1.54292E-07	0.00299474	0	0.00187109
2-Methylpentane	0.0177210	1.31837E-05	1.86515	3.43292E-07	0.0170511	0	0.0102295
3-Methylpentane	0.0143540	2.39827E-05	1.35799	1.48791E-06	0.0138654	0	0.00818276
n-Hexane	3.66518	0.000911048	2.65210	1.19384E-05	3.58665	0	1.91897
Methylcyclopentane	0.0106259	2.35894E-05	0.784752	2.33812E-06	0.0103393	0	0.00612497
Benzene	0.00114619	0.000202250	0.0729519	0.000183281	0.00111931	0	0.000664362
Cyclohexane	0.0122246	4.32010E-05	0.618819	8.82279E-06	0.0120013	0	0.00637199
2-Methylhexane	0.0864991	1.35088E-05	2.86393	2.42827E-07	0.0855103	0	0.0367302
3-Methylhexane	0.0792355	1.34373E-05	2.36482	2.87348E-07	0.0784191	0	0.0332272
2,2,4-Trimethylpentane	0	0	0	0	0	0	0
Heptane	0.188373	1.01229E-05	4.35382	9.81993E-08	0.186903	0	0.0726117
Methylcyclohexane	0.138845	8.84951E-05	3.19931	8.72719E-06	0.137738	0	0.0593300
Toluene	0.0404979	0.00141241	0.749880	0.00124176	0.0402384	0	0.015762
Octane	1.99618	1.40230E-05	16.7069	5.82269E-08	1.99117	0	0.614014
Ethylbenzene	0.234786	0.00224812	1.56282	0.00194864	0.234321	0	0.0793021
m-Xylene	0.217132	0.00117241	1.32675	0.000946925	0.216745	0	0.0722686
o-Xylene	0.482465	0.00534782	2.62831	0.00484701	0.481717	0	0.161195
Nonane	5.04786	1.17183E-05	16.9236	4.97390E-08	5.04397	0	1.36073
C10+	73.7694	0.000489950	89.4126	6.31102E-05	73.7647	0	31.0297

Process Streams	Gas	HP Separator Gas	HP Separator Oil	HP Separator Water	Oil	Oil W/B	OT Flash Gas	Produced Water	PWT Flash Gas	Sales Oil	Total gas to sale	Water	Water W/B	Well Stream
<b>Properties</b>	Status: Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: Light Liquid	From Block: --	3 Phase Separator	3 Phase Separator	3 Phase Separator	Oil	--	Condensate Tanks	PW Tanks	PW Tanks	Condensate Tanks	MIX-100	--	--	MIX-101
	To Block: MIX-101	MIX-100	Condensate Tanks	PW Tanks	MIX-101	--	--	--	--	--	--	MIX-101	--	3 Phase Separator
<b>Property</b>	Units													
Temperature	°F		70	70	85			75.94		75.94		85		83.7791
Pressure	psig		192	192	1000			0		0		1000		1000









Methylcyclohexane	0.0594034
Toluene	0.0188040
Octane	0.614023
Ethylbenzene	0.0807949
m-Xylene	0.0730862
o-Xylene	0.164802
Nonane	1.36073
C10+	31.0301

