



October 5, 2016

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 Registration G70-C Modification Application  
Cofor 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 Cofor Well Pad.

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

1. Decrease in production
2. Removal of one Cimarron enclosed combustors
3. Removal of ten line heaters
4. Addition of two Produced Water Tanks

Please refer to Table 14 in Attachment S - Emissions Calculations for the summary of changes in emissions of regulated air pollutants that will result from the above operational changes.

Enclosed are the following documents:

- Original copy of the G70-C General Permit Modification Application.
- Two CD copies of the G70-C General Permit Modification Application.
- The application fee with check no. 456803 in the amount of \$1,500.00.



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

Sincerely,

GHD Services Inc.

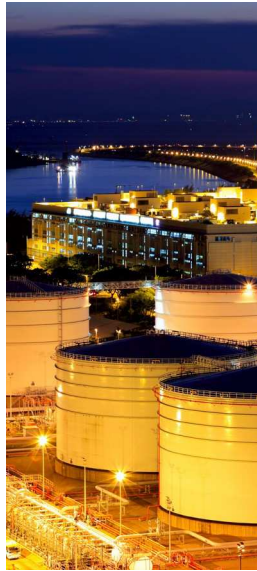
A handwritten signature in black ink, appearing to read "Manuel Bautista". The signature is fluid and cursive, with the first name being more prominent.

Manuel Bautista

MB/ma/273

Encl.

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



# General Permit G70-C Modification Application

Decrease in production, addition of two produced water tanks, and removal of one Cimarron enclosed combustor and 10 line heaters

Cofor Well Pad

Antero Resources Corporation

**GHD** | 6320 Rothway Suite 100 Houston Texas 77040  
082715 | Report No 273 | October 2016

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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-C 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

- CONSTRUCTION
- MODIFICATION
- RELOCATION
- CLASS I ADMINISTRATIVE UPDATE
- CLASS II ADMINISTRATIVE UPDATE

#### 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: Cofor Well Pad

Operating Site Physical Address: 770 Tunnel Hill Rd

City: West Union

Zip Code: 26456

County: Doddridge

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

Latitude: 39.29945

Longitude: -80.80026

SIC Code: 1311

DAQ Facility ID No. (For existing facilities)  
017-00112

NAICS Code: 211111

#### CERTIFICATION OF INFORMATION

This G70-C 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-C Registration Application will be returned to the applicant. Furthermore, if the G70-C 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-C 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: 10/5/16

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: Decrease in production, addition of 2 produced water tanks and the removal of 1 Cimarron enclosed combustor and 10 line heaters

Directions to the facility: From West Union, head north on Neely Ave toward Marie St/Old U.S. 50E for 36ft. Turn left at the 1<sup>st</sup> cross street onto Marie St/Old U.S. 50 W for 0.6 mile. Make slight right onto Tunnel Hill Rd for 1.0 mile. The facility will be on the right.

**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 and/or OOOO <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-C 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 (GPUs, 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
- Air Pollution Control Device/Emission Reduction Device(s) Sheet(s) (include manufacturer performance data sheet(s) if applicable) – Attachment R
- Emission Calculations (please be specific and include all calculation methodologies used) – Attachment S
- Facility-wide Emission Summary Sheet(s) – Attachment T
- Class I Legal Advertisement – Attachment U
- One (1) paper copy and two (2) copies of CD or DVD with pdf copy of application and attachments

GHD SERVICES INC.

▼ PLEASE DETACH AND RETAIN FOR YOUR RECORDS ▼

| INVOICE NUMBER | DATE | VOUCHER NO. | AMOUNT |
|----------------|------|-------------|--------|
|----------------|------|-------------|--------|

Account Number:  
CR90916

9/9/2016

40WVDEPAQ

456803

401021959

1,500.00

**TOTAL: 1,500.00**

THIS DOCUMENT IS PROTECTED BY A MICRO-PRINT SIGNATURE LINE, FLUORESCENT PAPER FIBERS, A WATERMARKED BACKER, AND IS REACTIVE TO CHEMICAL ALTERATION

**GHD SERVICES INC.**

2055 NIAGARA FALLS BLVD, SUITE 3  
NIAGARA FALLS, NY 14304

**M&T BANK**

MANUFACTURERS AND TRADERS TRUST COMPANY  
Commercial Banking  
Main Office, Ithaca, NY 14850  
50-7063-2213

9/9/2016

NO. 456803

PAY

\*\*\*\*\*1,500

DOLLARS AND

\*\*\*\*\*00

CENTS

\$ \*\*\*\*\*1,500.00

TO THE  
ORDER  
OF

**WEST VIRGINIA DEPT OF ENVIRONMENTAL  
PROTECTION - DIVISION AIR QUALITY  
601 57th Street SE  
Charleston,, WV 25304 US**

GHD SERVICES INC.

AUTHORIZED SIGNATURES

WARNING: THIS DOCUMENT IS VOID IF ACCOUNT NUMBER DOES NOT APPEAR ON THE REVERSE SIDE IN RED

⑈ 456803 ⑈ ⑆ 221370632⑆ ⑆ 61000000118910 ⑈

**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).*

Is there a facility owned by or associated with the natural gas industry located within one (1) mile of the proposed facility? Yes  No

*If Yes, please complete the questionnaire on the following page (Attachment A).*

Please provide a source aggregation analysis for the proposed facility below:

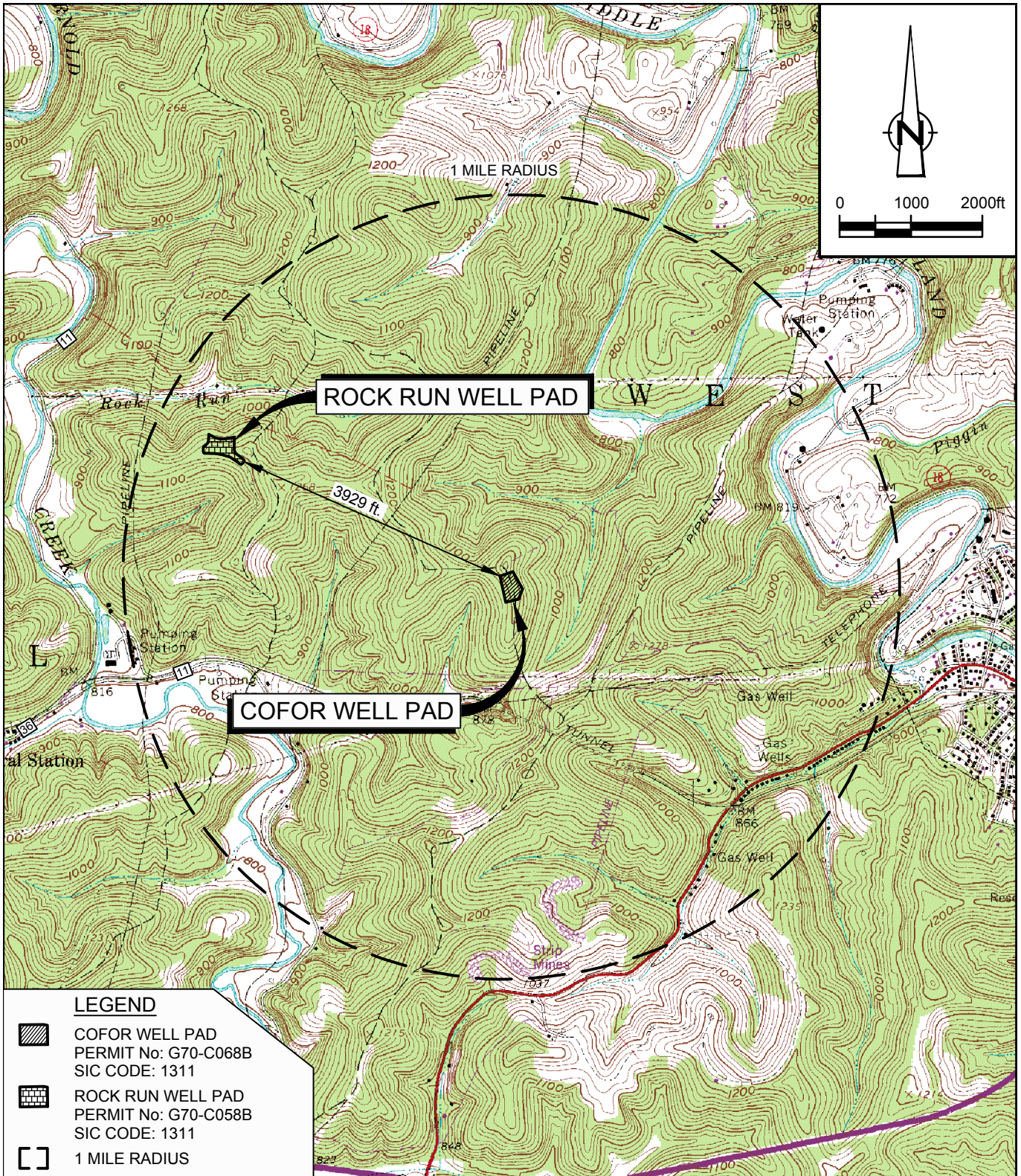
The Cofor Well Pad calculation of potential to emit included all the emissions sources that belong to the same industrial grouping, are located on contiguous or adjacent properties, and are under the control of the same person. The nearest emission source that belongs to the same industrial grouping and under the control of the same person but not located on contiguous or adjacent property is the Rock Run Well Pad. This well pad operates independently and is approximately 0.84 mile northwest of the facility.

## ATTACHMENT A - SINGLE SOURCE DETERMINATION FORM




Answer each question with a detailed explanation to determine contiguous or adjacent properties which are under a common control and any support facilities. This section must be completed in its entirety.

Provide a map of contiguous or adjacent facilities (production facilities, compressor stations, dehydration facilities, etc.) which are under common control and those facilities that are not under common control but are support facilities. Please indicate the SIC code, permit number (if applicable), and the distance between facilities in question on the map.

|  |   |  |
|--|---|--|
| Are the facilities owned by the same parent company or a subsidiary of the parent company? Provide the owners identity and the percentage of ownership of each facility. <b>Antero Resources has 100% ownership of each facility.</b>                                      | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            |
| Does an entity such as a corporation have decision making authority over the operation of a second entity through a contractual agreement or voting interest? Please explain.  | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> |
| Is there a contract for service relationship between the two (2) companies or, a support/dependency relationship that exists between the two (2) companies? Please explain.  | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> |
| Do the facilities share common workforces, plant managers, security forces, corporate executive officers or board executives?  | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            |
| Will managers or other workers frequently shuttle back and forth to be involved actively at both facilities?   | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> |
| Do the facilities share common payroll activities, employee benefits, health plans, retirement funds, insurance coverage, or other administrative functions? Please explain.   | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> |
| Does one (1) facility operation support the operation of the other facility?   | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> |
| Is one (1) facility dependent on the other? If one (1) facility shuts down, what are the limitations on the other to pursue outside business? Please explain. <b>No, these facilities operate completely independently.</b>  | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> |
| Are there any financial arrangements between the two (2) entities?   | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> |
| Are there any legal or lease agreements between the two (2) facilities?  | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> |
| Do the facilities share products, byproducts, equipment, or other manufacturing or air pollution control device equipment? Please explain. <b>No, these facilities operate completely independently.</b>   | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> |
| Do all the pollutant-emitting activities at the facilities belong to the same SIC Code? Please provide the SIC Codes. <b>1311</b>  | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            |
| Was the location of the new facility chosen primarily because of its proximity to the existing facility to integrate the operation of the two (2) facilities? Please explain. <b>No, these facilities operate completely independently.</b>                                | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> |
| Will materials be routinely transferred between the two (2) facilities? Please explain the amount of transfer and how often the transfers take place and what percentages go to the various entities.  | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> |
| Does the facility influence production levels or compliance with environmental regulations at other facilities? Who accepts the responsibility for compliance with air quality requirements? Please explain. <b>No, these facilities operate completely independently.</b> | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> |



**LEGEND**

-  COFOR WELL PAD  
PERMIT No: G70-C068B  
SIC CODE: 1311
-  ROCK RUN WELL PAD  
PERMIT No: G70-C058B  
SIC CODE: 1311
-  1 MILE RADIUS

SOURCE: USGS QUADRANGLE MAP;  
WEST UNION, WEST VIRGINIA

SITE COORDINATES: LAT. 39.299452, LONG. -80.800262



Attachment A  
SINGLE SOURCE DETERMINATION  
COFOR WELL PAD  
ANTERO RESOURCES  
*Doddridge County, West Virginia*

# **Attachment B**

## **Siting Criteria Waiver**

**Attachment B**

**Siting Waiver**

**Cofor 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 Cofor 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



IN THE OFFICE OF  
SECRETARY OF STATE

Penney Barker, Manager  
Corporations Division  
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)

APPLICATION FOR  
AMENDED CERTIFICATE  
OF AUTHORITY

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

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:

- Name under which the corporation was authorized to transact business in WV: Antero Resources Appalachian Corporation
- Date Certificate of Authority was issued in West Virginia: 6/25/2008
- Corporate name has been changed to: Antero Resources Corporation  
(Attach one Certified Copy of Name Change as filed in home State of Incorporation.)
- Name the corporation elects to use in WV: Antero Resources Corporation  
(due to home state name not being available)
- Other amendments: \_\_\_\_\_  
(attach additional pages if necessary)
- 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
- 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.

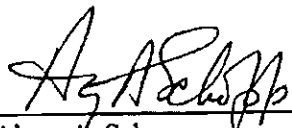
2. This Amendment to the Amended and Restated Certificate of Incorporation has been duly adopted and approved in accordance with Sections 242 of the General Corporation Law of the State of Delaware.

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.

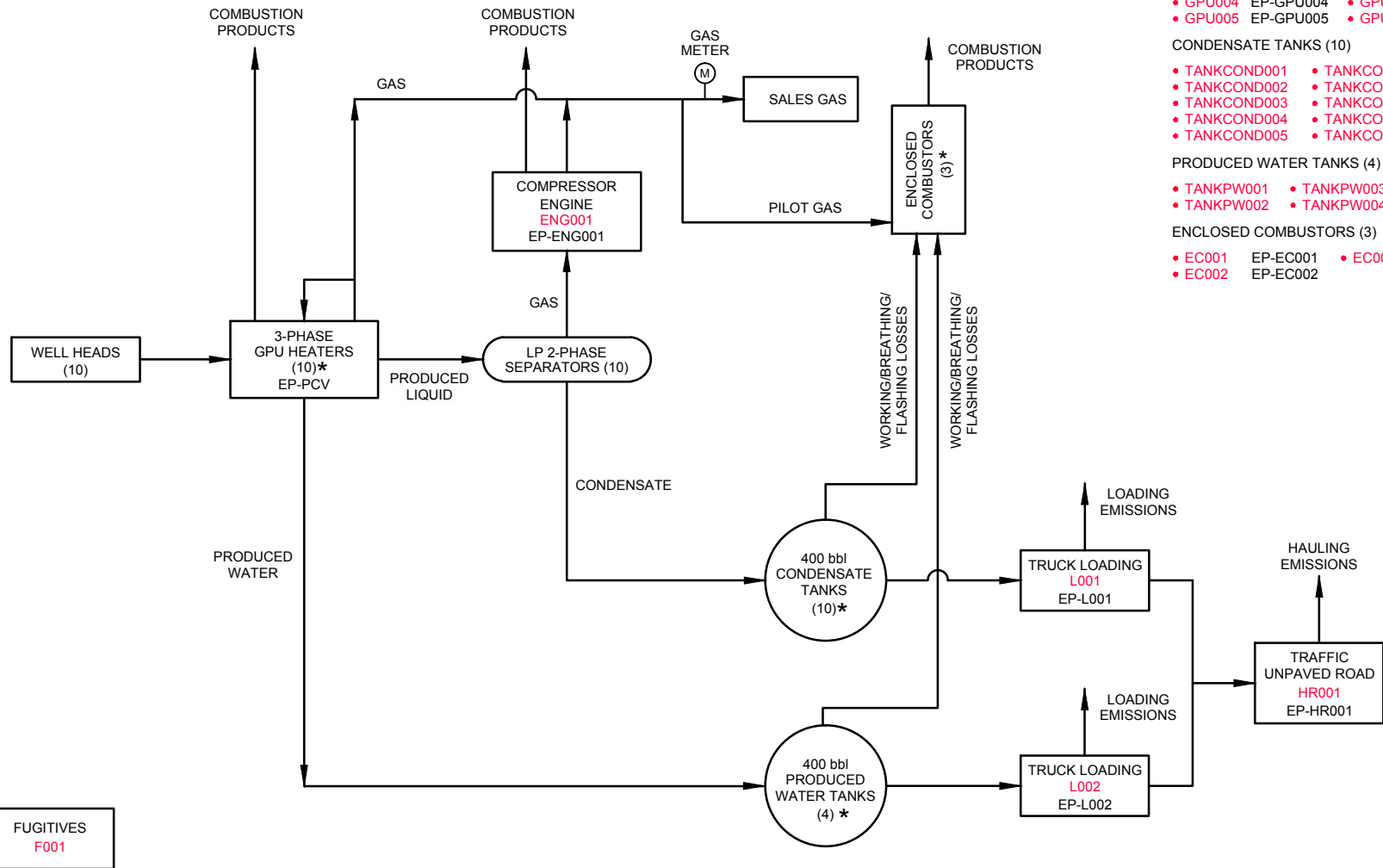
IN WITNESS WHEREOF, the Corporation has caused this Certificate of Amendment to be executed by its duly authorized officer on the 10th day of June, 2013.

ANTERO RESOURCES APPALACHIAN CORPORATION

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

# **Attachment D**

## **Process Flow Diagram**



- \* 3-PHASE GPU HEATERS (10)
  - 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 • GPU010 EP-GPU010
- CONDENSATE TANKS (10)
  - TANKCOND001 • TANKCOND006
  - TANKCOND002 • TANKCOND007
  - TANKCOND003 • TANKCOND008
  - TANKCOND004 • TANKCOND009
  - TANKCOND005 • TANKCOND010
- PRODUCED WATER TANKS (4)
  - TANKPW001 • TANKPW003
  - TANKPW002 • TANKPW004
- ENCLOSED COMBUSTORS (3)
  - EC001 EP-EC001 • EC003 EP-EC003
  - EC002 EP-EC002

FUGITIVES  
F001

Attachment D

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



# **Attachment E**

## **Process Description**

## **Attachment E**

### **Process Description**

#### **Cofor 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-GPU010) 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 gas from the three phase separators is metered and sent to the sales gas pipeline. The water flow to the produced water storage tanks (TANKPW001-004). The condensate is then sent to two phase low pressure separators where gas is further separated. The gas is routed to the gas fueled compressor engines (ENG001), compressed, metered and sent to the sales gas line. The condensate from the two phase separators flows to the condensate storage tanks (TANKSCOND001-010).

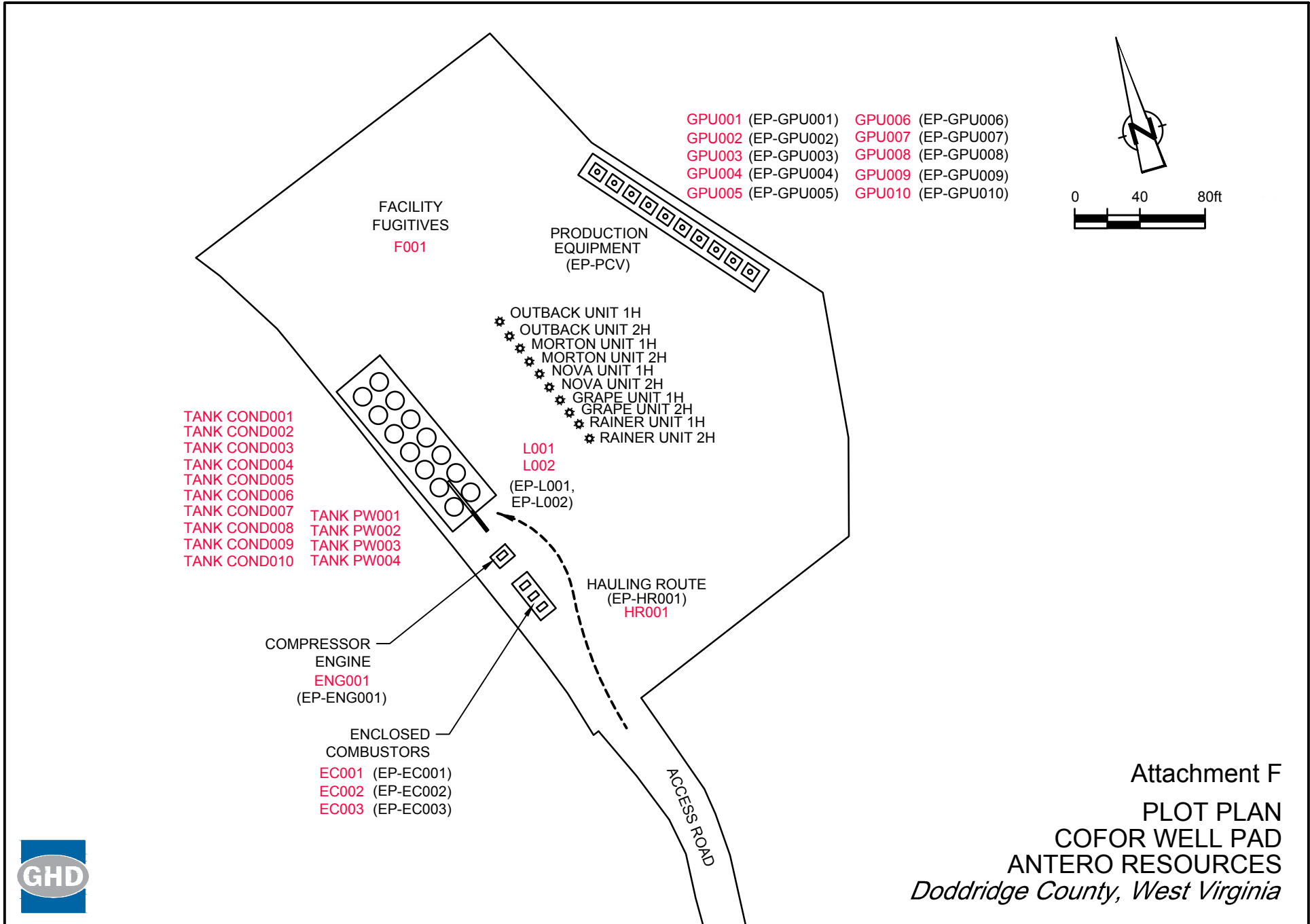
The facility has ten (10) tanks (TANKCOND001-010) on site to store condensate and four (4) tanks (TANKPW001-004) to store produced water prior to removal from the site. The flashing, working and breathing losses from the tanks are routed to three enclosed combustors (EC001-003) to control the emissions. The enclosed combustors that will be used to control emissions are designed to achieve a VOC destruction efficiency of 98 percent.

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 condensate from Nero Unit 2H, one of the wells in McGill Well Pad, and gas analysis from Twyford Unit 1H, one of the wells in Diane Davis Well Pad. The extended condensate and gas analyses are considered representative of the materials from Cofor Well Pad, being in the same Marcellus rock formation.

# **Attachment F Plot Plan**



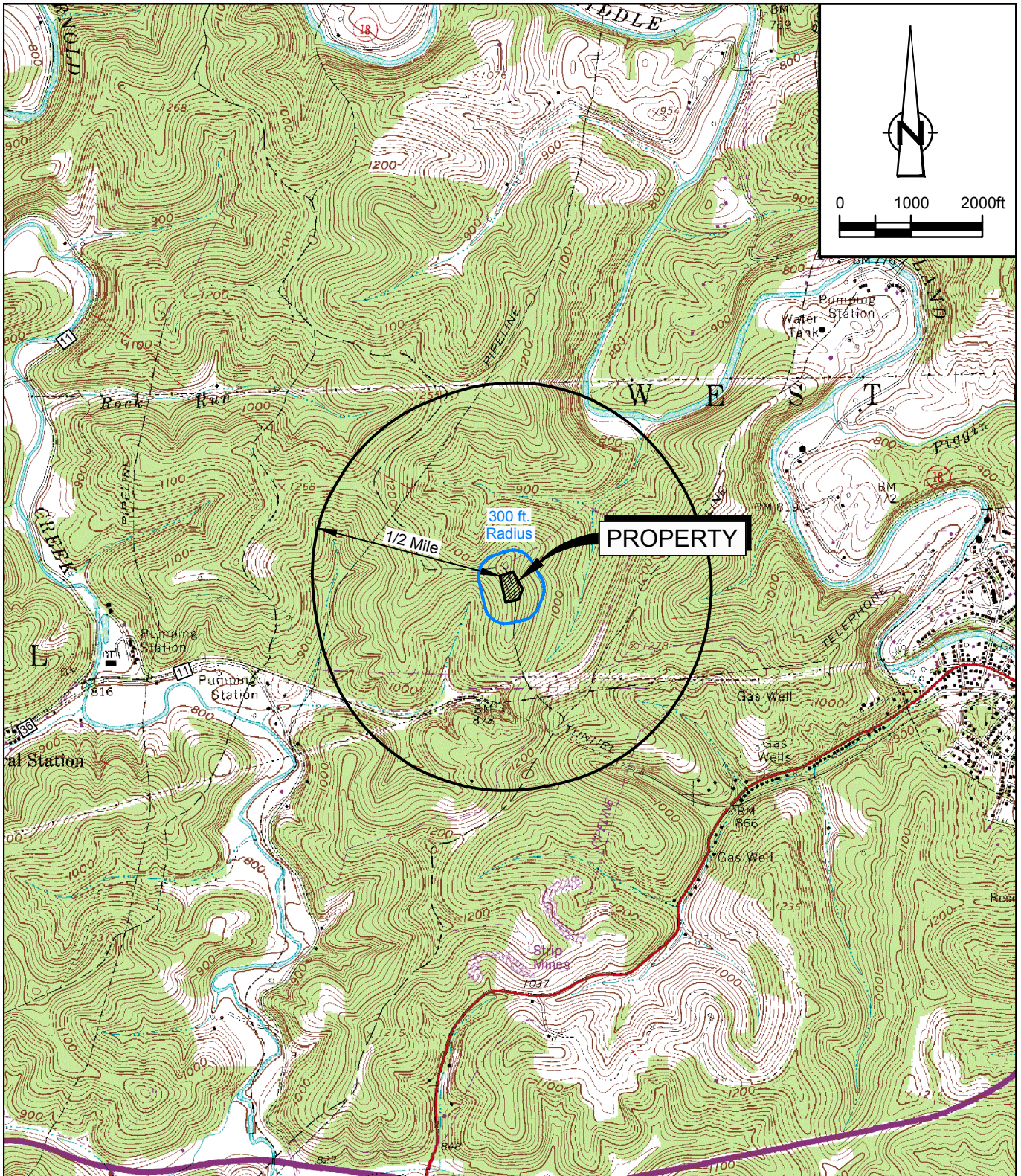


Attachment F  
PLOT PLAN  
COFOR WELL PAD  
ANTERO RESOURCES  
*Doddridge County, West Virginia*



# **Attachment G**

## **Area Map**



SOURCE: USGS QUADRANGLE MAP;  
WEST UNION, WEST VIRGINIA

SITE COORDINATES: LAT. 39.299452, LONG. -80.800262  
SITE ELEVATION: 2112 ft AMSL



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

# **Attachment H**

## **G70-C Section Applicability Form**

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

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

General Permit G70-C 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-C 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-C APPLICABLE SECTIONS</b>  |  |
|--|--|
| <input checked="" type="checkbox"/> Section 5.0  | Gas Well Affected Facility (NSPS, Subpart OOOO)  |
| <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)  |
| <input checked="" type="checkbox"/> Section 8.0  | Control Devices and Emission Reduction Devices not subject to NSPS Subpart OOOO 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)   |
| <input type="checkbox"/> Section 11.0            | Centrifugal Compressor Affected Facility (NSPS, Subpart OOOO) <sup>2</sup>                               |
| <input type="checkbox"/> Section 12.0            | Reciprocating Compressor Affected Facility (NSPS, Subpart OOOO) <sup>2</sup>                             |
| <input checked="" type="checkbox"/> Section 13.0 | Reciprocating Internal Combustion Engines, Generator Engines, Microturbines                              |
| <input checked="" type="checkbox"/> Section 14.0 | Tanker Truck Loading <sup>3</sup>  |
| <input type="checkbox"/> Section 15.0            | Glycol Dehydration Units <sup>4</sup>  |

- 1 Applicants that are subject to Section 6 may also be subject to Section 7 if the applicant is subject to the NSPS, Subpart OOOO control requirements or the applicable control device requirements of Section 8.*
- 2 Applicants that are subject to Section 11 and 12 may also be subject to the applicable RICE requirements of Section 13.*
- 3 Applicants that are subject to Section 14 may also be subject to control device and emission reduction device requirements of Section 8.*
- 4 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 through GPU010         | EP-GPU001 through EP-GPU010    | Gas Production Unit Heater | 2014           |                            | 1.5 MMBtu/hr  | Existing                             | N/A                               |                      |
| LH001 through LH000           | EP-LH001 through EP-LH000      | Line Heater                | 2015           |                            | 2.0 MMBtu/hr  | Removal 2016                         | N/A                               |                      |
| F001                          | F001                           | Fugitives                  | 2014           |                            | N/A   | Existing                             | N/A                               |                      |
| TANKCOND001-010               | EP-EC001, EP-EC002, EP-EC003   | Condensate Tank F/W/B      | 2014           |                            | 400 bbl each  | Modification <sup>1</sup>            | EC001, EC002, EC003               |                      |
| TANKPW001-002                 | EP-EC001, EP-EC002, EP-EC003   | PW Tank F/W/B              | 2014           |                            | 400 bbl each  | Modification <sup>2</sup>            | EC001, EC002, EC003               |                      |
| TANKPW003-004                 | EP-EC001, EP-EC002, EP-EC003   | PW Tank F/W/B              | 2016           |                            | 400 bbl each  | New                                  | EC001, EC002, EC003               |                      |
| L001                          | EP-L001                        | Loading (Condensate)       | 2014           |                            | 10,080 gal/hr<br>10,117,800 gal/yr  | Modification <sup>3</sup>            | N/A                               |                      |
| L002                          | EP-L002                        | Loading (Produced Water)   | 2014           |                            | 10,080 gal/hr<br>61,320,000 gal/yr  | Modification <sup>4</sup>            | N/A                               |                      |
| HR001                         | EP-HR001                       | Haul Road                  | 2014           |                            | Tanker Trucks<br>Condensate:<br>1205 trips per year<br>Tanker Trucks PW:<br>7300 trips per year<br>Pick Up Truck:<br>730 trips per year | Modification <sup>5</sup>            | N/A                               |                      |
| EC001                         | EP-EC001                       | Enclosed Combustor         | 2014           |                            | 12 MMBtu/hr   | Modification <sup>6</sup>            | N/A                               |                      |
| EC002                         | EP-EC002                       | Enclosed Combustor         | 2015           |                            | 12 MMBtu/hr   | Modification <sup>6</sup>            | N/A                               |                      |
| EC003                         | EP-EC003                       | Enclosed Combustor         | 2015           |                            | 12 MMBtu/hr   | Modification <sup>6</sup>            | N/A                               |                      |
| EC004                         | EP-EC004                       | Enclosed Combustor         | 2015           |                            | 12 MMBtu/hr   | Removal 2016                         | N/A                               |                      |
| PCV                           | EP-PCV                         | Pneumatic CV               | 2014           |                            | 6.6 scf/day/PCV   | Existing                             | N/A                               |                      |
| ENG001                        | EP-ENG001                      | Compressor Engine          | 2014           | 2013                       | 24 HP   | Existing                             | Non-Selective Catalytic Reduction |                      |

Notes:

1. This is not a physical modification. Change in emissions due to decrease in condensate throughput.
2. This is not a physical modification. Change in emissions due to decrease in condensate and increase in PW throughput.
3. This is not physical modification. Change in emissions due to decrease in loading throughput.
4. This is not physical modification. Change in emissions due to increase in produced water loading throughput.
5. This is not a physical modification. Change in emissions from increased number of trips.
6. This is not a physical modification. Change in emissions due to decrease in condensate throughput and increase in PW throughput.

