July 12, 2016 Reference No. 082715

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

Dear Ms. Beverly McKeone:

Re: General Permit Registration G70-C Modification Application
Dotson Holland Well Pad
Antero Resources Corporation

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

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

1. Decrease in production.
2. Addition of two Cimarron enclosed combustors
3. Addition of 8 line heaters

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

Enclosed are the following documents:

- Original copy of the G70-C General Permit Modification Application.
- Two CD copies of the G70-C General Permit Modification Application.
- The application fee with check no. 449977 in the amount of $1,500.00.

GHD Services Inc.
6320 Rothway Suite 100 Houston Texas 77040 USA
T 713 734 3090 **F** 713 734 3391 **W** www.ghd.com

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

Sincerely,

GHD Services Inc.

Manuel Bautista

MB/ma/259

Encl.

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

General Permit G70-C Modification Application

Decrease in production and the addition of eight line heaters and two Cimarron enclosed combustors.

Dotson Holland Well Pad

Antero Resources Corporation

GHD Services Inc.
6320 Rothway Suite 100 Houston Texas 77040
082715 | Report No 259 | July 2016

Table of Contents

west virginia department of environmental protection

Division of Air Quality
601 57th Street SE
Charleston, WV 25304
Phone (304) 926-0475
Fax (304) 926-0479
www.dep.wv.gov

G70-C GENERAL PERMIT REGISTRATION APPLICATION

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

☐CONSTRUCTION
☒MODIFICATION
☐RELOCATION
☐CLASS I ADMINISTRATIVE UPDATE
☐CLASS II ADMINISTRATIVE UPDATE

SECTION 1. GENERAL INFORMATION

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

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

Applicant's Mailing Address: 1615 Wynkoop Street

City: Denver	State: CO	ZIP Code: 80202

Facility Name: Dotson Holland Well Pad

Operating Site Physical Address: 138 Rocket Dr.

City: Greenwood	Zip Code: 26415	County: Doddridge

Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits):
Latitude: 39.27338
Longitude: -80.87378

SIC Code: 1311 NAICS Code: 211111	DAQ Facility ID No. (For existing facilities) 017-00106

CERTIFICATION OF INFORMATION

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

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

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

Responsible Official Signature:_____
Name and Title: Phone: Fax:
Email: Date:

If applicable:
Authorized Representative Signature: Barry Schatz
Name and Title: Barry Schatz/ Senior Environmental & Regulatory Manager Phone: 303-357-7276 Fax: 303-357-7315
Email: bschatz@anteroresources.com Date: 7/12/2016

If applicable:
Environmental Contact
Name and Title: Phone: Fax:
Email: Date:

OPERATING SITE INFORMATION	
Briefly describe the proposed new operation and/or any change(s) to the facility: Decrease in production and the addition of 8 line heaters and 2 Cimarron enclosed combustors.	
Directions to the facility: From Clarksburg, Get on US-50 W in North Urban from Traders Ave, S Chestnut St and Broaddus Ave. Head to US-50 for approximately 28.4 miles. Turn left onto Old U.S 50 E/Sunnyside Rd for 3.4 miles. Make a right onto Co Rte. 36/4 for 0.7 mile. Haul road entrance for Dotson Holland Pad will be on the right.	
ATTACHMENTS AND SUPPORTING DOCUMENTS	
I have enclosed the following required documents:	
Check payable to WVDEP – Division of Air Quality with the appropriate application fee (per 45CSR13 and 45CSR22). ☒ Check attached to front of application. ☐ I wish to pay by electronic transfer. Contact for payment (incl. name and email address): ☐ I wish to pay by credit card. Contact for payment (incl. name and email address): ☒$500 (Construction, Modification, and Relocation) ☐$300 (Class II Administrative Update) ☒$1,000 NSPS fee for 40 CFR60, Subpart IIII, JJJJ and/or OOOO [1] ☐$2,500 NESHAP fee for 40 CFR63, Subpart ZZZZ and/or HH [2] [1] Only one NSPS fee will apply. [2] Only one NESHAP fee will apply. The Subpart ZZZZ NESHAP fee will be waived for new engines that satisfy requirements by complying with NSPS, Subparts IIII and/or JJJJ. *NSPS and NESHAP fees apply to new construction or if the source is being modified.*	
☒ Responsible Official or Authorized Representative Signature (if applicable)	
☒ Single Source Determination Form **(must be completed in its entirety)** – Attachment A	
☐ Siting Criteria Waiver (if applicable) – Attachment B	☒ Current Business Certificate – Attachment C
☒ Process Flow Diagram – Attachment D	☒ Process Description – Attachment E
☒ Plot Plan – Attachment F	☒ Area Map – Attachment G
☒ G70-C Section Applicability Form – Attachment H	☒ Emission Units/ERD Table – Attachment I
☒ Fugitive Emissions Summary Sheet – Attachment J	
☒ Gas Well Affected Facility Data Sheet (if applicable) – Attachment K	
☒ Storage Vessel(s) Data Sheet (include gas sample data, USEPA Tanks, simulation software (e.g. ProMax, E&P Tanks, HYSYS, etc.), etc. where applicable) – Attachment L	
☒ Natural Gas Fired Fuel Burning Unit(s) Data Sheet (GPUs, Heater Treaters, In-Line Heaters if applicable) – Attachment M	
☒ Internal Combustion Engine Data Sheet(s) (include manufacturer performance data sheet(s) if applicable) – Attachment N	
☒ Tanker Truck Loading Data Sheet (if applicable) – Attachment O	
☐ Glycol Dehydration Unit Data Sheet(s) (include wet gas analysis, GRI- GLYCalc™ input and output reports and information on reboiler if applicable) – Attachment P	
☐ Pneumatic Controllers Data Sheet – Attachment Q	
☒ Air Pollution Control Device/Emission Reduction Device(s) Sheet(s) (include manufacturer performance data sheet(s) if applicable) – Attachment R	
☒ Emission Calculations (please be specific and include all calculation methodologies used) – Attachment S	
☒ Facility-wide Emission Summary Sheet(s) – Attachment T	
☒ Class I Legal Advertisement – Attachment U	
☒ One (1) paper copy and two (2) copies of CD or DVD with pdf copy of application and attachments	

GHD SERVICES INC.

▼ PLEASE DETACH AND RETAIN FOR YOUR RECORDS ▼

INVOICE NUMBER	DATE		VOUCHER NO.	AMOUNT
Account Number: CR61716	6/17/2016	40WVDEPAQ 401010379	449977	1,500.00

TOTAL: 1,500.00

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

GHD SERVICES INC.
2055 NIAGARA FALLS BLVD, SUITE 3
NIAGARA FALLS, NY 14304

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

6/17/2016 NO. 449977

PAY **********1,500 DOLLARS AND **********00 CENTS $**********1,500.00

TO THE ORDER OF

West Virginia Dept of Environmental
Protection - Division Air Quality
601 57th Street SE
Charleston,, WV 25304 US

GHD SERVICES INC.

AUTHORIZED SIGNATURES

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

⑈449977⑈ ⑆221370632⑆6100000011891O⑈

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

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

DATE: January 23, 2015

ATTN.: Director

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

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

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

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

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

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

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

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

Secretary

Name of Corporation or business entity

Attachment A
Single Source Determination Form

ATTACHMENT A - SINGLE SOURCE DETERMINATION FORM

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

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

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

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

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

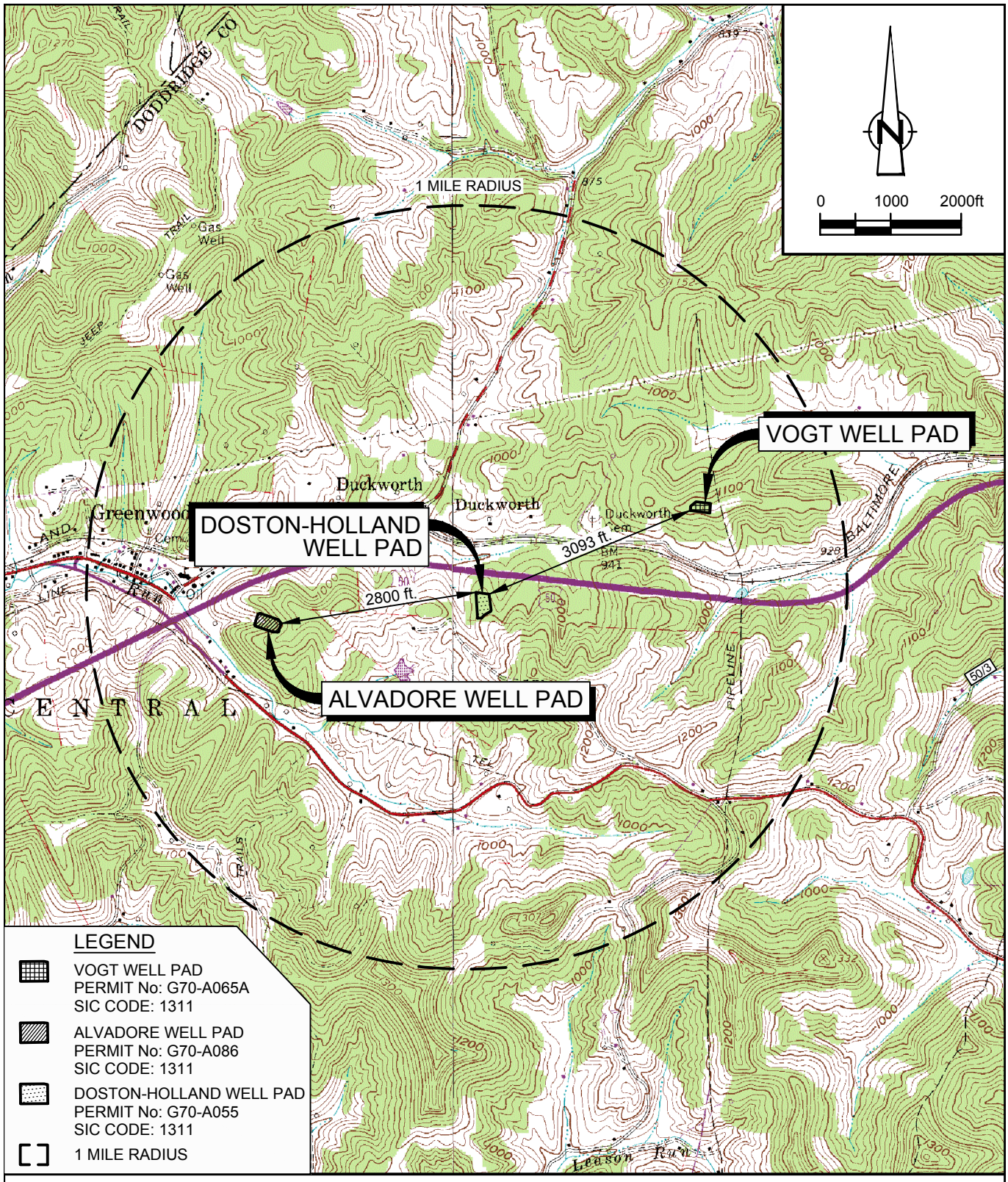
The Dotson Holland Well Pad calculation of potential to emit included all the emissions sources that belong to the same industrial grouping, are located on contiguous or adjacent properties, and are under the control of the same person. The nearest emission source that belongs to the same industrial grouping and under the control of the same person but not located on contiguous or adjacent property is the Alvadore Well Pad. This well pad operates independently and is approximately 0.53 mile west of the facility. There is one other nearby source, Vogt Well Pad that belongs to the same industrial grouping and is under the same control but not located on contiguous or adjacent property. This well pad is located approximately 0.58 mile northeast of Dotson Holland Well Pad and operates completely independent.

ATTACHMENT A - SINGLE SOURCE DETERMINATION FORM

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

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

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



SOURCE: USGS QUADRANGLE MAP;
WEST UNION, WEST VIRGINIA
PENNSBORO, WEST VIRGINIA

SITE COORDINATES: LAT: 39.273384, LONG: -80.873788

GHD

Attachment A

SINGLE SOURCE DETERMINATION
DOTSON HOLLAND WELL PAD
ANTERO RESOURCES
Doddridge County, West Virginia

82715-00(259)GN-WA001 JUN 21, 2016

Attachment B
Siting Criteria Waiver

Attachment B

Siting Waiver
Dotson Holland Well Pad
Antero Resources Corporation
Doddridge County, West Virginia

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

Attachment C
Current Business Certificate

State of West Virginia

Certificate

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

ANTERO RESOURCES CORPORATION

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

Therefore, I issue this

CERTIFICATE OF AMENDMENT TO CERTIFICATE OF AUTHORITY

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

Natalie E Tennant

Secretary of State

FILED

JUN 10 2013

IN THE OFFICE OF SECRETARY OF STATE

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

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

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

APPLICATION FOR AMENDED CERTIFICATE OF AUTHORITY

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

1. Name under which the corporation was authorized to transact business in WV: Antero Resources Appalachian Corporation

2. Date Certificate of Authority was issued in West Virginia: 6/25/2008

3. Corporate name has been changed to: Antero Resources Corporation
(Attach one Certified Copy of Name Change as filed in home State of incorporation.)

4. Name the corporation elects to use in WV: Antero Resources Corporation
(due to home state name not being available)

5. Other amendments:
(attach additional pages if necessary)

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

Alvyn A. Schopp — Contact Name
(303) 357-7310 — Phone Number

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

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

Signature: Alvyn A. Schopp **Date:** June 10, 2013

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

Delaware

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.

Jeffrey W. Bullock, Secretary of State

4520810 8100

130754186

AUTHENTICATION: 0496546

DATE: 06-10-13

You may verify this certificate online at corp.delaware.gov/authver.shtml

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:

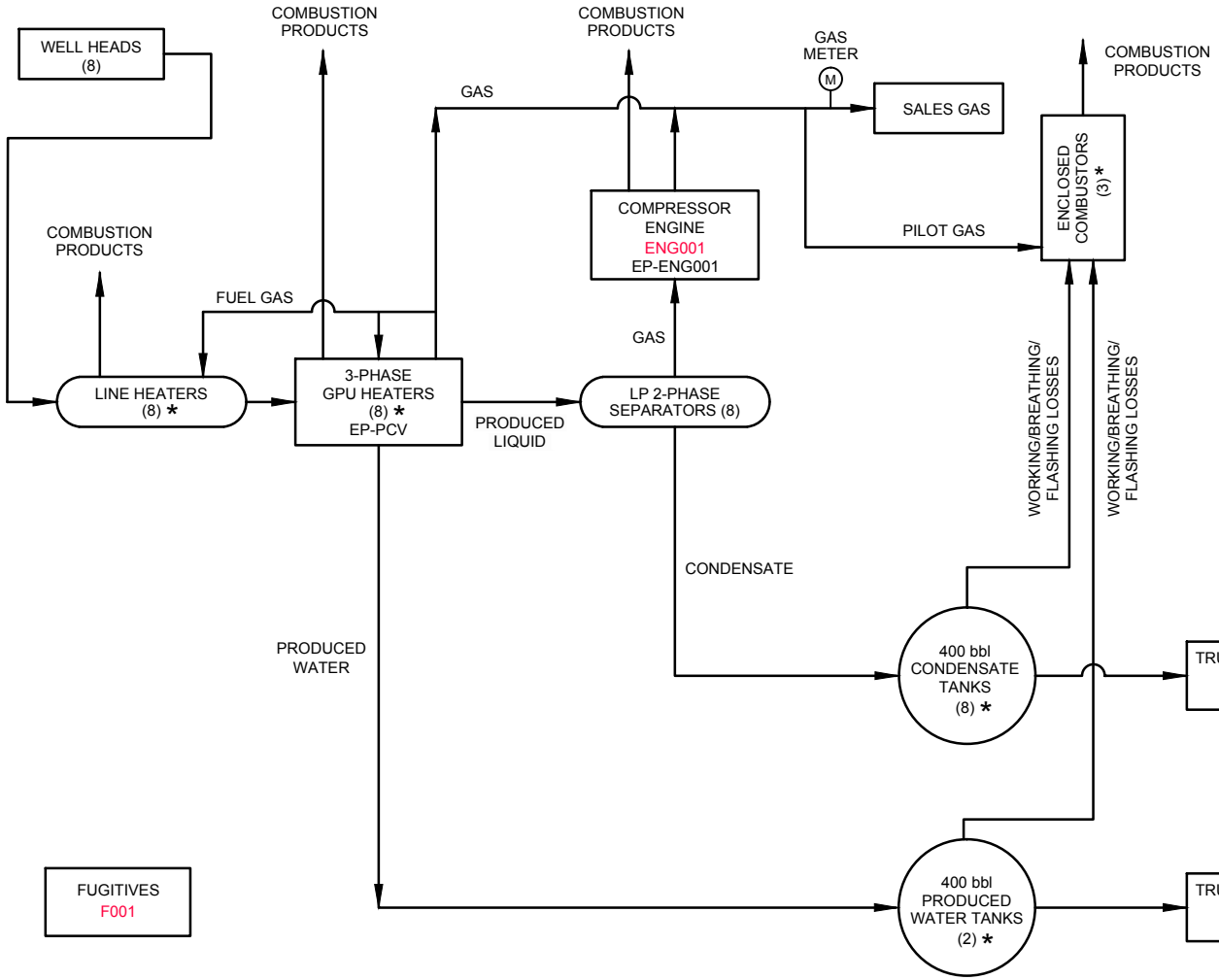
FIRST. The name of the Corporation is Antero Resources Corporation.

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: Alvyn A. Schopp
Title: Vice President of Accounting & Administration / Treasurer

Attachment D
Process Flow Diagram



* LINE HEATERS (8)

- LH001 EP-LH001
- LH002 EP-LH002
- LH003 EP-LH003
- LH004 EP-LH004
- LH005 EP-LH005
- LH006 EP-LH006
- LH007 EP-LH007
- LH008 EP-LH008

3-PHASE SEPARATORS WITH HEATERS (6)

- GPU001 EP-GPU001
- GPU002 EP-GPU002
- GPU003 EP-GPU003
- GPU004 EP-GPU004
- GPU005 EP-GPU005
- GPU006 EP-GPU006
- GPU007 EP-GPU007
- GPU008 EP-GPU008

CONDENSATE TANKS (6)

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

PRODUCED WATER TANKS (2)

- TANKPW001
- TANKPW002

ENCLOSED COMBUSTORS (3)

- EC001 EP-EC001
- EC002 EP-EC002
- EC003 EP-EC003

Attachment D

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

Attachment E
Process Description

Attachment E

Process Description
Dotson Holland Well Pad
Antero Resources Corporation
Doddridge County, West Virginia

A mixture of condensate, water, and entrained gas from the condensate and gas wells enters the facility through a series of line heaters (LH001-008) and gas production units (GPU001-GPU008) which are 3-phase separators where the gas, condensate, and produced water are separated. The line heaters and GPUs are fueled by a slip stream of the separated gas.

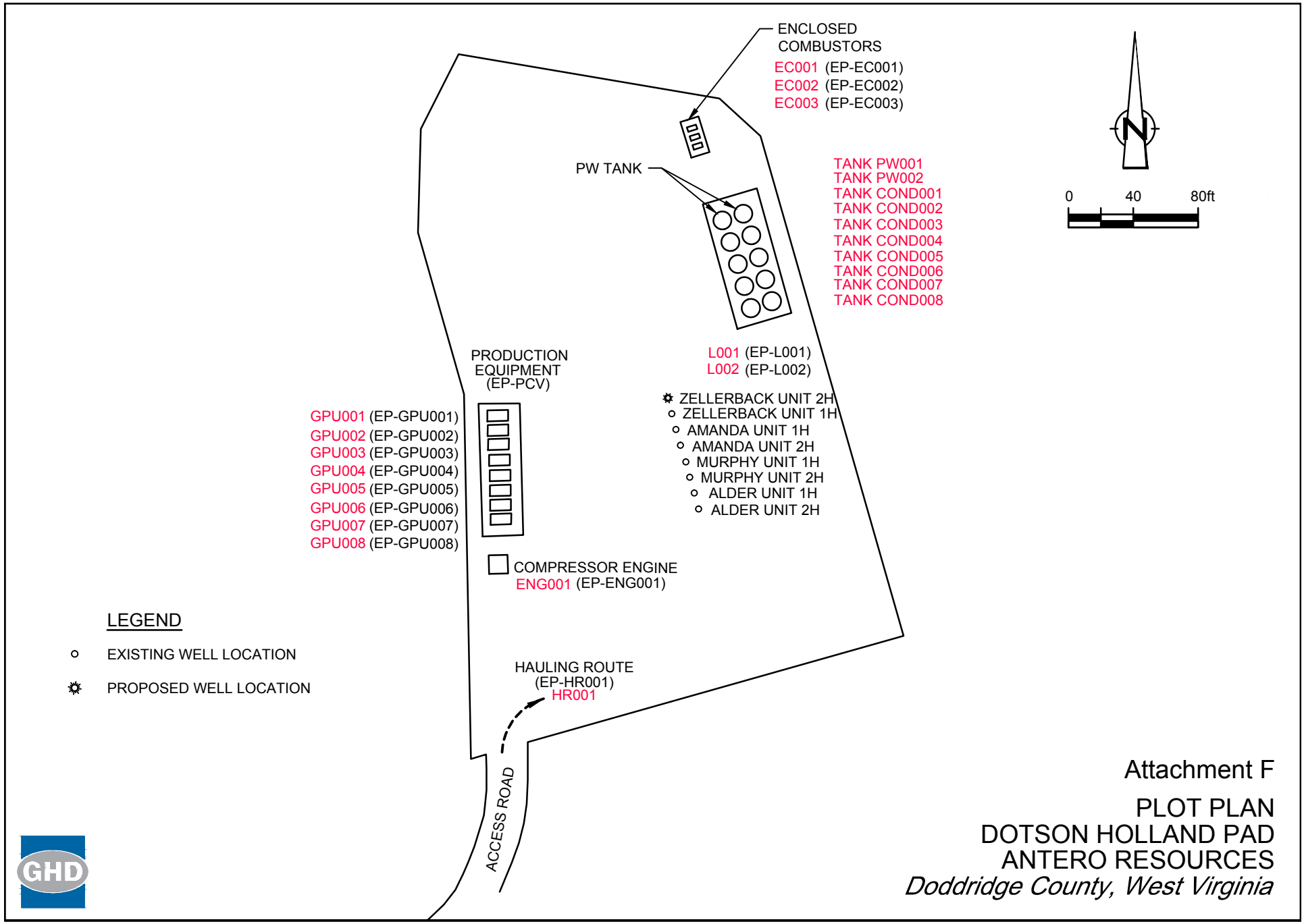
The gas from the three phase separators is metered and sent to the sales gas pipeline. The water flow to the produced water storage tanks (TANKPW001-002). The condensate is then sent to two phase low pressure separators where gas is further separated. The gas is routed to the gas fueled compressor engines (ENG001), compressed, metered and sent to the sales gas line. The condensate from the two phase separators flows to the condensate storage tanks (TANKSCOND001-008). The line heaters are only used during the first several months from start of production and will be removed once production has normalized.

The facility has eight (8) tanks (TANKCOND001-008) on site to store condensate and two (2) tanks (TANKPW001-002) to store produced water prior to removal from the site. The flashing, working and breathing losses from the tanks are routed to three enclosed combustors (EC001-003) to control the emissions. The enclosed combustors that will be used to control emissions are designed to achieve a VOC destruction efficiency of 98 percent.

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

Emissions from the facility's emission sources were calculated using the extended analysis of condensate from Nero Unit 2H and gas from Vonda Unit 1H, two of wells in McGill Well Pad. The extended condensate and gas analyses are considered representative of the materials from Dotson Holland Well Pad, being in the same Marcellus rock formation.

Attachment F
Plot Plan

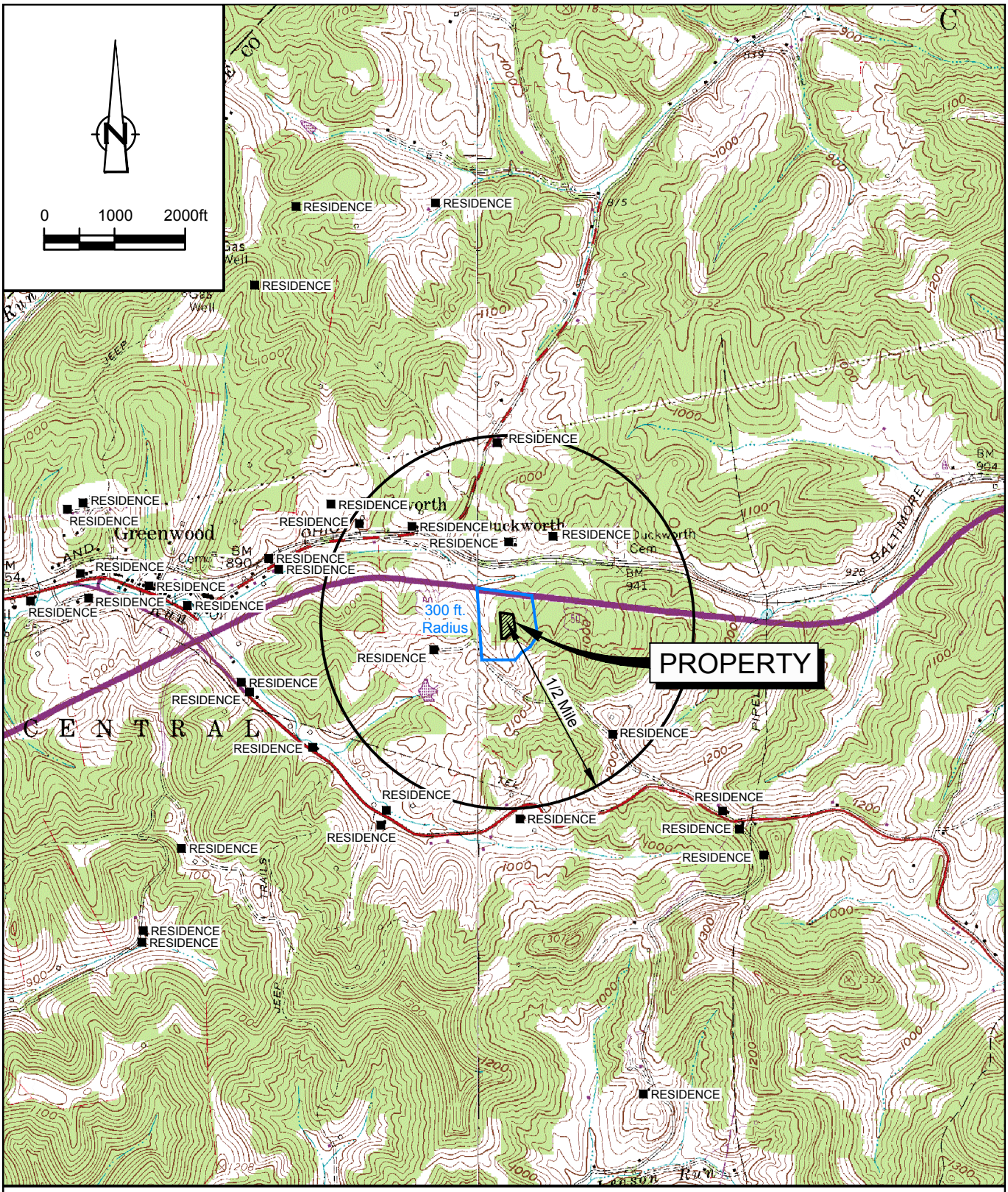


Attachment F

PLOT PLAN
DOTSON HOLLAND PAD
ANTERO RESOURCES
Doddridge County, West Virginia

82715-00(259)GN-WA003 JUN 21, 2016

Attachment G
Area Map



SOURCE: USGS QUADRANGLE MAP;
WEST UNION, WEST VIRGINIA
PENNSBORO, WEST VIRGINIA

SITE COORDINATES: LAT: 39.273384, LONG: -80.873788 NAD 83
SITE ELEVATION: 1055 ft AMSL

GHD

Attachment G
AREA MAP
DOTSON HOLLAND WELL PAD
ANTERO RESOURCES
Doddridge County, West Virginia

Attachment H
G70-C Section Applicability Form

ATTACHMENT H – G70-C SECTION APPLICABILITY FORM

General Permit G70-C Registration[1]
Section Applicability Form

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

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

GENERAL PERMIT G70-C APPLICABLE SECTIONS	
☒Section 5.0	Gas Well Affected Facility (NSPS, Subpart OOOO)
☒Section 6.0	Storage Vessels Containing Condensate and/or Produced Water[1]
☐Section 7.0	Storage Vessel Affected Facility (NSPS, Subpart OOOO)
☒Section 8.0	Control Devices and Emission Reduction Devices not subject to NSPS Subpart OOOO and/or NESHAP Subpart HH
☒Section 9.0	Small Heaters and Reboilers not subject to 40CFR60 Subpart Dc
☐Section 10.0	Pneumatic Controllers Affected Facility (NSPS, Subpart OOOO)
☐Section 11.0	Centrifugal Compressor Affected Facility (NSPS, Subpart OOOO)[2]
☐Section 12.0	Reciprocating Compressor Affected Facility (NSPS, Subpart OOOO)[2]
☒Section 13.0	Reciprocating Internal Combustion Engines, Generator Engines, Microturbines
☒Section 14.0	Tanker Truck Loading[3]
☐Section 15.0	Glycol Dehydration Units[4]

1 Applicants that are subject to Section 6 may also be subject to Section 7 if the applicant is subject to the NSPS, Subpart OOOO control requirements or the applicable control device requirements of Section 8.