Process Streams	Gas	HP Separator Gas	HP Separator Oil	HP Separator Water	Oil	Oil W/B	OT Flash Gas	Produced Water	PWT Flash Gas	Sales Oil	Total gas to sale	Water	Water W/B	Well Stream	
<b>Properties</b>	Status:	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	
Phase: <b>Mixed Liquid</b>	From Block:	--	3 Phase Separator	3 Phase Separator	3 Phase Separator	--	--	Condensate Tanks	PW Tanks	PW Tanks	Condensate Tanks	MIX-100	--	--	MIX-101
	To Block:	MIX-101	MIX-100	Condensate Tanks	PW Tanks	MIX-101	--	--	--	--	--	MIX-101	--	3 Phase Separator	
<b>Property</b>	<b>Units</b>														
Temperature	°F	83.7791													
Pressure	psig	1000													
Mole Fraction Vapor	%	0													
Mole Fraction Light Liquid	%	0.218473													
Mole Fraction Heavy Liquid	%	99.7815													
Molecular Weight	lb/lbmol	18.1796													
Mass Density	lb/ft³	61.8059													
Molar Flow	lbmol/h	206.259													
Mass Flow	lb/h	3749.72													
Vapor Volumetric Flow	ft³/h	60.6693													
Liquid Volumetric Flow	gpm	7.56396													
Std Vapor Volumetric Flow	MMSCFD	1.87853													
Std Liquid Volumetric Flow	sgpm	7.55693													
Compressibility		0.0511763													
Specific Gravity		0.990971													
API Gravity		10.7468													
Enthalpy	Btu/h	-2.52703E+07													
Mass Enthalpy	Btu/lb	-6739.26													
Mass Cp	Btu/(lb*°F)	0.975289													
Ideal Gas CpCv Ratio		1.32188													
Dynamic Viscosity	cP	0.836117													
Kinematic Viscosity	cSt	0.844533													
Thermal Conductivity	Btu/(h*ft*°F)	0.346902													
Surface Tension	lb/ft	0.004854647													
Net Ideal Gas Heating Value	Btu/ft³	11.5321													
Net Liquid Heating Value	Btu/lb	-807.523													
Gross Ideal Gas Heating Value	Btu/ft³	62.5602													
Gross Liquid Heating Value	Btu/lb	257.644													

**FESCO, Ltd.**  
**1100 FESCO Avenue - Alice, Texas 78332**

**For:** Antero Resources Appalachian Corp.  
 1625 17th Street  
 Denver, Colorado 80202

**Sample:** Moore No. 1H  
 Separator Hydrocarbon Liquid  
 Sampled @ 200 psig & 71 °F

Date Sampled: 09/25/13

Job Number: 35844.002

**CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2186-M**

COMPONENT	MOL %	LIQ VOL %	WT %
Nitrogen	0.013	0.003	0.003
Carbon Dioxide	0.000	0.000	0.000
Methane	5.429	1.872	0.782
Ethane	5.670	3.086	1.531
Propane	4.895	2.744	1.938
Isobutane	1.346	0.896	0.702
n-Butane	3.278	2.103	1.711
2,2 Dimethylpropane	0.112	0.087	0.072
Isopentane	2.120	1.578	1.374
n-Pentane	2.192	1.617	1.420
2,2 Dimethylbutane	0.171	0.146	0.133
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.285	0.238	0.221
2 Methylpentane	1.460	1.234	1.130
3 Methylpentane	1.063	0.883	0.822
n-Hexane	2.076	1.737	1.606
Heptanes Plus	<u>69.889</u>	<u>81.775</u>	<u>86.555</u>
Totals:	100.000	100.000	100.000

**Characteristics of Heptanes Plus:**

Specific Gravity -----	0.7602	(Water=1)
°API Gravity -----	54.63	@ 60°F
Molecular Weight -----	137.9	
Vapor Volume -----	17.49	CF/Gal
Weight -----	6.33	Lbs/Gal

**Characteristics of Total Sample:**

Specific Gravity -----	0.7182	(Water=1)
°API Gravity -----	65.51	@ 60°F
Molecular Weight -----	111.4	
Vapor Volume -----	20.47	CF/Gal
Weight -----	5.98	Lbs/Gal

Base Conditions: 14.850 PSI &amp; 60 °F

Certified: FESCO, Ltd. - Alice, Texas

Analyst: XG  
 Processor: JCdjv  
 Cylinder ID: W-1570

\_\_\_\_\_  
 David Dannhaus 361-661-7015



**TANKS DATA INPUT REPORT**

COMPONENT	Mol %	LiqVol %	Wt %
Carbon Dioxide	0.000	0.000	0.000
Nitrogen	0.013	0.003	0.003
Methane	5.429	1.872	0.782
Ethane	5.670	3.086	1.531
Propane	4.895	2.744	1.938
Isobutane	1.346	0.896	0.702
n-Butane	3.390	2.190	1.783
Isopentane	2.120	1.578	1.374
n-Pentane	2.192	1.617	1.420
Other C-6's	2.980	2.501	2.306
Heptanes	7.576	6.844	6.648
Octanes	12.065	11.665	11.797
Nonanes	8.901	9.909	10.137
Decanes Plus	37.229	50.209	54.133
Benzene	0.063	0.036	0.045
Toluene	0.549	0.374	0.454
E-Benzene	0.993	0.780	0.947
Xylenes	2.513	1.958	2.395
n-Hexane	2.076	1.737	1.606
2,2,4 Trimethylpentane	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>
Totals:	100.000	100.000	100.000