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

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

<sup>3</sup> When required by rule.

<sup>4</sup> New, modification, removal, existing.

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

<sup>6</sup> 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 | <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 (CO2e) |
| Valves                     | <input type="checkbox"/> Yes<br><input checked="" type="checkbox"/> No | 500   | EPA   | gas  | 2.88                                   | 0.39     | 355.74     |
| Valves                     | <input type="checkbox"/> Yes<br><input checked="" type="checkbox"/> No | 520   | EPA   | liquid   | 12.26                                  | 0.86     | 2.25       |
| Connections (Not sampling) | <input type="checkbox"/> Yes<br><input checked="" type="checkbox"/> No | 590   | EPA   | gas  | 0.15                                   | 2.04E-02 | 18.66      |
| Flanges                    | <input type="checkbox"/> Yes<br><input checked="" type="checkbox"/> No | 130   | EPA   | gas  | 0.07                                   | 8.76E-03 | 8.02       |
| Loading                    | <input type="checkbox"/> Yes<br><input checked="" type="checkbox"/> No | 2   | EPA   | gas  | 3.31                                   | 4.89E-02 | 5.23       |

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).

| API Number     | Date of Flowback | Date of Well Completion | Green Completion and/or Combustion Device |
|----------------|------------------|-------------------------|---|
| 47017067240000 | 2/1/2017         | 10/1/2016               | Green                                     |
| 47017067250000 | 2/1/2017         | 10/1/2016               | Green                                     |
| 47017065590000 | 7/21/2016        | 6/12/2016               | Green                                     |
| 47017065600000 | 7/22/2016        | 6/12/2016               | Green                                     |
| 47017067260000 | 2/1/2017         | 10/1/2016               | Green                                     |
| 47017067270000 | 2/1/2017         | 10/1/2016               | Green                                     |
| 47017065180000 | 7/21/2016        | 6/12/2016               | Green                                     |
| 47017065190000 | 7/21/2016        | 6/12/2016               | Green                                     |
| 47017067500000 | 7/20/2016        | 6/9/2016                | Green                                     |
| 47017067630000 | 7/20/2016        | 6/9/2016                | Green                                     |
|                |                  |                         |   |
|                |                  |                         |   |
|                |                  |                         |   |

*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 may be provided on the 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 Sheet**

**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<br>Tanks             | 2. Tank Name: Condensate Tank 001-010                        |
| 3. Emission Unit ID number:<br>TANKCOND001-010 | 4. Emission Point ID number.<br>EP-EC001, EP-EC002, EP-EC003 |

|   |   |
|---|---|
| 5. Date Installed , Modified or Relocated (for existing tanks)<br>2014  | 6. Type of change:<br><input checked="" type="checkbox"/> New construction <input type="checkbox"/> New stored material <input type="checkbox"/> Other<br><input type="checkbox"/> Relocation |
| Was the tank manufactured after August 23, 2011?<br><input checked="" type="checkbox"/> Yes <input 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.<br><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |

|  |
|--|
| 7C. Was USEPA Tanks simulation software utilized?<br><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): 10117800                                       | 13B. Maximum daily throughput (gal/day): 27720 |
| 14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 61 | 15. Maximum tank fill rate (gal/min) 168       |

16. Tank fill method    Submerged    Splash    Bottom Loading

17. Is the tank system a variable vapor space system?    Yes    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):<br><br><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)<br><input type="checkbox"/> External Floating Roof <input type="checkbox"/> pontoon roof <input type="checkbox"/> double deck roof<br><input type="checkbox"/> Domed External (or Covered) Floating Roof<br><input type="checkbox"/> Internal Floating Roof <input type="checkbox"/> vertical column support <input type="checkbox"/> self-supporting<br><input type="checkbox"/> Variable Vapor Space <input type="checkbox"/> lifter roof <input type="checkbox"/> diaphragm<br><input type="checkbox"/> Pressurized <input type="checkbox"/> spherical <input type="checkbox"/> cylindrical<br><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 \_\_\_\_\_ Pressure \_\_\_\_\_
- Emergency relief Valve (psig)
  - Vacuum \_\_\_\_\_ Pressure \_\_\_\_\_
- 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 |                   |

*Please see Table 6 and Table 7*

**TANK CONSTRUCTION & OPERATION INFORMATION**

21. Tank Shell Construction:

- Riveted  Gunitite 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 beated?<br><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?<br><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? | <input type="checkbox"/> Yes <input type="checkbox"/> No |
|---|--|

|   |  |
|---|--|
| 25D. If YES, how is the secondary seal mounted? (check one) | <input type="checkbox"/> Shoe <input type="checkbox"/> Rim <input type="checkbox"/> Other (describe) |
|---|--|

|   |  |
|---|--|
| 25E. Is the Floating Roof equipped with a weather shield? | <input type="checkbox"/> Yes <input type="checkbox"/> 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: | <input type="checkbox"/> 5 ft. wide <input type="checkbox"/> 6 ft. wide <input type="checkbox"/> 7 ft. wide <input type="checkbox"/> 5 x 7.5 ft wide <input type="checkbox"/> 5 x 12 ft wide <input type="checkbox"/> Other (describe) |
|-----------------|--|

|                            |                                      |  |   |
|----------------------------|--------------------------------------|--|---|
| 26D. Deck seam length (ft) | 26E. Area of deck (ft <sup>2</sup> ) | 26F. For column supported tanks:<br>Number of columns: | 26G. For column supported tanks, Diameter of each column: |
|----------------------------|--------------------------------------|--|---|

|                                 |   |
|---------------------------------|---|
| 27. Closed Vent System with VRU | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
|---------------------------------|---|

|   |   |
|---|---|
| 28. Closed Vent System with Enclosed Combustor? | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> 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):   | 65.08    | 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))                     | 1030.236 | 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): | 65.08 | 36A. Minimum (°F):                       | 46.56  | 36B. Maximum (°F)   | 75.94 |
| 37. Average operating pressure range of tank (psig):    | 0     | 37A. Minimum (psig)                      | 0      | 37B. Maximum (psig) | 0     |
| 38A. Minimum Liquid Surface Temperature (°F)            | 46.56 | 38B. Corresponding Vapor Pressure (psia) | 1.3337 |                     |       |
| 39A. Average Liquid Surface Temperature (°F)            | 65.08 | 39B. Corresponding Vapor Pressure (psia) | 1.9880 |                     |       |
| 40A. Maximum Liquid Surface Temperature (°F)            | 75.94 | 40B. Corresponding Vapor Pressure (psia) | 2.4806 |                     |       |

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)              | 5.9600     |  |  |
| 41D. Liquid Molecular Weight (lb/lb-mole) | 112.40     |  |  |
| 41E. Vapor Molecular Weight (lb/lb-mole)  | 38.8500    |  |  |
| Maximum Vapor Pressure                    | 2.4806     |  |  |
| 41F. True (psia)                          |            |  |  |
| 41G. Reid (psia)                          | 3.54       |  |  |
| Months Storage per Year                   | year round |  |  |
| 41H. From - To                            |            |  |  |

**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<br>Tanks   | 2. Tank Name: Produced Water Tank 001-004   |
| 3. Emission Unit ID number:<br>TANKPW001-004   | 4. Emission Point ID number.<br>EP-EC001,<br>EP-EC002,<br>EP-EC003  |
| 5. Date Installed , Modified or Relocated (for existing tanks)<br>2 installed in 2014<br>2 installed in 2016<br><br>Was the tank manufactured after August 23, 2011?<br><input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No | 6. Type of change:<br><input checked="" type="checkbox"/> New construction <input type="checkbox"/> New stored material <input type="checkbox"/> Other<br><br><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.<br><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No   |   |
| 7C. Was USEPA Tanks simulation software utilized?<br><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No<br><i>If Yes, please provide the appropriate documentation and items 8-42 below are not required.</i>                         |   |

**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):   | 61320000                                   | 13B. Maximum daily throughput (gal/day): | 168000 |
| 14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume):   | 913  | 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)?<br>(B) What are the number of transfers into the system per year?   |  |  |        |
| 18. Type of tank (check all that apply):<br><br><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)<br><input type="checkbox"/> External Floating Roof <input type="checkbox"/> pontoon roof <input type="checkbox"/> double deck roof<br><input type="checkbox"/> Domed External (or Covered) Floating Roof<br><input type="checkbox"/> Internal Floating Roof <input type="checkbox"/> vertical column support <input type="checkbox"/> self-supporting<br><input type="checkbox"/> Variable Vapor Space <input type="checkbox"/> lifter roof <input type="checkbox"/> diaphragm<br><input type="checkbox"/> Pressurized <input type="checkbox"/> spherical <input type="checkbox"/> cylindrical |  |  |        |



## ATTACHMENT L – STORAGE VESSEL DATA SHEET

## PRESSURE/VACUUM CONTROL DATA

19. Check as many as apply:

- Does not apply  Rupture Disc (psig)  
 Inert Gas Blanket  Carbon Adsorption  
 Vent to Vapor Combustion Device (vapor combustors, flares, thermal oxidizers, enclosed combustors)  
 Conservation Vent (psig)  
Vacuum Pressure  
 Emergency relief Valve (psig)  
Vacuum Pressure  
 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 &amp; OPERATION INFORMATION

21. Tank Shell Construction:

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

|                         |                        |                        |  |
|-------------------------|------------------------|------------------------|--|
| 21A. Shell Color: Green | 21B. Roof Color: Green | 21C. Year Last Painted | 2 painted in 2014<br>2 painted in 2016 |
|-------------------------|------------------------|------------------------|--|

22. Shell Condition (if metal and unlined):

- No Rust  Light Rust  Dense Rus:  Not applicable

22A. Is the tank beated?

- Yes  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?  
 Yes  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:

- Metallic (mechanical) shoe seal  Liquid mounted  
 Vapor mounted resilient seal  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:

- Bolted  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

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:27. Closed Vent System with VRU  Yes  No28. 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):   | 65.08    | 31. Annual Average Maximum Temperature (°F):  | 75.94 |
| 32. Annual Average Minimum Temperature (°F):  | 46.56    | 33. Average Wind Speed (miles/hr): 5.9mph   |       |
| 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): | 65.08 | 36A. Minimum (°F):                       | 46.56  | 36B. Maximum (°F)   | 75.94 |
| 37. Average operating pressure range of tank (psig):    | 0     | 37A. Minimum (psig)                      | 0      | 37B. Maximum (psig) | 0     |
| 38A. Minimum Liquid Surface Temperature (°F)            | 46.56 | 38B. Corresponding Vapor Pressure (psia) | 0.2279 |                     |       |
| 39A. Average Liquid Surface Temperature (°F)            | 65.08 | 39B. Corresponding Vapor Pressure (psia) | 0.3770 |                     |       |
| 40A. Maximum Liquid Surface Temperature (°F)            | 75.94 | 40B. Corresponding Vapor Pressure (psia) | 0.4985 |                     |       |

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) | 18.02               |  |  |
| 41E. Vapor Molecular Weight (lb/lb-mole)  | 18.4123             |  |  |
| Maximum Vapor Pressure                    | 0.4985              |  |  |
| 41F. True (psia)                          |                     |  |  |
| 41G. Reid (psia)                          | 1.0328              |  |  |
| Months Storage per Year                   | year round          |  |  |
| 41H. From - To                            |                     |  |  |

**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/sef) |
|-------------------|--------------------|--|-------------------------|-------------------------|--------------------------------------|------------------------------|
| GPU001            | EP-GPU001          | Gas Production Unit Heater                       | 2014                    | Existing                | 1.5                                  | 1215.8718                    |
| GPU002            | EP-GPU002          | Gas Production Unit Heater                       | 2014                    | Existing                | 1.5                                  | 1215.8718                    |
| GPU003            | EP-GPU003          | Gas Production Unit Heater                       | 2014                    | Existing                | 1.5                                  | 1215.8718                    |
| GPU004            | EP-GPU004          | Gas Production Unit Heater                       | 2014                    | Existing                | 1.5                                  | 1215.8718                    |
| GPU005            | EP-GPU005          | Gas Production Unit Heater                       | 2014                    | Existing                | 1.5                                  | 1215.8718                    |
| GPU006            | EP-GPU006          | Gas Production Unit Heater                       | 2014                    | Existing                | 1.5                                  | 1215.8718                    |
| GPU007            | EP-GPU007          | Gas Production Unit Heater                       | 2014                    | Existing                | 1.5                                  | 1215.8718                    |
| GPU008            | EP-GPU008          | Gas Production Unit Heater                       | 2014                    | Existing                | 1.5                                  | 1215.8718                    |
| GPU009            | EP-GPU009          | Gas Production Unit Heater                       | 2014                    | Existing                | 1.5                                  | 1215.8718                    |
| GPU010            | EP-GPU010          | Gas Production Unit Heater                       | 2014                    | Existing                | 1.5                                  | 1215.8718                    |
| LH001             | EP-LH001           | Line Heater                                      | 2015                    | Removal                 | 2                                    | 1215.8718                    |
| LH002             | EP-LH002           | Line Heater                                      | 2015                    | Removal                 | 2                                    | 1215.8718                    |
| LH003             | EP-LH003           | Line Heater                                      | 2015                    | Removal                 | 2                                    | 1215.8718                    |
| LH004             | EP-LH004           | Line Heater                                      | 2015                    | Removal                 | 2                                    | 1215.8718                    |
| LH005             | EP-LH005           | Line Heater                                      | 2015                    | Removal                 | 2                                    | 1215.8718                    |
| LH006             | EP-LH006           | Line Heater                                      | 2015                    | Removal                 | 2                                    | 1215.8718                    |
| LH007             | EP-LH007           | Line Heater                                      | 2015                    | Removal                 | 2                                    | 1215.8718                    |
| LH008             | EP-LH008           | Line Heater                                      | 2015                    | Removal                 | 2                                    | 1215.8718                    |
| LH009             | EP-LH009           | Line Heater                                      | 2015                    | Removal                 | 2                                    | 1215.8718                    |
| LH010             | EP-LH010           | Line Heater                                      | 2015                    | Removal                 | 2                                    | 1215.8718                    |

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 N**

## **Internal Combustion Engine Data Sheet**

## ATTACHMENT N – INTERNAL COMBUSTION ENGINE DATA SHEET

Complete this data sheet for each internal combustion engine at the facility. Include manufacturer performance data sheet(s) or any other supporting document if applicable. Use extra pages if necessary. *Generator(s) and microturbine generator(s) shall also use this form.*

| Emission Unit ID#   |              | ENG001   |   |   |                        |                    |                                 |
|---|--------------|--|---|---|------------------------|--------------------|---------------------------------|
| Engine Manufacturer/Model   |              | Engine (Kubota DG972-E2)   |   |   |                        |                    |                                 |
| Manufacturers Rated bhp/rpm   |              | 24 HP @ 3600 rpm   |   |   |                        |                    |                                 |
| Source Status   |              | ES   |   |   |                        |                    |                                 |
| Date Installed/ Modified/ Removed/ Relocated  |              | 2014   |   |   |                        |                    |                                 |
| Engine Manufacturer/ Reconstruction Date  |              | 2013   |   |   |                        |                    |                                 |
| Check all applicable Federal Rules for the engine (include EPA Certification of Conformity if applicable) |              | <input checked="" type="checkbox"/> 40CFR60 Subpart JJJJ<br><input checked="" type="checkbox"/> JJJJ Certified?<br><input type="checkbox"/> 40CFR60 Subpart IIII<br><input type="checkbox"/> IIII Certified?<br><input checked="" type="checkbox"/> 40CFR63 Subpart ZZZZ<br><input type="checkbox"/> NESHAP ZZZZ/NSPS JJJJ Window<br><input type="checkbox"/> NESHAP ZZZZ Remote Sources | <input type="checkbox"/> 40CFR60 Subpart JJJJ<br><input type="checkbox"/> JJJJ Certified?<br><input type="checkbox"/> 40CFR60 Subpart IIII<br><input type="checkbox"/> IIII Certified?<br><input type="checkbox"/> 40CFR63 Subpart ZZZZ<br><input type="checkbox"/> NESHAP ZZZZ/NSPS JJJJ Window<br><input type="checkbox"/> NESHAP ZZZZ Remote Sources | <input type="checkbox"/> 40CFR60 Subpart JJJJ<br><input type="checkbox"/> JJJJ Certified?<br><input type="checkbox"/> 40CFR60 Subpart IIII<br><input type="checkbox"/> IIII Certified?<br><input type="checkbox"/> 40CFR63 Subpart ZZZZ<br><input type="checkbox"/> NESHAP ZZZZ/NSPS JJJJ Window<br><input type="checkbox"/> NESHAP ZZZZ Remote Sources |                        |                    |                                 |
| Engine Type   |              | 4SRB   |   |   |                        |                    |                                 |
| APCD Type   |              | NSCR   |   |   |                        |                    |                                 |
| Fuel Type   |              | RG   |   |   |                        |                    |                                 |
| H2S (gr/ 100 scf)   |              | 0  |   |   |                        |                    |                                 |
| Operating bhp/rpm   |              | 16.5 HP @ 2400 rpm   |   |   |                        |                    |                                 |
| BSFC (BTU/bhp-hr)   |              | 9773   |   |   |                        |                    |                                 |
| Hourly Fuel Throughput (Must use 8,760 hrs/yr unless emergency generator)                                 |              | 193 ft <sup>3</sup> /hr<br>gal/hr  |   |   |                        |                    | ft <sup>3</sup> /hr<br>gal/hr   |
| Fuel Usage or Hours of Operation Metered  |              | 1.6907 MMft <sup>3</sup> /yr<br>gal/yr   |   |   |                        |                    | MMft <sup>3</sup> /yr<br>gal/yr |
| Calculation Methodology   | Pollutant    | Hourly PTE (lb/hr)   | Annual PTE (tons/year)  | Hourly PTE (lb/hr)  | Annual PTE (tons/year) | Hourly PTE (lb/hr) | Annual PTE (tons/year)          |
| MD  | NOx          | 0.3158   | 1.3831  |   |                        |                    |                                 |
| MD  | CO           | 5.6445   | 24.7228   |   |                        |                    |                                 |
| AP  | VOC          | 0.0069   | 0.0303  |   |                        |                    |                                 |
| AP  | SO2          | 0.0001   | 0.0006  |   |                        |                    |                                 |
| AP  | PM10         | 0.0022   | 0.0097  |   |                        |                    |                                 |
| AP  | Formaldehyde | 0.0048   | 0.0210  |   |                        |                    |                                 |
| AP  | Total HAPs   | 0.0054   | 0.0235  |   |                        |                    |                                 |
| OT  | GHG (CO2e)   | 27.0819  | 118.6185  |   |                        |                    |                                 |

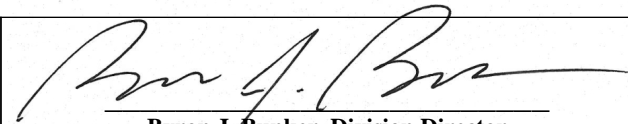


UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
2013 MODEL YEAR  
CERTIFICATE OF CONFORMITY  
WITH THE CLEAN AIR ACT OF 1990

OFFICE OF TRANSPORTATION  
AND AIR QUALITY  
ANN ARBOR, MICHIGAN 48105

**Certificate Issued To:** Kubota Corporation  
(U.S. Manufacturer or Importer)  
**Certificate Number:** DKBXS.9622HP-002

**Effective Date:**  
11/20/2012  
**Expiration Date:**  
12/31/2013

  
Byron J. Bunker, Division Director  
Compliance Division

**Issue Date:**  
11/20/2012  
**Revision Date:**  
N/A

**Manufacturer:** Kubota Corporation  
**Engine Family:** DKBXS.9622HP  
**Certificate Number:** DKBXS.9622HP-002  
**Useful Life :** 1000 Hours / 5 Years  
**Engine Class :** Nonhandheld-Class II  
**Fuel :** Natural Gas (CNG/LNG)  
**Emission Standards :** NMHC + NO<sub>x</sub> ( g/kW-hr ) : 8  
CO ( g/kW-hr ) : 610

Pursuant to Section 213 of the Clean Air Act (42 U.S.C. section 7547), 40 CFR Part 1054, 40 CFR Part 1068 and 40 CFR Part 60 (stationary only and combined stationary and mobile), and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued for the following small nonroad engine family, more fully described in the documentation required by 40 CFR Part 1054 and produced in the stated model year.

This certificate of conformity covers only those new small nonroad engines which conform in all material respects to the design specifications that applied to those engines described in the documentation required by 40 CFR Part 1054 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR Part 1054. This certificate of conformity does not cover small nonroad engines imported prior to the effective date of the certificate.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 1068.20 and 1068, Subpart E and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR Part 1054. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void *ab initio* for other reasons specified in 40 CFR Part 1054, 40 CFR Part 1068.

This certificate does not cover small nonroad engines sold, offered for sale, or introduced, or delivered for introduction, into commerce in the U.S. prior to the effective date of the certificate.

# **TECHNICAL INFORMATION**

## **DG972-SAEH-S1**

**NATURAL GAS FUEL ENGINE**

July, 2006

KUBOTA Corporation



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## 5. FUEL SYSTEM AND FUEL DIAGRAM

Specifications and dimensions are subject to change without prior notice.

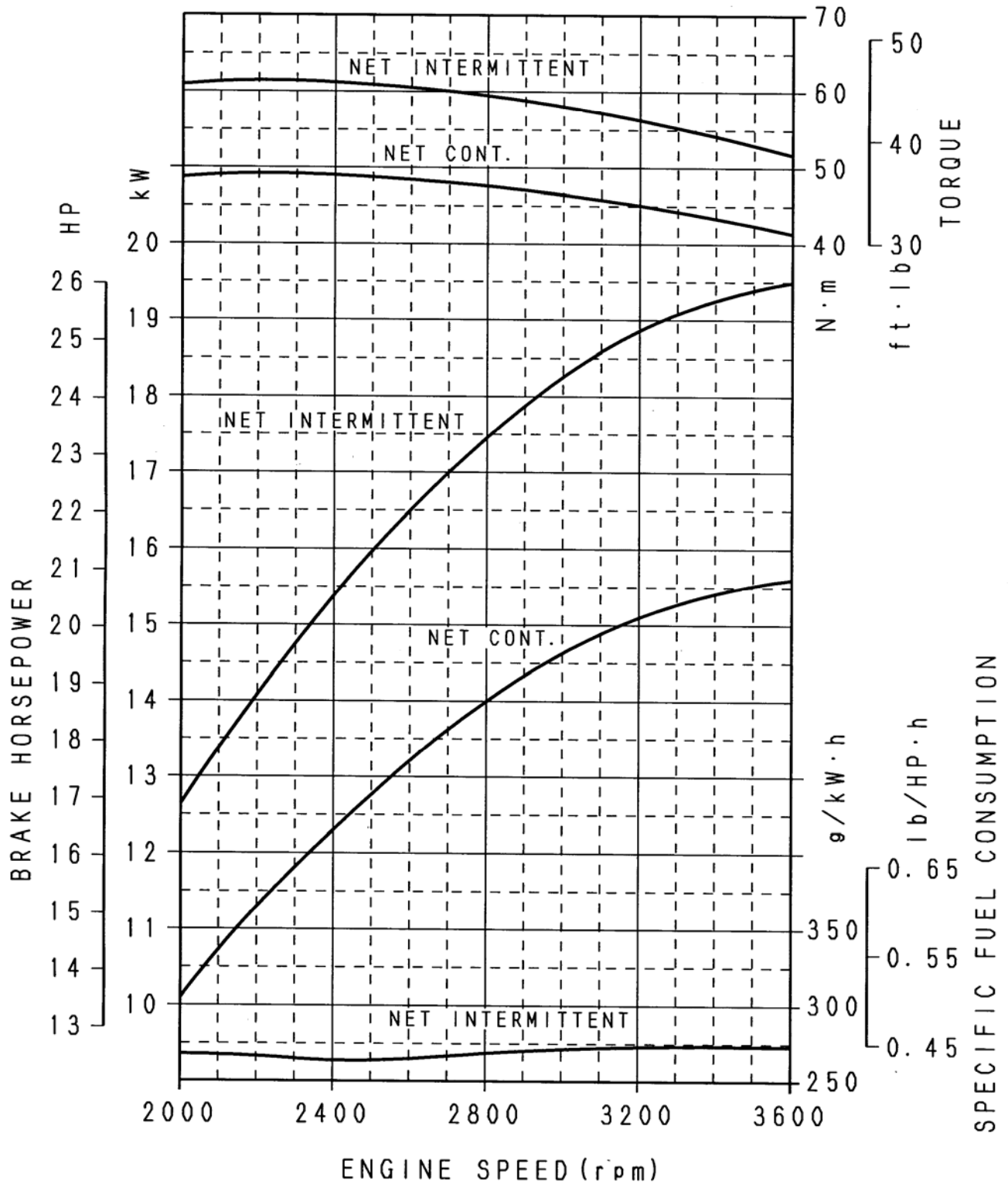
# 1. GENERAL SPECIFICATIONS

| ITEM                       | UNIT              | SPECIFICATIONS                                  |
|----------------------------|-------------------|---|
| Engine model               |                   | DG972-SAEH-S1                                   |
| Type                       |                   | Vertical, In line,<br>4cycle Natural Gas engine |
| Cooling system             |                   | Water cooling with water pump                   |
| Number of cylinders        |                   | 3   |
| Cylinder bore              | mm(in)            | 74.5 (2.93)                                     |
| Stroke                     | mm(in)            | 73.6 (2.90)                                     |
| Total displacement         | L(cu. in)         | 0.962 (58.7)                                    |
| High idle                  | rpm               | 3850  |
| Low idle                   | rpm               | 1500  |
| Horsepower                 | kW(HP)            | 19.5(26.1)                                      |
| Max. torque<br>(SAE J1349) | Nm(ft-lb)<br>/rpm | 61.2 (45.2)/2400                                |
| Compression ratio          |                   | 9.2   |
| Firing order               |                   | 1-2-3   |
| Ignition timing            |                   | B.T.D.C.15° /1000rpm    B.T.D.C.28° /3600rpm    |
| Ignition system            |                   | Distributor-less Solid State type               |
| Fuel                       |                   | Natural Gas only                                |
| Direction of rotation      |                   | Counter-clockwise from flywheel side            |
| Starting system            |                   | Electric starting with cell starter             |
| Starter output             | V-kW              | 12-1.0  |
| Alternator output          | V-W               | 12-480 (Standard)                               |
| Lubricating system         |                   | Forced lubricating by trochoid pump             |
| Lubricating oil            |                   | Quality better than SH class                    |
| Lube. oil capacity         | L(US gal)         | 3.4 (0.90)                                      |
| Coolant capacity           | L(US gal)         | 1.22 (0.32)                                     |
| Governor type              |                   | Centrifugal flyweight mechanical type governor  |
| Dimensions (LxBxH)         | mm(in)            | 526x415x503 (20.7x16.3x19.8)                    |
| Dry weight                 | kg(lb)            | Approx. 95.4(210)                               |
| Application                |                   | Stationary only                                 |