2 Applicants that are subject to Section 11 and 12 may also be subject to the applicable RICE requirements of Section 13.

3 Applicants that are subject to Section 14 may also be subject to control device and emission reduction device requirements of Section 8.

4 Applicants that are subject to Section 15 may also be subject to the requirements of Section 9 (reboilers). Applicants that are subject to Section 15 may also be subject to control device and emission reduction device requirements of Section 8.

Attachment I
Emission Units/ ERD Table

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

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

Emission Unit ID[1]	Emission Point ID[2]	Emission Unit Description	Year Installed/ Modified	Manufac. Date[3]	Design Capacity	Type[4] and Date of Change	Control Device(s)[5]	ERD (s)[6]
GPU001, GPU002, GPU003, GPU004, GPU005, GPU006, GPU007, GPU008	EP-GPU001, EP-GPU002, EP-GPU003, EP-GPU004, EP-GPU005, EP-GPU006, EP-GPU007, EP-GPU008	Gas Production Unit Heater	2014		1.5 MMBtu/hr	Existing	N/A	
LH001, LH002, LH003, LH004, LH005, LH006, LH007, LH008	EP-LH001, EP-LH002, EP-LH003, EP-LH004, EP-LH005, EP-LH006, EP-LH007, EP-LH008	Line Heater	2016		2.0 MMBtu/hr	New	N/A	
F001	F001	Fugitives	2014		N/A	Existing	N/A	
TANKCOND001-008	EP-EC001, EP-EC002, EP-EC003	Condensate Tank F/W/B	2014		400 bbl each	Existing	EC001, EC002, EC003	
TANKPW001-002	EP-EC001, EP-EC002, EP-EC003	PW Tank F/W/B	2014		400 bbl each	Existing	EC001, EC002, EC003	
L001	EP-L001	Loading (Condensate)	2014		200 bbl capacity (each)	Existing	N/A	
L002	EP-L002	Loading (Produced Water)	2014		200 bbl capacity (each)	Existing	N/A	
HR001	EP-HR001	Haul Truck	2014		40 ton capacity	Existing	N/A	
EC001	EP-EC001	Enclosed Combustor	2014		90 scf/min	Existing	N/A	
EC002	EP-EC002	Enclosed Combustor	2016		90 scf/min	New	N/A	
EC003	EP-EC003	Enclosed Combustor	2016		90 scf/min	New	N/A	
PCV	EP-PCV	Pneumatic CV	2014		6.6 scf/day/PCV	Existing	N/A	
ENG001	EP-ENG001	Compressor Engine	2014	2013	24 HP	Existing	Non-Selective Catalytic Reduction	

1 For Emission Units (or Sources) use the following numbering system: 1S, 2S, 3S, ... or other appropriate designation.
2 For Emission Points use the following numbering system: 1E, 2E, 3E, ... or other appropriate designation.
3 When required by rule.
4 New, modification, removal, existing.
5 For Control Devices use the following numbering system: 1C, 2C, 3C, ... or other appropriate designation.
6 For ERDs use the following numbering system: 1D, 2D, 3D, ... or other appropriate designation.

Attachment J
Fugitive Emissions Summary Sheet

ATTACHMENT J – FUGITIVE EMISSIONS SUMMARY SHEET

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

Source/Equipment:

Leak Detection Method Used	☐ Audible, visual, and	☑ Infrared (FLIR) cameras	☐ Other (please describe)	☐ None required

Component Type	Closed Vent System	Count	Source of Leak Factors (EPA, other (specify))	Stream type (gas, liquid, etc.)	Estimated Emissions (tpy)		
					VOC	HAP	GHG (CO_2e)
Valves	☐ Yes ☑ No	400	EPA	gas	2.60	0.44	280.41
Valves	☐ Yes ☑ No	416	EPA	liquid	9.81	0.69	1.80
Connections (Not sampling)	☐ Yes ☑ No	472	EPA	gas	0.14	2.32E-02	14.71
Flanges	☐ Yes ☑ No	104	EPA	gas	0.06	9.98E-03	6.32
Loading	☐ Yes ☑ No	2	EPA	gas	0.67	9.85E-03	0.84

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

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

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

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

Attachment K
Gas Well Affected Facility Data Sheet

ATTACHMENT K – GAS WELL AFFECTED FACILITY DATA SHEET			
Complete this data sheet if you are the owner or operator of a gas well affected facility for which construction, modification or reconstruction commenced after August 23, 2011. This form must be completed for natural gas well affected facilities regardless of when flowback operations occur (or have occurred).			
API Number	**Date of Flowback**	**Date of Well Completion**	**Green Completion and/or Combustion Device**
47017066400000	7/1/2017	4/1/2017	Green
47017066920000	7/1/2017	4/1/2017	Green
47017064310000	12/15/2014	11/1/2014	Green
47017064320000	12/23/2014	11/1/2014	Green
47017066410000	7/1/2017	4/1/2017	Green
47017066420000	7/1/2017	4/1/2017	Green
47017064300000	12/8/2014	11/1/2014	Green
1 proposed well			

Note: If future wells are planned and no API number is available please list as PLANNED.
If there are existing wells that commenced construction prior to August 23, 2011, please acknowledge as existing.

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

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

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

Where,

047 =	*State code. The state code for WV is 047.*
001 =	*County Code. County codes are odd numbers, beginning with 001 (Barbour) and continuing to 109 (Wyoming).*
00001=	*Well number. Each well will have a unique well number.*

Attachment L
Storage Vessel Data Sheet

ATTACHMENT L – STORAGE VESSEL DATA SHEET

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

The following information is REQUIRED:

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

Additional information may be requested if necessary.

GENERAL INFORMATION (REQUIRED)

1. Bulk Storage Area Name: Tanks	2. Tank Name: Condensate Tank 001-008
3. Emission Unit ID number: TANKCOND001-008	4. Emission Point ID number. EP-EC001, EP-EC002, EP-EC003
5. Date Installed , Modified or Relocated (for existing tanks)	6. Type of change:
2014 Was the tank manufactured after August 23, 2011? ☑ Yes ☐ No	☑ New construction ☐ New stored material ☐ Other ☐ Relocation

7A. Description of Tank Modification (if applicable)

7B. Will more than one material be stored in this tank? If so, a separate form must be completed for each material.
☐ Yes ☑ No

7C.Was USEPA Tanks simulation software utilized?

☐ Yes ☑ No

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

TANK INFORMATION

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. 400bbls

9A. Tank Internal Diameter (ft): 12	9B. Tank Internal Height (or Length) (ft): 20
10A. Maximum Liquid Height (ft): 18	10B. Average Liquid Height (ft): 10
11A. Maximum Vapor Space Height (ft): 18	11B. Average Vapor Space Height (ft): 10

12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights.: 400bbls

13A. Maximum annual throughput (gal/yr): 1992900	13B. Maximum daily throughput (gal/day): 5460
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 15	15. Maximum tank fill rate (gal/min) 168

16. Tank fill method ☐ Submerged ☑ Splash ☐ Bottom Loading

17. Is the tank system a variable vapor space system? ☐ Yes ☑ No

If yes, (A) What is the volume expansion capacity of the system (gal)?
(B) What are the number of transfers into the system per year?

18. Type of tank (check all that apply):

☑ Fixed Roof ☑ vertical ☐ horizontal ☑ 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
☐ other

ATTACHMENT L – STORAGE VESSEL DATA SHEET

PRESSURE/VACUUM CONTROL DATA

19. Check as many as apply:

- ☐ Does Not Apply
- ☐ Inert Gas Blanket of
- ☑ Vent to Vapor Combustion Device (vapor combustors, flares, thermal oxidizers, enclosed combustors)
- ☐ Conservation Vent (psig)
  Vacuum Pressure
- ☐ Emergency relief Valve (psig)
  Vacuum Pressure
- ☐ Thief Hatch Weighted ☐ Yes ☐ No

Complete appropriate Air Pollution Control Device Sheet

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

Material Name	Flashing Loss		Breathing Loss		Working Loss		Total Emission Loss		[1]Estimation Method
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	
Please see Table 6 and Table 7									

TANK CONSTRUCTION & OPERATION INFORMATION

21. Tank Shell Construction:
☐ Riveted ☐ Gunite lined ☐ Epoxy-coated ☑ Other (describe): Steel

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

22. Shell Condition (if metal and unlined):
☑ No Rust ☐ Light Rust ☐ Dense Rust ☐ Not applicable

22A. Is the tank heated? ☐ Yes ☑ No	22B. If yes, operating temperature:	22C. If yes, how is heat provided to tank?

23. Operating Pressure Range (psig): 0 psig, atmospheric
Must be listed for tanks using VRUs with closed vent system

24. Is the tank a Vertical Fixed Roof Tank? ☑ Yes ☐ No	24A. If yes, for dome roof provide radius (ft): NA	24B. If yes, for cone roof, provide slop (ft/ft): NA

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

25A. Year Internal Floaters Installed:

25B. Primary Seal Type: ☐ Metallic (mechanical) shoe seal ☐ Liquid mounted resilient seal ☐ Vapor mounted resilient seal ☐ Other (describe):

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

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

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

25F. Describe deck fittings

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

26A. Deck Type: ☐ Bolted ☐ Welded	26B. For bolted decks, provide deck construction

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

26D. Deck seam length (ft)	26E. Area of deck (ft^2)	26F. For column supported tanks: Number of columns:	26G. For column supported tanks, Diameter of each column:

27. Closed Vent System with VRU ☐ Yes ☑ No

28. Closed Vent System with Enclosed Combustor? ☑ Yes ☐ No

ATTACHMENT L – STORAGE VESSEL DATA SHEET

SITE INFORMATION

29. Provide the city and state on which the data in this section are based.: West Union, WV			
30. Daily Average Ambient Temperature (°F):	65.08	31. Annual Average Maximum Temperature (°F):	75.94
32. Annual Average Minimum Temperature (°F):	46.56	33. Average Wind Speed (miles/hr): 18.5mph	
34. Annual Average Solar Insulation Factor (BTU/(ft2·day))	1030.236	35. Atmospheric Pressure (psia): 14.8 (based off local conditions, could not find annual)	

LIQUID INFORMATION

36. Average daily temperature range of bulk liquid (F):	65.08	36A. Minimum (°F):	46.56	36B. Maximum (°F)	75.94
37. Average operating pressure range of tank (psig):	0	37A. Minimum (psig)	0	37B. Maximum (psig)	0

38A. Minimum Liquid Surface Temperature (°F)	46.56	38B. Corresponding Vapor Pressure (psia)	1.3337
39A. Average Liquid Surface Temperature (°F)	65.08	39B. Corresponding Vapor Pressure (psia)	1.9880
40A. Maximum Liquid Surface Temperature (°F)	75.94	40B. Corresponding Vapor Pressure (psia)	2.4806

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

41A. Material Name or Composition	Condensate		
41B. CAS Number	mix of HC		
41C. Liquid Density (lb/gal)	5.9600		
41D. Liquid Molecular Weight (lb/lb-mole)	112.40		
41E. Vapor Molecular Weight (lb/lb-mole)	39.7637		
Maximum Vapor Pressure 41F. True (psia)	2.4806		
41G. Reid (psia)	3.54		
Months Storage per Year 41H. From - To	year round		

ATTACHMENT L – STORAGE VESSEL DATA SHEET

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

The following information is REQUIRED:

☐ Composition of the representative sample used for the simulation
☐ For each stream that contributes to flashing emissions:
- ☐ Temperature and pressure (inlet and outlet from separator(s))
- ☐ Simulation-predicted composition
- ☐ Molecular weight
- ☐ Flow rate

☐ Resulting flash emission factor or flashing emissions from simulation
☐ Working/breathing loss emissions from tanks and/or loading emissions if simulation is used to quantify those emissions

Additional information may be requested if necessary.

GENERAL INFORMATION (REQUIRED)

1. Bulk Storage Area Name: Tanks	2. Tank Name: Produced Water Tank 001-002
3. Emission Unit ID number: TANKPW001-002	4. Emission Point ID number. EP-EC001, EP-EC002, EP-EC003
5. Date Installed , Modified or Relocated (for existing tanks) 2014 Was the tank manufactured after August 23, 2011? ☑ Yes ☐ No	6. Type of change: ☑ New construction ☐ New stored material ☐ Other ☐ Relocation

7A. Description of Tank Modification (if applicable)

7B. Will more than one material be stored in this tank? If so, a separate form must be completed for each material.
☐ Yes ☑ No

7C.Was USEPA Tanks simulation software utilized?
☐ Yes ☑ No

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

TANK INFORMATION

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. 400bbls

9A. Tank Internal Diameter (ft): 12	9B. Tank Internal Height (or Length) (ft): 20
10A. Maximum Liquid Height (ft): 18	10B. Average Liquid Height (ft): 10
11A. Maximum Vapor Space Height (ft): 18	11B. Average Vapor Space Height (ft): 10

12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights.: 400bbls

13A. Maximum annual throughput (gal/yr): 7511700	13B. Maximum daily throughput (gal/day): 20580
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 224	15. Maximum tank fill rate (gal/min) 168

16. Tank fill method ☐ Submerged ☑ Splash ☐ Bottom Loading

17. Is the tank system a variable vapor space system? ☐ Yes ☑ No

If yes, (A) What is the volume expansion capacity of the system (gal)?
(B) What are the number of transfers into the system per year?

18. Type of tank (check all that apply):

☑ Fixed Roof ☑ vertical ☐ horizontal ☑ 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

ATTACHMENT L – STORAGE VESSEL DATA SHEET

PRESSURE/VACUUM CONTROL DATA

19. Check as many as apply:

☐ Does not apply ☐ Rupture Disc (psig)

☐ Inert Gas Blanket ☐ Carbon Adsorption

☑ Vent to Vapor Combustion Device (vapor combustors, flares, thermal oxidizers, enclosed combustors)

☐ Conservation Vent (psig)
Vacuum Pressure

☐ Emergency relief Valve (psig)
Vacuum Pressure

☐ Thief Hatch Weighted ☐ Yes ☐ No

Complete appropriate Air Pollution Control Device Sheet

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

Material Name	Flashing Loss		Breathing Loss		Working Loss		Total Emission Loss		[1] Estimation Method
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	
Please see Table 6 and Table 7									

TANK CONSTRUCTION & OPERATION INFORMATION

21. Tank Shell Construction:
☐ Riveted ☐ Gunite lined ☐ Epoxy-coated ☑ Other(describe): Steel

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

22. Shell Condition (if metal and unlined):
☑ No Rust ☐ Light Rust ☐ Dense Rust ☐ Not applicable

22A. Is the tank heated? ☐ Yes ☑ No	22B. If yes, operating temperature:	22C. If yes, how is heat provided to tank?

23. Operating Pressure Range (psig): 0 psig, atmospheric
Must be listed for tanks using VRUs with closed vent system

24. Is the tank a Vertical Fixed Roof Tank? ☑ Yes ☐ No	24A. If yes, for dome roof provide radius (ft): NA	24B. If yes, for cone roof, provide slop (ft/ft): NA

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

25A. Year Internal Floaters Installed:

25B. Primary Seal Type: ☐ Metallic (mechanical) shoe seal ☐ Liquid mounted ☐ Vapor mounted resilient seal ☐ Other (describe):

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

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

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

25F. Describe deck fittings

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

26A. Deck Type: ☐ Bolted ☐ Welded	26B. For bolted decks, provide deck construction

26C. Deck seam:
☐ 5 ft. wide ☐ 6 ft. wide ☐ 7 ft. wide ☐ 5 x 7.5 ft. wide ☐ 5 x 12 ft. wide ☐ Other

26D. Deck seam length (ft)	26E. Area of deck (ft^2)	26F. For column supported tanks: Number of columns:	26G. For column supported tanks, Diameter of each column:

27. Closed Vent System with VRU ☐ Yes ☑ No

28. Closed Vent System with Enclosed Combustor? ☑ Yes ☐ No

ATTACHMENT L – STORAGE VESSEL DATA SHEET

SITE INFORMATION

29. Provide the city and state on which the data in this section are based.: West Union, WV			
30. Daily Average Ambient Temperature (°F):	65.08	31. Annual Average Maximum Temperature (°F):	75.94
32. Annual Average Minimum Temperature (°F):	46.56	33. Average Wind Speed (miles/hr): 5.9mph	
34. Annual Average Solar Insulation Factor (BTU/(ft2·day))	1030.236	35. Atmospheric Pressure (psia): 14.8 (based off local conditions, could not find annual)	

LIQUID INFORMATION

36. Average daily temperature range of bulk liquid (F):	65.08	36A. Minimum (°F):	46.56	36B. Maximum (°F)	75.94
37. Average operating pressure range of tank (psig):	0	37A. Minimum (psig)	0	37B. Maximum (psig)	0

38A. Minimum Liquid Surface Temperature (°F)	46.56	38B. Corresponding Vapor Pressure (psia)	0.2245
39A. Average Liquid Surface Temperature (°F)	65.08	39B. Corresponding Vapor Pressure (psia)	0.3717
40A. Maximum Liquid Surface Temperature (°F)	75.94	40B. Corresponding Vapor Pressure (psia)	0.4917

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

41A. Material Name or Composition	Produced Water		
41B. CAS Number	mix of HC and water		
41C. Liquid Density (lb/gal)	8.3300		
41D. Liquid Molecular Weight (lb/lb-mole)	18.02		
41E. Vapor Molecular Weight (lb/lb-mole)	18.4551		
Maximum Vapor Pressure 41F. True (psia)	0.4917		
41G. Reid (psia)	1.0220		
Months Storage per Year 41H. From - To	year round		

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

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

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

Emission Unit ID#	Emission Point ID#	Emission Unit Description (Manufacturer, model#)	Year Installed/ Modified	Type and Date of Change	Maximum Design Heat Input (MMBTU/hr)	Fuel Heating Value (BTU/scf)
GPU001	EP-GPU001	Gas Production Unit Heater	2014	Existing	1.5	1228.7615
GPU002	EP-GPU002	Gas Production Unit Heater	2014	Existing	1.5	1228.7615
GPU003	EP-GPU003	Gas Production Unit Heater	2014	Existing	1.5	1228.7615
GPU004	EP-GPU004	Gas Production Unit Heater	2014	Existing	1.5	1228.7615
GPU005	EP-GPU005	Gas Production Unit Heater	2014	Existing	1.5	1228.7615
GPU006	EP-GPU006	Gas Production Unit Heater	2014	Existing	1.5	1228.7615
GPU007	EP-GPU007	Gas Production Unit Heater	2014	Existing	1.5	1228.7615
GPU008	EP-GPU008	Gas Production Unit Heater	2014	Existing	1.5	1228.7615
LH001	EP-LH001	Line Heater	2016	New	2	1228.7615
LH002	EP-LH002	Line Heater	2016	New	2	1228.7615
LH003	EP-LH003	Line Heater	2016	New	2	1228.7615
LH004	EP-LH004	Line Heater	2016	New	2	1228.7615
LH005	EP-LH005	Line Heater	2016	New	2	1228.7615
LH006	EP-LH006	Line Heater	2016	New	2	1228.7615
LH007	EP-LH007	Line Heater	2016	New	2	1228.7615
LH008	EP-LH008	Line Heater	2016	New	2	1228.7615

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

Attachment N
Internal Combustion Engine Data Sheet

ATTACHMENT N – INTERNAL COMBUSTION ENGINE DATA SHEET

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

Emission Unit ID#	ENG001		
Engine Manufacturer/Model	Engine (Kubota DG972-E2)		
Manufacturers Rated bhp/rpm	24 HP @ 3600 rpm		
Source Status	ES		
Date Installed/ Modified/ Removed/ Relocated	2014		
Engine Manufacturer/ Reconstruction Date	2013		
Check all applicable Federal Rules for the engine (include EPA Certification of Conformity if applicable)	☑ 40CFR60 Subpart JJJJ ☑ JJJJ Certified? ☐ 40CFR60 Subpart IIII ☐ IIII Certified? ☑ 40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources	☐ 40CFR60 Subpart JJJJ ☐ JJJJ Certified? ☐ 40CFR60 Subpart IIII ☐ IIII Certified? ☐ 40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources	☐ 40CFR60 Subpart JJJJ ☐ JJJJ Certified? ☐ 40CFR60 Subpart IIII ☐ IIII Certified? ☐ 40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources
Engine Type	4SRB		
APCD Type	NSCR		
Fuel Type	RG		
H2S (gr/ 100 scf)	0		
Operating bhp/rpm	16.5 HP @ 2400 rpm		
BSFC (BTU/bhp-hr)	9773		
Hourly Fuel Throughput (Must use 8,760 hrs/yr unless emergency generator)	193 ft^3/hr gal/hr		ft^3/hr gal/hr
Fuel Usage or Hours of Operation Metered	1.6907 $MMft^3/yr$ gal/yr		$MMft^3/yr$ gal/yr

Calculation Methodology	Pollutant	Hourly PTE (lb/hr)	Annual PTE (tons/year)	Hourly PTE (lb/hr)	Annual PTE (tons/year)	Hourly PTE (lb/hr)	Annual PTE (tons/year)
MD	NOx	0.3158	1.3831				
MD	CO	5.6445	24.7228				
AP	VOC	0.0070	0.0307				
AP	SO2	0.0001	0.0006				
AP	PM10	0.0022	0.0098				
AP	Formaldehyde	0.0048	0.0212				
AP	Total HAPs	0.0054	0.0238				
OT	GHG (CO2e)	27.3690	119.8760				

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

CONTENTS

Specifications and dimensions are subject to change without prior notice.

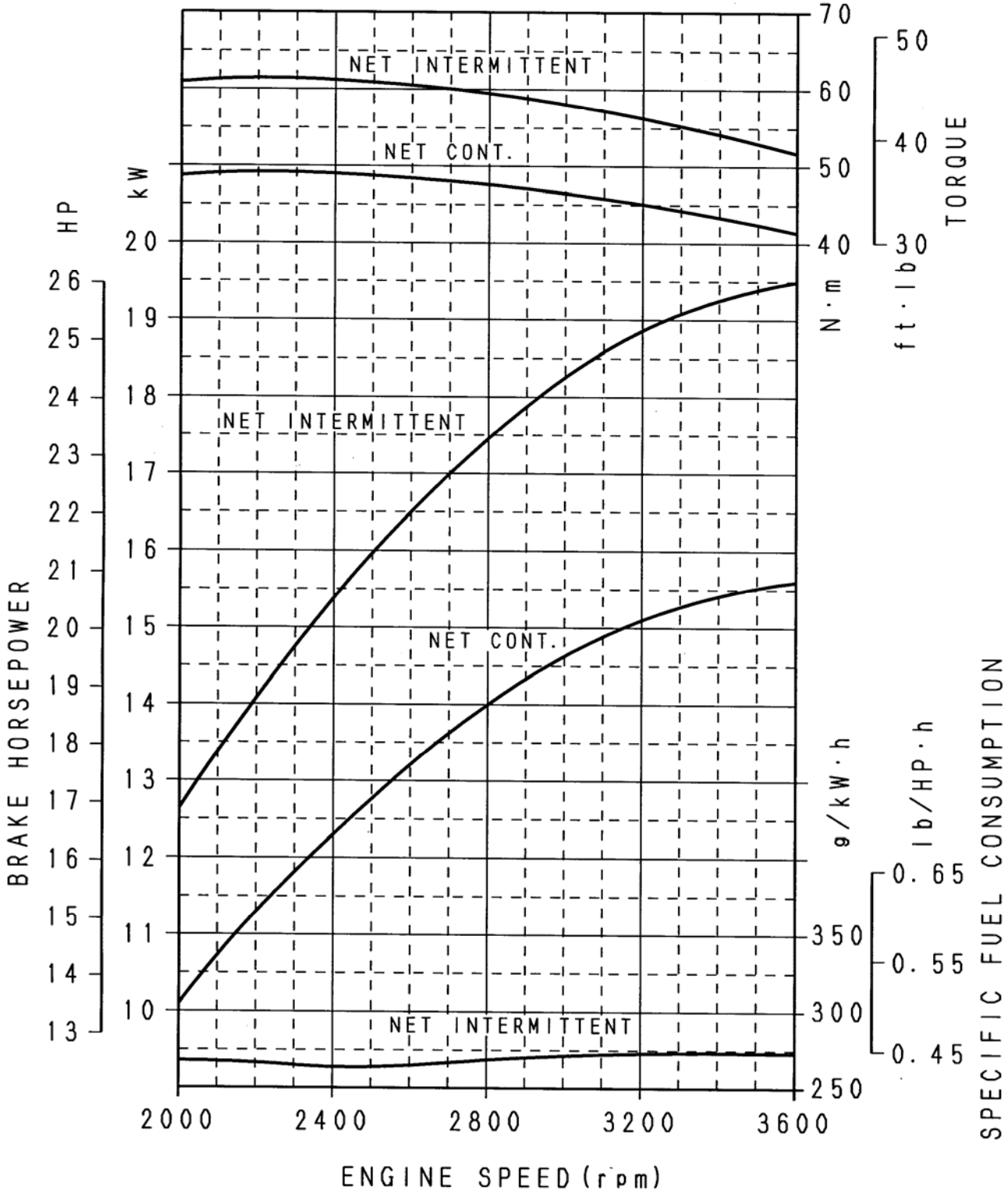
1. GENERAL SPECIFICATIONS

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

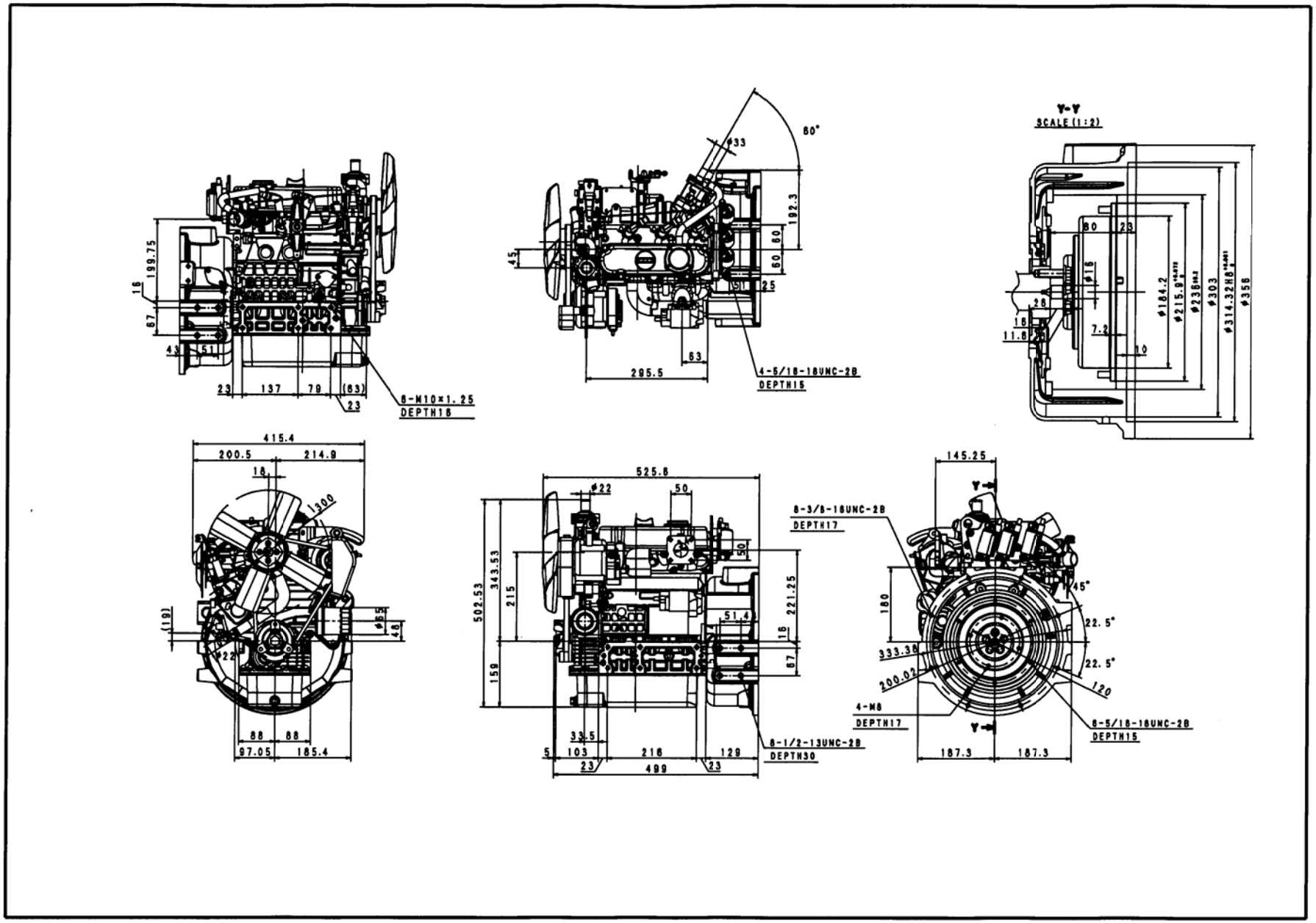
2. PERFORMANCE CURVES

DG972 PERFORMANCE CURVES

Higher calorific value : 11000kcal/m^3 (1236BTU/ft^3)



3. DIMENSIONS



4. TECHNICAL DATA

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

4-1) BRAKE HORSE POWER

SAE J1349

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

Note

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

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

4-3) NOISE LEVEL

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

These data show the average noise level at four points.

