

Roy
670-A144
095-0005P



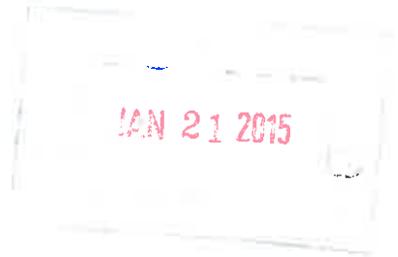
www.CRAworld.com



General Permit Application G70-A

Folger Well Pad

Prepared for: Antero Resources Corporation



Conestoga-Rovers & Associates

6320 Rothway, Suite 100
Houston, Texas 77040

January 2015 • 082715 • Report No. 98



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WEST VIRGINIA
 DEPARTMENT OF ENVIRONMENTAL PROTECTION
 DIVISION OF AIR QUALITY
 601 57th Street, SE
 Charleston, WV 25304
 Phone: (304) 926-0475 • www.dep.wv.gov/daq

APPLICATION FOR GENERAL PERMIT REGISTRATION
 CONSTRUCT, MODIFY, RELOCATE OR ADMINISTRATIVELY UPDATE
 A STATIONARY SOURCE OF AIR POLLUTANTS

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

CHECK WHICH TYPE OF GENERAL PERMIT REGISTRATION YOU ARE APPLYING FOR:

- | | |
|--|--|
| <input type="checkbox"/> G10-D – Coal Preparation and Handling | <input type="checkbox"/> G40-C – Nonmetallic Minerals Processing |
| <input type="checkbox"/> G20-B – Hot Mix Asphalt | <input type="checkbox"/> G50-B – Concrete Batch |
| <input type="checkbox"/> G30-D – Natural Gas Compressor Stations | <input type="checkbox"/> G60-C – Class II Emergency Generator |
| <input type="checkbox"/> G33-A – Spark Ignition Internal Combustion Engines | <input type="checkbox"/> G65-C – Class I Emergency Generator |
| <input type="checkbox"/> G35-A – Natural Gas Compressor Stations (Flare/Glycol Dehydration Unit) | <input checked="" type="checkbox"/> G70-A – Class II Oil and Natural Gas Production Facility |

SECTION I. GENERAL INFORMATION

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

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

3. Applicant's mailing address:
 1615 Wynkoop St.

 Denver, CO, 80202

4. Applicant's physical address:
 1615 Wynkoop St.

 Denver, CO, 80202

5. If applicant is a subsidiary corporation, please provide the name of parent corporation:

6. **WV BUSINESS REGISTRATION.** Is the applicant a resident of the State of West Virginia? YES NO

IF YES, provide a copy of the Certificate of Incorporation/ Organization / Limited Partnership (one page) including any name change amendments or other Business Registration Certificate as Attachment A.

IF NO, provide a copy of the Certificate of Authority / Authority of LLC / Registration (one page) including any name change amendments or other Business Certificate as Attachment A.

SECTION II. FACILITY INFORMATION

7. Type of plant or facility (stationary source) to be constructed, modified, relocated or administratively updated (e.g., coal preparation plant, primary crusher, etc.):
 Natural Gas and Oil Production facility

8a. Standard Industrial Classification AND 8b. North American Industry
 Classification (SIC) code: 1311 System (NAICS) code: 211111

9. DAQ Plant ID No. (for existing facilities only):

10. List all current 45CSR13 and other General Permit numbers associated with this process (for existing facilities only):
 N/A

A: PRIMARY OPERATING SITE INFORMATION

<p>11A. Facility name of primary operating site:</p> <p><u>Folger Well Pad</u></p>	<p>12A. Address of primary operating site:</p> <p>Mailing: <u>N/A</u> Physical: <u>near 1.7 miles southwest of the intersection of Tyler Hwy 18 and Hickman Run</u></p>	
<p>13A. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>- IF YES, please explain: <u>Antero is leasing the mineral rights for this site</u></p> <p>- IF NO, YOU ARE NOT ELIGIBLE FOR A PERMIT FOR THIS SOURCE.</p>		
<p>14A. — For Modifications or Administrative Updates at an existing facility, please provide directions to the present location of the facility from the nearest state road;</p> <p>— For Construction or Relocation permits, please provide directions to the proposed new site location from the nearest state road. Include a MAP as Attachment F.</p> <p>from Middlebourne, WV, head northeast on WV-18 N for 6.7 miles. Turn left onto Hickman Run and continue for 1.7 miles. The entrance to the site will be on the right</p>		
<p>15A. Nearest city or town:</p> <p>Middlebourne</p>	<p>16A. County:</p> <p>Tyler</p>	<p>17A. UTM Coordinates:</p> <p>Northing (KM): 4375.1015 Easting (KM): 503.7675 Zone: 17 N</p>
<p>18A. Briefly describe the proposed new operation or change (s) to the facility:</p> <p>Construction of a new natural gas and oil production facility.</p>		<p>19A. Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits):</p> <p>Latitude: 39.525555 Longitude: -80.956165</p>

B: 1ST ALTERNATE OPERATING SITE INFORMATION (only available for G20, G40, & G50 General Permits)

<p>11B. Name of 1st alternate operating site:</p> <p>_____</p> <p>_____</p>	<p>12B. Address of 1st alternate operating site:</p> <p>Mailing: _____ Physical: _____</p> <p>_____</p>
<p>13B. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>- IF YES, please explain: _____</p> <p>- IF NO, YOU ARE NOT ELIGIBLE FOR A PERMIT FOR THIS SOURCE.</p>	
<p>14B. — For Modifications or Administrative Updates at an existing facility, please provide directions to the present location of the facility from the nearest state road;</p> <p>— For Construction or Relocation permits, please provide directions to the proposed new site location from the nearest state road. Include a MAP as Attachment F.</p> <p>_____</p> <p>_____</p>	

15B. Nearest city or town:	16B. County:	17B. UTM Coordinates: Northing (KM): _____ Easting (KM): _____ Zone: _____
18B. Briefly describe the proposed new operation or change (s) to the facility:		19B. Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits): Latitude: _____ Longitude: _____

C: 2ND ALTERNATE OPERATING SITE INFORMATION (only available for G20, G40, & G50 General Permits):

11C. Name of 2 nd alternate operating site:	12C. Address of 2 nd alternate operating site: Mailing: _____ Physical: _____
--	---

13C. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? YES NO

- IF YES, please explain: _____

- IF NO, YOU ARE NOT ELIGIBLE FOR A PERMIT FOR THIS SOURCE.

14C. - For **Modifications or Administrative Updates** at an existing facility, please provide directions to the present location of the facility from the nearest state road;

- For **Construction or Relocation** permits, please provide directions to the proposed new site location from the nearest state road. Include a **MAP as Attachment F.**

15C. Nearest city or town:	16C. County:	17C. UTM Coordinates: Northing (KM): _____ Easting (KM): _____ Zone: _____
18C. Briefly describe the proposed new operation or change (s) to the facility:		19C. Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits): Latitude: _____ Longitude: _____

20. Provide the date of anticipated installation or change: <u>10/01/2015</u> <input type="checkbox"/> If this is an After-The-Fact permit application, provide the date upon which the proposed change did happen: : ____/____/____	21. Date of anticipated Start-up if registration is granted: <u>11/01/2015</u>
--	---

22. Provide maximum projected **Operating Schedule** of activity/activities outlined in this application if other than 8760 hours/year. (Note: anything other than 24/7/52 may result in a restriction to the facility's operation).

Hours per day _____ Days per week _____ Weeks per year _____ Percentage of operation _____

SECTION III. ATTACHMENTS AND SUPPORTING DOCUMENTS

23. Include a check payable to WVDEP – Division of Air Quality with the appropriate **application fee** (per 45CSR22 and 45CSR13).

24. Include a **Table of Contents** as the first page of your application package.

All of the required forms and additional information can be found under the Permitting Section (General Permits) of DAQ's website, or requested by phone.

25. Please check all attachments included with this permit application. Please refer to the appropriate reference document for an explanation of the attachments listed below.

- ATTACHMENT A : CURRENT BUSINESS CERTIFICATE
- ATTACHMENT B: PROCESS DESCRIPTION
- ATTACHMENT C: DESCRIPTION OF FUGITIVE EMISSIONS
- ATTACHMENT D: PROCESS FLOW DIAGRAM
- ATTACHMENT E: PLOT PLAN
- ATTACHMENT F: AREA MAP
- ATTACHMENT G: EQUIPMENT DATA SHEETS AND REGISTRATION SECTION APPLICABILITY FORM
- ATTACHMENT H: AIR POLLUTION CONTROL DEVICE SHEETS
- ATTACHMENT I: EMISSIONS CALCULATIONS
- ATTACHMENT J: CLASS I LEGAL ADVERTISEMENT
- ATTACHMENT K: ELECTRONIC SUBMITTAL
- ATTACHMENT L: GENERAL PERMIT REGISTRATION APPLICATION FEE
- ATTACHMENT M: SITING CRITERIA WAIVER
- ATTACHMENT N: MATERIAL SAFETY DATA SHEETS (MSDS)
- ATTACHMENT O: EMISSIONS SUMMARY SHEETS
- OTHER SUPPORTING DOCUMENTATION NOT DESCRIBED ABOVE (Equipment Drawings, Aggregation Discussion, etc.)

Please mail an original and two copies of the complete General Permit Registration Application with the signature(s) to the DAQ Permitting Section, at the address shown on the front page of this application. Please DO NOT fax permit applications. For questions regarding applications or West Virginia Air Pollution Rules and Regulations, please refer to the website shown on the front page of the application or call the phone number also provided on the front page of the application.

SECTION IV. CERTIFICATION OF INFORMATION

This 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 a 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, Emission Inventory, Certified Emission Statement, 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 Registration Application will be returned to the applicant.

FOR A CORPORATION (domestic or foreign)

I certify that I am a President, Vice President, Secretary, Treasurer or in charge of a principal business function of the corporation

FOR A PARTNERSHIP

I certify that I am a General Partner

FOR A LIMITED LIABILITY COMPANY

I certify that I am a General Partner or General Manager

FOR AN ASSOCIATION

I certify that I am the President or a member of the Board of Directors

FOR A JOINT VENTURE

I certify that I am the President, General Partner or General Manager

FOR A SOLE PROPRIETORSHIP

I certify that I am the Owner and Proprietor

I hereby certify that (please print or type) _____ 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 Office of Air Quality immediately, and/or,

I hereby certify that all information contained in this 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

Signature _____
(please use blue ink) Responsible Official Date

Name & Title Donald Gray, Environmental and Regulatory Manager
(please print or type)

Signature  _____
(please use blue ink) Authorized Representative (if applicable) Date 1-20-15

Applicant's Name Antero Resources Corporation

Phone & Fax _____
Phone 303-357-6730 Fax 303-357-7315

Email dgray@anteroresources.com

**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: 6/14/13: 14 JUN, 2013

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) DONALD C. GRAY (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.

Kevin J. Kilstrom KEVIN J. KILSTROM - VICE PRESIDENT
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
Current Business Certificate

State of West Virginia



Certificate

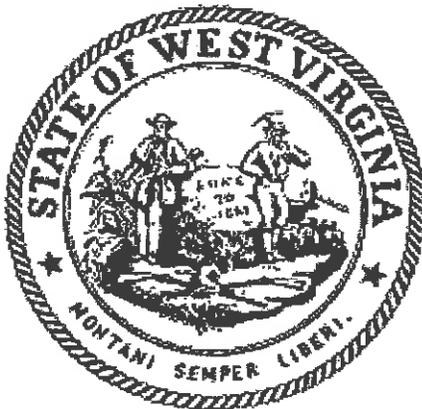
*I, Natalie E. Tennant, Secretary of State of the
State of West Virginia, hereby certify that*

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

Natalje 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
E-mail: business@wvsos.com

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

**APPLICATION FOR
AMENDED CERTIFICATE
OF AUTHORITY**

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

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

- 1. Name under which the corporation was authorized to transact business in WV: Antero Resources Appalachian Corporation
- 2. Date Certificate of Authority was issued in West Virginia: 6/26/2008
- 3. Corporate name has been changed to: Antero Resources Corporation
(Attach one Certified Copy of Name Change as filed in home State of Incorporation.)
- 4. Name the corporation elects to use in WV: Antero Resources Corporation
(due to home state name not being available)
- 5. Other amendments: _____
(attach additional pages if necessary)

6. Name and phone number of contact person. (This is optional; however, if there is a problem with the filing, listing a contact person and phone number may avoid having to return or reject the document.)

Alvyn A. Schopp (303) 367-7310
Contact Name Phone Number

7. Signature information (See below Important Legal Notice Regarding Signature):

Print Name of Signer: Alvyn A. Schopp Title/Capacity: Authorized Person

Signature: Date: June 10, 2013

Regarding Signature: West Virginia Code §311-1-129. 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

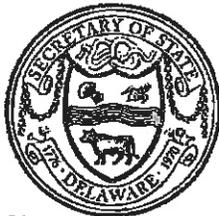
I, JEFFREY W. BULLOCK, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY THE ATTACHED IS A TRUE AND CORRECT COPY OF THE CERTIFICATE OF AMENDMENT OF "ANTERO RESOURCES APPALACHIAN CORPORATION", CHANGING ITS NAME FROM "ANTERO RESOURCES APPALACHIAN CORPORATION" TO "ANTERO RESOURCES CORPORATION", 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




Jeffrey W. Bullock, Secretary of State
AUTHENTICATION: 0496546

DATE: 06-10-13

State of Delaware
Secretary of State
Division of Corporations
Delivered 09:37 AM 06/10/2013
FILED 09:37 AM 06/10/2013
SRV 130754186 - 4520810 FILE

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 B**Process Description****Folger Well Pad****Antero Resources Corporation****Tyler County, West Virginia**

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

The Facility has ten (10) tanks (TANKCOND001-010) on site to store condensate and two (2) tanks (TANKPW001-002) to store produced water prior to removal from the site. Flashing, working, and breathing losses from the tanks are routed to the flare (FL001) to control the emissions. The flare that will be used to control emissions is 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 gas and extended analysis of the condensate from Sweeny No. 2H, one of the wells in the Forest well Pad. This extended analysis is considered representative of the materials from Folger Well Pad, being in the same Marcellus rock formation. Gas analysis from Sweeny No.2H, one of the wells in Forest well Pad, was used to calculate fugitive emissions.

Folger Well Pad calculation of potential to emit included all of the emission sources that belong to the same industrial grouping, are located on contiguous or adjacent properties, and are under the control of the same person. The nearest emission source that belongs to the same industrial grouping and under the control of the same person but not located on contiguous or adjacent property is the Pierpoint Well Pad. This operates independently and is approximately 7.2 miles from the Facility.

Attachment C

Description of Fugitive Emissions

Attachment C**Description of Fugitive Emissions
Folger Well Pad
Antero Resources Corporation
Tyler County, West Virginia**

Sources of fugitive emissions include loading operations, haul road emissions, equipment leaks, and pneumatic control valves. Fugitive emissions were calculated using AP-42 factors. Routine equipment leaks are assumed to be occurring continuously throughout the year. Loading operations and haul road emissions only occur when tanker trucks are onsite. The fugitives emissions summary is also located in Attachment O.

Equipment Leaks

Equipment include valves, flanges, and connectors installed in various process equipment such as gas production unit heaters, compressor, pipelines, and separators. Emissions are assumed to be occurring throughout the year. Detailed calculations are shown on Table 4.

Pneumatic Control Valves

Pneumatic control valves are part of the gas production unit heaters. These are intermittent low bleed valves and their emissions are assumed to be occurring throughout the year. Detailed calculations are shown on Table 5.

Loading Operations

Loading emissions occur when condensate and produced water are transferred out of the well site via tanker trucks. Fugitive emissions were estimated using AP-42 loading loss formula, $L = 12.46 * SPM/T$, and Bryan & Engineering (BR&E) software known as Promax. Detailed calculations are shown in Table 8.

Haul Road Emissions

Haul road emissions are emitted when tanker trucks or service vehicles enter the Facility. The Facility is flat and unpaved. Detailed calculations are shown on Table 12.

Attachment C/O: G70-A Emissions Summary Sheet
Fugitive Emissions Data Summary Sheet

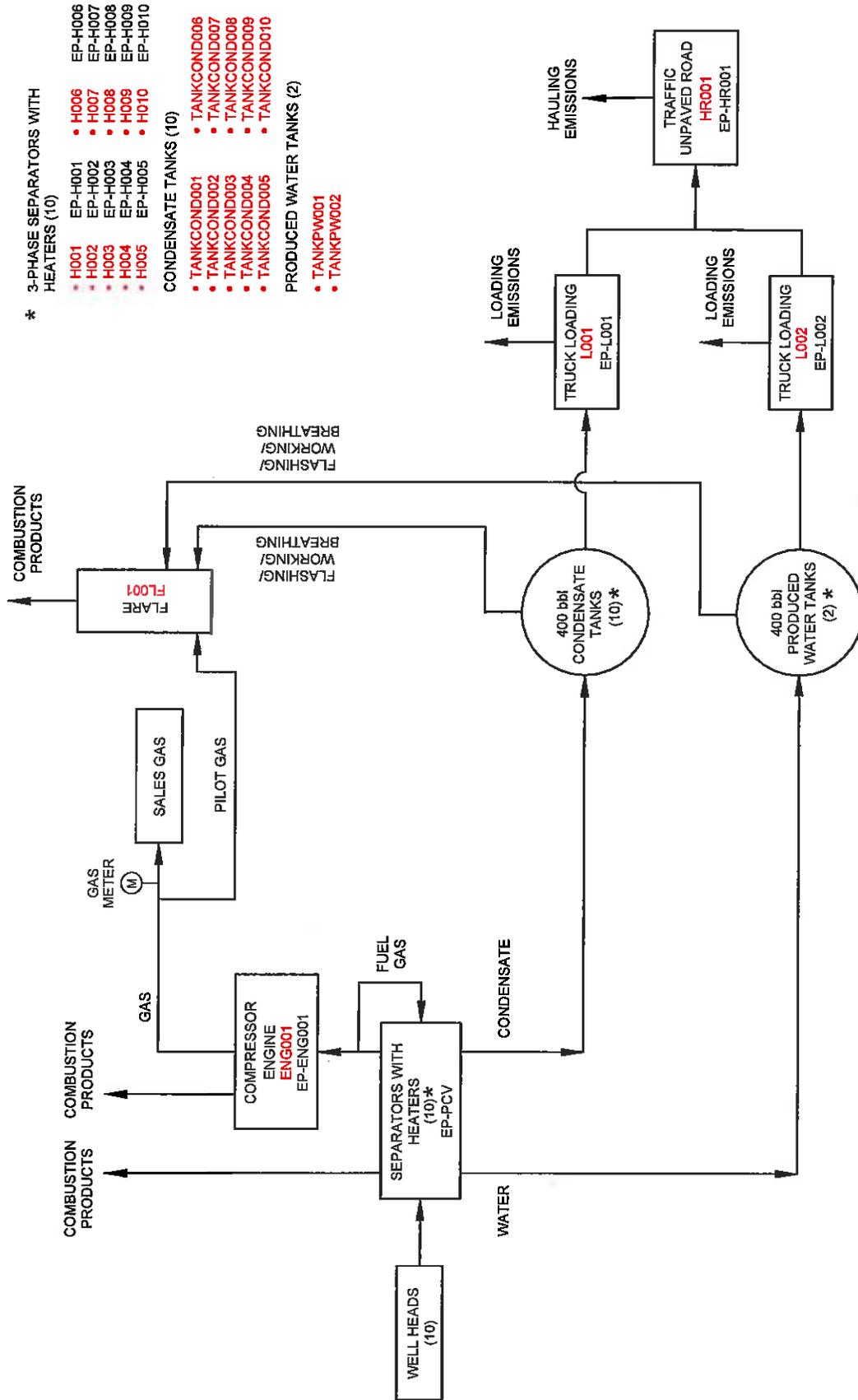
FUGITIVE EMISSIONS SUMMARY	All Regulated Pollutants Chemical Name/CAS 1	Maximum Potential Uncontrolled Emissions 2		Maximum Potential Controlled Emissions 3		Est. Method Used 4
		lb/hr	ton/yr	lb/hr	ton/yr	
Haul Road/Road Dust Emissions	n/a					
Paved Haul Roads						
Unpaved Haul Roads						
Loading/Unloading Operations	PM, PM10, PM2.5	2.3768	6.8246	1.1884	3.4123	MB
	VOCs	5.8898	2.2446	5.8898	2.2446	MB
	toluene (108883)	0.0011	0.0004	0.0011	0.0004	
	ethyl benzene (100414)	0.0013	0.0005	0.0013	0.0005	
	hexane (110543)	0.0103	0.0039	0.0103	0.0039	
	o,m,p-xylenes (95476,108383,106423)	0.0027	0.0010	0.0027	0.0010	
	CO2 Equivalent	8.2963	7.2966	8.2963	7.2966	
	CO2 (124389), CH4	0.0002	0.0001	0.0002	0.0001	
	benzene (71432)	0.0002	0.0001	0.0002	0.0001	
	TAPs (benzene)	0.0002	0.0001	0.0002	0.0001	
	Benzene (71432)		0.0103		0.0103	MB
	Toluene (108883)		0.0788		0.0788	
	Ethyl benzene (100414)		0.1384		0.1384	
	Hexane (110543)		0.8741		0.8741	
	o,m,p-xylenes (95476,108383,106423)		0.3209		0.3209	
	CO2 Equivalent		354.4988		354.4988	
	CO2 (124389), CH4		16.5870		16.5870	
VOCs		0.0103		0.0103		
TAPs (benzene)		0.00E+00		0.00E+00		
toluene (108883)		0.00E+00		0.00E+00		
ethyl benzene (100414)		0.00E+00		0.00E+00		
hexane (110543)		0.0136		0.0136		
o,m,p-xylenes (95476,108383,106423)		0.00E+00		0.00E+00		
CO2 Equivalent		9.0327		9.0327		
CO2 (124389), CH4		0.1145		0.1145		
VOCs		0.00E+00		0.00E+00		
TAPs (benzene)		0.00E+00		0.00E+00		
Equipment Leaks (Components)						
Equipment Leaks (PCVs)						

1 List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS₂, VOCs, H₂S, Inorganics, Lead, Organics, O₃, NO, NO₂, SO₂, SO₃, all applicable Greenhouse Gases (including CO₂ and methane), etc. DO NOT LIST H₂, H₂O, N₂, O₂, and Noble Gases.

2 Give rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

3 Give rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

4 Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify).