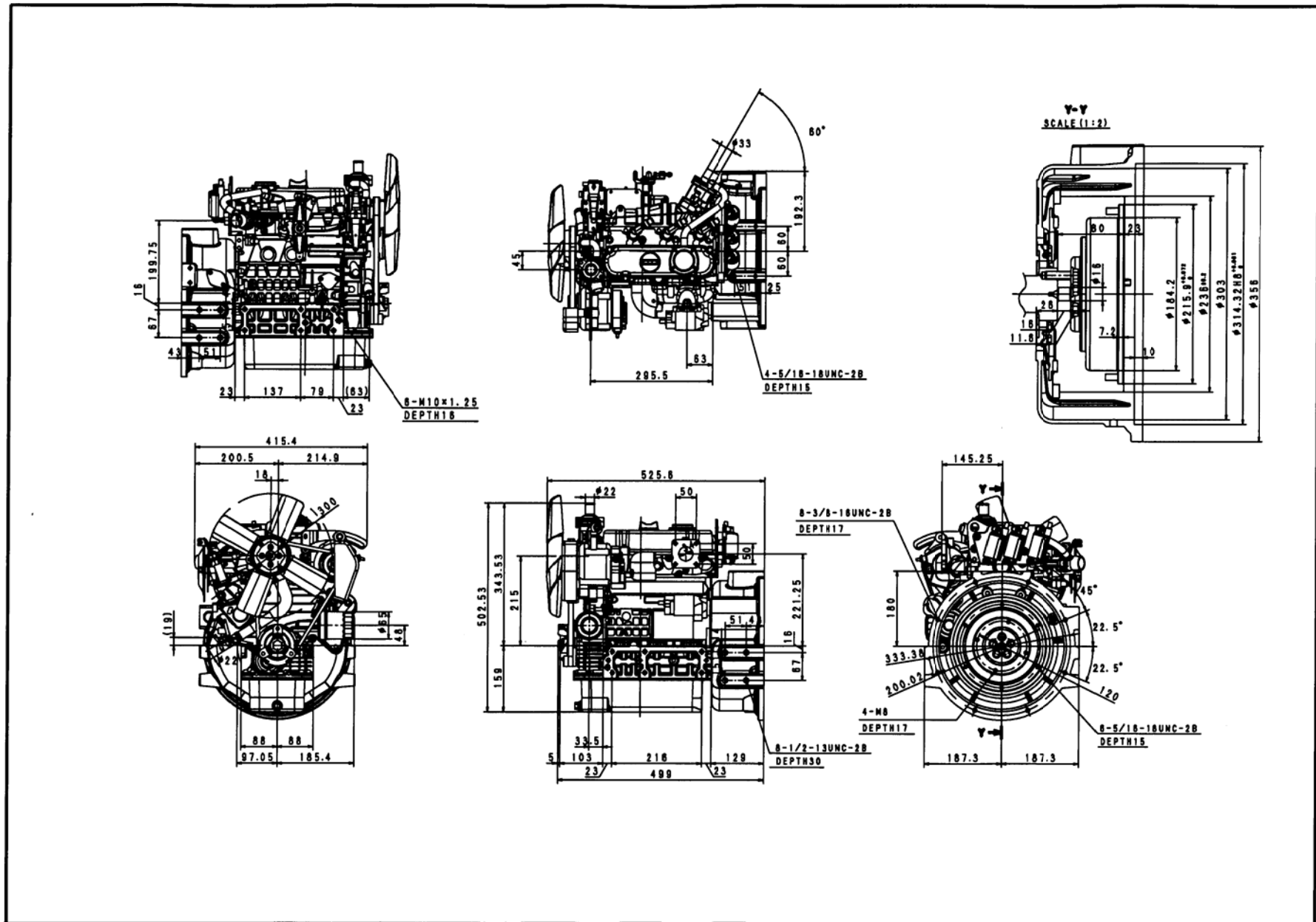
## 2. PERFORMANCE CURVES

### DG972 PERFORMANCE CURVES

Higher calorific value : 11000kcal/m<sup>3</sup> (1236BTU/ft<sup>3</sup>)



### 3. DIMENSIONS



## 4. TECHNICAL DATA

| ITEM                                    |                            | SPECIFICATIONS  |       |
|---|----------------------------|---|-------|
| Engine model                            |                            | DG972-SAEH-S1   |       |
| Brake horse power                       |                            | See attached sheet  | 4-1)  |
| Top Clearance                           |                            | 1.35 to 1.65mm (0.05315 to 0.06496in)   |       |
| Compression pressure                    |                            | 1.32MPa (192psi)  |       |
| Fuel consumption                        |                            | See attached sheet  | 4-2)  |
| Lube. oil consumption                   |                            | Max.0.67g/kWh (0.5g/HPh) at rated load  |       |
| Lube. oil pressure                      |                            | at idling speed: more than 69kPa (more than 9.95psi)                              |       |
|   |                            | at rated speed: 196 to 441kPa (28.44 to 63.99psi)                                 |       |
| Noise level                             |                            | See attached sheet  | 4-3)  |
| Combustion air requirements             |                            | See attached sheet<br>(Refer to 25deg.C and 1000hPa)                              |       |
| Cooling air requirements                |                            |   |       |
| Combustion and cooling air requirements |                            |   |       |
| Exhaust gas volume                      |                            | See attached sheet<br>(Refer to 25deg.C and 1000hPa)                              | 4-5)  |
| Cold starting limits                    |                            | -15deg.C (5deg.F)   |       |
| Heat rejection                          |                            | See attached sheet  | 4-6)  |
| Angles of tilt                          | Front or Rear<br>down      | 30° (Less than 10min. continuous operation)                                       |       |
|   |                            | 20° (Continuous operation)  |       |
|   | Left or Right<br>side down | 30° (Less than 10min. continuous operation)                                       |       |
|   |                            | 20° (Continuous operation)  |       |
| Valve timing                            |                            | [Inlet valve] Open: TDC -20° Close: BDT +45°                                      |       |
|   |                            | [Exhaust valve] Open: BDC -50° Close: TDC +15°                                    |       |
| Cooling fan data                        |                            | See attached sheet  | 4-7)  |
| Center of gravity                       |                            | See attached sheet  | 4-8)  |
| Unbalanced forces of engines            |                            | See attached sheet  | 4-9)  |
| Mass elastic system                     |                            | See attached sheet  | 4-10) |
| Thermostat specifications               |                            | Opening temperature: 71±1.5deg.C (159.8±2.7deg.F)                                 |       |
|   |                            | Fully opened temperature: 85deg.C (185deg.F)<br>[at Thermostat lift:8mm (0.31in)] |       |

## 4-1) BRAKE HORSE POWER

### SAE J1349

| Engine speed     | rpm | 2000 | 2400 | 2800 | 3200 | 3600 |
|------------------|-----|------|------|------|------|------|
| Net intermittent | kW  | 12.6 | 15.4 | 17.4 | 18.9 | 19.5 |
|                  | HP  | 16.9 | 20.6 | 23.3 | 25.3 | 26.1 |
|                  | PS  | 17.1 | 20.9 | 23.7 | 25.7 | 26.5 |
| Net continuous   | kW  | 10.1 | 12.3 | 13.9 | 15.1 | 15.6 |
|                  | HP  | 13.5 | 16.5 | 18.7 | 20.3 | 20.9 |
|                  | PS  | 13.7 | 16.8 | 18.9 | 20.6 | 21.2 |

Note

- Conversion rates  
 $1\text{kW}=1.35962\text{PS}=1.34048\text{HP}$   
 $1\text{PS}=0.7355\text{kW}=0.985925\text{HP}$   
 $1\text{HP}=0.7457\text{kW}=1.01428\text{PS}$
- Fuel detail  
 Japanese standard gas  
 higher calorific value :  $11000\text{kcal/m}^3$  ( $1236\text{BTU/ft}^3$ )  
 supply pressure :  $0.98 - 2.45\text{kPa}$  ( $7.35 - 18.38\text{mmHg}$ )

## 4-2) FUEL CONSUMPTION

### Specific at net intermittent (SAE J1349)

| Engine speed      | rpm    | 2000  | 2400  | 2800  | 3200  | 3600  |
|-------------------|--------|-------|-------|-------|-------|-------|
| Brake horse power | kW     | 12.6  | 15.4  | 17.4  | 18.9  | 19.5  |
|                   | HP     | 16.9  | 20.6  | 23.3  | 25.3  | 26.1  |
|                   | PS     | 17.1  | 20.9  | 23.7  | 25.7  | 26.5  |
| Fuel consumption  | g/kWh  | 269   | 264   | 269   | 273   | 273   |
|                   | g/HPh  | 200   | 197   | 200   | 204   | 204   |
|                   | g/PSh  | 198   | 194   | 198   | 201   | 201   |
|                   | lb/HPh | 0.442 | 0.434 | 0.442 | 0.449 | 0.449 |

Note

- Conversion rates  
 $1\text{kW}=1.35962\text{PS}=1.34048\text{HP}$      $1\text{kg}=2.20462\text{lb}$  ( $1\text{g}=0.00220462\text{lb}$ )  
 $1\text{PS}=0.7355\text{kW}=0.985925\text{HP}$      $1\text{lb}=0.45359\text{kg}$   
 $1\text{HP}=0.7457\text{kW}=1.01428\text{PS}$
- Fuel detail  
 Japanese standard gas  
 higher calorific value :  $11000\text{kcal/m}^3$  ( $1236\text{BTU/ft}^3$ )  
 supply pressure :  $0.98 - 2.45\text{kPa}$  ( $7.35 - 18.38\text{mmHg}$ )

## 4-3) NOISE LEVEL

| Load × rpm                    | Unit  | Sound pressure at 1m(3.3ft) |
|-------------------------------|-------|-----------------------------|
| 0/4 × 3850                    | dB(A) | 90.0                        |
| 4/4 × 3850<br>15.6kW (20.9HP) | dB(A) | 92.0                        |
| 0/4 × 1500                    | dB(A) | 72.0                        |

These data show the average noise level at four points.

Note

- Measurement conditions : With radiator, cooling fan, air cleaner and muffler.

## 4-4) AIR REQUIREMENTS

### 1. Combustion air requirements (Refer to 25deg.C and 1000hPa)

|                      |       |       |       |       |       |
|----------------------|-------|-------|-------|-------|-------|
| rpm                  | 2000  | 2400  | 2800  | 3200  | 3600  |
| L/sec                | 12.35 | 14.81 | 17.28 | 19.75 | 22.22 |
| m <sup>3</sup> /h    | 44.44 | 53.33 | 62.22 | 71.11 | 80.00 |
| in <sup>3</sup> /sec | 753   | 904   | 1055  | 1205  | 1356  |
| ft <sup>3</sup> /min | 26.13 | 31.35 | 36.58 | 41.80 | 47.03 |

Combustion air requirements calculating formula

$$Q_1 = V_h \cdot N \cdot C \cdot \eta \cdot 10^{-3}$$

Q<sub>1</sub>: Amount of intake air (m<sup>3</sup>/min)

η: Intake efficiency

V<sub>h</sub>: Total displacement (L)

Natural Gas: 0.77

N: Engine speed (rpm)

C: Coefficient=0.5

### 2. Cooling air requirements (Refer to 25deg.C and 1000hPa)

|                      |        |        |        |        |        |
|----------------------|--------|--------|--------|--------|--------|
| rpm                  | 2000   | 2400   | 2800   | 3200   | 3600   |
| L/sec                | 571.2  | 737.2  | 824.7  | 833.9  | 764.7  |
| m <sup>3</sup> /h    | 2056   | 2654   | 2969   | 3002   | 2753   |
| in <sup>3</sup> /sec | 34859  | 44984  | 50327  | 50888  | 46667  |
| ft <sup>3</sup> /min | 1210.2 | 1561.8 | 1747.3 | 1766.7 | 1620.2 |

Above data is decided by following conditions.

1. Using the standard radiator.
2. Engine is run as open unit.

### 3. Combustion and cooling air requirements (Refer to 25deg.C and 1000hPa)

|                      |        |        |        |        |        |
|----------------------|--------|--------|--------|--------|--------|
| rpm                  | 2000   | 2400   | 2800   | 3200   | 3600   |
| L/sec                | 583.5  | 752.0  | 842.0  | 853.7  | 786.9  |
| m <sup>3</sup> /h    | 2100.4 | 2707.3 | 3031.2 | 3073.1 | 2833.0 |
| in <sup>3</sup> /sec | 35612  | 45888  | 51382  | 52093  | 48023  |
| ft <sup>3</sup> /min | 1236.3 | 1593.2 | 1783.9 | 1808.5 | 1667.2 |

Note

#### 1. Cooling fan and fan pulley specifications(Cooling fan Part No. 15881-74112)

| Item                           |                 |
|--------------------------------|-----------------|
| Fan diameter                   | 300mm (11.81in) |
| No. of blade and type of shape | 4, S type       |
| Diameter of fan driving pulley | 100mm (3.94in)  |
| Diameter of fan pulley         | 84mm (3.31in)   |

#### 2. Conversion rates

$$1L = 61.0237 \text{ in}^3 = 0.035315 \text{ ft}^3$$

$$1 \text{ ft}^3 = 28.3168 \text{ L}$$

$$1 \text{ L/sec} = 3.6 \text{ m}^3/\text{h} = 2.1189 \text{ ft}^3/\text{min}$$

## 4-5) EXHAUST GAS VOLUME

Refer to 25deg.C and 1000hPa

| rpm                  | 2000   | 2400   | 2800   | 3200   | 3600   |
|----------------------|--------|--------|--------|--------|--------|
| L/sec                | 35.46  | 42.55  | 49.65  | 56.74  | 63.83  |
| m <sup>3</sup> /h    | 127.67 | 153.19 | 178.73 | 204.26 | 229.80 |
| in <sup>3</sup> /sec | 2164   | 2597   | 3030   | 3462   | 3895   |
| ft <sup>3</sup> /min | 75.05  | 90.06  | 105.07 | 120.08 | 135.09 |

Note

- Conversion rates
  - 1L=61.0237in<sup>3</sup>=0.035315ft<sup>3</sup>
  - 1ft<sup>3</sup>=28.3168L
  - 1L/sec=3.6m<sup>3</sup>/h=127.133ft<sup>3</sup>/hr

## 4-6) HEAT REJECTION TO COOLING WATER

### 1. Specific at net intermittent (SAE J1349)

| Engine speed                    | rpm    | 2000  | 2400  | 2800  | 3200  | 3600  |
|---------------------------------|--------|-------|-------|-------|-------|-------|
| Brake horse power               | kW     | 12.6  | 15.4  | 17.4  | 18.9  | 19.5  |
|                                 | HP     | 16.9  | 20.6  | 23.3  | 25.3  | 26.1  |
|                                 | PS     | 17.1  | 20.9  | 23.7  | 25.7  | 26.5  |
| Fuel consumption                | g/kWh  | 269   | 264   | 269   | 273   | 273   |
|                                 | g/HPh  | 200   | 197   | 200   | 204   | 204   |
|                                 | g/PSh  | 198   | 194   | 198   | 201   | 201   |
|                                 | lb/HPh | 0.442 | 0.434 | 0.442 | 0.449 | 0.449 |
| Heat rejection to cooling water | MJ/h   | 29.05 | 31.52 | 38.79 | 45.13 | 51.82 |
|                                 | kcal/h | 6940  | 7529  | 9267  | 10781 | 12379 |
|                                 | BTU/h  | 12491 | 13551 | 16679 | 19404 | 22281 |

Note

Heat rejection to cooling water calculating formula

$$Ho=Hu \cdot Ne \cdot be \cdot i$$

Ho: Heat rejection to cooling water

Hu: Fuel low calorific value

Japanese standard gas; 49.4MJ/kg, 11800kcal/h, 212391BTU/lb

Ne: Brake horse power

Be: Specific fuel consumption

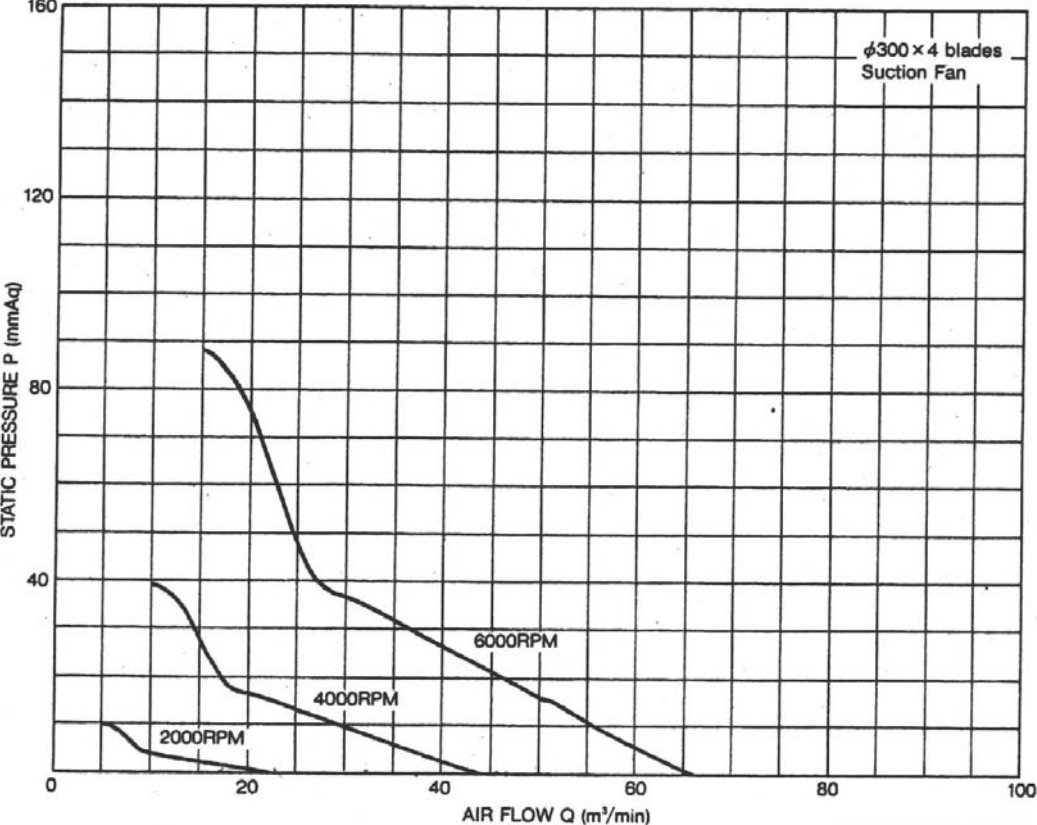
i: Dispersion ratio to cooling water



# 4-7) COOLING FAN DATA

## 1. Performance curves <P-Q>

• Part No. 15881-74110 (Applicable for DG972)



## 4-8) CENTER OF GRAVITY

### 1. With standard flywheel and rear-end plate

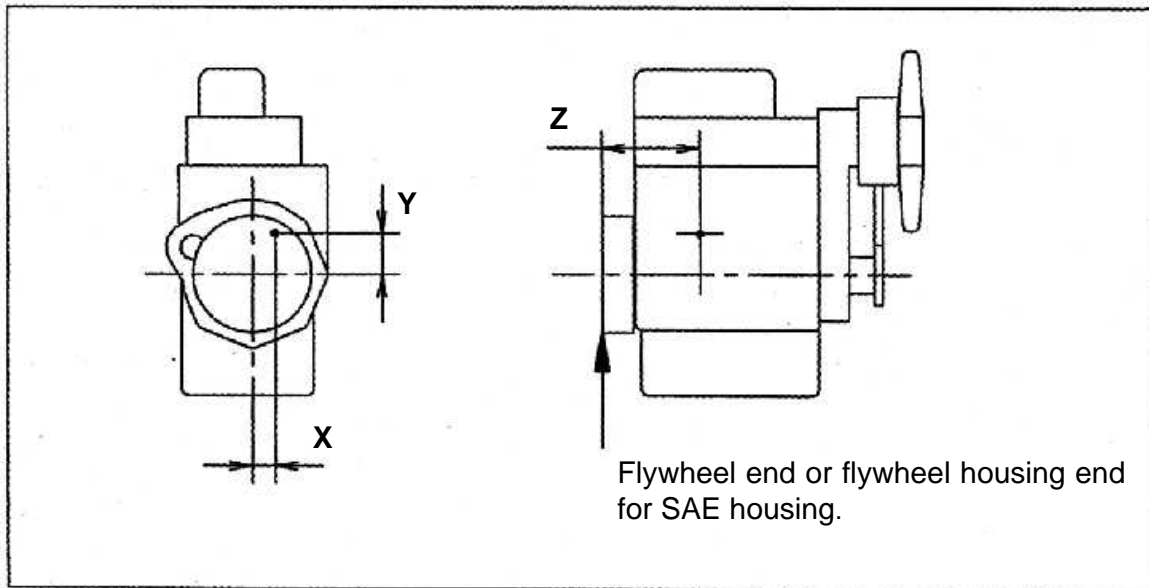
| Model    | Dry weight<br>kg<br>(lb) | Center of gravity |                |                 |
|----------|--------------------------|-------------------|----------------|-----------------|
|          |                          | X mm<br>(in)      | Y mm<br>(in)   | Z mm<br>(in)    |
| WG/DF972 | 72.0<br>(159)            | -25.5<br>(-1.00)  | 73.3<br>(2.89) | 179.5<br>(7.07) |

### 2. With SAE flywheel and flywheel housing

| Model             | Dry weight<br>kg<br>(lb) | Center of gravity |                |                 |
|-------------------|--------------------------|-------------------|----------------|-----------------|
|                   |                          | X mm<br>(in)      | Y mm<br>(in)   | Z mm<br>(in)    |
| DG972<br>-SAEH-S1 | 95.4<br>(210)            | -10.0<br>(0.39)   | 28.0<br>(1.10) | 207.0<br>(8.15) |

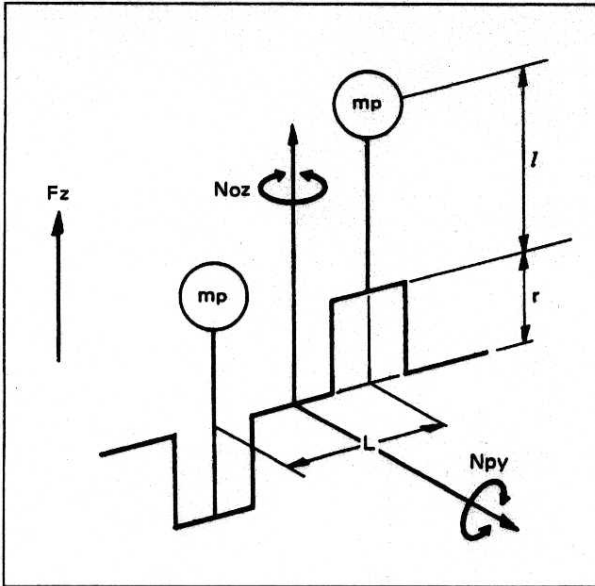
#### Note

Cooling water and lubricating oil weight is not included in above engine weight.



# 4-9) UNBALANCED FORCES OF ENGINES

## 1. Base data



$F_z$ : Unbalanced inertia force  
 $N_{py}$ ,  $N_{oz}$ : Unbalanced inertia couple  
 $m_p$ : Reciprocating mass  
 $r$ : Crank radius  
 $l$ : Center distance of connecting rod  
 $L$ : Cylinder distance  
 $\omega$ : Angular velocity

|                        |                          |
|------------------------|--------------------------|
| $\omega = 2\pi n / 60$ | $n$ : Engine speed (rpm) |
|------------------------|--------------------------|

|                      |                    |              |
|----------------------|--------------------|--------------|
| $l = 0.098\text{m}$  | Cylinder bore (mm) | $m_p$ (kg)   |
| $r = 0.0368\text{m}$ | 74.5               | 0.37/9.80665 |
| $L = 0.080\text{m}$  |                    |              |

## 2. Unbalanced inertia force and couple

( $\times \omega^2$ )

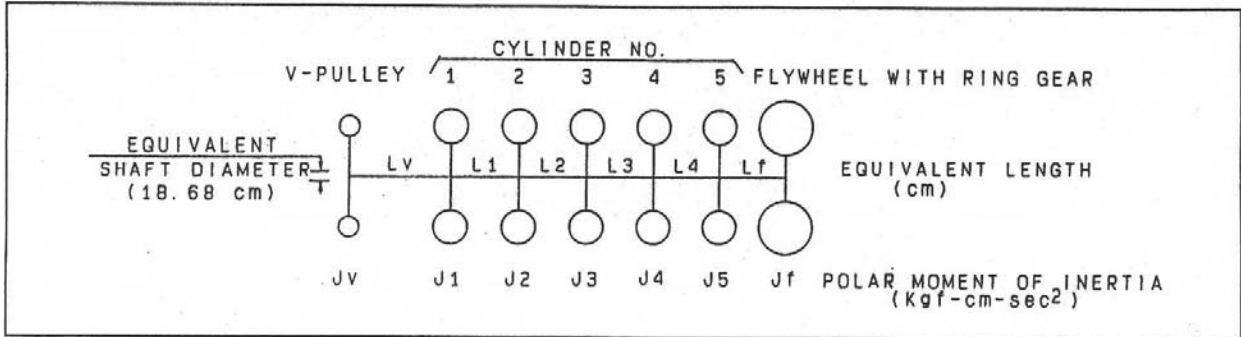
| Model           | No. of Cylinder | Cylinder Bore | Order | $F_z$ | $N_{py}$ | $N_{oz}$ |
|-----------------|-----------------|---------------|-------|-------|----------|----------|
| WG/DF/DG<br>972 | 3               | 74.5mm        | 1     | 0     | 0.000096 | 0.000096 |
|                 |                 |               | 2     | 0     | 0.000072 | 0        |

### ▼An example of calculation

| Calculation condition                              | $\omega^2$                                      | $F_z, N_{py}, N_{oz}$ |             |  |
|--|---|-----------------------|-------------|--|
|  |   | Order                 | Calculation |  |
| Engine model<br>DG972<br>Engine speed<br>3600(rpm) | $[2 \times \pi \times 3600/60]^2$<br>$= 142122$ | $F_z$                 | 1           | 0  |
|  |   |                       | 2           | 0  |
|  |   | $N_{py}$              | 1           | $0.000096 \times 142122 = 13.6\text{kg}$ |
|  |   |                       | 2           | $0.000072 \times 142122 = 10.2\text{kg}$ |
|  |   | $N_{oz}$              | 1           | $0.000096 \times 142122 = 13.6\text{kg}$ |
|  |   |                       | 2           | 0  |

# 4-10) MASS ELASTIC SYSTEM

## Equivalent torsional vibration data



| MODEL             | EQUIVALENT LENGTH<br>(cm) |      |      |      | POLAR MOMENT OF INERTIA<br>(kgf-cm-sec <sup>2</sup> ) |       |       |       |       |
|-------------------|---------------------------|------|------|------|---|-------|-------|-------|-------|
|                   | LV                        | L1   | L2   | Lf   | JV  | J1    | J2    | J3    | Jf    |
| DG972<br>-SAEH-S1 | 35082                     | 4528 | 4528 | 2824 | 0.013   | 0.026 | 0.026 | 0.026 | 1.281 |

Note: Flywheel E8052-25110, V-Pulley 16861-74280

## 5. FUEL SYSTEM AND FUEL DIAGRAM

- All fuel connections added to this engine must be installed by qualified personnel utilizing recognized procedures and standards.
- These non-KUBOTA installed parts, such as hoses, shutoff solenoid valve should be approved for Natural gas use.
- An approved, listed fuel filter and shutoff solenoid valve must be installed between the gas tank and Kubota regulator.
- Two fuel cut solenoids must be installed in series before the regulator on the fuel supply line for safety (backup) purpose.

### 1. Tightening torque and leak check

- 1) The joint must be installed to the gas entrance of the regulator by screw with O-ring. Screw is tightened to the specified torque using a driver, and leak check must be performed as shown in the below table.
- 2) The connector on the gas mixer may be mounted on any position since it is not sealed. The lock nut may be loosened using a wrench. The connector may be changed to any specified angle. The lock nut should be tightened to the specified torque using a wrench as shown in the below table.

#### [ TIGHTENING TORQUE AND LEAK CHECK ]

|          | Qty. | Size    | Tightening torque |            |              | Leak check pressure             |
|----------|------|---------|-------------------|------------|--------------|---------------------------------|
|          |      |         | Nm                | kgfm       | ft-lb        |                                 |
| SCREW    | 2    | M4      | 1.9 to 2.9        | 0.2 to 0.3 | 1.5 to 2.2   | Soap solution or its equivalent |
| LOCK NUT | 1    | M16 × 1 | 19.6 to 39.2      | 2.0 to 4.0 | 14.5 to 28.9 |                                 |

### 2. Setting of the regulator

- 1) Install the regulator in **UPRIGHT** position, it must be installed within 4G vibration level. If not, it may not supply necessary fuel to the engine.
- 2) **DO NOT** connect any extension hose to the air vent pipe of the regulator. This may cause an improper supply of fuel to the engine.