Note

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

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

Q_1: Amount of intake air (m^3/min)
Vh: Total displacement (L)
N: Engine speed (rpm)
C: Coefficient=0.5
η: Intake efficiency
Natural Gas: 0.77

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

$1L=61.0237in^3=0.035315ft^3$
$1ft^3=28.3168L$
$1L/sec=3.6m^3/h=2.1189ft^3/min$

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

1. Conversion rates $1L=61.0237in^3=0.035315ft^3$
   $1ft^3=28.3168L$
   $1L/sec=3.6m^3/h=127.133ft^3/hr$

4-6) HEAT REJECTION TO COOLING WATER

1. Specific at net intermittent (SAE J1349)

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

Note

Heat rejection to cooling water calculating formula

Ho=Hu•Ne•be•i

Ho: Heat rejection to cooling water

Hu: Fuel low calorific value

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

Ne: Brake horse power

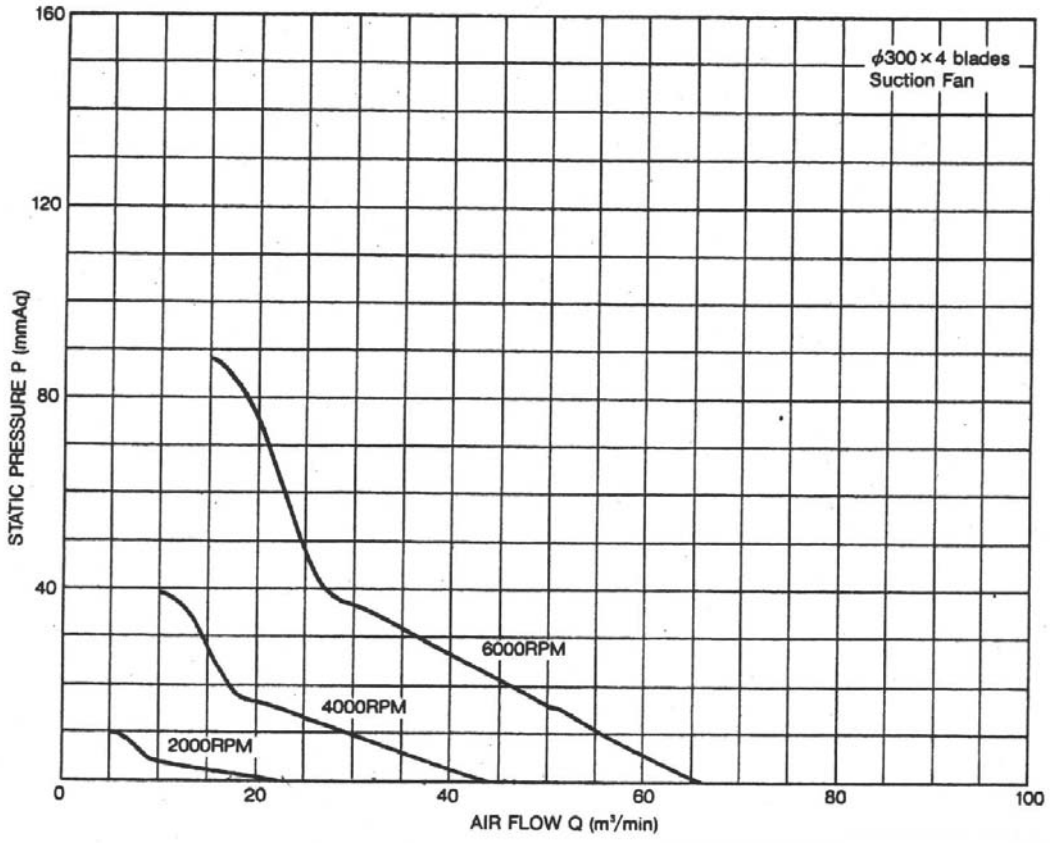
Be: Specific fuel consumption

i: Dispersion ratio to cooling water

4-7) COOLING FAN DATA

1. Performance curves <P-Q>

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



4-8) CENTER OF GRAVITY

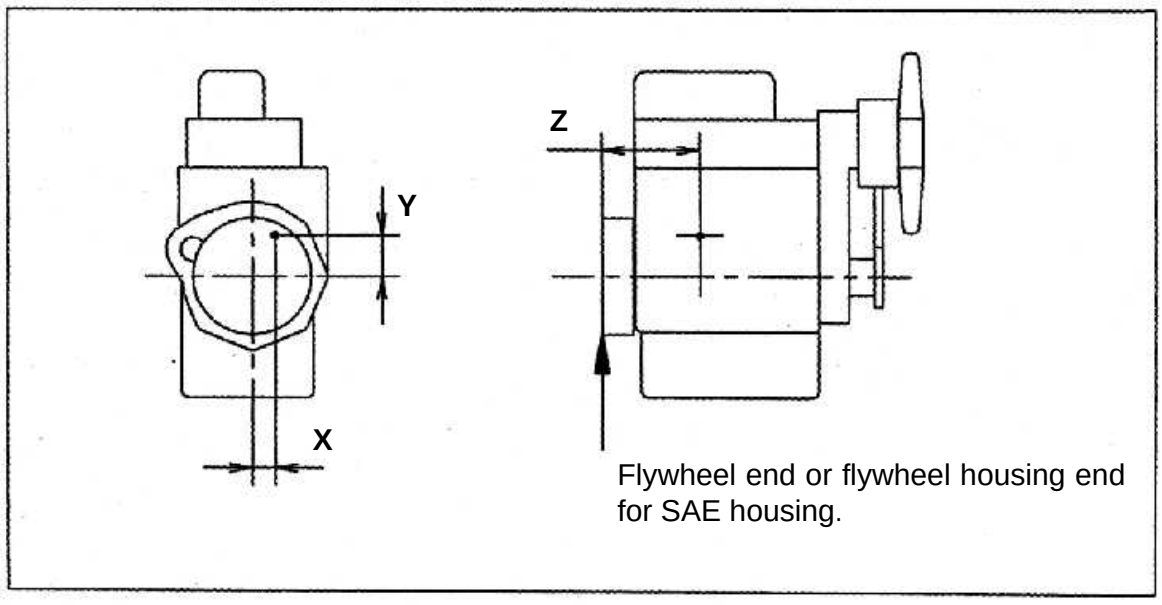
1. With standard flywheel and rear-end plate

Model	Dry weight 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)

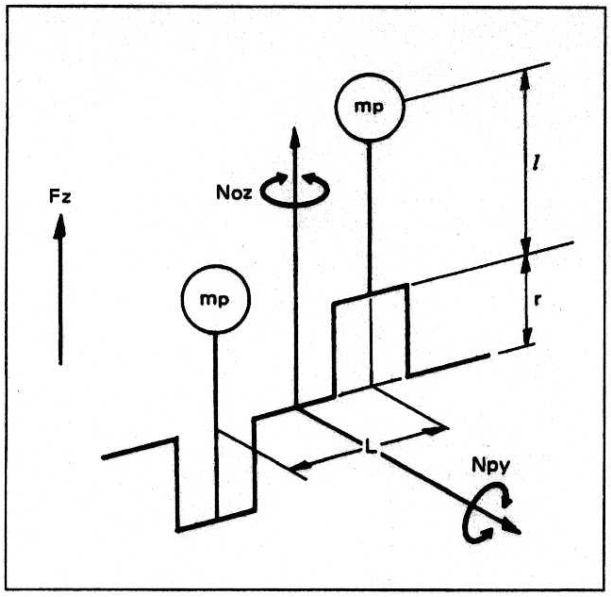
Note
Cooling water and lubricating oil weight is not included in above engine weight.



Flywheel end or flywheel housing end for SAE housing.

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

ω=2πn/60	n: Engine speed(rpm)

l=0.098m r=0.0368m L=0.080m	Cylinder bore (mm)	mp (kg)
	74.5	0.37/9.80665

2. Unbalanced inertia force and couple

($x\omega^2$)

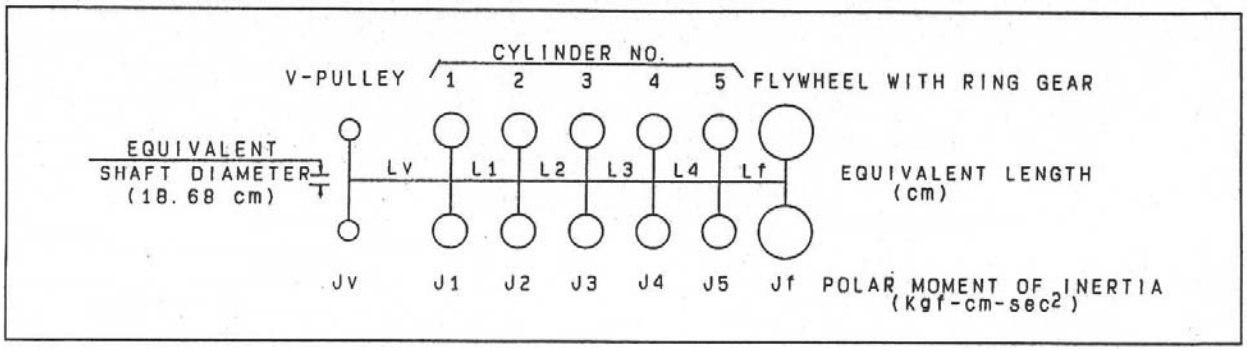
Model	No. of Cylinder	Cylinder Bore	Order	Fz	Npy	Noz
WG/DF/DG 972	3	74.5mm	1	0	0.000096	0.000096
			2	0	0.000072	0

▼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 × 142122=13.6kg
			2	0.000072 × 142122=10.2kg
		Noz	1	0.000096 × 142122=13.6kg
			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 SYSTEM AND FUEL DIAGRAM

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

1. Tightening torque and leak check

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

[TIGHTENING TORQUE AND LEAK CHECK]

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

2. Setting of the regulator

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

3. Caution for FUEL SYSTEM

The standard engine is equipped with ϕ6.6 jet for the fuel calorific gas value of 11000kcal/m^3 (1236BTU/ft^3).
When the engine is operated with the different calorific gas, it is necessary to select the correct jet of the mixer.
In that case, refer to the manual **[Adjustment for Natural Gas Engine DG972]**.

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

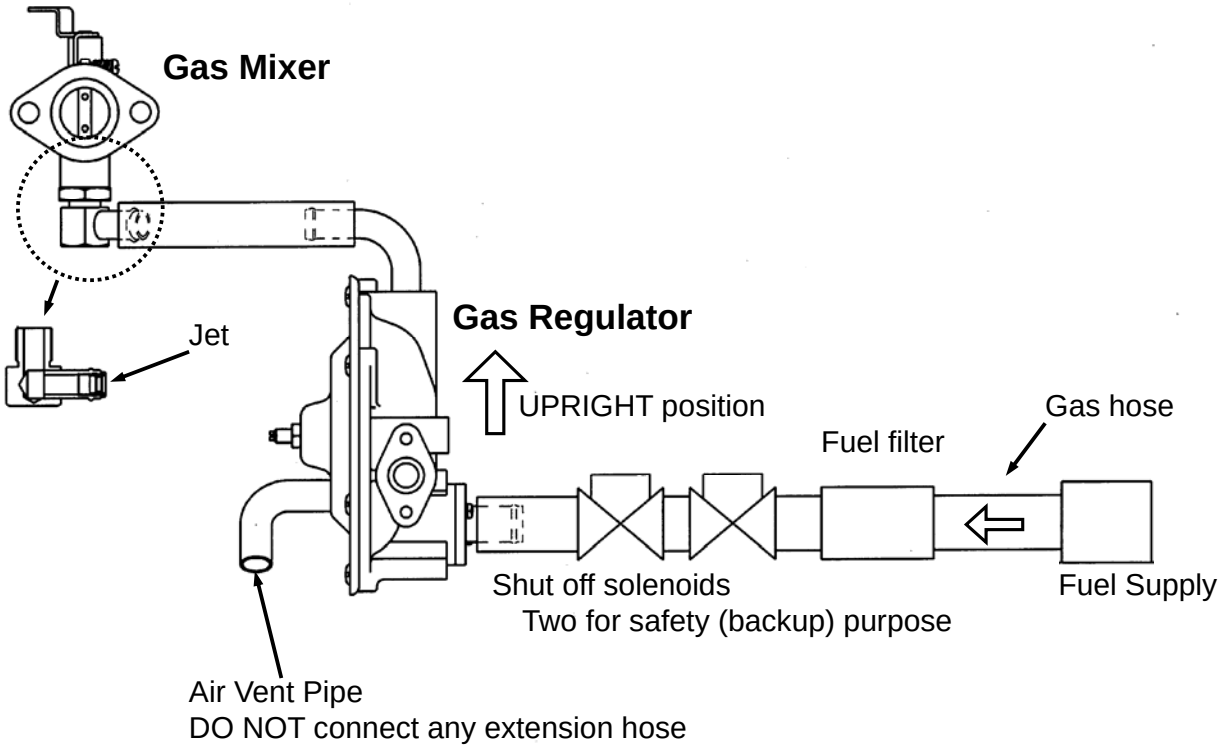
Equipments Vacuum Meter : Not KUBOTA supplied
Adjustable Jet : Service Tool

4. Application Check Item

The items as shown below must be managed for all engines, and these items must be informed to KUBOTA with Application Check results.
Refer to the attached sheet **[Application Check Sheet for DG972]**.

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

5. Fuel diagram



NATURAL GAS ENGINE

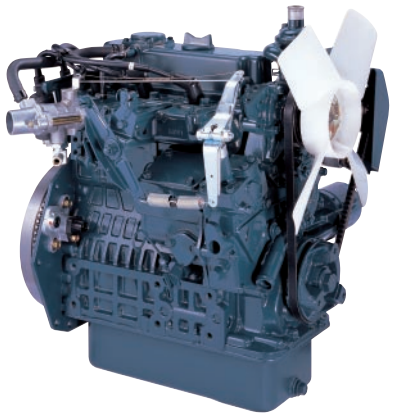
KUBOTA DG SERIES (3-cylinder)

DG972-E2

2 EPA Tier

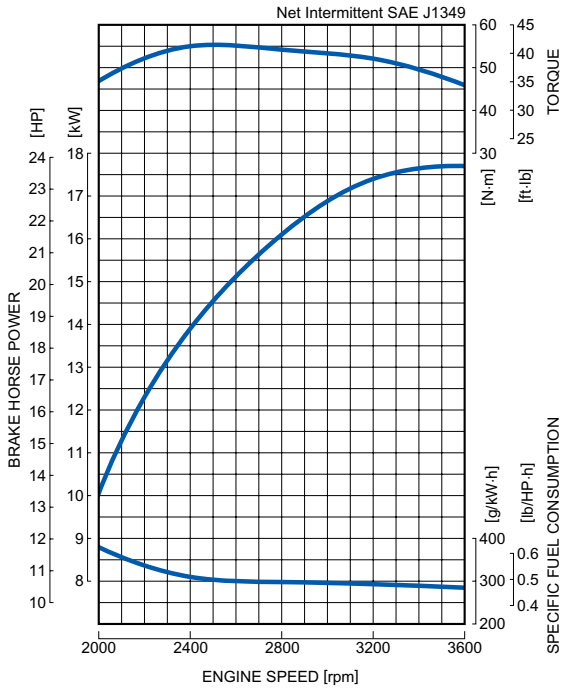
RATED POWER

17.6kW@3600rpm



Photograph may show non-standard equipment.

PERFORMANCE CURVE



FEATURES and BENEFITS

New Engine Series

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

Emission

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

Best Fuel System

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

Ease maintenance cost and time

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

DG972-E2

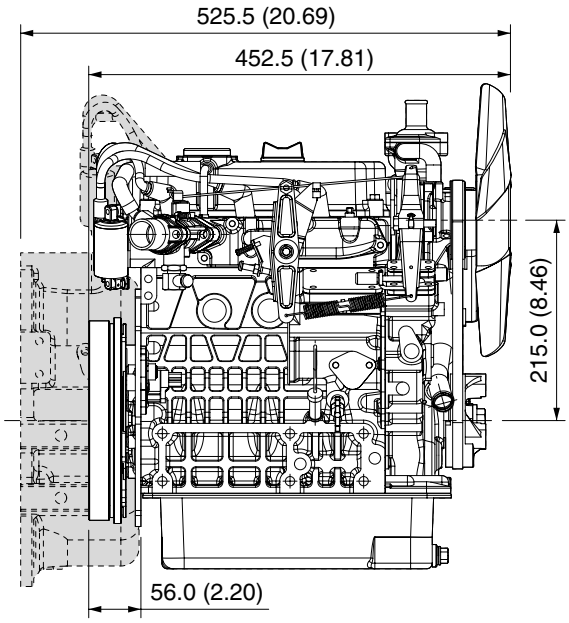
KUBOTA DG SERIES

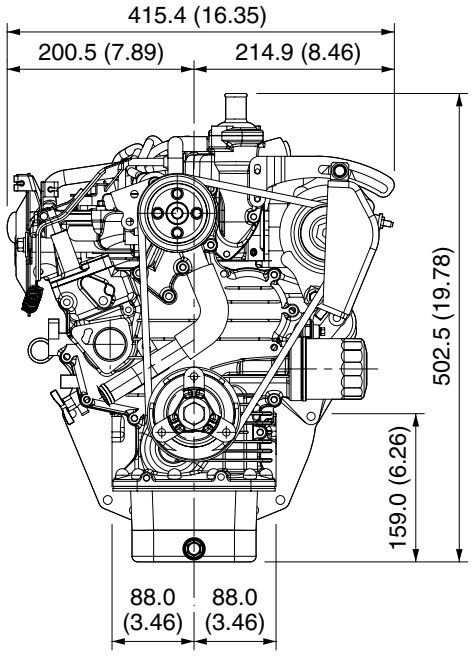
GENERAL SPECIFICATION

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





Kubota

Your Driving Force
KUBOTA ENGINE

KUBOTA Corporation
2-47, Shikitsuhigashi 1-chome, Naniwa-ku, Osaka, 556-8601 Japan
Fax: 06-6648-3521
http://www.engine.kubota.co.jp

1334-01-COM '08.09. .STD

Attachment O
Tanker Truck Loading Data Sheet

ATTACHMENT O – TANKER TRUCK LOADING DATA S HEET

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

Truck Loadout Collection Efficiencies

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

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

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

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

Emission Unit Description: Condensate Loading, Produced Water Loading

Loading Area Data

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

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

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

Provide description of closed vent system and any bypasses

Are any of the following truck loadout systems utilized? No

☐ Closed System to Tanker Truck passing a MACT level annual leak test?

☐ Closed System to Tanker Truck passing a NSPS level annual leak test?

☐ Closed System to Tanker Truck not passing an annual leak test and has vapor return?

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

Time	Jan - Mar	Apr - Jun	Jul - Sept	Oct - Dec
Hours/day	3	3	3	3
Days/week	7	7	7	7

Bulk Liquid Data (use extra pages as necessary)

Liquid Name		Condensate	Produced Water	
Max. Daily Throughput (1000 gal/day)		5.46	20.58	
Max. Annual Throughput (1000 gal/yr)		1992.90	7511.70	
Loading Method		BF	BF	
Max. Fill Rate (gal/min)		168	168	
Average Fill Time (min/loading)		50	50	
Max. Bulk Liquid Temperature (F)		65.1	65.1	
True Vapor Pressure		2.0	0.4	
Cargo Vessel Condition		U	U	
Control Equipment or Method		None	None	
Max. Collection Efficiency (%)		0	0	
Max. Control Efficiency (%)		0	0	
Max VOC Emission Rate	Loading (lb/hr)	6.7517	0.0009	
	Annual (ton/yr)	0.6674	0.0003	
Max HAP Emission Rate	Loading (lb/hr)	0.0997	7.26E-07	
	Annual (ton/yr)	0.0099	2.70E-07	
Estimation Method		Promax	Promax	

1 BF Bottom Fill SP Splash Fill SUB Submerged Fill

2 At maximum bulk liquid temperature

3 B Ballasted Vessel C Cleaned U Uncleaned (dedicated servi O Other (describe)

4 List as many as apply (complete and submit appropriate Air Pollution Control Device Sheets)

CA Carbon Adsorption VB Dedicated Vapor Balance (closed system)

ECD Enclosed Combustion Device F Flare

TO Thermal Oxidization or Incineration

5 EPA EPA Emission Factor in AP-42 MB Material Balance

TM Test Measurement based upon test data submittal O Other (describe)

Attachment R
Air Pollution Control Device – Emission Reduction Device Sheets

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

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

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

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

Emission Unit ID:	NA	Make/Model:	NA
Primary Control Device ID:	NA	Make/Model	NA
Control Efficiency (%):	NA	APCD/ERD Data Sheet Completed	☐ Yes ☐ No
Secondary Control Device ID:	NA	Make/Model	NA
Control Efficiency (%):	NA	APCD/ERD Data Sheet Completed	☐ Yes ☐ No

VAPOR COMBUSTION (Including Enclosed Combustors)

General Information

Control Device ID#:	EC001-003	Installation Date: ☑ New ☐ Modified ☐ Relocated	
Maximum Rated Total Flow Capacity		Maximum Design Heating Input (from mfg. spec sheet)	Design Heat Content
5458 scfh	131000 scfd	12.0 MMBTU/hr	2300 BTU/scf

Control Device Information

Type of Vapor Combustion Control?

☑ Enclosed Combustion Device ☐ Elevated Flare ☐ Ground Flare
☐ Thermal Oxidizer

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

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

Emission Unit ID#	Emission Source Description	Emission Unit ID#	Emission Source Description
TANKCOND001-008	Condensate Tanks		
TANKPW001-002	Produced Water Tanks		

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

Assist Type (Flares only)	Flare height	Tip Diameter	Was the design per §60.18?
☐ Steam ☐ Air ☐ Pressure ☑ Non	25 feet	3.33 feet	☑ Yes ☐ No Provide determination

Waste Gas Information

Maximum Waste Gas Flow Rate	Heat Value of Waste Gas Stream	Exit Velocity of the Emission Stream
7.24 (scfm)	1,991.78 BTU/ft^3	0.0138 (ft/s)

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

Pilot Gas Information

Number of Pilot Lights	Fuel Flow Rate to Pilot Flame per Pilot	Heat Input per Pilot	Will automatic re-ignition be used?
3	12.6 scfh	12800 BTU/hr	☑ Yes ☐ No

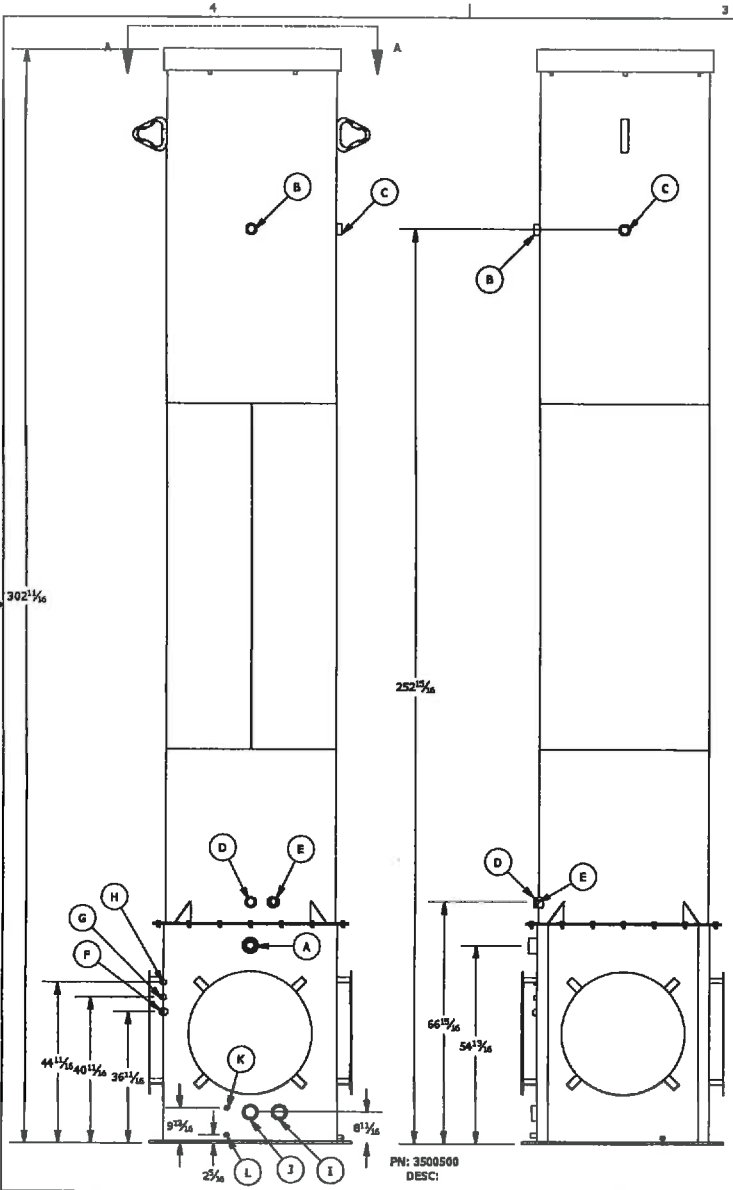
If automatic re-ignition is used, please describe the method. Flame Rectification, a thermocouple equivalent

Is pilot flame equipped with a monitor to detect the presence of the flame? ☑ Yes ☐ No	If Yes, What type? ☑ Thermocouple ☐ Infrared ☐ Ultraviolet ☐ Camera ☐ Other:

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

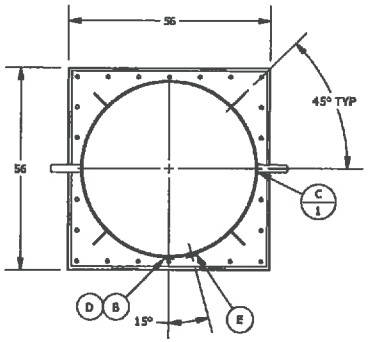
Additional information attached? ☑ Yes ☐ No Manufacturer's specs sheet

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



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

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



VIEW A-A

PN: 3500500
DESC:

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

UNLESS OTHERWISE SPECIFIED

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

APPROVED FOR A.S.M.E CODE, SECTION VIII DIV 1
_____ED,_____ ADDENDA BY_____ DATE_____

CIMARRON
Energy Inc.

