July 1, 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
McGill 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 McGill Well Pad.

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

1. Decrease in production.
2. Addition of a Cimarron enclosed combustor.
3. Addition of 2 condensate tanks
4. Addition of 10 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. 448514 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

REGISTERED COMPANY FOR
ISO 9001
ENGINEERING DESIGN

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

Sincerely,

GHD Services Inc.

Manuel Bautista

MB/ma/246

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 two condensate tanks, ten line heaters and two Cimarron enclosed combustors.

McGill Well Pad

Antero Resources Corporation

GHD Services Inc.
6320 Rothway Suite 100 Houston Texas 77040
082715 | Report No 251 | June 2016

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west virginia department of environmental protection

Division of Air Quality
601 57th Street SE
Charleston, WV 25 4
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: McGill Well Pad

Operating Site Physical Address: 498 Wilhelm Run Rd.

City: Greenwood	Zip Code: 26415	County: Doddridge

Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits):
Latitude: 39.27489
Longitude: -80.84890

SIC Code: 1311 NAICS Code: 211111	DAQ Facility ID No. (For existing facilities) 017-00075

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: 7/11/2016

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 condensate production and the addition of 2 condensate tanks, 10 line heaters and 2 Cimarron enclosed combustor.	
Directions to the facility: From the intersection of US-50 and Wilhelm Run Road, go South on Wilhelm Run road for 0.6 mi. The entrance to the pad will be towards 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:		40WVDEPAQ	448515	
CR53116	5/31/2016	401007715		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
50-7083-2213

NO. 448514

5/31/2016

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

⑈448514⑈ ⑆221370632⑆6000000168910⑈

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:

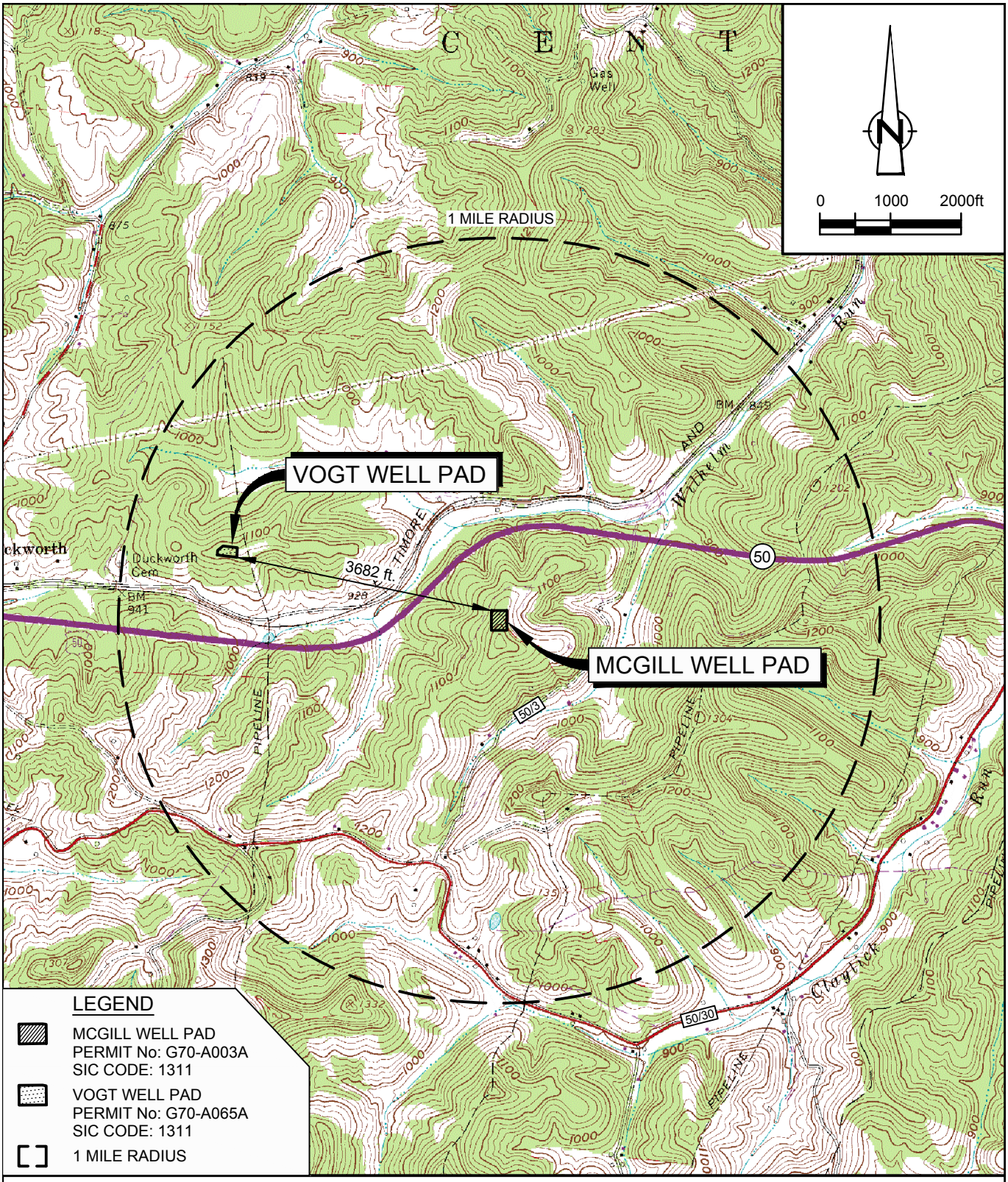
The McGill Well Pad calculation potential to emit included all the emissions sources that belong to the same industrial grouping, are located on contiguous or adjacent properties, and are under the control of the same person. The nearest emission source that belongs to the same industrial grouping and under the control of the same person but not located on contiguous or adjacent property is the Vogt Well Pad. This operates independently and is approximately 0.7 mile west of the facility.