### 3. Caution for FUEL SYSTEM

The standard engine is equipped with  $\phi 6.6$  jet for the fuel calorific gas value of 11000kcal/m<sup>3</sup> (1236BTU/ft<sup>3</sup>).

When the engine is operated with the different calorific gas, it is necessary to select the correct jet of the mixer.

In that case, refer to the manual [**Adjustment for Natural Gas Engine DG972**].

Japanese standard gas      higher calorific value : 11000kcal/m<sup>3</sup> (1236BTU/ft<sup>3</sup>)  
    supply pressure        : 0.98 – 2.45kPa (7.35 – 18.38mmHg)

Equipments                  Vacuum Meter    : Not KUBOTA supplied  
    Adjustable Jet    : Service Tool

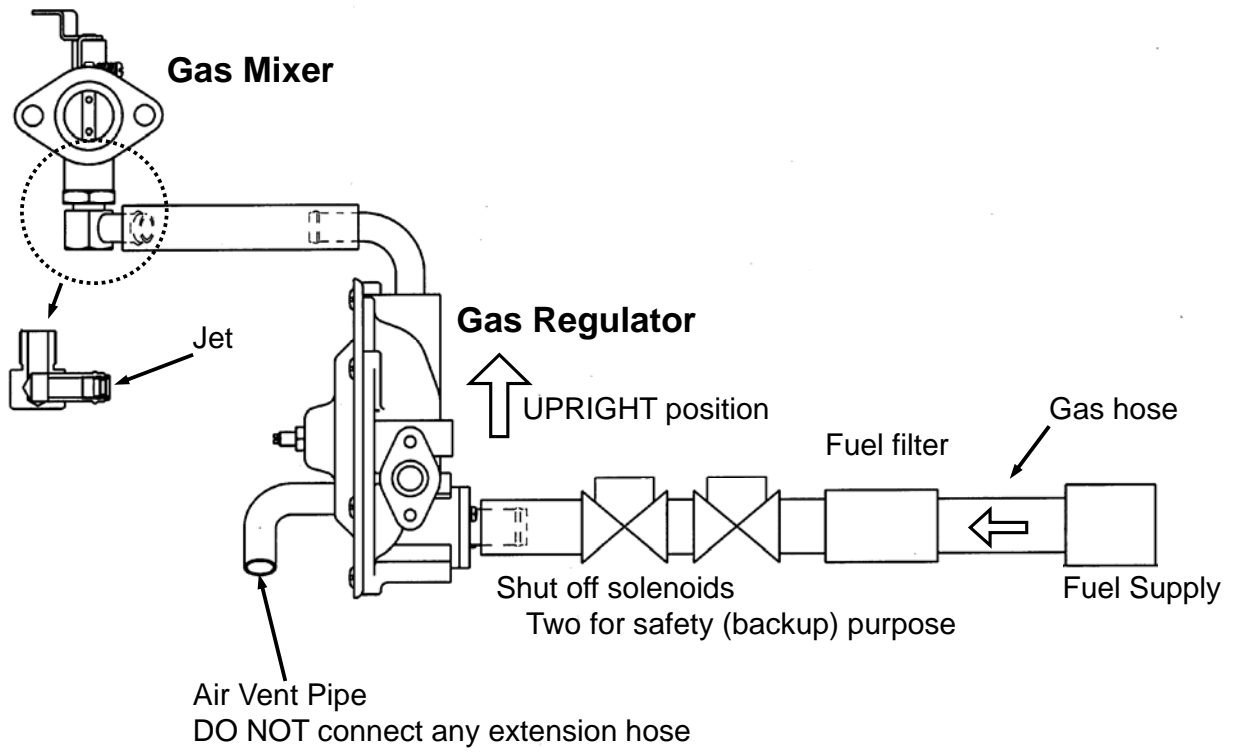
### 4. Application Check Item

The items as shown below must be managed for all engines, and these items must be informed to KUBOTA with Application Check results.

Refer to the attached sheet [**Application Check Sheet for DG972**].

- 1) The diameter of the jet (with the intake vacuum curve)
- 2) The calorific value of the gas
- 3) The supply pressure of gas
- 4) The serial number of the engine

## 5. Fuel diagram



NATURAL GAS ENGINE

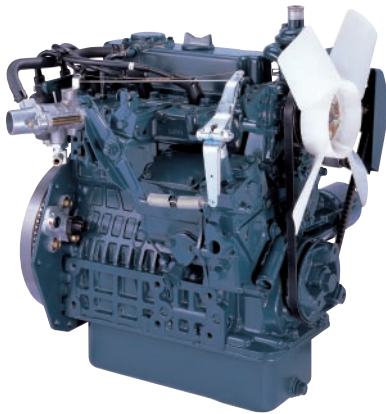
**KUBOTA DG SERIES (3-cylinder)**

# DG972-E2

**2**  
EPA Tier

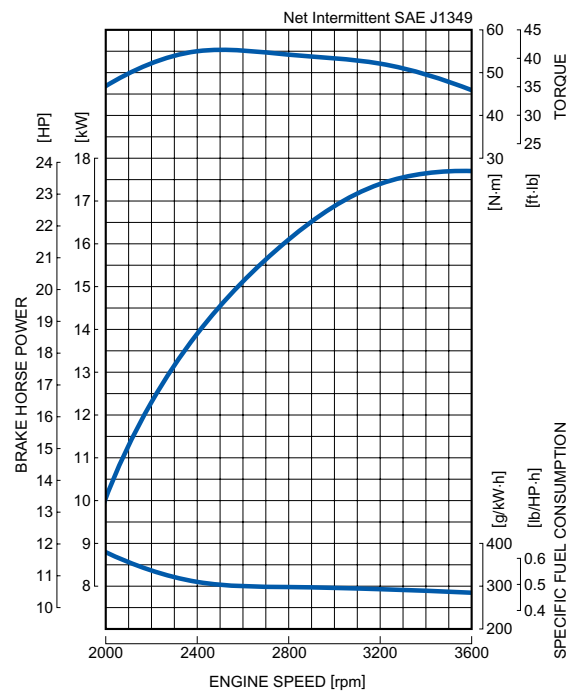
## RATED POWER

**17.6kW@3600rpm**



Photograph may show non-standard equipment.

## PERFORMANCE CURVE



## FEATURES and BENEFITS

### New Engine Series

- The Kubota DG Series offers a new solution to the increasing needs for natural gas engine. The diesel engine based Kubota DG Series gives users the same foot-print, reliability and durability of D902, WG972, and DF972 acknowledged as the world's top quality small industrial engines.
- Kubota offers SAE Flywheel Housing and Rear End Plate specifications for the DG972 engine. These options offer users flexible Power Take Off (PTO) choices.
- The Kubota DG Series is designed to endure use outdoors under severe environment. This series is equipped with a bypass breather tube to avoid freezing below zero.

### Emission

- Kubota DG Series complies with EPA Tier 2 Emissions Regulations. EPA regulation is one of the most stringent emissions regulations in the world.

### Best Fuel System

- Specialized for Natural Gas use, the DG972 engine eliminated the carburetor, regulator and a fuel filter parts, which are only necessary for Gasoline or LPG use. Also, Kubota adopts the best jet set and the ignition timing that provides the best engine performance in severe conditions.

### Ease maintenance cost and time

- Mechanical governor system will contribute to lower maintenance cost and prevents users from having to deal with complicated electric maintenance. Moreover, water resistant spark plug caps are adopted for outdoor use.

## GENERAL SPECIFICATION

|                             |           |   |
|-----------------------------|-----------|---|
| Model                       |           | <b>DG972-E2</b>   |
| Emission Regulation         |           | Tier 2  |
| Type                        |           | Vertical 4-cycle Liquid Cooled Natural Gas                |
| Number of Cylinders         |           | 3   |
| Bore                        | mm (in)   | 74.5 (2.93)   |
| Stroke                      | mm (in)   | 73.6 (2.9)  |
| Displacement                | L (cu.in) | 0.962 (58.70)   |
| Fuel                        |           | Natural Gas   |
| Intake System               |           | Naturally Aspirated                                       |
| Maximum Speed               | rpm       | 3600  |
| Output:<br>Net Intermittent | kW        | 17.6  |
|                             | hp        | 23.6  |
|                             | ps        | 23.9  |
| Direction of Rotation       |           | Counterclockwise Viewed on Flywheel                       |
| Oil Pan Capacity            | L (gal)   | 3.7 (0.98)  |
| Starter Capacity            | V-kW      | 12-1.0  |
| Alternator Capacity         | V-A       | 12-40   |
| Length                      | mm (in)   | 525.5 (20.69)* <sup>1</sup> / 452.5 (17.81)* <sup>2</sup> |
| Width                       | mm (in)   | 415.4 (16.35)   |
| Height (1)                  | mm (in)   | 502.5 (19.78)   |
| Height (2)                  | mm (in)   | 159.0 (6.26)  |
| Dry Weight                  | kg (lb)   | 72.0 (158.7)* <sup>1</sup> / 95.4 (210.3)* <sup>2</sup>   |

\*Specification is subject to change without notice.

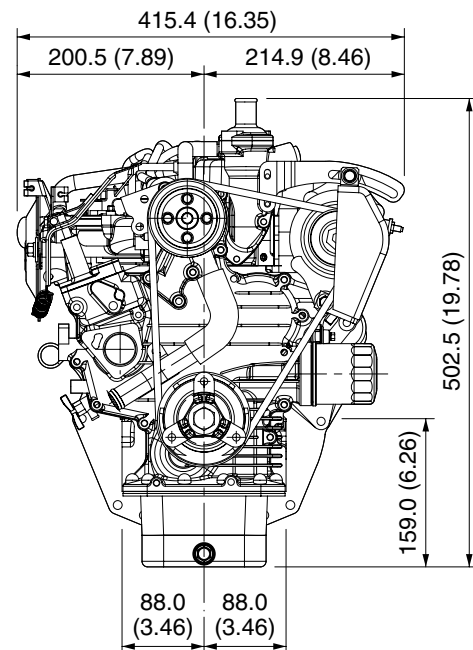
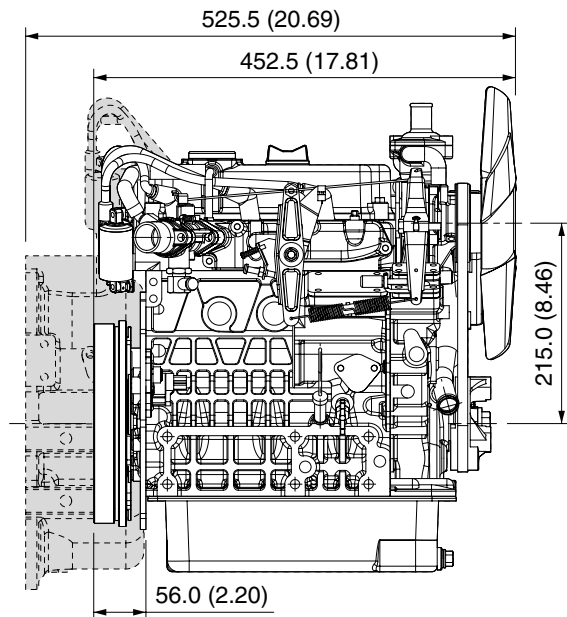
\*Output: Net Intermittent SAE J1349

\*Dry weight is according to Kubota's standard specification.  
When specification varies, the weight will vary accordingly.

\*<sup>1</sup> with SAE Flywheel and Housing

\*<sup>2</sup> with Rear End Plate

## DIMENSIONS



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Your Driving Force  
KUBOTA ENGINE



# **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 | 10        | 10        | 10         | 10        |
| Days/week | 7         | 7         | 7          | 7         |

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

| Liquid Name                          | Condensate      | Produced Water |          |
|--------------------------------------|-----------------|----------------|----------|
| Max. Daily Throughput (1000 gal/day) | 27.72           | 168.00         |          |
| Max. Annual Throughput (1000 gal/yr) | 10117.80        | 61320.00       |          |
| Loading Method                       | BF              | BF             |          |
| Max. Fill Rate (gal/min)             | 168             | 168            |          |
| Average Fill Time (min/loading)      | 50              | 50             |          |
| Max. Bulk Liquid Temperature (F)     | 65.1            | 65.1           |          |
| True Vapor Pressure                  | 2.0             | 0.4            |          |
| 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) | 6.5966         | 0.0009   |
|                                      | Annual (ton/yr) | 3.3107         | 0.0028   |
| Max HAP Emission Rate                | Loading (lb/hr) | 0.0974         | 7.34E-07 |
|                                      | Annual (ton/yr) | 0.0489         | 2.23E-06 |
| 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 R**  
**Air Pollution Control Device – Emission**  
**Reduction Device Sheets**

## ATTACHMENT R – AIR POLLUTION CONTROL DEVICE / EMISSION REDUCTION DEVICE SHEETS

Complete the applicable air pollution control device sheet s for each flare, vapor combustor, thermal oxidizer, condenser, adsorption system, vapor recovery unit , BTEX Eliminator, Reboiler with and without Glow Plug, etc. at the facility. Use extra pages if necessary.

Emissions calculations must be performed using the most conservative control device efficiency.

*The following five (5) rows are only to be completed if registering an alternative air pollution control device.*

|                              |    |                               |  |
|------------------------------|----|-------------------------------|--|
| Emission Unit ID:            | NA | Make/Model:                   | NA   |
| Primary Control Device ID:   | NA | Make/Model                    | NA   |
| Control Efficiency (%):      | NA | APCD/ERD Data Sheet Completed | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Secondary Control Device ID: | NA | Make/Model                    | NA   |
| Control Efficiency (%):      | NA | APCD/ERD Data Sheet Completed | <input type="checkbox"/> Yes <input type="checkbox"/> No |

### VAPOR COMBUSTION (Including Enclosed Combustors)

#### General Information

|  |             |  |                                     |
|--|-------------|--|-------------------------------------|
| Control Device ID#:                            | EC001-003   | Installation Date:<br><input checked="" type="checkbox"/> New <input type="checkbox"/> Modified <input type="checkbox"/> Relocated |                                     |
| Maximum Rated Total Flow Capacity<br>5458 scfh | 131000 scfd | Maximum Design Heating Input (from mfg. spec sheet)<br>12.0 MMBTU/hr   | Design Heat Content<br>2300 BTU/scf |

#### Control Device Information

Type of Vapor Combustion Control?

- Enclosed Combustion Device     
  Elevated Flare     
  Ground Flare  
 Thermal Oxidizer

|                        |                              |      |
|------------------------|------------------------------|------|
| Manufacturer: Cimarron | Hours of operation per year? | 8760 |
| Model: 48" HV ECD      |                              |      |

List the emission units whose emissions are controlled by this vapor control device (Emission Point ID# NA)

| Emission Unit ID# | Emission Source Description | Emission Unit ID# | Emission Source Description |
|-------------------|-----------------------------|-------------------|-----------------------------|
| TANKCOND001-010   | Condensate Tanks            |                   |                             |
| TANKPW001-004     | Produced Water Tanks        |                   |                             |
|                   |                             |                   |                             |

*If this vapor combustor controls emissions from more than six (6) emission units, please attach additional pages.*

|   |                         |                           |  |
|---|-------------------------|---------------------------|--|
| Assist Type (Flares only)<br><input type="checkbox"/> Steam <input type="checkbox"/> Air<br><input type="checkbox"/> Pressure <input checked="" type="checkbox"/> Non | Flare height<br>25 feet | Tip Diameter<br>3.33 feet | Was the design per §60.18?<br><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No<br>Provide determination |
|---|-------------------------|---------------------------|--|

#### Waste Gas Information

|   |  |   |
|---|--|---|
| Maximum Waste Gas Flow Rate<br>33.37 (scfm) | Heat Value of Waste Gas Stream<br>1,943.03 BTU/ft <sup>3</sup> | Exit Velocity of the Emission Stream<br>0.0639 (ft/s) |
|---|--|---|

Please see Attachment S, Tables 6 & 7 for VOC composition/ characteristics of the waste gas stream to be burned.

#### Pilot Gas Information

|                             |  |                                      |  |
|-----------------------------|--|--------------------------------------|--|
| Number of Pilot Lights<br>3 | Fuel Flow Rate to Pilot Flame per Pilot<br>12.6 scfh | Heat Input per Pilot<br>12800 BTU/hr | Will automatic re-ignition be used?<br><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
|-----------------------------|--|--------------------------------------|--|

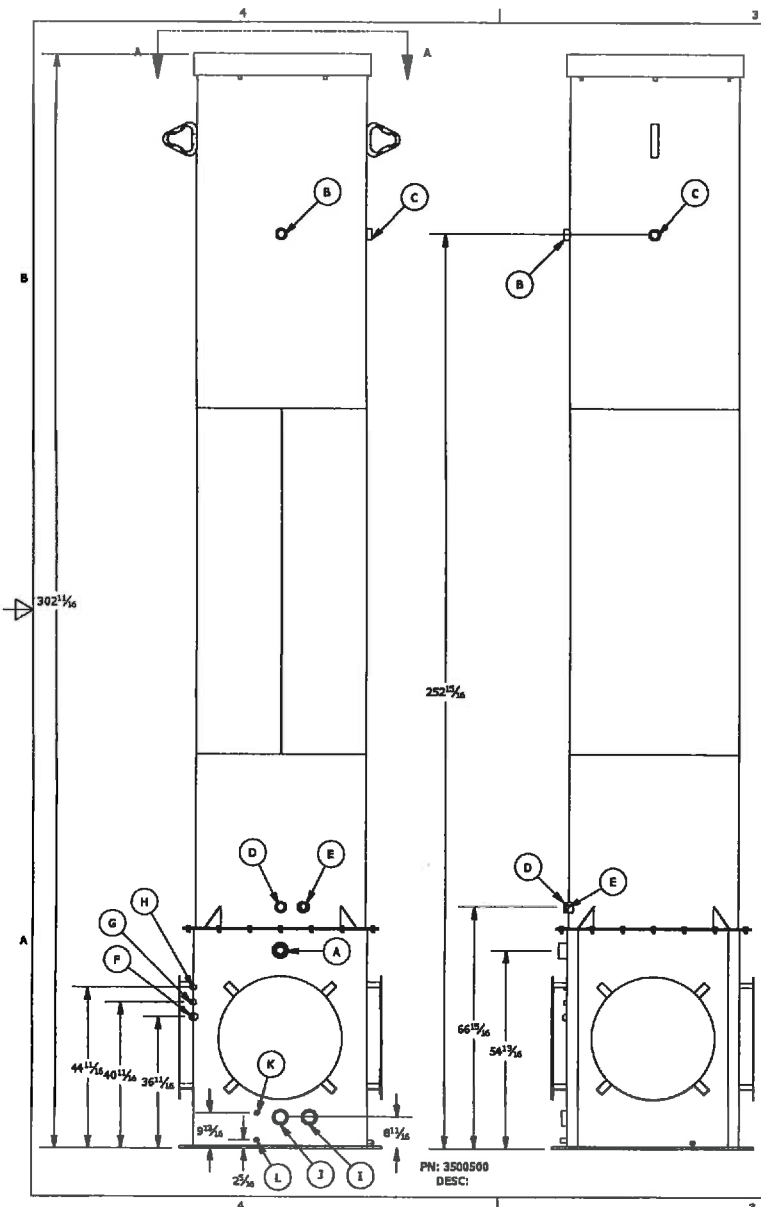
If automatic re-ignition is used, please describe the method. Flame Rectification, a thermocouple equivalent

|  |  |
|--|--|
| Is pilot flame equipped with a monitor to detect the presence of the flame?<br><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No | If Yes, What type?<br><input checked="" type="checkbox"/> Thermocouple <input type="checkbox"/> Infrared<br><input type="checkbox"/> Ultraviolet <input type="checkbox"/> Camera <input type="checkbox"/> Other: |
|--|--|

Describe all operating ranges and maintenance procedures required by the manufacturer to maintain the warranty. *(If unavailable, please indicate).*

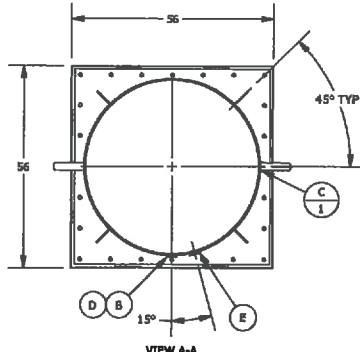
Additional information attached?  Yes  No Manufacturer's specs sheet

Please attach copies of manufacturer's data sheets, drawings, flame demonstration per §60.18 or §63.11 (b) and performance testing.



**48" DIA x 302 5/8" HEIGHT, 88 ORIFICES  
EMISSION CONTROL DEVICE**

- \* >98% TVOC DRE, CERTIFIED USEPA 40 CFR 60, APPENDIX A, SOURCE EMISSIONS TEST METHODS REFERENCED. MEETS ALL EPA & CDPHE REGULATIONS.
- \* DESTROYS OIL/CONDENSATE PRODUCTION TANK VAPORS W/ NO VISIBLE FLAME.
- \* EXCELLENT OPACITY AND SMOKELESS OPERATION.
- \* RELIABLE AND CUSTOMIZABLE IGNITION.
- \* VERY LOW CAPITAL AND OPERATING COST.
- \* EASY TO OPERATE AND MAINTAIN.
- \* FIELD TESTED TO DESTROY UP TO 119.5 MDSCFD (131 MCFD) @ 10 oz/in<sup>2</sup>; 2300 BTU/CF WASTE GAS (SG 1.45)
- \* STRUCTURE CERTIFIED FOR 90 MPH 3-SEC WIND GUST PER ASCE 7-05 & IBC 2006 STANDARDS. HIGHER WIND LOAD RATED STRUCTURES AVAILABLE.



PN: 3500500  
DESC:

| SCHEDULE OF NOZZLES |     |                    |                               |
|---------------------|-----|--------------------|-------------------------------|
| MARK                | QTY | DESCRIPTION        | SERVICE                       |
| A                   | 1   | 3" HALF COUPLING   | 2000# BURNER WASTE GAS IN     |
| B                   | 1   | 2" FULL COUPLING   | 3000# FLOW TEST/AUTOMATION    |
| C                   | 1   | 2" FULL COUPLING   | 3000# FLOW TEST/AUTOMATION    |
| D                   | 1   | 2" FULL COUPLING   | 3000# SIGHT GLASS             |
| E                   | 1   | 2" FULL COUPLING   | 3000# MANUAL LIGHTING         |
| F                   | 1   | 1" FULL COUPLING   | 3000# PILOT GAS IN            |
| G                   | 1   | 1/2" FULL COUPLING | 3000# IGNITOR CABLE           |
| H                   | 1   | 1/2" FULL COUPLING | 3000# AUTOMATION              |
| I                   | 1   | 3" HALF COUPLING   | 3000# DRIP TANK WASTE GAS IN  |
| J                   | 1   | 3" HALF COUPLING   | 3000# DRIP TANK WASTE GAS OUT |
| K                   | 1   | 1/2" FULL COUPLING | 3000# AUTOMATION              |
| L                   | 1   | 1/2" FULL COUPLING | 3000# LIQUID DRAIN            |

- UNLESS OTHERWISE SPECIFIED
1. REMOVE ALL BURRS AND SHARP CORNERS.
  2. COR. RAD .03
  3. DO NOT SCALE DRAWING.
  4. ALL DIMENSIONS ARE IN INCHES.
  5. MACHINE FIN.
  6. FABRICATION AND SHARP CORNERS.
    - .X = ± 0.25
    - .XX = ± 0.125
    - .XXX = ± 0.06
    - ANGLES ± 3°
  7. MACHINE
    - .X = ± 0.030
    - .XX = ± 0.015
    - .XXX = ± 0.005
    - ANGLES ± 1/2°
    - CONTRICTY WITHIN 0.010 TIR

APPROVED FOR A.S.M.E CODE, SECTION VIII DIV 1  
ED, ADDENDA BY, DATE

**CIMARRON**  
Energy Inc.

TITLE:  
48" HIGH VOLLUME BCD

DATE: \_\_\_\_\_ WO No.: \_\_\_\_\_ SHEET: 1 OF 1

DRAWN BY: TDS | REV. | DRAW NO.: 3500500

# **Attachment S**

## **Emissions Calculations**

**Table 1**

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

|   |
|---|
| <b>Oil and Gas Site General Information</b> |
|---|

| <b>Administrative Information</b> |                              |
|-----------------------------------|------------------------------|
| Company Name                      | Antero Resources Corporation |
| Facility/Well Name                | Cofor Well Pad               |
| Nearest City/Town                 | West Union                   |
| API Number/SIC Code               | 1311                         |
| Latitude/Longitude                | 39.29945, -80.80026          |
| County                            | Doddridge County             |

| <b>Technical Information</b>                  |       |
|---|-------|
| Max Condensate Site Throughput (bbl/day):     | 660   |
| Max Produced Water Site Throughput (bbl/day): | 4,000 |
| 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                          | 10                             |
| IC Engines                         | 1                              |
| Gas Production Unit Heaters        | 10                             |
| Condensate Tanks                   | 10                             |
| Produced Water Tanks               | 4                              |
| Loading Jobs                       | 2                              |
| Enclosed Combustors                | 3                              |

Table 2

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

| Emission Source   | VOC             |                 | NO <sub>x</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)        |                 |  |
| <b>UNCONTROLLED (Fugitives, Storage Tanks, Engine, Gas Production Unit Heaters)</b> |                 |                 |                 |                |                  |                  |                |                |                 |                 |                   |               |                  |               |                 |                 |            |                |                |                 |                 |                 |               |                 |                 |  |
| Fugitive Emissions (Component Count, PCV and Hauling) <sup>1</sup>                  | 3.5837          | 15.6968         |                 |                | 97.208           | 425.77           |                |                |                 |                 |                   |               |                  | 1.6835        | 3.5191          |                 |            | 0.3028         | 1.3261         | 0.0016          | 0.0070          | 7.00E-02        | 3.06E-01      |                 |                 |  |
| Flashing, Working and Breathing (F/W/B) Losses <sup>2</sup>                         | 101.8043        | 445.9029        |                 |                | 614.2706         | 2690.5054        |                |                |                 |                 |                   |               |                  |               |                 |                 |            | 13.0256        | 57.0521        | 0.0160          | 0.0699          | 0.1649          | 0.7222        |                 |                 |  |
| Engine Emissions <sup>3</sup>   | 0.007           | 0.030           | 0.316           | 1.383          | 27.082           | 118.619          | 5.644          | 24.723         | 1.38E-04        | 6.03E-04        | 0.002             | 0.010         | 0.002            | 0.010         |                 |                 |            | 0.005          | 0.024          | 0.000           | 0.002           | 4.56E-05        | 2.00E-04      | 0.005           | 0.021           |  |
| Gas Production Unit Heater Emissions <sup>4</sup>                                   | 0.0679          | 0.2972          | 1.2337          | 5.4035         | 1,480.42         | 6,484.24         | 1.0363         | 4.5390         | 0.0074          | 0.0324          | 0.0938            | 0.4107        | 0.0938           | 0.4107        | 6.17E-06        | 2.70E-05        |            | 0.023          | 0.102          | 2.59E-05        | 1.13E-04        |                 |               | 0.0009          | 0.0041          |  |
| <b>TOTALS:</b>  | <b>105.4628</b> | <b>461.9272</b> | <b>1.5495</b>   | <b>6.7866</b>  | <b>2218.9797</b> | <b>9719.1312</b> | <b>6.6808</b>  | <b>29.2618</b> | <b>0.0075</b>   | <b>0.0330</b>   | <b>0.0960</b>     | <b>0.4204</b> | <b>1.7795</b>    | <b>3.9395</b> | <b>6.17E-06</b> | <b>2.70E-05</b> |            | <b>13.3569</b> | <b>58.5034</b> | <b>0.0180</b>   | <b>0.0786</b>   | <b>0.2349</b>   | <b>1.0288</b> | <b>0.0057</b>   | <b>0.0251</b>   |  |
| <b>TOTALS (Excluding Fugitives):</b>  | <b>101.8791</b> | <b>446.2305</b> | <b>1.5495</b>   | <b>6.7866</b>  | <b>2121.7717</b> | <b>9293.3602</b> | <b>6.6808</b>  | <b>29.2618</b> | <b>0.0075</b>   | <b>0.0330</b>   | <b>0.0960</b>     | <b>0.4204</b> | <b>0.0960</b>    | <b>0.4204</b> | <b>6.17E-06</b> | <b>2.70E-05</b> |            | <b>13.0542</b> | <b>57.1773</b> | <b>0.0164</b>   | <b>0.0717</b>   | <b>0.1649</b>   | <b>0.7224</b> | <b>0.0057</b>   | <b>0.0251</b>   |  |
| <b>UNCONTROLLED (Truck Loading Emissions)</b>                                       |                 |                 |                 |                |                  |                  |                |                |                 |                 |                   |               |                  |               |                 |                 |            |                |                |                 |                 |                 |               |                 |                 |  |
| Truck Loading Emissions <sup>5</sup>  | 6.5975          | 3.3134          |                 |                | 6.0933           | 5.2294           |                |                |                 |                 |                   |               |                  |               |                 |                 |            | 0.0974         | 4.89E-02       | 0.0000          | 8.30E-06        | 0.0016          | 8.16E-04      |                 |                 |  |
| <b>CONTROLLED EMISSIONS</b>   |                 |                 |                 |                |                  |                  |                |                |                 |                 |                   |               |                  |               |                 |                 |            |                |                |                 |                 |                 |               |                 |                 |  |
| Enclosed Combustor Emissions (from F/W/B losses) <sup>6</sup>                       | 2.0363          | 8.9190          | 2.4518          | 10.7388        | 557.2440         | 2440.7286        | 11.1632        | 48.8947        | 2.27E-05        | 0.0001          | 0.0116            | 0.0509        | 0.0155           | 0.0679        | 1.02E-06        | 4.47E-06        |            | 0.2606         | 1.1413         | 0.0003          | 0.0014          | 0.0033          | 0.0144        | 2.84E-06        | 1.24E-05        |  |
| Controlled Fugitive Emissions from Hauling  |                 |                 |                 |                |                  |                  |                |                |                 |                 |                   |               | 0.8417           | 1.7595        |                 |                 |            |                |                |                 |                 |                 |               |                 |                 |  |
| <b>TOTALS:</b>  | <b>2.036</b>    | <b>8.919</b>    | <b>2.452</b>    | <b>10.739</b>  | <b>557.244</b>   | <b>2440.729</b>  | <b>11.163</b>  | <b>48.895</b>  | <b>2.27E-05</b> | <b>9.93E-05</b> | <b>0.012</b>      | <b>0.051</b>  | <b>0.857</b>     | <b>1.827</b>  | <b>1.02E-06</b> | <b>4.47E-06</b> |            | <b>0.261</b>   | <b>1.141</b>   | <b>3.19E-04</b> | <b>1.40E-03</b> | <b>3.30E-03</b> | <b>0.014</b>  | <b>2.84E-06</b> | <b>1.24E-05</b> |  |
| <b>POTENTIAL TO EMIT<sup>7</sup></b>  | <b>5.6948</b>   | <b>28.2567</b>  | <b>4.0012</b>   | <b>17.5254</b> | <b>2161.9531</b> | <b>9474.5838</b> | <b>17.8439</b> | <b>78.1565</b> | <b>0.0076</b>   | <b>0.0331</b>   | <b>0.1076</b>     | <b>0.4713</b> | <b>0.9532</b>    | <b>2.2478</b> | <b>7.19E-06</b> | <b>3.15E-05</b> |            | <b>0.5919</b>  | <b>2.6415</b>  | <b>0.0023</b>   | <b>0.0101</b>   | <b>0.0733</b>   | <b>0.3219</b> | <b>0.0057</b>   | <b>0.0251</b>   |  |
| <b>POTENTIAL TO EMIT (Excluding Fugitives)</b>                                      | <b>2.1111</b>   | <b>9.2465</b>   | <b>4.0012</b>   | <b>17.5254</b> | <b>2064.7451</b> | <b>9043.5834</b> | <b>17.8439</b> | <b>78.1565</b> | <b>0.0076</b>   | <b>0.0331</b>   | <b>0.1076</b>     | <b>0.4713</b> | <b>0.1115</b>    | <b>0.4883</b> | <b>7.19E-06</b> | <b>3.15E-05</b> |            | <b>0.2892</b>  | <b>1.2666</b>  | <b>0.0007</b>   | <b>0.0031</b>   | <b>0.0033</b>   | <b>0.0146</b> | <b>0.0057</b>   | <b>0.0251</b>   |  |

**Enter any notes here:**

1 - See Tables 4 and 5 for fugitive emission calculations; Table 12 for PM emissions from hauling.  
 2 - See Tables 6 and 7 for tanks emission calculations  
 3 - See Table 13 for engine emissions  
 4 - See Table 9 for gas production unit heater emission calculations  
 5 - The maximum emission was calculated based on tank truck capacity of 200 barrels and actual fill rate of 50 minutes per tank truck. At a production rate of 660 barrels per day, VOC emissions would be 6.5975 pounds per hour when there are truck loading activities. Average hourly VOC emissions from truck loading is 0.7565 pound per hour.  
 6 - See Table 10 and 11 for enclosed combustion emission calculations.  
 7 - The hourly potential to emit is the sum of emissions from gas production unit heaters, engine, storage tanks, enclosed combustors, and fugitives. Does not include emissions from loading (see footnote 5). The total TPY PTE is the sum of all emissions.  
 PM 10 TPY is the sum of uncontrolled hauling and other PM10 sources.