TITLE:
48" HIGH VOLUME ECD

DATE:	WO No.:	SHEET: 1 OF 1

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

Attachment S
Emissions Calculations

Table 1

Facility Information
Dotson Holland Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Oil and Gas Site General Information

Administrative Information	
Company Name	Antero Resources Corporation
Facility/Well Name	Dotson Holland Well Pad
Nearest City/Town	West Union
API Number/SIC Code	1311
Latitude/Longitude	39.273384, -80.873788
County	Doddridge County

Technical Information	
Max Condensate Site Throughput (bbl/day):	130
Max Produced Water Site Throughput (bbl/day):	490
Are there any sour gas streams at this site?	No
Is this site currently operational/producing?	Yes

Equipment/Processes at Site	
Equipment/Process Types	**How many for this site?**
Fugitives	8
IC Engines	1
Gas Production Unit Heaters	8
Line Heaters	8
Condensate Tanks	8
Produced Water Tanks	2
Loading Jobs	2
Enclosed Combustors	3

Table 2

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

Emission Source	VOC		NO_X		CO_{2e}		CO		SO_2		$PM_{2.5}$		PM_{10}		Lead		Total HAPs		Benzene		Xylenes		Formaldehyde	
	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)
UNCONTROLLED (Fugitives, Storage Tanks, Engine, Gas Production Unit Heaters, Line Heaters)																								
Fugitive Emissions (Component Count, PCV and Hauling)[1]	2.9483	12.9134			76.717	336.02							8.7635	2.4853			0.2781	1.2181	0.0013	0.0056	5.60E-02	2.45E-01		
Flashing, Working and Breathing (F/W/B) Losses[2]	26.4194	115.7169			97.9547	429.0414											4.4121	19.3251	0.0010	0.0043	0.0217	0.0951		
Engine Emissions[3]	0.007	0.031	0.316	1.383	27.369	119.876	5.644	24.723	1.39E-04	6.09E-04	0.002	0.010	0.002	0.010			0.005	0.024	0.000	0.002	4.61E-05	2.02E-04	0.005	0.021
Gas Production Unit Heater Emissions[4]	0.0537	0.2353	0.9766	4.2775	1,171.91	5,132.97	0.8203	3.5931	0.0059	0.0257	0.0742	0.3251	0.0742	0.3251	4.88E-06	2.14E-05	0.018	0.081	2.05E-05	8.98E-05			0.0007	0.0032
Line Heater Emissions[4]	0.0716	0.3137	1.3021	5.7033	1,562.55	6,843.96	1.0938	4.7908	0.0078	0.0342	0.0990	0.4335	0.0990	0.4335	6.51E-06	2.85E-05	0.025	0.107	2.73E-05	1.20E-04			0.0010	0.0043
TOTALS:	**29.5000**	**129.2099**	**2.5945**	**11.3639**	**2936.5016**	**12861.8772**	**7.5586**	**33.1067**	**0.0138**	**0.0605**	**0.1754**	**0.7684**	**8.9390**	**3.2536**	**1.14E-05**	**4.99E-05**	**4.7386**	**20.7549**	**0.0027**	**0.0117**	**0.0777**	**0.3405**	**0.0066**	**0.0287**
TOTALS (Excluding Fugitives):	**26.5517**	**116.2965**	**2.5945**	**11.3639**	**2859.7843**	**12525.8551**	**7.5586**	**33.1067**	**0.0138**	**0.0605**	**0.1754**	**0.7684**	**0.1754**	**0.7684**	**1.14E-05**	**4.99E-05**	**4.4605**	**19.5368**	**0.0014**	**0.0061**	**0.0218**	**0.0953**	**0.0066**	**0.0287**
UNCONTROLLED (Truck Loading Emissions)																								
Truck Loading Emissions[5]	6.7526	0.6678			6.2065	0.8448											0.0997	9.85E-03	0.0000	1.66E-06	0.0017	1.64E-04		
CONTROLLED EMISSIONS																								
Enclosed Combustor Emissions (from F/W/B losses)[6]	0.5286	2.3152	0.0472	0.2067	134.7790	590.3320	0.0396	0.1736	2.27E-05	0.0001	0.0027	0.0118	0.0036	0.0157	2.36E-07	1.03E-06	0.0883	0.3868	0.0000	0.0001	0.0004	0.0019	2.84E-06	1.24E-05
Controlled Fugitive Emissions from Hauling													4.3818	1.2426										
TOTALS:	**0.529**	**2.315**	**0.047**	**0.207**	**134.779**	**590.332**	**0.040**	**0.174**	**2.27E-05**	**9.93E-05**	**0.003**	**0.012**	**4.385**	**1.258**	**2.36E-07**	**1.03E-06**	**0.088**	**0.387**	**1.97E-05**	**8.62E-05**	**4.34E-04**	**0.002**	**2.84E-06**	**1.24E-05**
POTENTIAL TO EMIT[7]	**3.6092**	**16.4760**	**2.6417**	**11.5706**	**2973.3260**	**13024.0126**	**7.5982**	**33.2803**	**0.0138**	**0.0606**	**0.1781**	**0.7802**	**4.5608**	**2.0267**	**1.16E-05**	**5.09E-05**	**0.4147**	**1.8264**	**0.0017**	**0.0075**	**0.0564**	**0.2474**	**0.0066**	**0.0287**
POTENTIAL TO EMIT (Excluding Fugitives)	**0.6609**	**2.8948**	**2.6417**	**11.5706**	**2896.6086**	**12687.1457**	**7.5982**	**33.2803**	**0.0138**	**0.0606**	**0.1781**	**0.7802**	**0.1790**	**0.7841**	**1.16E-05**	**5.09E-05**	**0.1366**	**0.5984**	**0.0004**	**0.0019**	**0.0005**	**0.0021**	**0.0066**	**0.0287**

Enter any notes here:

1 - See Tables 4 and 5 for fugitive emission calculations; Table 12 for PM emissions from hauling.
2 - See Tables 6 and 7 for tanks emission calculations
3 - See Table 13 for engine emissions
4 - See Table 9 for gas production unit heater and line heater emission calculations
5 - The maximum emission was calculated based on tank truck capacity of 200 barrels and actual fill rate of 50 minutes per tank truck. At a production rate of 130 barrels per day, VOC emissions would be 6.7526 pounds per hour when there are truck loading activities. Average hourly VOC emissions from truck loading is 0.1525 pound per hour.
6 - See Table 10 and 11 for enclosed combustion emission calculations.
7 - The hourly potential to emit is the sum of emissions from gas production unit heaters, line heaters, engine, storage tanks, enclosed combustors, and fugitives. Does not include emissions from loading (see footnote 5). The total TPY PTE is the sum of all emissions.
PM 10 TPY is the sum of uncontrolled hauling and other PM10 sources.

Table 3

Permits Summary

Dotson Holland Well Pad

Doddridge County, West Virginia

Antero Resources Corporation

Pollutant		Emissions		Threshold Exceeded?		
		Uncontrolled	Controlled	Threshold	Uncontrolled	Controlled
VOC	lbs/hr	29.5000	3.6092	6	**Yes**	
	tons/yr	129.8776	16.4760	10	**Yes**	**Yes**
NO_X	lbs/hr	2.5945	2.6417	6		
	tons/yr	11.3639	11.5706	10	**Yes**	**Yes**
CO	lbs/hr	7.5586	7.5982	6	**Yes**	**Yes**
	tons/yr	33.1067	33.2803	10	**Yes**	**Yes**
SO_2	lbs/hr	0.0138	0.0138	6		
	tons/yr	0.0605	0.0606	10		
$PM_{2.5}$	lbs/hr	0.1754	0.1781	6		
	tons/yr	0.7684	0.7802	10		
PM_{10}	lbs/hr	8.9390	4.5608	6	**Yes**	
	tons/yr	3.2536	2.0267	10		
Lead	lbs/hr	1.14E-05	1.16E-05	6		
	tons/yr	4.99E-05	5.09E-05	10		
Total HAPs	lbs/hr	4.7386	0.4147	2	**Yes**	
	tons/yr	20.7648	1.8264	5	**Yes**	
Total TAPs	lbs/hr	0.0092	0.0083	1.14		
n-Hexane	lbs/hr	4.6018	0.3166			
	tons/yr	20.1654	1.3962			
Toluene	lbs/hr	0.0201	0.0125			
	tons/yr	0.0880	0.0550			
Ethylbenzene	lbs/hr	0.0297	0.0208			
	tons/yr	0.1300	0.0914			
Xylenes	lbs/hr	0.0777	0.0564			
	tons/yr	0.3406	0.2474			
Benzene	lbs/hr	0.0027	0.0017			
	tons/yr	0.0117	0.0075			

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

Table 4

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

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

Gas Weight Fraction From Analysis:	VOC frac	0.150
	Benzene frac	0.000
	Toluene	0.000
	Ethylbenzene	0.000
	Xylenes	0.000
	n-Hexane	0.026
	HAPs	0.026
	Methane	0.647

Gas					
Number	Component	Pollutant	Emission Factor (kg/hr of THC per component)	kg/hr	lb/yr
400	Valves	Gas VOC	0.004500	0.27	5,207.75
		Non VOC	0.004500	1.53	29,481.85
		HAPs	0.004500	0.05	885.53
		CO2e	0.004500	29.10	560,829.47
472	Connectors	VOC	0.000200	0.01	273.12
		Non-VOC	0.000200	0.08	1,546.16
		HAPs	0.000200	0.00	46.44
		CO2e	0.000200	1.53	29,412.39
104	Flanges	VOC	0.000390	0.01	117.35
		Non-VOC	0.000390	0.03	664.32
		HAPs	0.000390	0.00	19.95
		CO2e	0.000390	0.655737	12637.357348
			Total VOCs:	0.29	5598.22
			Total THC:	1.93	37290.55

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

Light Liquid					
Number	Component	Pollutant	Emission Factor (kg/hr of THC per component)	kg/hr	lb/yr
416	Valves	Light Liquid VOC	0.002500	1.02	19,619.75
		Light Liquid Non-VOC	0.002500	0.02	423.13
		Light Liquid HAPs	0.002500	0.07	1,380.82
		CO2e	0.002500	0.19	3595.86
			Total VOC:	1.02	19,619.75
			Total THC:	1.04	20,042.88

Fugitive Total Emissions			
	Annual Emissions (lb/yr)	Annual Emissions (lb/hr)	Annual Emissions (tpy)
VOC	25,217.97	2.88	12.61
Ethylbenzene		0.02	0.09
Toluene		0.01	0.05
Xylenes		0.06	0.25
n-Hexane		0.18	0.77
TAPs (Benzene)		0.00	0.01
HAPs		0.27	1.17
CO_{2e}	606,475.07	69.23	303.24

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

Table 5

Pneumatic Control Valve Emissions
Dotson Holland Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Number of PCVs	32
Bleed Rate (scf/day/PCV)	6.6
Total Bleed Rate (scf/day)	211.2

Component	Mol%	Molecular Weight (lb/lb-mole)	Component Flow (scf/day)	Component Moles (lb-moles)	Component Emissions (lbs/day)	(lbs/hr)	(tons/year)
H2S	0.00E+00	34.08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrogen	0.418	14.01	0.882816	2.33E-03	0.03	1.36E-03	0.01
Carbon Dioxide	0.1849	44.01	0.3905088	1.03E-03	0.05	1.89E-03	8.27E-03
Methane	80.4725	16.04	169.95792	0.45	7.18	0.30	1.31
Ethane	13.4876	30.07	28.4858112	0.08	2.26	0.09	0.41
Propane	2.8486	44.1	6.0162432	0.02	0.70	0.03	0.13
Isobutane	0.5527	58.12	1.1673024	3.08E-03	0.18	0.01	0.03
n-Butane	0.9447	58.12	1.9952064	5.26E-03	0.31	0.01	0.06
Isopentane	0.2715	72.15	0.573408	1.51E-03	0.11	4.54E-03	0.02
n-Pentane	0.2282	72.15	0.4819584	1.27E-03	0.09	3.82E-03	0.02
2-Methylpentane	0.00E+00	86.18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3-Methylpentane	0.00E+00	86.18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
n-Hexane	0.5913	86.18	1.2488256	3.29E-03	0.28	0.01	0.05
Methylcyclopentane	0.00E+00	84.16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	0.00E+00	78.11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2-Methylhexane	0.00E+00	100.2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3-Methylhexane	0.00E+00	100.2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Heptane	0.00E+00	100.21	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methylcyclohexane	0.00E+00	98.186	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Toluene	0.00E+00	92.14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Octane	0.00E+00	114.23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ethylbenzene	0.00E+00	106.17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
m & p-Xylene	0.00E+00	106.16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
o-Xylene	0.00E+00	106.16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nonane	0.00E+00	128.2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C10+	0.00E+00	174.28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

	lb/hr	tpy
VOC Emissions	0.0695	0.3044
Benzene Emissions	0.00E+00	0.00E+00
Toluene Emissions	0.00E+00	0.00E+00
Ethylbenzene Emissions	0.00E+00	0.00E+00
Xylene Emissions	0.00E+00	0.00E+00
n-Hexane Emissions	0.0118	0.0518
HAPs Emissions	0.0118	0.0518
TAPs Emissions	0.00E+00	0.00E+00
CO_{2e} emissions	7.4851	32.7846

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

Table 6

Uncontrolled Flashing Emissions
Dotson Holland Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

# Hours Operational	8760

	Condensate Tank Flashing Losses			Produced Water Tank Flashing Losses		
	Vapor Mass Fraction	Flashing Losses		Vapor Mass Fraction	Flashing Losses	
	wt%	lbs/hr	tpy	wt%	lbs/hr	tpy
Water	0.1721	0.0574	0.2514	2.7195	0.0579	0.2536
H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Nitrogen	0.0100	0.0033	0.0146	0.2925	0.0062	0.0273
Carbon Dioxide	0.3256	0.1086	0.4757	3.0236	0.0644	0.2820
Methane	7.3876	2.4639	10.7919	61.2917	1.3051	5.7162
Ethane	26.9231	8.9794	39.3296	21.0687	0.4486	1.9649
Propane	21.0584	7.0234	30.7624	7.0570	0.1503	0.6581
Isobutane	7.2750	2.4263	10.6274	0.6326	0.0135	0.0590
n-Butane	13.3169	4.4415	19.4536	2.2307	0.0475	0.2080
Isopentane	5.1034	1.7021	7.4552	0.5405	0.0115	0.0504
n-Pentane	4.3936	1.4654	6.4183	0.4438	0.0095	0.0414
2-Methylpentane	0.0575	0.0192	0.0841	0.0027	0.0001	0.0003
3-Methylpentane	0.0399	0.0133	0.0584	0.0049	0.0001	0.0005
n-Hexane	12.8892	4.2988	18.8287	0.4775	0.0102	0.0445
Methylcyclopentane	0.0102	0.0034	0.0150	0.0035	0.0001	0.0003
Benzene	0.0026	0.0009	0.0038	0.0043	0.0001	0.0004
2-Methylhexane	0.0801	0.0267	0.1170	0.0033	0.0001	0.0003
3-Methylhexane	0.0691	0.0230	0.1009	0.0030	0.0001	0.0003
Heptane	0.1627	0.0543	0.2376	0.0073	0.0002	0.0007
Methylcyclohexane	0.0861	0.0287	0.1258	0.0197	0.0004	0.0018
Toluene	0.0205	0.0068	0.0299	0.0321	0.0007	0.0030
Octane	0.3462	0.1155	0.5057	0.0093	0.0002	0.0009
Ethylbenzene	0.0235	0.0078	0.0343	0.0366	0.0008	0.0034
m & p-Xylene	0.0219	0.0073	0.0320	0.0338	0.0007	0.0031
o-Xylene	0.0343	0.0115	0.0502	0.0541	0.0012	0.0050
Nonane	0.1571	0.0524	0.2295	0.0065	0.0001	0.0006
C10+	0.0334	0.0111	0.0488	0.0006	0.0000	0.0001
Total VOCs	65.182	21.74	95.2	11.604	0.2471	1.0822
Total CO_{2e}		61.71	270.3		32.69	143.2
Total TAPs (Benzene)		0.0009	0.0038		0.0001	0.0004
Toluene		0.0068	0.0299		0.0007	0.0030
Ethylbenzene		0.0078	0.0343		0.0008	0.0034
Xylenes		0.0188	0.0822		0.0019	0.0082
n-Hexane		4.299	18.829		0.0102	0.0445
Total HAPs		4.333	18.979		0.0136	0.0595
Total	100.00	33.35	146.1	100.00	2.129	9.33

Enter any notes here:	Vapor mass fractions and Flashing losses from Promax output

Table 7

Uncontrolled Working and Breathing Losses
Dotson Holland Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Condensate Tank Information	
Number of Tanks	8
Maximum Working Losses (lbs/hr)	2.4097
Maximum Breathing Losses (lbs/hr)	5.0438
# Hours Operational	8760

	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
H2S	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrogen	0.0005	1.24E-05	5.43E-05	0.0000	0.0001	0.0000	0.0002
Carbon Dioxide	0.4293	0.0103	0.0453	0.0217	0.0948	0.0320	0.1402
Methane	1.8720	0.0451	0.1976	0.0944	0.4136	0.1395	0.6111
Ethane	38.2242	0.9211	4.0344	1.9280	8.4445	2.8490	12.4788
Propane	25.2007	0.6073	2.6598	1.2711	5.5673	1.8783	8.2271
Isobutane	8.1601	0.1966	0.8613	0.4116	1.8027	0.6082	2.6640
n-Butane	14.6666	0.3534	1.5480	0.7398	3.2402	1.0932	4.7881
Isopentane	5.2812	0.1273	0.5574	0.2664	1.1667	0.3936	1.7241
n-Pentane	4.4650	0.1076	0.4713	0.2252	0.9864	0.3328	1.4577
2-Methylpentane	0.0565	0.0014	0.0060	0.0029	0.0125	0.0042	0.0185
3-Methylpentane	0.0390	0.0009	0.0041	0.0020	0.0086	0.0029	0.0127
n-Hexane	0.8557	0.0206	0.0903	0.0432	0.1890	0.0638	0.2793
Methylcyclopentane	0.0093	0.0002	0.0010	0.0005	0.0021	0.0007	0.0030
Benzene	0.0001	3.52E-06	0.0000	0.0000	0.0000	0.0000	0.0000
2-Methylhexane	0.0052	1.25E-04	0.0005	0.0003	0.0011	0.0004	0.0017
3-Methylhexane	0.0672	0.0016	0.0071	0.0034	0.0148	0.0050	0.0219
Heptane	0.1463	0.0035	0.0154	0.0074	0.0323	0.0109	0.0478
Methylcyclohexane	0.0757	0.0018	0.0080	0.0038	0.0167	0.0056	0.0247
Toluene	0.0025	5.96E-05	2.61E-04	0.0001	0.0005	0.0002	0.0008
Octane	0.2861	0.0069	0.0302	0.0144	0.0632	0.0213	0.0934
Ethylbenzene	0.0052	1.25E-04	5.47E-04	0.0003	0.0011	0.0004	0.0017
m & p-Xylene	0.0062	1.50E-04	6.57E-04	0.0003	0.0014	0.0005	0.0020
o-Xylene	0.0084	2.03E-04	0.0009	0.0004	0.0019	0.0006	0.0027
Nonane	0.1171	0.0028	0.0124	0.0059	0.0259	0.0087	0.0382
C10+	0.0197	4.74E-04	0.0021	0.0010	0.0043	0.0015	0.0064
Total VOCs	59.474	1.4331	6.277	2.9998	13.1390	4.4329	19.416
Total CO_{2e}		1.1381	4.9848	2.3821	10.4338	3.5202	15.419
Total TAPs (Benzene)		3.52E-06	1.54E-05	0.0000	0.0000	0.0000	0.0000
Toluene		5.96E-05	2.61E-04	0.0001	0.0005	0.0002	0.0008
Ethylbenzene		1.25E-04	5.47E-04	0.0003	0.0011	0.0004	0.0017
Xylenes		3.53E-04	0.0015	0.0007	0.0032	0.0011	0.0048
n-Hexane		0.0206	0.0903	0.0432	0.1890	0.0638	0.2793
Total HAPs		0.0212	0.0927	0.0443	0.1940	0.0654	0.2867
Total	100.00	2.4097	10.5545	5.0438	22.0920	7.4535	32.646

Table 7

Uncontrolled Working and Breathing Losses
Dotson Holland Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Produced Water Tank Information	
Number of Tanks	2
Maximum Working Losses (lbs/hr)	0.0355
Maximum Breathing Losses (lbs/hr)	0.0083

	Produced Water 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
H2S	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrogen	0.0056	1.99E-06	8.74E-06	4.67E-07	2.05E-06	2.46E-06	1.08E-05
Carbon Dioxide	3.9156	0.0014	0.0061	0.0003	0.0014	0.0017	0.0075
Methane	3.2736	0.0012	0.0051	0.0003	0.0012	0.0014	0.0063
Ethane	1.0385	0.0004	0.0016	0.0001	0.0004	0.0005	0.0020
Propane	0.0848	3.01E-05	0.0001	7.04E-06	3.08E-05	3.71E-05	0.0002
Isobutane	0.0010	3.38E-07	1.48E-06	7.91E-08	3.46E-07	4.17E-07	1.83E-06
n-Butane	0.0051	1.79E-06	7.85E-06	4.20E-07	1.84E-06	2.21E-06	9.69E-06
Isopentane	0.0003	1.09E-07	4.77E-07	2.55E-08	1.12E-07	1.34E-07	5.88E-07
n-Pentane	0.0002	6.52E-08	2.85E-07	1.53E-08	6.68E-08	8.04E-08	3.52E-07
2-Methylpentane	2.12E-07	7.54E-11	3.30E-10	1.77E-11	7.73E-11	9.30E-11	4.08E-10
3-Methylpentane	9.39E-07	3.33E-10	1.46E-09	7.80E-11	3.42E-10	4.11E-10	1.80E-09
n-Hexane	1.46E-06	5.18E-10	2.27E-09	1.21E-10	5.32E-10	6.40E-10	2.80E-09
Methylcyclopentane	1.44E-06	5.11E-10	2.24E-09	1.20E-10	5.24E-10	6.31E-10	2.76E-09
Benzene	5.50E-06	1.95E-09	8.55E-09	4.57E-10	2.00E-09	2.41E-09	1.05E-08
2-Methylhexane	4.28E-09	1.52E-12	6.65E-12	3.55E-13	1.56E-12	1.87E-12	8.21E-12
3-Methylhexane	5.76E-08	2.04E-11	8.95E-11	4.79E-12	2.10E-11	2.52E-11	1.10E-10
Heptane	1.04E-07	3.70E-11	1.62E-10	8.67E-12	3.80E-11	4.57E-11	2.00E-10
Methylcyclohexane	1.73E-06	6.15E-10	2.69E-09	1.44E-10	6.30E-10	7.58E-10	3.32E-09
Toluene	1.96E-05	6.94E-09	3.04E-08	1.63E-09	7.12E-09	8.57E-09	3.75E-08
Octane	2.57E-08	9.13E-12	4.00E-11	2.14E-12	9.36E-12	1.13E-11	4.93E-11
Ethylbenzene	1.25E-05	4.45E-09	1.95E-08	1.04E-09	4.56E-09	5.49E-09	2.41E-08
m & p-Xylene	1.29E-05	4.58E-09	2.01E-08	1.07E-09	4.70E-09	5.66E-09	2.48E-08
o-Xylene	2.17E-05	7.68E-09	3.36E-08	1.80E-09	7.88E-09	9.48E-09	4.15E-08
Nonane	8.54E-09	3.03E-12	1.33E-11	7.09E-13	3.11E-12	3.74E-12	1.64E-11
C10+	8.89E-12	3.15E-15	1.38E-14	7.39E-16	3.24E-15	3.89E-15	1.71E-14
Total VOCs	0.0914	3.24E-05	0.0001	7.59E-06	3.32E-05	4.00E-05	0.0002
Total CO_{2e}		0.0304	0.1333	0.0071	0.0312	0.0375	0.1645
Total TAPs (Benzene)		1.95E-09	8.55E-09	4.57E-10	2.00E-09	2.41E-09	1.05E-08
Toluene		6.94E-09	3.04E-08	1.63E-09	7.12E-09	8.57E-09	3.75E-08
Ethylbenzene		4.45E-09	1.95E-08	1.04E-09	4.56E-09	5.49E-09	2.41E-08
Xylenes		1.23E-08	5.37E-08	2.87E-09	1.26E-08	1.51E-08	6.63E-08
n-Hexane		5.18E-10	2.27E-09	1.21E-10	5.32E-10	6.40E-10	2.80E-09
Total HAPs		2.61E-08	1.14E-07	6.12E-09	2.68E-08	3.22E-08	1.41E-07
Total	100.00	0.0355	0.1554	0.0083	0.0364	0.0438	0.1918

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

Table 8

Loading Emissions
Dotson Holland Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Annual Loading	Oil Truck Loading	Water Truck Loading
RVP	3.54	1.0220
Annual Average Temp (F)	65.08	65.08
S (saturation factor)	0.6	0.6
P (true vapor pressure)	1.99	0.37
M (MW of vapor)	39.76	18.46
Collection Efficiency (%)	0.00	0.00
Loading Loss (lb/10^3 gal)*	1.13	0.10
Maximum Throughput (gallons/hr)**	10,080	10,080
Average Throughput (gallons/yr)	1,992,900	7,511,700
Loading Emissions (lbs/hr)	11.35	0.99
Loading Emissions (tpy)	1.12	0.37

	Condensate Tank Loading Losses			Produced Water Tank Loading Losses		
	Vapor Mass Fraction	Loading Losses		Vapor Mass Fraction	Loading Losses	
	wt%	lbs/hr	tpy	wt%	lbs/hr	tpy
H2S	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrogen	0.0005	5.84E-05	5.78E-06	0.0056	5.54E-05	2.06E-05
Carbon Dioxide	0.4293	0.0487	4.82E-03	3.9156	3.86E-02	1.44E-02
Methane	1.8720	0.2125	2.10E-02	3.2736	3.23E-02	1.20E-02
Ethane	38.2242	4.3394	0.4290	1.0385	1.02E-02	3.81E-03
Propane	25.2007	2.8609	2.83E-01	0.0848	8.35E-04	3.11E-04
Isobutane	8.1601	0.9264	9.16E-02	0.0010	9.38E-06	3.49E-06
n-Butane	14.6666	1.6650	1.65E-01	0.0051	4.98E-05	1.85E-05
Isopentane	5.2812	0.5995	5.93E-02	0.0003	3.02E-06	1.13E-06
n-Pentane	4.4650	0.5069	5.01E-02	0.0002	1.81E-06	6.74E-07
2-Methylpentane	0.0565	0.0064	6.34E-04	2.12E-07	2.09E-09	7.80E-10
3-Methylpentane	0.0390	0.0044	4.38E-04	9.39E-07	9.25E-09	3.45E-09
n-Hexane	0.8557	0.0971	9.60E-03	1.46E-06	1.44E-08	5.36E-09
Methylcyclopentane	0.0093	0.0011	1.04E-04	1.44E-06	1.42E-08	5.29E-09
Benzene	0.0001	0.0000	1.64E-06	0.0000	5.42E-08	2.02E-08
2-Methylhexane	0.0052	0.0006	5.82E-05	4.28E-09	4.22E-11	1.57E-11
3-Methylhexane	0.0672	0.0076	7.54E-04	5.76E-08	5.68E-10	2.11E-10
Heptane	0.1463	0.0166	1.64E-03	1.04E-07	1.03E-09	3.83E-10
Methylcyclohexane	0.0757	0.0086	8.49E-04	1.73E-06	1.71E-08	6.36E-09
Toluene	0.0025	0.0003	2.78E-05	0.0000	1.93E-07	7.18E-08
Octane	0.2861	0.0325	3.21E-03	2.57E-08	2.54E-10	9.45E-11
Ethylbenzene	0.0052	0.0006	5.81E-05	1.25E-05	1.24E-07	4.60E-08
m & p-Xylene	0.0062	0.0007	6.98E-05	1.29E-05	1.27E-07	4.74E-08
o-Xylene	0.0084	0.0010	9.44E-05	2.17E-05	2.13E-07	7.95E-08
Nonane	0.1171	0.0133	1.31E-03	8.54E-09	8.41E-11	3.14E-11
C10+	0.0197	0.0022	2.21E-04	8.89E-12	8.76E-14	3.26E-14
Total VOCs	59.4739	6.7517	0.6674	0.0914	9.00E-04	3.35E-04
Total CO_{2e}		5.3616	0.5300		0.8448	0.3148
Total TAPs (Benzene)		0.0000	1.64E-06		5.42E-08	2.02E-08
Toluene		0.0003	2.78E-05		1.93E-07	7.18E-08
Ethylbenzene		0.0006	5.81E-05		1.24E-07	4.60E-08
Xylenes		0.0017	1.64E-04		3.41E-07	1.27E-07
n-Hexane		0.0971	9.60E-03		1.44E-08	5.36E-09
Total HAPs		0.0997	9.85E-03		7.26E-07	2.70E-07
Total	100.0000	11.3524	1.1222	100.0000	0.9852	0.3671

Enter any notes here

Vapor mass fractions and loading losses from Promax output

Using equation L_L = 12.46 SPM/T from AP-42, Chapter 5, Section 5.2-4

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

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

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

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

** Maximum throughput in gallons per hour obtained from actual transfer rate of 200 barrels in 50 minutes. (10,080 gal/hr = 200 bbl / 50 min x 42 gal/bbl x 60 min/hr)

Loading emissions are vented to the atmosphere.