ATTACHMENT A - SINGLE SOURCE DETERMINATION FORM

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

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

Are the facilities owned by the same parent company or a subsidiary of the parent company? Provide the owners identity and the percentage of ownership of each facility. **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

SITE COORDINATES: LAT: 39.274589, LONG: -80.848908

Attachment A

SINGLE SOURCE DETERMINATION MAP
MCGILL WELL PAD
ANTERO RESOURCES
Doddridge County, West Virginia

82715-00(251)GN-WA004 JUN 6, 2016

Attachment B
Siting Criteria Waiver

Attachment B

Siting Waiver
McGill 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 McGill 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:

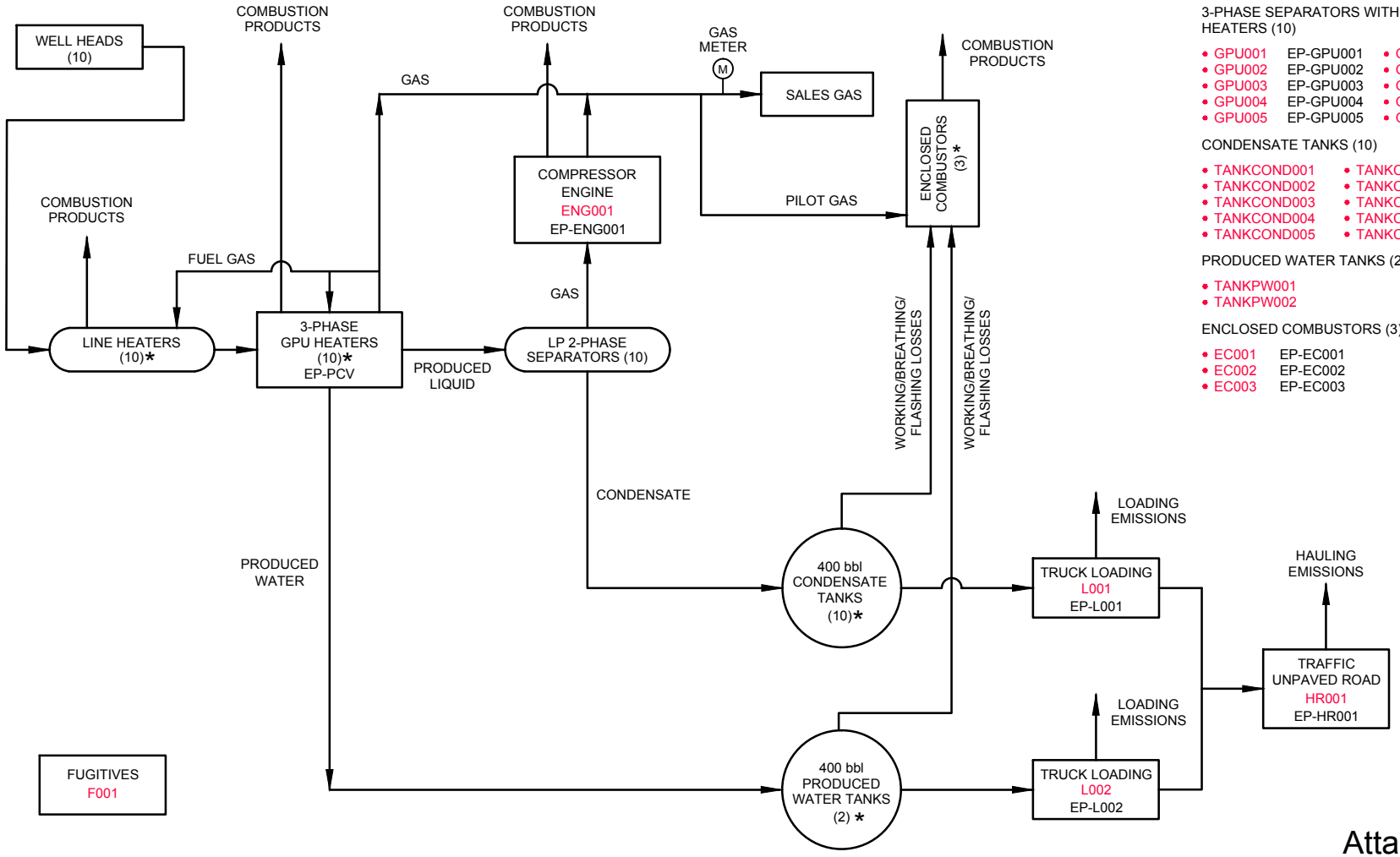
FIRST. The name of the Corporation is Antero Resources Corporation.

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 (10)

• LH001	EP-LH001	• LH006	EP-LH006
• LH002	EP-LH002	• LH007	EP-LH007
• LH003	EP-LH003	• LH008	EP-LH008
• LH004	EP-LH004	• LH009	EP-LH009
• LH005	EP-LH005	• LH010	EP-LH010

3-PHASE SEPARATORS WITH HEATERS (10)

• GPU001	EP-GPU001	• GPU006	EP-GPU006
• GPU002	EP-GPU002	• GPU007	EP-GPU007
• GPU003	EP-GPU003	• GPU008	EP-GPU008
• GPU004	EP-GPU004	• GPU009	EP-GPU009
• GPU005	EP-GPU005	• GPU010	EP-GPU010

CONDENSATE TANKS (10)

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

PRODUCED WATER TANKS (2)

- TANKPW001
- TANKPW002

ENCLOSED COMBUSTORS (3)

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

Attachment D

PROCESS FLOW DIAGRAM - ANTERO RESOURCES MCGILL WELL PAD

Doddridge County, West Virginia

Attachment E
Process Description

Attachment E

Process Description
McGill 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 (LH001-010) and gas production units (GPU001-GPU010) 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.