**Characteristics of Total Sample:**

Specific Gravity -----	0.7182 (Water=1)
°API Gravity -----	65.51 @ 60°F
Molecular Weight-----	111.4
Vapor Volume -----	20.47 CF/Gal
Weight -----	5.98 Lbs/Gal

**Characteristics of Decanes (C10) Plus:**

Specific Gravity -----	0.7744 (Water=1)
Molecular Weight-----	162.0

**Characteristics of Atmospheric Sample:**

°API Gravity -----	58.66 @ 60°F
Reid Vapor Pressure (ASTM D-5191)-----	1.65 psi

QUALITY CONTROL CHECK			
	Sampling Conditions	Test Samples	
Cylinder Number	-----	W-1570*	----
Pressure, PSIG	200	192	----
Temperature, °F	71	70	----

\* Sample used for analysis

## TOTAL EXTENDED REPORT

COMPONENT	Mol %	LiqVol %	Wt %
Nitrogen	0.013	0.003	0.003
Carbon Dioxide	0.000	0.000	0.000
Methane	5.429	1.872	0.782
Ethane	5.670	3.086	1.531
Propane	4.895	2.744	1.938
Isobutane	1.346	0.896	0.702
n-Butane	3.278	2.103	1.711
2,2 Dimethylpropane	0.112	0.087	0.072
Isopentane	2.120	1.578	1.374
n-Pentane	2.192	1.617	1.420
2,2 Dimethylbutane	0.171	0.146	0.133
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.285	0.238	0.221
2 Methylpentane	1.460	1.234	1.130
3 Methylpentane	1.063	0.883	0.822
n-Hexane	2.076	1.737	1.606
Methylcyclopentane	0.629	0.453	0.475
Benzene	0.063	0.036	0.045
Cyclohexane	0.496	0.344	0.375
2-Methylhexane	1.928	1.824	1.735
3-Methylhexane	1.592	1.487	1.432
2,2,4 Trimethylpentane	0.000	0.000	0.000
Other C-7's	0.623	0.570	0.555
n-Heptane	2.308	2.167	2.076
Methylcyclohexane	2.198	1.798	1.938
Toluene	0.549	0.374	0.454
Other C-8's	7.225	7.113	7.150
n-Octane	2.641	2.754	2.709
E-Benzene	0.993	0.780	0.947
M & P Xylenes	0.843	0.666	0.804
O-Xylene	1.670	1.292	1.591
Other C-9's	6.223	6.843	7.054
n-Nonane	2.678	3.066	3.083
Other C-10's	8.998	10.873	11.414
n-decane	2.504	3.128	3.199
Undecanes(11)	9.521	11.804	12.566
Dodecanes(12)	6.162	8.252	8.907
Tridecanes(13)	3.969	5.699	6.237
Tetradecanes(14)	2.330	3.584	3.976
Pentadecanes(15)	1.359	2.238	2.513
Hexadecanes(16)	0.796	1.402	1.587
Heptadecanes(17)	0.538	1.001	1.144
Octadecanes(18)	0.366	0.717	0.825
Nonadecanes(19)	0.238	0.486	0.562
Eicosanes(20)	0.164	0.348	0.405
Heneicosanes(21)	0.099	0.222	0.259
Docosanes(22)	0.065	0.150	0.177
Tricosanes(23)	0.049	0.118	0.139
Tetracosanes(24)	0.031	0.078	0.093
Pentacosanes(25)	0.013	0.033	0.040
Hexacosanes(26)	0.009	0.023	0.027
Heptacosanes(27)	0.006	0.015	0.019
Octacosanes(28)	0.005	0.015	0.018
Nonacosanes(29)	0.003	0.010	0.012
Triacontanes(30)	0.001	0.003	0.004
Hentriacontanes Plus(31+)	<u>0.002</u>	<u>0.008</u>	<u>0.010</u>
Total	100.000	100.000	100.000