* 3-PHASE SEPARATORS WITH HEATERS (10)

- H001 EP-H001
- H002 EP-H002
- H003 EP-H003
- H004 EP-H004
- H005 EP-H005
- H006 EP-H006
- H007 EP-H007
- H008 EP-H008
- H009 EP-H009
- H010 EP-H010

CONDENSATE TANKS (10)

- TANKCOND001
- TANKCOND002
- TANKCOND003
- TANKCOND004
- TANKCOND005
- TANKCOND006
- TANKCOND007
- TANKCOND008
- TANKCOND009
- TANKCOND010

PRODUCED WATER TANKS (2)

- TANKPW001
- TANKPW002

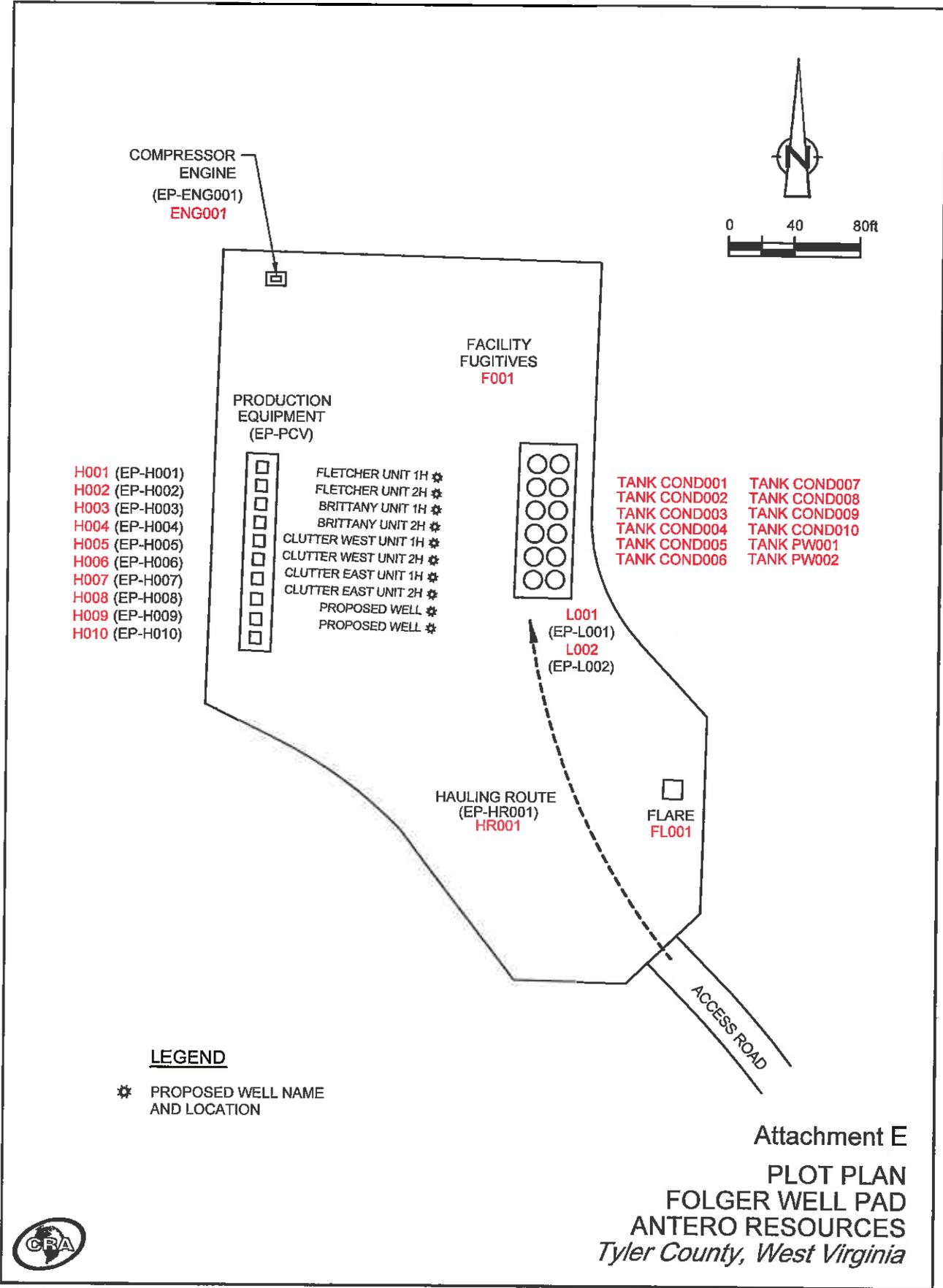
Attachment D
**PROCESS FLOW DIAGRAM - ANTERO RESOURCES
 FOLGER WELL PAD**
Tyler County, West Virginia

FUGITIVES
F001



Attachment E

Plot Plan



LEGEND

* PROPOSED WELL NAME AND LOCATION

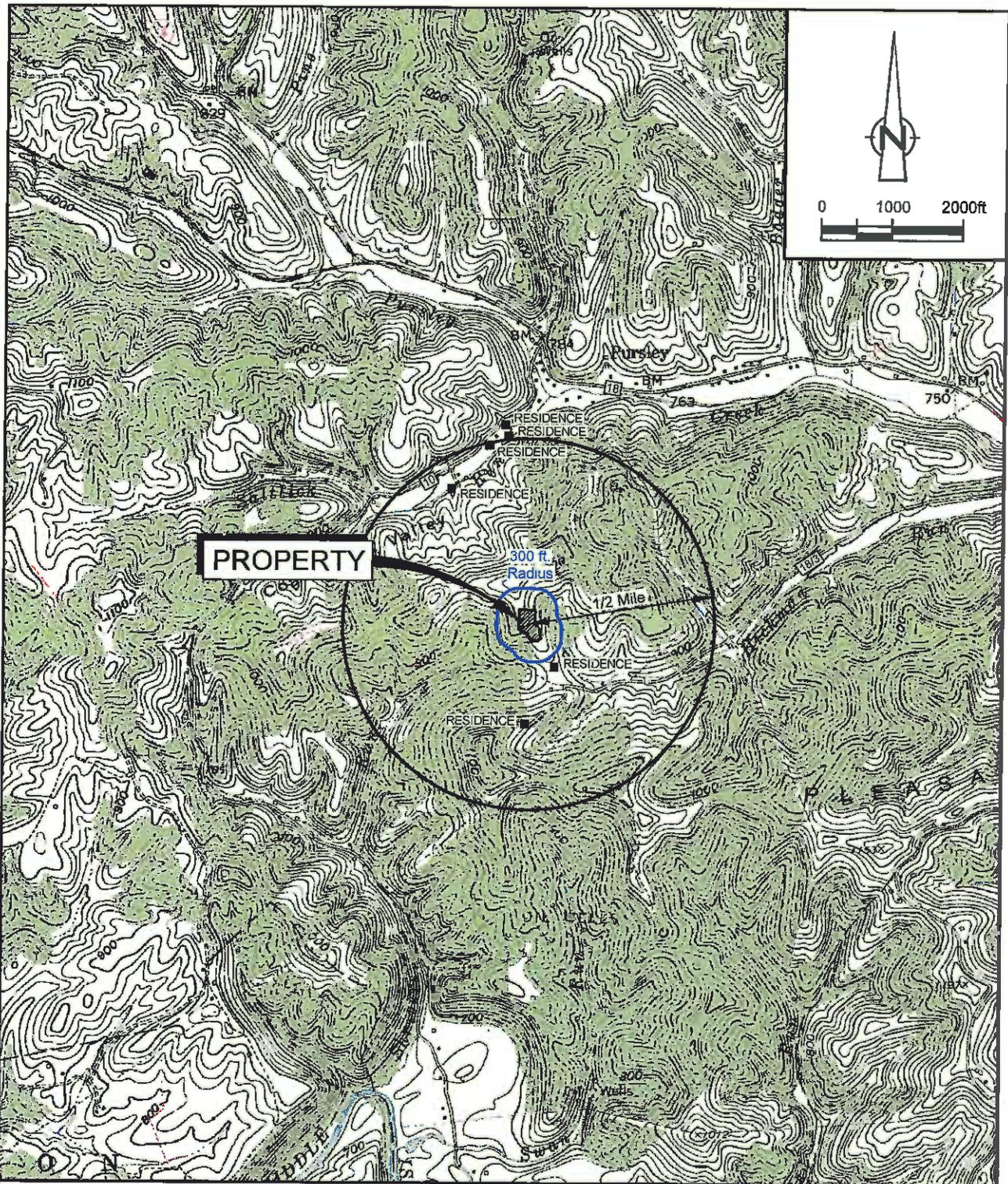
Attachment E

PLOT PLAN
 FOLGER WELL PAD
 ANTERO RESOURCES
 Tyler County, West Virginia



Attachment F

Area Map



SOURCE: USGS QUADRANGLE MAP;
PADEN CITY, WEST VIRGINIA

SITE COORDINATES: LAT. 39.525555, LONG. -80.956165
SITE ELEVATION: 993 ft AMSL



Attachment F
AREA MAP
FOLGER WELL PAD
ANTERO RESOURCES
Tyler County, West Virginia

Attachment G

Emission Unit Data Sheets/G70-A Section Applicability Form

**General Permit G70-A Registration
 Section Applicability Form**

General Permit G70-A was developed to allow qualified applicants to seek registration for a variety of sources. These sources include natural gas well affected facilities, storage tanks, natural gas-fired compressor engines (RICE), natural gas producing units, natural gas-fired in-line heaters, pneumatic controllers, heater treaters, tank truck loading, glycol dehydration units, 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-A 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.

Section 5	Natural Gas Well Affected Facility	<input checked="" type="checkbox"/>
Section 6	Storage Vessels*	<input checked="" type="checkbox"/>
Section 7	Gas Producing Units, In-Line Heaters, Heater Treaters, and Glycol Dehydration Reboilers	<input checked="" type="checkbox"/>
Section 8	Pneumatic Controllers Affected Facility (NSPS, Subpart OOOO)	<input type="checkbox"/>
Section 9	<i>Reserved</i>	<input type="checkbox"/>
Section 10	Natural gas-fired Compressor Engine(s) (RICE) **	<input checked="" type="checkbox"/>
Section 11	Tank Truck Loading Facility ***	<input checked="" type="checkbox"/>
Section 12	Standards of Performance for Storage Vessel Affected Facilities (NSPS, Subpart OOOO)	<input type="checkbox"/>
Section 13	Standards of Performance for Stationary Spark Ignition Internal Combustion Engines (NSPS, Subpart JJJJ)	<input checked="" type="checkbox"/>
Section 14	Control Devices not subject to NSPS, Subpart OOOO	<input checked="" type="checkbox"/>
Section 15	National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (40CFR63, Subpart ZZZZ)	<input checked="" type="checkbox"/>
Section 16	Glycol Dehydration Units	<input type="checkbox"/>
Section 17	Dehydration Units With Exemption from NESHAP Standard, Subpart HH § 63.764(d) (40CFR63, Subpart HH)	<input type="checkbox"/>
Section 18	Dehydration Units Subject to NESHAP Standard, Subpart HH and Not Located Within an UA/UC (40CFR63, Subpart HH)	<input type="checkbox"/>
Section 19	Dehydration Units Subject to NESHAP Standard, Subpart HH and Located Within an UA/UC (40CFR63, Subpart HH)	<input type="checkbox"/>

* Applicants that are subject to Section 6 may also be subject to Section 12 if the applicant is subject to the NSPS, Subpart OOOO control requirements or the applicable control device requirements of Section 14.

** Applicants that are subject to Section 10 may also be subject to the applicable RICE requirements of Section 13 and/or Section 15.

*** Applicants that are subject to Section 11 may also be subject to control device requirements of Section 14.

Attachment G: Storage Vessel Emission Unit Data Sheet (Condensate)

Provide the following information for each new or modified bulk liquid storage tank.

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name COND TANK	2. Tank Name TANKCOND001-010
3. Emission Unit ID number TANKCOND001-010	4. Emission Point ID number FL001
5. Date Installed or Modified (for existing tanks): New	6. Type of change: NA
7A. Description of Tank Modification (if applicable) NA	
7B. Will more than one material be stored in this tank? If so, a separate form must be completed for each material. No	
7C. Provide any limitations on source operation affecting emissions. (production variation, etc.)	

II. TANK INFORMATION (required)

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 (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." 400bbbls	
13A. Maximum annual throughput (gal/yr) 7,665,000	13B. Maximum daily throughput (gal/day) 21,000
14. Number of tank turnovers per year 46	15. Maximum tank fill rate (gal/min) 168
16. Tank fill method: Splash Fill	
17. Is the tank system a variable vapor space system? No If yes, (A) What is the volume expansion capacity of the system (gal)? (B) What are the number of transfers into the system per year?	
18. Type of tank (check all that apply): <input checked="" type="checkbox"/> Fixed Roof <input checked="" type="checkbox"/> vertical horizontal <input checked="" type="checkbox"/> flat roof cone roof dome roof other (describe) External Floating Roof pontoon roof double deck roof Domed External (or Covered) Floating Roof Internal Floating Roof vertical column support self-supporting Variable Vapor Space lifter roof diaphragm Pressurized spherical cylindrical Underground Other (describe)	

III. TANK CONSTRUCTION AND OPERATION INFORMATION (check which one applies)

Refer to enclosed TANKS Summary Sheets

Refer to the responses to items 19 – 26 in section VII

IV. SITE INFORMATION (check which one applies)

Refer to enclosed TANKS Summary Sheets

Refer to the responses to items 27 – 33 in section VII

V. LIQUID INFORMATION (check which one applies)

Refer to enclosed TANKS Summary Sheets

Refer to the responses to items 34 – 39 in section VII

Attachment G: Storage Vessel Emission Unit Data Sheet (Condensate)

Provide the following information for each new or modified bulk liquid storage tank.

SITE INFORMATION:			
27. Provide the city and state on which the data in this section are based: Charleston, WV			
28. Daily Avg. Ambient Temperature (°F): 55.3		29. Annual Avg. Maximum Temperature (°F): 75.94	
30. Annual Avg. Minimum Temperature (°F): 65.9		31. Avg. Wind Speed (mph): 5.9	
32. Annual Avg. Solar Insulation Factor (BTU/ft ² -day): 1030.235999		33. Atmospheric Pressure (psia): 14.8	
LIQUID INFORMATION:			
34. Avg. daily temperature range of bulk liquid (°F):	34A. Minimum (°F):	34B. Maximum (°F):	
51.7	39.5	63.8	
35. Avg. operating pressure range of tank (psig): 0	35A. Minimum (psig): 0	35B. Maximum (psig): 0	
36A. Minimum liquid surface temperature (°F): 39.5		36B. Corresponding vapor pressure (psia):	0.7429
37A. Avg. liquid surface temperature (°F): 51.7		37B. Corresponding vapor pressure (psia):	0.9934
38A. Maximum liquid surface temperature (°F): 63.8		38B. Corresponding vapor pressure (psia):	1.3075
39. Provide the following for each liquid or gas to be stored in the tank. Add additional pages if necessary.			
39A. Material name and composition:	Condensate		
39B. CAS number:	mix of HC		
39C. Liquid density (lb/gal):	5.77		
39D. Liquid molecular weight (lb/lb-mole):	97.4		
39E. Vapor molecular weight (lb/lb-mole):	40.82		
39F. Maximum true vapor pressure (psia):	1.5672		
39G. Max Reid vapor pressure (psi):	2.65000		
39H. Months Storage per year. From:	year round		
To:			

Attachment G: Storage Vessel Emission Unit Data Sheet (Produced Water)

Provide the following information for each new or modified bulk liquid storage tank.

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name PWTANK	2. Tank Name TANKPW001-002
3. Emission Unit ID number TANKPW001-002	4. Emission Point ID number FL001
5. Date Installed or Modified (for existing tanks): New	
6. Type of change: NA	
7A. Description of Tank Modification (if applicable) NA	
7B. Will more than one material be stored in this tank? If so, a separate form must be completed for each material. No	
7C. Provide any limitations on source operation affecting emissions. (production variation, etc.)	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. 400bbls	
9A. Tank Internal Diameter (ft.) 12	9B. Tank Internal Height (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." 400bbls	
13A. Maximum annual throughput (gal/yr) 91,980,000	13B. Maximum daily throughput (gal/day) 252,000
14. Number of tank turnovers per year 2738	15. Maximum tank fill rate (gal/min) 168
16. Tank fill method Splash Fill	
17. Is the tank system a variable vapor space system? No If yes, (A) What is the volume expansion capacity of the system (gal)? (B) What are the number of transfers into the system per year?	
18. Type of tank (check all that apply): <input checked="" type="checkbox"/> Fixed Roof <input checked="" type="checkbox"/> vertical horizontal <input checked="" type="checkbox"/> flat roof cone roof dome roof other (describe) External Floating Roof pontoon roof double deck roof Domed External (or Covered) Floating Roof Internal Floating Roof vertical column support self-supporting Variable Vapor Space lifter roof diaphragm Pressurized spherical cylindrical Underground Other (describe)	

III. TANK CONSTRUCTION AND OPERATION INFORMATION (check which one applies)

Refer to enclosed TANKS Summary Sheets

Refer to the responses to items 19 – 26 in section VII

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IV. SITE INFORMATION (check which one applies)

Refer to enclosed TANKS Summary Sheets

Refer to the responses to items 27 – 33 in section VII

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V. LIQUID INFORMATION (check which one applies)

Refer to enclosed TANKS Summary Sheets

Refer to the responses to items 34 – 39 in section VII

--

Attachment G: Storage Vessel Emission Unit Data Sheet (Produced Water)

Provide the following information for each new or modified bulk liquid storage tank.

SITE INFORMATION:			
27. Provide the city and state on which the data in this section are based: Charleston, WV			
28. Daily Avg. Ambient Temperature (°F): 55.3		29. Annual Avg. Maximum Temperature (°F): 75.94	
30. Annual Avg. Minimum Temperature (°F): 65.9		31. Avg. Wind Speed (mph): 5.9	
32. Annual Avg. Solar Insulation Factor (BTU/ft ² -day): 1030.235999		33. Atmospheric Pressure (psia): 14.8	
LIQUID INFORMATION:			
34. Avg. daily temperature range of bulk liquid (°F): 51.7		34A. Minimum (°F): 39.5	
		34B. Maximum (°F): 63.8	
35. Avg. operating pressure range of tank (psig): 0		35A. Minimum (psig): 0	
		35B. Maximum (psig): 0	
36A. Minimum liquid surface temperature (°F): 39.5		36B. Corresponding vapor pressure (psia): 0.1837	
37A. Avg. liquid surface temperature (°F): 51.7		37B. Corresponding vapor pressure (psia): 0.2596	
38A. Maximum liquid surface temperature (°F): 63.8		38B. Corresponding vapor pressure (psia): 0.3600	
39. Provide the following for each liquid or gas to be stored in the tank. Add additional pages if necessary.			
39A. Material name and composition:		Produced Water	
39B. CAS number:		mix of HC and water	
39C. Liquid density (lb/gal):		8.33	
39D. Liquid molecular weight (lb/lb-mole):		18.0156	
39E. Vapor molecular weight (lb/lb-mole):		18.3230	
39F. Maximum true vapor pressure (psia):		0.4467	
39G. Max Reid vapor pressure (psi):		1.02320	
39H. Months Storage per year. From:		year round	
To:			

Attachment G: Natural Gas Fired Fuel Burning Units Emission Data Sheet

Complete the information on this data for each Gas Producing Unit(s), Heater Treater(s), and in-line heater(s) at the production pad. Reboiler information should be entered on the Glycol Dehydration Emission Unit Data Sheet.

Emission Unit ID # ¹	Emission Point ID# ²	Emission Unit Description (Manufacturer / Model #)	Year Installed/Modified	Type ³ and Date of Change	Control Device ⁴	Design Heat Input (mmBtu/hr) ⁵	Fuel Heating Value (Btu/scf) ⁶
H001	EP-H001	Gas Production Unit Heater	New	N/A	--	1.50	1,247.06
H002	EP-H002	Gas Production Unit Heater	New	N/A	--	1.50	1,247.06
H003	EP-H003	Gas Production Unit Heater	New	N/A	--	1.50	1,247.06
H004	EP-H004	Gas Production Unit Heater	New	N/A	--	1.50	1,247.06
H005	EP-H005	Gas Production Unit Heater	New	N/A	--	1.50	1,247.06
H006	EP-H006	Gas Production Unit Heater	New	N/A	--	1.50	1,247.06
H007	EP-H007	Gas Production Unit Heater	New	N/A	--	1.50	1,247.06
H008	EP-H008	Gas Production Unit Heater	New	N/A	--	1.50	1,247.06
H009	EP-H009	Gas Production Unit Heater	New	N/A	--	1.50	1,247.06
H010	EP-H010	Gas Production Unit Heater	New	N/A	--	1.50	1,247.06
ENG001	EP-ENG001	Engine (Kubota DG972-E2)	New	N/A	--	--	1,247.06
FL001	FL001	Flare (Abutec-200)	New	N/A	FL001	18.4	1,247.06

¹ Enter the appropriate Emission Unit (or Sources) 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 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 Complete appropriate air pollution control device sheet for any control device.

⁵ Enter design heat input capacity in mmBtu/hr.

⁶ Enter the fuel heating value in Btu/standard cubic foot.

**Attachment G: Natural Gas-Fired Compressor Engine (RICE)
Emission Unit Data Sheet**

Complete this section for any natural gas-fired reciprocating internal combustion engine.

Emission Unit (Source) ID No.		ENG001	
Emission Point ID No.		EP-ENG001	
Engine Manufacturer and Model		Engine (Kubota DG972-E2)	
Manufacturer's Rated bhp/rpm		24 HP @ 3600 rpm	
Source Status		NS	
Date Installed/Modified/Removed		October 2015	
Engine Manufactured/Reconstruction Date		2013	
Is this engine subject to 40CFR60, Subpart JJJJ?		Yes	
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60, Subpart JJJJ? (Yes or No)		Yes	
Is this engine subject to 40CFR63, Subpart ZZZZ? (yes or no)		Yes	
Engine, Fuel and Combustion Data	Engine Type	RB4S	
	APCD Type	-	
	Fuel Type	RG	
	H ₂ S (gr/100 scf)	0	
	Operating bhp/rpm	16.5 HP @ 2400 rpm	
	BSFC (Btu/bhp-hr)	9773	
	Fuel throughput (ft ³ /hr)	193	
	Fuel throughput (MMft ³ /yr)	1.6907	
	Operation (hrs/yr)	8760	
Reference	Potential Emissions	lbs/hr	tons/yr
MD	NO _x	0.3158	1.3831
MD	CO	5.6445	24.7228
AP	VOC	0.0071	0.0311
AP	SO ₂	0.0001	0.0006
AP	PM ₁₀	0.0024	0.0104
AP	Formaldehyde	0.0049	0.0215
MRR	Proposed Monitoring:	Monitor engine setting adjustments to ensure these are consistent with manufacturer's instructions.	
	Proposed Recordkeeping:	1) Maintain records of maintenance performed on engines. 2) Documentation from manufacturer that engine is certified to meet emission standards	
	Proposed Reporting:	N/A	

Attachment G: Tank Truck Loading

Emissions Unit Data Sheet

*Furnish the following information for each new or modified bulk liquid transfer area or loading rack at the natural gas production pad.
This form is to be used for bulk liquid transfer operations to tank trucks.*

1. Emission Unit ID: L001, L002	2. Emission Point ID: EP-L001, EP-L002	3. Year Installed/Modified: New		
4. Emission Unit Description: CONDENSATE AND PRODUCED WATER				
5. Loading Area Data				
5A. Number of pumps: 2	5B. Number of liquids loaded: 2	5C. Maximum number of tank trucks loading at one time: 2		
6. Describe cleaning location, compounds and procedure for tank trucks: For hire tank trucks are used and are cleaned at the operator's dispatch terminal. These trucks are in dedicated service and cleaned only prior to repair or leak tests. Cleaning materials include water, steam, detergent, and solvents which are applied using hand held pressurized spray nozzles.				
7. Are tank trucks pressure tested for leaks at this or any other location? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If YES, 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.				
8. Projected Maximum Operating Schedule (for rack or transfer point as a whole):				
Maximum	Jan. - Mar.	Apr. - June	July - Sept.	Oct. - Dec.
hours/day	14	14	14	14
days/week	7	7	7	7
9. Bulk Liquid Data (add pages as necessary)				
Liquid Name	Condensate	Produced Water		
Max. daily throughput (1000 gal/day)	21	252		
Max. annual throughput (1000 gal/yr)	7,665.00	91,980.00		
Loading Method ¹	BF	BF		
Max. Fill Rate (gal/min)	168	168		
Average Fill Time (min/loading)	50	50		
Max. Bulk Liquid Temperature (°F)	72.1	72.1		
True Vapor Pressure ²	1.57	0.45		
Cargo Vessel Condition ³	U	U		
Control Equipment or Method ⁴	None	None		
Minimum collection efficiency (%)	0	0		
Minimum control efficiency (%)	0	0		
Maximum	Loading (lb/hr)	9.06	1.16	
Emission Rate	Annual (ton/yr)	3.45	5.29	
Estimation Method ⁵		Promax	Promax	
Notes:				
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 service), O = other (describe)				
4 List as many as apply (complete and submit appropriate Air Pollution Control Device Sheets as Attachment "H"): CA = Carbon Adsorption VB = Dedicated Vapor Balance (closed system) ECD = Enclosed Combustion Device F = Flare TO = Thermal Oxidation or Incineration				
5 EPA = EPA Emission Factor as stated in AP-42				
10. Proposed Monitoring, Recordkeeping, Reporting, and Testing				
MONITORING		RECORDKEEPING		
1) Visual inspection to ensure that loading connections from storage tanks to trucks are leak-free.		1) Maintain records of condensate transferred from storage tanks.		
		2) Maintain records of produced water transferred from storage tanks.		
REPORTING		TESTING		
N/A		N/A		
11. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty: N/A				

Attachment H

Air Pollution Control Device Data Sheet

Attachment H: Air Pollution Control Device Vapor Combustion Control Device Sheet

Complete this vapor combustion control device sheet for each enclosed combustion device, flare, thermal oxidizer, or completion combustion device that is located at the natural gas production pad for the purpose of thermally destructing waste gas to control emissions of regulated pollutants to the atmosphere.