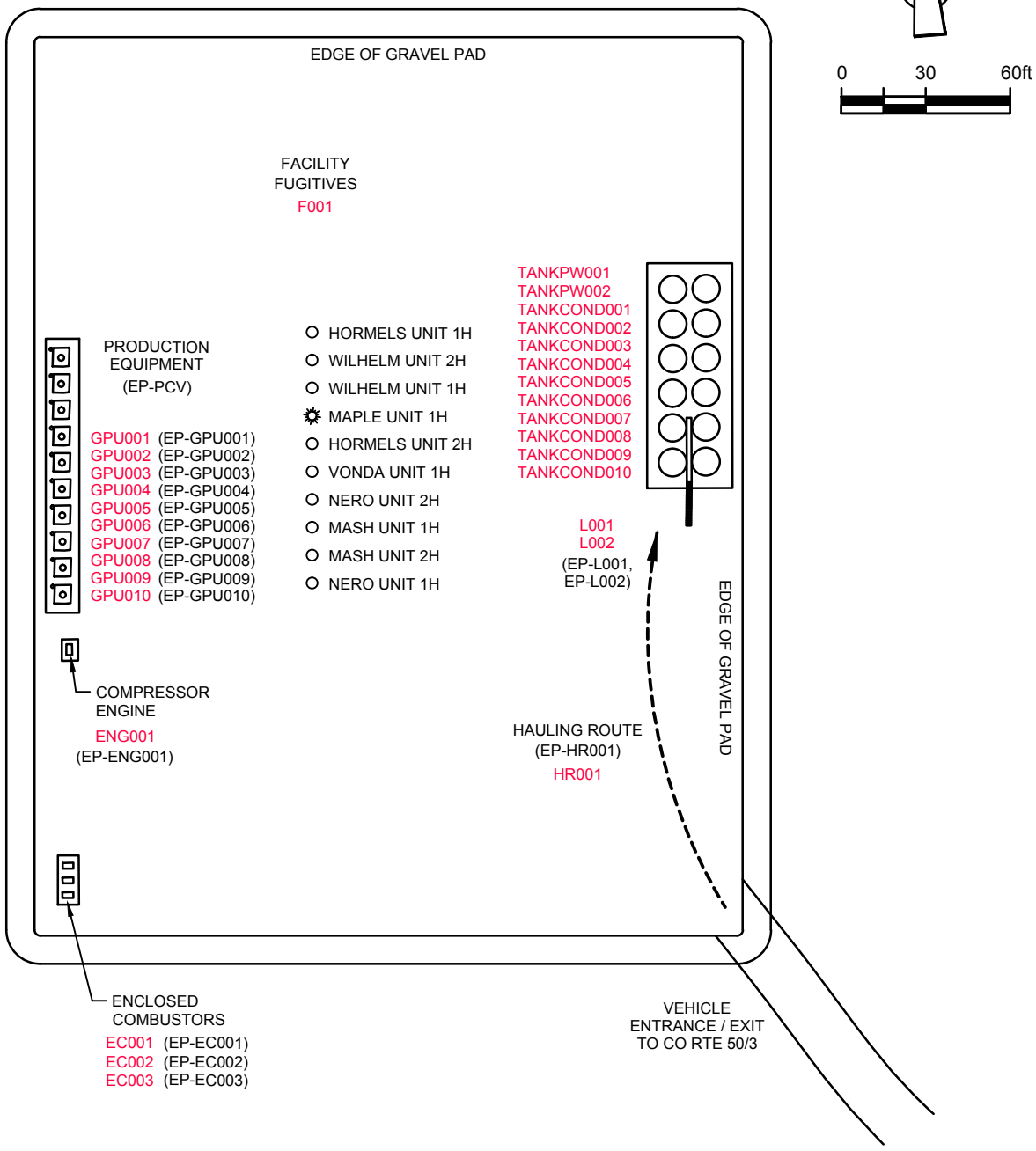
The gas from the three phase separators is metered and sent to the sales gas pipeline. The water flow to the produced water storage tanks (TANKPW001-002). The condensate is then sent to two phase low pressure separators where gas is further separated. The gas is routed to the gas fueled compressor engines (ENG001), compressed, metered and sent to the sales gas line. The condensate from the two phase separators flows to the condensate storage tanks (TANKSCOND001-010). 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 ten (10) tanks (TANKCOND001-010) on site to store condensate and two (2) tanks (TANKPW001-002) to store produced water prior to removal from the site. The flashing, working and breathing losses from the tanks are routed to three enclosed combustors (EC001-*003*) to control the emissions. The enclosed combustor(s) 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 No. 2H Unit and gas from Vonda Unit 1H, two of the wells in the McGill Well Pad.