Table 9

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

Gas Production Unit Heater Emissions

Number of Units	8
GPU Heater Rating (MMBtu/hr)	1.50
Operating hours/year	8760
Fuel Heat Value (Btu/scf)	1,229

Pollutant	Emission Factors (lb/MMscf)	lb/hr	tpy
NOx	100	0.977	4.277
CO	84	0.820	3.593
CO_2	120,000	1171.912	5132.973
Lead	0.0005	4.88E-06	2.14E-05
N_2O	2.2	0.021	0.094
PM (Total)	7.6	0.074	0.325
SO_2	0.6	0.006	0.026
TOC	11	0.107	0.471
Methane	2.3	0.022	0.098
VOC	5.5	0.054	0.235
HAPS			
2-Methylnaphthalene	2.40E-05	2.34E-07	1.03E-06
Benzene	2.10E-03	2.05E-05	8.98E-05
Dichlorobenzene	1.20E-03	1.17E-05	5.13E-05
Fluoranthene	3.00E-06	2.93E-08	1.28E-07
Fluorene	2.80E-06	2.73E-08	1.20E-07
Formaldehyde	7.50E-02	7.32E-04	3.21E-03
Hexane	1.80E+00	1.76E-02	7.70E-02
Naphthalene	6.10E-04	5.96E-06	2.61E-05
Phenanathrene	1.70E-05	1.66E-07	7.27E-07
Toluene	3.40E-03	3.32E-05	1.45E-04

Line Heater Emissions

Number of Units	8
Line Heater Rating (MMBtu/hr)	2.00
Operating hours/year	8760
Fuel Heat Value (Btu/scf)	1,229

Pollutant	Emission Factors (lb/MMscf)	lb/hr	tpy
NOx	100	1.302	5.703
CO	84	1.094	4.791
CO_2	120,000	1562.549	6843.964
Lead	0.0005	6.51E-06	2.85E-05
N_2O	2.2	0.029	0.125
PM (Total)	7.6	0.099	0.433
SO_2	0.6	0.008	0.034
TOC	11	0.143	0.627
Methane	2.3	0.030	0.131
VOC	5.5	0.072	0.314
HAPS			
2-Methylnaphthalene	2.40E-05	3.13E-07	1.37E-06
Benzene	2.10E-03	2.73E-05	1.20E-04
Dichlorobenzene	1.20E-03	1.56E-05	6.84E-05
Fluoranthene	3.00E-06	3.91E-08	1.71E-07
Fluorene	2.80E-06	3.65E-08	1.60E-07
Formaldehyde	7.50E-02	9.77E-04	4.28E-03
Hexane	1.80E+00	2.34E-02	1.03E-01
Naphthalene	6.10E-04	7.94E-06	3.48E-05
Phenanathrene	1.70E-05	2.21E-07	9.70E-07
Toluene	3.40E-03	4.43E-05	1.94E-04

	lb/hr	tpy
TOTAL Uncontrolled VOC	0.125	0.549
TOTAL Uncontrolled HAPs	0.043	0.188
TOTAL Uncontrolled TAPs (Benzene)	4.79E-05	2.10E-04
TOTAL Uncontrolled Toluene	7.75E-05	3.39E-04
TOTAL Uncontrolled Hexane	0.041	0.180
TOTAL Uncontrolled TAPs (Formaldehyde)	0.002	0.007
TOTAL CO_{2e} Emissions	2,750.71	12,048.11

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

Table 10

Enclosed Combustor Emissions
Dotson Holland Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

General Information	
Unit Name:	EC001, EC002, EC003

Pollutant	Emission Factor (lb/MMscf)
NOx	100
CO	84
PM10	7.6
PM2.5	5.7
SO_2	0.6
CO_2	120,000
VOC	5.5
benzene	2.10E-03
Hexane	1.80E+00
Toluene	3.40E-03
Formaldehyde	7.50E-02
N_2O	2.20
Lead	5.00E-04

Constants	
Btu/MMBtu	1,000,000
scf/MMscf	1,000,000
lb/ton	2,000
H_2S molecular weight	34.08
SO_2 molecular weight	64.06
seconds/hour	3,600
inches/ft	12

Destruction Efficiency	
VOC percent destruction efficiency (%)	98
H_2S percent destruction efficiency (%)	98

Enclosed Combustor operating hours	8760
No. of Enclosed Combustors	3

Stream Information							
	1	2	3	4	5	6	Total
Stream Sent to Enclosed/Vapor Combustor (Enter Name of Each Stream Here)	pilot(s)	added fuel stream(s)	Oil Tank Flash Emissions	Water Tank Flash Emissions	Oil Tank W/B Emissions	Water Tank W/B Emissions	-
Maximum Expected Hourly Volumetric Flow Rate of Stream (scf/hr)	37.8	--	318.29	43.78	71.13	0.90	471.91
Maximum Expected Annual Volumetric Flow Rate of Stream (scf/yr)	331,128.00	--	2,788,234.70	383,536.54	623,117.25	7,886.88	4,133,903.37
Heating Content (Btu/ft3)	1,229		2,285.45	1,156.52	2,274.24	97.52	1,991.78

Mass Flow Rates of the Vapors Sent to this Control Device, Hourly Basis (lb/hr)							
	1	2	3	4	5	6	Total
Stream Sent to Enclosed Combustor/Vapor Combustor	pilot(s)	added fuel stream(s)	Oil Tank Flash Emissions	Water Tank Flash Emissions	Oil Tank W/B Emissions	Water Tank W/B Emissions	-
H2S	-	-	0.000	0.000	0.000	0.000	0.000
Total VOC	-	-	21.739	0.247	4.433	0.000	26.42
Benzene	-	-	0.001	0.000	0.000	0.000	0.001
Toluene	-	-	0.007	0.001	0.000	0.000	0.008
Ethylbenzene	-	-	0.008	0.001	0.000	0.000	0.009
Xylenes	-	-	0.019	0.002	0.001	0.000	0.022
n-Hexane	-	-	4.299	0.010	0.064	0.000	4.373
HAPs	-	-	4.333	0.014	0.065	0.000	4.412
Total Mass Flow	-	-	33.352	2.129	7.454	0.044	42.979
Mass Flow Rates of the Vapors Sent to this Control Device, Annual Basis (tpy)							
H2S	-	-	0.000	0.000	0.000	0.000	0.000
Total VOC	-	-	95.218	1.082	19.416	0.000	115.717
Benzene	-	-	0.004	0.000	0.000	0.000	0.004
Toluene	-	-	0.030	0.003	0.001	0.000	0.034
Ethylbenzene	-	-	0.034	0.003	0.002	0.000	0.039
Xylenes	-	-	0.082	0.008	0.005	0.000	0.095
n-Hexane	-	-	18.829	0.045	0.279	0.000	19.153
HAP	-	-	18.979	0.060	0.287	0.000	19.325
Total Mass Flow	-	-	146.082	9.326	32.646	0.192	188.246

Table 10

Enclosed Combustor Emissions
Dotson Holland Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Controlled Emissions							
Hourly (lb/hr)							
	1	2	3	4	5	6	Total
Stream Sent to Enclosed Combustor/Vapor Combustor	pilot(s)	added fuel stream(s)	Oil Tank Flash Emissions	Water Tank Flash Emissions	Oil Tank W/B Emissions	Water Tank W/B Emissions	-
NOx	0.004	-	0.032	0.004	0.007	0.000	0.05
CO	0.003	-	0.027	0.004	0.006	0.000	0.04
PM2.5	0.000	-	0.002	0.000	0.000	0.000	0.00
PM10	0.000	-	0.002	0.000	0.001	0.000	0.00
H2S	0.000	-	0.000	0.000	0.000	0.000	0.00
SO_2	0.000	-	0.000	0.000	0.000	0.000	0.00
CO_2	4.536	-	-	-	-	-	4.54
Total VOC	0.000	-	0.435	0.005	0.089	0.000	0.53
Benzene	0.000	-	0.000	0.000	0.000	0.000	0.00
Toluene	0.000	-	0.000	0.000	0.000	0.000	0.00
Ethylbenzene	0.000	-	0.000	0.000	0.000	0.000	0.00
Xylenes	0.000	-	0.000	0.000	0.000	0.000	0.00
n-Hexane	0.000	-	0.086	0.000	0.001	0.000	0.09
HAP	0.000	-	0.087	0.000	0.001	0.000	0.09
N_2O	0.000	-	0.001	0.000	0.000	0.000	0.00
Lead	0.000	-	0.000	0.000	0.000	0.000	0.00
Formaldehyde	0.000	-	-	-	-	-	0.00
Annual (tpy)							
	1	2	3	4	5	6	Total
Stream Sent to Enclosed Combustor/Vapor Combustor	pilot(s)	added fuel stream(s)	Oil Tank Flash Emissions	Water Tank Flash Emissions	Oil Tank W/B Emissions	Water Tank W/B Emissions	-
NOx	0.017	-	0.139	0.019	0.031	0.000	0.21
CO	0.014	-	0.117	0.016	0.026	0.000	0.17
PM2.5	0.001	-	0.008	0.001	0.002	0.000	0.01
PM10	0.001	-	0.011	0.001	0.002	0.000	0.02
H_2S	0.000	-	0.000	0.000	0.000	0.000	0.00
SO_2	0.000	-	0.000	0.000	0.000	0.000	0.00
CO_2	19.868	-	-	-	-	-	19.87
Total VOC	0.001	-	1.904	0.022	0.388	0.000	2.32
Benzene	0.000	-	0.000	0.000	0.000	0.000	0.00
Toluene	0.000	-	0.001	0.000	0.000	0.000	0.00
Ethylbenzene	0.000	-	0.001	0.000	0.000	0.000	0.00
Xylenes	0.000	-	0.002	0.000	0.000	0.000	0.00
n-Hexane	0.000	-	0.377	0.001	0.006	0.000	0.38
HAP	0.000	-	0.380	0.001	0.006	0.000	0.39
N_2O	0.000	-	0.003	0.000	0.001	0.000	0.00
Lead	0.000	-	0.000	0.000	0.000	0.000	0.00
Formaldehyde	0.000	-	-	-	-	-	0.00

Enclosed Combustor/Vapor Combustor Total Emissions		
	Hourly Emissions (lb/hr)	Annual Emissions (tpy)
Total VOC	0.53	2.32
NOx	0.047	0.207
CO	0.040	0.174
PM2.5	0.003	0.012
PM10	0.004	0.016
H_2S	1.21E-05	5.28E-05
SO_2	2.27E-05	9.93E-05
Benzene (TAPs)	1.97E-05	8.62E-05
Toluene	1.54E-04	6.75E-04
Ethylbenzene	1.80E-04	7.88E-04
Xylenes	4.34E-04	0.002
Hexanes	0.088	0.383
Formaldehyde (TAPs)	2.84E-06	1.24E-05
HAPs	0.09	0.39
CO_2e	134.78	590.33
N_2O	0.001	0.005
Lead	2.36E-07	1.03E-06

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

Enclosed Combustor GHG Emissions
Dotson Holland Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Enclosed Combustor CO_2 and CH_4 Emissions

Components	Mole fraction of oil flash gas constituents[a]	Volume of oil flash gas sent to Enclosed Combustor *scf/year*	Mole fraction of water flash gas constituents[a]	Volume of water flash gas sent to Enclosed Combustor *scf/year*	Mole fraction of oil tank vapors constituents[a]	Volume of oil tank vapor sent to Enclosed Combustor *scf/year*	Mole fraction of water tank vapors constituents[a]	Volume of water tank vapors sent to Enclosed Combustor *scf/year*	Component volume of gas sent to Enclosed Combustor *scf/year*	Number of carbon atoms	Combustion Efficiency	Combusted CO_2 Volume[b] *scf/year*	Uncombusted CO_2 and CH_4 Volume[b] *scf/year*	Volume GHGs Emitted *scf/year*
CO_2	0.003	2,788,235	0.0138	383,537	0.0039	623,117	0.016	7,887	16,084	1	0	--	16,084	9,478,675
Methane	0.184	2,788,235	0.7653	383,537	0.0464	623,117	0.038	7,887	836,965	1	0.98	820,226	16,739	16,739
Ethane	0.359	2,788,235	0.1403	383,537	0.5055	623,117	0.006	7,887	1,368,489	2	0.98	2,682,239	--	
Propane	0.191	2,788,235	0.0320	383,537	0.2273	623,117	0.000	7,887	687,043	3	0.98	2,019,906	--	
i-Butane	0.050	2,788,235	0.0022	383,537	0.0558	623,117	0.000	7,887	175,377	4	0.98	687,476	--	
n-Butane	0.092	2,788,235	0.0077	383,537	0.1003	623,117	0.000	7,887	321,293	4	0.98	1,259,470	--	
Pentane	0.053	2,788,235	0.0027	383,537	0.0537	623,117	0.000	7,887	181,483	5	0.98	889,266	--	
Hexane	0.060	2,788,235	0.0011	383,537	0.0044	623,117	0.000	7,887	171,415	6	0.98	1,007,921	--	
Benzene	0.000	2,788,235	0.0000	383,537	0.0000	623,117	0.000	7,887	42	6	0.98	249	--	
Heptanes	0.001	2,788,235	0.0000	383,537	0.0009	623,117	0.000	7,887	4,192	7	0.98	28,758	--	
Toluene	0.000	2,788,235	0.0001	383,537	0.0000	623,117	0.000	7,887	281	7	0.98	1,931	--	
Octane	0.002	2,788,235	0.0001	383,537	0.0013	623,117	0.000	7,887	5,196	8	0.98	40,738	--	
Ethyl benzene	0.000	2,788,235	0.0001	383,537	0.0000	623,117	0.000	7,887	286	8	0.98	2,239	--	
Xylenes	0.000	2,788,235	0.0002	383,537	0.0001	623,117	0.000	7,887	689	8	0.98	5,404	--	
Nonane	0.000	2,788,235	0.0000	383,537	0.0004	623,117	0.000	7,887	1,598	9	0.98	14,096	--	
Decane plus	0.000	2,788,235	0.0000	383,537	0.0000	623,117	0.000	7,887	273	10	0.98	2,672	--	
											Subtotal	**9,462,591**	--	

Pollutant	Volume Emitted *scf/year*	Density of GHG[c] *lb/scf*	Conversion Factor *lb/ton*	GWF	Emissions[c] *lbs/hr*	Emissions[c] *(tons/yr)*
CO_2	9,478,675	0.12	2000	1	125.48	549.59
CH_4	16,739	0.09	2000	25	0.18	0.78
				CO_2e Emissions	**129.9**	**569.05**

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
Dotson Holland Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

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

Tanker Truck Trip Calculation	
Condensate Production (bbl/day)	130
PW Production (bbl/day)	490
Truck Capacity (bbl)	200

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

	# of Wheels	Mean Vehicle Weight (W) (tons)	Mean Vehicle Speed (S) (mph)	Miles Per Trip (miles)	Maximum Trips per Hour	Maximum Trips per Year	Vehicle Miles Travelled (miles/hr)	Vehicle Miles Travelled (miles/year)	PM (lbs/VMT)	PM10 (lbs/VMT)
Tanker Trucks Condensate	10	40	10	2.5400	1	238	2.5400	604.5200	3.8175	1.7179
Tanker Trucks PW	10	40	10	2.5400	1	895	2.5400	2273.3000	3.8175	1.7179
Pick Up Truck	4	3	10	0.2350	1	730	0.2350	171.5500	0.3467	0.1560

	Uncontrolled Emissions						Controlled Emissions					
	PM			PM10			PM			PM10		
	(lbs/hr)	(lbs/year)	(tpy)	(lbs/hr)	(lbs/year)	(tpy)	(lbs/hr)	(lbs/year)	(tpy)	(lbs/hr)	(lbs/year)	(tpy)
Tanker Trucks Condensate	9.6965	2307.7729	1.1539	4.3634	1038.4978	0.5192	4.8483	1153.8864	0.5769	2.1817	519.2489	0.2596
Tanker Trucks PW	9.6965	8678.3896	4.3392	4.3634	3905.2753	1.9526	4.8483	4339.1948	2.1696	2.1817	1952.6377	0.9763
Pick Up Truck	0.0815	59.4729	0.0297	0.0367	26.7628	0.0134	0.0407	29.7365	0.0149	0.0183	13.3814	0.0067
Total Emissions	19.4745	11,045.6353	5.5228	8.7635	4,970.5359	2.4853	9.7373	5,522.8177	2.7614	4.3818	2,485.2679	1.2426

Enter any notes here:	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
Dotson Holland Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Kubota DG972-E2

Power (hp)	24
Fuel consumption (lbs/BHP-hr)	0.449
Heat Content of Fuel (Btu/scf)	1228.7615
Density of NG (lb/scf)	0.056
Operating Hours/year	8760
No. of Engines	1

Pollutant	Emission Factors (g/hp-hr)	Emission Factors (lb/MMBtu)	lb/hr	tpy
NOx[1]	5.97		0.3158	1.3831
CO[2]	106.7		5.6445	24.7228
CO_2		110.000	26.0094	113.92
$PM_{2.5}$		0.010	0.0022	0.0098
PM_{10}		0.010	0.0022	0.0098
PM (Total)		0.010	0.0023	0.0103
SO_2		5.880E-04	0.0001	0.0006
TOC		0.358	0.0846	0.3708
Methane		0.230	0.0544	0.2382
VOC[3]		0.0296	0.0070	0.0307
HAPS				
Benzene		0.002	3.74E-04	0.002
Ethylbenzene		2.48E-05	5.86E-06	2.57E-05
Formaldehyde		0.021	0.005	0.021
Naphthalene		9.71E-05	2.30E-05	1.01E-04
Toluene		5.58E-04	1.32E-04	5.78E-04
Xylene		1.95E-04	4.61E-05	2.02E-04

	lb/hr	tpy
TOTAL Uncontrolled VOC	0.007	0.031
TOTAL Uncontrolled NOx	0.316	1.383
TOTAL Uncontrolled HAPs	0.005	0.024
TOTAL Uncontrolled TAPs (Benzene)	3.74E-04	0.002
TOTAL Uncontrolled Toluene	1.32E-04	5.78E-04
TOTAL Uncontrolled Ethylbenzene	5.86E-06	2.57E-05
TOTAL Uncontrolled Xylenes	4.61E-05	2.02E-04
TOTAL Uncontrolled TAPs (Formaldehyde)	0.005	0.021
TOTAL CO_{2e} Emissions	27.369	119.876

Enter Any Notes Here:

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

Table 14

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

	Potential Emissions		Initial Permit Application Emissions		Change in Emissions	
Pollutant	**Hourly PTE**	**Yearly PTE**	**Hourly PTE**	**Yearly PTE**	**Hourly PTE**	**Yearly PTE**
PM	9.9163	3.5455	0.357	1.57	9.56E+00	1.9803
PM10	4.5608	2.0267	0.579	1.23	3.9820	0.7958
VOC (uncontrolled)	29.5000	129.8776	511.887	2245.72	-482.3874	-2115.8422
CO	7.5982	33.2803	7.063	30.94	0.5349	2.3430
NOx	2.6417	11.5706	2.005	8.78	0.6368	2.7893
SO2	0.0138	0.0606	0.006	0.03	7.78E-03	3.41E-02
Pb	1.16E-05	5.09E-05	0.000	0.00	3.18E-06	1.39E-05
HAPs	0.4147	1.8264	1.185	5.22	-0.7707	-3.3887
TAPs	0.0083	0.0362	0.027	0.12	-1.84E-02	-0.0808

Notes:
1. Change in emissions due to the decrease in condensate production, and the addition of 8 line heaters, and 2 Cimarron enclosed combustors.
2. Change in permit from G70A to G70C.

Bryan Research & Engineering, Inc.

ProMax® 3.2

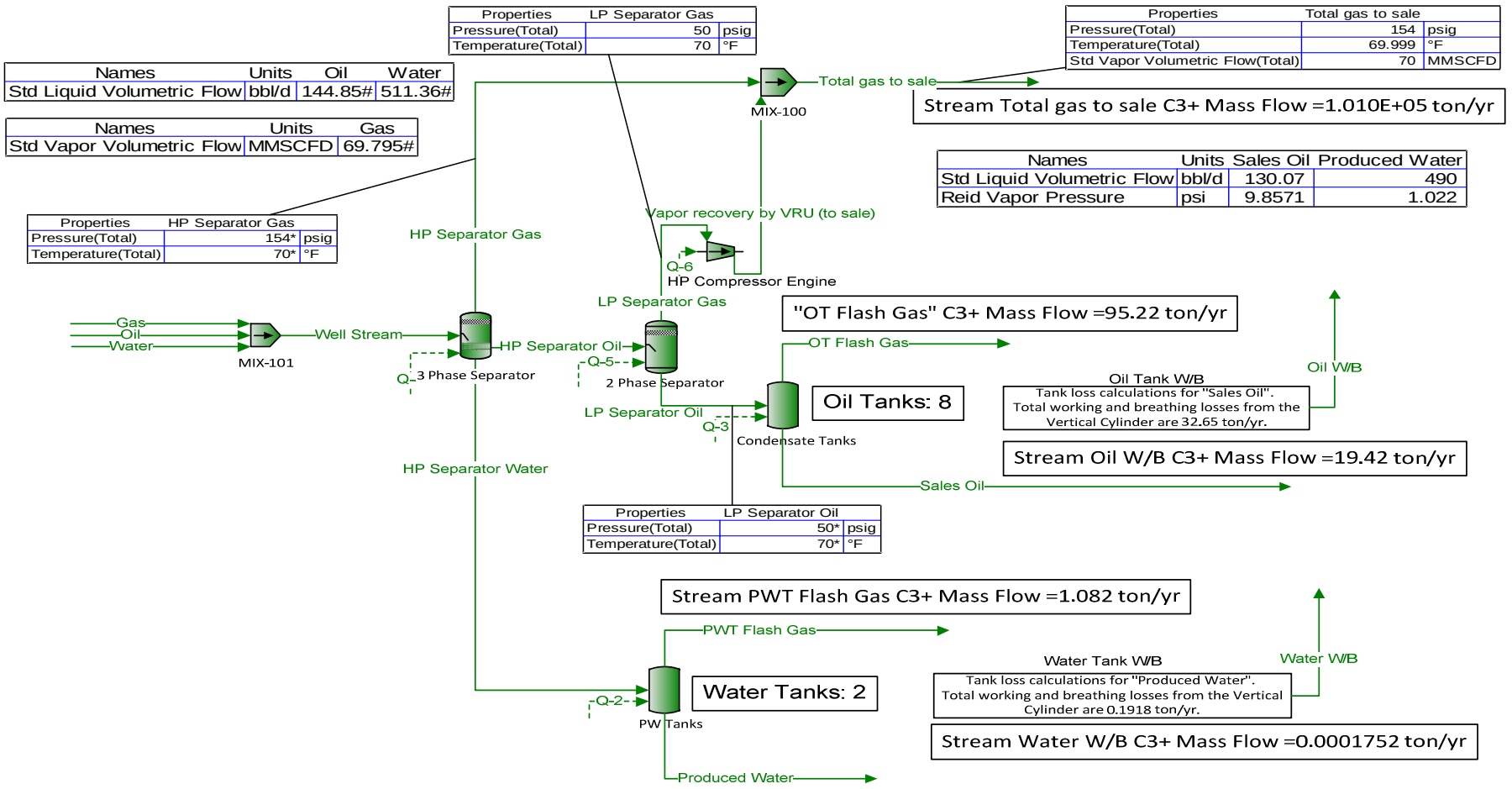
with

TSWEET® & PROSIM®

Simulation Report	
Client Name:	Antero Resources Corporation
Location:	West Virginia
Job:	Dotson Holland Well Pad

Project Name:	PROMAX SCENARIO 3
File Name:	ProMax@C:\Users\ychen1\Documents\Drafts\082715- ANTERO\ProMax Report\2 PH\PROMAX SCENARIO 3.pmx
ProMax Version:	

Report Created:	6/22/2016 12:58


Properties LP Separator Gas
Pressure(Total) 50 psig
Temperature(Total) 70 °F
Properties Total gas to sale
Pressure(Total) 154 psig
Temperature(Total) 69.999 °F
Std Vapor Volumetric Flow(Total) 70 MMSCFD
Names Units Oil Water
Std Liquid Volumetric Flow bbl/d 144.85# 511.36#
Total gas to sale
MIX-100
Stream Total gas to sale C3+ Mass Flow =1.010E+05 ton/yr
Names Units Gas
Std Vapor Volumetric Flow MMSCFD 69.795#
Names Units Sales Oil Produced Water
Std Liquid Volumetric Flow bbl/d 130.07 490
Reid Vapor Pressure psi 9.8571 1.022
Properties HP Separator Gas
Pressure(Total) 154* psig
Temperature(Total) 70* °F
Vapor recovery by VRU (to sale)
HP Separator Gas
Q-6
HP Compressor Engine
LP Separator Gas
"OT Flash Gas" C3+ Mass Flow =95.22 ton/yr
Gas
Oil
Water
MIX-101
Well Stream
HP Separator Oil
Q-5
Q-3
3 Phase Separator
2 Phase Separator
OT Flash Gas
Oil Tank W/B
Tank loss calculations for "Sales Oil".
Total working and breathing losses from the Vertical Cylinder are 32.65 ton/yr.
Oil W/B
LP Separator Oil
Q-3
Oil Tanks: 8
Condensate Tanks
Stream Oil W/B C3+ Mass Flow =19.42 ton/yr
HP Separator Water
Sales Oil
Properties LP Separator Oil
Pressure(Total) 50* psig
Temperature(Total) 70* °F
Stream PWT Flash Gas C3+ Mass Flow =1.082 ton/yr
PWT Flash Gas
Water Tank W/B
Tank loss calculations for "Produced Water".
Total working and breathing losses from the Vertical Cylinder are 0.1918 ton/yr.
Water W/B
Q-2
Water Tanks: 2
PW Tanks
Stream Water W/B C3+ Mass Flow =0.0001752 ton/yr
Produced Water