IMPORTANT: READ THE INSTRUCTIONS ACCOMPANYING THIS FORM BEFORE COMPLETING.			
General Information			
1. Control Device ID#: FLO01		2. Installation Date: New	
3. Maximum Rated Total Flow Capacity: 200,000 scfd		4. Maximum Design Heat Input: 18.4 MMBtu/hr	
5. Design Heat Content: 2208 BTU/scf			
Control Device Information			
6. Select the type of vapor combustion control device being used: Elevated Flare			
7. Manufacturer: Model No. Abutec-200		8. Hours of operation per year: 8760	
9. List the emission units whose emissions are controlled by this vapor combustion control device: (Emission Point ID#)			
10. Emission Unit ID#	Emission Source Description:	Emission Unit ID#	Emission Source Description:
TANKCOND001-010	Condensate Tank		
TANKPW001-002	PW Tanks		
<i>If this vapor combustor controls emissions from more than six emission units, please attach additional pages.</i>			
11. Assist Type		12. Flare Height (ft)	13. Tip Diameter (ft)
Steam - Air - Pressure - <input checked="" type="checkbox"/> Non -		20	3.92
Waste Gas Information			
15. Maximum waste gas flow rate (scfm):	16. Heat value of waste gas stream (BTU/ft3)	17. Temperature of the emissions stream (°F)	18. Exit Velocity of the emissions stream (ft/s)
83.72	1,798.82	900	1.16E-01
19. Provide an attachment with the characteristics of the waste gas stream to be burned.			
Pilot Information			
20. Type/Grade of pilot fuel:	21. Number of pilot lights:	22. Fuel flow rate to pilot flame per pilot (scf/hr):	23. Heat input per pilot (BTU/hr):
Natural Gas	1	12.6	12800
24. Will automatic re-ignition be used? Yes			
25. If automatic re-ignition will be used, describe the method: Based on a monitoring system			
26. Describe the method of controlling flame: Flame Rectification, a thermocouple equivalent			
27. Is pilot flame equipped with a monitor to detect the presence of the flame? Yes		28. If yes, what type? Thermocouple	
29. Pollutant(s) Controlled		30. % Capture Efficiency	
F/W/B Emissions from TANKCOND		98	
F/W/B Emissions from TANKPW		98	
31. Manufacturer's Guaranteed Control Efficiency (%)			

Attachment H: Air Pollution Control Device Vapor Combustion Control Device Sheet

Complete this vapor combustion control device sheet for each enclosed combustion device, flare, thermal oxidizer, or completion combustion device that is located at the natural gas production pad for the purpose of thermally destructing waste gas to control emissions of regulated pollutants to the atmosphere.

32. Has the control device been tested by the manufacturer and certified? Yes, see spec sheet.

33. Describe all operating ranges and maintenance procedures required by the manufacturer to maintain warranty: See spec sheet for operating ranges.

MONITORING

- 1) Report any period when visible emissions exceeded 5 minutes during any two-hour period.
- 2) Monitor the presence of pilot flame at all times with the Flame rectification system, a thermocouple equivalent.
- 3) Monitor visible emissions from the vapor combustor.
- 4) Monitor throughput to the vapor combustor.

RECORDKEEPING

- 1) Record the times and duration of periods when the pilot flame was not present.
- 2) Records of throughput to the vapor combustor.
- 3) Records of vapor combustor malfunction or shutdown which resulted in excess emissions.
- 4) Records of vapor combustor inspection and maintenance activities conducted.

REPORTING

- 1) Report any period when visible emissions exceeded 5 minutes during any two-hour period.

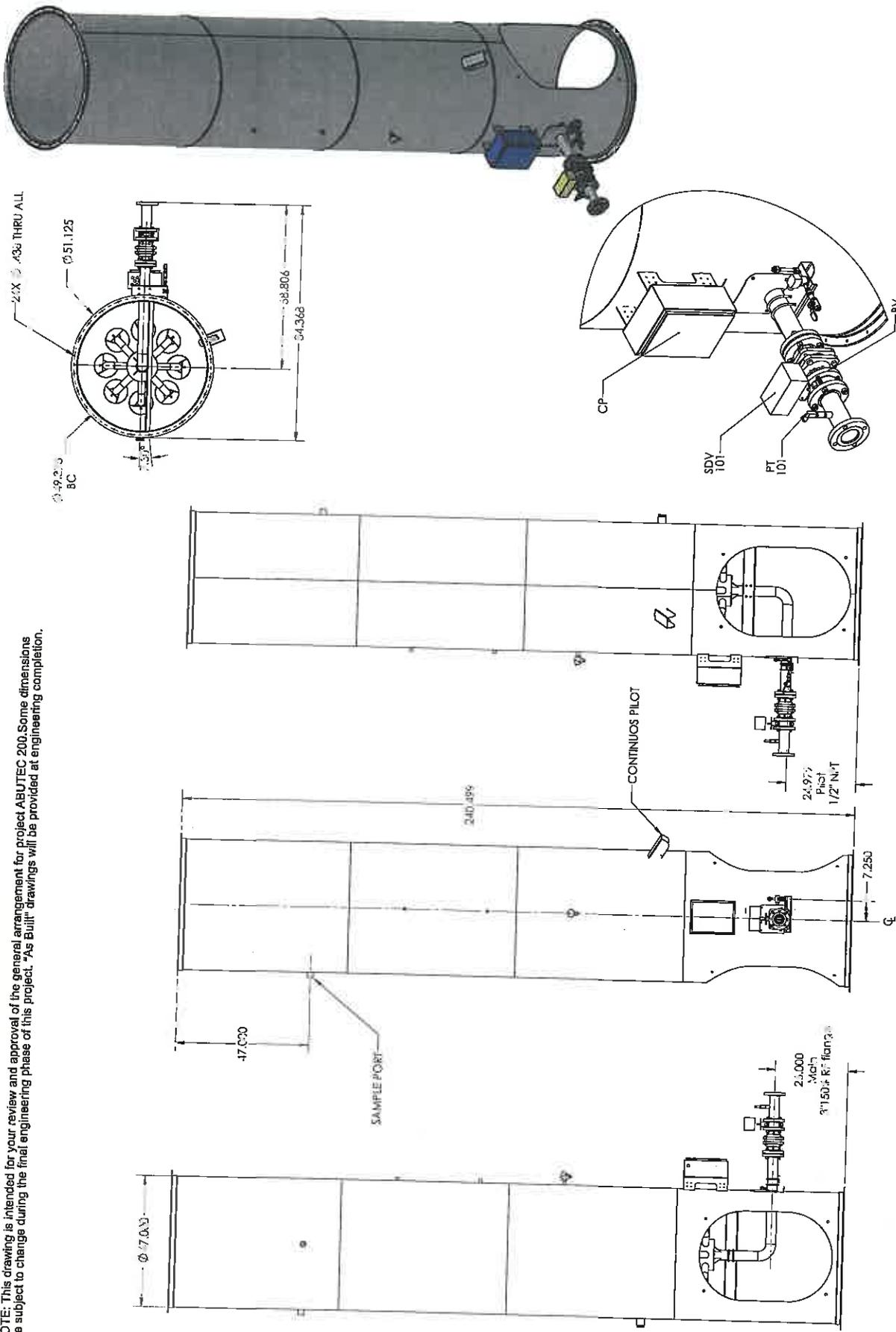
34. Additional Information Attached? **YES**

*Please attach a copy of manufacturer's data sheet. Please attach a copy of manufacturer's drawing.
Please attach a copy of the manufacturer's performance testing.*

If any of the requested information is not available, please contact the manufacturer.

General Arrangement Drawing

NOTE: This drawing is intended for your review and approval of the general arrangement for project ABUTEC 200. Some dimensions are subject to change during the final engineering phase of this project. "As Built" drawings will be provided at engineering completion.



ABUTEC™ A Division of INTEGRATED PROCESS SYSTEMS	
ABUTEC-200 GAD	
TITLE:	SCALE: 1:24
DRAWN BY: J. PHILLIPS	CHECKED BY: HYP
DESIGNED BY: J. PHILLIPS	DATE: 1/24/04
PROJECT: ABUTEC-200 GAD	SHEET: 1 OF 1

PROPRIETARY AND CONFIDENTIAL
 THIS DRAWING IS THE PROPERTY OF INTEGRATED PROCESS SYSTEMS. IT IS TO BE USED ONLY FOR THE PROJECT AND NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, WITHOUT THE WRITTEN PERMISSION OF INTEGRATED PROCESS SYSTEMS.

Attachment I

Emission Calculations

Table 2

Uncontrolled/Controlled Emissions Summary
 Folger Well Pad
 Tyler County, West Virginia
 Antero Resources Corporation

Emission Source	VOC		HCl		CO ₂		CO		SO ₂		PM ₁₀		PM _{2.5}		NO _x		Benzene		Xylenes		Formaldehyde			
	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)		
UNCONTROLLED (Fugitives, Storage Tanks, Gas Production Unit Heaters)																								
Fugitive Emissions (Component Count, RCV and Hauling) ¹	3,901.5	17,088.4			89,969	394.06							1,089.6	3,071.1			0.3384	1.4821	0.0023	0.0103	7.33E-02	3.21E-01		
Flaring, Working and Blasting (FNM/S) Losses ²	28.98	1,392.0			2,042.9	8,946.0											9.373	41,653	0.2313	1.0131	0.5511	2.160		
Engine Emissions ³	0.0071	0.0311	0.3358	1.3831	27.78	121.86	5.6405	24,728	0.0001	0.0006	0.0024	0.0104	0.0025	0.0100			2.16E-02	9.37E-02	0.0004	0.0017	0.0000	0.0002	0.0002	0.0009
Gas Production Unit Heater Emissions ⁴	0.0662	0.2888	1.2028	5.2684	1,451.97	6,359.54	1.0104	4,425.4	0.0072	0.0316	0.0914	0.4004	0.0024	0.0100	2.16E-02	9.37E-02	2.16E-02	9.37E-02	2.53E-05	1.11E-04				0.0040
TOTALS:	294.9213	1,349.4668	1.9186	6.6515	3612.6458	15,623.3136	6.6549	28,148.2	0.0074	0.0322	0.0938	0.4108	0.0025	0.0100	2.16E-02	9.37E-02	9.7394	42,639.7	0.2340	1.0251	0.6244	2.7351	0.0058	0.0235
UNCONTROLLED (Truck Loading Emissions)																								
Truck Loading Emissions ⁵	5.880	2.245				7,297											0.0157	0.0660	2.40E-04	9.53E-05	0.0027	0.0010		
CONTROLLED EMISSIONS																								
Flare Emissions (from FNM/S losses) ⁶	5.8995	25.8403	0.5036	2.2058	1,597.62-3	6,997.5944	0.4330	1,832.9	7.56E-06	3.31E-05	0.0287	0.1257	0.0383	0.1676	1.10E-05	1.10E-05	0.1875	0.8212	4.65E-03	2.03E-02	0.0110	0.0483	9.45E-07	4.12E-06
Controlled Fugitive Emissions from Hauling	5.8996	25.8403	0.5036	2.2058	1,597.6243	6,997.5944	0.4330	1,832.9	7.56E-06	3.31E-05	0.0287	0.1257	0.0384	0.1676	1.10E-05	1.10E-05	0.1875	0.8212	0.0046	0.0203	0.0110	0.0483	9.45E-07	4.14E-06
TOTALS:	9.8775	45.6806	2.0222	8.8375	3,195.2441	13,695.1888	0.8660	3,665.8	0.0074	0.0322	0.1225	0.2514	0.0767	0.3352	2.20E-05	2.20E-05	0.3750	1.6424	0.0074	0.0322	0.0220	0.0967	0.0058	0.0235

1 - See Tables 4 and 5 for fugitive emission calculations; Table 12 for PM emissions from hauling.
 2 - See Tables 6 and 7 for flare 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 100 barrels and actual fill rate of 50 minutes per tank truck. At a production rate of 500 barrels per day, VOC emissions would be 5.8898 pounds per day, VOC emissions would be 5.8898 pounds per hour when there is truck loading activity. Average hourly VOC emissions from truck loading per year is 0.5123 pound per hour.
 6 - See Table 10 and 11 for flare emission calculations.
 7 - The hourly potential to emit is the sum of emissions from gas production unit heaters, engine, storage tanks, fugitives and flare. Does not include emissions from loading (see footnote 5). The total TPY FTE is the sum of all emissions.
 PM 10 TPY is the sum of uncontrolled hauling and other PM 10 sources.

Table 3

**Permit Summary
Folger Well Pad
Tyler County, West Virginia
Antero Resources Corporation**

Pollutant		Emissions			Threshold Exceeded?	
		Uncontrolled	Controlled	Threshold	Uncontrolled	Controlled
VOC	lbs/hr	298.9513	9.8743	6	Yes	Yes
	tons/yr	1311.6514	45.4942	10	Yes	Yes
NO _x	lbs/hr	1.5186	2.0222	6		
	tons/yr	6.6515	8.8573	10		
CO	lbs/hr	6.6549	7.0779	6	Yes	Yes
	tons/yr	29.1482	31.0011	10	Yes	Yes
SO ₂	lbs/hr	0.0074	0.0074	6		
	tons/yr	0.0322	0.0323	10		
PM _{2.5}	lbs/hr	9.38E-02	1.22E-01	6		
	tons/yr	4.11E-01	5.37E-01	10		
PM ₁₀	lbs/hr	1.1633	0.6668	6		
	tons/yr	3.4815	2.1136	10		
Lead	lbs/hr	6.01E-06	8.53E-06	6		
	tons/yr	2.63E-05	3.74E-05	10		
Total HAPs	lbs/hr	9.7394	0.5540	2	Yes	
	tons/yr	42.6646	2.4325	5	Yes	
Total TAPs	lbs/hr	0.2399	0.0132	1.14		
n-Hexane	lbs/hr	8.0093	0.4005			
	tons/yr	35.0395	1.7127			
Toluene	lbs/hr	0.5394	0.0297			
	tons/yr	2.3581	0.1256			
Ethylbenzene	lbs/hr	0.3391	0.0390			
	tons/yr	1.4800	0.1657			
Xylenes	lbs/hr	0.6271	0.0870			
	tons/yr	2.7361	0.3704			
Benzene	lbs/hr	0.2343	0.0076			
	tons/yr	1.0252	0.0324			

Enter any notes here:	<p>1. Emissions are based on 98% Flare DRE operating 100% of the time.</p> <p>2. Please see Attachment C/O- Fugitive Emissions Data Summary Sheet and Attachment O – Emission Points Data Summary Sheet for sitewide sources and breakdown of emission quantities.</p>
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Table 4
Fugitive Emissions
Folger Well Pad
Tyler County, West Virginia
Antero Resources Corporation

VOC Type	Condensate VOC
Emission Type	Steady State (continuous)

Gas Weight Fraction From Analysis	VOC frac	0.191
	Benzene frac	0.000
	Toluene	0.000
	Ethylbenzene	0.000
	Xylenes	0.000
	n-Hexane	0.023
	Methane	0.603

Gas					
Number	Component	Pollutant	Emission Factor (kg/hr of THC per component)	kg/hr	lb/yr
500	Valves	Gas VOC	0.004500	0.43	8,280.76
		Non VOC	0.004500	1.82	35,081.24
590	Connectors	VOC	0.000200	0.02	434.28
		Non-VOC	0.000200	0.10	1,839.82
130	Flanges	VOC	0.000390	0.01	186.59
		Non-VOC	0.000390	0.04	790.50
Total VOCs:				0.46	8,901.63
Total THC:				2.42	46,613.19

Light Liquid Weight Fraction From Analysis	VOC frac	0.969
	Benzene frac	0.001
	Toluene	0.006
	Ethylbenzene	0.011
	Xylenes	0.026
	n-hexane	0.028
	Methane	0.011

Light Liquid					
Number	Component	Pollutant	Emission Factor (kg/hr of THC per component)	kg/hr	lb/yr
520	Valves	Light Liquid VOC	0.002500	1.26	24,272.31
		Light Liquid Non-VOC		0.04	781.29
Total VOC:				1.26	24,272.31
Total THC:				1.30	25,053.60

Fugitive Total Emissions			
	Annual Emissions (lb/yr)	Annual Emissions (lb/hr)	Annual Emissions (tpy)
VOC	33,173.94	3.79	16.59
Ethylbenzene		0.03	0.14
Toluene		0.02	0.08
Xylenes		0.07	0.32
n-Hexane		0.20	0.87
TAPs (Benzene)		0.00	0.01
HAPs		0.32	1.42
CO _{2e}	708,997.62	80.94	354.50

Enter Notes Here	Fugitive emissions based on an estimated component count
	Global Warming Potentials from EPA site
	<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.
	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
Folger Well Pad
Tyler 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 (lb/lb-mole)	Component Flow (scf/day)	Component Moles (lb-moles)	Component Emissions		
					(lbs/day)	(lbs/hr)	(tons/year)
H2S	0	34.08	0	0.00	0.00	0.00	0.00
Nitrogen	0.4946	14.01	1.305744	0.00	0.05	0.00	0.01
Carbon Dioxide	0.1467	44.01	0.387288	0.00	0.04	0.00	0.01
Methane	77.6927	16.04	205.108728	0.54	8.67	0.36	1.58
Ethane	14.1987	30.07	37.484568	0.10	2.97	0.12	0.54
Propane	4.4938	44.1	11.863632	0.03	1.38	0.06	0.25
Isobutane	0.5666	58.12	1.495824	0.00	0.23	0.01	0.04
n-Butane	1.1838	58.12	3.125232	0.01	0.48	0.02	0.09
Isopentane	0.3749	72.15	0.989736	0.00	0.19	0.01	0.03
n-Pentane	0.2914	72.15	0.769296	0.00	0.15	0.01	0.03
2-Methylpentane	0	86.18	0	0.00	0.00	0.00	0.00
3-Methylpentane	0	86.18	0	0.00	0.00	0.00	0.00
n-Hexane	0.5451	86.18	1.439064	0.00	0.33	0.01	0.06
Methylcyclopentane	0	84.16	0	0.00	0.00	0.00	0.00
Benzene	0	78.11	0	0.00	0.00	0.00	0.00
2-Methylhexane	0	100.2	0	0.00	0.00	0.00	0.00
3-Methylhexane	0	100.2	0	0.00	0.00	0.00	0.00
Heptane	0	100.21	0	0.00	0.00	0.00	0.00
Methylcyclohexane	0	98.186	0	0.00	0.00	0.00	0.00
Toluene	0	92.14	0	0.00	0.00	0.00	0.00
Octane	0	114.23	0	0.00	0.00	0.00	0.00
Ethylbenzene	0	106.17	0	0.00	0.00	0.00	0.00
m & p-Xylene	0	106.16	0	0.00	0.00	0.00	0.00
o-Xylene	0	106.16	0	0.00	0.00	0.00	0.00
Nonane	0	128.2	0	0.00	0.00	0.00	0.00
C10+	0	174.28	0	0.00	0.00	0.00	0.00

	lb/hr	tpy
VOC Emissions	0.1145	0.5015
Benzene Emissions	0.0000	0.0000
Toluene Emissions	0.0000	0.0000
Ethylbenzene Emissions	0.0000	0.0000
Xylene Emissions	0.0000	0.0000
n-Hexane Emissions	0.0136	0.0596
HAPs Emissions	0.0136	0.0596
TAPs Emissions	0.0000	0.0000
CO ₂ emissions	9.0327	39.5633

Enter any notes here	<p>1. PCV bleed rate obtained from the user manual for PCV http://issuu.com/rmcprocesscontrols/docs/mizer-pilot-operation--parts---installation-manual</p> <p>2. Emissions per hour= Mol % x no. of PCV x bleed rate x MW / 379.48 / 24</p>
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Table 7

Uncontrolled Working and Breathing Losses
Folger Well Pad
Tyler County, West Virginia
Antero Resources Corporation

Condensate Tank Information	
Number of Tanks	10
Maximum Working Losses (lbs/hr)	6.7207
Maximum Breathing Losses (lbs/hr)	4.6661