**FESCO, Ltd.**  
**1100 Fesco Avenue - Alice, Texas 78332**

**For:** Antero Resources Appalachian Corp.  
 1625 17th Street  
 Denver, Colorado 80202

**Date Sampled:** 09/25/13

**Date Analyzed:** 10/02/13

**Sample:** Morre No. 1H

**Job Number:** J35844

FLASH LIBERATION OF HYDROCARBON LIQUID		
	Separator HC Liquid	Stock Tank
Pressure, psig	200	0
Temperature, °F	71	70
Gas Oil Ratio (1)	-----	139
Gas Specific Gravity (2)	-----	1.149
Separator Volume Factor (3)	1.0837	1.000

STOCK TANK FLUID PROPERTIES	
Shrinkage Recovery Factor (4)	0.9228
Oil API Gravity at 60 °F	58.66
Reid Vapor Pressure, psi (5)	1.65

Quality Control Check			
	Sampling Conditions	Test Samples	
Cylinder No.	-----	W-1570*	----
Pressure, psig	200	192	----
Temperature, °F	71	70	----

(1) - Scf of flashed vapor per barrel of stock tank oil

(2) - Air = 1.000

(3) - Separator volume / Stock tank volume

(4) - Fraction of first stage separator liquid

(5) - Absolute pressure at 100 deg F

Analyst: \_\_\_\_\_ M. G.

\* Sample used for flash study

**Base Conditions: 14.85 PSI & 60 °F**

Certified: FESCO, Ltd.     -     Alice, Texas

\_\_\_\_\_  
 David Dannhaus    361-661-7015

**FESCO, Ltd.**  
**1100 Fesco Ave. - Alice, Texas 78332**

**For:** Antero Resources Appalachian Corp.  
 1625 17th Street  
 Denver, Colorado 80202

**Sample:** Morre No. 1H  
 Gas Evolved from Hydrocarbon Liquid Flashed  
 From 200 psig & 71 °F to 0 psig & 70 °F

Date Sampled: 09/25/13

Job Number: 35844.001

**CHROMATOGRAPH EXTENDED ANALYSIS - SUMMATION REPORT**

<b>COMPONENT</b>	<b>MOL%</b>	<b>GPM</b>
Hydrogen Sulfide*	< 0.001	
Nitrogen	0.054	
Carbon Dioxide	0.117	
Methane	35.770	
Ethane	31.071	8.375
Propane	18.617	5.169
Isobutane	3.229	1.065
n-Butane	5.838	1.855
2-2 Dimethylpropane	0.101	0.039
Isopentane	1.708	0.630
n-Pentane	1.353	0.494
Hexanes	1.101	0.457
Heptanes Plus	<u>1.041</u>	<u>0.471</u>
Totals	100.000	18.556

**Computed Real Characteristics Of Heptanes Plus:**

Specific Gravity ----- 3.643 (Air=1)  
 Molecular Weight ----- 104.45  
 Gross Heating Value ----- 5573 BTU/CF

**Computed Real Characteristics Of Total Sample:**

Specific Gravity ----- 1.149 (Air=1)  
 Compressibility (Z) ----- 0.9899  
 Molecular Weight ----- 32.94  
 Gross Heating Value  
 Dry Basis ----- 1951 BTU/CF  
 Saturated Basis ----- 1918 BTU/CF

\*Hydrogen Sulfide tested in laboratory by: Stained Tube Method (GPA 2377)