Process Streams		HP Separator Gas	HP Separator Water	HP Separator Oil	OT Flash Gas	Sales Oil	Gas	Water	Oil	Produced Water	PWT Flash Gas	Oil W/B	Water W/B	Well Stream	LP Separator Oil	LP Separator Gas	r recovery by VRU (to	Total gas to sale
Phase: Total	Status	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Unsolved	Unsolved	Solved	Solved	Solved	Solved	Solved
Mole Fraction		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water		0.225602	99.9710	0.0502723	0.382541	0.00760862	0	100	0	99.9969	3.03002			5.11852	0.0329809	0.370998	0.370998	0.225615
H2S		0	0	0	0	0	0	0	0	0	0			0	0	0	0	0
Nitrogen		0.417056	5.84736E-05	0.00791334	0.0142834	2.31948E-05	0.418	0	0.0180005	2.45524E-06	0.209603			0.395943	0.000988205	0.136363	0.136363	0.417032
Carbon Dioxide		0.184382	0.00103698	0.0391816	0.296313	0.00562419	0.1849	0	0.0150005	0.000668601	1.37901			0.175155	0.0252956	0.296742	0.296742	0.184392
Methane		80.2876	0.0223409	4.42415	18.4427	0.0886912	80.4725	0	4.77714	0.00184577	76.6874			76.2284	1.33074	61.8016	61.8016	80.2860
Ethane		13.4574	0.00415320	4.55446	35.8591	1.10037	13.4876	0	4.94815	0.000394504	14.0641			12.7831	3.45254	24.9930	24.9930	13.4584
Propane		2.84455	0.000958065	3.51134	19.1260	2.20917	2.8486	0	4.86315	9.95604E-05	3.21231			2.70612	3.35395	6.43069	6.43069	2.84486
Isobutane		0.550913	6.07466E-05	1.71717	5.01283	1.50296	0.5527	0	1.36904	2.35610E-06	0.218479			0.525759	1.74047	1.28492	1.28492	0.550976
n-Butane		0.942077	0.000224173	4.19664	9.17605	3.95024	0.9447	0	3.81511	1.82944E-05	0.770341			0.901090	4.30388	2.20760	2.20760	0.942186
Isopentane		0.270113	4.26320E-05	2.98337	2.83287	3.13079	0.2715	0	2.45607	2.44725E-06	0.150359			0.261214	3.11063	0.622931	0.622931	0.270144
n-Pentane		0.228026	3.49908E-05	3.36195	2.43887	3.59293	0.2282	0	3.46210	1.98995E-06	0.123479			0.221865	3.51483	0.526180	0.526180	0.228051
2-Methylpentane		0.00246293	1.72211E-07	0.0859878	0.0267446	0.0949373	0	0	1.49804	4.80691E-09	0.000626371			0.00247601	0.0903226	0.00558539	0.00558539	0.00246320
3-Methylpentane		0.00170575	3.28905E-07	0.0662833	0.0185662	0.0733562	0	0	1.04403	2.37722E-08	0.00114172			0.00172560	0.0696484	0.00386583	0.00386583	0.00170593
n-Hexane		0.551473	3.04040E-05	26.5541	5.99012	29.5105	0.5913	0	3.65811	6.78724E-07	0.111222			0.566103	27.9188	1.24115	1.24115	0.551533
Methylcyclopentane		0.000442577	2.74967E-07	0.0224731	0.00487224	0.0249920	0	0	0.276008	5.21218E-08	0.000833859			0.000456194	0.0236304	0.00100679	0.00100679	0.000442626
Benzene		0.000121707	3.77702E-06	0.00617068	0.00134680	0.00686154	0	0	0.0760023	3.47956E-06	0.00111647			0.000125619	0.00648835	0.000278608	0.000278608	0.000121721
2-Methylhexane		0.00299249	1.81290E-07	0.344641	0.0320185	0.386883	0	0	2.05306	4.29862E-09	0.000662241			0.00339335	0.362868	0.00655948	0.00655948	0.00299280
3-Methylhexane		0.00257892	1.63038E-07	0.311165	0.0276000	0.349414	0	0	1.78305	4.03640E-09	0.000594930			0.00294708	0.327636	0.00565673	0.00565673	0.00257919
Heptane		0.00613897	4.02366E-07	0.927013	0.0650183	1.04241	0	0	4.42513	1.00159E-08	0.00146804			0.00731397	0.976272	0.0133530	0.0133530	0.00613959
Methylcyclohexane		0.00325611	1.24194E-06	0.480294	0.0351207	0.539965	0	0	2.33607	1.66457E-07	0.00402422			0.00386112	0.505801	0.00718566	0.00718566	0.00325645
Toluene		0.000819192	1.98957E-05	0.150442	0.00889640	0.169310	0	0	0.617019	1.80301E-05	0.00699821			0.00101982	0.158455	0.00181531	0.00181531	0.000819278
Octane		0.0117778	4.42716E-07	5.36629	0.121379	6.05586	0	0	11.9694	7.33469E-09	0.00162905			0.0197833	5.65427	0.0248091	0.0248091	0.0117790
Ethylbenzene		0.000840008	1.79797E-05	0.438230	0.00885933	0.494633	0	0	0.908027	1.61339E-05	0.00692256			0.00150081	0.461760	0.00179986	0.00179986	0.000840091
m-Xylene		0.000785641	1.71072E-05	0.487984	0.00826421	0.550925	0	0	0.925028	1.54050E-05	0.00638454			0.00152891	0.514203	0.00167553	0.00167553	0.000785718
o-Xylene		0.00123034	3.61152E-05	0.853022	0.0129531	0.963172	0	0	1.53505	3.33885E-05	0.0102357			0.00253716	0.898869	0.00262414	0.00262414	0.00123046
Nonane		0.00488394	2.80633E-07	6.60010	0.0490476	7.45668	0	0	9.20628	7.32303E-09	0.00102264			0.0152164	6.95540	0.00995463	0.00995463	0.00488438
C10+		0.000845212	1.91222E-08	32.4594	0.00772121	36.6917	0	0	31.9660	2.23276E-10	7.07134E-05			0.0528342	34.2093	0.00156150	0.00156150	0.000845273
Molar Flow		lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h
Water		17.3286	396.800	0.00652010	0.00318570	0.000872964	0	414.135	0	396.796	0.00321426			414.135	0.00405867	0.00246144	0.00246144	17.3310
H2S		0	0	0	0	0	0	0	0	0	0			0	0	0	0	0
Nitrogen		32.0342	0.000232090	0.00102633	0.000118948	2.66122E-06	32.0330	0	0.00240719	9.74263E-06	0.000222348			32.0354	0.000121610	0.000904717	0.000904717	32.0351
Carbon Dioxide		14.1624	0.00411593	0.00508168	0.00246762	0.000645283	14.1696	0	0.00200599	0.00265307	0.00146286			14.1716	0.00311290	0.00196878	0.00196878	14.1644
Methane		6166.91	0.0886744	0.573794	0.153586	0.0101758	6166.93	0	0.638841	0.00732419	0.0813502			6167.57	0.163762	0.410032	0.410032	6167.32
Ethane		1033.66	0.0164846	0.590694	0.298625	0.126249	1033.61	0	0.661709	0.00156543	0.0149192			1034.27	0.424874	0.165820	0.165820	1033.83
Propane		218.491	0.00380270	0.455407	0.159276	0.253465	218.300	0	0.650342	0.000395064	0.00340764			218.950	0.412741	0.0426654	0.0426654	218.534
Isobutane		42.3158	0.000241112	0.222710	0.0417456	0.172439	42.3556	0	0.183080	9.34920E-06	0.000231763			42.5387	0.214185	0.00852501	0.00852501	42.3243
n-Butane		72.3612	0.000889775	0.544287	0.0764158	0.453225	72.3962	0	0.510190	7.25939E-05	0.000817181			72.9064	0.529641	0.0146467	0.0146467	72.3759
Isopentane		20.7475	0.000169213	0.386930	0.0235914	0.359206	20.8061	0	0.328447	9.71091E-06	0.000159502			21.1346	0.382797	0.00413293	0.00413293	20.7516
n-Pentane		17.5147	0.000138884	0.436031	0.0203103	0.412229	17.4879	0	0.462983	7.89628E-06	0.000130987			17.9509	0.432540	0.00349102	0.00349102	17.5182
2-Methylpentane		0.189179	6.83531E-07	0.0111523	0.000222723	0.0108925	0	0	0.200332	1.90742E-08	6.64456E-07			0.200332	0.0111152	3.70570E-05	3.70570E-05	0.189216
3-Methylpentane		0.131019	1.30547E-06	0.00859667	0.000154615	0.00841640	0	0	0.139617	9.43301E-08	1.21114E-06			0.139617	0.00857102	2.56484E-05	2.56484E-05	0.131045
n-Hexane		42.3588	0.000120678	3.44395	0.0498842	3.38584	45.3137	0	0.489194	2.69323E-06	0.000117985			45.8029	3.43572	0.00823459	0.00823459	42.3671
Methylcyclopentane		0.0339945	1.09138E-06	0.00291467	4.05747E-05	0.00286741	0	0	0.0369102	2.06824E-07	8.84561E-07			0.0369102	0.00290799	6.67969E-06	6.67969E-06	0.0340011
Benzene		0.00934838	1.49916E-05	0.000800312	1.12158E-05	0.000787248	0	0	0.0101637	1.38072E-05	1.18436E-06			0.0101637	0.000798463	1.84847E-06	1.84847E-06	0.00935023
2-Methylhexane		0.229854	7.19565E-07	0.0446985	0.000266642	0.0443884	0	0	0.274553	1.70573E-08	7.02508E-07			0.274553	0.0446550	4.35198E-05	4.35198E-05	0.229897
3-Methylhexane		0.198088	6.47121E-07	0.0403568	0.000229846	0.0400895	0	0	0.238445	1.60168E-08	6.31104E-07			0.238445	0.0403193	3.75304E-05	3.75304E-05	0.198125
Heptane		0.471536	1.59705E-06	0.120230	0.000541456	0.119600	0	0	0.591767	3.97439E-08	1.55731E-06			0.591767	0.120141	8.85921E-05	8.85921E-05	0.471624
Methylcyclohexane		0.250102	4.92943E-06	0.0622922	0.000292476	0.0619520	0	0	0.312400	6.60518E-07	4.26891E-06			0.312400	0.0622445	4.76743E-05	4.76743E-05	0.250150
Toluene		0.0629224	7.89689E-05	0.0195117	7.40870E-05	0.0194256	0	0	0.0825131	7.15452E-05	7.42373E-06			0.0825131	0.0194997	1.20439E-05	1.20439E-05	0.0629344
Octane		0.904659	1.75720E-06	0.695985	0.00101082	0.694810	0	0	1.60065	2.91047E-08	1.72810E-06			1.60065	0.695821	0.000164600	0.000164600	0.904824
Ethylbenzene		0.0645213	7.13642E-05	0.0568367	7.37782E-05	0.0567509	0	0	0.121429	6.40207E-05	7.34348E-06			0.121429	0.0568247	1.19414E-05	1.19414E-05	0.0645332
m-Xylene		0.0603453	6.79010E-05	0.0632895	6.88223E-05	0.0632096	0	0	0.123703	6.11283E-05	6.77275E-06			0.123703	0.0632784	1.11166E-05	1.11166E-05	0.0603565
o-Xylene		0.0945030	0.000143347	0.110633	0.000107870	0.110508	0	0	0.205280	0.000132488	1.08581E-05			0.205280	0.110616	1.74102E-05	1.74102E-05	0.0945204
Nonane		0.375137	1.11387E-06	0.856005	0.000408456	0.855531	0	0	1.23114	2.90584E-08	1.08482E-06			1.23114	0.855939	6.60454E-05	6.60454E-05	0.375203
C10+		0.0649209	7.58990E-08	4.20984	6.43003E-05	4.20977	0	0	4.27477	8.85978E-10	7.50130E-08			4.27477	4.20983	1.03600E-05	1.03600E-05	0.0649313
Mass Fraction		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water		0.201543	99.9663	0.00826517	0.172078	0.00114664	0	100	0	99.9952	2.71953			4.56408	0.00520453	0.272541	0.272541	0.201550
H2S		0	0	0	0	0	0	0	0	0	0			0	0	0	0	0
Nitrogen		0.579352	9.09210E-05	0.00202306	0.00999087	5.43549E-06	0.580824	0	0.00446810	3.81779E-06	0.292530			0.548993	0.000242488	0.155769	0.155769	0.579308
Carbon Dioxide		0.402391	0.00253312	0.0157366	0.325615	0.00207056	0.403632	0	0.00584955	0.00163330	3.02358			0.381537	0.00975146	0.532532	0.532532	0.402404
Methane		63.8707	0.0198935	0.647714	7.38757	0.0119024	64.0355	0	0.679064	0.00164362	61.2917			60.5279	0.187000	40.4288	40.4288	63.8682
Ethane		20.0661	0.00693171	1.24979	26.9231	0.276783	20.1167	0	1.31836	0.000658450	21.0687			19.0250	0.909363	30.6449	30.6449	20.0672
Propane		6.22002	0.00234492	1.41303	21.0584	0.814902	6.23059	0	1.90014	0.000243688	7.05701			5.90624	1.29548	11.5631	11.5631	6.22058
Isobutane		1.58784	0.000195976	0.910831	7.27498	0.730752	1.59343	0	0.705067	7.60129E-06	0.632643			1.51250	0.886111	3.04537	3.04537	1.58800
n-Butane		2.71526	0.000723208	2.22601	13.3169	1.92065	2.72357	0	1.96481	5.90218E-05	2.23065			2.59226	2.19119	5.23218	5.23218	2.71552
Isopentane		0.966402	0.000170728	1.96435	5.10343	1.88958	0.971630	0	1.57015	9.80076E-06	0.540464			0.932810	1.96587	1.83269	1.83269	0.966493
n-Pentane		0.815821	0.000140127	2.21362	4.39364	2.16850	0.816670	0	2.21330	7.96934E-06	0.443844			0.792291	2.22132	1.54805	1.54805	0.815898
2-Methylpentane		0.0105249	8.23725E-07	0.0676242	0.0575475	0.0684387	0	0	1.14388	2.29933E-08	0.00268919			0.0105609	0.0681801	0.0196271	0.0196271	0.0105259
3-Methylpentane		0.00728921	1.57323E-06	0.0521278	0.0399497	0.0528812	0	0	0.797202	1.13711E-07	0.00490174			0.00736023	0.0525742	0.0135845	0.0135845	0.00728987
n-Hexane		2.35662	0.000145429	20.8832	12.8892	21.2736	2.52751	0	2.79326	3.24659E-06	0.477508			2.41461	21.0745	4.36141	4.36141	2.35683
Methylcyclopentane		0.00184703	1.28446E-06	0.0172603	0.0102385	0.0175948	0	0	0.205824	2.43486E-07	0.00349625			0.00190029	0.0174202	0.00345511	0.00345511	0.00184720
Benzene		0.000471429	1.63759E-05	0.00439878	0.00262679	0.00448353	0	0	0.0526036	1.50867E-05	0.00434481			0.000485667	0.00443945	0.000887423	0.000887423	0.000471473
2-Methylhexane		0.0148693	1.00829E-06	0.315156	0.0801093	0.324293	0	0	1.82285	2.39088E-08	0.00330597			0.0168296	0.318496	0.0268019	0.0268019	0.0148706
3-Methylhexane		0.0128144	9.06782E-07	0.284544	0.0690545	0.292886	0	0	1.58311	2.24503E-08	0.00296995			0.0146162	0.287572	0.0231133	0.0231133	0.0128154

Heptane		0.0305038	2.23788E-06	0.847704	0.162674	0.873771	0	0	3.92893	5.57080E-08	0.00732863			0.0362742	0.856890	0.0545599	0.0545599	0.0305063
Methylcyclohexane		0.0158537	6.76843E-06	0.430368	0.0861032	0.443503	0	0	2.03239	9.07204E-07	0.0196852			0.0187642	0.435019	0.0287698	0.0287698	0.0158551
Toluene		0.00374291	0.000101751	0.126501	0.0204673	0.130499	0	0	0.503745	9.22129E-05	0.0321244			0.00465087	0.127887	0.00682042	0.00682042	0.00374323
Octane		0.0667149	2.80697E-06	5.59411	0.346199	5.78672	0	0	12.1148	4.65059E-08	0.00927076			0.111851	5.65756	0.115559	0.115559	0.0667200
Ethylbenzene		0.00442229	0.000105950	0.424587	0.0234849	0.439285	0	0	0.854185	9.50763E-05	0.0366147			0.00788633	0.429414	0.00779184	0.00779184	0.00442264
m-Xylene		0.00413607	0.000100809	0.472791	0.0219073	0.489278	0	0	0.870178	9.07808E-05	0.0337690			0.00803398	0.478183	0.00725361	0.00725361	0.00413640
o-Xylene		0.00647724	0.000212819	0.826464	0.0343370	0.855396	0	0	1.44402	0.000196757	0.0541385			0.0133321	0.835904	0.0113603	0.0113603	0.00647775
Nonane		0.0310619	1.99780E-06	7.72516	0.157072	8.00022	0	0	10.4624	5.21336E-08	0.00653435			0.0965947	7.81402	0.0520619	0.0520619	0.0310641
C10+		0.00725513	1.83728E-07	51.2766	0.0333725	53.1309	0	0	49.0294	2.14531E-09	0.000609826			0.452668	51.8704	0.0110220	0.0110220	0.00725552
Mass Flow		**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**
Water		312.179	7148.45	0.117461	0.0573913	0.0157267	0	7460.75	0	7148.40	0.0579058			7460.75	0.0731180	0.0443435	0.0443435	312.223
H2S		0	0	0	0	0	0	0	0	0	0			0	0	0	0	0
Nitrogen		897.386	0.00650164	0.0287509	0.00333215	7.45499E-05	897.354	0	0.0674335	0.000272924	0.00622872			897.422	0.00340670	0.0253442	0.0253442	897.412
Carbon Dioxide		623.282	0.181140	0.223642	0.108599	0.0283986	623.599	0	0.0882826	0.116760	0.0643798			623.687	0.136997	0.0866450	0.0866450	623.369
Methane		98932.4	1.42256	9.20506	2.46390	0.163246	98932.8	0	10.2486	0.117498	1.30506			98943.0	2.62714	6.57792	6.57792	98939.0
Ethane		31081.3	0.495677	17.7616	8.97937	3.79618	31079.6	0	19.8970	0.0470708	0.448607			31099.5	12.7756	4.98605	4.98605	31086.3
Propane		9634.49	0.167682	20.0814	7.02338	11.1767	9626.06	0	28.6772	0.0174206	0.150262			9654.74	18.2001	1.88136	1.88136	9636.37
Isobutane		2459.49	0.0140140	12.9444	2.42635	10.0225	2461.80	0	10.6410	0.000543396	0.0134706			2472.44	12.4489	0.495492	0.495492	2459.98
n-Butane		4205.79	0.0517157	31.6352	4.44146	26.3424	4207.83	0	29.6534	0.00421932	0.0474964			4237.48	30.7839	0.851296	0.851296	4206.64
Isopentane		1496.91	0.0122085	27.9166	1.70209	25.9163	1501.14	0	23.6971	0.000700630	0.0115079			1524.84	27.6184	0.298186	0.298186	1497.20
n-Pentane		1263.66	0.0100203	31.4591	1.46536	29.7418	1261.73	0	33.4036	0.000569707	0.00945057			1295.13	31.2072	0.251873	0.251873	1263.92
2-Methylpentane		16.3025	5.89035E-05	0.961050	0.0191932	0.938663	0	0	17.2636	1.64373E-06	5.72598E-05			17.2636	0.957856	0.00319340	0.00319340	16.3057
3-Methylpentane		11.2906	0.000112500	0.740821	0.0133240	0.725287	0	0	12.0315	8.12893E-06	0.000104371			12.0315	0.738611	0.00221026	0.00221026	11.2928
n-Hexane		3650.29	0.0103995	296.784	4.29879	291.776	3904.93	0	42.1565	0.000232090	0.0101674			3947.08	296.074	0.709619	0.709619	3651.00
Methylcyclopentane		2.86096	9.18503E-05	0.245297	0.00341475	0.241320	0	0	3.10635	1.74062E-05	7.44442E-05			3.10635	0.244735	0.000562160	0.000562160	2.86152
Benzene		0.730219	0.00117102	0.0625138	0.000876087	0.0614934	0	0	0.793904	0.00107851	9.25122E-05			0.793904	0.0623694	0.000144387	0.000144387	0.730364
2-Methylhexane		23.0318	7.21018E-05	4.47888	0.0267180	4.44780	0	0	27.5108	1.70917E-06	7.03927E-05			27.5108	4.47452	0.00436077	0.00436077	23.0362
3-Methylhexane		19.8488	6.48428E-05	4.04383	0.0230310	4.01704	0	0	23.8927	1.60491E-06	6.32379E-05			23.8927	4.04007	0.00376062	0.00376062	19.8526
Heptane		47.2488	0.000160028	12.0473	0.0542550	11.9841	0	0	59.2962	3.98242E-06	0.000156045			59.2962	12.0384	0.00887710	0.00887710	47.2577
Methylcyclohexane		24.5566	0.000484001	6.11622	0.0287171	6.08282	0	0	30.6733	6.48536E-05	0.000419148			30.6733	6.11154	0.00468095	0.00468095	24.5613
Toluene		5.79757	0.00727607	1.79778	0.00682626	1.78984	0	0	7.60262	0.00659206	0.000684010			7.60262	1.79667	0.00110971	0.00110971	5.79868
Octane		103.338	0.000200723	79.5014	0.115464	79.3671	0	0	182.839	3.32459E-06	0.000197398			182.839	79.4826	0.0188020	0.0188020	103.357
Ethylbenzene		6.84990	0.00757638	6.03406	0.00783267	6.02496	0	0	12.8915	0.00679676	0.000779620			12.8915	6.03280	0.00126776	0.00126776	6.85117
m-Xylene		6.40656	0.00720871	6.71913	0.00730652	6.71064	0	0	13.1329	0.00648968	0.000719029			13.1329	6.71795	0.00118019	0.00118019	6.40774
o-Xylene		10.0329	0.0152184	11.7454	0.0114520	11.7321	0	0	21.7935	0.0140656	0.00115275			21.7935	11.7435	0.00184836	0.00184836	10.0348
Nonane		48.1132	0.000142860	109.787	0.0523866	109.726	0	0	157.900	3.72689E-06	0.000139133			157.900	109.779	0.00847066	0.00847066	48.1217
C10+		11.2378	1.31381E-05	728.724	0.0111304	728.711	0	0	739.962	1.53363E-07	1.29848E-05			739.962	728.722	0.00179332	0.00179332	11.2396

Process Streams		**HP Separator Gas**	**HP Separator Water**	**HP Separator Oil**	**OT Flash Gas**	**Sales Oil**	**Gas**	**Water**	**Oil**	**Produced Water**	**PWT Flash Gas**	**Oil W/B**	**Water W/B**	**Well Stream**	**LP Separator Oil**	**LP Separator Gas**	**r recovery by VRU (to**	**Total gas to sale**
Phase: Total	**Status**	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Unsolved	Unsolved	Solved	Solved	Solved	Solved	Solved
Property	**Units**																	
Temperature	°F	70.0	70.0	70.0	75.9	75.9	85.0	85.0	85.0	75.9	75.9			84.7354	70	70	70	69.9989
Pressure	psig	154	154	154	0	0	1000	1000	1000	0	0			1000	50	50	154	154
Mole Fraction Vapor	%	100	0	0	100	0	100	0	0	0	100	100	100	94.4840	0	100	99.2082	100
Mole Fraction Light Liquid	%	0	100	100	0	100	0	100	100	100	0			0.463841	100	0	0.643958	0
Mole Fraction Heavy Liquid	%	0	0	0	0	0	0	0	0	0	0			5.05216	0	0	0.147826	0
Molecular Weight	lb/lbmol	20.2	18.0	109.6	40.0	119.5	20.2	18.0	112.9	18.0	20.1			20.2038	114.162	24.5234	24.5234	20.1663
Mass Density	lb/ft^3	0.6	62.3	44.6	0.1	45.0	4.4	62.2	45.1	62.2	0.1			4.63539	44.8978	0.285904	0.780957	0.624044
Molar Flow	lbmol/h	7681.0	396.9	13.0	0.8	11.5	7663.4	414.1	13.4	396.8	0.1			8090.91	12.3061	0.663464	0.663464	7681.69
Mass Flow	lb/h	154894.8	7150.9	1421.2	33.4	1371.5	154496.9	7460.8	1509.2	7148.7	2.1			163467	1404.89	16.2704	16.2704	154911
Vapor Volumetric Flow	MCFH	248.2	0.1	0.0	0.3	0.0	35.1	0.1	0.0	0.1	0.0			35.2650	0.0312909	0.0569086	0.0208339	248.237
Liquid Volumetric Flow	Mbbl/d	1061.0	0.5	0.1	1.4	0.1	150.2	0.5	0.1	0.5	0.2			150.743	0.133755	0.243260	0.0890562	1061.11
Std Vapor Volumetric Flow	MMSCFD	70.0	3.6	0.1	0.0	0.1	69.8	3.8	0.1	3.6	0.0			73.6890	0.112080	0.00604259	0.00604259	69.9620
Std Liquid Volumetric Flow	Mbbl/d	31.5	0.5	0.1	0.0	0.1	31.5	0.5	0.1	0.5	0.0			32.1759	0.134968	0.00302885	0.00302885	31.5505
Compressibility		0.959	0.009	0.073	0.986	0.007	0.796	0.050	0.434	0.001	0.997			0.756999	0.0289404	0.976265	0.931940	0.959062
Specific Gravity		0.696	0.998	0.716	1.383	0.722	0.696	0.997	0.724	0.998	0.693				0.719874	0.846725		0.696287
API Gravity			10.0	64.9		62.4		9.9	60.9	10.0					63.7704			
Enthalpy	MMBtu/h	-262.9	-48.8	-1.2	0.0	-1.2	-265.4	-50.8	-1.3	-48.8	0.0			-317.501	-1.21647	-0.0241625	-0.0243092	-262.894
Mass Enthalpy	Btu/lb	-1697.1	-6826.4	-874.3	-1106.5	-853.4	-1717.9	-6810.9	-842.3	-6822.4	-1864.8			-1942.30	-865.884	-1485.06	-1494.08	-1697.06
Mass Cp	Btu/(lb*°F)	0.5	1.0	0.5	0.4	0.5	0.7	1.0	0.5	1.0	0.5			0.680417	0.490150	0.462434	0.481820	0.504074
Ideal Gas CpCv Ratio		1.256	1.326	1.050	1.137	1.045	1.252	1.325	1.048	1.326	1.261			1.25364	1.04793	1.21745	1.21745	1.25646
Dynamic Viscosity	cP	0.0	1.0	0.5	0.0	0.6	0.0	0.8	0.5	0.9	0.0				0.554883	0.0101100		0.0107558
Kinematic Viscosity	cSt	1.1	1.0	0.7	5.2	0.8	0.2	0.8	0.8	0.9	13.1				0.771534	2.20756		1.07599
Thermal Conductivity	Btu/(h*ft*°F)	0.0	0.3	0.1	0.0	0.1	0.0	0.4	0.1	0.3	0.0				0.0688298	0.0157827		0.0178505
Surface Tension	lbf/ft		0.005	0.001		0.002		0.005	0.001	0.005					0.00150853			
Net I.G. Heating Value	Btu/ft^3	1103.7	0.3	5523.5	2099.8	6015.0	1105.7	0.0	5675.4	0.0	1046.4			1056.65	5750.02	1322.48	1322.48	1103.72
Net Liquid Heating Value	Btu/lb	20713.2	-1052.9	18971.5	19749.3	18936.0	20758.7	-1059.8	18915.4	-1059.1	19701.3			19745.9	18955.3	20370.5	20370.5	20713.1
Gross I.G. Heating Value	Btu/ft^3	1217.9	50.6	5933.0	2285.4	6456.9	1220.1	50.3	6092.6	50.3	1156.5			1168.24	6174.59	1452.41	1452.41	1217.97
Gross Liquid Heating Value	Btu/lb	22863.1	7.2	20389.5	21508.5	20338.6	22911.4	0.0	20317.2	0.7	21783.9			21841.8	20366.4	22381.1	22381.1	22863.1

Process Streams		**HP Separator Gas**	**HP Separator Water**	**HP Separator Oil**	**OT Flash Gas**	**Sales Oil**	**Gas**	**Water**	**Oil**	**Produced Water**	**PWT Flash Gas**	**Oil W/B**	**Water W/B**	**Well Stream**	**LP Separator Oil**	**LP Separator Gas**	**r recovery by VRU (to**	**Total gas to sale**
Phase: Vapor	**Status**	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Unsolved	Unsolved	Solved	Solved	Solved	Solved	Solved
Mole Fraction		**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Water		0.225602	0.225602	0.225602	0.382541	0.382541	0			3.03002	3.03002			0.0766352	0.370998	0.370998	0.224775	0.225615
H2S		0	0	0	0	0	0			0	0			0	0	0	0	0
Nitrogen		0.417056	0.417056	0.417056	0.0142834	0.0142834	0.418			0.209603	0.209603			0.418761	0.136363	0.136363	0.137433	0.417032