	Condensate Tank W/B Losses							
	Vapor Mass Fraction		Working Losses		Breathing Losses		Max W/B Losses	
	wt%	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	tpy
H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Nitrogen	0.0024	0.0002	0.0007	0.0001	0.0005	0.0003	0.0012	0.0012
Carbon Dioxide	0.1791	0.0120	0.0527	0.0084	0.0366	0.0204	0.0899	0.0899
Methane	3.2166	0.2162	0.9469	0.1501	0.6574	0.3663	1.6043	1.6043
Propane	31.6425	2.1266	9.3146	1.4765	6.4669	3.6031	15.7815	15.7815
Isobutane	27.8061	1.8688	8.1852	1.2975	5.8828	3.1662	13.8681	13.8681
n-Butane	7.0208	0.4719	2.0667	0.3276	1.4349	0.7994	3.5016	3.5016
i-Butane	13.6847	0.9197	4.0283	0.6385	2.7988	1.5582	6.8251	6.8251
Isopentane	5.3872	0.3621	1.5858	0.2514	1.1010	0.6134	2.6868	2.6868
n-Pentane	4.3903	0.2951	1.2924	0.2049	0.8973	0.4999	2.1896	2.1896
2-Methylpentane	1.9880	0.1336	0.5852	0.0928	0.4063	0.2264	0.9915	0.9915
3-Methylpentane	0.9662	0.0649	0.2844	0.0451	0.1975	0.1100	0.4819	0.4819
n-Hexane	0.1142	0.0077	0.0336	0.0053	0.0233	0.0130	0.0569	0.0569
Methylcyclopentane	0.3157	0.0212	0.0929	0.0147	0.0645	0.0359	0.1574	0.1574
Benzene	0.0026	0.0002	0.0008	0.0001	0.0005	0.0003	0.0013	0.0013
2-Methylhexane	0.0476	0.0032	0.0140	0.0022	0.0097	0.0054	0.0237	0.0237
3-Methylhexane	0.5587	0.0375	0.1645	0.0261	0.1142	0.0636	0.2786	0.2786
Heptane	0.9844	0.0662	0.2898	0.0459	0.2012	0.1121	0.4910	0.4910
Methylcyclohexane	0.5762	0.0387	0.1696	0.0269	0.1178	0.0656	0.2874	0.2874
Toluene	0.0126	0.0008	0.0037	0.0006	0.0026	0.0014	0.0063	0.0063
Octane	0.8286	0.0557	0.2439	0.0387	0.1693	0.0944	0.4133	0.4133
Ethylbenzene	0.0140	0.0009	0.0041	0.0007	0.0029	0.0016	0.0070	0.0070
m & p-Xylene	0.0108	0.0007	0.0032	0.0005	0.0022	0.0012	0.0054	0.0054
o-Xylene	0.0188	0.0013	0.0055	0.0009	0.0038	0.0021	0.0094	0.0094
Nonane	0.1913	0.0129	0.0563	0.0089	0.0391	0.0218	0.0954	0.0954
C10+	0.0405	0.0027	0.0119	0.0019	0.0083	0.0046	0.0202	0.0202
Total VOCs	64.959	4.3657	19.122	3.0310	13.2760	7.3968	32.398	32.398
Total CO ₂ s	5.4166	0.0002	23.7245	3.7606	16.4715	9.1772	40.196	40.196
Total TAPs (Benzene)	0.0008	0.0008	0.0008	0.0001	0.0005	0.0003	0.0013	0.0013
Toluene	0.0008	0.0008	0.0037	0.0006	0.0026	0.0014	0.0063	0.0063
Ethylbenzene	0.0009	0.0009	0.0041	0.0007	0.0029	0.0016	0.0070	0.0070
Xylenes	0.020	0.0087	0.0087	0.0014	0.0060	0.0034	0.0147	0.0147
n-Hexane	0.0077	0.0336	0.0336	0.0053	0.0233	0.0130	0.0569	0.0569
Total HAPs	0.0116	0.0509	0.0509	0.0081	0.0354	0.0197	0.0863	0.0863
Total	100.00	6.7207	29.4368	4.6661	20.4374	11.3868	49.874	49.874

Table 8

Loading Emissions
Folger Well Pad
Tyler County, West Virginia
Antero Resources Corporation

Annual Loading	Oil Truck Loading	Water Truck Loading
RVP	2.65	1.0232
Annual Average Temp (F)	72.1	72.1
S (saturation factor)	0.6	0.6
P (true vapor pressure)	1.57	0.45
M (MW of vapor)	40.82	18.32
Collection Efficiency (%)	0	0
Loading Loss (lb/10 ³ gal) ^a	0.90	0.12
Maximum Throughput (gallons/hr)	10,080	10,080
Average Throughput (gallons/yr)	7,665,000	91,980,000
Loading Emissions (lbs/hr)	9.06	1.16
Loading Emissions (tpy)	3.45	5.29

	Condensate Tank Loading Losses			Produced Water Tank Loading Losses		
	Vapor Mass Fraction wt%	Loading Losses lbs/hr	tpy	Vapor Mass Fraction wt%	Loading Losses lbs/hr	tpy
H2S	0.0000	0.00	0.00	0.0000	0.00E+00	0.00E+00
Nitrogen	0.0024	0.00	0.00	0.0074	8.63E-05	3.94E-04
Carbon Dioxide	0.1791	0.02	0.01	2.6953	3.13E-02	1.43E-01
Methane	3.2166	0.29	0.11	3.3081	3.84E-02	1.75E-01
Ethane	31.6425	2.87	1.09	1.0647	1.23E-02	5.63E-02
Propane	27.8061	2.52	0.96	0.1034	1.20E-03	5.47E-03
Isobutane	7.0208	0.64	0.24	0.0007	8.32E-06	3.80E-05
n-Butane	13.6847	1.24	0.47	0.0039	4.47E-05	2.04E-04
Isopentane	5.3872	0.49	0.19	0.0002	2.49E-06	1.14E-05
n-Pentane	4.3903	0.40	0.15	0.0001	1.39E-06	6.34E-06
2-Methylpentane	1.9880	0.18	0.07	0.0000	5.29E-08	2.41E-07
3-Methylpentane	0.9662	0.09	0.03	0.0000	1.66E-07	7.55E-07
n-Hexane	0.1142	0.01	0.00	0.0000	1.35E-09	6.17E-09
Methylcyclopentane	0.3157	0.03	0.01	0.0000	3.60E-07	1.64E-06
Benzene	0.0026	0.00	0.00	0.0001	9.59E-07	4.38E-06
2-Methylhexane	0.0476	0.00	0.00	0.0000	2.80E-10	1.28E-09
3-Methylhexane	0.5587	0.05	0.02	0.0000	3.41E-09	1.56E-08
Heptane	0.9844	0.09	0.03	0.0000	5.01E-09	2.29E-08
Methylcyclohexane	0.5762	0.05	0.02	0.0000	9.42E-08	4.30E-07
Toluene	0.0126	0.00	0.00	0.0001	9.65E-07	4.41E-06
Octane	0.8286	0.08	0.03	0.0000	5.16E-10	2.35E-09
Ethylbenzene	0.0140	0.00	0.00	0.0000	3.14E-07	1.43E-06
m & p-Xylene	0.0108	0.00	0.00	0.0000	2.08E-07	9.47E-07
o-Xylene	0.0188	0.00	0.00	0.0000	4.50E-07	2.06E-06
Nonane	0.1913	0.02	0.01	0.0000	9.57E-11	4.36E-10
C10+	0.0405	0.00	0.00	0.0000	1.81E-11	8.24E-11
Total VOCs	64.9593	5.889	2.239	0.1086	1.26E-03	5.75E-03
Total CO ₂		7.306	2.7778		0.9904	4.5189
Total TAPs (Benzene)		0.0002	0.0001		0.0000	0.0000
Toluene		0.0011	0.0004		0.0000	0.0000
Ethylbenzene		0.0013	0.0005		0.0000	0.0000
Xylenes		0.0027	0.0010		0.0000	0.0000
n-Hexane		0.0103	0.0039		0.0000	0.0000
Total HAPs		0.0157	0.0060		0.0000	0.0000
Total	100.0000	9.0650	3.4466	100.0000	1.1598	5.2916

Enter any notes here

Vapor mass fractions and loading losses from Promax output

*Using equation $L_t = 12.46 \cdot SPM/T$ 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 7.1-13b

Loading emissions are vented to the atmosphere.

Table 10

Flare Emissions
Folger Well Pad
Tyler County, West Virginia
Antero Resources Corporation

Controlled Emissions							
Hourly (lb/hr)							
	1	2	3	4	5	6	Total
Stream Sent to Flare/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	0.001	-	0.414	0.077	0.011	0.001	0.50
CO	0.001	-	0.348	0.065	0.009	0.000	0.42
PM2.5	0.000	-	0.024	0.004	0.001	0.000	0.03
PM10	0.000	-	0.031	0.006	0.001	0.000	0.04
H2S	0.000	-	0.000	0.000	0.000	0.000	0.00
SO2	0.000	-	0.000	0.000	0.000	0.000	0.00
CO2	1.512	-	-	-	-	-	1.51
Total VOC	0.000	-	5.658	0.093	0.148	0.000	5.90
Benzene	0.000	-	0.004	0.000	0.000	0.000	0.00
Toluene	0.000	-	0.009	0.001	0.000	0.000	0.01
Ethylbenzene	0.000	-	0.005	0.001	0.000	0.000	0.01
Xylenes	0.000	-	0.010	0.001	0.000	0.000	0.01
n-Hexane	0.000	-	0.155	0.000	0.000	0.000	0.16
HAP	0.000	-	0.184	0.004	0.000	0.000	0.19
N2O	0.000	-	0.009	0.002	0.000	0.000	0.01
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 Flare/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	0.006	-	1.814	0.338	0.046	0.002	2.21
CO	0.005	-	1.523	0.284	0.039	0.002	1.85
PM2.5	0.000	-	0.103	0.019	0.003	0.000	0.13
PM10	0.000	-	0.138	0.026	0.004	0.000	0.17
H2S	0.000	-	0.000	0.000	0.000	0.000	0.00
SO2	0.000	-	0.000	0.000	0.000	0.000	0.00
CO2	6.623	-	-	-	-	-	6.62
Total VOC	0.000	-	24.783	0.409	0.648	0.000	25.84
Benzene	0.000	-	0.018	0.002	0.000	0.000	0.02
Toluene	0.000	-	0.041	0.005	0.000	0.000	0.05
Ethylbenzene	0.000	-	0.024	0.003	0.000	0.000	0.03
Xylenes	0.000	-	0.043	0.005	0.000	0.000	0.05
n-Hexane	0.000	-	0.678	0.001	0.001	0.000	0.68
HAP	0.000	-	0.804	0.015	0.002	0.000	0.82
N2O	0.000	-	0.040	0.007	0.001	0.000	0.05
Lead	0.000	-	0.000	0.000	0.000	0.000	0.00
Formaldehyde	0.000	-	-	-	-	-	0.00

Flare/Vapor Combustor Total Emissions		
	Hourly Emissions (lb/hr)	Annual Emissions (tpy)
Total VOC	5.90	25.84
NOx	5.04E-01	2.21E+00
CO	4.23E-01	1.85E+00
PM2.5	2.87E-02	1.26E-01
PM10	3.83E-02	1.68E-01
H2S	4.02E-06	1.76E-05
SO2	7.56E-06	3.31E-05
Benzene (TAPs)	4.63E-03	2.03E-02
Formaldehyde (TAPs)	9.45E-07	4.14E-06
HAPs	0.19	0.82
CO2s	1597.62	6997.59
N2O	1.11E-02	4.85E-02
Lead	2.52E-06	1.10E-05

Enter any notes here as needed
1. Emission Factors from AP-42 Tables 1.4-1, 1.4-2, and 1.4.3

Table 11

Flare GHG Emissions
Folger Well Pad
Tyler County, West Virginia
Antero Resources Corporation

Flare CO₂ and CH₄ Emissions

Components	Mole fraction of oil flash gas constituents ^a	Volume of oil flash gas sent to flare scf/year	Mole fraction of water flash gas constituents ^a	Volume of water flash gas sent to flare scf/year	Mole fraction of oil tank vapors constituents ^a	Volume of oil tank vapors sent to flare scf/year	Mole fraction of water tank vapors constituents ^a	Volume of water tank vapors sent to flare scf/year	Component volume sent to flare scf/year	Number of carbon atoms	Combustion Efficiency	Combusted CO ₂ Volume ^b scf/year	Uncombusted CO ₂ and CH ₄ Volume ^c scf/year	Volume GHG Emitted scf/year
CO ₂	0.001	36,270,489	0.0233	6,758,396	0.0017	927,401	0.011	49,185	206,072	1	0	---	206,072	110,785,966
Methane	0.298	36,270,489	1.9055	6,758,396	0.0819	927,401	0.038	49,185	23,749,832	1	0.98	23,274,835	474,997	474,997
Ethane	0.283	36,270,489	0.3545	6,758,396	0.4295	927,401	0.006	49,185	13,071,989	2	0.98	25,621,098	---	---
Propane	0.201	36,270,489	0.0963	6,758,396	0.2574	927,401	0.000	49,185	8,182,900	3	0.98	24,057,725	---	---
i-Butane	0.042	36,270,489	0.0040	6,758,396	0.0493	927,401	0.000	49,185	1,580,508	4	0.98	6,195,590	---	---
n-Butane	0.082	36,270,489	0.0145	6,758,396	0.0961	927,401	0.000	49,185	3,168,420	4	0.98	12,420,207	---	---
Pentane	0.050	36,270,489	0.0046	6,758,396	0.0553	927,401	0.000	49,185	1,898,709	5	0.98	9,303,673	---	---
Hexane	0.020	36,270,489	0.0010	6,758,396	0.0145	927,401	0.000	49,185	761,692	6	0.98	4,478,746	---	---
Benzene	0.000	36,270,489	0.0004	6,758,396	0.0080	927,401	0.000	49,185	10,709	6	0.98	62,971	---	---
Heptanes	0.011	36,270,489	0.0008	6,758,396	0.0080	927,401	0.000	49,185	404,814	7	0.98	2,777,025	---	---
Toluene	0.000	36,270,489	0.0007	6,758,396	0.0001	927,401	0.000	49,185	20,173	7	0.98	138,388	---	---
O-xylene	0.006	36,270,489	0.0005	6,758,396	0.0054	927,401	0.000	49,185	218,920	8	0.98	1,716,329	---	---
m-xylene	0.000	36,270,489	0.0004	6,758,396	0.0001	927,401	0.000	49,185	10,280	8	0.98	80,592	---	---
p-xylene	0.000	36,270,489	0.0007	6,758,396	0.0001	927,401	0.000	49,185	18,540	8	0.98	145,356	---	---
Nonane	0.001	36,270,489	0.0000	6,758,396	0.0006	927,401	0.000	49,185	28,213	9	0.98	248,839	---	---
Decane plus	0.000	36,270,489	0.0000	6,758,396	0.0001	927,401	0.000	49,185	5,972	10	0.98	58,521	---	---
											Subtotal	110,579,894		

Pollutant	Volume Emitted scf/year	Density of GHG ^c lb/scf	Conversion ^b Factor lb/ton	GWPF	Emissions ^d	
					lb/hr	tons/hr
CO ₂	110,785,966	0.12	2000	1	1466.56	6,423.54
CH ₄	474,997	0.09	2000	25	5.04	22.10
					CO ₂ e Emissions	6975.99

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
Folger Well Pad
Tyler 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 + (%)	50	50

Tanker Truck Trip Calculation	
Condensate Production (bbl/day)	500
P/W Production (bbl/day)	6,000
Truck Capacity (bbl)	200

Pick Up Truck Trip Calculation	
Mo. of Trips Per Day	2
Trips Per Year	730

	# of Wheels	Mean Vehicle Weight (W) (tons)	Mean Vehicle Speed (S) (mph)	Miles Per Trip (miles)	Maximum Trips per Hour	Maximum Trips per Year	Vehicle Miles Travelled (miles/yr)	PM (lbs/VMT)	PM10 (lbs/VMT)
Tanker Trucks Condensate	10	40	10	0.3000	1	913	0.3000	273.9000	1.7179
Tanker Trucks PW	10	40	10	0.3000	1	10950	0.3000	3285.0000	1.7179
Pick Up Truck	4	3	10	0.2490	1	730	0.2490	181.7700	0.1560

	Uncontrolled Emissions				Controlled Emissions			
	PM (lbs/hr)	PM (lbs/yr)	PM10 (lbs/hr)	PM10 (lbs/yr)	PM (lbs/hr)	PM (lbs/yr)	PM10 (lbs/hr)	PM10 (lbs/yr)
Tanker Trucks Condensate	1.1453	1045.6213	0.5228	470.5296	0.5726	522.8107	0.2577	235.2648
Tanker Trucks PW	1.1453	12540.5841	6.2703	5643.2628	0.5726	6270.2920	3.1351	2821.6314
Pick Up Truck	0.0863	63.0160	0.0315	28.3572	0.0432	31.5080	0.0158	14.1786
Total Emissions	2.3768	13,649.2213	6.8246	6,142.1496	1.1884	6,824.6107	3.4123	3,071.0748

1 EPA, AP-42, Volume I, Section 13.2.2 Unpaved Roads (11/06); assume 2:1 moisture ratio Section 13.2.2 Unpaved Roads (11/06)
Source: Attachment L, Fugitive Emissions from Unpaved Haul Roads, Rev 03/2007, West Virginia Department of Environmental Protection

Table 13

**Engine Emissions
Folger Well Pad
Tyler County, West Virginia
Antero Resources Corporation**

Kubota DG972-E2

Power (hp)	24
Fuel consumption (lbs/BHP-hr) ¹	0.449
Heat Content of Fuel (Btu/scf)	1247.06
Density of NG (lb/scf)	0.056
Operating Hours/year	8760

Pollutant	Emission Factors		lb/hr	tpy
	(g/hp-hr)	(lb/MMBtu)		
NOx ¹	5.97		0.3158	1.3831
CO ²	106.7		5.6445	24.7228
CO ₂		110.000	26.3967	115.62
PM _{2.5}		9.910E-03	0.0024	0.0104
PM ₁₀		9.500E-03	0.0023	0.0100
PM (Total)		9.910E-03	0.0024	0.0104
SO ₂		5.880E-04	0.0001	0.0006
TOC		0.358	0.0859	0.3763
Methane		0.230	0.0552	0.2417
VOC ³		0.0296	0.0071	0.0311
HAPS				
Benzene		1.58E-03	3.79E-04	1.66E-03
Ethylbenzene		2.48E-05	5.95E-06	2.61E-05
Formaldehyde		2.05E-02	4.92E-03	2.15E-02
Naphthalene		9.71E-05	2.33E-05	1.02E-04
Toluene		5.58E-04	1.34E-04	5.86E-04
Xylene		1.95E-04	4.68E-05	2.05E-04

	lb/hr	tpy
TOTAL Uncontrolled VOC	0.007	0.031
TOTAL Uncontrolled NOx	0.316	1.383
TOTAL Uncontrolled HAPs	0.006	0.024
TOTAL Uncontrolled TAPs (Benzene)	0.000	0.002
TOTAL Uncontrolled TAPs (Formaldehyde)	0.005	0.022
TOTAL CO ₂ Emissions	27.78	121.7

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 P.
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.



Bryan Research & Engineering, Inc.

ProMax[®] 3.2

with

TSWEET[®] & PROSIM[®]

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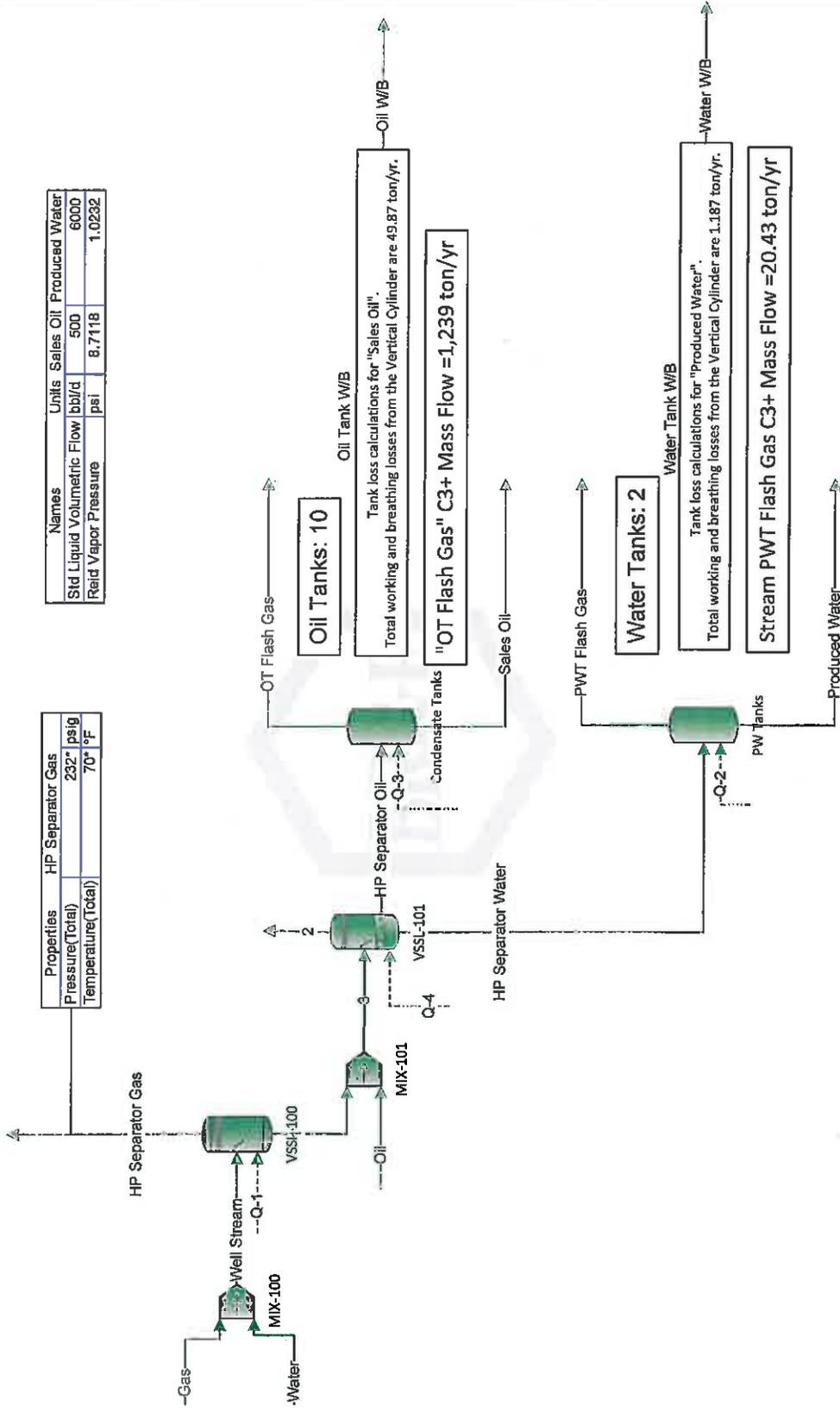
Simulation Report

Client Name:	Antero Resources Corporation
Location:	West Virginia
Job:	Folger Well Pad

Project Name:	PROMAX SCENARIO 3
File Name:	.ProMax@C:\Users\yichen\Documents\New Model\Antero ProMax\PROMAX SCENARIO 3.PMX
ProMax Version:	3.2.13330.0

Report Created:	1/6/2015 11:02
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Stream HP Separator Gas C3+ Mass Flow =1.677E+05 ton/yr



Properties		HP Separator Gas	
Pressure(Total)	232'	psig	
Temperature(Total)	70'	°F	

Names		Units		Sales Oil		Produced Water	
Std Liquid Volumetric Flow	500	bb/d					
Reid Vapor Pressure	8.7118	psi					1.0232

Attachment J

Class I Legal Advertisement

Attachment J

**Air Quality Permit Notice
Notice of Application
Folger Well Pad
Antero Resources Corporation
Tyler 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 General Permit Registration for an Oil and Natural Gas facility located near 1.7 miles southwest of the intersection of WV Tyler Hwy 18 and Hickman Run in Tyler County, West Virginia.

The latitude and longitude coordinates are: 39.525555 degrees N and -80.956165 degrees W

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

Pollutants	TOTALS (tpy):
VOC	45.4940
NO _x	8.8573
CO _{2e}	13880.3000
CO	31.0011
SO ₂	0.0323
PM _{2.5}	0.5365
PM ₁₀	2.1136
Lead	3.74E-05
Total HAPs	2.4325
Benzene	0.0324
Formaldehyde	0.0255
Xylenes	0.3704

Startup in operation is planned to begin in November 2015. 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 1227, during normal business hours.

Dated this the ___ day of _____, 2015

By: Antero Resources Corporation
Donald Gray
Environmental and Regulatory Manager
1615 Wynkoop Street
Denver, CO 80202

Attachment K

Electronic Submittal

Attachment K

**Electronic Submittal
Folger Well Pad
Antero Resources Corporation
Tyler County, West Virginia**

No electronic submission was made.

Attachment L

General Permit Registration Application Fee

Attachment M

Siting Criteria Waiver

Attachment M

**Siting Waiver
Folger Well Pad**

**Antero Resources Corporation
Tyler County, West Virginia**

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

Attachment N

Material Safety Data Sheet

Attachment N**Description of Material Safety Data Sheets (MSDS)****Folger Well Pad****Antero Resources Corporation****Tyler County, West Virginia**

Three generic Material Safety Data Sheets (MSDS), and analysis of the condensate and produced water of a similar well with the same formation are provided. Antero Resources Corporation has developed its own MSDS for these materials.