Results: 0.063 Gr/100 CF, 1.0 PPMV or 0.0001 Mol %

Base Conditions: 14.850 PSI & 60 Deg F

Certified: FESCO, Ltd. - Alice, Texas

Analyst: MR  
 Processor: ANB  
 Cylinder ID: FL# 15 S

David Dannhaus 361-661-7015

**CHROMATOGRAPH EXTENDED ANALYSIS  
TOTAL REPORT**

COMPONENT	MOL %	GPM	WT %
Hydrogen Sulfide*	< 0.001		< 0.001
Nitrogen	0.054		0.046
Carbon Dioxide	0.117		0.156
Methane	35.770		17.417
Ethane	31.071	8.375	28.359
Propane	18.617	5.169	24.919
Isobutane	3.229	1.065	5.697
n-Butane	5.838	1.855	10.300
2,2 Dimethylpropane	0.101	0.039	0.221
Isopentane	1.708	0.630	3.741
n-Pentane	1.353	0.494	2.963
2,2 Dimethylbutane	0.063	0.027	0.165
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.081	0.033	0.212
2 Methylpentane	0.363	0.152	0.950
3 Methylpentane	0.229	0.094	0.599
n-Hexane	0.365	0.151	0.955
Methylcyclopentane	0.034	0.012	0.087
Benzene	0.010	0.003	0.024
Cyclohexane	0.050	0.017	0.128
2-Methylhexane	0.110	0.052	0.335
3-Methylhexane	0.110	0.050	0.335
2,2,4 Trimethylpentane	0.000	0.000	0.000
Other C7's	0.119	0.052	0.358
n-Heptane	0.120	0.056	0.365
Methylcyclohexane	0.101	0.041	0.301
Toluene	0.023	0.008	0.064
Other C8's	0.177	0.083	0.592
n-Octane	0.039	0.020	0.135
Ethylbenzene	0.002	0.001	0.006
M & P Xylenes	0.014	0.005	0.045
O-Xylene	0.002	0.001	0.006
Other C9's	0.074	0.038	0.284
n-Nonane	0.015	0.009	0.058
Other C10's	0.031	0.018	0.133
n-Decane	0.004	0.002	0.017
Undecanes (11)	<u>0.006</u>	<u>0.004</u>	<u>0.027</u>
Totals	100.000	18.556	100.000

**Computed Real Characteristics Of Total Sample:**

Specific Gravity -----	1.149	(Air=1)
Compressibility (Z) -----	0.9899	
Molecular Weight -----	32.94	
Gross Heating Value		
Dry Basis -----	1951	BTU/CF
Saturated Basis -----	1918	BTU/CF

**Antero Resources**  
**Ruth Unit 1H - Clarence Pad**

Tag Name	Value	Units	Timestamp
Accumulated Gas Flow	301839		1/9/2014 14:00:07
Battery	13.9	Volts	1/9/2014 14:00:07
Casing Pressure	416	PSIA	1/9/2014 14:00:07
Current Day Gas Flow	1689.86	MCF	1/9/2014 14:00:07
Differential Pressure	28	inH2O	1/9/2014 14:00:07
Flow Rate	6803	MCF Per Day	1/9/2014 14:00:07
Pressure	192	PSIA	1/9/2014 14:00:04
Previous Day Flow	6800.11	MCF	1/9/2014 14:00:04
Temperature	72	F	1/9/2014 14:00:04
Tubing Pressure	676		1/9/2014 14:00:07
Daily AP	207	PSIA	1/8/2014 09:00:00
Daily DP	26.9	inH2O	1/8/2014 09:00:00
Daily Energy	7693	MBTU	1/8/2014 09:00:00
Daily Flow	6800	MCF	1/8/2014 09:00:00
Daily Tf	70.6	F	1/8/2014 09:00:00
Hourly AP	223.05	PSIA	1/9/2014 11:00:00
Hourly DP	23.54	Inches	1/9/2014 11:00:00
Hourly Energy	317.45	MBTU	1/9/2014 11:00:00
Hourly FlowTime	60		1/9/2014 11:00:00
Hourly Tf	73.5	F	1/9/2014 11:00:00
Hourly Volume	280.59	MCF	1/9/2014 11:00:00
Audited Accumulated Gas Volume		MCF	
Audited Casing Pressure	451	PSI	1/7/2014 09:00:00
Audited Gas Volume	7014.1	MCF	1/7/2014 09:00:00
Audited Oil Volume	0	Barrels	1/7/2014 09:00:00
Audited Tubing Pressure	697	PSI	1/7/2014 09:00:00
Audited Water Volume	0	Barrels	1/7/2014 09:00:00
Argon	0	%	1/9/2014 14:00:07
BTU	1131.38	BTU	1/9/2014 14:00:04
CO2	0.0894	%	1/9/2014 14:00:04
Carbon Monoxide	0	%	1/9/2014 14:00:07
Decane	0	%	1/9/2014 14:00:04
Ethane	10.9701	%	1/9/2014 14:00:04
Helium	0	%	1/9/2014 14:00:04
Heptane	0	%	1/9/2014 14:00:04
Hexane	0.1128	%	1/9/2014 14:00:04
Hydrogen	0	%	1/9/2014 14:00:04
Hydrogen Sulfide	0	%	1/9/2014 14:00:04
Iso-Butane	0.2734	%	1/9/2014 14:00:04
Iso-Pentane	0.1083	%	1/9/2014 14:00:04
Methane	85.4948	%	1/9/2014 14:00:04
N2	0.3529	%	1/9/2014 14:00:04
N-Butane	0.3611	%	1/9/2014 14:00:04
Nonane	0	%	1/9/2014 14:00:04
N-Pentane	0.0568	%	1/9/2014 14:00:04
Octane	0	%	1/9/2014 14:00:04
Oxygen	0.0381	%	1/9/2014 14:00:04
Plate Size	3.75	Inches	1/9/2014 14:00:07
Propane	2.1423	%	1/9/2014 14:00:04
SPG	0.6473		1/9/2014 14:00:04
Water	0	%	1/9/2014 14:00:04