**Table 3**

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

| Pollutant         |         | Emissions    |            | Threshold Exceeded? |              |            |
|-------------------|---------|--------------|------------|---------------------|--------------|------------|
|                   |         | Uncontrolled | Controlled | Threshold           | Uncontrolled | Controlled |
| VOC               | lbs/hr  | 105.4628     | 5.6948     | 6                   | <b>Yes</b>   |            |
|                   | tons/yr | 465.2406     | 28.2567    | 10                  | <b>Yes</b>   | <b>Yes</b> |
| NO <sub>x</sub>   | lbs/hr  | 1.5495       | 4.0012     | 6                   |              |            |
|                   | tons/yr | 6.7866       | 17.5254    | 10                  |              | <b>Yes</b> |
| CO                | lbs/hr  | 6.6808       | 17.8439    | 6                   | <b>Yes</b>   | <b>Yes</b> |
|                   | tons/yr | 29.2618      | 78.1565    | 10                  | <b>Yes</b>   | <b>Yes</b> |
| SO <sub>2</sub>   | lbs/hr  | 0.0075       | 0.0076     | 6                   |              |            |
|                   | tons/yr | 0.0330       | 0.0331     | 10                  |              |            |
| PM <sub>2.5</sub> | lbs/hr  | 0.0960       | 0.1076     | 6                   |              |            |
|                   | tons/yr | 0.4204       | 0.4713     | 10                  |              |            |
| PM <sub>10</sub>  | lbs/hr  | 1.7795       | 0.9532     | 6                   |              |            |
|                   | tons/yr | 3.9395       | 2.2478     | 10                  |              |            |
| Lead              | lbs/hr  | 6.17E-06     | 7.19E-06   | 6                   |              |            |
|                   | tons/yr | 2.70E-05     | 3.15E-05   | 10                  |              |            |
| Total HAPs        | lbs/hr  | 13.3569      | 0.5919     | 2                   | <b>Yes</b>   |            |
|                   | tons/yr | 58.5523      | 2.6415     | 5                   | <b>Yes</b>   |            |
| Total TAPs        | lbs/hr  | 0.0237       | 0.0080     | 1.14                |              |            |
| n-Hexane          | lbs/hr  | 12.8952      | 0.4661     |                     |              |            |
|                   | tons/yr | 56.5287      | 2.0891     |                     |              |            |
| Toluene           | lbs/hr  | 0.1069       | 0.0172     |                     |              |            |
|                   | tons/yr | 0.4686       | 0.0756     |                     |              |            |
| Ethylbenzene      | lbs/hr  | 0.0962       | 0.0272     |                     |              |            |
|                   | tons/yr | 0.4214       | 0.1196     |                     |              |            |
| Xylenes           | lbs/hr  | 0.2349       | 0.0733     |                     |              |            |
|                   | tons/yr | 1.0296       | 0.3219     |                     |              |            |
| Benzene           | lbs/hr  | 0.0180       | 0.0023     |                     |              |            |
|                   | tons/yr | 0.0786       | 0.0101     |                     |              |            |

|                              |   |
|------------------------------|---|
| <b>Enter any notes here:</b> | <p>1. Emissions are based on 98% Enclosed Combustor DRE operating 100% of the time.</p> <p>2. Please see Attachment J - Fugitive Emissions Data Summary Sheet and Attachment T - Emission Points Summary Sheet for sitewide sources and breakdown of emission quantities.</p> |
|------------------------------|---|

Table 4

**Fugitive Emissions  
Cofor 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     | 0.133 |
|                                    | Benzene frac | 0.000 |
|                                    | Toluene      | 0.000 |
|                                    | Ethylbenzene | 0.000 |
|                                    | Xylenes      | 0.000 |
|                                    | n-Hexane     | 0.018 |
|                                    | HAPs         | 0.018 |
|                                    | Methane      | 0.656 |

| Gas                |            |           |  |          |              |
|--------------------|------------|-----------|--|----------|--------------|
| Number             | Component  | Pollutant | Emission Factor (kg/hr of THC per component) | kg/hr    | lb/yr        |
| 500                | Valves     | Gas VOC   | 0.004500                                     | 0.30     | 5,769.53     |
|                    |            | Non VOC   | 0.004500                                     | 1.95     | 37,592.47    |
|                    |            | HAPs      | 0.004500                                     | 0.04     | 777.87       |
|                    |            | CO2e      | 0.004500                                     | 36.92    | 711,471.74   |
| 590                | Connectors | VOC       | 0.000200                                     | 0.02     | 302.58       |
|                    |            | Non-VOC   | 0.000200                                     | 0.10     | 1,971.52     |
|                    |            | HAPs      | 0.000200                                     | 0.00     | 40.79        |
|                    |            | CO2e      | 0.000200                                     | 1.94     | 37,312.74    |
| 130                | Flanges    | VOC       | 0.000390                                     | 0.01     | 130.01       |
|                    |            | Non-VOC   | 0.000390                                     | 0.04     | 847.08       |
|                    |            | HAPs      | 0.000390                                     | 0.00     | 17.53        |
|                    |            | CO2e      | 0.000390                                     | 0.831872 | 16031.829860 |
| <b>Total VOCs:</b> |            |           |  | 0.32     | 6202.12      |
| <b>Total THC:</b>  |            |           |  | 2.42     | 46613.19     |

|   |              |       |
|---|--------------|-------|
| Light Liquid Weight Fraction From Analysis: | VOC frac     | 0.979 |
|   | Benzene frac | 0.001 |
|   | Toluene      | 0.005 |
|   | Ethylbenzene | 0.009 |
|   | Xylenes      | 0.024 |
|   | n-hexane     | 0.030 |
|   | HAPs         | 0.069 |
|   | Methane      | 0.007 |

| Light Liquid      |           |                      |  |       |           |
|-------------------|-----------|----------------------|--|-------|-----------|
| Number            | Component | Pollutant            | Emission Factor (kg/hr of THC per component) | kg/hr | lb/yr     |
| 520               | Valves    | Light Liquid VOC     | 0.002500                                     | 1.27  | 24,524.69 |
|                   |           | Light Liquid Non-VOC | 0.002500                                     | 0.03  | 528.91    |
|                   |           | Light Liquid HAPs    | 0.002500                                     | 0.09  | 1,726.03  |
|                   |           | CO2e                 | 0.002500                                     | 0.23  | 4494.82   |
| <b>Total VOC:</b> |           |                      |  | 1.27  | 24,524.69 |
| <b>Total THC:</b> |           |                      |  | 1.30  | 25,053.60 |

| Fugitive Total Emissions |                          |                          |                        |
|--------------------------|--------------------------|--------------------------|------------------------|
|                          | Annual Emissions (lb/yr) | Annual Emissions (lb/hr) | Annual Emissions (tpy) |
| VOC                      | 30,726.81                | 3.51                     | 15.36                  |
| Ethylbenzene             |                          | 0.03                     | 0.11                   |
| Toluene                  |                          | 0.02                     | 0.07                   |
| Xylenes                  |                          | 0.07                     | 0.31                   |
| n-Hexane                 |                          | 0.18                     | 0.79                   |
| TAPs (Benzene)           |                          | 0.00                     | 0.01                   |
| HAPs                     |                          | 0.29                     | 1.28                   |
| CO <sub>2e</sub>         | 769,311.13               | 87.82                    | 384.66                 |

|                          |   |
|--------------------------|---|
| <b>Enter Notes Here:</b> | Fugitive emissions based on an estimated component count<br>Global Warming Potentials from EPA site<br><u>Reference to Emission factors used:</u>   |
|                          | 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.<br>2. Percent of speciated VOCs used in fugitive calculations are based on the total hydrocarbons, not of the total sample. |

Table 5

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

|                            |     |
|----------------------------|-----|
| Number of PCVs             | 40  |
| Bleed Rate (scf/day/PCV)   | 6.6 |
| Total Bleed Rate (scf/day) | 264 |

| Component          | Mol%     | Molecular Weight<br>(lb/lb-mole) | Component Flow<br>(scf/day) | Component Moles<br>(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           | 0.412    | 14.01                            | 1.08768                     | 2.87E-03                      | 0.04                | 1.67E-03 | 0.01        |
| Carbon Dioxide     | 0.1493   | 44.01                            | 0.394152                    | 1.04E-03                      | 0.05                | 1.90E-03 | 8.34E-03    |
| Methane            | 80.7411  | 16.04                            | 213.156504                  | 0.56                          | 9.01                | 0.38     | 1.64        |
| Ethane             | 13.8226  | 30.07                            | 36.491664                   | 0.10                          | 2.89                | 0.12     | 0.53        |
| Propane            | 2.7162   | 44.1                             | 7.170768                    | 0.02                          | 0.83                | 0.03     | 0.15        |
| Isobutane          | 0.499    | 58.12                            | 1.31736                     | 3.47E-03                      | 0.20                | 0.01     | 0.04        |
| n-Butane           | 0.8364   | 58.12                            | 2.208096                    | 5.82E-03                      | 0.34                | 0.01     | 0.06        |
| Isopentane         | 0.2287   | 72.15                            | 0.603768                    | 1.59E-03                      | 0.11                | 4.78E-03 | 0.02        |
| n-Pentane          | 0.1839   | 72.15                            | 0.485496                    | 1.28E-03                      | 0.09                | 3.85E-03 | 0.02        |
| 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           | 0.4108   | 86.18                            | 1.084512                    | 2.86E-03                      | 0.25                | 0.01     | 0.04        |
| 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    |
| 2-Methylhexane     | 0.00E+00 | 100.2                            | 0.00E+00                    | 0.00E+00                      | 0.00E+00            | 0.00E+00 | 0.00E+00    |
| 3-Methylhexane     | 0.00E+00 | 100.2                            | 0.00E+00                    | 0.00E+00                      | 0.00E+00            | 0.00E+00 | 0.00E+00    |
| Heptane            | 0.00E+00 | 100.21                           | 0.00E+00                    | 0.00E+00                      | 0.00E+00            | 0.00E+00 | 0.00E+00    |
| Methylcyclohexane  | 0.00E+00 | 98.186                           | 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 | 106.16                           | 0.00E+00                    | 0.00E+00                      | 0.00E+00            | 0.00E+00 | 0.00E+00    |
| o-Xylene           | 0.00E+00 | 106.16                           | 0.00E+00                    | 0.00E+00                      | 0.00E+00            | 0.00E+00 | 0.00E+00    |
| Nonane             | 0.00E+00 | 128.2                            | 0.00E+00                    | 0.00E+00                      | 0.00E+00            | 0.00E+00 | 0.00E+00    |
| C10+               | 0.00E+00 | 174.28                           | 0.00E+00                    | 0.00E+00                      | 0.00E+00            | 0.00E+00 | 0.00E+00    |

|                            | lb/hr    | tpy      |
|----------------------------|----------|----------|
| VOC Emissions              | 0.0761   | 0.3334   |
| 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         | 0.0103   | 0.0449   |
| HAPs Emissions             | 0.0103   | 0.0449   |
| TAPs Emissions             | 0.00E+00 | 0.00E+00 |
| CO <sub>2e</sub> emissions | 9.3871   | 41.1155  |

|                              |  |
|------------------------------|--|
| <b>Enter any notes here:</b> | 1. PCV bleed rate obtained from the user manual for PCV<br><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  
Cofor Well Pad  
Doddridge County, West Virginia  
Antero Resources Corporation**

|                     |      |
|---------------------|------|
| # Hours Operational | 8760 |
|---------------------|------|

|                        | Condensate Tank Flashing Losses |                 |          | Produced Water Tank Flashing Losses |                 |         |
|------------------------|---------------------------------|-----------------|----------|-------------------------------------|-----------------|---------|
|                        | Vapor Mass Fraction<br>wt%      | Flashing Losses |          | Vapor Mass Fraction<br>wt%          | Flashing Losses |         |
|                        |                                 | lbs/hr          | tpy      |                                     | lbs/hr          | tpy     |
| Water                  | 0.2860                          | 0.4370          | 1.9140   | 2.7068                              | 0.4915          | 2.1528  |
| H2S                    | 0.0000                          | 0.0000          | 0.0000   | 0.0000                              | 0.0000          | 0.0000  |
| Nitrogen               | 0.0112                          | 0.0172          | 0.0752   | 0.2763                              | 0.0502          | 0.2197  |
| Carbon Dioxide         | 0.2077                          | 0.3174          | 1.3901   | 2.3915                              | 0.4343          | 1.9020  |
| Methane                | 8.8688                          | 13.5494         | 59.3464  | 59.0960                             | 10.7305         | 46.9997 |
| Ethane                 | 30.3136                         | 46.3118         | 202.8455 | 26.2722                             | 4.7704          | 20.8945 |
| Propane                | 21.5826                         | 32.9730         | 144.4216 | 5.2995                              | 0.9623          | 4.2147  |
| Isobutane              | 7.0022                          | 10.6976         | 46.8555  | 0.9037                              | 0.1641          | 0.7188  |
| n-Butane               | 12.5860                         | 19.2283         | 84.2200  | 1.8727                              | 0.3400          | 1.4893  |
| Isopentane             | 4.5695                          | 6.9811          | 30.5774  | 0.4473                              | 0.0812          | 0.3558  |
| n-Pentane              | 3.8632                          | 5.9021          | 25.8511  | 0.1455                              | 0.0264          | 0.1157  |
| 2-Methylpentane        | 0.2075                          | 0.3171          | 1.3888   | 0.0104                              | 0.0019          | 0.0083  |
| 3-Methylpentane        | 0.1420                          | 0.2170          | 0.9504   | 0.0170                              | 0.0031          | 0.0136  |
| n-Hexane               | 8.2025                          | 12.5314         | 54.8876  | 0.2018                              | 0.0366          | 0.1605  |
| Methylcyclopentane     | 0.0352                          | 0.0538          | 0.2357   | 0.0068                              | 0.0012          | 0.0054  |
| Benzene                | 0.0088                          | 0.0134          | 0.0589   | 0.0138                              | 0.0025          | 0.0110  |
| 2-Methylhexane         | 0.2346                          | 0.3584          | 1.5697   | 0.0083                              | 0.0015          | 0.0066  |
| 3-Methylhexane         | 0.1955                          | 0.2987          | 1.3083   | 0.0083                              | 0.0015          | 0.0066  |
| Heptane                | 0.4267                          | 0.6519          | 2.8555   | 0.0077                              | 0.0014          | 0.0062  |
| Methylcyclohexane      | 0.2244                          | 0.3429          | 1.5017   | 0.0422                              | 0.0077          | 0.0336  |
| Toluene                | 0.0508                          | 0.0776          | 0.3400   | 0.0748                              | 0.0136          | 0.0595  |
| Octane                 | 0.6179                          | 0.9440          | 4.1348   | 0.0046                              | 0.0008          | 0.0036  |
| Ethylbenzene           | 0.0389                          | 0.0594          | 0.2603   | 0.0562                              | 0.0102          | 0.0447  |
| m & p-Xylene           | 0.0368                          | 0.0563          | 0.2465   | 0.0487                              | 0.0088          | 0.0387  |
| o-Xylene               | 0.0544                          | 0.0831          | 0.3639   | 0.0811                              | 0.0147          | 0.0645  |
| Nonane                 | 0.1961                          | 0.2996          | 1.3122   | 0.0016                              | 0.0003          | 0.0012  |
| C10+                   | 0.0366                          | 0.0560          | 0.2451   | 0.0050                              | 0.0009          | 0.0040  |
| Total VOCs             | 60.313                          | 92.14           | 403.6    | 9.257                               | 1.6809          | 7.3623  |
| Total CO <sub>2e</sub> |                                 | 339.05          | 1,485.1  |                                     | 268.70          | 1,176.9 |
| Total TAPs (Benzene)   |                                 | 0.0134          | 0.0589   |                                     | 0.0025          | 0.0110  |
| Toluene                |                                 | 0.0776          | 0.3400   |                                     | 0.0136          | 0.0595  |
| Ethylbenzene           |                                 | 0.0594          | 0.2603   |                                     | 0.0102          | 0.0447  |
| Xylenes                |                                 | 0.1394          | 0.6104   |                                     | 0.0236          | 0.1032  |
| n-Hexane               |                                 | 12.531          | 54.888   |                                     | 0.0366          | 0.1605  |
| Total HAPs             |                                 | 12.821          | 56.157   |                                     | 0.0865          | 0.3789  |
| Total                  | 100.00                          | 152.78          | 669.2    | 100.00                              | 18.158          | 79.53   |

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

Table 7

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

| Condensate Tank Information       |        |
|-----------------------------------|--------|
| Number of Tanks                   | 10     |
| Maximum Working Losses (lbs/hr)   | 7.4089 |
| Maximum Breathing Losses (lbs/hr) | 6.0097 |
| # Hours Operational               | 8760   |

|                        | Condensate Tank W/B Losses |                |          |                  |          |                |          |
|------------------------|----------------------------|----------------|----------|------------------|----------|----------------|----------|
|                        | Vapor Mass Fraction<br>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               | 0.0005                     | 3.81E-05       | 1.67E-04 | 0.0000           | 0.0001   | 0.0001         | 0.0003   |
| Carbon Dioxide         | 0.4293                     | 0.0318         | 0.1393   | 0.0258           | 0.1130   | 0.0576         | 0.2523   |
| Methane                | 1.8720                     | 0.1387         | 0.6075   | 0.1125           | 0.4928   | 0.2512         | 1.1002   |
| Ethane                 | 38.2242                    | 2.8320         | 12.4041  | 2.2972           | 10.0616  | 5.1292         | 22.4658  |
| Propane                | 25.2007                    | 1.8671         | 8.1779   | 1.5145           | 6.6335   | 3.3816         | 14.8114  |
| Isobutane              | 8.1601                     | 0.6046         | 2.6480   | 0.4904           | 2.1480   | 1.0950         | 4.7960   |
| n-Butane               | 14.6666                    | 1.0866         | 4.7595   | 0.8814           | 3.8607   | 1.9681         | 8.6201   |
| Isopentane             | 5.2812                     | 0.3913         | 1.7138   | 0.3174           | 1.3902   | 0.7087         | 3.1040   |
| n-Pentane              | 4.4650                     | 0.3308         | 1.4489   | 0.2683           | 1.1753   | 0.5991         | 2.6242   |
| 2-Methylpentane        | 0.0565                     | 0.0042         | 0.0183   | 0.0034           | 0.0149   | 0.0076         | 0.0332   |
| 3-Methylpentane        | 0.0390                     | 0.0029         | 0.0127   | 0.0023           | 0.0103   | 0.0052         | 0.0229   |
| n-Hexane               | 0.8557                     | 0.0634         | 0.2777   | 0.0514           | 0.2252   | 0.1148         | 0.5029   |
| Methylcyclopentane     | 0.0093                     | 0.0007         | 0.0030   | 0.0006           | 0.0024   | 0.0012         | 0.0055   |
| Benzene                | 0.0001                     | 1.08E-05       | 0.0000   | 0.0000           | 0.0000   | 0.0000         | 0.0001   |
| 2-Methylhexane         | 0.0052                     | 3.84E-04       | 0.0017   | 0.0003           | 0.0014   | 0.0007         | 0.0030   |
| 3-Methylhexane         | 0.0672                     | 0.0050         | 0.0218   | 0.0040           | 0.0177   | 0.0090         | 0.0395   |
| Heptane                | 0.1463                     | 0.0108         | 0.0475   | 0.0088           | 0.0385   | 0.0196         | 0.0860   |
| Methylcyclohexane      | 0.0757                     | 0.0056         | 0.0246   | 0.0045           | 0.0199   | 0.0102         | 0.0445   |
| Toluene                | 0.0025                     | 1.83E-04       | 8.03E-04 | 0.0001           | 0.0007   | 0.0003         | 0.0015   |
| Octane                 | 0.2861                     | 0.0212         | 0.0929   | 0.0172           | 0.0753   | 0.0384         | 0.1682   |
| Ethylbenzene           | 0.0052                     | 3.84E-04       | 1.68E-03 | 0.0003           | 0.0014   | 0.0007         | 0.0030   |
| m & p-Xylene           | 0.0062                     | 4.61E-04       | 2.02E-03 | 0.0004           | 0.0016   | 0.0008         | 0.0037   |
| o-Xylene               | 0.0084                     | 6.23E-04       | 0.0027   | 0.0005           | 0.0022   | 0.0011         | 0.0049   |
| Nonane                 | 0.1171                     | 0.0087         | 0.0380   | 0.0070           | 0.0308   | 0.0157         | 0.0688   |
| C10+                   | 0.0197                     | 1.46E-03       | 0.0064   | 0.0012           | 0.0052   | 0.0026         | 0.0116   |
| Total VOCs             | 59.474                     | 4.4064         | 19.300   | 3.5742           | 15.6551  | 7.9806         | 34.955   |
| Total CO <sub>2e</sub> |                            | 3.4991         | 15.3263  | 2.8383           | 12.4319  | 6.3375         | 27.758   |
| Total TAPs (Benzene)   |                            | 1.08E-05       | 4.74E-05 | 0.0000           | 0.0000   | 0.0000         | 0.0001   |
| Toluene                |                            | 1.83E-04       | 8.03E-04 | 0.0001           | 0.0007   | 0.0003         | 0.0015   |
| Ethylbenzene           |                            | 3.84E-04       | 1.68E-03 | 0.0003           | 0.0014   | 0.0007         | 0.0030   |
| Xylenes                |                            | 1.08E-03       | 0.0047   | 0.0009           | 0.0039   | 0.0020         | 0.0086   |
| n-Hexane               |                            | 0.0634         | 0.2777   | 0.0514           | 0.2252   | 0.1148         | 0.5029   |
| Total HAPs             |                            | 0.0651         | 0.2850   | 0.0528           | 0.2311   | 0.1178         | 0.5161   |
| Total                  | 100.00                     | 7.4089         | 32.4510  | 6.0098           | 26.3227  | 13.4187        | 58.774   |

Table 7

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

|                                   |        |
|-----------------------------------|--------|
| Produced Water Tank Information   |        |
| Number of Tanks                   | 4      |
| Maximum Working Losses (lbs/hr)   | 0.1968 |
| Maximum Breathing Losses (lbs/hr) | 0.0166 |

|                        | Produced Water Tank W/B Losses |                |          |                  |          |                |          |
|------------------------|--------------------------------|----------------|----------|------------------|----------|----------------|----------|
|                        | Vapor Mass Fraction<br>wt%     | Working Losses |          | Breathing Losses |          | Max W/B Losses |          |
|                        |                                | lbs/hr         | tpy      | lbs/hr           | tpy      | lbs/hr         | tpy      |
| Water                  | 91.9551                        | 0.1809         | 0.7926   | 0.0152           | 0.0667   | 0.1962         | 0.8593   |
| H2S                    | 0.00E+00                       | 0.00E+00       | 0.00E+00 | 0.00E+00         | 0.00E+00 | 0.00E+00       | 0.00E+00 |
| Nitrogen               | 0.0056                         | 1.11E-05       | 4.85E-05 | 9.31E-07         | 4.08E-06 | 1.20E-05       | 5.25E-05 |
| Carbon Dioxide         | 3.9156                         | 0.0077         | 0.0337   | 0.0006           | 0.0028   | 0.0084         | 0.0366   |
| Methane                | 3.2736                         | 0.0064         | 0.0282   | 0.0005           | 0.0024   | 0.0070         | 0.0306   |
| Ethane                 | 1.0385                         | 0.0020         | 0.0090   | 0.0002           | 0.0008   | 0.0022         | 0.0097   |
| Propane                | 0.0848                         | 1.67E-04       | 0.0007   | 1.40E-05         | 6.15E-05 | 1.81E-04       | 0.0008   |
| Isobutane              | 0.0010                         | 1.87E-06       | 8.20E-06 | 1.58E-07         | 6.91E-07 | 2.03E-06       | 8.89E-06 |
| n-Butane               | 0.0051                         | 9.94E-06       | 4.35E-05 | 8.37E-07         | 3.66E-06 | 1.08E-05       | 4.72E-05 |
| Isopentane             | 0.0003                         | 6.03E-07       | 2.64E-06 | 5.08E-08         | 2.23E-07 | 6.54E-07       | 2.87E-06 |
| n-Pentane              | 0.0002                         | 3.61E-07       | 1.58E-06 | 3.04E-08         | 1.33E-07 | 3.92E-07       | 1.72E-06 |
| 2-Methylpentane        | 2.12E-07                       | 4.18E-10       | 1.83E-09 | 3.52E-11         | 1.54E-10 | 4.53E-10       | 1.99E-09 |
| 3-Methylpentane        | 9.39E-07                       | 1.85E-09       | 8.09E-09 | 1.56E-10         | 6.81E-10 | 2.00E-09       | 8.78E-09 |
| n-Hexane               | 1.46E-06                       | 2.88E-09       | 1.26E-08 | 2.42E-10         | 1.06E-09 | 3.12E-09       | 1.37E-08 |
| Methylcyclopentane     | 1.44E-06                       | 2.83E-09       | 1.24E-08 | 2.39E-10         | 1.05E-09 | 3.07E-09       | 1.35E-08 |
| Benzene                | 5.50E-06                       | 1.08E-08       | 4.74E-08 | 9.11E-10         | 3.99E-09 | 1.17E-08       | 5.14E-08 |
| 2-Methylhexane         | 4.28E-09                       | 8.42E-12       | 3.69E-11 | 7.09E-13         | 3.10E-12 | 9.13E-12       | 4.00E-11 |
| 3-Methylhexane         | 5.76E-08                       | 1.13E-10       | 4.97E-10 | 9.54E-12         | 4.18E-11 | 1.23E-10       | 5.38E-10 |
| Heptane                | 1.04E-07                       | 2.05E-10       | 9.00E-10 | 1.73E-11         | 7.57E-11 | 2.23E-10       | 9.75E-10 |
| Methylcyclohexane      | 1.73E-06                       | 3.41E-09       | 1.49E-08 | 2.87E-10         | 1.26E-09 | 3.70E-09       | 1.62E-08 |
| Toluene                | 1.96E-05                       | 3.85E-08       | 1.69E-07 | 3.24E-09         | 1.42E-08 | 4.17E-08       | 1.83E-07 |
| Octane                 | 2.57E-08                       | 5.06E-11       | 2.22E-10 | 4.26E-12         | 1.87E-11 | 5.49E-11       | 2.40E-10 |
| Ethylbenzene           | 1.25E-05                       | 2.47E-08       | 1.08E-07 | 2.08E-09         | 9.10E-09 | 2.68E-08       | 1.17E-07 |
| m & p-Xylene           | 1.29E-05                       | 2.54E-08       | 1.11E-07 | 2.14E-09         | 9.37E-09 | 2.76E-08       | 1.21E-07 |
| o-Xylene               | 2.17E-05                       | 4.26E-08       | 1.87E-07 | 3.59E-09         | 1.57E-08 | 4.62E-08       | 2.02E-07 |
| Nonane                 | 8.54E-09                       | 1.68E-11       | 7.36E-11 | 1.41E-12         | 6.20E-12 | 1.82E-11       | 7.98E-11 |
| C10+                   | 8.89E-12                       | 1.75E-14       | 7.66E-14 | 1.47E-15         | 6.45E-15 | 1.90E-14       | 8.31E-14 |
| Total VOCs             | 0.0914                         | 1.80E-04       | 0.0008   | 1.51E-05         | 6.63E-05 | 1.95E-04       | 0.0009   |
| Total CO <sub>2e</sub> |                                | 0.1687         | 0.7391   | 0.0142           | 0.0622   | 0.1830         | 0.8013   |
| Total TAPs (Benzene)   |                                | 1.08E-08       | 4.74E-08 | 9.11E-10         | 3.99E-09 | 1.17E-08       | 5.14E-08 |
| Toluene                |                                | 3.85E-08       | 1.69E-07 | 3.24E-09         | 1.42E-08 | 4.17E-08       | 1.83E-07 |
| Ethylbenzene           |                                | 2.47E-08       | 1.08E-07 | 2.08E-09         | 9.10E-09 | 2.68E-08       | 1.17E-07 |
| Xylenes                |                                | 6.80E-08       | 2.98E-07 | 5.73E-09         | 2.51E-08 | 7.37E-08       | 3.23E-07 |
| n-Hexane               |                                | 2.88E-09       | 1.26E-08 | 2.42E-10         | 1.06E-09 | 3.12E-09       | 1.37E-08 |
| Total HAPs             |                                | 1.45E-07       | 6.35E-07 | 1.22E-08         | 5.34E-08 | 1.57E-07       | 6.88E-07 |
| Total                  | 100.28                         | 0.1973         | 0.8643   | 0.0166           | 0.0728   | 0.2139         | 0.9371   |

|                              |  |
|------------------------------|--|
| <b>Enter any notes here:</b> | Vapor mass fractions, working losses and breathing losses from Promax output |
|------------------------------|--|