1. **Natural Gas:** The MSDS for natural gas reflects pipeline quality odorized gas. This is essentially the same as the material delivered to the metering and downstream gathering lines from the Antero well pad.
2. **Condensate:** Condensate is the hydrocarbon liquid that has been separated from raw natural gas through the well pad gas production unit. The liquid is often characterized as having a gasoline-like odor and consistency.
3. **Produced Water:** Produced water is primarily groundwater with residual trace hydrocarbons that has been withdrawn from the ground during the gas extraction process and then separated from the natural gas and condensate in the gas production units.

Material Name: Dry Field Natural Gas

US GHS

SYNONYMS: CNG, Natural Gas, Methane.

***** Section 1 – PRODUCT AND COMPANY IDENTIFICATION *****

PRODUCT NAME:	Dry Field Natural Gas	EMERGENCY PHONE:	(800) 878-1373
PRODUCT CODES:	CAS Reg. No. 68410-63-9	AFTER HOURS:	(800) 878-1373
PRODUCER:	Antero Resources		
ADDRESS:	1615 Wynkoop Street Denver, Colorado 80202	CHEMTREC PHONE:	(800) 424-9300

***** Section 2 – HAZARDS IDENTIFICATION *****

GHS Classification:

Flammable Gas – Category 1.

Gases Under Pressure – Gas.

Specific Target Organ Systemic Toxicity (STOT) – Single Exposure Category 2.

GHS LABEL ELEMENTS

Symbol(s)



Signal Word

Danger

Hazard Statements

Extremely flammable gas.

Contains gas under pressure, may explode if heated.

May cause damage to central nervous and respiratory systems.

Precautionary Statements

Prevention

Keep away from heat/sparks/open flames/hot surfaces. No smoking.

Do not breathe fume/gas/mist/vapors/spray.

Wash thoroughly after handling.

Do not eat, drink or smoke when using this product.

SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

Response

Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

If exposed to gas, or concerned about possible exposure: Call a POISON CENTER or doctor/physician.

Storage

Protect from sunlight. Store in a well-ventilated place.

Store in a secure area.

Disposal

Dispose of contents/containers in accordance with local/regional/national/international regulations.

*** Section 3 – COMPOSITION / INFORMATION ON INGREDIENTS ***

CAS #	Component	Percent
74-82-8	Methane	95.01
78-84-0	Ethane	3.99
74-98-6	Propane	0.32
106-97-8	Butanes	0.07
109-66-0	Pentanes	0.02
110-54-3	Hexanes	0.01
7727-37-9	Nitrogen	0.35
124-38-9	Carbon Dioxide	0.19
7782-44-7	Oxygen	0.03

Because natural gas is a natural product, composition can vary greatly.

*** Section 4 – FIRST AID MEASURES ***

First Aid: Eyes

In case of freeze burn, cover eyes to protect from light. Flush eyes with running water for at least fifteen (15) minutes. Following flushing, seek medical attention.

First Aid: Skin

Remove contaminated clothing. In case of blistering, frostbite or freeze burns, seek immediate medical attention.

SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

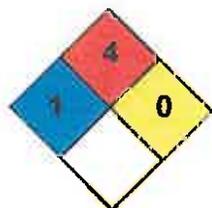
First Aid: Ingestion

Risk of ingestion is extremely low. However, if oral exposure occurs, seek immediate medical assistance.

First Aid: Inhalation

Remove person to fresh air. If person is not breathing, provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

***** Section 5 – FIRE FIGHTING MEASURES *****



NFPA 704 Hazard Class

Health: **1** Flammability: **4** Instability: **0** (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

General Fire Hazards

See Section 9 for Flammability Properties.

Forms a flammable mixture with air. If released, the resulting vapors will disperse with the prevailing wind. If a source of ignition is present where the vapor exists at a 5 – 15% concentration in air, the vapor will burn along the flame front toward the source of the fuel.

Hazardous Combustion Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

Extinguishing Media

Any extinguisher suitable for Class B fires, dry chemical, fire fighting foam, CO₂, and other gaseous agents. However, fire should not be extinguished unless flow of gas can be immediately stopped.

Unsuitable Extinguishing Media

None.

Fire Fighting Equipment / Instructions

Gas fires should not be extinguished unless flow of gas can be immediately stopped. Shut off gas source and allow gas to burn out. If spill or leak has not ignited, determine

SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

if water spray may assist in dispersing gas or vapor to protect personnel attempting to stop leak. Use water to cool equipment, surfaces and piping exposed to fire and excessive heat. For large fire, the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Isolate area, particularly around piping. Let the fire burn unless leak can be stopped. Concentrate fire-fighting efforts on objects / materials ignited by the initial fire. Withdraw immediately in the event of a rising sound from a venting safety device.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH-approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

*** Section 6 – ACCIDENTAL RELEASE MEASURES ***

Recovery and Neutralization

Stop the source of the release, if safe to do so.

Materials and Methods for Clean-Up

Consider the use of water spray to disperse gas vapors. Do not use water spray to direct gas vapors toward sewer or drainage systems. Isolate the area until gas has dispersed. Ventilate and gas test area before entering.

Emergency Measures

Evacuate nonessential personnel and secure all ignition sources. No road flares, smoking or flames in hazard area. Consider wind direction. Stay upwind and uphill, if possible. Vapor cloud may be white, but color will dissipate as cloud disperses. Fire and explosion hazard is still present.

Personal Precautions and Protective Equipment

Cooling effect of expanding gas from leak may present frostbite / freeze burn hazard. Wear flame retardant (FR) clothing around un-ignited leak. Wear fire protective clothing around an active fire.

Environmental Precautions

Do not flush gas vapors toward sewer or drainage systems.

Prevention of Secondary Hazards

None.

SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

*** Section 7 – HANDLING AND STORAGE ***

Handling Procedures

Keep away from flame, sparks and excessive temperatures. Bond and ground containers. Use only in well ventilated areas.

Storage Procedures

Natural gas will be contained in the pipeline. Keep away from flame, sparks, excessive temperatures and open flames. Empty pipeline segments may contain explosive residues from natural gas liquids. Do not cut, heat, weld or expose containers to sources of ignition sections of pipeline unless the sections have been purged of natural gas residues.

Incompatibilities

Keep away from strong oxidizers, ignition sources and heat.

*** Section 8 – EXPOSURE CONTROLS / PERSONAL PROTECTION ***

Component Exposure Limits

Methane (74-82-8)

ACGIH: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases : Alkane C1-4)

Ethane (74-84-0)

ACGIH: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases : Alkane C1-4)

Propane (74-98-6)

ACGIH: 2500 ppm TWA (listed under Aliphatic hydrocarbon gases : Alkane C1-4)

Butane (106-97-8)

ACGIH: 800 ppm TWA (listed under Aliphatic hydrocarbon gases : Alkane C1-4)

Pentanes (109-66-0)

ACGIH: 600 ppm TWA (listed under Pentane, all isomers)

Hexanes (110-54-3)

ACGIH: 50 ppm TWA (listed under n-Hexane)

SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

Nitrogen (7727-37-9)
Simple Asphyxiant

Carbon Dioxide (124-38-9)
ACGIH: 5000 ppm TWA (listed under Carbon Dioxide)

Oxygen (7782-44-7)
N/A – Necessary for life

Engineering Measures

Use adequate ventilation to keep gas and vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces. Use explosion-proof equipment and lighting in classified / controlled areas.

Personal Protective Equipment: Respiratory

Use a NIOSH approved positive-pressure, supplied air respirator with escape bottle or self-contained breathing apparatus (SCBA) for gas concentrations above occupational exposure limits, for potential for uncontrolled release, if exposure levels are not known, or in an oxygen-deficient atmosphere. CAUTION: Flammability limits (i.e., explosion hazard) should be considered when assessing the need to expose personnel to concentrations requiring respiratory protection.

Personal Protective Equipment: Hands

Use cold-impervious, insulating flame-retardant (FR) gloves where contact with pressurized gas may occur.

Personal Protective Equipment: Eyes

Where there is a possibility of pressurized gas contact, wear splash-proof safety goggles and faceshield.

Personal Protective Equipment: Skin and Body

Where contact with pressurized gas may occur, wear flame-retardant (FR) and a faceshield.

*** Section 9 – PHYSICAL AND CHEMICAL PROPERTIES ***

Appearance: Colorless	Odor: Odorless to slight petroleum odor
Physical State: Gas	pH: ND
Vapor Pressure: 40 atm @ -187°F (-86°C)	Vapor Density: 0.6
Boiling Point: -259°F (-162°C)	Melting Point: ND
Solubility (H₂O): 3.5%	Specific Gravity: 0.4 @ -263°F (-164°C)

SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

Evaporation Rate: ND	VOC: ND
Octanol / H₂O Coeff.: ND	Flash Point: Flammable Gas
Flash Point Method: N/A	
Lower Flammability Limit: 3.8 – 6.5	Upper Flammability Limit: 13-17
(LFL):	(UFL):
Auto Ignition: 900-1170°F (482-632°C)	Burning Rate: ND

*** Section 10 – CHEMICAL STABILITY & REACTIVITY INFORMATION ***

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

Keep away from strong oxidizers, ignition sources and heat.

Hazardous Decomposition Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

*** Section 11 – TOXICOLOGICAL INFORMATION ***

Acute Toxicity

A: General Product Information

Methane and ethane, the main components of natural gas, are considered practically inert in terms of physiological effects. At high concentrations these materials act as simple asphyxiants and may cause death due to lack of oxygen.

B. Component Analysis – LD50/LC50

Methane (74-82-8)

Inhalation LC50 Mouse 326 g/m³ 2h

Ethane (74-84-0)

Inhalation LC50 Rat 658 mg/l 4h

Propane (74-98-6)

Inhalation LC50 Rat 658 mg/l 4h

SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

Butanes (106-97-8)

Inhalation LC50 Rat 658 g/m³ 4h

Pentanes (109-66-0)

Inhalation LD50 Rat 364 g/m³ 4h

Hexanes (110-54-3)

Inhalation LC50 Rat > 20 mg/l 4h

Nitrogen (7727-37-9)

Simple Asphyxiant

Carbon Dioxide (124-38-9)

Inhalation LC50 Human 100,000 ppm 1minute

Oxygen (7782-44-7)

N/A – Necessary for life

Potential Health Effects: Skin Corrosion Property / Stimulativeness

This product is not reported to have any skin sensitization effects.

Generative Cell Mutagenicity

This product is not reported to have any mutagenic effects.

Carcinogenicity

A: General Product Information

This product is not reported to have any carcinogenic effects.

B: Component Carcinogenicity

None of this product's components are listed by ACGIH, IARC, OSHA, NIOSH, or NTP.

Reproductive Toxicity

This product is not reported to have any reproductive toxicity effects.

Specified Target Organ General Toxicity: Single Exposure

This product may cause damage to the heart.

Specified Target Organ General Toxicity: Repeated Exposure

This product is not reported to have any specific target organ repeat effects.

Aspiration Respiratory Organs Hazard

This product is not reported to have any aspiration hazard effects.

SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

*** Section 12 – ECOLOGICAL INFORMATION ***

Ecotoxicity

A: General Product Information

Keep gas and vapors out of sewers, drainage areas, and waterways. Report spills and releases, as applicable under Federal and State regulations.

B: Component Analysis – Ecotoxicity – Aquatic Toxicity

No ecotoxicity data are available for this product's components.

Persistence / Degradability

No information available.

Bioaccumulation

No information available.

Mobility in Soil

No information available.

*** Section 13 – DISPOSAL CONSIDERATIONS ***

Waste Disposal Instructions

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment Recommendations.

Disposal of Contaminated Containers or Packaging

Dispose of contents / container in accordance with local / regional / national / international regulations.

*** Section 14 – TRANSPORTATION INFORMATION ***

DOT Information

Shipping Name: Natural Gas, Compressed

UN #: 1971 Hazard Class: 2.1

Placard:



SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

***** Section 15 – REGULATORY INFORMATION *****

Regulatory Information

Component Analysis

None of this products components are listed under SARA Section 302 (40 CFR 355 Appendix A).

n-hexane is listed under SARA Section 313 (40 CFR 372.65). However the concentration of this component is approximately 0.01 % in compressed natural gas and is therefore far under the reporting threshold for the chemical.

n-hexane is listed under CERCLA (40 CFR 302.4). However the concentration of this component is approximately 0.01 % in compressed natural gas and is therefore far under the reporting threshold for the chemical.

SARA Section 311/312 – Hazard Classes

<u>Acute Health</u>	<u>Chronic Health</u>	<u>Fire</u>	<u>Sudden Release of Pressure</u>	<u>Reactive</u>
---	---	X	X	---

SARA Section 313 – Supplier Notification

This product contains one chemical (n-Hexane) that is subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-to-know act (EPCRA) of 1986 and of 40 CFR 372. However the concentration of this component is approximately 0.01 % in compressed natural gas and is therefore far under the reporting threshold for the chemical.

State Regulations

Component Analysis – State

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA	RI
Methane	74-82-8	No	No	Yes	Yes	Yes	No
Ethane	78-84-0	No	No	Yes	Yes	Yes	No
Propane	74-98-6	No	No	Yes	Yes	Yes	Yes
Butane	106-97-8	Yes	No	Yes	Yes	Yes	Yes
Pentanes	109-66-0	Yes	No	Yes	Yes	Yes	Yes
Hexanes	110-54-3	Yes	Yes	Yes	Yes	Yes	Yes
Nitrogen	7727-37-9	No	No	No	No	No	No
Carbon Dioxide	124-38-9	Yes	No	Yes	Yes	Yes	Yes
Oxygen	7782-44-7	No	No	No	No	No	No

SAFETY DATA SHEET

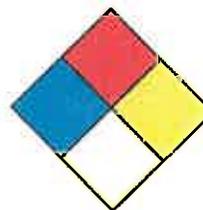
Material Name: Dry Field Natural Gas

US GHS

*** Section 16 – OTHER INFORMATION ***

NFPA® Hazard Rating

Health	1
Fire	4
Reactivity	0



HMIS® Hazard Rating

Health	1	Moderate
Fire	4	Severe
Physical	0	Minimal

* Chronic

Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act; ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; NJTSR = New Jersey Trade Secret Registry.

Literature References

None

Other Information

The information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

Date of Preparation: January 30, 2014

Date of Last Revision: March 4, 2014

End of Sheet



Antero SAFETY DATA SHEET

Resources

Material Name: Natural Gas Condensate

US GHS

SYNONYMS: Drips; Condensate; Field Condensate; Gas Well Condensate; High Pressure Inlet Liquids; Lease Condensate; Natural Gas Liquids; Pipeline Liquids

***** Section 1 – PRODUCT AND COMPANY IDENTIFICATION *****

PRODUCT NAME:	Natural Gas Condensate	EMERGENCY PHONE:	(800) 878-1373
PRODUCT CODES:	64741-47-5	AFTER HOURS:	(800) 878-1373
PRODUCER:	Antero Resources		
ADDRESS:	1615 Wynkoop Street Denver, Colorado 80202	CHEMTREC PHONE:	(800) 424-9300

***** Section 2 – HAZARDS IDENTIFICATION *****

GHS Classification:

Flammable Liquids – Category 2.
Acute Toxicity Inhalation – Category 3
Germ Cell Mutagenicity – Category 1B
Carcinogenicity – Category 1A
Specific Target Organ Systemic Toxicity (STOT) – Single Exposure Category 3
Specific Target Organ Systemic Toxicity (STOT) – Repeat Exposure Category 1
Aspiration Toxicity – Category 1
Toxic to the Aquatic Environment Acute – Category 3

GHS LABEL ELEMENTS

Symbol(s)



Signal Word
Danger

SAFETY DATA SHEET

Material Name: Natural Gas Condensate

US GHS

Hazard Statements

Highly flammable liquid and vapor.
Toxic if inhaled.
May cause genetic defects.
May cause cancer.
May cause respiratory irritation.
May cause drowsiness or dizziness.
May cause damage to organs (liver, kidneys, blood, nervous system, and skin) through prolonged or repeated exposure.
May be fatal if swallowed and enters airways.
Harmful to aquatic life.

Precautionary Statements

Prevention

Keep away from heat/sparks/open flames/hot surfaces. No smoking.
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ventilating/lighting equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Wear protective gloves/protective clothing/eye protection/face protection.
Do not breathe gas/mist/vapors/spray.
Do not handle until all safety precautions have been read and understood.
Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Avoid release to the environment.

Response

If on SKIN (or hair): Wash with plenty of soap and water. Remove / Take off all contaminated clothing immediately. Rinse skin with water/shower.
If INHALED: Remove victim to fresh air and keep comfortable for breathing. Call a poison center/doctor if the victim feels unwell.
If SWALLOWED: Immediately call a poison center or doctor / physician. Do not induce vomiting.
If exposed or concerned: Get medical advice/attention.
In case of fire: Use water spray, fog or fire-fighting foam.

Storage

Store in a well-ventilated place. Keep cool.
Store in a secure area.

SAFETY DATA SHEET

Material Name: Natural Gas Condensate

US GHS

Disposal

Dispose of contents/containers in accordance with local/regional/national/international regulations.

*** Section 3 – COMPOSITION / INFORMATION ON INGREDIENTS ***

CAS #	Component	Percent
111-65-9	Octanes	25 - 95
142-82-5	Heptanes	25 - 95
110-54-3	Hexanes as n-Hexane	25 - 95
109-66-0	Pentanes as n-Pentane	5 - 70
106-97-8	N-butane	0 - 45
74-98-6	Propane	0 - 15
78-84-0	Ethane	0 - 5
71-43-2	Benzene	< 1
108-88-3	Toluene	< 1
1330-20-7	m-,o-,p-Xylene	< 1

Because natural gas condensate is a natural product, composition can vary greatly.

*** Section 4 – FIRST AID MEASURES ***

First Aid: Eyes

Flush eyes with clean running water for at least fifteen (15) minutes. Following flushing, seek medical attention.

First Aid: Skin

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops. Wash contaminated clothing before reuse.

First Aid: Ingestion (swallowing)

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean the victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

SAFETY DATA SHEET

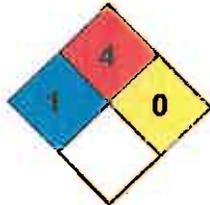
Material Name: Natural Gas Condensate

US GHS

First Aid: Inhalation (breathing)

Remove person to fresh air. If person is not breathing, provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

*** Section 5 – FIRE FIGHTING MEASURES ***



NFPA 704 Hazard Class

Health: 1 Flammability: 4 Instability: 0 (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

General Fire Hazards

See Section 9 for Flammability Properties.

Extremely flammable. Vapors may be ignited rapidly when exposed to heat, spark, open flame, or other source of ignition (e.g., static electricity, pilot lights, mechanical / electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe). Flammable vapors can burn in the open or explode in confined spaces. Vapors are heavier than air, and may travel distances to an ignition source and flash back. Runoff to sewer systems may cause fire or explosion.

Hazardous Combustion Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

Extinguishing Media

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, firefighting foam, water spray, carbon dioxide (CO₂), or other gaseous extinguishing agents. Use caution when applying CO₂ in confined spaces.

LARGE FIRES: Water spray, fog or fire-fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

Unsuitable Extinguishing Media

None

SAFETY DATA SHEET

Material Name: Natural Gas Condensate

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Fire Fighting Equipment / Instructions

Small fires in the beginning stage may typically be extinguished using handheld portable fire extinguishers and other firefighting equipment. Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied firefighting foam.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full face piece and full protective clothing.

*** Section 6 – ACCIDENTAL RELEASE MEASURES ***

Recovery and Neutralization

Contain and stop the source of the spill, if safe to do so.

Materials and Methods for Clean-Up

Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken.

Emergency Measures

Evacuate nonessential personnel and secure all ignition sources. No road flares, smoking or flames in hazard area. Consider wind direction. Stay upwind and uphill, if possible. Vapor cloud may be white, but color will dissipate as cloud disperses. Fire and explosion hazard is still present.

Personal Precautions and Protective Equipment

Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8). Extremely flammable. Spillages of liquid product will create a fire hazard and may form an explosive atmosphere. Keep all sources of

SAFETY DATA SHEET

Material Name: Natural Gas Condensate

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ignition and hot metal surfaces away from spill/release if safe to do so.

The use of explosion-proof electrical equipment is recommended. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons downwind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions

Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of firefighting foam may be useful in certain situations to reduce vapors. If spill occurs on water notify appropriate authorities and advise shipping of any hazard. Spills into or upon navigable waters, the contiguous zone, or adjoining shorelines that cause a sheen or discoloration on the surface of the water, may require notification of the National Response Center (phone number 800-424-8802).

Prevention of Secondary Hazards

None

*** Section 7 – HANDLING AND STORAGE ***

Handling Procedures

Keep away from flame, sparks and excessive temperatures. Bond and ground containers. Use non-sparking tools. Use only outdoors or in well ventilated areas. Wear protective gloves / clothing and eye / face protection. Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8).

Storage Procedures

Store only in approved containers. Bond and ground containers. Keep away from flame, sparks, excessive temperatures and open flames. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks."

SAFETY DATA SHEET

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Incompatibilities

Keep away from strong oxidizers, ignition sources and heat.

*** Section 8 – EXPOSURE CONTROLS / PERSONAL PROTECTION ***

Component Exposure Limits

Octanes (111-65-9)

ACGIH: 300 ppm TWA (listed under Octane, all isomers)

Heptanes (142-82-5)

ACGIH: 400 ppm TWA (listed under n-Heptane)

n-Hexane (110-54-3)

ACGIH: 20 ppm TWA (listed under n-Hexane)

n-Pentane (109-66-0)

ACGIH: 600 ppm TWA (listed under Pentane, all isomers)

n-Butane (106-97-8)

ACGIH: 600 ppm TWA (listed under n-Butane)

Propane (74-98-6)

ACGIH: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases C1-C4)

Ethane (74-84-0)

ACGIH: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases C1-C4)

Benzene (71-43-2)

ACGIH: 0.5 ppm (TWA); NIOSH: 0.1 ppm (TWA); OSHA 1 ppm (TWA)

Toluene (108-88-3)

ACGIH: 20 ppm TWA (listed under Toluene)

m-, o-, p-Xylene (1330-20-7)

ACGIH: 100 ppm TWA (listed under Xylene o, m & p isomers)

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Material Name: Natural Gas Condensate

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Engineering Measures

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces. Use explosion-proof equipment and lighting in classified / controlled areas.

Personal Protective Equipment: Respiratory

Use a NIOSH-approved positive-pressure, supplied air respirator with escape bottle or self-contained breathing apparatus (SCBA) for gas concentrations above occupational exposure limits, for potential for uncontrolled release, if exposure levels are not known, or in an oxygen-deficient atmosphere (oxygen content less than 19.5 percent). A respiratory program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant the use of a respirator.

If benzene concentrations equal or exceed applicable exposure limits, OSHA requirements for personal protective equipment, exposure monitoring, and training may apply (29 CFR 1910.1028 – Benzene).

CAUTION: Flammability limits (i.e., explosion hazard should be considered when assessing the need to expose personnel to concentrations requiring respiratory protection.

Personal Protective Equipment: Hands

Gloves constructed of nitrile or neoprene are recommended.

Personal Protective Equipment: Eyes

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying. Eye protection that meets or exceeds ANSI Z.87.1 is recommended. Depending on conditions of use, a face shield may be necessary.