Carbon Dioxide		0.184382	0.184382	0.184382	0.296313	0.296313	0.1849			1.37901	1.37901			0.184488	0.296742	0.296742	0.298794	0.184392
Methane		80.2876	80.2876	80.2876	18.4427	18.4427	80.4725			76.6874	76.6874			80.5513	61.8016	61.8016	62.2701	80.2860
Ethane		13.4574	13.4574	13.4574	35.8591	35.8591	13.4876			14.0641	14.0641			13.4526	24.9930	24.9930	25.1305	13.4584
Propane		2.84455	2.84455	2.84455	19.1260	19.1260	2.8486			3.21231	3.21231			2.82486	6.43069	6.43069	6.42940	2.84486
Isobutane		0.550913	0.550913	0.550913	5.01283	5.01283	0.5527			0.218479	0.218479			0.542249	1.28492	1.28492	1.26939	0.550976
n-Butane		0.942077	0.942077	0.942077	9.17605	9.17605	0.9447			0.770341	0.770341			0.922107	2.20760	2.20760	2.16198	0.942186
Isopentane		0.270113	0.270113	0.270113	2.83287	2.83287	0.2715			0.150359	0.150359			0.260462	0.622931	0.622931	0.587623	0.270144
n-Pentane		0.228026	0.228026	0.228026	2.43887	2.43887	0.2282			0.123479	0.123479			0.217990	0.526180	0.526180	0.486494	0.228051
2-Methylpentane		0.00246293	0.00246293	0.00246293	0.0267446	0.0267446	0			0.000626371	0.000626371			0.00228874	0.00558539	0.00558539	0.00463537	0.00246320
3-Methylpentane		0.00170575	0.00170575	0.00170575	0.0185662	0.0185662	0			0.00114172	0.00114172			0.00157704	0.00386583	0.00386583	0.00314685	0.00170593
n-Hexane		0.551473	0.551473	0.551473	5.99012	5.99012	0.5913			0.111222	0.111222			0.506982	1.24115	1.24115	0.966239	0.551533
Methylcyclopentane		0.000442577	0.000442577	0.000442577	0.00487224	0.00487224	0			0.000833859	0.000833859			0.000401999	0.00100679	0.00100679	0.000777146	0.000442626
Benzene		0.000121707	0.000121707	0.000121707	0.00134680	0.00134680	0			0.00111647	0.00111647			0.000110439	0.000278608	0.000278608	0.000218623	0.000121721
2-Methylhexane		0.00299249	0.00299249	0.00299249	0.0320185	0.0320185	0			0.000662241	0.000662241			0.00271515	0.00655948	0.00655948	0.00389076	0.00299280
3-Methylhexane		0.00257892	0.00257892	0.00257892	0.0276000	0.0276000	0			0.000594930	0.000594930			0.00233114	0.00565673	0.00565673	0.00329261	0.00257919
Heptane		0.00613897	0.00613897	0.00613897	0.0650183	0.0650183	0			0.00146804	0.00146804			0.00556718	0.0133530	0.0133530	0.00704281	0.00613959
Methylcyclohexane		0.00325611	0.00325611	0.00325611	0.0351207	0.0351207	0			0.00402422	0.00402422			0.00288098	0.00718566	0.00718566	0.00384443	0.00325645
Toluene		0.000819192	0.000819192	0.000819192	0.00889640	0.00889640	0			0.00699821	0.00699821			0.000715542	0.00181531	0.00181531	0.000894391	0.000819278
Octane		0.0117778	0.0117778	0.0117778	0.121379	0.121379	0			0.00162905	0.00162905			0.0114705	0.0248091	0.0248091	0.00701686	0.0117790
Ethylbenzene		0.000840008	0.000840008	0.000840008	0.00885933	0.00885933	0			0.00692256	0.00692256			0.000783513	0.00179986	0.00179986	0.000460990	0.000840091
m-Xylene		0.000785641	0.000785641	0.000785641	0.00826421	0.00826421	0			0.00638454	0.00638454			0.000749693	0.00167553	0.00167553	0.000376830	0.000785718
o-Xylene		0.00123034	0.00123034	0.00123034	0.0129531	0.0129531	0			0.0102357	0.0102357			0.00118008	0.00262414	0.00262414	0.000542401	0.00123046
Nonane		0.00488394	0.00488394	0.00488394	0.0490476	0.0490476	0			0.00102264	0.00102264			0.00577675	0.00995463	0.00995463	0.00113192	0.00488438
C10+		0.000845212	0.000845212	0.000845212	0.00772121	0.00772121	0			7.07134E-05	7.07134E-05			0.00305174	0.00156150	0.00156150	8.02679E-06	0.000845273
Molar Flow		**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**
Water		17.3286	0	0	0.00318570	0	0			0	0.00321426			5.85847	0	0.00246144	0.00147950	17.3310
H2S		0	0	0	0	0	0			0	0			0	0	0	0	0
Nitrogen		32.0342	0	0	0.000118948	0	32.0330			0	0.000222348			32.0127	0	0.000904717	0.000904601	32.0351
Carbon Dioxide		14.1624	0	0	0.00246762	0	14.1696			0	0.00146286			14.1034	0	0.00196878	0.00196670	14.1644
Methane		6166.91	0	0	0.153586	0	6166.93			0	0.0813502			6157.84	0	0.410032	0.409869	6167.32
Ethane		1033.66	0	0	0.298625	0	1033.61			0	0.0149192			1028.40	0	0.165820	0.165411	1033.83
Propane		218.491	0	0	0.159276	0	218.300			0	0.00340764			215.950	0	0.0426654	0.0423190	218.534
Isobutane		42.3158	0	0	0.0417456	0	42.3556			0	0.000231763			41.4529	0	0.00852501	0.00835527	42.3243
n-Butane		72.3612	0	0	0.0764158	0	72.3962			0	0.000817181			70.4916	0	0.0146467	0.0142304	72.3759
Isopentane		20.7475	0	0	0.0235914	0	20.8061			0	0.000159502			19.9113	0	0.00413293	0.00386780	20.7516
n-Pentane		17.5147	0	0	0.0203103	0	17.4879			0	0.000130987			16.6645	0	0.00349102	0.00320216	17.5182
2-Methylpentane		0.189179	0	0	0.000222723	0	0			0	6.64456E-07			0.174966	0	3.70570E-05	3.05105E-05	0.189216
3-Methylpentane		0.131019	0	0	0.000154615	0	0			0	1.21114E-06			0.120558	0	2.56484E-05	2.07129E-05	0.131045
n-Hexane		42.3588	0	0	0.0498842	0	45.3137			0	0.000117985			38.7568	0	0.00823459	0.00635989	42.3671
Methylcyclopentane		0.0339945	0	0	4.05747E-05	0	0			0	8.84561E-07			0.0307313	0	6.67969E-06	5.11526E-06	0.0340011
Benzene		0.00934838	0	0	1.12158E-05	0	0			0	1.18436E-06			0.00844264	0	1.84847E-06	1.43900E-06	0.00935023
2-Methylhexane		0.229854	0	0	0.000266642	0	0			0	7.02508E-07			0.207563	0	4.35198E-05	2.56094E-05	0.229897
3-Methylhexane		0.198088	0	0	0.000229846	0	0			0	6.31104E-07			0.178207	0	3.75304E-05	2.16723E-05	0.198125
Heptane		0.471536	0	0	0.000541456	0	0			0	1.55731E-06			0.425590	0	8.85921E-05	4.63565E-05	0.471624
Methylcyclohexane		0.250102	0	0	0.000292476	0	0			0	4.26891E-06			0.220240	0	4.76743E-05	2.53045E-05	0.250150
Toluene		0.0629224	0	0	7.40870E-05	0	0			0	7.42373E-06			0.0547004	0	1.20439E-05	5.88698E-06	0.0629344
Octane		0.904659	0	0	0.00101082	0	0			0	1.72810E-06			0.876877	0	0.000164600	4.61857E-05	0.904824
Ethylbenzene		0.0645213	0	0	7.37782E-05	0	0			0	7.34348E-06			0.0598966	0	1.19414E-05	3.03429E-06	0.0645332
m-Xylene		0.0603453	0	0	6.88223E-05	0	0			0	6.77275E-06			0.0573111	0	1.11166E-05	2.48034E-06	0.0603565
o-Xylene		0.0945030	0	0	0.000107870	0	0			0	1.08581E-05			0.0902127	0	1.74102E-05	3.57014E-06	0.0945204
Nonane		0.375137	0	0	0.000408456	0	0			0	1.08482E-06			0.441611	0	6.60454E-05	7.45045E-06	0.375203
C10+		0.0649209	0	0	6.43003E-05	0	0			0	7.50130E-08			0.233294	0	1.03600E-05	5.28332E-08	0.0649313
Mass Fraction		**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Water		0.201543	0.201543	0.201543	0.172078	0.172078	0			2.71953	2.71953			0.0686691	0.272541	0.272541	0.167116	0.201550
H2S		0	0	0	0	0	0			0	0			0	0	0	0	0
Nitrogen		0.579352	0.579352	0.579352	0.00999087	0.00999087	0.580824			0.292530	0.292530			0.583478	0.155769	0.155769	0.158886	0.579308
Carbon Dioxide		0.402391	0.402391	0.402391	0.325615	0.325615	0.403632			3.02358	3.02358			0.403837	0.532532	0.532532	0.542683	0.402404
Methane		63.8707	63.8707	63.8707	7.38757	7.38757	64.0355			61.2917	61.2917			64.2741	40.4288	40.4288	41.2267	63.8682
Ethane		20.0661	20.0661	20.0661	26.9231	26.9231	20.1167			21.0687	21.0687			20.1195	30.6449	30.6449	31.1851	20.0672
Propane		6.22002	6.22002	6.22002	21.0584	21.0584	6.23059			7.05701	7.05701			6.19562	11.5631	11.5631	11.7002	6.22058
Isobutane		1.58784	1.58784	1.58784	7.27498	7.27498	1.59343			0.632643	0.632643			1.56759	3.04537	3.04537	3.04484	1.58800
n-Butane		2.71526	2.71526	2.71526	13.3169	13.3169	2.72357			2.23065	2.23065			2.66573	5.23218	5.23218	5.18587	2.71552

Isopentane		0.966402	0.966402	0.966402	5.10343	5.10343	0.971630			0.540464	0.540464			0.934684	1.83269	1.83269	1.74967	0.966493
n-Pentane		0.815821	0.815821	0.815821	4.39364	4.39364	0.816670			0.443844	0.443844			0.782270	1.54805	1.54805	1.44855	0.815898
2-Methylpentane		0.0105249	0.0105249	0.0105249	0.0575475	0.0575475	0			0.00268919	0.00268919			0.00981007	0.0196271	0.0196271	0.0164852	0.0105259
3-Methylpentane		0.00728921	0.00728921	0.00728921	0.0399497	0.0399497	0			0.00490174	0.00490174			0.00675954	0.0135845	0.0135845	0.0111915	0.00728987
n-Hexane		2.35662	2.35662	2.35662	12.8892	12.8892	2.52751			0.477508	0.477508			2.17304	4.36141	4.36141	3.43633	2.35683
Methylcyclopentane		0.00184703	0.00184703	0.00184703	0.0102385	0.0102385	0			0.00349625	0.00349625			0.00168275	0.00345511	0.00345511	0.00269919	0.00184720
Benzene		0.000471429	0.000471429	0.000471429	0.00262679	0.00262679	0			0.00434481	0.00434481			0.000429073	0.000887423	0.000887423	0.000704757	0.000471473
2-Methylhexane		0.0148693	0.0148693	0.0148693	0.0801093	0.0801093	0			0.00330597	0.00330597			0.0135320	0.0268019	0.0268019	0.0160893	0.0148706
3-Methylhexane		0.0128144	0.0128144	0.0128144	0.0690545	0.0690545	0			0.00296995	0.00296995			0.0116182	0.0231133	0.0231133	0.0136158	0.0128154
Heptane		0.0305038	0.0305038	0.0305038	0.162674	0.162674	0			0.00732863	0.00732863			0.0277462	0.0545599	0.0545599	0.0291239	0.0305063
Methylcyclohexane		0.0158537	0.0158537	0.0158537	0.0861032	0.0861032	0			0.0196852	0.0196852			0.0140696	0.0287698	0.0287698	0.0155779	0.0158551
Toluene		0.00374291	0.00374291	0.00374291	0.0204673	0.0204673	0			0.0321244	0.0321244			0.00327920	0.00682042	0.00682042	0.00340091	0.00374323
Octane		0.0667149	0.0667149	0.0667149	0.346199	0.346199	0			0.00927076	0.00927076			0.0651703	0.115559	0.115559	0.0330784	0.0667200
Ethylbenzene		0.00442229	0.00442229	0.00442229	0.0234849	0.0234849	0			0.0366147	0.0366147			0.00413733	0.00779184	0.00779184	0.00201976	0.00442264
m-Xylene		0.00413607	0.00413607	0.00413607	0.0219073	0.0219073	0			0.0337690	0.0337690			0.00395874	0.00725361	0.00725361	0.00165103	0.00413640
o-Xylene		0.00647724	0.00647724	0.00647724	0.0343370	0.0343370	0			0.0541385	0.0541385			0.00623140	0.0113603	0.0113603	0.00237645	0.00647775
Nonane		0.0310619	0.0310619	0.0310619	0.157072	0.157072	0			0.00653435	0.00653435			0.0368511	0.0520619	0.0520619	0.00599128	0.0310641
C10+		0.00725513	0.00725513	0.00725513	0.0333725	0.0333725	0			0.000609826	0.000609826			0.0262746	0.0110220	0.0110220	5.73412E-05	0.00725552
Mass Flow		**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**
Water		312.179	0	0	0.0573913	0	0			0	0.0579058			105.542	0	0.0443435	0.0266535	312.223
H2S		0	0	0	0	0	0			0	0			0	0	0	0	0
Nitrogen		897.386	0	0	0.00333215	0	897.354			0	0.00622872			896.785	0	0.0253442	0.0253409	897.412
Carbon Dioxide		623.282	0	0	0.108599	0	623.599			0	0.0643798			620.683	0	0.0866450	0.0865533	623.369
Methane		98932.4	0	0	2.46390	0	98932.8			0	1.30506			98786.9	0	6.57792	6.57531	98939.0
Ethane		31081.3	0	0	8.97937	0	31079.6			0	0.448607			30922.9	0	4.98605	4.97376	31086.3
Propane		9634.49	0	0	7.02338	0	9626.06			0	0.150262			9522.44	0	1.88136	1.86608	9636.37
Isobutane		2459.49	0	0	2.42635	0	2461.80			0	0.0134706			2409.33	0	0.495492	0.485627	2459.98
n-Butane		4205.79	0	0	4.44146	0	4207.83			0	0.0474964			4097.12	0	0.851296	0.827103	4206.64
Isopentane		1496.91	0	0	1.70209	0	1501.14			0	0.0115079			1436.58	0	0.298186	0.279057	1497.20
n-Pentane		1263.66	0	0	1.46536	0	1261.73			0	0.00945057			1202.32	0	0.251873	0.231032	1263.92
2-Methylpentane		16.3025	0	0	0.0191932	0	0			0	5.72598E-05			15.0777	0	0.00319340	0.00262926	16.3057
3-Methylpentane		11.2906	0	0	0.0133240	0	0			0	0.000104371			10.3892	0	0.00221026	0.00178494	11.2928
n-Hexane		3650.29	0	0	4.29879	0	3904.93			0	0.0101674			3339.89	0	0.709619	0.548066	3651.00
Methylcyclopentane		2.86096	0	0	0.00341475	0	0			0	7.44442E-05			2.58633	0	0.000562160	0.000430498	2.86152
Benzene		0.730219	0	0	0.000876087	0	0			0	9.25122E-05			0.659470	0	0.000144387	0.000112403	0.730364
2-Methylhexane		23.0318	0	0	0.0267180	0	0			0	7.03927E-05			20.7982	0	0.00436077	0.00256611	23.0362
3-Methylhexane		19.8488	0	0	0.0230310	0	0			0	6.32379E-05			17.8567	0	0.00376062	0.00217161	19.8526
Heptane		47.2488	0	0	0.0542550	0	0			0	0.000156045			42.6449	0	0.00887710	0.00464501	47.2577
Methylcyclohexane		24.5566	0	0	0.0287171	0	0			0	0.000419148			21.6245	0	0.00468095	0.00248455	24.5613
Toluene		5.79757	0	0	0.00682626	0	0			0	0.000684010			5.04001	0	0.00110971	0.000542417	5.79868
Octane		103.338	0	0	0.115464	0	0			0	0.000197398			100.164	0	0.0188020	0.00527573	103.357
Ethylbenzene		6.84990	0	0	0.00783267	0	0			0	0.000779620			6.35892	0	0.00126776	0.000322135	6.85117
m-Xylene		6.40656	0	0	0.00730652	0	0			0	0.000719029			6.08444	0	0.00118019	0.000263325	6.40774
o-Xylene		10.0329	0	0	0.0114520	0	0			0	0.00115275			9.57743	0	0.00184836	0.000379024	10.0348
Nonane		48.1132	0	0	0.0523866	0	0			0	0.000139133			56.6388	0	0.00847066	0.000955558	48.1217
C10+		11.2378	0	0	0.0111304	0	0			0	1.29848E-05			40.3831	0	0.00179332	9.14543E-06	11.2396

Process Streams		**HP Separator Gas**	**HP Separator Water**	**HP Separator Oil**	**OT Flash Gas**	**Sales Oil**	**Gas**	**Water**	**Oil**	**Produced Water**	**PWT Flash Gas**	**Oil W/B**	**Water W/B**	**Well Stream**	**LP Separator Oil**	**LP Separator Gas**	**r recovery by VRU (to**	**Total gas to sale**
Phase: Vapor	**Status**	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Unsolved	Unsolved	Solved	Solved	Solved	Solved	Solved
Property	**Units**																	
Temperature	°F	70.0	70.0	70.0	75.9	75.9	85.0			75.9	75.9			84.7354	70	70	70	69.9989
Pressure	psig	154	154	154	0	0	1000			0	0			1000	50	50	154	154
Mole Fraction Vapor	%	100	100	100	100	100	100			100	100			100	100	100	100	100
Mole Fraction Light Liquid	%	0	0	0	0	0	0			0	0			0	0	0	0	0
Mole Fraction Heavy Liquid	%	0	0	0	0	0	0			0	0			0	0	0	0	0
Molecular Weight	lb/lbmol	20.2	20.2	20.2	40.0	40.0	20.2			20.1	20.1			20.1052	24.5234	24.5234	24.2311	20.1663
Mass Density	lb/ft^3	0.6	0.6	0.6	0.1	0.1	4.4			0.1	0.1			4.38095	0.285904	0.285904	0.765834	0.624044
Molar Flow	lbmol/h	7681.0	0.0	0.0	0.8	0.0	7663.4			0.0	0.1			7644.62	0	0.663464	0.658211	7681.69
Mass Flow	lb/h	154894.8	0.0	0.0	33.4	0.0	154496.9			0.0	2.1			153696	0	16.2704	15.9492	154911
Vapor Volumetric Flow	MCFH	248.2	0.0	0.0	0.3	0.0	35.1			0.0	0.0			35.0829	0	0.0569086	0.0208259	248.237
Liquid Volumetric Flow	Mbbl/d	1061.0	0.0	0.0	1.4	0.0	150.2			0.0	0.2			149.965	0	0.243260	0.0890219	1061.11
Std Vapor Volumetric Flow	MMSCFD	70.0	0.0	0.0	0.0	0.0	69.8			0.0	0.0			69.6243	0	0.00604259	0.00599474	69.9620

Std Liquid Volumetric Flow	Mbbl/d	31.5	0.0	0.0	0.0	0.0	31.5			0.0	0.0			31.3915	0	0.00302885	0.00299398	31.5505
Compressibility		0.959	0.959	0.959	0.986	0.986	0.796			0.997	0.997			0.797055	0.976265	0.976265	0.939016	0.959062
Specific Gravity		0.696	0.696	0.696	1.383	1.383	0.696			0.693	0.693			0.694177	0.846725	0.846725	0.836633	0.696287
API Gravity																		
Enthalpy	MMBtu/h	-262.9	0.0	0.0	0.0	0.0	-265.4			0.0	0.0			-264.915	0	-0.0241625	-0.0238758	-262.894
Mass Enthalpy	Btu/lb	-1697.1	-1697.1	-1697.1	-1106.5	-1106.5	-1717.9			-1864.8	-1864.8			-1723.63	-1485.06	-1485.06	-1496.99	-1697.06
Mass Cp	Btu/(lb*°F)	0.5	0.5	0.5	0.4	0.4	0.7			0.5	0.5			0.667968	0.462434	0.462434	0.480287	0.504074
Ideal Gas CpCv Ratio		1.256	1.256	1.256	1.137	1.137	1.252			1.261	1.261			1.25322	1.21745	1.21745	1.21996	1.25646
Dynamic Viscosity	cP	0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0			0.0131391	0.0101100	0.0101100	0.0103161	0.0107558
Kinematic Viscosity	cSt	1.1	1.1	1.1	5.2	5.2	0.2			13.1	13.1			0.187231	2.20756	2.20756	0.840930	1.07599
Thermal Conductivity	Btu/(h*ft*°F)	0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0			0.0225241	0.0157827	0.0157827	0.0162549	0.0178505
Surface Tension	lbf/ft																	
Net I.G. Heating Value	Btu/ft^3	1103.7	1103.7	1103.7	2099.8	2099.8	1105.7			1046.4	1046.4			1102.14	1322.48	1322.48	1309.37	1103.72
Net Liquid Heating Value	Btu/lb	20713.2	20713.2	20713.2	19749.3	19749.3	20758.7			19701.3	19701.3			20748.4	20370.5	20370.5	20414.5	20713.1
Gross I.G. Heating Value	Btu/ft^3	1217.9	1217.9	1217.9	2285.4	2285.4	1220.1			1156.5	1156.5			1216.25	1452.41	1452.41	1438.35	1217.97
Gross Liquid Heating Value	Btu/lb	22863.1	22863.1	22863.1	21508.5	21508.5	22911.4			21783.9	21783.9			22902.3	22381.1	22381.1	22434.4	22863.1

Process Streams		HP Separator Gas	HP Separator Water	HP Separator Oil	OT Flash Gas	Sales Oil	Gas	Water	Oil	Produced Water	PWT Flash Gas	Oil W/B	Water W/B	Well Stream	LP Separator Oil	LP Separator Gas	r recovery by VRU (to	Total gas to sale
Phase: Light Liquid	Status	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Unsolved	Unsolved	Solved	Solved	Solved	Solved	Solved
Mole Fraction		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water		0.0502723	99.9710	0.0502723	0.00760862	0.00760862		100	0	99.9969	99.9969			0.0599744	0.0329809	0.0329809	0.0341897	
H2S		0	0	0	0	0		0	0	0	0			0	0	0	0	
Nitrogen		0.00791334	5.84736E-05	0.00791334	2.31948E-05	2.31948E-05		0	0.0180005	2.45524E-06	2.45524E-06			0.0569094	0.000988205	0.000988205	0.00272067	
Carbon Dioxide		0.0391816	0.00103698	0.0391816	0.00562419	0.00562419		0	0.0150005	0.000668601	0.000668601			0.139039	0.0252956	0.0252956	0.0483779	
Methane		4.42415	0.0223409	4.42415	0.0886912	0.0886912		0	4.77714	0.00184577	0.00184577			24.7900	1.33074	1.33074	3.80799	
Ethane		4.55446	0.00415320	4.55446	1.10037	1.10037		0	4.94815	0.000394504	0.000394504			15.5091	3.45254	3.45254	9.55991	
Propane		3.51134	0.000958065	3.51134	2.20917	2.20917		0	4.86315	9.95604E-05	9.95604E-05			7.97219	3.35395	3.35395	8.10555	
Isobutane		1.71717	6.07466E-05	1.71717	1.50296	1.50296		0	1.36904	2.35610E-06	2.35610E-06			2.89223	1.74047	1.74047	3.97291	
n-Butane		4.19664	0.000224173	4.19664	3.95024	3.95024		0	3.81511	1.82944E-05	1.82944E-05			6.43040	4.30388	4.30388	9.74249	
Isopentane		2.98337	4.26320E-05	2.98337	3.13079	3.13079		0	2.45607	2.44725E-06	2.44725E-06			3.25907	3.11063	3.11063	6.20546	
n-Pentane		3.36195	3.49908E-05	3.36195	3.59293	3.59293		0	3.46210	1.98995E-06	1.98995E-06			3.42730	3.51483	3.51483	6.76106	
2-Methylpentane		0.0859878	1.72211E-07	0.0859878	0.0949373	0.0949373		0	1.49804	4.80691E-09	4.80691E-09			0.0675885	0.0903226	0.0903226	0.153227	
3-Methylpentane		0.0662833	3.28905E-07	0.0662833	0.0733562	0.0733562		0	1.04403	2.37722E-08	2.37722E-08			0.0507801	0.0696484	0.0696484	0.115518	
n-Hexane		26.5541	3.04040E-05	26.5541	29.5105	29.5105		0	3.65811	6.78724E-07	6.78724E-07			18.7747	27.9188	27.9188	43.8789	
Methylcyclopentane		0.0224731	2.74967E-07	0.0224731	0.0249920	0.0249920		0	0.276008	5.21218E-08	5.21218E-08			0.0164619	0.0236304	0.0236304	0.0366168	
Benzene		0.00617068	3.77702E-06	0.00617068	0.00686154	0.00686154		0	0.0760023	3.47956E-06	3.47956E-06			0.00454553	0.00648835	0.00648835	0.00958243	
2-Methylhexane		0.344641	1.81290E-07	0.344641	0.386883	0.386883		0	2.05306	4.29862E-09	4.29862E-09			0.178502	0.362868	0.362868	0.419207	
3-Methylhexane		0.311165	1.63038E-07	0.311165	0.349414	0.349414		0	1.78305	4.03640E-09	4.03640E-09			0.160511	0.327636	0.327636	0.371171	
Heptane		0.927013	4.02366E-07	0.927013	1.04241	1.04241		0	4.42513	1.00159E-08	1.00159E-08			0.442795	0.976272	0.976272	0.988560	
Methylcyclohexane		0.480294	1.24194E-06	0.480294	0.539965	0.539965		0	2.33607	1.66457E-07	1.66457E-07			0.245560	0.505801	0.505801	0.523585	
Toluene		0.150442	1.98957E-05	0.150442	0.169310	0.169310		0	0.617019	1.80301E-05	1.80301E-05			0.0739543	0.158455	0.158455	0.144104	
Octane		5.36629	4.42716E-07	5.36629	6.05586	6.05586		0	11.9694	7.33469E-09	7.33469E-09			1.92856	5.65427	5.65427	2.77158	
Ethylbenzene		0.438230	1.79797E-05	0.438230	0.494633	0.494633		0	0.908027	1.61339E-05	1.61339E-05			0.163859	0.461760	0.461760	0.208477	
m-Xylene		0.487984	1.71072E-05	0.487984	0.550925	0.550925		0	0.925028	1.54050E-05	1.54050E-05			0.176810	0.514203	0.514203	0.202136	
o-Xylene		0.853022	3.61152E-05	0.853022	0.963172	0.963172		0	1.53505	3.33885E-05	3.33885E-05			0.306398	0.898869	0.898869	0.323936	
Nonane		6.60010	2.80633E-07	6.60010	7.45668	7.45668		0	9.20628	7.32303E-09	7.32303E-09			2.10379	6.95540	6.95540	1.37147	
C10+		32.4594	1.91222E-08	32.4594	36.6917	36.6917		0	31.9660	2.23276E-10	2.23276E-10			10.7689	34.2093	34.2093	0.241248	
Molar Flow		lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h
Water		0	396.800	0.00652010	0	0.000872964		414.135	0	396.796	0			0.0225078	0.00405867	0	1.46073E-06	
H2S		0	0	0	0	0		0	0	0	0			0	0	0	0	
Nitrogen		0	0.000232090	0.00102633	0	2.66122E-06		0	0.00240719	9.74263E-06	0			0.0213575	0.000121610	0	1.16239E-07	
Carbon Dioxide		0	0.00411593	0.00508168	0	0.000645283		0	0.00200599	0.00265307	0			0.0521801	0.00311290	0	2.06691E-06	
Methane		0	0.0886744	0.573794	0	0.0101758		0	0.638841	0.00732419	0			9.30343	0.163762	0	0.000162694	
Ethane		0	0.0164846	0.590694	0	0.126249		0	0.661709	0.00156543	0			5.82042	0.424874	0	0.000408441	
Propane		0	0.00380270	0.455407	0	0.253465		0	0.650342	0.000395064	0			2.99188	0.412741	0	0.000346304	
Isobutane		0	0.000241112	0.222710	0	0.172439		0	0.183080	9.34920E-06	0			1.08543	0.214185	0	0.000169740	
n-Butane		0	0.000889775	0.544287	0	0.453225		0	0.510190	7.25939E-05	0			2.41326	0.529641	0	0.000416242	
Isopentane		0	0.000169213	0.386930	0	0.359206		0	0.328447	9.71091E-06	0			1.22310	0.382797	0	0.000265124	
n-Pentane		0	0.000138884	0.436031	0	0.412229		0	0.462983	7.89628E-06	0			1.28623	0.432540	0	0.000288862	
2-Methylpentane		0	6.83531E-07	0.0111523	0	0.0108925		0	0.200332	1.90742E-08	0			0.0253653	0.0111152	0	6.54651E-06	
3-Methylpentane		0	1.30547E-06	0.00859667	0	0.00841640		0	0.139617	9.43301E-08	0			0.0190572	0.00857102	0	4.93544E-06	
n-Hexane		0	0.000120678	3.44395	0	3.38584		0	0.489194	2.69323E-06	0			7.04595	3.43572	0	0.00187470	