Table 8

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

| Annual Loading   | Oil Truck Loading | Water Truck Loading |
|--|-------------------|---------------------|
| RVP  | 3.54              | 1.0328              |
| Annual Average Temp (F)                                  | 65.08             | 65.08               |
| S (saturation factor)                                    | 0.6               | 0.6                 |
| P (true vapor pressure)                                  | 1.99              | 0.38                |
| M (MW of vapor)  | 38.85             | 18.41               |
| Collection Efficiency (%)                                | 0.00              | 0.00                |
| Total Hydrocarbon Loading Loss (lb/10 <sup>3</sup> gal)* | 1.10              | 0.10                |
| Maximum Throughput (gallons/hr)**                        | 10,080            | 10,080              |
| Average Throughput (gallons/yr)                          | 10,117,800        | 61,320,000          |
| Total Hydrocarbon Loading Emissions (lbs/hr)             | 11.09             | 1.00                |
| Total Hydrocarbon Loading Emissions (tpy)                | 5.57              | 3.03                |

|                        | Condensate Tank Loading Losses |                          |                       | Produced Water Tank Loading Losses |                          |                       |
|------------------------|--------------------------------|--------------------------|-----------------------|------------------------------------|--------------------------|-----------------------|
|                        | Vapor Mass Fraction<br>wt%     | Loading Losses<br>lbs/hr | Loading Losses<br>tpy | Vapor Mass Fraction<br>wt%         | Loading Losses<br>lbs/hr | Loading Losses<br>tpy |
| H2S                    | 0.0000                         | 0.00E+00                 | 0.00E+00              | 0.00E+00                           | 0.00E+00                 | 0.00E+00              |
| Nitrogen               | 0.0005                         | 5.71E-05                 | 2.86E-05              | 0.0056                             | 5.61E-05                 | 1.71E-04              |
| Carbon Dioxide         | 0.4293                         | 0.0476                   | 2.39E-02              | 3.9156                             | 3.90E-02                 | 1.19E-01              |
| Methane                | 1.8720                         | 0.2076                   | 1.04E-01              | 3.2736                             | 3.26E-02                 | 9.93E-02              |
| Ethane                 | 38.2242                        | 4.2396                   | 2.1278                | 1.0385                             | 1.04E-02                 | 3.15E-02              |
| Propane                | 25.2007                        | 2.7951                   | 1.40E+00              | 0.0848                             | 8.45E-04                 | 2.57E-03              |
| Isobutane              | 8.1601                         | 0.9051                   | 4.54E-01              | 0.0010                             | 9.49E-06                 | 2.89E-05              |
| n-Butane               | 14.6666                        | 1.6268                   | 8.16E-01              | 0.0051                             | 5.04E-05                 | 1.53E-04              |
| Isopentane             | 5.2812                         | 0.5858                   | 2.94E-01              | 0.0003                             | 3.06E-06                 | 9.30E-06              |
| n-Pentane              | 4.4650                         | 0.4952                   | 2.49E-01              | 0.0002                             | 1.83E-06                 | 5.57E-06              |
| 2-Methylpentane        | 0.0565                         | 0.0063                   | 3.15E-03              | 2.12E-07                           | 2.12E-09                 | 6.44E-09              |
| 3-Methylpentane        | 0.0390                         | 0.0043                   | 2.17E-03              | 9.39E-07                           | 9.36E-09                 | 2.85E-08              |
| n-Hexane               | 0.8557                         | 0.0949                   | 4.76E-02              | 1.46E-06                           | 1.46E-08                 | 4.43E-08              |
| Methylcyclopentane     | 0.0093                         | 0.0010                   | 5.18E-04              | 1.44E-06                           | 1.44E-08                 | 4.37E-08              |
| Benzene                | 0.0001                         | 0.0000                   | 8.13E-06              | 0.0000                             | 5.48E-08                 | 1.67E-07              |
| 2-Methylhexane         | 0.0052                         | 0.0006                   | 2.89E-04              | 4.28E-09                           | 4.27E-11                 | 1.30E-10              |
| 3-Methylhexane         | 0.0672                         | 0.0075                   | 3.74E-03              | 5.76E-08                           | 5.74E-10                 | 1.75E-09              |
| Heptane                | 0.1463                         | 0.0162                   | 8.14E-03              | 1.04E-07                           | 1.04E-09                 | 3.17E-09              |
| Methylcyclohexane      | 0.0757                         | 0.0084                   | 4.21E-03              | 1.73E-06                           | 1.73E-08                 | 5.25E-08              |
| Toluene                | 0.0025                         | 0.0003                   | 1.38E-04              | 0.0000                             | 1.95E-07                 | 5.93E-07              |
| Octane                 | 0.2861                         | 0.0317                   | 1.59E-02              | 2.57E-08                           | 2.57E-10                 | 7.80E-10              |
| Ethylbenzene           | 0.0052                         | 0.0006                   | 2.88E-04              | 1.25E-05                           | 1.25E-07                 | 3.80E-07              |
| m & p-Xylene           | 0.0062                         | 0.0007                   | 3.46E-04              | 1.29E-05                           | 1.29E-07                 | 3.92E-07              |
| o-Xylene               | 0.0084                         | 0.0009                   | 4.68E-04              | 2.17E-05                           | 2.16E-07                 | 6.57E-07              |
| Nonane                 | 0.1171                         | 0.0130                   | 6.52E-03              | 8.54E-09                           | 8.51E-11                 | 2.59E-10              |
| C10+                   | 0.0197                         | 0.0022                   | 1.10E-03              | 8.89E-12                           | 8.87E-14                 | 2.70E-13              |
| Total VOCs             | 59.4739                        | 6.5966                   | 3.3107                | 0.0914                             | 9.11E-04                 | 2.77E-03              |
| Total CO <sub>2e</sub> |                                | 5.2384                   | 2.6290                |                                    | 0.8549                   | 2.6004                |
| Total TAPs (Benzene)   |                                | 0.0000                   | 8.13E-06              |                                    | 5.48E-08                 | 1.67E-07              |
| Toluene                |                                | 0.0003                   | 1.38E-04              |                                    | 1.95E-07                 | 5.93E-07              |
| Ethylbenzene           |                                | 0.0006                   | 2.88E-04              |                                    | 1.25E-07                 | 3.80E-07              |
| Xylenes                |                                | 0.0016                   | 8.15E-04              |                                    | 3.45E-07                 | 1.05E-06              |
| n-Hexane               |                                | 0.0949                   | 4.76E-02              |                                    | 1.46E-08                 | 4.43E-08              |
| Total HAPs             |                                | 0.0974                   | 4.89E-02              |                                    | 7.34E-07                 | 2.23E-06              |
| Total                  | 100.0001                       | 11.0915                  | 5.5666                | 100.2797                           | 0.9997                   | 3.0409                |

**Enter any notes here**

Vapor mass fractions and loading losses from Promax output

\*Using equation  $L_L = 12.46 \cdot \text{SPM}/T$  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 throughput in gallons per hour obtained from actual transfer rate of 200 barrels in 50 minutes. (10,080 gal/hr = 200 bbl / 50 min x 42 gal/bbl x 60 min/hr)

Loading emissions are vented to the atmosphere.

**Table 9**

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

**Gas Production Unit Heater Emissions**

|                              |            |
|------------------------------|------------|
| Number of Units              | 10         |
| GPU Heater Rating (MMBtu/hr) | 1.50       |
| Operating hours/year         | 8760       |
| Fuel Heat Value (Btu/scf)    | 1,215.8718 |

| Pollutant           | Emission Factors<br>(lb/MMscf) | lb/hr    | tpy      |
|---------------------|--------------------------------|----------|----------|
| NOx                 | 100                            | 1.234    | 5.404    |
| CO                  | 84                             | 1.036    | 4.539    |
| CO <sub>2</sub>     | 120,000                        | 1480.419 | 6484.236 |
| Lead                | 0.0005                         | 6.17E-06 | 2.70E-05 |
| N <sub>2</sub> O    | 2.2                            | 0.027    | 0.119    |
| PM (Total)          | 7.6                            | 0.094    | 0.411    |
| SO <sub>2</sub>     | 0.6                            | 0.007    | 0.032    |
| TOC                 | 11                             | 0.136    | 0.594    |
| Methane             | 2.3                            | 0.028    | 0.124    |
| VOC                 | 5.5                            | 0.068    | 0.297    |
| <b>HAPS</b>         |                                |          |          |
| 2-Methylnaphthalene | 2.40E-05                       | 2.96E-07 | 1.30E-06 |
| Benzene             | 2.10E-03                       | 2.59E-05 | 1.13E-04 |
| Dichlorobenzene     | 1.20E-03                       | 1.48E-05 | 6.48E-05 |
| Fluoranthene        | 3.00E-06                       | 3.70E-08 | 1.62E-07 |
| Fluorene            | 2.80E-06                       | 3.45E-08 | 1.51E-07 |
| Formaldehyde        | 7.50E-02                       | 9.25E-04 | 4.05E-03 |
| Hexane              | 1.80E+00                       | 2.22E-02 | 9.73E-02 |
| Naphthalene         | 6.10E-04                       | 7.53E-06 | 3.30E-05 |
| Phenanathrene       | 1.70E-05                       | 2.10E-07 | 9.19E-07 |
| Toluene             | 3.40E-03                       | 4.19E-05 | 1.84E-04 |

|  | lb/hr    | tpy      |
|--|----------|----------|
| TOTAL Uncontrolled VOC                 | 0.068    | 0.297    |
| TOTAL Uncontrolled HAPs                | 0.023    | 0.102    |
| TOTAL Uncontrolled TAPs (Benzene)      | 2.59E-05 | 1.13E-04 |
| TOTAL Uncontrolled Toluene             | 4.19E-05 | 1.84E-04 |
| TOTAL Uncontrolled Hexane              | 0.022    | 0.097    |
| TOTAL Uncontrolled TAPs (Formaldehyde) | 0.001    | 0.004    |
| TOTAL CO <sub>2e</sub> Emissions       | 1,489.22 | 6,522.77 |

**Enter any notes here:**

All Emission Factors based off AP-42 Sec 1.4 Natural Gas Combustion



Table 10

**Enclosed Combustor Emissions  
Cofor Well Pad  
Doddridge County, West Virginia  
Antero Resources Corporation**

| General Information |                     |
|---------------------|---------------------|
| Unit Name:          | EC001, EC002, EC003 |

| Pollutant        | Emission Factor <sup>1</sup> (lb/MMscf) |
|------------------|---|
| Nox -Pilot gas   | 100                                     |
| CO - Pilot gas   | 84                                      |
| PM10             | 7.6                                     |
| PM2.5            | 5.7                                     |
| SO <sub>2</sub>  | 0.6                                     |
| CO <sub>2</sub>  | 120,000                                 |
| VOC              | 5.5                                     |
| benzene          | 2.10E-03                                |
| Hexane           | 1.80E+00                                |
| Toluene          | 3.40E-03                                |
| Formaldehyde     | 7.50E-02                                |
| N <sub>2</sub> O | 2.20                                    |
| Lead             | 5.00E-04                                |

| Pollutant | Emission Factor <sup>2</sup> (lb/MMBtu) |
|-----------|---|
| NOx       | 0.068                                   |
| CO        | 0.31                                    |

| Constants                         |           |
|-----------------------------------|-----------|
| Btu/MMBtu                         | 1,000,000 |
| scf/MMscf                         | 1,000,000 |
| lb/ton                            | 2,000     |
| H <sub>2</sub> S molecular weight | 34.08     |
| SO <sub>2</sub> molecular weight  | 64.06     |
| seconds/hour                      | 3,600     |
| inches/ft                         | 12        |

| Destruction Efficiency                              |    |
|---|----|
| VOC percent destruction efficiency (%)              | 98 |
| H <sub>2</sub> S percent destruction efficiency (%) | 98 |

|   |      |
|---|------|
| Enclosed Combustor operating hours                          | 8760 |
| No. of Enclosed Combustors                                  | 3    |
| Maximum Design Heat Input Per Enclosed Combustor (MMBtu/hr) | 12   |

| Stream Information   |            |                      |                          |                            |                        |                          |               |
|--|------------|----------------------|--------------------------|----------------------------|------------------------|--------------------------|---------------|
|  | 1          | 2                    | 3                        | 4                          | 5                      | 6                        | Total         |
| Stream Sent to Enclosed/Vapor Combustor (Enter Name of Each Stream Here) | pilot(s)   | added fuel stream(s) | Oil Tank Flash Emissions | Water Tank Flash Emissions | Oil Tank W/B Emissions | Water Tank W/B Emissions | -             |
| Maximum Expected Hourly Volumetric Flow Rate of Stream (scf/hr)          | 37.8       | --                   | 1,492.29                 | 374.24                     | 131.07                 | 4.41                     | 2,039.81      |
| Maximum Expected Annual Volumetric Flow Rate of Stream (scf/yr)          | 331,128.00 | --                   | 13,072,452.81            | 3,278,307.66               | 1,148,188.70           | 38,626.17                | 17,868,703.34 |
| Heating Content (Btu/ft <sup>3</sup> )                                   | 1,216      |                      | 2,166.29                 | 1,169.88                   | 2,230.95               | 103.03                   | 1,943.03      |

| Mass Flow Rates of the Vapors Sent to this Control Device, Hourly Basis (lb/hr) |          |                      |                          |                            |                        |                          |         |
|---|----------|----------------------|--------------------------|----------------------------|------------------------|--------------------------|---------|
|   | 1        | 2                    | 3                        | 4                          | 5                      | 6                        | Total   |
| Stream Sent to Enclosed Combustor/Vapor Combustor                               | pilot(s) | added fuel stream(s) | Oil Tank Flash Emissions | Water Tank Flash Emissions | Oil Tank W/B Emissions | Water Tank W/B Emissions | -       |
| H <sub>2</sub> S  | -        | -                    | 0.000                    | 0.000                      | 0.000                  | 0.000                    | 0.000   |
| Total VOC   | -        | -                    | 92.143                   | 1.681                      | 7.981                  | 0.000                    | 101.80  |
| Benzene   | -        | -                    | 0.013                    | 0.003                      | 0.000                  | 0.000                    | 0.016   |
| Toluene   | -        | -                    | 0.078                    | 0.014                      | 0.000                  | 0.000                    | 0.092   |
| Ethylbenzene  | -        | -                    | 0.059                    | 0.010                      | 0.001                  | 0.000                    | 0.070   |
| Xylenes   | -        | -                    | 0.139                    | 0.024                      | 0.002                  | 0.000                    | 0.165   |
| n-Hexane  | -        | -                    | 12.531                   | 0.037                      | 0.115                  | 0.000                    | 12.683  |
| HAPs  | -        | -                    | 12.821                   | 0.087                      | 0.118                  | 0.000                    | 13.026  |
| Total Mass Flow   | -        | -                    | 152.775                  | 18.158                     | 13.419                 | 0.214                    | 184.566 |
| Mass Flow Rates of the Vapors Sent to this Control Device, Annual Basis (tpy)   |          |                      |                          |                            |                        |                          |         |
| H <sub>2</sub> S  | -        | -                    | 0.000                    | 0.000                      | 0.000                  | 0.000                    | 0.000   |
| Total VOC   | -        | -                    | 403.585                  | 7.362                      | 34.955                 | 0.001                    | 445.903 |
| Benzene   | -        | -                    | 0.059                    | 0.011                      | 0.000                  | 0.000                    | 0.070   |
| Toluene   | -        | -                    | 0.340                    | 0.060                      | 0.001                  | 0.000                    | 0.401   |
| Ethylbenzene  | -        | -                    | 0.260                    | 0.045                      | 0.003                  | 0.000                    | 0.308   |
| Xylenes   | -        | -                    | 0.610                    | 0.103                      | 0.009                  | 0.000                    | 0.722   |
| n-Hexane  | -        | -                    | 54.888                   | 0.160                      | 0.503                  | 0.000                    | 55.551  |
| HAP   | -        | -                    | 56.157                   | 0.379                      | 0.516                  | 0.000                    | 57.052  |
| Total Mass Flow   | -        | -                    | 669.156                  | 79.531                     | 58.774                 | 0.937                    | 808.398 |

Table 10

**Enclosed Combustor Emissions  
Cofor Well Pad  
Doddridge County, West Virginia  
Antero Resources Corporation**

| Controlled Emissions                              |          |                      |                          |                            |                        |                          |       |
|---|----------|----------------------|--------------------------|----------------------------|------------------------|--------------------------|-------|
| Hourly (lb/hr)                                    |          |                      |                          |                            |                        |                          |       |
|   | 1        | 2                    | 3                        | 4                          | 5                      | 6                        | Total |
| Stream Sent to Enclosed Combustor/Vapor Combustor | pilot(s) | added fuel stream(s) | Oil Tank Flash Emissions | Water Tank Flash Emissions | Oil Tank W/B Emissions | Water Tank W/B Emissions | -     |
| NOx <sup>3</sup>                                  | 0.004    | -                    | 2.448                    |                            |                        |                          | 2.45  |
| CO <sup>3</sup>                                   | 0.003    | -                    | 11.160                   |                            |                        |                          | 11.16 |
| PM2.5   | 0.000    | -                    | 0.009                    | 0.002                      | 0.001                  | 0.000                    | 0.01  |
| PM10  | 0.000    | -                    | 0.011                    | 0.003                      | 0.001                  | 0.000                    | 0.02  |
| H <sub>2</sub> S                                  | 0.000    | -                    | 0.000                    | 0.000                      | 0.000                  | 0.000                    | 0.00  |
| SO <sub>2</sub>                                   | 0.000    | -                    | 0.000                    | 0.000                      | 0.000                  | 0.000                    | 0.00  |
| CO <sub>2</sub>                                   | 4.536    | -                    | -                        | -                          | -                      | -                        | 4.54  |
| Total VOC   | 0.000    | -                    | 1.843                    | 0.034                      | 0.160                  | 0.000                    | 2.04  |
| Benzene   | 0.000    | -                    | 0.000                    | 0.000                      | 0.000                  | 0.000                    | 0.00  |
| Toluene   | 0.000    | -                    | 0.002                    | 0.000                      | 0.000                  | 0.000                    | 0.00  |
| Ethylbenzene                                      | 0.000    | -                    | 0.001                    | 0.000                      | 0.000                  | 0.000                    | 0.00  |
| Xylenes   | 0.000    | -                    | 0.003                    | 0.000                      | 0.000                  | 0.000                    | 0.00  |
| n-Hexane  | 0.000    | -                    | 0.251                    | 0.001                      | 0.002                  | 0.000                    | 0.25  |
| HAP   | 0.000    | -                    | 0.256                    | 0.002                      | 0.002                  | 0.000                    | 0.26  |
| N <sub>2</sub> O                                  | 0.000    | -                    | 0.003                    | 0.001                      | 0.000                  | 0.000                    | 0.00  |
| Lead  | 0.000    | -                    | 0.000                    | 0.000                      | 0.000                  | 0.000                    | 0.00  |
| Formaldehyde                                      | 0.000    | -                    | -                        | -                          | -                      | -                        | 0.00  |
| Annual (tpy)                                      |          |                      |                          |                            |                        |                          |       |
|   | 1        | 2                    | 3                        | 4                          | 5                      | 6                        | Total |
| Stream Sent to Enclosed Combustor/Vapor Combustor | pilot(s) | added fuel stream(s) | Oil Tank Flash Emissions | Water Tank Flash Emissions | Oil Tank W/B Emissions | Water Tank W/B Emissions | -     |
| NOx <sup>3</sup>                                  | 0.017    | -                    | 10.722                   |                            |                        |                          | 10.74 |
| CO <sup>3</sup>                                   | 0.014    | -                    | 48.881                   |                            |                        |                          | 48.89 |
| PM2.5   | 0.001    | -                    | 0.037                    | 0.009                      | 0.003                  | 0.000                    | 0.05  |
| PM10  | 0.001    | -                    | 0.050                    | 0.012                      | 0.004                  | 0.000                    | 0.07  |
| H <sub>2</sub> S                                  | 0.000    | -                    | 0.000                    | 0.000                      | 0.000                  | 0.000                    | 0.00  |
| SO <sub>2</sub>                                   | 0.000    | -                    | 0.000                    | 0.000                      | 0.000                  | 0.000                    | 0.00  |
| CO <sub>2</sub>                                   | 19.868   | -                    | -                        | -                          | -                      | -                        | 19.87 |
| Total VOC   | 0.001    | -                    | 8.072                    | 0.147                      | 0.699                  | 0.000                    | 8.92  |
| Benzene   | 0.000    | -                    | 0.001                    | 0.000                      | 0.000                  | 0.000                    | 0.00  |
| Toluene   | 0.000    | -                    | 0.007                    | 0.001                      | 0.000                  | 0.000                    | 0.01  |
| Ethylbenzene                                      | 0.000    | -                    | 0.005                    | 0.001                      | 0.000                  | 0.000                    | 0.01  |
| Xylenes   | 0.000    | -                    | 0.012                    | 0.002                      | 0.000                  | 0.000                    | 0.01  |
| n-Hexane  | 0.000    | -                    | 1.098                    | 0.003                      | 0.010                  | 0.000                    | 1.11  |
| HAP   | 0.000    | -                    | 1.123                    | 0.008                      | 0.010                  | 0.000                    | 1.14  |
| N <sub>2</sub> O                                  | 0.000    | -                    | 0.014                    | 0.004                      | 0.001                  | 0.000                    | 0.02  |
| Lead  | 0.000    | -                    | 0.000                    | 0.000                      | 0.000                  | 0.000                    | 0.00  |
| Formaldehyde                                      | 0.000    | -                    | -                        | -                          | -                      | -                        | 0.00  |

| Enclosed Combustor/Vapor Combustor Total Emissions |                          |                        |
|--|--------------------------|------------------------|
|  | Hourly Emissions (lb/hr) | Annual Emissions (tpy) |
| Total VOC  | 2.04                     | 8.92                   |
| NOx  | 2.452                    | 10.739                 |
| CO   | 11.163                   | 48.895                 |
| PM2.5  | 0.012                    | 0.051                  |
| PM10   | 0.016                    | 0.068                  |
| H <sub>2</sub> S                                   | 1.21E-05                 | 5.28E-05               |
| SO <sub>2</sub>                                    | 2.27E-05                 | 9.93E-05               |
| Benzene (TAPs)                                     | 3.19E-04                 | 1.40E-03               |
| Toluene  | 1.83E-03                 | 8.02E-03               |
| Ethylbenzene                                       | 1.41E-03                 | 6.16E-03               |
| Xylenes  | 3.30E-03                 | 0.014                  |
| Hexanes  | 0.254                    | 1.111                  |
| Formaldehyde (TAPs)                                | 2.84E-06                 | 1.24E-05               |
| HAPs   | 0.26                     | 1.14                   |
| CO <sub>2</sub> e                                  | 557.24                   | 2440.73                |
| N <sub>2</sub> O                                   | 0.004                    | 0.020                  |
| Lead   | 1.02E-06                 | 4.47E-06               |

**Enter any notes here as needed**

- Emission Factors from AP-42 Tables 1.4-1, 1.4-2, and 1.4.3
- Emission Factors from AP-42 Tables 13.5-1 and 13.5-2 for industrial flares
- Worst case emissions based on enclosed combustors total maximum design heat input