Personal Protective Equipment: Skin and Body

Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

Hygiene Measures

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use gasoline or solvents (naphtha, kerosene, etc.) for washing this product from

SAFETY DATA SHEET

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exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and laundry before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

*** Section 9 – PHYSICAL AND CHEMICAL PROPERTIES ***

Appearance:	Colorless to straw yellow	Odor:	Aromatic, Gasoline;
Physical State:	Liquid	pH:	ND
Vapor Pressure:	110 – 200 psia (Reid VP) @ 100°F/37.8°C	Vapor Density (air = 1):	> 1
Boiling Point:	Approx. 85 - 437°F (39 – 200°C)	Melting Point:	ND
Solubility (H2O):	Insoluble to slightly soluble	Specific Gravity:	AP 0.62-0.76 (varies)
Evaporation Rate:	High	VOC:	ND
Octanol / H2O Coeff.:	ND	Flash Point:	-40°F -40°C
Flash Point Method:	Tag Closed Cup (TCC)		
Lower Flammability Limit: (LFL):	ND (NFPA Gasoline 1.4)	Upper Flammability Limit: (UFL):	ND (NFPA Gasoline 7.6)
Auto Ignition:	AP 480°F (250°C)	Burning Rate:	ND

*** Section 10 – CHEMICAL STABILITY & REACTIVITY INFORMATION ***

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

Keep away from ignition sources and high temperatures.

Hazardous Decomposition Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

SAFETY DATA SHEET

Material Name: Natural Gas Condensate

US GHS

*** Section 11 – TOXICOLOGICAL INFORMATION ***

Acute Toxicity

A: General Product Information

Harmful if swallowed.

B. Component Analysis – LD50/LC50

Octanes (111-65-9)

Inhalation LC50 rat = 118,000 mg/m³ / 4H

Heptanes (142-82-5)

Inhalation LC50 rat = 103,000 mg/m³ / 4H

Hexanes as n-Hexane (110-53-3)

Inhalation LC50 rat = 48,000 ppm / 4H

Pentanes as n-Pentane (109-66-0)

Inhalation LC50 rat = 364,000 mg/m³ / 4H

Butanes as n-Butane (106-97-8)

Inhalation LC50 rat 658,000 mg/l / 4H

Propane (74-98-6)

Inhalation LC50 Rat > 800,000 ppm / 0.25H

Ethane (74-84-0)

Inhalation LC50 Rat 658,000 mg/l / 4H

Benzene (71-43-2)

Inhalation LC50 Rat 44,700 mg/m³ /

Toluene (108-88-3)

Inhalation LD50 Rat 12/5 mg/l / 4H

m-, o-, p-Xylene (1330-20-7)

Inhalation LC50 Rat 5000 ppm / 4H

Potential Health Effects: Skin Corrosion Property / Stimulativeness

May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are exposed repeatedly.

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Material Name: Natural Gas Condensate

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Potential Health Effects: Eye Critical Damage / Stimulativeness

Contact with eyes may cause moderate irritation.

Potential Health Effects: Ingestion (swallowing)

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

Potential Health Effects: Inhalation (breathing)

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

Respiratory Organs Sensitization / Skin Sensitization

This product is not reported to have any skin sensitization effects.

Generative Cell Mutagenicity

May cause genetic defects. Some crude oils and crude oil fractions have been positive in mutagenicity studies.

Carcinogenicity

A: General Product Information

May cause cancer.

This product contains benzene, although at very low concentrations. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

Exposure to light hydrocarbons in the same boiling range as this product have been associated in animal studies with effects to the central nervous system, peripheral nervous system, liver, and kidneys. The significance of these animal models to predict similar human response is uncertain. Observing good work practices and personal hygiene procedures (Sections 7 and 8) can minimize potential risks to humans.

B: Component Carcinogenicity

Benzene (71-43-2)

ACGIH:	A1 - Confirmed Human Carcinogen
OSHA:	5 ppm STEL (Cancer hazard, Flammable, See 29 CFR 1910.1028, 15 min); 0.5 ppm Action Level; 1 ppm TWA
NIOSH:	potential occupational carcinogen
NTP:	Known Human Carcinogen (Select Carcinogen)

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IARC: Monograph 100F [in preparation]; Supplement 7 [1987]; Monograph 29 [1982] (Group 1 (carcinogenic to humans))

Reproductive Toxicity

This product is not reported to have any reproductive toxicity effects.

Specified Target Organ General Toxicity: Single Exposure

This product is not reported to have any specific target organ general toxicity single exposure effects.

Specified Target Organ General Toxicity: Repeated Exposure

May cause damage to organs (liver, kidneys, blood, nervous system and skin) through prolonged or repeated exposure.

Aspiration Respiratory Organs Hazard

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

*** Section 12 – ECOLOGICAL INFORMATION ***

Ecotoxicity

A: General Product Information

Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable under Federal and State regulations.

B: Component Analysis – Ecotoxicity – Aquatic Toxicity

Benzene (71-43-2)

Test and Species	Conditions
96 Hr LC50 Pimephales promelas	10.7-14.7 mg/L [flow-through]
96 Hr LC50 Oncorhynchus mykiss	5.3 mg/L [flow-through]
96 Hr LC50 Lepomis macrochirus	22.49 mg/L [static]
96 Hr LC50 Poecilia reticulata	28.6 mg/L [static]
96 Hr LC50 Pimephales promelas	22330-41160 µg/L [static]
96 Hr LC50 Lepomis macrochirus	70000-142000 µg/L [static]
72 Hr EC50 Pseudokirchneriella subcapitata	29 mg/L
48 Hr EC50 Daphnia magna	8.76 - 15.6 mg/L [static]
48 Hr EC50 Daphnia magna	10 mg/L

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Material Name: Natural Gas Condensate

US GHS

*** Section 14 – TRANSPORTATION INFORMATION ***

DOT Information

Shipping Name: Petroleum Products, n.o.s. (condensate)

UN #: 1268 **Hazard Class:** 3

Additional Info.: Dependent on the product's properties, the shipper may also elect to classify as Gasoline UN1203 or Petroleum Crude Oil UN1267 - reference 49 CFR 172.101 for further description (e.g., packing group determination).

Placard:



*** Section 15 – REGULATORY INFORMATION ***

Regulatory Information

Component Analysis

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65) and/or CERCLA (40 CFR 302.4).

Benzene (71-43-2)

SARA 313: 0.1% de minimis concentration

CERCLA: 10 lb final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 14, 1989 final rule); 4.54 kg final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 14, 1989 final rule)

SARA Section 311/312 – Hazard Classes

<u>Acute Health</u>	<u>Chronic Health</u>	<u>Fire</u>	<u>Sudden Release of Pressure</u>	<u>Reactive</u>
X	X	X	--	--

SARA SECTION 313 – SUPPLIER NOTIFICATION

This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372:

SAFETY DATA SHEET

Material Name: Natural Gas Condensate

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INGREDIENT NAME (CAS NUMBER)	CONCENTRATION PERCENT BY WEIGHT
Benzene (71-43-2)	<0.1 to 2

Canadian Regulatory Information

DSL/NDSL Inventory	This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the SDS contains all the information required by the Regulations.
Workplace Hazardous Materials Information System	B2 - Flammable Liquid D1A – Material Causing Immediate and Serious Toxic Effects - Very Toxic Material D2A: Material Causing Other Toxic Effects Very Toxic D2B - Material Causing Other Toxic Effects - Toxic Material

European Union Regulatory Information

Labeling	Product is dangerous as defined by the European Union Dangerous Substances / Preparations Directives. Contains: Low Boiling Point Naphtha
Symbol	F+ Extremely Flammable T Toxic N Dangerous for the Environment
Risk Phrases	R12-45-38-65-67-51/53 Extremely flammable. May cause cancer. Irritating to skin. Harmful: may cause lung damage if swallowed. Vapors may cause drowsiness and dizziness. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Safety Phrases	S16-53-45-2-23-24-29-43-62 Keep away from sources of ignition – No smoking. Avoid exposure – obtain special instructions before use. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Keep out of reach of children. Do not breathe vapor. Avoid contact with skin. Do not empty into drains. In case of fire use foam/dry powder/CO2. If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.

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Material Name: Natural Gas Condensate

US GHS

State Regulations

Component Analysis – State

The following components appear on one or more of the following state hazardous substances lists

Component	CAS	CA	MA	MN	NJ	PA	RI
Octanes	111-65-9	Yes	No	Yes	Yes	Yes	Yes
Heptanes	142-82-5	Yes	No	Yes	Yes	Yes	Yes
n-Hexane	110-54-3	Yes	Yes	Yes	Yes	Yes	Yes
n-Pentane	109-66-0	Yes	No	Yes	Yes	Yes	Yes
n-Butane	106-97-8	Yes	No	Yes	Yes	Yes	Yes
Propane	74-98-6	No	No	Yes	Yes	Yes	Yes
Ethane	78-84-0	No	No	Yes	Yes	Yes	No
Benzene	71-43-2	Yes	Yes	Yes	Yes	Yes	Yes
Toluene	108-88-3	Yes	Yes	Yes	Yes	Yes	Yes
m-, o-, p-Xylene	1330-20-7	Yes	Yes	Yes	Yes	Yes	Yes

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):

WARNING! This product contains a chemical known to the state of California to cause cancer.

WARNING! This product contains a chemical known to the state of California to cause Reproductive / developmental effects.

Component Analysis – WHMIS IDL

The following components are identified under the Canadian Hazardous Products Act

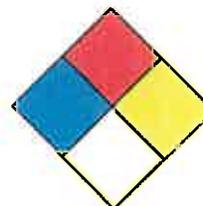
Ingredient Disclosure List:

Component	CAS #	Minimum Concentration
Benzene	71-43-2	0.1%

***** Section 16 – OTHER INFORMATION *****

NFPA® Hazard Rating

Health 1
Fire 4
Reactivity 0



HMIS® Hazard Rating

Health 1 Slight
Fire 4 Severe
Physical 0 Minimal
* Chronic

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Material Name: Natural Gas Condensate

US GHS

Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act; ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; NJTSR = New Jersey Trade Secret Registry.

Literature References

None

Other Information

The information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

Date of Preparation: January 29, 2014

Date of Last Revision: March 4, 2014

End of Sheet



SAFETY DATA SHEET

Material Name: Produced Water

US GHS

SYNONYMS: Produced Brine Water, Brine, Brine Water, Formation Water

***** Section 1 – PRODUCT AND COMPANY IDENTIFICATION *****

PRODUCT NAME: Produced Water

EMERGENCY PHONE: (800) 878-1373

PRODUCT CODES: Mixture

AFTER HOURS: (800) 878-1373

PRODUCER: Antero Resources

ADDRESS: 1615 Wynkoop Street
Denver, Colorado 80202

CHEMTREC PHONE: (800) 424-9300

***** Section 2 – HAZARDS IDENTIFICATION *****

GHS Classification:

Eye Irritant – Category 2A.

GHS LABEL ELEMENTS

Symbol(s)



Signal Word

Warning

Hazard Statements

Causes serious eye irritation

Precautionary Statements

Prevention

Wear protective gloves/protective clothing/eye protection/face protection.

Response

If on SKIN (or hair): Rinse skin with water / shower. Remove / Take off all contaminated clothing immediately.

SAFETY DATA SHEET

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If in EYES: Rinse cautiously with water for at least fifteen (15) minutes. Remove Contact Lenses, if present and easy to do. Continue rinsing.

If EYE irritation persists, get medical advice / attention.

Storage

Store in a secure area.

Disposal

Dispose of contents/containers in accordance with regulations.

*** Section 3 – COMPOSITION / INFORMATION ON INGREDIENTS ***

CAS #	Component	Percent
7732-18-5	Water	80
7647-14-5	Sodium Chloride	20

Because brine water is a natural product, composition can vary greatly.

*** Section 4 – FIRST AID MEASURES ***

First Aid: Eyes

Flush eyes with clean running water for at least fifteen (15) minutes. If irritation or redness develops from exposure, following flushing, seek medical attention.

First Aid: Skin

First aid is not required, normally. However, it is a good practice to wash any chemical from the skin.

First Aid: Ingestion (Swallowing)

First aid is not required, normally. If spontaneous vomiting occurs, lean the victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. If symptoms develop, seek medical attention.

First Aid: Inhalation (Breathing)

Remove person to fresh air. If person is not breathing, provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

SAFETY DATA SHEET

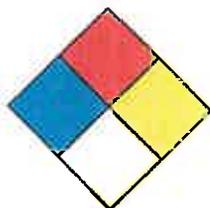
Material Name: Produced Water

US GHS

Most important symptoms and effects

None known or anticipated.

*** Section 5 – FIRE FIGHTING MEASURES ***



NFPA 704 Hazard Class

Health: 1 Flammability: 0 Instability: 0 (0=Minimal, 1=Slight, 2=Moderate, 3=Serious, 4=Severe)

General Fire Hazards

No fire hazards are expected.

General Fire Hazards

No unusual fire or explosion hazards are expected. If container is not properly cooled, it can rupture in the heat of a fire.

Extinguishing Media

The material is non-flammable. Use extinguishing agent suitable for the type of surrounding fire.

Unsuitable Extinguishing Media

None

Fire Fighting Equipment / Instructions

Small fires in the beginning stage may typically be extinguished using handheld portable fire extinguishers and other firefighting equipment. Isolate area around container involved in fire and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from the immediate hazard area if it can be done safely. Cool equipment exposed to fire with water, if it can be done safely.

Hazardous Combustion Products

None Anticipated. See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

SAFETY DATA SHEET

Material Name: Produced Water

US GHS

*** Section 6 – ACCIDENTAL RELEASE MEASURES ***

Recovery and Neutralization

Contain and stop the source of the spill, if safe to do so.

Materials and Methods for Clean-Up

Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios of this material. However, local conditions and regulations may influence or limit the choice of appropriate actions to be taken. See Section 13 for information on appropriate disposal.

Emergency Measures

The material is not considered hazardous. Nevertheless, evacuate nonessential personnel and secure the area. Stay upwind and uphill, if possible.

Personal Precautions and Protective Equipment

Stay upwind and away from the spill/release. Avoid direct contact with the material. For large spillages, notify persons downstream of the spill/release. Isolate the immediate hazard area and keep unauthorized personnel out. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

Environmental Precautions

Protect bodies of water by diking or absorbents, if possible. Do not flush down sewer or drainage systems. Use water sparingly to minimize environmental contamination and reduce disposal requirements. If a spill occurs on water, notify appropriate authorities and advise shipping of any hazard.

Prevention of Secondary Hazards

None

SAFETY DATA SHEET

Material Name: Produced Water

US GHS

*** Section 7 – HANDLING AND STORAGE ***

Handling Procedures

Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8).

Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29 CFR 1910.146. Do not wear contaminated clothing or shoes.

Storage Procedures

Keep container(s) tightly closed and properly labeled. Use and store this material in cool, dry, well ventilated areas. Store only in approved containers. Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage.

Incompatibilities

Keep away from excessive heat to prevent rupture of container.

*** Section 8 – EXPOSURE CONTROLS / PERSONAL PROTECTION ***

Component Exposure Limits

Water (7732-18-5)

ACGIH: Not listed

Sodium Chloride (7647-14-5)

ACGIH: Not listed

Engineering Measures

If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Personal Protective Equipment: Respiratory

Emergencies or conditions that could result in significant airborne exposures may require the use of NIOSH approved respiratory protection. An industrial hygienist or other appropriate health and safety professional should be consulted for specific guidance under these situations.

A respiratory protection program that meets or is equivalent to OSHA 29 CFR

SAFETY DATA SHEET

Material Name: Produced Water

US GHS

*** Section 10 – CHEMICAL STABILITY & REACTIVITY INFORMATION ***

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will react with alkali and alkaline metals to form flammable hydrogen gas.

Conditions to Avoid

Avoid contact with alkali metals (lithium, sodium, potassium), alkaline metals (beryllium, magnesium, calcium, strontium, and barium), and metallic hydrides like lithium aluminum hydride.

Hazardous Decomposition Products

Not anticipated under normal conditions of use.

Hazardous Polymerization

Not known to occur.

*** Section 11 – TOXICOLOGICAL INFORMATION ***

Acute Toxicity

A: General Product Information

Unlikely to be harmful.

B. Component Analysis – D50/LC50

Water (7732-18-5)

Oral LD50 Rat 90 g/kg

Sodium Chloride (7647-14-5)

Oral LD50 Rat 3 g/kg

Potential Health Effects: Skin Corrosion Property / Stimulativeness

May cause skin irritation with prolonged or repeated contact. Not expected to be a skin sensitizer.

Potential Health Effects: Eye Critical Damage / Stimulativeness

Contact with eyes may cause moderate irritation.

SAFETY DATA SHEET

Material Name: Produced Water

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Potential Health Effects: Ingestion

Ingestion may result in nausea, vomiting, diarrhea, abdominal cramps, and dehydration (thirst).

Potential Health Effects: Inhalation

No information available on the mixture. However, none of the components have been classified for respiratory sensitization (or are below the concentration threshold for classification).

Generative Cell Mutagenicity

Not expected to cause genetic effects.

Carcinogenicity

General Product Information

Not expected to cause cancer. This substance is not listed as a carcinogen by IARC, NTP or OSHA.

Reproductive Toxicity

This product is not reported to have any reproductive toxicity effects.

Specified Target Organ General Toxicity: Single Exposure

This product is not reported to have any specific target organ general toxicity single exposure effects.

Specified Target Organ General Toxicity: Repeated Exposure

This product is not reported to have any specific target organ general toxicity multiple exposure effects.

Aspiration Respiratory Organs Hazard

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

***** Section 12 – ECOLOGICAL INFORMATION *****

Ecotoxicity

A: General Product Information

Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable under Federal and State regulations.

SAFETY DATA SHEET

Material Name: Produced Water

US GHS

Persistence / Degradability

No information available

Bioaccumulation

No information available

Mobility in Soil

No information available

***** Section 13 – DISPOSAL CONSIDERATIONS *****

Waste Disposal Instructions

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment Recommendations.

Disposal of Contaminated Containers or Packaging

Recover or recycle if possible. It is the responsibility of the generator to determine the toxicity and physical properties of the material generated so as to properly classify the waste and ensure disposal methods comply with applicable regulations.

This material, if discarded as produced, is not a RCRA "listed" hazardous waste, and is not believed to exhibit characteristics of hazardous waste. Consult state and local regulations regarding the proper disposal of this material. Do not dispose of brine water by draining onto the ground. This will result in soil and groundwater contamination. Waste arising from spillage or tank cleaning should be disposed of in accordance with applicable regulations.

Container contents should be completely used and containers should be emptied prior to discard. Container rinsate should not be considered a RCRA hazardous waste but must be disposed of with care and in full compliance with federal, state and local regulations. Larger empty containers, such as drums, should be returned to the distributor or to a qualified drum reconditioner. To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

***** Section 14 – TRANSPORTATION INFORMATION *****

DOT Information

Shipping Description: Not Regulated

UN #: Not Regulated

SAFETY DATA SHEET

Material Name: Produced Water

US GHS

*** Section 15 – REGULATORY INFORMATION ***

CERCLA/SARA – Section 302 Extremely Hazardous Substances and TPQs (in pounds):

This material does not contain any chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372,

CERCLA/SARA – Section 313 and 40 CFR 372):

This material does not contain any chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372.

EPA (CERCLA) Reportable Quantity (in pounds):

This material does not contain any chemicals with CERCLA Reportable Quantities.

State Regulations

Component Analysis

The following components appear on one or more of the following state hazardous substances list.

California Proposition 65:

This material does not contain any chemicals that are known to the State of California to cause cancer, birth defects or other reproductive harm at concentrations that trigger the warning requirements of California Proposition 65.

National Chemical Inventories:

All components are either listed on the US TSCA Inventory, or are not regulated under TSCA.

U.S. Export control classification Number: EAR99.

*** Section 16 – OTHER INFORMATION ***

NFPA® Hazard Rating

Health 1
Fire 0
Reactivity 0

HMIS® Hazard Rating

Health 1 Slight
Fire 0 Minimal
Physical 0 Minimal

SAFETY DATA SHEET

Material Name: Produced Water

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Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act; ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; NJTSR = New Jersey Trade Secret Registry.