# **Attachment U**

## **Facility-wide Emissions Summary Sheet(s)**

**ATTACHMENT U – FACILITY-WIDE CONTROLLED EMISSIONS SUMMARY SHEET**

List all sources of emissions in this table. Use extra pages if necessary.

Emission Point ID#	NOx		CO		VOC		SO2		PM10		PM2.5		CH <sub>4</sub>		GHG (CO <sub>2</sub> e)	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
EP-HR001									0.9081	0.1108						
EP-PCV					0.0299	0.1311							0.2683	1.1752	6.7087	29.3843
F001					2.9082	12.7380							3.5625	15.6038	89.0626	390.0942
EP-L001					2.5932	0.0158							0.1772	0.0011	4.4336	0.0270
EP-L002					0.0005	0.0001							0.0404	0.0077	1.0340	0.1966
EP-GPU001, EP-GPU002, EP-GPU003, EP-GPU004, EP-GPU005, EP-GPU006, EP-GPU007, EP-GPU008, EP-GPU009 (emissions per EPN)	0.0884	0.3871	0.0742	0.3252	0.0049	0.0213	0.0005	0.0023	0.0067	0.0294	0.0067	0.0294	0.0020	0.0089	106.0652	464.5654
EP-TANKCOND001-002 (emissions per EPN)	0.0000	0.0000	0.0000	0.0000	0.6576	2.8804	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3013	1.3197	7.5348	33.0023
EP-TANKPW001-002 (emissions per EPN)	0.0000	0.0000	0.0000	0.0000	0.0405	0.1776	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4384	1.9200	10.9703	48.0501
<b>TOTAL</b>	<b>0.7955</b>	<b>3.4842</b>	<b>0.6682</b>	<b>2.9268</b>	<b>4.0339</b>	<b>6.3235</b>	<b>0.0048</b>	<b>0.0209</b>	<b>0.0605</b>	<b>0.2648</b>	<b>0.0605</b>	<b>0.2648</b>	<b>1.7151</b>	<b>6.5682</b>	<b>997.0643</b>	<b>4343.4170</b>

Annual emissions shall be based on 8760 hours per year of operation for all emission units except emergency generators.

According to 45CSR14 Section 2.43.e, fugitive emissions are not included in the major source determination because it is not listed as one of the source categories in Table 1. Therefore, fugitive emissions shall not be included in the PTE above



**ATTACHMENT U – FACILITY-WIDE CONTROLLED EMISSIONS SUMMARY SHEET**

List all sources of emissions in this table. Use extra pages if necessary.