Table 11

**Enclosed Combustor GHG Emissions  
Cofor Well Pad  
Doddridge County, West Virginia  
Antero Resources Corporation**

**Enclosed Combustor CO<sub>2</sub> and CH<sub>4</sub> Emissions**

| Components      | Mole fraction of oil flash gas constituents <sup>a</sup> | Volume of oil flash gas sent to Enclosed Combustor scf/year | Mole fraction of water flash gas constituents <sup>a</sup> | Volume of water flash gas sent to Enclosed Combustor scf/year | Mole fraction of oil tank vapors constituents <sup>a</sup> | Volume of oil tank vapor sent to Enclosed Combustor scf/year | Mole fraction of water tank vapors constituents <sup>a</sup> | Volume of water tank vapors sent to Enclosed Combustor scf/year | Component volume of gas sent to Enclosed Combustor scf/year | Number of carbon atoms | Combustion Efficiency | Combusted CO <sub>2</sub> Volume <sup>b</sup> scf/year | Uncombusted CO <sub>2</sub> and CH <sub>4</sub> Volume <sup>b</sup> scf/year | Volume GHGs Emitted scf/year |
|-----------------|--|---|--|---|--|--|--|---|---|------------------------|-----------------------|--|--|------------------------------|
| CO <sub>2</sub> | 0.002  | 13,072,453  | 0.0109   | 3,278,308   | 0.0039   | 1,148,189  | 0.016  | 38,626  | 64,295  | 1                      | 0                     | --   | 64,295   | 39,553,253                   |
| Methane         | 0.209  | 13,072,453  | 0.7421   | 3,278,308   | 0.0464   | 1,148,189  | 0.038  | 38,626  | 5,219,995   | 1                      | 0.98                  | 5,115,595  | 104,400  | 104,400                      |
| Ethane          | 0.381  | 13,072,453  | 0.1760   | 3,278,308   | 0.5055   | 1,148,189  | 0.006  | 38,626  | 6,139,378   | 2                      | 0.98                  | 12,033,180   | --   |                              |
| Propane         | 0.185  | 13,072,453  | 0.0242   | 3,278,308   | 0.2273   | 1,148,189  | 0.000  | 38,626  | 2,758,817   | 3                      | 0.98                  | 8,110,922  | --   |                              |
| i-Butane        | 0.046  | 13,072,453  | 0.0031   | 3,278,308   | 0.0558   | 1,148,189  | 0.000  | 38,626  | 669,744   | 4                      | 0.98                  | 2,625,397  | --   |                              |
| n-Butane        | 0.082  | 13,072,453  | 0.0065   | 3,278,308   | 0.1003   | 1,148,189  | 0.000  | 38,626  | 1,206,642   | 4                      | 0.98                  | 4,730,036  | --   |                              |
| Pentane         | 0.044  | 13,072,453  | 0.0017   | 3,278,308   | 0.0537   | 1,148,189  | 0.000  | 38,626  | 644,691   | 5                      | 0.98                  | 3,158,986  | --   |                              |
| Hexane          | 0.038  | 13,072,453  | 0.0005   | 3,278,308   | 0.0044   | 1,148,189  | 0.000  | 38,626  | 497,195   | 6                      | 0.98                  | 2,923,506  | --   |                              |
| Benzene         | 0.000  | 13,072,453  | 0.0000   | 3,278,308   | 0.0000   | 1,148,189  | 0.000  | 38,626  | 674   | 6                      | 0.98                  | 3,964  | --   |                              |
| Heptanes        | 0.003  | 13,072,453  | 0.0001   | 3,278,308   | 0.0009   | 1,148,189  | 0.000  | 38,626  | 45,584  | 7                      | 0.98                  | 312,708  | --   |                              |
| Toluene         | 0.000  | 13,072,453  | 0.0002   | 3,278,308   | 0.0000   | 1,148,189  | 0.000  | 38,626  | 3,274   | 7                      | 0.98                  | 22,458   | --   |                              |
| Octane          | 0.003  | 13,072,453  | 0.0001   | 3,278,308   | 0.0013   | 1,148,189  | 0.000  | 38,626  | 39,833  | 8                      | 0.98                  | 312,292  | --   |                              |
| Ethyl benzene   | 0.000  | 13,072,453  | 0.0001   | 3,278,308   | 0.0000   | 1,148,189  | 0.000  | 38,626  | 2,182   | 8                      | 0.98                  | 17,109   | --   |                              |
| Xylenes         | 0.000  | 13,072,453  | 0.0002   | 3,278,308   | 0.0001   | 1,148,189  | 0.000  | 38,626  | 5,116   | 8                      | 0.98                  | 40,113   | --   |                              |
| Nonane          | 0.001  | 13,072,453  | 0.0000   | 3,278,308   | 0.0004   | 1,148,189  | 0.000  | 38,626  | 7,984   | 9                      | 0.98                  | 70,421   | --   |                              |
| Decane plus     | 0.000  | 13,072,453  | 0.0000   | 3,278,308   | 0.0000   | 1,148,189  | 0.000  | 38,626  | 1,252   | 10                     | 0.98                  | 12,270   | --   |                              |
| <b>Subtotal</b> |  |   |  |   |  |  |  |   |   |                        |                       | <b>39,488,958</b>                                      | --   |                              |

| Pollutant                        | Volume Emitted scf/year | Density of GHG <sup>c</sup> lb/scf | Conversion Factor lb/ton | GWF | Emissions <sup>c</sup> |                |
|----------------------------------|-------------------------|------------------------------------|--------------------------|-----|------------------------|----------------|
|                                  |                         |                                    |                          |     | lbs/hr                 | (tons/yr)      |
| CO <sub>2</sub>                  | 39,553,253              | 0.12                               | 2000                     | 1   | 523.60                 | 2,293.36       |
| CH <sub>4</sub>                  | 104,400                 | 0.09                               | 2000                     | 25  | 1.11                   | 4.86           |
| <b>CO<sub>2</sub>e Emissions</b> |                         |                                    |                          |     | <b>551.3</b>           | <b>2414.77</b> |

**GHG Emissions Summary**

Notes

a Flashing/Working/Breathing Losses from ProMax output reports

b 40 CFR 98.233 (n)(4): Eqns: W-19, W-20 and W-21

c 40 CFR 98.233(v) Eqn W-36 - density at 60F and 14.7 psia

**Table 12**

**Haul Road Emissions  
Cofor 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) | 660   |
| PW Production (bbl/day)         | 4,000 |
| 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)<br>(tons) | Mean Vehicle Speed (S)<br>(mph) | Miles Per Trip<br>(miles) | Maximum Trips per Hour | Maximum Trips per Year | Vehicle Miles Travelled |              | PM<br>(lbs/VMT) | PM10<br>(lbs/VMT) |
|--------------------------|-------------|-----------------------------------|---------------------------------|---------------------------|------------------------|------------------------|-------------------------|--------------|-----------------|-------------------|
|                          |             |                                   |                                 |                           |                        |                        | (miles/hr)              | (miles/year) |                 |                   |
| Tanker Trucks Condensate | 10          | 40                                | 10                              | 0.4800                    | 1                      | 1205                   | 0.4800                  | 578.4000     | 3.8175          | 1.7179            |
| Tanker Trucks PW         | 10          | 40                                | 10                              | 0.4800                    | 1                      | 7300                   | 0.4800                  | 3504.0000    | 3.8175          | 1.7179            |
| Pick Up Truck            | 4           | 3                                 | 10                              | 0.2200                    | 1                      | 730                    | 0.2200                  | 160.6000     | 0.3467          | 0.1560            |

|                          | Uncontrolled Emissions |                    |               |               |                   |               | Controlled Emissions |                   |               |               |                   |               |
|--------------------------|------------------------|--------------------|---------------|---------------|-------------------|---------------|----------------------|-------------------|---------------|---------------|-------------------|---------------|
|                          | PM                     |                    |               | PM10          |                   |               | PM                   |                   |               | PM10          |                   |               |
|                          | (lbs/hr)               | (lbs/year)         | (tpy)         | (lbs/hr)      | (lbs/year)        | (tpy)         | (lbs/hr)             | (lbs/year)        | (tpy)         | (lbs/hr)      | (lbs/year)        | (tpy)         |
| Tanker Trucks Condensate | 1.8324                 | 2208.0590          | 1.1040        | 0.8246        | 993.6265          | 0.4968        | 0.9162               | 1104.0295         | 0.5520        | 0.4123        | 496.8133          | 0.2484        |
| Tanker Trucks PW         | 1.8324                 | 13376.6230         | 6.6883        | 0.8246        | 6019.4803         | 3.0097        | 0.9162               | 6688.3115         | 3.3442        | 0.4123        | 3009.7402         | 1.5049        |
| Pick Up Truck            | 0.0763                 | 55.6768            | 0.0278        | 0.0343        | 25.0545           | 0.0125        | 0.0381               | 27.8384           | 0.0139        | 0.0172        | 12.5273           | 0.0063        |
| <b>Total Emissions</b>   | <b>3.7411</b>          | <b>15,640.3587</b> | <b>7.8202</b> | <b>1.6835</b> | <b>7,038.1614</b> | <b>3.5191</b> | <b>1.8705</b>        | <b>7,820.1794</b> | <b>3.9101</b> | <b>0.8417</b> | <b>3,519.0807</b> | <b>1.7595</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)<br>Source: Attachment L, Fugitive Emissions from Unpaved Haul Roads, Rev 03/2007, West Virginia Department of Environmental Protection |
|------------------------------|---|

**Table 13**

**Engine Emissions  
Cofor Well Pad  
Doddridge County, West Virginia  
Antero Resources Corporation**

**Kubota DG972-E2**

|                                |           |
|--------------------------------|-----------|
| Power (hp)                     | 24        |
| Fuel consumption (lbs/BHP-hr)  | 0.449     |
| Heat Content of Fuel (Btu/scf) | 1215.8718 |
| Density of NG (lb/scf)         | 0.056     |
| Operating Hours/year           | 8760      |
| No. of Engines                 | 1         |

| Pollutant         | Emission Factors |            | lb/hr    | tpy      |
|-------------------|------------------|------------|----------|----------|
|                   | (g/hp-hr)        | (lb/MMBtu) |          |          |
| NOx <sup>1</sup>  | 5.97             |            | 0.3158   | 1.3831   |
| CO <sup>2</sup>   | 106.7            |            | 5.6445   | 24.7228  |
| CO <sub>2</sub>   |                  | 110.000    | 25.7365  | 112.73   |
| PM <sub>2.5</sub> |                  | 0.010      | 0.0022   | 0.0097   |
| PM <sub>10</sub>  |                  | 0.010      | 0.0022   | 0.0097   |
| PM (Total)        |                  | 0.010      | 0.0023   | 0.0102   |
| SO <sub>2</sub>   |                  | 5.880E-04  | 0.0001   | 0.0006   |
| TOC               |                  | 0.358      | 0.0838   | 0.3669   |
| Methane           |                  | 0.230      | 0.0538   | 0.2357   |
| VOC <sup>3</sup>  |                  | 0.0296     | 0.0069   | 0.0303   |
| <b>HAPS</b>       |                  |            |          |          |
| Benzene           |                  | 0.002      | 3.70E-04 | 0.002    |
| Ethylbenzene      |                  | 2.48E-05   | 5.80E-06 | 2.54E-05 |
| Formaldehyde      |                  | 0.021      | 0.005    | 0.021    |
| Naphthalene       |                  | 9.71E-05   | 2.27E-05 | 9.95E-05 |
| Toluene           |                  | 5.58E-04   | 1.31E-04 | 5.72E-04 |
| Xylene            |                  | 1.95E-04   | 4.56E-05 | 2.00E-04 |

|  | lb/hr    | tpy      |
|--|----------|----------|
| TOTAL Uncontrolled VOC                 | 0.007    | 0.030    |
| TOTAL Uncontrolled NOx                 | 0.316    | 1.383    |
| TOTAL Uncontrolled HAPs                | 0.005    | 0.024    |
| TOTAL Uncontrolled TAPs (Benzene)      | 3.70E-04 | 0.002    |
| TOTAL Uncontrolled Toluene             | 1.31E-04 | 5.72E-04 |
| TOTAL Uncontrolled Ethylbenzene        | 5.80E-06 | 2.54E-05 |
| TOTAL Uncontrolled Xylenes             | 4.56E-05 | 2.00E-04 |
| TOTAL Uncontrolled TAPs (Formaldehyde) | 0.005    | 0.021    |
| TOTAL CO <sub>2e</sub> Emissions       | 27.082   | 118.619  |

**Enter Any Notes Here:**

1. Emission factor used for the 24 HP engine's NOx is the 40 CFR 1054 standard indicated on the EPA's Certificate of Conformity. See Appendix N.
2. Emission factor for CO was the Certification CO level taken from EPA's Non-Road Small SI 2013 Certification issued by Office of Transportation and Air Quality, March 2014.
3. Emission factors for all other contaminants including VOCs were obtained from AP-42, Section 3.2 "Natural Gas-fired Reciprocating Engines", Table 3.2-3.

**Table 14**

**Change in Regulated Air Pollutants Emissions  
Cofor Well Pad  
Doddridge County, West Virginia  
Antero Resources Corporation**

| Pollutant                 | Potential Emissions |            | Previous Permit Application Emissions |            | Change in Emissions |            |
|---------------------------|---------------------|------------|---------------------------------------|------------|---------------------|------------|
|                           | Hourly PTE          | Yearly PTE | Hourly PTE                            | Yearly PTE | Hourly PTE          | Yearly PTE |
| <b>PM</b>                 | 1.9820              | 4.3984     | 1.4899                                | 2.8092     | 4.92E-01            | 1.5892     |
| <b>PM10</b>               | 0.9532              | 2.2478     | 0.8181                                | 1.9107     | 0.1352              | 0.3372     |
| <b>VOC (uncontrolled)</b> | 105.4628            | 465.2406   | 600.6269                              | 2642.6511  | -495.1640           | -2177.4104 |
| <b>CO</b>                 | 17.8439             | 78.1565    | 8.5860                                | 37.6067    | 9.2579              | 40.5498    |
| <b>NOx</b>                | 4.0012              | 17.5254    | 3.8176                                | 16.7211    | 0.1836              | 0.8044     |
| <b>SO2</b>                | 0.0076              | 0.0331     | 0.0174                                | 0.0760     | -9.79E-03           | -4.29E-02  |
| <b>Pb</b>                 | 7.19E-06            | 3.15E-05   | 1.75E-05                              | 7.67E-05   | -1.03E-05           | -4.52E-05  |
| <b>HAPs</b>               | 0.5919              | 2.6415     | 0.8711                                | 3.8493     | -0.2792             | -1.2078    |
| <b>TAPs</b>               | 0.0080              | 0.0352     | 0.0159                                | 0.0700     | -7.87E-03           | -0.0348    |

Notes:

1. Change in emissions due to the decrease in condensate production, addition of 2 produced water tanks, removal of 1 Cimarron enclosed combustor, and removal of 11 line heaters.
2. Change in permit from G70A to G70C.



Bryan Research & Engineering, Inc.

# ProMax<sup>®</sup> 3.2

with  
TSWEET<sup>®</sup> & PROSIM<sup>®</sup>

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## Simulation Report

|                 |   |
|-----------------|---|
| Client Name:    | Antero Resources Corporation  |
| Location:       | West Virginia   |
| Job:            | Cofor Well Pad  |
| Project Name:   | PROMAX SCENARIO 3   |
| File Name:      | C:\Users\ychen1\Documents\Drafts\082715- ANTERO\ProMax Report\2<br>PH\PROMAX SCENARIO 3.pmx |
| ProMax Version: | 4.0.16071.0   |
| Report Created: | 8/26/2016 10:36   |

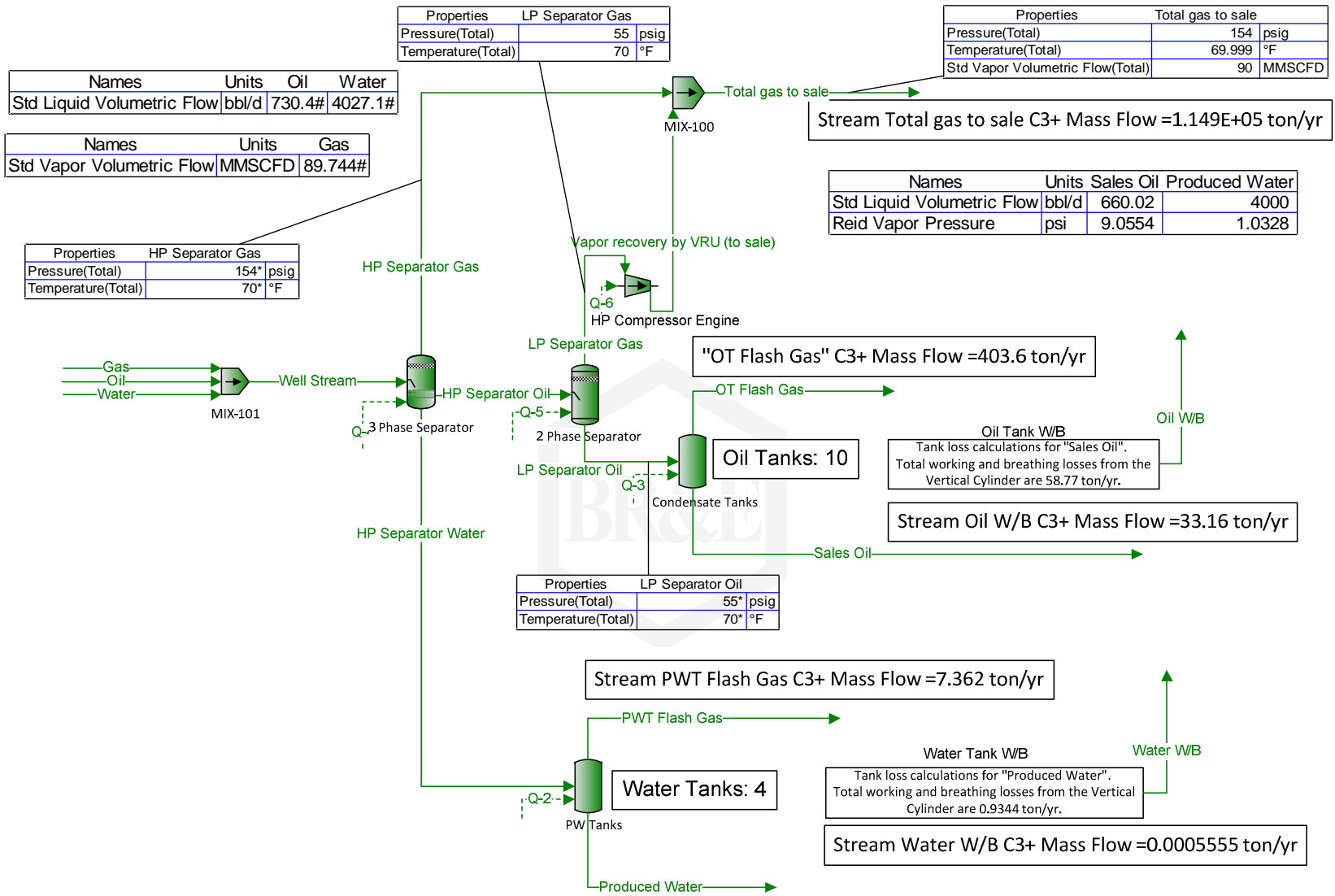






Table with 17 columns listing chemical compounds (Heptane, Methylcyclohexane, etc.) and their values in various units (lb/h, etc.).

Table with 17 columns listing various hydrocarbon and chemical compounds (Water, H2S, Nitrogen, Carbon Dioxide, etc.) and their values in various units (lb/h, etc.).

Large table with 18 columns: Process Streams, Phase: Total, Property, and various process variables (Temperature, Pressure, Mole Fraction, etc.) with values in different units.

Table with 17 columns: Process Streams, Phase: Vapor, and Mole Fraction for various compounds (Water, H2S, Nitrogen) with values in different units.









|                    |             |      |             |      |      |      |      |      |      |      |      |      |      |             |      |      |             |
|--------------------|-------------|------|-------------|------|------|------|------|------|------|------|------|------|------|-------------|------|------|-------------|
| n-Hexane           | 1.33330E-05 |      | 1.33330E-05 |      |      |      |      |      |      |      |      |      |      | 1.20123E-05 |      |      | 2.46188E-05 |
| Methylcyclopentane | 5.11397E-07 |      | 5.11397E-07 |      |      |      |      |      |      |      |      |      |      | 4.72144E-07 |      |      | 9.60977E-07 |
| Benzene            | 1.26393E-05 |      | 1.26393E-05 |      |      |      |      |      |      |      |      |      |      | 1.14500E-05 |      |      | 2.40850E-05 |
| 2-Methylhexane     | 4.77132E-07 |      | 4.77132E-07 |      |      |      |      |      |      |      |      |      |      | 3.03918E-07 |      |      | 7.84024E-07 |
| 3-Methylhexane     | 4.79277E-07 |      | 4.79277E-07 |      |      |      |      |      |      |      |      |      |      | 2.97136E-07 |      |      | 7.73894E-07 |
| Heptane            | 4.37882E-07 |      | 4.37882E-07 |      |      |      |      |      |      |      |      |      |      | 3.00790E-07 |      |      | 6.71446E-07 |
| Methylcyclohexane  | 2.72902E-06 |      | 2.72902E-06 |      |      |      |      |      |      |      |      |      |      | 1.92886E-06 |      |      | 4.27269E-06 |
| Toluene            | 4.49322E-05 |      | 4.49322E-05 |      |      |      |      |      |      |      |      |      |      | 3.33317E-05 |      |      | 6.99891E-05 |
| Octane             | 2.26105E-07 |      | 2.26105E-07 |      |      |      |      |      |      |      |      |      |      | 1.59349E-07 |      |      | 2.32566E-07 |
| Ethylbenzene       | 2.65065E-05 |      | 2.65065E-05 |      |      |      |      |      |      |      |      |      |      | 1.69649E-05 |      |      | 2.74666E-05 |
| m-Xylene           | 1.57346E-05 |      | 1.57346E-05 |      |      |      |      |      |      |      |      |      |      | 1.07228E-05 |      |      | 1.56914E-05 |
| o-Xylene           | 5.47712E-05 |      | 5.47712E-05 |      |      |      |      |      |      |      |      |      |      | 3.60082E-05 |      |      | 5.04754E-05 |
| Nonane             | 6.87254E-08 |      | 6.87254E-08 |      |      |      |      |      |      |      |      |      |      | 3.98473E-08 |      |      | 3.41832E-08 |
| C10+               | 1.76717E-07 |      | 1.76717E-07 |      |      |      |      |      |      |      |      |      |      | 1.27053E-07 |      |      | 5.00878E-09 |
| Mass Fraction      | %           | %    | %           | %    | %    | %    | %    | %    | %    | %    | %    | %    | %    | %           | %    | %    | %           |
| Water              | 99.9648     |      | 99.9648     |      |      |      |      |      |      |      |      |      |      | 99.8633     |      |      | 99.9572     |
| H2S                | 0           |      | 0           |      |      |      |      |      |      |      |      |      |      | 0           |      |      | 0           |
| Nitrogen           | 8.95669E-05 |      | 8.95669E-05 |      |      |      |      |      |      |      |      |      |      | 0.000511078 |      |      | 3.05006E-05 |
| Carbon Dioxide     | 0.00204198  |      | 0.00204198  |      |      |      |      |      |      |      |      |      |      | 0.00766106  |      |      | 0.00289912  |
| Methane            | 0.0199766   |      | 0.0199766   |      |      |      |      |      |      |      |      |      |      | 0.0936880   |      |      | 0.0160368   |
| Ethane             | 0.00922962  |      | 0.00922962  |      |      |      |      |      |      |      |      |      |      | 0.0283522   |      |      | 0.0164545   |
| Propane            | 0.00179906  |      | 0.00179906  |      |      |      |      |      |      |      |      |      |      | 0.00409240  |      |      | 0.00376826  |
| Isobutane          | 0.000299011 |      | 0.000299011 |      |      |      |      |      |      |      |      |      |      | 0.000476766 |      |      | 0.000634647 |
| n-Butane           | 0.000631322 |      | 0.000631322 |      |      |      |      |      |      |      |      |      |      | 0.00104764  |      |      | 0.00133977  |
| Isopentane         | 0.000147392 |      | 0.000147392 |      |      |      |      |      |      |      |      |      |      | 0.000164172 |      |      | 0.000302586 |
| n-Pentane          | 4.63428E-05 |      | 4.63428E-05 |      |      |      |      |      |      |      |      |      |      | 5.90471E-05 |      |      | 9.42960E-05 |
| 2-Methylpentane    | 3.35087E-06 |      | 3.35087E-06 |      |      |      |      |      |      |      |      |      |      | 3.19755E-06 |      |      | 6.40671E-06 |
| 3-Methylpentane    | 5.72829E-06 |      | 5.72829E-06 |      |      |      |      |      |      |      |      |      |      | 5.23202E-06 |      |      | 1.08739E-05 |
| n-Hexane           | 6.37748E-05 |      | 6.37748E-05 |      |      |      |      |      |      |      |      |      |      | 5.74552E-05 |      |      | 0.000117750 |
| Methylcyclopentane | 2.38890E-06 |      | 2.38890E-06 |      |      |      |      |      |      |      |      |      |      | 2.20546E-06 |      |      | 4.48876E-06 |
| Benzene            | 5.47995E-05 |      | 5.47995E-05 |      |      |      |      |      |      |      |      |      |      | 4.96412E-05 |      |      | 0.000104417 |
| 2-Methylhexane     | 2.65370E-06 |      | 2.65370E-06 |      |      |      |      |      |      |      |      |      |      | 1.69026E-06 |      |      | 4.36030E-06 |
| 3-Methylhexane     | 2.66563E-06 |      | 2.66563E-06 |      |      |      |      |      |      |      |      |      |      | 1.65254E-06 |      |      | 4.30396E-06 |
| Heptane            | 2.43540E-06 |      | 2.43540E-06 |      |      |      |      |      |      |      |      |      |      | 1.67287E-06 |      |      | 3.73420E-06 |
| Methylcyclohexane  | 1.48728E-05 |      | 1.48728E-05 |      |      |      |      |      |      |      |      |      |      | 1.05117E-05 |      |      | 2.30390E-05 |
| Toluene            | 0.000229792 |      | 0.000229792 |      |      |      |      |      |      |      |      |      |      | 0.000170459 |      |      | 0.000357916 |
| Octane             | 1.43358E-06 |      | 1.43358E-06 |      |      |      |      |      |      |      |      |      |      | 1.01028E-06 |      |      | 1.47439E-06 |
| Ethylbenzene       | 0.000156196 |      | 0.000156196 |      |      |      |      |      |      |      |      |      |      | 9.99665E-05 |      |      | 0.000161844 |
| m-Xylene           | 9.27203E-05 |      | 9.27203E-05 |      |      |      |      |      |      |      |      |      |      | 6.31847E-05 |      |      | 9.24596E-05 |
| o-Xylene           | 0.000322753 |      | 0.000322753 |      |      |      |      |      |      |      |      |      |      | 0.000212180 |      |      | 0.000297421 |
| Nonane             | 4.89247E-07 |      | 4.89247E-07 |      |      |      |      |      |      |      |      |      |      | 2.83658E-07 |      |      | 2.43331E-07 |
| C10+               | 1.69790E-06 |      | 1.69790E-06 |      |      |      |      |      |      |      |      |      |      | 1.22069E-06 |      |      | 4.81215E-08 |
| 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        | lb/h | lb/h | lb/h        |
| Water              | 0           |      | 0           |      |      |      |      |      |      |      |      |      |      | 58619.0     |      |      | 0.0977865   |
| H2S                | 0           |      | 0           |      |      |      |      |      |      |      |      |      |      | 0           |      |      | 0           |
| Nitrogen           | 0           |      | 0           |      |      |      |      |      |      |      |      |      |      | 0.299999    |      |      | 2.98382E-08 |
| Carbon Dioxide     | 0           |      | 0           |      |      |      |      |      |      |      |      |      |      | 4.49699     |      |      | 2.83616E-06 |
| Methane            | 0           |      | 0           |      |      |      |      |      |      |      |      |      |      | 54.9942     |      |      | 1.56885E-05 |
| Ethane             | 0           |      | 0           |      |      |      |      |      |      |      |      |      |      | 16.6425     |      |      | 1.60972E-05 |
| Propane            | 0           |      | 0           |      |      |      |      |      |      |      |      |      |      | 2.40221     |      |      | 3.68643E-06 |
| Isobutane          | 0           |      | 0           |      |      |      |      |      |      |      |      |      |      | 0.279858    |      |      | 6.20865E-07 |
| n-Butane           | 0           |      | 0           |      |      |      |      |      |      |      |      |      |      | 0.614956    |      |      | 1.31068E-06 |
| Isopentane         | 0           |      | 0           |      |      |      |      |      |      |      |      |      |      | 0.0963676   |      |      | 2.96014E-07 |
| n-Pentane          | 0           |      | 0           |      |      |      |      |      |      |      |      |      |      | 0.0346603   |      |      | 9.22482E-08 |
| 2-Methylpentane    | 0           |      | 0           |      |      |      |      |      |      |      |      |      |      | 0.00187694  |      |      | 6.26758E-09 |
| 3-Methylpentane    | 0           |      | 0           |      |      |      |      |      |      |      |      |      |      | 0.00307175  |      |      | 1.06377E-08 |
| n-Hexane           | 0           |      | 0           |      |      |      |      |      |      |      |      |      |      | 0.0337258   |      |      | 1.15193E-07 |
| Methylcyclopentane | 0           |      | 0           |      |      |      |      |      |      |      |      |      |      | 0.00129459  |      |      | 4.39128E-09 |
| Benzene            | 0           |      | 0           |      |      |      |      |      |      |      |      |      |      | 0.0291390   |      |      | 1.02150E-07 |
| 2-Methylhexane     | 0           |      | 0           |      |      |      |      |      |      |      |      |      |      | 0.000992169 |      |      | 4.26561E-09 |
| 3-Methylhexane     | 0           |      | 0           |      |      |      |      |      |      |      |      |      |      | 0.000970031 |      |      | 4.21049E-09 |
| Heptane            | 0           |      | 0           |      |      |      |      |      |      |      |      |      |      | 0.000981961 |      |      | 3.65310E-09 |

|                   |   |   |   |   |   |   |   |   |   |   |   |             |             |
|-------------------|---|---|---|---|---|---|---|---|---|---|---|-------------|-------------|
| Methylcyclohexane | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00617027  | 2.25387E-08 |
| Toluene           | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.100058    | 3.50144E-07 |
| Octane            | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.000593030 | 1.44237E-09 |
| Ethylbenzene      | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0586797   | 1.58329E-07 |
| m-Xylene          | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0370889   | 9.04517E-08 |
| o-Xylene          | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.124548    | 2.90962E-07 |
| Nonane            | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.000166505 | 2.38047E-10 |
| C10+              | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.000716534 | 4.70765E-11 |