Literature References

None

Other Information

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Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

Date of Preparation: January 28, 2014

Date of Last Revision: March 4, 2014

End of Sheet

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

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

Sample: Sweeny No. 2H (Forest Well Pad)
 Separator Hydrocarbon Liquid
 Sampled @ 265 psig & 72 °F

Date Sampled: 09/20/13

Job Number: 35822.002

CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2186-M

COMPONENT	MOL %	LIQ VOL %	WT %
Nitrogen	0.016	0.004	0.005
Carbon Dioxide	0.000	0.000	0.000
Methane	6.555	2.493	1.079
Ethane	6.561	3.938	2.025
Propane	5.950	3.679	2.693
Isobutane	1.825	1.340	1.088
n-Butane	4.352	3.079	2.596
2,2 Dimethylpropane	0.094	0.081	0.070
Isopentane	2.955	2.425	2.188
n-Pentane	3.109	2.529	2.302
2,2 Dimethylbutane	0.233	0.218	0.206
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.371	0.341	0.328
2 Methylpentane	2.077	1.935	1.837
3 Methylpentane	1.448	1.327	1.281
n-Hexane	3.097	2.858	2.739
Heptanes Plus	<u>61.357</u>	<u>73.752</u>	<u>79.565</u>
Totals:	100.000	100.000	100.000

Characteristics of Heptanes Plus:

Specific Gravity ----- 0.7476 (Water=1)
 °API Gravity ----- 57.76 @ 60°F
 Molecular Weight ----- 126.4
 Vapor Volume ----- 18.78 CF/Gal
 Weight ----- 6.23 Lbs/Gal

Characteristics of Total Sample:

Specific Gravity ----- 0.6930 (Water=1)
 °API Gravity ----- 72.68 @ 60°F
 Molecular Weight ----- 97.4
 Vapor Volume ----- 22.57 CF/Gal
 Weight ----- 5.77 Lbs/Gal

Base Conditions: 14.850 PSI & 60 °F

Certified: FESCO, Ltd. - Alice, Texas

Analyst: XG
 Processor: JCdjv
 Cylinder ID: W-1002

David Dannhaus 361-661-7015

TANKS DATA INPUT REPORT

COMPONENT	Mol %	LiqVol %	Wt %
Carbon Dioxide	0.000	0.000	0.000
Nitrogen	0.016	0.004	0.005
Methane	6.555	2.493	1.079
Ethane	6.561	3.938	2.025
Propane	5.950	3.679	2.693
Isobutane	1.825	1.340	1.088
n-Butane	4.446	3.160	2.665
Isopentane	2.955	2.425	2.188
n-Pentane	3.109	2.529	2.302
Other C-6's	4.129	3.821	3.652
Heptanes	10.940	10.981	11.026
Octanes	16.323	17.415	18.233
Nonanes	9.129	11.236	11.888
Decanes Plus	20.852	30.674	34.062
Benzene	0.102	0.064	0.082
Toluene	0.662	0.498	0.626
E-Benzene	1.009	0.874	1.099
Xylenes	2.340	2.009	2.549
n-Hexane	3.097	2.858	2.739
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 -----	0.6930 (Water=1)
°API Gravity -----	72.68 @ 60°F
Molecular Weight -----	97.4
Vapor Volume -----	22.57 CF/Gal
Weight -----	5.77 Lbs/Gal

Characteristics of Decanes (C10) Plus:

Specific Gravity -----	0.7696 (Water=1)
Molecular Weight -----	159.2

Characteristics of Atmospheric Sample:

°API Gravity -----	61.33 @ 60°F
Reid Vapor Pressure (ASTM D-5191)-----	2.65 psi

QUALITY CONTROL CHECK			
	Sampling Conditions	Test Samples	
Cylinder Number	----	W-1002*	T-3030
Pressure, PSIG	265	232	231
Temperature, °F	72	70	70

* Sample used for analysis

TOTAL EXTENDED REPORT

COMPONENT	Mol %	LiqVol %	Wt %
Nitrogen	0.016	0.004	0.005
Carbon Dioxide	0.000	0.000	0.000
Methane	6.555	2.493	1.079
Ethane	6.561	3.938	2.025
Propane	5.950	3.679	2.693
Isobutane	1.825	1.340	1.088
n-Butane	4.352	3.079	2.596
2,2 Dimethylpropane	0.094	0.081	0.070
Isopentane	2.955	2.425	2.188
n-Pentane	3.109	2.529	2.302
2,2 Dimethylbutane	0.233	0.218	0.206
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.371	0.341	0.328
2 Methylpentane	2.077	1.935	1.837
3 Methylpentane	1.448	1.327	1.281
n-Hexane	3.097	2.858	2.739
Methylcyclopentane	0.667	0.530	0.576
Benzene	0.102	0.064	0.082
Cyclohexane	0.624	0.476	0.539
2-Methylhexane	2.715	2.833	2.792
3-Methylhexane	2.221	2.288	2.283
2,2,4 Trimethylpentane	0.000	0.000	0.000
Other C-7's	1.061	1.073	1.080
n-Heptane	3.652	3.781	3.755
Methylcyclohexane	3.129	2.823	3.153
Toluene	0.662	0.498	0.626
Other C-8's	9.393	10.222	10.624
n-Octane	3.801	4.370	4.455
E-Benzene	1.009	0.874	1.099
M & P Xylenes	0.720	0.627	0.784
O-Xylene	1.620	1.383	1.765
Other C-9's	6.182	7.514	8.009
n-Nonane	2.948	3.722	3.879
Other C-10's	6.082	8.124	8.817
n-decane	2.003	2.760	2.925
Undecanes(11)	5.075	6.955	7.656
Dodecanes(12)	2.899	4.291	4.789
Tridecanes(13)	1.869	2.966	3.356
Tetradecanes(14)	1.118	1.901	2.180
Pentadecanes(15)	0.652	1.188	1.379
Hexadecanes(16)	0.379	0.738	0.864
Heptadecanes(17)	0.250	0.514	0.607
Octadecanes(18)	0.184	0.399	0.475
Nonadecanes(19)	0.121	0.274	0.328
Eicosanes(20)	0.077	0.181	0.218
Heneicosanes(21)	0.047	0.115	0.140
Docosanes(22)	0.032	0.081	0.099
Tricosanes(23)	0.020	0.054	0.066
Tetracosanes(24)	0.015	0.040	0.050
Pentacosanes(25)	0.009	0.027	0.033
Hexacosanes(26)	0.006	0.017	0.021
Heptacosanes(27)	0.004	0.012	0.016
Octacosanes(28)	0.003	0.009	0.011
Nonacosanes(29)	0.002	0.008	0.010
Triacosanes(30)	0.002	0.005	0.007
Hentriacosanes Plus(31+)	<u>0.003</u>	<u>0.012</u>	<u>0.016</u>
Total	100.000	100.000	100.000



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

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

Date Sampled: 09/20/13

Date Analyzed: 10/02/13

Sample: Sweeny No. 2H (Forest Well Pad)

Job Number: J35822

FLASH LIBERATION OF HYDROCARBON LIQUID		
	Separator HC Liquid	Stock Tank
Pressure, psig	265	0
Temperature, °F	72	70
Gas Oil Ratio (1)	---	209
Gas Specific Gravity (2)	---	1.225
Separator Volume Factor (3)	1.1348	1.000

STOCK TANK FLUID PROPERTIES	
Shrinkage Recovery Factor (4)	0.8812
Oil API Gravity at 60 °F	61.33
Reid Vapor Pressure, psi (5)	2.65

Quality Control Check			
	Sampling Conditions	Test Samples	
Cylinder No.	---	W-1002*	T-3030
Pressure, psig	265	232	231
Temperature, °F	72	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: _____ M. G. _____

* Sample used for flash study

Base Conditions: 14.85 PSI & 60 °F

Certified: FESCO, Ltd. - Alice, Texas

David Dannhaus 361-661-7015

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

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

Sample: Sweeny No. 2H (Forest Well Pad)
 Gas Evolved from Hydrocarbon Liquid Flashed
 From 265 psig & 72 °F to 0 psig & 70 °F

Date Sampled: 09/20/13

Job Number: 35822.001

CHROMATOGRAPH EXTENDED ANALYSIS - SUMMATION REPORT

COMPONENT	MOL%	GPM
Hydrogen Sulfide*	< 0.001	
Nitrogen	0.042	
Carbon Dioxide	0.128	
Methane	33.021	
Ethane	28.999	7.817
Propane	19.505	5.416
Isobutane	3.942	1.300
n-Butane	7.039	2.237
2-2 Dimethylpropane	0.112	0.043
Isopentane	2.264	0.835
n-Pentane	1.810	0.661
Hexanes	1.577	0.655
Heptanes Plus	<u>1.561</u>	<u>0.703</u>
Totals	100.000	19.666

Computed Real Characteristics Of Heptanes Plus:

Specific Gravity ----- 3.626 (Air=1)
 Molecular Weight ----- 103.80
 Gross Heating Value ----- 5537 BTU/CF

Computed Real Characteristics Of Total Sample:

Specific Gravity ----- 1.225 (Air=1)
 Compressibility (Z) ----- 0.9884
 Molecular Weight ----- 35.07
 Gross Heating Value
 Dry Basis ----- 2069 BTU/CF
 Saturated Basis ----- 2033 BTU/CF

*Hydrogen Sulfide tested in laboratory by: Stained Tube Method (GPA 2377)
 Results: 0.063 Gr/100 CF, 1.0 PPMV or 0.0001 Mol %

Base Conditions: 14.850 PSI & 60 Deg F

Certified: FESCO, Ltd. - Alice, Texas

Analyst: MR
 Processor: ANB
 Cylinder ID: FL# 4 S

David Dannhaus 361-661-7015

**CHROMATOGRAPH EXTENDED ANALYSIS
TOTAL REPORT**

COMPONENT	MOL %	GPM	WT %
Hydrogen Sulfide*	< 0.001		< 0.001
Nitrogen	0.042		0.034
Carbon Dioxide	0.128		0.161
Methane	33.021		15.106
Ethane	28.999	7.817	24.867
Propane	19.505	5.416	24.528
Isobutane	3.942	1.300	6.534
n-Butane	7.039	2.237	11.667
2,2 Dimethylpropane	0.112	0.043	0.230
Isopentane	2.264	0.835	4.658
n-Pentane	1.810	0.661	3.724
2,2 Dimethylbutane	0.086	0.036	0.211
Cyclopentane	0.015	0.006	0.030
2,3 Dimethylbutane	0.102	0.042	0.251
2 Methylpentane	0.510	0.213	1.253
3 Methylpentane	0.317	0.130	0.779
n-Hexane	0.547	0.227	1.344
Methylcyclopentane	0.054	0.019	0.130
Benzene	0.020	0.006	0.045
Cyclohexane	0.072	0.025	0.173
2-Methylhexane	0.160	0.075	0.457
3-Methylhexane	0.158	0.073	0.452
2,2,4 Trimethylpentane	0.000	0.000	0.000
Other C7's	0.171	0.075	0.484
n-Heptane	0.197	0.092	0.563
Methylcyclohexane	0.165	0.067	0.462
Toluene	0.038	0.013	0.100
Other C8's	0.264	0.124	0.830
n-Octane	0.066	0.034	0.215
Ethylbenzene	0.003	0.001	0.009
M & P Xylenes	0.019	0.007	0.058
O-Xylene	0.003	0.001	0.009
Other C9's	0.106	0.054	0.382
n-Nonane	0.022	0.012	0.080
Other C10's	0.035	0.021	0.141
n-Decane	0.004	0.002	0.016
Undecanes (11)	<u>0.004</u>	<u>0.002</u>	<u>0.017</u>
Totals	100.000	19.666	100.000

Computed Real Characteristics Of Total Sample:

Specific Gravity -----	1.225	(Air=1)
Compressibility (Z) -----	0.9884	
Molecular Weight -----	35.07	
Gross Heating Value		
Dry Basis -----	2069	BTU/CF
Saturated Basis -----	2033	BTU/CF

**Antero Resources
Sweeny Unit 2H - Forest Pad**

Tag Name	Value	Units	Timestamp
Accumulated Gas Flow	733909.8	MCF	10/16/2013 16:11:13
Casing Pressure	504.96	PSIA	10/16/2013 17:05:05
Current Day Gas Flow	488.7	MCF	10/16/2013 16:11:13
Differential Pressure	7.88	inH2O	10/16/2013 16:11:13
Flow Rate	3760.18	MCF Per Day	10/16/2013 16:11:13
Pressure	209.88	PSIA	10/16/2013 16:11:13
Previous Day Energy	3854.11	MBTU	10/16/2013 16:11:15
Previous Day Gas Flow	3090.55	MCF	10/16/2013 16:11:15
Temperature	68.16	F	10/16/2013 16:11:13
Tubing Pressure	504.05	PSIA	10/16/2013 17:05:05
Daily AP	3.63	PSIA	10/16/2013 09:00:00
Daily DP	310	inH2O	10/16/2013 09:00:00
Daily Energy	3854.1	MBTU	10/16/2013 09:00:00
Daily Flow	3090.55	MCF	10/16/2013 09:00:00
Daily Tf	70.89	F	10/16/2013 09:00:00
Hourly AP	280.83	PSIA	10/16/2013 10:00:00
Hourly DP	4.8	Inches	10/16/2013 10:00:00
Hourly Energy	175.9	MBTU	10/16/2013 10:00:00
Hourly Flow Time	3600	Seconds	10/16/2013 10:00:00
Hourly Tf	69.9	F	10/16/2013 10:00:00
Hourly Volume	141.1	MCF	10/16/2013 10:00:00
Audited Accumulated Gas Volume		MCF	
Audited Casing Pressure	526	PSI	
Audited Gas Volume	3849.42	MCF	
Audited Oil Volume	183.7	Barrels	
Audited Tubing Pressure	465	PSI	
Audited Water Volume	0	Barrels	
Argon	0	%	10/16/2013 16:11:25
BTU	1247.06	BTU	10/16/2013 16:11:13
CO2	0.1467	%	10/16/2013 16:11:25
Carbon Monoxide	0	%	10/16/2013 16:11:25
Decane	0	%	10/16/2013 16:11:25
Ethane	14.1987	%	10/16/2013 16:11:25
Helium	0	%	10/16/2013 16:11:25
Heptane	0	%	10/16/2013 16:11:25
Hexane	0.5451	%	10/16/2013 16:11:25
Hydrogen	0	%	10/16/2013 16:11:25
Hydrogen Sulfide	0	%	10/16/2013 16:11:25
Iso-Butane	0.5666	%	10/16/2013 16:11:25
Iso-Pentane	0.3749	%	10/16/2013 16:11:25
Methane	77.6927	%	10/16/2013 16:11:25
N2	0.4946	%	10/16/2013 16:11:25
N-Butane	1.1838	%	10/16/2013 16:11:25
Nonane	0	%	10/16/2013 16:11:25
N-Pentane	0.2914	%	10/16/2013 16:11:25
Octane	0	%	10/16/2013 16:11:25
Oxygen	0.0117	%	10/16/2013 16:11:25
Plate Size	3.75	Inches	10/16/2013 16:11:20
Propane	4.4938	%	10/16/2013 16:11:25
SPG	0.7248		10/16/2013 16:11:13
Water	0	%	10/16/2013 16:11:25

Attachment O

Emissions Summary Sheet

Attachment C: G70-A Emissions Summary Sheet
Emission Points Data Summary Sheet

Emission Point ID No. (Must match Emission Units Table & Plot Plan)	Emission Point Type ¹	Emission Unit Vented Through This Point (Must match Emission Units Table & Plot Plan)		Air Pollution Control Device (Must match Emission Units Table & Plot Plan)	All Regulated Pollutants - Chemical Name/CALs (Speciate VOCs & HAPs)		Maximum Potential Uncontrolled Emissions ⁴		Maximum Potential Controlled Emissions ⁵		Emission Form or Phase (At what conditions, Solid, Liquid or Gas/Vapor)	Est. Method Used ⁶		
		ID No.	Source		ID No.	Device Type	lb/hr	ton/yr	lb/hr	ton/yr			lb/yr	ton/yr
EP-H001, EP-H002, EP-H003, EP-H004, EP-H005, EP-H006, EP-H007, EP-H008, EP-H009, EP-H010	Vertical Stack	H001, H002, H003, H004, H005, H006, H007, H008, H009, H010	Gas Production Unit Heater	N/A		CO (630280)	4.4254	1.0104	4.4254	4.4254	Gas/Vapor	MB		
						NOx (10102439)	5.2684	1.0208	5.2684	5.2684	Solid (for PM)	AP-42		
						Pb (7439-92-1)	2.63E-05	6.01E-06	2.63E-05	2.63E-05				
						CO2 Equivalent (95476,108383,106423)	6359.6384	1451.9722	6359.6384	6359.6384				
						SO2 (7446095)	0.0316	0.0072	0.0316	0.0316				
						PM, PM10, PM2.5	0.4004	0.0914	0.4004	0.4004				
						Benzene (71432)	2.53E-05	0.0001	2.53E-05	0.0001				
						Toluene (108883)	4.09E-05	0.0002	4.09E-05	0.0002				
						Hexane (110543)	0.0217	0.0048	0.0217	0.0048				
						Formaldehyde (50000)	0.0009	0.0040	0.0009	0.0040				
						2-Methylnaphthalene (91576)	2.89E-07	1.26E-06	2.89E-07	1.26E-06				
						Dichlorobenzene (95501)	1.44E-05	6.32E-05	1.44E-05	6.32E-05				
						Fluoranthene (206440)	3.61E-08	1.58E-07	3.61E-08	1.58E-07				
						Fluorene (86737)	3.37E-08	1.48E-07	3.37E-08	1.48E-07				
						Naphthalene (91203)	7.34E-06	3.21E-05	7.34E-06	3.21E-05				
						Phenanthrene (85018)	2.04E-07	8.96E-07	2.04E-07	8.96E-07				
						Total VOCs	0.0662	0.2898	0.0662	0.2898				
F001	n/a	F001	Fugitives	N/A		Benzene (71432)	0.0023	0.0103	0.0023	0.0103	Gas/Vapor	MB		
						Toluene (108883)	0.0180	0.0788	0.0180	0.0788				
						Ethyl benzene (100414)	0.0316	0.1384	0.0316	0.1384				
						Hexane (110543)	0.1996	0.8741	0.1996	0.8741				
						c,m,p-xylenes	0.0793	0.3209	0.0793	0.3209				
						(95476,108383,106423)	80.9358	354.4988	80.9358	354.4988				
						CO2 Equivalent (95476,108383,106423)	3.7870	16.5870	3.7870	16.5870				
						VOCs	0.0023	0.0103	0.0023	0.0103				
						TA's (benzene)	5.8898	2.2446	5.8898	2.2446				
						VOCs	0.0011	0.0004	0.0011	0.0004				
						toluene (108883)	0.0013	0.0005	0.0013	0.0005				
						Ethyl benzene (100414)	0.0103	0.0039	0.0103	0.0039				
						Hexane (110543)	0.0027	0.0010	0.0027	0.0010				
						c,m,p-xylenes (95476,108383,106423)	8.2963	7.2966	8.2963	7.2966				
						CO2 Equivalent (95476,108383,106423)	0.0002	0.0001	0.0002	0.0001				
						Benzene (71432)	0.0002	0.0001	0.0002	0.0001				
						TA's (benzene)	2.3768	6.8246	2.3768	6.8246				
EP-HR001	n/a	HR001	Haul Truck	N/A		PM, PM10, PM2.5	1.1884	3.4123	1.1884	3.4123	Solid	MB		

**Attachment O: G70-A Emissions Summary Sheet
Emission Points Data Summary Sheet**

Emission Point ID No. (Must match Emission Units Table & Plot Plan)	Emission Point Type ¹	Emission Unit Vented Through This Point (Must match Emission Units Table & Plot Plan)	Air Pollution Control Device (Must match Emission Units Table & Plot Plan)		All Regulated Pollutants - Chemical Name/CA/S (Speciate VOCs & HAPs)	Maximum Potential Uncontrolled Emissions ⁴		Maximum Potential Controlled Emissions ⁵		Emission Form or Phase (At exit conditions, Solid, Liquid or Gas/Vapor)	Est. Method Used ⁶
			ID No.	Device Type		lb/hr	ton/yr	lb/hr	ton/yr		
FLO01	n/a	TANKCOND001-010, TANKPW001-002, and FLO01	N/A	Flare	CD (651080)	0.00E+00	0.00E+00	0.4230	1.8529	Gas/Vapor/ Solid (for PM)	MB
					NOx (10102439)	0.00E+00	0.00E+00	0.5096	2.2058		
					Pb (7439-92-1)	0.00E+00	0.00E+00	2.52E-06	1.10E-05		
					CO2 Equivalent N2O (10024972), CO2 (1243899), CH4	2042.9285	8948.0269	1597.6243	6997.5944		
					SO2 (7446095)	0.00E+00	0.00E+00	7.56E-06	3.31E-05		
					PM, PM10, PM2.5	0.00E+00	0.00E+00	0.0383	0.1676		
					Benzene (71432)	0.2313	1.0131	0.0046	0.0203		
					Toluene (108883)	0.5201	2.2781	0.0104	0.0456		
					ethyl benzene (100414)	0.3062	1.3412	0.0061	0.0258		
					hexane (110543)	7.7642	34.0070	0.1553	0.6801		
					o,m,p-xylenes (95476,108383,106423)	0.5511	2.4140	0.0110	0.0483		
					Formaldehyde (50000)	0.00E+00	0.00E+00	9.45E-07	4.14E-06		
					VOCs	294.9766	1291.9975	5.8996	25.8403		
					toluene (108883)	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
					ethyl benzene (100414)	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
					hexane (110543)	0.0136	0.0596	0.0136	0.0596		
					o,m,p-xylenes (95476,108383,106423)	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
					CO2 Equivalent CO2 (1243899), CH4	9.0327	39.5633	9.0327	39.5633		
					VOCs	0.1145	0.5015	0.1145	0.5015		
					TAPs (benzene)	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
					CO (630080)	5.6445	24.7228	5.6445	24.7228		
					NOx (10102439)	0.3158	1.3831	0.3158	1.3831		
					CO2 Equivalent N2O (10024972), CO2 (1243899), CH4 (74828)	27.7765	121.6612	27.7765	121.6612		
					SO2 (7446095)	0.0001	0.0006	0.0001	0.0006		
					PM, PM10, PM2.5	0.0023	0.0100	0.0023	0.0100		
					TAPs Benzene (71432)	0.0004	0.0017	0.0004	0.0017		
					Toluene (108883)	0.0001	0.0006	0.0001	0.0006		
					TAPs Formaldehyde (50000)	0.0049	0.0215	0.0049	0.0215		
					Ethyl Benzene (100414)	0.0000	0.0000	0.0000	0.0000		
					Naphthalene (91203)	0.0000	0.0001	0.0000	0.0001		
					o,m,p-xylenes (95476,108383,106423)	0.0000	0.0002	0.0000	0.0002		
					Total VOCs	0.0071	0.0311	0.0071	0.0311		
EP-PCV	valve	PCV	N/A	Pneumatic CV						Gas/Vapor	MB
EP-ENG001	Vertical Stack	ENG001	N/A	Compressor Engine						Gas/Vapor/ Solid (for PM)	MB

Attachment C/O: G70-A Emissions Summary Sheet
Fugitive Emissions Data Summary Sheet

FUGITIVE EMISSIONS SUMMARY	All Regulated Pollutants Chemical Name/CAS 1	Maximum Potential Uncontrolled Emissions 2		Maximum Potential Controlled Emissions 3		Est. Method Used 4
		lb/hr	ton/yr	lb/hr	ton/yr	
Haul Road/Road Dust Emissions	n/a					
Paved Haul Roads						
Unpaved Haul Roads						
Loading/Unloading Operations	PM, PM10, PM2.5	2.3768	6.8246	1.1884	3.4123	MB
	VOCs	5.8898	2.2446	5.8898	2.2446	MB
	toluene (108883)	0.0011	0.0004	0.0011	0.0004	
	ethyl benzene (100414)	0.0013	0.0005	0.0013	0.0005	
	hexane (110543)	0.0103	0.0039	0.0103	0.0039	
	o,m,p-xylenes (95476,108383,106423)	0.0027	0.0010	0.0027	0.0010	
	CO2 Equivalent	8.2963	7.2966	8.2963	7.2966	
	CO2 (124389), CH4	0.0002	0.0001	0.0002	0.0001	
	benzene (71432)	0.0002	0.0001	0.0002	0.0001	
	TAPs (benzene)					
	benzene (71432)		0.0103		0.0103	MB
	Toluene (108883)		0.0788		0.0788	
	Ethyl benzene (100414)		0.1384		0.1384	
	hexane (110543)		0.8741		0.8741	
Equipment Leaks (Components)	o,m,p-xylenes (95476,108383,106423)	Does not apply	0.3209	Does not apply	0.3209	
	CO2 Equivalent		354.4988		354.4988	
	CO2 (124389), CH4		16.5870		16.5870	
	VOCs					
	TAPs (benzene)		0.0103		0.0103	
	toluene (108883)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	ethyl benzene (100414)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	hexane (110543)	0.0136	0.0596	0.0136	0.0596	
	o,m,p-xylenes (95476,108383,106423)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	CO2 Equivalent	9.0327	39.5633	9.0327	39.5633	
	CO2 (124389), CH4					
	VOCs	0.1145	0.5015	0.1145	0.5015	
	TAPs (benzene)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	Equipment Leaks (PCVs)					MB

1 List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS2, VOCs, H2S, Inorganics, Lead, Organics, O3, NO, NO2, SO2, SO3, all applicable Greenhouse Gases (including CO2 and methane), etc. DO NOT LIST H2, H2O, N2, O2, and Noble Gases.

2 Give rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

3 Give rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

4 Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify).

Attachment P

**Other Supporting Documentation
(Engine EPA's Certificate of Conformity and Technical Information)**

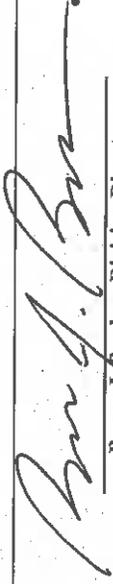


UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
2013 MODEL YEAR
CERTIFICATE OF CONFORMITY
WITH THE CLEAN AIR ACT OF 1990

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 + NOx (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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4-10) MASS ELASTIC SYSTEM

5. FUEL SYSTEM AND FUEL DIAGRAM

Specifications and dimensions are subject to change without prior notice.