Attachment F
Plot Plan



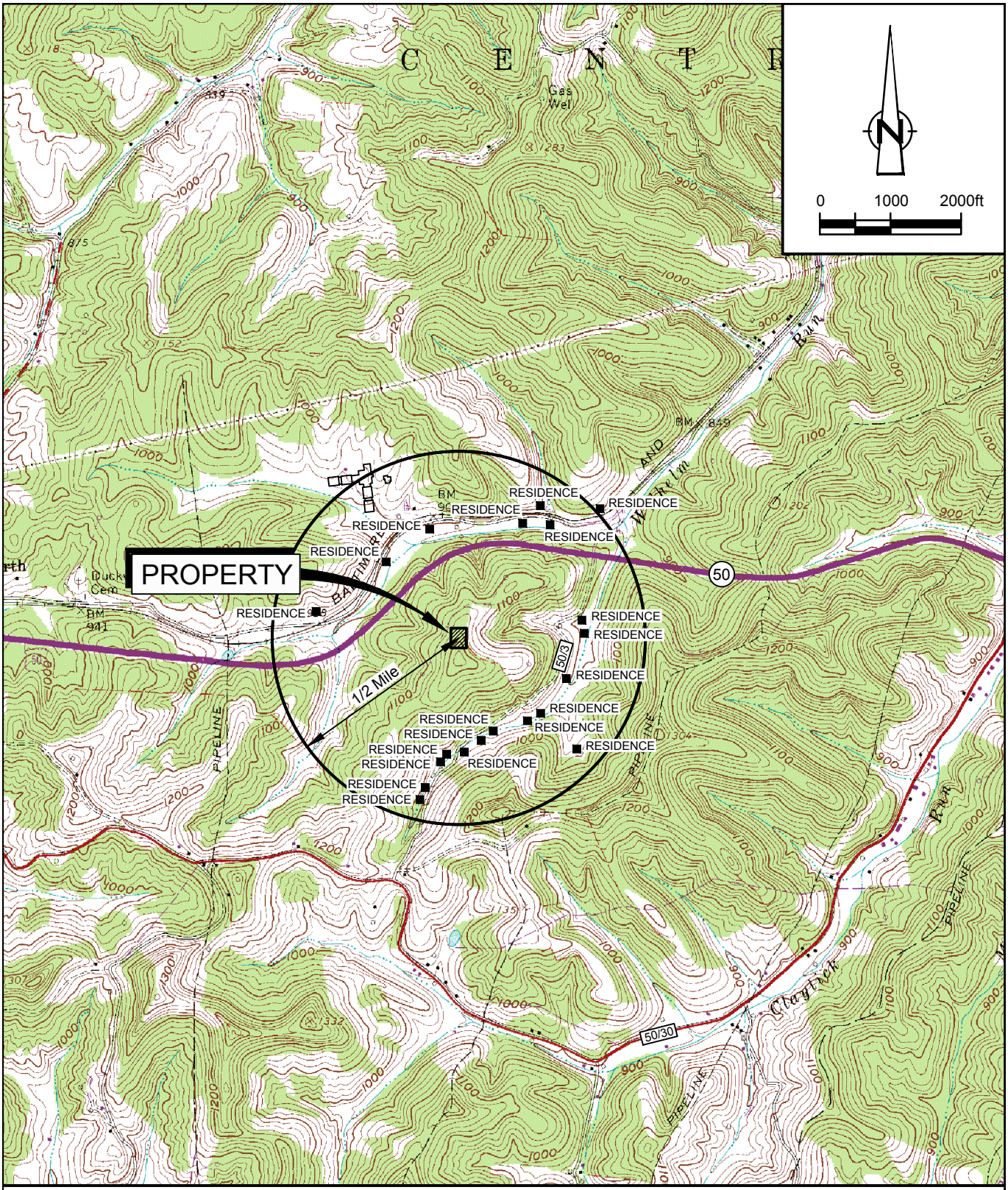
LEGEND

- EXISTING WELL LOCATION
- PROPOSED WELL LOCATION

Attachment F

PLOT PLAN
MCGILL WELL PAD
ANTERO RESOURCES
Doddridge County, West Virginia

Attachment G
Area Map



SOURCE: USGS QUADRANGLE MAP;
WEST UNION, WEST VIRGINIA

SITE COORDINATES: LAT: 39.274589, LONG: -80.848908
SITE ELEVATION: 1164 ft AMSL

GHD

Attachment G

AREA MAP
MCGILL WELL PAD
ANTERO RESOURCES
Doddridge County, West Virginia

82715-00(251)GN-WA003 JUN 6, 2016

Attachment H
G70-B Section Applicability Form

ATTACHMENT H – G70-C SECTION APPLICABILITY FORM

General Permit G70-C Registration
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, GPU009, GPU010	EP-GPU001, EP-GPU002, EP-GPU003, EP-GPU004, EP-GPU005, EP-GPU006, EP-GPU007, EP-GPU008, EP-GPU009, EP-GPU010	Gas Production Unit Heater	2014		1.5 MMBtu/hr	Existing	N/A	
LH001, LH002, LH003, LH004, LH005, LH006, LH007, LH008, LH009, LH010	EP-LH001, EP-LH002, EP-LH003, EP-LH004, EP-LH005, EP-LH006, EP-LH007, EP-LH008, EP-LH009, EP-LH010	Line Heater	2016		2.0 MMBtu/hr	New	N/A	
F001	F001	Fugitives	2014		N/A	Existing	N/A	
TANKCOND001-010	EP-EC001, EP-EC002, EP-EC003	Condensate Tank F/W/B	(8) 2014 (2) 2016		400 bbl each	(8) Existing (2) New	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 (CO2e)
Valves	☐ Yes ☑ No	500	EPA	gas	3.25	0.55	350.52
Valves	☐ Yes ☑ No	520	EPA	liquid	12.26	0.86	2.25
Connections (Not sampling)	☐ Yes ☑ No	590	EPA	gas	0.17	2.90E-02	18.38
Flanges	☐ Yes ☐ No	130	EPA	gas	0.07	1.25E-02	7.90
Loading	☐ Yes ☑ No	2	EPA	gas	2.22	2.92E-02	2.08

[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**
47017065550000	3/1/2018	11/1/2017	Green
47017065560000	3/1/2018	11/1/2017	Green
47017062720000	2/18/2014	12/1/2013	Green
47017062750000	2/9/2014	12/1/2013	Green
47017062110000	1/29/2014	12/1/2013	Green
47017062120000	9/13/2014	8/1/2014	Green
47017062130000	10/1/2014	8/1/2014	Green