| Process Streams            |               | HP Separator Gas | HP Separator Water | HP Separator Oil | OT Flash Gas | Sales Oil | Gas    | Water  | Oil    | Produced Water | PWT Flash Gas | Oil W/B | Water W/B | Well Stream | LP Separator Oil | LP Separator Gas | recovery by VRU (to | Total gas to sale |
|----------------------------|---------------|------------------|--------------------|------------------|--------------|-----------|--------|--------|--------|----------------|---------------|---------|-----------|-------------|------------------|------------------|---------------------|-------------------|
| Phase: Heavy Liquid        | Status        | Solved           | Solved             | Solved           | Solved       | Solved    | Solved | Solved | Solved | Solved         | Solved        | Solved  | Solved    | Solved      | Solved           | Solved           | Solved              | Solved            |
| Property                   | Units         |                  |                    |                  |              |           |        |        |        |                |               |         |           |             |                  |                  |                     |                   |
| Temperature                | °F            | 70.0             |                    | 70.0             |              |           |        |        |        |                |               |         |           | 65.3029     |                  |                  | 70                  |                   |
| Pressure                   | psig          | 154              |                    | 154              |              |           |        |        |        |                |               |         |           | 1000        |                  |                  | 154                 |                   |
| Mole Fraction Vapor        | %             | 0                |                    | 0                |              |           |        |        |        |                |               |         |           | 0           |                  |                  | 0                   |                   |
| Mole Fraction Light Liquid | %             | 0                |                    | 0                |              |           |        |        |        |                |               |         |           | 0           |                  |                  | 0                   |                   |
| Mole Fraction Heavy Liquid | %             | 100              |                    | 100              |              |           |        |        |        |                |               |         |           | 100         |                  |                  | 100                 |                   |
| Molecular Weight           | lb/lbmol      | 18.0             |                    | 18.0             |              |           |        |        |        |                |               |         |           | 18.0169     |                  |                  | 18.0173             |                   |
| Mass Density               | lb/ft³        | 62.3             |                    | 62.3             |              |           |        |        |        |                |               |         |           | 62.0844     |                  |                  | 62.2679             |                   |
| Molar Flow                 | lbmol/h       | 0.0              |                    | 0.0              |              |           |        |        |        |                |               |         |           | 3258.02     |                  |                  | 0.00542969          |                   |
| Mass Flow                  | lb/h          | 0.0              |                    | 0.0              |              |           |        |        |        |                |               |         |           | 58699.3     |                  |                  | 0.0978284           |                   |
| Vapor Volumetric Flow      | MCFH          | 0.0              |                    | 0.0              |              |           |        |        |        |                |               |         |           | 0.945475    |                  |                  | 1.57109E-06         |                   |
| Liquid Volumetric Flow     | Mbbld         | 0.0              |                    | 0.0              |              |           |        |        |        |                |               |         |           | 4.04151     |                  |                  | 6.71575E-06         |                   |
| Std Vapor Volumetric Flow  | MMSCFD        | 0.0              |                    | 0.0              |              |           |        |        |        |                |               |         |           | 29.6728     |                  |                  | 4.94515E-05         |                   |
| Std Liquid Volumetric Flow | Mbbld         | 0.0              |                    | 0.0              |              |           |        |        |        |                |               |         |           | 4.03438     |                  |                  | 6.71004E-06         |                   |
| Compressibility            |               | 0.009            |                    | 0.009            |              |           |        |        |        |                |               |         |           | 0.0503494   |                  |                  | 0.00858739          |                   |
| Specific Gravity           |               | 0.998            |                    | 0.998            |              |           |        |        |        |                |               |         |           | 0.995437    |                  |                  | 0.998379            |                   |
| API Gravity                |               | 10.0             |                    | 10.0             |              |           |        |        |        |                |               |         |           | 10.0939     |                  |                  | 10.0302             |                   |
| Enthalpy                   | MMBtu/h       | 0.0              |                    | 0.0              |              |           |        |        |        |                |               |         |           | -399.379    |                  |                  | -0.000667731        |                   |
| Mass Enthalpy              | Btu/lb        | -6826.0          |                    | -6826.0          |              |           |        |        |        |                |               |         |           | -6803.81    |                  |                  | -6825.54            |                   |
| Mass Cp                    | Btu/(lb**F)   | 1.0              |                    | 1.0              |              |           |        |        |        |                |               |         |           | 0.980456    |                  |                  | 0.982140            |                   |
| Ideal Gas Cp/Cv Ratio      |               | 1.326            |                    | 1.326            |              |           |        |        |        |                |               |         |           | 1.32503     |                  |                  | 1.32580             |                   |
| Dynamic Viscosity          | cP            | 1.0              |                    | 1.0              |              |           |        |        |        |                |               |         |           | 0.828865    |                  |                  | 0.995388            |                   |
| Kinematic Viscosity        | cSt           | 1.0              |                    | 1.0              |              |           |        |        |        |                |               |         |           | 0.833451    |                  |                  | 0.997947            |                   |
| Thermal Conductivity       | Btu/(h*ft**F) | 0.3              |                    | 0.3              |              |           |        |        |        |                |               |         |           | 0.352081    |                  |                  | 0.346537            |                   |
| Surface Tension            | lb/ft         | 0.005            |                    | 0.005            |              |           |        |        |        |                |               |         |           | 0.00490627  |                  |                  | 0.00502932          |                   |
| Net I.G. Heating Value     | Btu/ft³       | 0.3              |                    | 0.3              |              |           |        |        |        |                |               |         |           | 1.29266     |                  |                  | 0.391256            |                   |
| Net Liquid Heating Value   | Btu/lb        | -1052.5          |                    | -1052.5          |              |           |        |        |        |                |               |         |           | -1031.14    |                  |                  | -1051.10            |                   |
| Gross I.G. Heating Value   | Btu/ft³       | 50.7             |                    | 50.7             |              |           |        |        |        |                |               |         |           | 51.6748     |                  |                  | 50.7239             |                   |
| Gross Liquid Heating Value | Btu/lb        | 7.6              |                    | 7.6              |              |           |        |        |        |                |               |         |           | 30.0        |                  |                  | 9.0                 |                   |



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

**For:** Antero Resources Appalachian Corp.  
 1615 Wynkoop Street  
 Denver, Colorado 80202

**Sample:** Nero No. 2H  
 First Stage Separator Hydrocarbon Liquid  
 Sampled @ 168 psig & 81 °F

Date Sampled: 10/14/14

Job Number: 45832.002

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

| COMPONENT           | MOL %         | LIQ VOL %     | WT %          |
|---------------------|---------------|---------------|---------------|
| Nitrogen            | 0.018         | 0.004         | 0.005         |
| Carbon Dioxide      | 0.015         | 0.005         | 0.006         |
| Methane             | 4.777         | 1.626         | 0.682         |
| Ethane              | 4.948         | 2.658         | 1.324         |
| Propane             | 4.863         | 2.691         | 1.908         |
| Isobutane           | 1.369         | 0.900         | 0.708         |
| n-Butane            | 3.815         | 2.416         | 1.973         |
| 2,2 Dimethylpropane | 0.071         | 0.055         | 0.046         |
| Isopentane          | 2.456         | 1.804         | 1.576         |
| n-Pentane           | 3.391         | 2.469         | 2.177         |
| 2,2 Dimethylbutane  | 0.121         | 0.101         | 0.093         |
| Cyclopentane        | 0.000         | 0.000         | 0.000         |
| 2,3 Dimethylbutane  | 0.214         | 0.176         | 0.164         |
| 2 Methylpentane     | 1.498         | 1.249         | 1.149         |
| 3 Methylpentane     | 1.044         | 0.856         | 0.801         |
| n-Hexane            | 2.751         | 2.273         | 2.109         |
| Heptanes Plus       | <u>68.649</u> | <u>80.716</u> | <u>85.281</u> |
| Totals:             | 100.000       | 100.000       | 100.000       |

**Characteristics of Heptanes Plus:**

Specific Gravity ----- 0.7559 (Water=1)  
 °API Gravity ----- 55.70 @ 60°F  
 Molecular Weight ----- 139.6  
 Vapor Volume ----- 17.18 CF/Gal  
 Weight ----- 6.30 Lbs/Gal

**Characteristics of Total Sample:**

Specific Gravity ----- 0.7154 (Water=1)  
 °API Gravity ----- 66.29 @ 60°F  
 Molecular Weight ----- 112.4  
 Vapor Volume ----- 20.20 CF/Gal  
 Weight ----- 5.96 Lbs/Gal

Base Conditions: 14.850 PSI &amp; 60 °F

Certified: FESCO, Ltd. - Alice, Texas

Analyst: XG  
 Processor: XGdjv  
 Cylinder ID: W-872

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

**TANKS DATA INPUT REPORT - GPA 2186-M**

| COMPONENT              | Mol %        | LiqVol %     | Wt %         |
|------------------------|--------------|--------------|--------------|
| Carbon Dioxide         | 0.015        | 0.005        | 0.006        |
| Nitrogen               | 0.018        | 0.004        | 0.005        |
| Methane                | 4.777        | 1.626        | 0.682        |
| Ethane                 | 4.948        | 2.658        | 1.324        |
| Propane                | 4.863        | 2.691        | 1.908        |
| Isobutane              | 1.369        | 0.900        | 0.708        |
| n-Butane               | 3.887        | 2.471        | 2.019        |
| Isopentane             | 2.456        | 1.804        | 1.576        |
| n-Pentane              | 3.391        | 2.469        | 2.177        |
| Other C-6's            | 2.877        | 2.383        | 2.206        |
| Heptanes               | 9.109        | 8.235        | 7.991        |
| Octanes                | 14.305       | 13.813       | 13.908       |
| Nonanes                | 9.207        | 10.205       | 10.397       |
| Decanes Plus           | 31.967       | 45.408       | 49.244       |
| Benzene                | 0.076        | 0.043        | 0.053        |
| Toluene                | 0.617        | 0.415        | 0.506        |
| E-Benzene              | 0.908        | 0.704        | 0.858        |
| Xylenes                | 2.460        | 1.894        | 2.324        |
| n-Hexane               | 2.751        | 2.273        | 2.109        |
| 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 ----- | 0.7154 | (Water=1) |
| °API Gravity -----     | 66.29  | @ 60°F    |
| Molecular Weight-----  | 112.4  |           |
| Vapor Volume -----     | 20.20  | CF/Gal    |
| Weight -----           | 5.96   | Lbs/Gal   |

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

|                        |        |           |
|------------------------|--------|-----------|
| Specific Gravity ----- | 0.7759 | (Water=1) |
| Molecular Weight-----  | 173.1  |           |

**Characteristics of Atmospheric Sample:**

|  |       |        |
|--|-------|--------|
| °API Gravity -----                     | 59.77 | @ 60°F |
| Reid Vapor Pressure (ASTM D-5191)----- | 3.54  | psi    |

| QUALITY CONTROL CHECK |                     |              |       |
|-----------------------|---------------------|--------------|-------|
|                       | Sampling Conditions | Test Samples |       |
| Cylinder Number       | -----               | W-872*       | W-298 |
| Pressure, PSIG        | 168                 | 154          | 150   |
| Temperature, °F       | 81                  | 70           | 70    |

\* Sample used for analysis

## TOTAL EXTENDED REPORT - GPA 2186-M

| COMPONENT                | Mol %        | LiqVol %     | Wt %         |
|--------------------------|--------------|--------------|--------------|
| Nitrogen                 | 0.018        | 0.004        | 0.005        |
| Carbon Dioxide           | 0.015        | 0.005        | 0.006        |
| Methane                  | 4.777        | 1.626        | 0.682        |
| Ethane                   | 4.948        | 2.658        | 1.324        |
| Propane                  | 4.863        | 2.691        | 1.908        |
| Isobutane                | 1.369        | 0.900        | 0.708        |
| n-Butane                 | 3.815        | 2.416        | 1.973        |
| 2,2 Dimethylpropane      | 0.071        | 0.055        | 0.046        |
| Isopentane               | 2.456        | 1.804        | 1.576        |
| n-Pentane                | 3.391        | 2.469        | 2.177        |
| 2,2 Dimethylbutane       | 0.121        | 0.101        | 0.093        |
| Cyclopentane             | 0.000        | 0.000        | 0.000        |
| 2,3 Dimethylbutane       | 0.214        | 0.176        | 0.164        |
| 2 Methylpentane          | 1.498        | 1.249        | 1.149        |
| 3 Methylpentane          | 1.044        | 0.856        | 0.801        |
| n-Hexane                 | 2.751        | 2.273        | 2.109        |
| Methylcyclopentane       | 0.276        | 0.196        | 0.207        |
| Benzene                  | 0.076        | 0.043        | 0.053        |
| Cyclohexane              | 0.572        | 0.391        | 0.428        |
| 2-Methylhexane           | 2.053        | 1.918        | 1.831        |
| 3-Methylhexane           | 1.783        | 1.644        | 1.590        |
| 2,2,4 Trimethylpentane   | 0.000        | 0.000        | 0.000        |
| Other C-7's              | 0.995        | 0.907        | 0.878        |
| n-Heptane                | 3.430        | 3.179        | 3.058        |
| Methylcyclohexane        | 2.336        | 1.886        | 2.041        |
| Toluene                  | 0.617        | 0.415        | 0.506        |
| Other C-8's              | 8.334        | 8.186        | 8.173        |
| n-Octane                 | 3.635        | 3.740        | 3.694        |
| E-Benzene                | 0.908        | 0.704        | 0.858        |
| M & P Xylenes            | 0.925        | 0.721        | 0.874        |
| O-Xylene                 | 1.535        | 1.172        | 1.450        |
| Other C-9's              | 6.075        | 6.665        | 6.824        |
| n-Nonane                 | 3.131        | 3.540        | 3.573        |
| Other C-10's             | 7.205        | 8.687        | 9.057        |
| n-decane                 | 2.282        | 2.813        | 2.888        |
| Undecanes(11)            | 6.933        | 8.576        | 9.068        |
| Dodecanes(12)            | 4.501        | 6.014        | 6.448        |
| Tridecanes(13)           | 3.174        | 4.548        | 4.943        |
| Tetradecanes(14)         | 2.056        | 3.156        | 3.476        |
| Pentadecanes(15)         | 1.432        | 2.354        | 2.624        |
| Hexadecanes(16)          | 0.949        | 1.667        | 1.874        |
| Heptadecanes(17)         | 0.752        | 1.397        | 1.586        |
| Octadecanes(18)          | 0.575        | 1.124        | 1.283        |
| Nonadecanes(19)          | 0.436        | 0.889        | 1.020        |
| Eicosanes(20)            | 0.329        | 0.698        | 0.806        |
| Heneicosanes(21)         | 0.255        | 0.568        | 0.660        |
| Docosanes(22)            | 0.213        | 0.494        | 0.578        |
| Tricosanes(23)           | 0.164        | 0.395        | 0.464        |
| Tetracosanes(24)         | 0.142        | 0.355        | 0.419        |
| Pentacosanes(25)         | 0.103        | 0.267        | 0.317        |
| Hexacosanes(26)          | 0.089        | 0.238        | 0.283        |
| Heptacosanes(27)         | 0.071        | 0.198        | 0.237        |
| Octacosanes(28)          | 0.054        | 0.156        | 0.188        |
| Nonacosanes(29)          | 0.047        | 0.140        | 0.169        |
| Triacotanes(30)          | 0.035        | 0.107        | 0.130        |
| Hentriacotanes Plus(31+) | <u>0.168</u> | <u>0.566</u> | <u>0.726</u> |
| Total                    | 100.000      | 100.000      | 100.000      |



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

**For:** Antero Resources Appalachian Corp.  
 1615 Wynkoop Street  
 Denver, Colorado 80202

**Date Sampled:** 10/14/14

**Date Analyzed:** 10/24/14

**Sample:** Nero No. 2H

**Job Number:** J45832

| FLASH LIBERATION OF HYDROCARBON LIQUID |                                 |            |
|--|---------------------------------|------------|
|  | First Stage Separator HC Liquid | Stock Tank |
| Pressure, psig                         | 168                             | 0          |
| Temperature, °F                        | 81                              | 70         |
| Gas Oil Ratio (1)                      | -----                           | 112        |
| Gas Specific Gravity (2)               | -----                           | 1.194      |
| Separator Volume Factor (3)            | 1.0721                          | 1.000      |

| STOCK TANK FLUID PROPERTIES   |        |
|-------------------------------|--------|
| Shrinkage Recovery Factor (4) | 0.9328 |
| Oil API Gravity at 60 °F      | 59.77  |
| Reid Vapor Pressure, psi (5)  | 3.54   |

| Quality Control Check |                     |              |       |
|-----------------------|---------------------|--------------|-------|
|                       | Sampling Conditions | Test Samples |       |
| Cylinder No.          | -----               | W-872*       | W-298 |
| Pressure, psig        | 168                 | 154          | 150   |
| Temperature, °F       | 81                  | 70           | 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: \_\_\_\_\_ T. 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.  
 1615 Wynkoop Street  
 Denver, Colorado 80202

**Sample:** Nero No. 2H  
 Gas Evolved from Hydrocarbon Liquid Flashed  
 From 168 psig & 81 °F to 0 psig & 70 °F

Date Sampled: 10/14/14

Job Number: 45832.001

**CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2286**

| <b>COMPONENT</b>    | <b>MOL%</b>  | <b>GPM</b>   |
|---------------------|--------------|--------------|
| Hydrogen Sulfide*   | < 0.001      |              |
| Nitrogen            | 0.132        |              |
| Carbon Dioxide      | 0.650        |              |
| Methane             | 34.713       |              |
| Ethane              | 29.751       | 8.019        |
| Propane             | 18.532       | 5.146        |
| Isobutane           | 2.953        | 0.974        |
| n-Butane            | 6.222        | 1.977        |
| 2-2 Dimethylpropane | 0.064        | 0.025        |
| Isopentane          | 1.702        | 0.627        |
| n-Pentane           | 1.747        | 0.638        |
| Hexanes             | 1.654        | 0.687        |
| Heptanes Plus       | <u>1.880</u> | <u>0.832</u> |
| Totals              | 100.000      | 18.925       |

**Computed Real Characteristics Of Heptanes Plus:**

Specific Gravity ----- 3.543 (Air=1)  
 Molecular Weight ----- 101.49  
 Gross Heating Value ----- 5409 BTU/CF

**Computed Real Characteristics Of Total Sample:**

Specific Gravity ----- 1.194 (Air=1)  
 Compressibility (Z) ----- 0.9890  
 Molecular Weight ----- 34.21  
 Gross Heating Value  
     Dry Basis ----- 2005 BTU/CF  
     Saturated Basis ----- 1971 BTU/CF

\*Hydrogen Sulfide tested in laboratory by: Stain Tube Method (GPA 2377)  
 Results: <0.013 Gr/100 CF, <0.2 PPMV or <0.001 Mol %

Base Conditions: 14.850 PSI & 60 Deg F

Certified: FESCO, Ltd. - Alice, Texas

Analyst: MR  
 Processor: IM  
 Cylinder ID: FL-7S

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

**CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2286**  
**TOTAL REPORT**

| COMPONENT              | MOL %        | GPM          | WT %         |
|------------------------|--------------|--------------|--------------|
| Hydrogen Sulfide*      | < 0.001      |              | < 0.001      |
| Nitrogen               | 0.132        |              | 0.108        |
| Carbon Dioxide         | 0.650        |              | 0.836        |
| Methane                | 34.713       |              | 16.278       |
| Ethane                 | 29.751       | 8.019        | 26.150       |
| Propane                | 18.532       | 5.146        | 23.887       |
| Isobutane              | 2.953        | 0.974        | 5.017        |
| n-Butane               | 6.222        | 1.977        | 10.571       |
| 2,2 Dimethylpropane    | 0.064        | 0.025        | 0.135        |
| Isopentane             | 1.702        | 0.627        | 3.590        |
| n-Pentane              | 1.747        | 0.638        | 3.684        |
| 2,2 Dimethylbutane     | 0.059        | 0.025        | 0.149        |
| Cyclopentane           | 0.000        | 0.000        | 0.000        |
| 2,3 Dimethylbutane     | 0.094        | 0.039        | 0.237        |
| 2 Methylpentane        | 0.497        | 0.208        | 1.252        |
| 3 Methylpentane        | 0.315        | 0.130        | 0.794        |
| n-Hexane               | 0.689        | 0.286        | 1.736        |
| Methylcyclopentane     | 0.060        | 0.021        | 0.148        |
| Benzene                | 0.026        | 0.007        | 0.059        |
| Cyclohexane            | 0.100        | 0.034        | 0.246        |
| 2-Methylhexane         | 0.198        | 0.093        | 0.580        |
| 3-Methylhexane         | 0.203        | 0.093        | 0.595        |
| 2,2,4 Trimethylpentane | 0.000        | 0.000        | 0.000        |
| Other C7's             | 0.191        | 0.084        | 0.554        |
| n-Heptane              | 0.309        | 0.144        | 0.905        |
| Methylcyclohexane      | 0.214        | 0.087        | 0.614        |
| Toluene                | 0.064        | 0.022        | 0.172        |
| Other C8's             | 0.333        | 0.156        | 1.073        |
| n-Octane               | 0.086        | 0.044        | 0.287        |
| Ethylbenzene           | 0.002        | 0.001        | 0.006        |
| M & P Xylenes          | 0.016        | 0.006        | 0.050        |
| O-Xylene               | 0.002        | 0.001        | 0.006        |
| Other C9's             | 0.067        | 0.034        | 0.247        |
| n-Nonane               | 0.006        | 0.003        | 0.022        |
| Other C10's            | 0.003        | 0.002        | 0.012        |
| n-Decane               | 0.000        | 0.000        | 0.000        |
| Undecanes (11)         | <u>0.000</u> | <u>0.000</u> | <u>0.000</u> |
| Totals                 | 100.000      | 18.925       | 100.000      |

**Computed Real Characteristics Of Total Sample:**

|                           |        |         |
|---------------------------|--------|---------|
| Specific Gravity -----    | 1.194  | (Air=1) |
| Compressibility (Z) ----- | 0.9890 |         |
| Molecular Weight -----    | 34.21  |         |
| Gross Heating Value       |        |         |
| Dry Basis -----           | 2005   | BTU/CF  |
| Saturated Basis -----     | 1971   | BTU/CF  |

## Gas Analytical

Report Date: Feb 10, 2016 10:05a

 Client: Antero Resources  
 Site: Twyford Unit 1H  
 Field No: 9998  
 Meter: 40620  
 Source Laboratory: Clarksburg (Bridgeport), WV  
**Lab File No: X\_CH1-9451.CHR**  
 Sample Type: Spot  
 Reviewed By:

 Date Sampled: Feb 1, 2016 10:15a  
 Analysis Date: Feb 9, 2016 11:15a  
 Collected By: Doug Lipscomb  
 Date Effective: Feb 1, 2016 12:00a  
 Sample Pressure (PSI): 158.2  
 Sample Temp (°F): 65  
 Field H2O: No Test  
 Field H2S: No Test

| Component      | Mol %    | Gal/MSCF |
|----------------|----------|----------|
| Methane        | 80.7411  |          |
| Ethane         | 13.8226  | 3.67     |
| Propane        | 2.7162   | 0.75     |
| I-Butane       | 0.4990   | 0.16     |
| N-Butane       | 0.8364   | 0.26     |
| I-Pentane      | 0.2287   | 0.08     |
| N-Pentane      | 0.1839   | 0.07     |
| Nitrogen       | 0.4120   |          |
| Oxygen         | <MDL     |          |
| Carbon Dioxide | 0.1493   |          |
| Hexanes+       | 0.4108   | 0.17     |
| TOTAL          | 100.0000 | 5.17     |

| Analytical Results at Base Conditions (Real) |                                |
|--|--------------------------------|
| BTU/SCF (Dry):                               | 1,215.8718 BTU/ft <sup>3</sup> |
| BTU/SCF (Saturated):                         | 1,195.5880 BTU/ft <sup>3</sup> |
| PSIA:  | 14.730 PSI                     |
| Temperature (°F):                            | 60.00 °F                       |
| Z Factor (Dry):                              | 0.99677                        |
| Z Factor (Saturated):                        | 0.99637                        |

| Analytical Results at Contract Conditions (Real) |                                |
|--|--------------------------------|
| BTU/SCF (Dry):                                   | 1,215.8718 BTU/ft <sup>3</sup> |
| BTU/SCF (Saturated):                             | 1,195.5880 BTU/ft <sup>3</sup> |
| PSIA:  | 14.730 PSI                     |
| Temperature (°F):                                | 60.00 °F                       |
| Z Factor (Dry):                                  | 0.99677                        |
| Z Factor (Saturated):                            | 0.99637                        |

| Calculated Specific Gravities |                  |                      |
|-------------------------------|------------------|----------------------|
| Ideal Gravity:                | 0.6886           | Real Gravity: 0.6906 |
| Molecular Wt:                 | 19.9447 lb/lbmol |                      |

Gross Heating Values are Based on:  
 GPA 2145-09, 2186  
 Compressibility is Calculated using AGA-8.

| Source | Date | Notes |
|--------|------|-------|
|--------|------|-------|

# **Attachment T**

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



**ATTACHMENT T – 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         |               | GHG (CO2e)       |                  |
|--|---------------|----------------|----------------|----------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|------------------|------------------|
|  | lb/hr         | tpy            | lb/hr          | tpy            | lb/hr         | tpy           | lb/hr         | tpy           | lb/hr         | tpy           | lb/hr         | tpy           | lb/hr            | tpy              |
| EP-HR001   |               |                |                |                |               |               |               |               | 0.8417        | 1.7595        |               |               |                  |                  |
| EP-PCV   |               |                |                |                | 0.0761        | 0.3334        |               |               |               |               |               |               | 9.3871           | 41.1155          |
| F001   |               |                |                |                | 3.5076        | 15.3634       |               |               |               |               |               |               | 87.8209          | 384.6556         |
| EP-ENG001  | 0.316         | 1.383          | 5.644          | 24.723         | 0.007         | 0.030         | 1.38E-04      | 6.03E-04      | 0.002         | 0.010         | 0.002         | 0.010         | 27.08            | 118.62           |
| EP-L001  |               |                |                |                | 6.5966        | 3.3107        |               |               |               |               |               |               | 5.2384           | 2.6290           |
| EP-L002  |               |                |                |                | 9.11E-04      | 2.77E-03      |               |               |               |               |               |               | 0.8549           | 2.6004           |
| EP-GPU001 through EP-GPU010<br>(emissions per EPN) | 0.1234        | 0.5404         | 0.1036         | 0.4539         | 0.0068        | 0.0297        | 0.0007        | 0.0032        | 0.0094        | 0.0411        | 0.0094        | 0.0411        | 148.0419         | 648.4236         |
| EP-EC001 through EP-EC003<br>(emissions per EPN)   | 0.8173        | 3.5796         | 3.7211         | 16.2982        | 0.6788        | 2.9730        | 0.0000        | 0.0000        | 0.0052        | 0.0226        | 0.0039        | 0.0170        | 185.7480         | 813.5762         |
| <b>TOTAL</b>                                       | <b>4.0012</b> | <b>17.5254</b> | <b>17.8439</b> | <b>78.1565</b> | <b>2.1111</b> | <b>9.2465</b> | <b>0.0076</b> | <b>0.0331</b> | <b>0.1115</b> | <b>0.4883</b> | <b>0.1076</b> | <b>0.4713</b> | <b>2064.7451</b> | <b>9043.5834</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 T – 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      | 0.0103        | 0.0449        | 0.0103        | 0.0449        |
| F001   |               |               | 0.0016        | 0.0070        | 0.0152        | 0.0667        | 0.0258        | 0.1131        | 0.0700        | 0.3064        | 0.1799        | 0.7880        | 0.2925        | 1.2811        |
| EP-ENG001  | 0.005         | 0.021         | 3.70E-04      | 0.002         | 1.31E-04      | 5.72E-04      | 5.80E-06      | 2.54E-05      | 4.56E-05      | 2.00E-04      |               |               | 0.005         | 0.024         |
| EP-L001  |               |               | 1.62E-05      | 8.13E-06      | 2.74E-04      | 1.38E-04      | 5.75E-04      | 2.88E-04      | 0.002         | 8.15E-04      | 0.095         | 0.048         | 0.097         | 0.049         |
| EP-L002  |               |               | 5.48E-08      | 1.67E-07      | 1.95E-07      | 5.93E-07      | 1.25E-07      | 3.80E-07      | 3.45E-07      | 1.05E-06      | 1.46E-08      | 4.43E-08      | 7.34E-07      | 2.23E-06      |
| EP-GPU001 through EP-GPU010<br>(emissions per EPN) | 0.0001        | 0.0004        | 2.59E-06      | 1.13E-05      | 4.19E-06      | 1.84E-05      |               |               | 0.00E+00      | 0.00E+00      | 0.0022        | 0.0097        | 0.0023        | 0.0102        |
| EP-EC001 through EP-EC003<br>(emissions per EPN)   | 9.45E-07      | 4.14E-06      | 0.0001        | 0.0005        | 0.0006        | 0.0027        | 0.0005        | 0.0021        | 0.0011        | 0.0048        | 0.0846        | 0.3704        | 0.0869        | 0.3804        |
| <b>TOTAL</b>                                       | <b>0.0057</b> | <b>0.0251</b> | <b>0.0007</b> | <b>0.0031</b> | <b>0.0020</b> | <b>0.0088</b> | <b>0.0014</b> | <b>0.0062</b> | <b>0.0033</b> | <b>0.0146</b> | <b>0.2759</b> | <b>1.2086</b> | <b>0.2892</b> | <b>1.2666</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**

## **Class I Legal Advertisement**

**Attachment U**

**Air Quality Permit Notice  
Notice of Application  
Cofor 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-C General Permit Modification for an Oil and Natural Gas Production facility located at 770 Tunnel Hill Rd. West Union, in Doddridge County, West Virginia.

The latitude and longitude coordinates are: 39.29945 and -80.80026

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

| Pollutants        | TOTALS (tpy): |
|-------------------|---------------|
| NO <sub>x</sub>   | 17.5254       |
| CO                | 78.1565       |
| PM <sub>2.5</sub> | 0.4713        |
| PM <sub>10</sub>  | 0.4883        |
| VOC               | 12.5599       |
| SO <sub>2</sub>   | 0.0331        |
| Formaldehyde      | 0.0251        |
| Benzene           | 0.0031        |
| Toluene           | 0.0088        |
| Ethylbenzene      | 0.0062        |
| Xylenes           | 0.0146        |
| Hexane            | 1.2086        |
| Total HAPs        | 1.2666        |

Proposed new equipment will be installed upon permit issuance. Startup of operation is planned to begin on or about February 2017. 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 \_\_\_\_\_, 2016

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

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