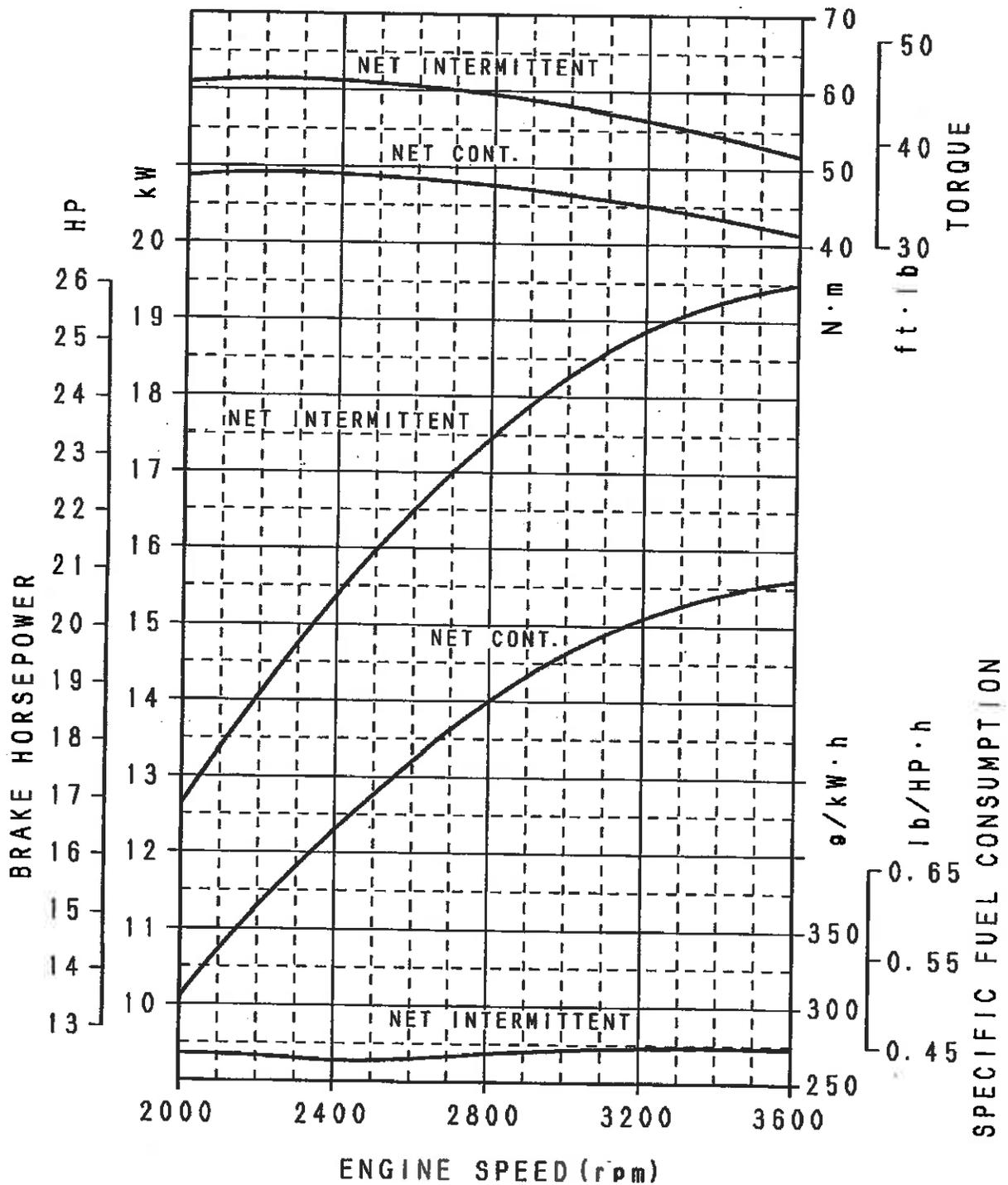
1. GENERAL SPECIFICATIONS

ITEM	UNIT	SPECIFICATIONS
Engine model		DG972-SAEH-S1
Type		Vertical, In line, 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 (SAE J1349)	Nm(ft-lb) /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

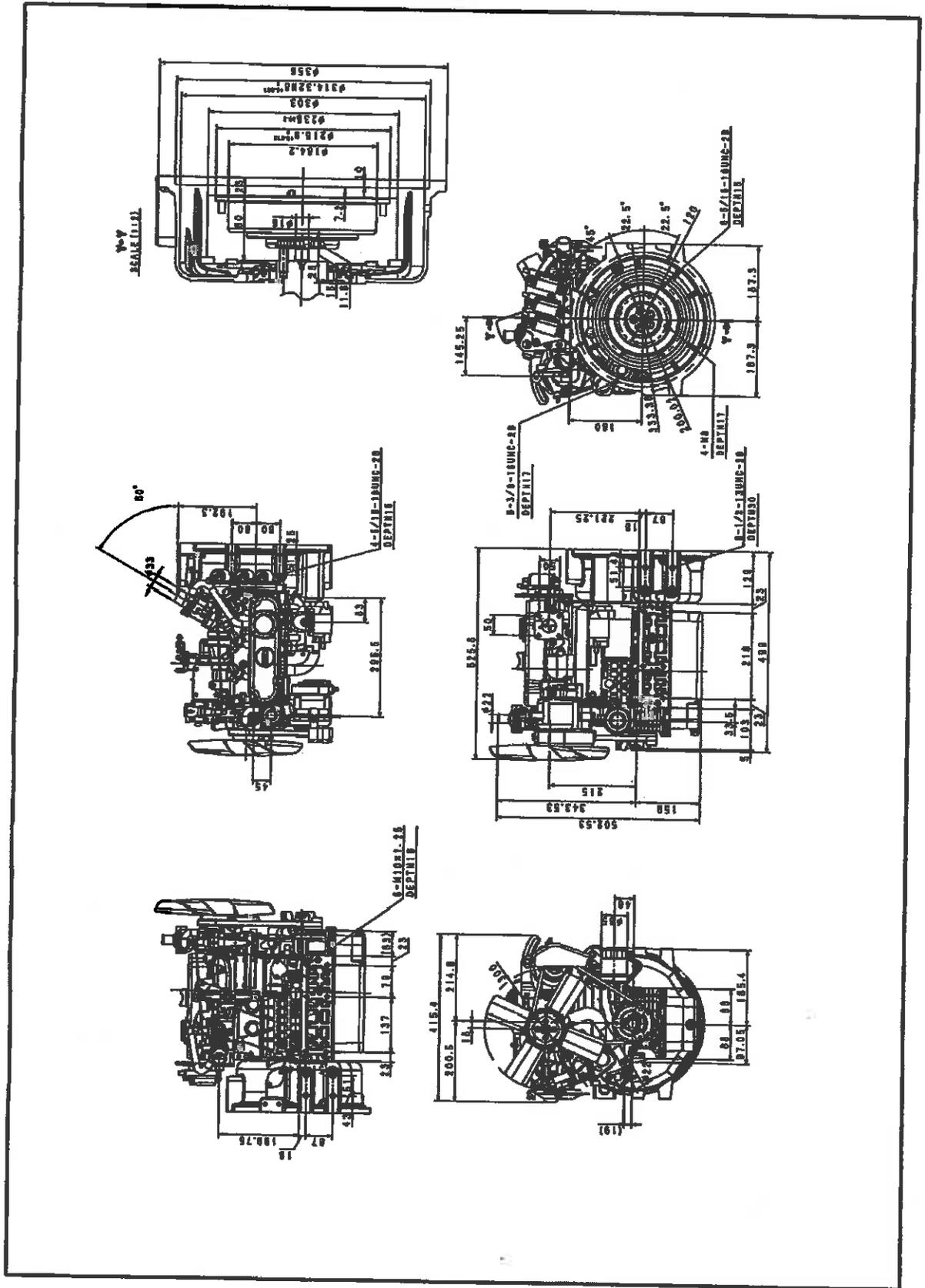
2. PERFORMANCE CURVES

DG972 PERFORMANCE CURVES

Higher calorific value : 11000kcal/m³ (1236BTU/ft³)



3. DIMENSIONS



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

1. Conversion rates
 $1\text{kW}=1.35962\text{PS}=1.34048\text{HP}$
 $1\text{PS}=0.7355\text{kW}=0.985925\text{HP}$
 $1\text{HP}=0.7457\text{kW}=1.01428\text{PS}$
2. Fuel detail
 Japanese standard gas
 higher calorific value : 11000kcal/m^3 (1236BTU/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

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

4-3) NOISE LEVEL

Load x rpm	Unit	Sound pressure at 1m(3.3ft)
0/4 x 3850	dB(A)	90.0
4/4 x 3850 15.6kW (20.9HP)	dB(A)	92.0
0/4 x 1500	dB(A)	72.0

These data show the average noise level at four points.

Note

1. 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 ³ /h	44.44	53.33	62.22	71.11	80.00
in ³ /sec	753	904	1055	1205	1356
ft ³ /min	26.13	31.35	36.58	41.80	47.03

Combustion air requirements calculating formula

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

Q₁: Amount of intake air (m³/min)

η: Intake efficiency

Vh: 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 ³ /h	2056	2654	2969	3002	2753
in ³ /sec	34859	44984	50327	50888	46667
ft ³ /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 ³ /h	2100.4	2707.3	3031.2	3073.1	2833.0
in ³ /sec	35612	45888	51382	52093	48023
ft ³ /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 ³ /h	127.67	153.19	178.73	204.26	229.80
in ³ /sec	2164	2597	3030	3462	3895
ft ³ /min	75.05	90.06	105.07	120.08	135.09

Note

- Conversion rates
 - 1L=61.0237in³=0.035315ft³
 - 1ft³=28.3168L
 - 1L/sec=3.6m³/h=127.133ft³/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

$$H_o = H_u \cdot N_e \cdot b_e \cdot i$$

H_o: Heat rejection to cooling water

H_u: Fuel low calorific value

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

N_e: Brake horse power

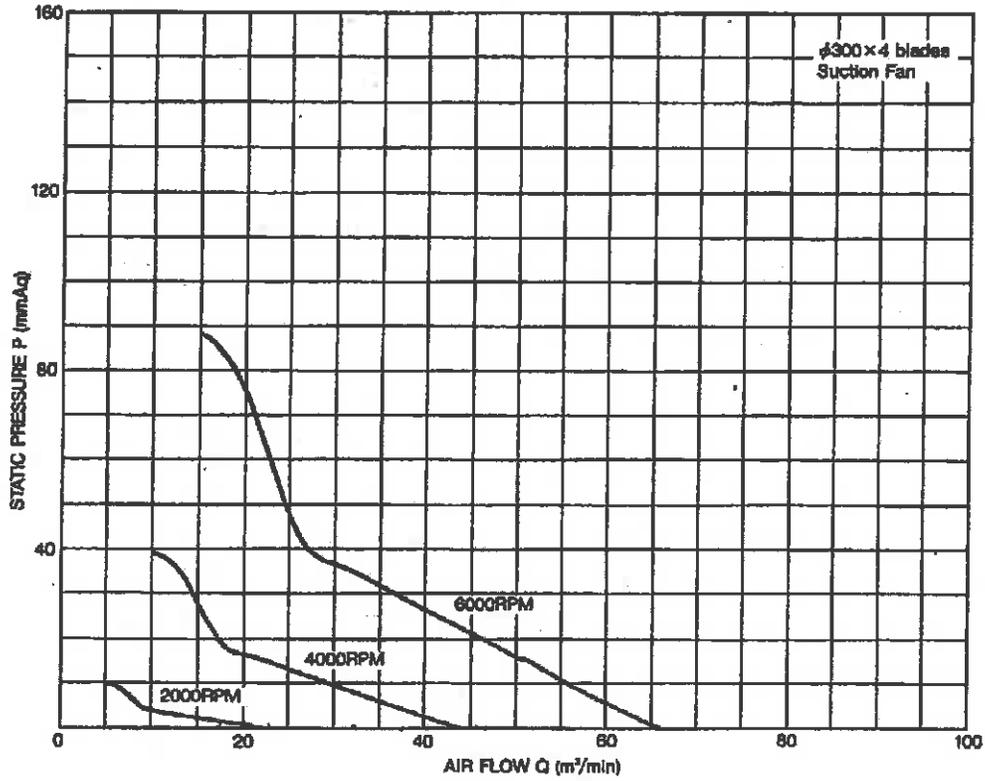
B_e: Specific fuel consumption

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

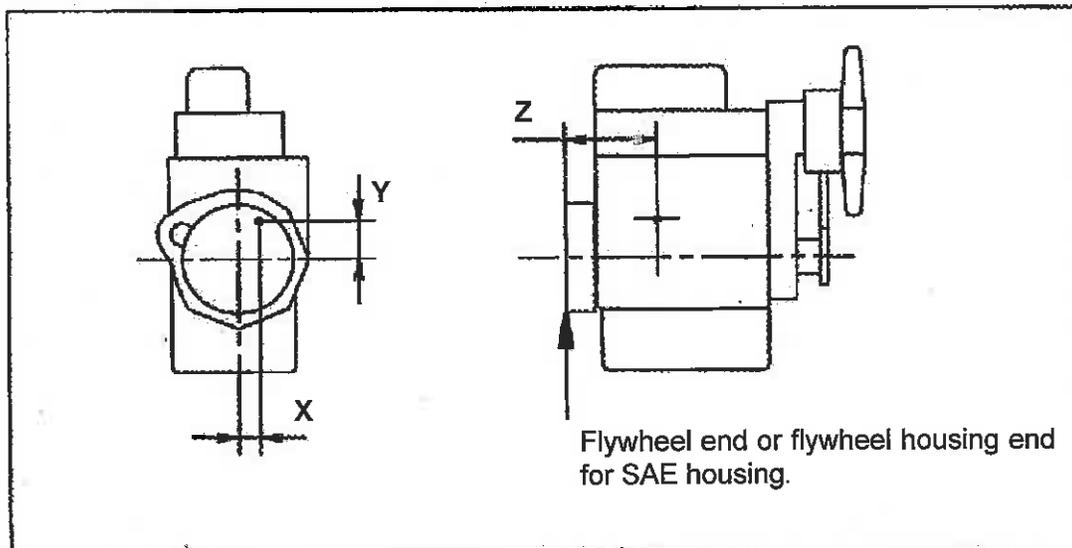
Model	Dry weight kg (lb)	Center of gravity		
		X mm (in)	Y mm (in)	Z mm (in)
WG/DF972	72.0 (159)	-25.5 (-1.00)	73.3 (2.89)	179.5 (7.07)

2. With SAE flywheel and flywheel housing

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

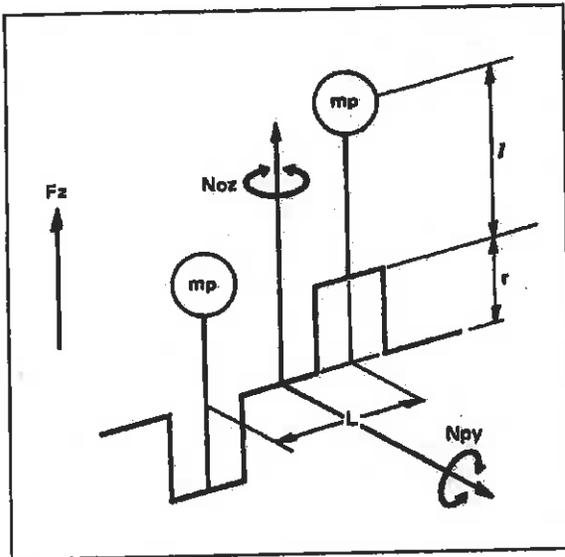
Note

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



4-9) UNBALANCED FORCES OF ENGINES

1. Base data



Fz: Unbalanced inertia force
Npy, Noz: Unbalanced inertia couple
mp: Reciprocating mass
r: Crank radius
l: Center distance of connecting rod
L: Cylinder distance
 ω : Angular velocity

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

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

2. Unbalanced inertia force and couple

($\times \omega^2$)

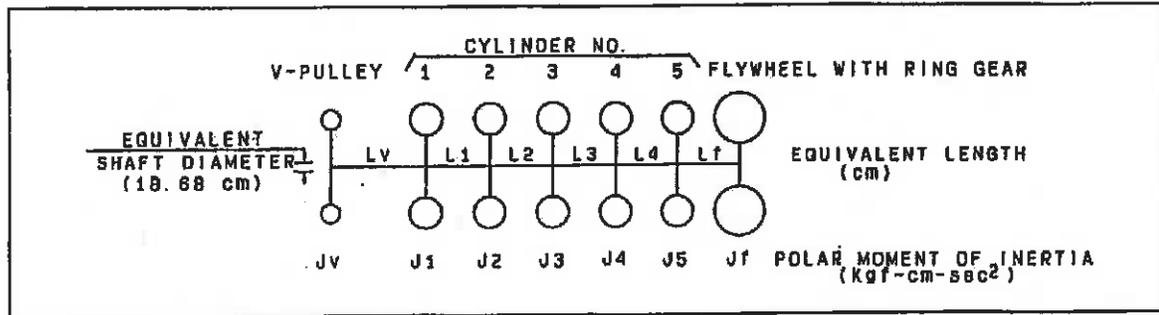
Model	No. of Cylinder	Cylinder Bore	Order	Fz	Npy	Noz
WG/DF/DG 972	3	74.5mm	1	0	0.000096	0.000096
			2	0	0.000072	0

▼An example of calculation

Calculation condition	ω^2	Fz, Npy, Noz		
		Order	Calculation	
Engine model DG972 Engine speed 3600(rpm)	$[2 \times \pi \times 3600/60]^2$ $= 142122$	Fz	1	0
			2	0
		Npy	1	$0.000096 \times 142122 = 13.6\text{kg}$
			2	$0.000072 \times 142122 = 10.2\text{kg}$
		Noz	1	$0.000096 \times 142122 = 13.6\text{kg}$
			2	0

4-10) MASS ELASTIC SYSTEM

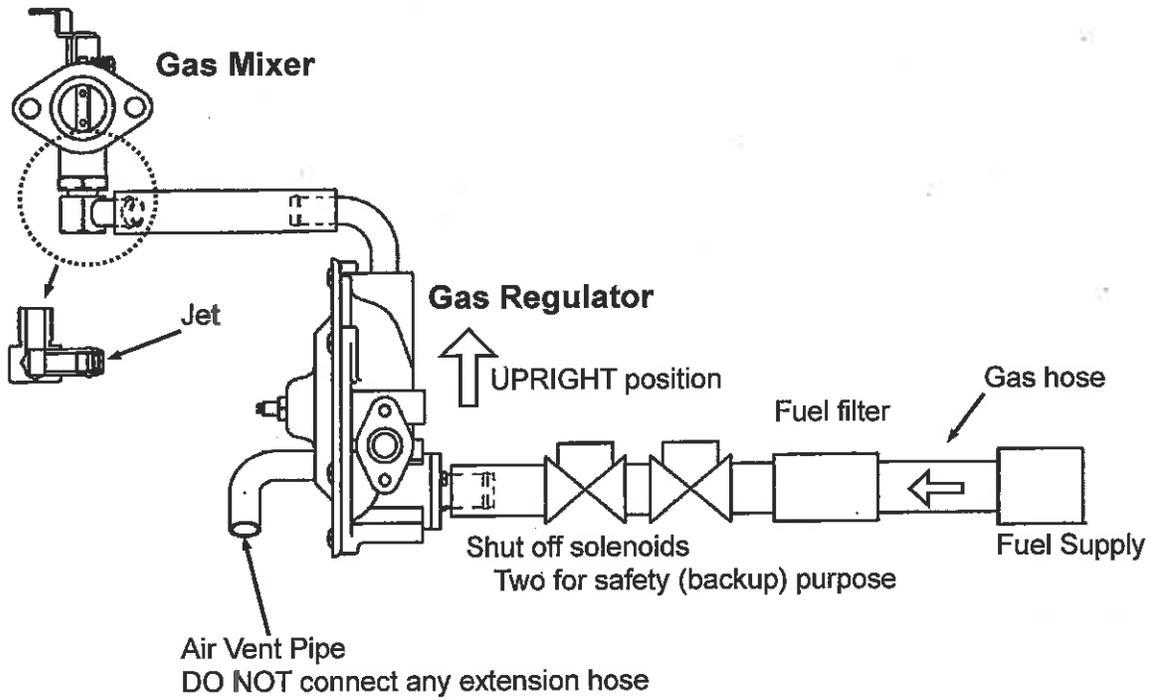
Equivalent torsional vibration data



MODEL	EQUIVALENT LENGTH (cm)				POLAR MOMENT OF INERTIA (kgfcm-sec ²)				
	LV	L1	L2	Lf	JV	J1	J2	J3	Jf
DG972 -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 diagram





NATURAL GAS ENGINE

KUBOTA DG SERIES (3-cylinder)

DG972-E2



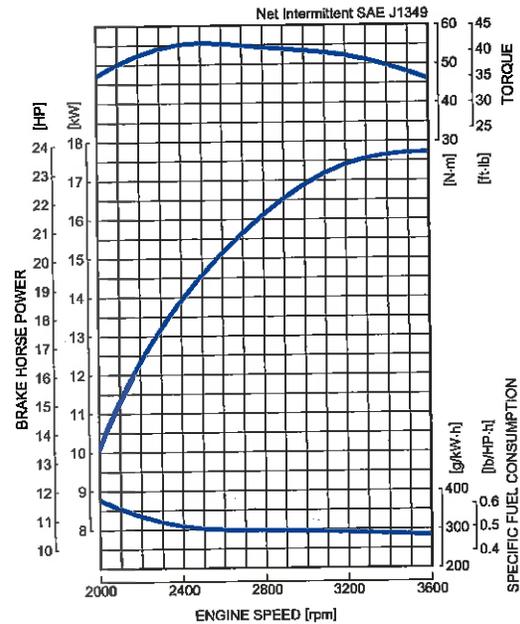
RATED POWER

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	DG972-E2	
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: 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)* ¹ / 452.5 (17.81)* ²
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)* ¹ / 95.4 (210.3)* ²

*Specification is subject to change without notice.

*Output: Net Intermittent SAE J1349

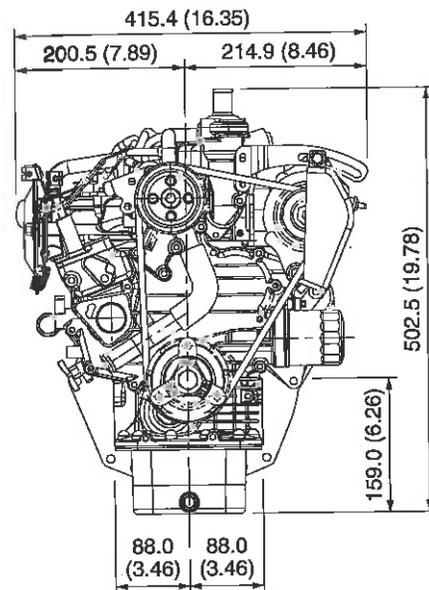
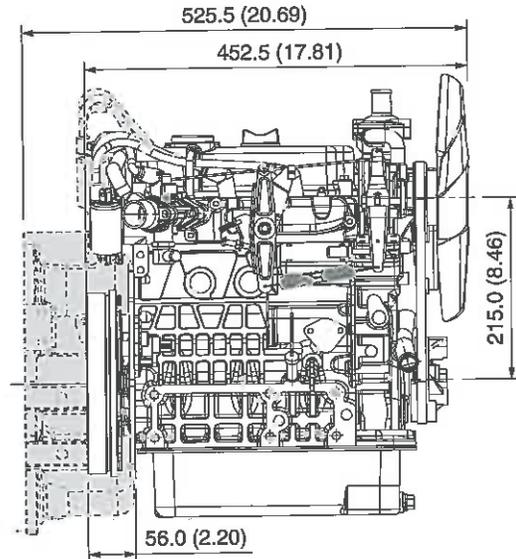
*Dry weight is according to Kubota's standard specification.

When specification varies, the weight will vary accordingly.

*¹ with SAE Flywheel and Housing

*² with Rear End Plate

DIMENSIONS



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