Methylcyclopentane		0	1.09138E-06	0.00291467	0	0.00286741		0	0.0369102	2.06824E-07	0			0.00617799	0.00290799	0	1.56443E-06	
Benzene		0	1.49916E-05	0.000800312	0	0.000787248		0	0.0101637	1.38072E-05	0			0.00170589	0.000798463	0	4.09403E-07	
2-Methylhexane		0	7.19565E-07	0.0446985	0	0.0443884		0	0.274553	1.70573E-08	0			0.0669899	0.0446550	0	1.79103E-05	
3-Methylhexane		0	6.47121E-07	0.0403568	0	0.0400895		0	0.238445	1.60168E-08	0			0.0602380	0.0403193	0	1.58580E-05	
Heptane		0	1.59705E-06	0.120230	0	0.119600		0	0.591767	3.97439E-08	0			0.166176	0.120141	0	4.22356E-05	
Methylcyclohexane		0	4.92943E-06	0.0622922	0	0.0619520		0	0.312400	6.60518E-07	0			0.0921561	0.0622445	0	2.23698E-05	
Toluene		0	7.89689E-05	0.0195117	0	0.0194256		0	0.0825131	7.15452E-05	0			0.0277543	0.0194997	0	6.15675E-06	
Octane		0	1.75720E-06	0.695985	0	0.694810		0	1.60065	2.91047E-08	0			0.723768	0.695821	0	0.000118414	
Ethylbenzene		0	7.13642E-05	0.0568367	0	0.0567509		0	0.121429	6.40207E-05	0			0.0614947	0.0568247	0	8.90706E-06	
m-Xylene		0	6.79010E-05	0.0632895	0	0.0632096		0	0.123703	6.11283E-05	0			0.0663551	0.0632784	0	8.63615E-06	
o-Xylene		0	0.000143347	0.110633	0	0.110508		0	0.205280	0.000132488	0			0.114988	0.110616	0	1.38399E-05	
Nonane		0	1.11387E-06	0.856005	0	0.855531		0	1.23114	2.90584E-08	0			0.789532	0.855939	0	5.85950E-05	
C10+		0	7.58990E-08	4.20984	0	4.20977		0	4.27477	8.85978E-10	0			4.04147	4.20983	0	1.03072E-05	

Process Streams		HP Separator Gas	HP Separator Water	HP Separator Oil	OT Flash Gas	Sales Oil	Gas	Water	Oil	Produced Water	PWT Flash Gas	Oil W/B	Water W/B	Well Stream	LP Separator Oil	LP Separator Gas	r recovery by VRU (to	Total gas to sale
Phase: Light Liquid	Status	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Unsolved	Unsolved	Solved	Solved	Solved	Solved	Solved
Property	Units																	
Temperature	°F	70.0	70.0	70.0	75.9	75.9		85.0	85.0	75.9	75.9			84.7354	70	70	70	
Pressure	psig	154	154	154	0	0		1000	1000	0	0			1000	50	50	154	
Mole Fraction Vapor	%	0	0	0	0	0		0	0	0	0			0	0	0	0	
Mole Fraction Light Liquid	%	100	100	100	100	100		100	100	100	100			100	100	100	100	
Mole Fraction Heavy Liquid	%	0	0	0	0	0		0	0	0	0			0	0	0	0	
Molecular Weight	lb/lbmol	109.6	18.0	109.6	119.5	119.5		18.0	112.9	18.0	18.0			64.1067	114.162	114.162	71.0492	
Mass Density	lb/ft^3	44.6	62.3	44.6	45.0	45.0		62.2	45.1	62.2	62.2			37.8811	44.8978	44.8978	39.2298	
Molar Flow	lbmol/h	0.0	396.9	13.0	0.0	11.5		414.1	13.4	396.8	0.0			37.5290	12.3061	0	0.00427243	
Mass Flow	lb/h	0.0	7150.9	1421.2	0.0	1371.5		7460.8	1509.2	7148.7	0.0			2405.86	1404.89	0	0.303553	
Vapor Volumetric Flow	MCFH	0.0	0.1	0.0	0.0	0.0		0.1	0.0	0.1	0.0			0.0635108	0.0312909	0	7.73783E-06	
Liquid Volumetric Flow	Mbbl/d	0.0	0.5	0.1	0.0	0.1		0.5	0.1	0.5	0.0			0.271482	0.133755	0	3.30760E-05	
Std Vapor Volumetric Flow	MMSCFD	0.0	3.6	0.1	0.0	0.1		3.8	0.1	3.6	0.0			0.341800	0.112080	0	3.89117E-05	
Std Liquid Volumetric Flow	Mbbl/d	0.0	0.5	0.1	0.0	0.1		0.5	0.1	0.5	0.0			0.278250	0.134968	0	3.36601E-05	
Compressibility		0.073	0.009	0.073	0.007	0.007		0.050	0.434	0.001	0.001			0.293921	0.0289404	0.0289404	0.0537500	
Specific Gravity		0.716	0.998	0.716	0.722	0.722		0.997	0.724	0.998	0.998			0.607370	0.719874	0.719874	0.628994	
API Gravity		64.9	10.0	64.9	62.4	62.4		9.9	60.9	10.0	10.0			95.4801	63.7704	63.7704	91.4047	
Enthalpy	MMBtu/h	0.0	-48.8	-1.2	0.0	-1.2		-50.8	-1.3	-48.8	0.0			-2.47033	-1.21647	0	-0.000312750	
Mass Enthalpy	Btu/lb	-874.3	-6826.4	-874.3	-853.4	-853.4		-6810.9	-842.3	-6822.4	-6822.4			-1026.80	-865.884	-865.884	-1030.30	
Mass Cp	Btu/(lb*°F)	0.5	1.0	0.5	0.5	0.5		1.0	0.5	1.0	1.0			0.554384	0.490150	0.490150	0.533174	
Ideal Gas CpCv Ratio		1.050	1.326	1.050	1.045	1.045		1.325	1.048	1.326	1.326			1.08311	1.04793	1.04793	1.07678	
Dynamic Viscosity	cP	0.5	1.0	0.5	0.6	0.6		0.8	0.5	0.9	0.9			0.194587	0.554883	0.554883	0.228585	
Kinematic Viscosity	cSt	0.7	1.0	0.7	0.8	0.8		0.8	0.8	0.9	0.9			0.320679	0.771534	0.771534	0.363756	
Thermal Conductivity	Btu/(h*ft*°F)	0.1	0.3	0.1	0.1	0.1		0.4	0.1	0.3	0.3			0.0632595	0.0688298	0.0688298	0.0660075	
Surface Tension	lbf/ft	0.001	0.005	0.001	0.002	0.002		0.005	0.001	0.005	0.005			0.000526148	0.00150853	0.00150853	0.000996313	
Net I.G. Heating Value	Btu/ft^3	5523.5	0.3	5523.5	6015.0	6015.0		0.0	5675.4	0.0	0.0			3286.29	5750.02	5750.02	3645.12	
Net Liquid Heating Value	Btu/lb	18971.5	-1052.9	18971.5	18936.0	18936.0		-1059.8	18915.4	-1059.1	-1059.1			19304.2	18955.3	18955.3	19306.8	
Gross I.G. Heating Value	Btu/ft^3	5933.0	50.6	5933.0	6456.9	6456.9		50.3	6092.6	50.3	50.3			3549.86	6174.59	6174.59	3940.81	
Gross Liquid Heating Value	Btu/lb	20389.5	7.2	20389.5	20338.6	20338.6		0.0	20317.2	0.7	0.7			20864.2	20366.4	20366.4	20885.8	

Process Streams		HP Separator Gas	HP Separator Water	HP Separator Oil	OT Flash Gas	Sales Oil	Gas	Water	Oil	Produced Water	PWT Flash Gas	Oil W/B	Water W/B	Well Stream	LP Separator Oil	LP Separator Gas	r recovery by VRU (to	Total gas to sale
Phase: Heavy Liquid	Status	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Unsolved	Unsolved	Solved	Solved	Solved	Solved	Solved
Mole Fraction		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water		99.9710		99.9710										99.8748			99.9701	
H2S		0		0										0			0	
Nitrogen		5.84736E-05		5.84736E-05										0.000335259			1.95331E-05	
Carbon Dioxide		0.00103698		0.00103698										0.00393204			0.00168393	
Methane		0.0223409		0.0223409										0.105015			0.0174370	
Ethane		0.00415320		0.00415320										0.0132204			0.00769710	
Propane		0.000958065		0.000958065										0.00207328			0.00212402	
Isobutane		6.07466E-05		6.07466E-05										0.000105702			0.000135932	
n-Butane		0.000224173		0.000224173										0.000382385			0.000498968	
Isopentane		4.26320E-05		4.26320E-05										5.02008E-05			8.93348E-05	
n-Pentane		3.49908E-05		3.49908E-05										4.32622E-05			7.15908E-05	
2-Methylpentane		1.72211E-07		1.72211E-07										1.73445E-07			3.06771E-07	
3-Methylpentane		3.28905E-07		3.28905E-07										3.14902E-07			5.74253E-07	

n-Hexane		3.04040E-05		3.04040E-05										2.78493E-05			5.03190E-05	
Methylcyclopentane		2.74967E-07		2.74967E-07										2.38226E-07			4.58432E-07	
Benzene		3.77702E-06		3.77702E-06										3.70767E-06			6.50122E-06	
2-Methylhexane		1.81290E-07		1.81290E-07										1.09451E-07			2.20767E-07	
3-Methylhexane		1.63038E-07		1.63038E-07										9.98528E-08			1.95058E-07	
Heptane		4.02366E-07		4.02366E-07										2.05371E-07			4.31860E-07	
Methylcyclohexane		1.24194E-06		1.24194E-06										8.58191E-07			1.38011E-06	
Toluene		1.98957E-05		1.98957E-05										1.42712E-05			2.05023E-05	
Octane		4.42716E-07		4.42716E-07										2.31872E-07			2.43795E-07	
Ethylbenzene		1.79797E-05		1.79797E-05										9.28899E-06			9.22895E-06	
m-Xylene		1.71072E-05		1.71072E-05										8.91665E-06			7.66281E-06	
o-Xylene		3.61152E-05		3.61152E-05										1.92806E-05			1.48750E-05	
Nonane		2.80633E-07		2.80633E-07										1.25748E-07			5.93043E-08	
C10+		1.91222E-08		1.91222E-08										1.08855E-08			1.60000E-10	
Mass Fraction		**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Water		99.9663		99.9663										99.8668			99.9590	
H2S		0		0										0			0	
Nitrogen		9.09210E-05		9.09210E-05										0.000521279			3.03702E-05	
Carbon Dioxide		0.00253312		0.00253312										0.00960480			0.00411321	
Methane		0.0198935		0.0198935										0.0935077			0.0155258	
Ethane		0.00693171		0.00693171										0.0220642			0.0128457	
Propane		0.00234492		0.00234492										0.00507433			0.00519834	
Isobutane		0.000195976		0.000195976										0.000340996			0.000438506	
n-Butane		0.000723208		0.000723208										0.00123358			0.00160963	
Isopentane		0.000170728		0.000170728										0.000201031			0.000357734	
n-Pentane		0.000140127		0.000140127										0.000173246			0.000286680	
2-Methylpentane		8.23725E-07		8.23725E-07										8.29600E-07			1.46726E-06	
3-Methylpentane		1.57323E-06		1.57323E-06										1.50620E-06			2.74661E-06	
n-Hexane		0.000145429		0.000145429										0.000133205			0.000240672	
Methylcyclopentane		1.28446E-06		1.28446E-06										1.11280E-06			2.14136E-06	
Benzene		1.63759E-05		1.63759E-05										1.60747E-05			2.81853E-05	
2-Methylhexane		1.00829E-06		1.00829E-06										6.08721E-07			1.22778E-06	
3-Methylhexane		9.06782E-07		9.06782E-07										5.55342E-07			1.08480E-06	
Heptane		2.23788E-06		2.23788E-06										1.14220E-06			2.40176E-06	
Methylcyclohexane		6.76843E-06		6.76843E-06										4.67690E-06			7.52097E-06	
Toluene		0.000101751		0.000101751										7.29834E-05			0.000104847	
Octane		2.80697E-06		2.80697E-06										1.47010E-06			1.54565E-06	
Ethylbenzene		0.000105950		0.000105950										5.47362E-05			5.43807E-05	
m-Xylene		0.000100809		0.000100809										5.25421E-05			4.51523E-05	
o-Xylene		0.000212819		0.000212819										0.000113613			8.76495E-05	
Nonane		1.99780E-06		1.99780E-06										8.95156E-07			4.22154E-07	
C10+		1.83728E-07		1.83728E-07										1.04585E-07			1.53719E-09	
Mass Flow		**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**
Water		0		0										7354.80			0.0176637	
H2S		0		0										0			0	
Nitrogen		0		0										0.0383902			5.36668E-09	
Carbon Dioxide		0		0										0.707356			7.26841E-07	
Methane		0		0										6.88648			2.74355E-06	
Ethane		0		0										1.62495			2.26995E-06	
Propane		0		0										0.373705			9.18594E-07	
Isobutane		0		0										0.0251130			7.74879E-08	
n-Butane		0		0										0.0908485			2.84435E-07	
Isopentane		0		0										0.0148052			6.32148E-08	
n-Pentane		0		0										0.0127589			5.06589E-08	
2-Methylpentane		0		0										6.10969E-05			2.59279E-10	
3-Methylpentane		0		0										0.000110926			4.85350E-10	
n-Hexane		0		0										0.00981006			4.25289E-08	
Methylcyclopentane		0		0										8.19534E-05			3.78397E-10	
Benzene		0		0										0.00118384			4.98059E-09	
2-Methylhexane		0		0										4.48300E-05			2.16960E-10	
3-Methylhexane		0		0										4.08988E-05			1.91695E-10	
Heptane		0		0										8.41183E-05			4.24413E-10	

Methylcyclohexane		0		0										0.000344436			1.32902E-09	
Toluene		0		0										0.00537495			1.85273E-08	
Octane		0		0										0.000108267			2.73130E-10	
Ethylbenzene		0		0										0.00403111			9.60955E-09	
m-Xylene		0		0										0.00386952			7.97882E-09	
o-Xylene		0		0										0.00836712			1.54885E-08	
Nonane		0		0										6.59248E-05			7.45984E-11	
C10+		0		0										7.70227E-06			2.71635E-13	

Process Streams		HP Separator Gas	HP Separator Water	HP Separator Oil	OT Flash Gas	Sales Oil	Gas	Water	Oil	Produced Water	PWT Flash Gas	Oil W/B	Water W/B	Well Stream	LP Separator Oil	LP Separator Gas	r recovery by VRU (to	Total gas to sale
Phase: Heavy Liquid	Status	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Unsolved	Unsolved	Solved	Solved	Solved	Solved	Solved
Property	Units																	
Temperature	°F	70.0		70.0										84.7354			70	
Pressure	psig	154		154										1000			154	
Mole Fraction Vapor	%	0		0										0			0	
Mole Fraction Light Liquid	%	0		0										0			0	
Mole Fraction Heavy Liquid	%	100		100										100			100	
Molecular Weight	lb/lbmol	18.0		18.0										18.0167			18.0173	
Mass Density	lb/ft^3	62.3		62.3										62.0880			62.2640	
Molar Flow	lbmol/h	0.0		0.0										408.766			0.000980775	
Mass Flow	lb/h	0.0		0.0										7364.61			0.0176709	
Vapor Volumetric Flow	MCFH	0.0		0.0										0.118616			2.83806E-07	
Liquid Volumetric Flow	Mbbl/d	0.0		0.0										0.507033			1.21315E-06	
Std Vapor Volumetric Flow	MMSCFD	0.0		0.0										3.72289			8.93253E-06	
Std Liquid Volumetric Flow	Mbbl/d	0.0		0.0										0.506115			1.21197E-06	
Compressibility		0.009		0.009										0.0503985			0.00858791	
Specific Gravity		0.998		0.998										0.995494			0.998316	
API Gravity		10.0		10.0										10.1006			10.0393	
Enthalpy	MMBtu/h	0.0		0.0										-50.1158			-0.000120622	
Mass Enthalpy	Btu/lb	-6826.4		-6826.4										-6804.94			-6826.02	
Mass Cp	Btu/(lb*°F)	1.0		1.0										0.981390			0.983067	
Ideal Gas CpCv Ratio		1.326		1.326										1.32506			1.32580	
Dynamic Viscosity	cP	1.0		1.0										0.834522			0.995527	
Kinematic Viscosity	cSt	1.0		1.0										0.839092			0.998149	
Thermal Conductivity	Btu/(h*ft*°F)	0.3		0.3										0.351897			0.346586	
Surface Tension	lbf/ft	0.005		0.005										0.00491980			0.00503970	
Net I.G. Heating Value	Btu/ft^3	0.3		0.3										1.23913			0.362508	
Net Liquid Heating Value	Btu/lb	-1052.9		-1052.9										-1032.30			-1051.73	
Gross I.G. Heating Value	Btu/ft^3	50.6		50.6										51.6176			50.6933	
Gross Liquid Heating Value	Btu/lb	7.2		7.2										28.8			8.4	

November 6, 2014

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

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

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

Date Sampled: 10/14/14 Job Number: 45832.002

CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2186-M

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

Characteristics of Heptanes Plus:

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

Characteristics of Total Sample:

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

Base Conditions: 14.850 PSI & 60 °F

Certified: FESCO, Ltd. - Alice, Texas

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

David Dannhaus 361-661-7015

TANKS DATA INPUT REPORT - GPA 2186-M

COMPONENT	Mol %	LiqVol %	Wt %
Carbon Dioxide	0.015	0.005	0.006
Nitrogen	0.018	0.004	0.005
Methane	4.777	1.626	0.682
Ethane	4.948	2.658	1.324
Propane	4.863	2.691	1.908
Isobutane	1.369	0.900	0.708
n-Butane	3.887	2.471	2.019
Isopentane	2.456	1.804	1.576
n-Pentane	3.391	2.469	2.177
Other C-6's	2.877	2.383	2.206
Heptanes	9.109	8.235	7.991
Octanes	14.305	13.813	13.908
Nonanes	9.207	10.205	10.397
Decanes Plus	31.967	45.408	49.244
Benzene	0.076	0.043	0.053
Toluene	0.617	0.415	0.506
E-Benzene	0.908	0.704	0.858
Xylenes	2.460	1.894	2.324
n-Hexane	2.751	2.273	2.109
2,2,4 Trimethylpentane	0.000	0.000	0.000
Totals:	100.000	100.000	100.000

Characteristics of Total Sample:

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

Characteristics of Decanes (C10) Plus:

Specific Gravity	0.7759	(Water=1)
Molecular Weight	173.1	

Characteristics of Atmospheric Sample:

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

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

* Sample used for analysis

TOTAL EXTENDED REPORT - GPA 2186-M

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

November 6, 2014

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

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

Date Sampled: 10/14/14

Date Analyzed: 10/24/14

Sample: Nero No. 2H

Job Number: J45832

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

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

Quality Control Check			
	Sampling Conditions	**Test Samples**	
Cylinder No.	------	W-872*	W-298
Pressure, psig	168	154	150
Temperature, °F	81	70	70

(1) - Scf of flashed vapor per barrel of stock tank oil
(2) - Air = 1.000
(3) - Separator volume / Stock tank volume
(4) - Fraction of first stage separator liquid
(5) - Absolute pressure at 100 deg F
Analyst: T. G.
* Sample used for flash study
Base Conditions: 14.85 PSI & 60 °F

Certified: FESCO, Ltd. - Alice, Texas

David Dannhaus 361-661-7015

October 28, 2014

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

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

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

Date Sampled: 10/14/14 Job Number: 45832.001

CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2286

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

Computed Real Characteristics Of Heptanes Plus:

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

Computed Real Characteristics Of Total Sample:

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

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

Base Conditions: 14.850 PSI & 60 Deg F

Certified: FESCO, Ltd. - Alice, Texas

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

David Dannhaus 361-661-7015

CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2286
TOTAL REPORT

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

Computed Real Characteristics Of Total Sample:

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

GAS ANALYTICAL SERVICES

C6+ Gas Analysis Report

Gas Analytical

Report Date: Feb 15, 2016 8:49a

Client:	Antero Resources	Date Sampled:	Feb 2, 2016 10:50a
Site:	Vonda Unit 1H	Analysis Date:	Feb 10, 2016 9:44a
Field No:	9998	Collected By:	M. Hileman
Meter:	40980	Date Effective:	Feb 2, 2016 12:00a
Source Laboratory	Clarksburg (Bridgeport), WV	Sample Pressure (PSI):	184.0
Lab File No:	**X_CH1-9480.CHR**	Sample Temp (°F):	63
Sample Type:	Spot	Field H2O:	No Test
Reviewed By:		Field H2S:	No Test

Component	Mol %	Gal/MSCF
Methane	80.4725	
Ethane	13.4876	3.59
Propane	2.8486	0.78
I-Butane	0.5527	0.18
N-Butane	0.9447	0.30
I-Pentane	0.2715	0.10
N-Pentane	0.2282	0.08
Nitrogen	0.4180	
Oxygen	<MDL	
Carbon Dioxide	0.1849	
Hexanes+	0.5913	0.24
TOTAL	100.0000	5.27

Analytical Results at Base Conditions (Real)		
BTU/SCF (Dry):	1,228.7615	BTU/ft³
BTU/SCF (Saturated):	1,208.2534	BTU/ft³
PSIA:	14.730	PSI
Temperature (°F):	60.00	°F
Z Factor (Dry):	0.99668	
Z Factor (Saturated):	0.99628	

Analytical Results at Contract Conditions (Real)		
BTU/SCF (Dry):	1,228.7615	BTU/ft³
BTU/SCF (Saturated):	1,208.2534	BTU/ft³
PSIA:	14.730	PSI
Temperature (°F):	60.00	°F
Z Factor (Dry):	0.99668	
Z Factor (Saturated):	0.99628	

Calculated Specific Gravities			
Ideal Gravity:	0.6975	Real Gravity:	0.6996
Molecular Wt:	20.2018	lb/lbmol	

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

Source	Date	Notes

<MDL = Less than Method Detection Limits, NG = Not Given, NT = Not Tested

Attachment T
Facility-wide Emissions Summary Sheet(s)

ATTACHMENT T – FACILITY-WIDE CONTROLLED EMISSIONS SUMMARY SHEET

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

Emission Point ID#	NOx		CO		VOC		SO2		PM10		PM2.5		GHG (CO2e)	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
EP-HR001									4.3818	1.2426				
EP-PCV					0.0695	0.3044							7.4851	32.7846
F001					2.8788	12.6090							69.2323	303.2375
EP-ENG001	0.316	1.383	5.644	24.723	0.007	0.031	1.39E-04	6.09E-04	0.002	0.010	0.002	0.010	27.37	119.88
EP-GPU001, EP-GPU002, EP-GPU003, EP-GPU004, EP-GPU005, EP-GPU006, EP-GPU007, EP-GPU008	0.9766	4.2775	0.8203	3.5931	0.0537	0.2353	0.0059	0.0257	0.0742	0.3251	0.0742	0.3251	1171.9117	5132.9733
EP-LH001, EP-LH002, EP-LH003, EP-LH004, EP-LH005, EP-LH006, EP-LH007, EP-LH008	1.3021	5.7033	1.0938	4.7908	0.0716	0.3137	0.0078	0.0342	0.0990	0.4335	0.0990	0.4335	1562.5490	6843.9644
EP-L001					6.7517	0.6674							5.3616	0.5300
EP-L002					9.00E-04	3.35E-04							0.8448	0.3148
EP-EC001, EP-EC002, EP-EC003	0.0472	0.2067	0.0396	0.1736	0.5286	2.3152	2.27E-05	9.93E-05	0.0036	0.0157	0.0027	0.0118	134.7790	590.3320
TOTAL	2.6417	11.5706	7.5982	33.2803	0.6609	2.8948	0.0138	0.0606	0.1790	0.7841	0.1781	0.7802	2896.6086	12687.1457

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

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

ATTACHMENT T – FACILITY-WIDE CONTROLLED EMISSIONS SUMMARY SHEET

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

Emission Point ID#	Formaldehyde		Benzene		Toluene		Ethylbenzene		Xylenes		Hexane		Total HAPs	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
EP-HR001														
EP-PCV			0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.0118	0.0518	0.0118	0.0518
F001			0.0013	0.0056	0.0122	0.0534	0.0207	0.0905	0.0560	0.2451	0.1762	0.7718	0.2663	1.1664
EP-ENG001	0.005	0.021	3.74E-04	0.002	1.32E-04	5.78E-04	5.86E-06	2.57E-05	4.61E-05	2.02E-04			0.005	0.024
EP-GPU001, EP-GPU002, EP-GPU003, EP-GPU004, EP-GPU005, EP-GPU006, EP-GPU007, EP-GPU008	0.0007	0.0032	2.05E-05	8.98E-05	3.32E-05	0.0001			0.00E+00	0.00E+00	0.0176	0.0770	0.0184	0.0805
EP-LH001, EP-LH002, EP-LH003, EP-LH004, EP-LH005, EP-LH006, EP-LH007, EP-LH008	0.0010	0.0043	2.73E-05	0.0001	4.43E-05	1.94E-04			0.00E+00	0.00E+00	0.0234	0.1027	0.0245	0.1074
EP-L001			1.66E-05	1.64E-06	2.81E-04	2.78E-05	5.88E-04	5.81E-05	0.002	1.64E-04	0.097	0.010	0.100	0.010
EP-L002			5.42E-08	2.02E-08	1.93E-07	7.18E-08	1.24E-07	4.60E-08	3.41E-07	1.27E-07	1.44E-08	5.36E-09	7.26E-07	2.70E-07
EP-EC001, EP-EC002, EP-EC003	2.84E-06	1.24E-05	0.0000	0.0001	0.0002	0.0007	0.0002	0.0008	0.0004	0.0019	0.0875	0.3833	0.0883	0.3868
TOTAL	0.0066	0.0287	0.0004	0.0019	0.0004	0.0016	0.0002	0.0008	0.0005	0.0021	0.1285	0.5630	0.1366	0.5984

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

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

Attachment U
Class I Legal Advertisement

Attachment U

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

Notice is given that Antero Resources Corporation has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a G70-C General Permit Modification for an Oil and Natural Gas Production facility located at 138 Rocket Dr. Greenwood, WV 26415, near West Union in Doddridge County, West Virginia.

The latitude and longitude coordinates are: 39.273384 and -80.873788

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

Pollutants	TOTALS (tpy):
NO_X	11.5706
CO	33.2803
$PM_{2.5}$	0.7802
PM_{10}	0.7841
VOC	2.8948
SO_2	0.0606
Formaldehyde	0.0287
Benzene	0.0019
Toluene	0.0016
Ethylbenzene	0.0008
Xylenes	0.0021
Hexane	0.5630
Total HAPs	0.5984

Proposed new equipment will be installed upon permit issuance. Startup of operation is planned to begin on or about July 2017. Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57th Street, SE, Charleston, WV 25304, for at least 30 calendar days from

Any questions regarding this permit application should be directed to the DAQ at (304) 926-0499, extension 1250, during normal business hours.
Dated this the __ day of _____, 2016

By: Antero Resources Corporation
Barry Schatz
Senior Environmental & Regulatory Manager
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