Emission Point ID#	Formaldehyde		Benzene		Toluene		Ethylbenzene		Xylenes		Hexane		Total HAPs	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
EP-HR001														
EP-PCV			0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.0019	0.0083	0.0019	0.0083
F001			0.0012	0.0051	0.0120	0.0524	0.0249	0.1092	0.0631	0.2762	0.0674	0.2952	0.1685	0.7381
EP-L001			0.0000	0.0000	0.0004	0.0000	0.0008	0.0000	0.0020	0.0000	0.2095	0.0013	0.2127	0.0013
EP-L002			2.39E-07	4.55E-08	4.66E-07	8.86E-08	2.45E-07	4.66E-08	5.43E-07	1.03E-07	2.53E-08	4.81E-09	1.52E-06	2.89E-07
EP-GPU001, EP-GPU002, EP-GPU003, EP-GPU004, EP-GPU005, EP-GPU006, EP-GPU007, EP-GPU008, EP-GPU009 (emissions per EPN)	6.63E-05	2.90E-04	1.86E-06	8.13E-06	3.01E-06	1.32E-05			0.00E+00	0.00E+00	0.0016	0.0070	0.0017	0.0073
EP-TANKCOND001-002 (emissions per EPN)	0.0000	0.0000	0.0000	0.0001	0.0002	0.0007	0.0003	0.0012	0.0007	0.0030	0.0596	0.2609	0.0607	0.2658
EP-TANKPW001-002 (emissions per EPN)	0.0000	0.0000	0.0000	0.0000	0.0001	0.0004	0.0001	0.0007	0.0004	0.0016	0.0004	0.0020	0.0011	0.0046
<b>TOTAL</b>	<b>0.0006</b>	<b>0.0026</b>	<b>0.0001</b>	<b>0.0003</b>	<b>0.0009</b>	<b>0.0022</b>	<b>0.0017</b>	<b>0.0037</b>	<b>0.0041</b>	<b>0.0091</b>	<b>0.3438</b>	<b>0.5897</b>	<b>0.3512</b>	<b>0.6077</b>

Annual emissions shall be based on 8760 hours per year of operation for all emission units except emergency generators.

According to 45CSR14 Section 2.43.e, fugitive emissions are not included in the major source determination because it is not listed as one of the source categories in Table 1. Therefore, fugitive emissions shall not be included in the PTE above

**Attachment V**  
**Class I Legal Advertisement**

**Attachment V**

**Air Quality Permit Notice  
Notice of Application  
Clarence Well Pad  
Antero Resources Corporation  
Doddridge County, West Virginia**

Notice is given that Antero Resources Corporation has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a G70-D General Permit Modification for an Oil and Natural Gas Production facility located at 3762 Miletus Rd, in Doddridge County, West Virginia.

The latitude and longitude coordinates are: 39.244692 and -80.568211

The applicant estimates the increased potential to discharge the following Regulated Air Pollutants will be:

Pollutants	TOTALS (tpy):
NO <sub>x</sub>	3.4842
CO	2.9268
PM <sub>2.5</sub>	0.2648
PM <sub>10</sub>	0.2648
VOC	6.3235
SO <sub>2</sub>	0.0209
CO <sub>2e</sub>	4,343.42
Formaldehyde	0.0026
Benzene	0.0003
Toluene	0.0022
Ethylbenzene	0.0037
Xylenes	0.0091
Hexane	0.5897
Total HAPs	0.6077

Proposed changes will be implemented upon issuance of the permit. Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57th Street, SE, Charleston, WV 25304, for at least 30 calendar days from the date of publication of this notice.

Any questions regarding this permit application should be directed to the DAQ at (304) 926-0499, extension 1250, during normal business hours.

Dated this the \_\_ day of \_\_\_\_\_, 2018

By: Antero Resources Corporation  
Barry Schatz  
Senior Environmental & Regulatory Manager  
1615 Wynkoop Street  
Denver, CO 80202

[www.ghd.com](http://www.ghd.com)