47017066260000	3/1/2018	11/1/2017	Green
47017065540000	3/1/2018	11/1/2017	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 001-010
3. Emission Unit ID number: TANKCOND001-010	4. Emission Point ID number. EP-EC001, EP-EC002, EP-EC003
5. Date Installed , Modified or Relocated (for existing tanks)	6. Type of change:
(8) 2014 (2) 2016 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.): 6622560	13B. Maximum daily throughput (gal/day): 18144
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 40	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 (8) 2014(2) 2016

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.: Charleston, 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)	1.33
39A. Average Liquid Surface Temperature (°F)	65.08	39B. Corresponding Vapor Pressure (psia)	1.99
40A. Maximum Liquid Surface Temperature (°F)	75.94	40B. Corresponding Vapor Pressure (psia)	2.48

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)	39.8171		
Maximum Vapor Pressure 41F. True (psia)	1.9880		
41G. Reid (psia)	3.5400		
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- ☑ 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):	46.5583333	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)	0.22
39A. Average Liquid Surface Temperature (°F)	65.08	39B. Corresponding Vapor Pressure (psia)	0.37
40A. Maximum Liquid Surface Temperature (°F)	75.94	40B. Corresponding Vapor Pressure (psia)	0.49

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)	18.4550		
Maximum Vapor Pressure 41F. True (psia)	0.3719		
41G. Reid (psia)	1.0225		
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
GPU009	EP-GPU009	Gas Production Unit Heater	2014	Existing	1.5	1228.7615
GPU010	EP-GPU010	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
LH009	EP-LH009	Line Heater	2016	New	2	1228.7615
LH010	EP-LH010	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.

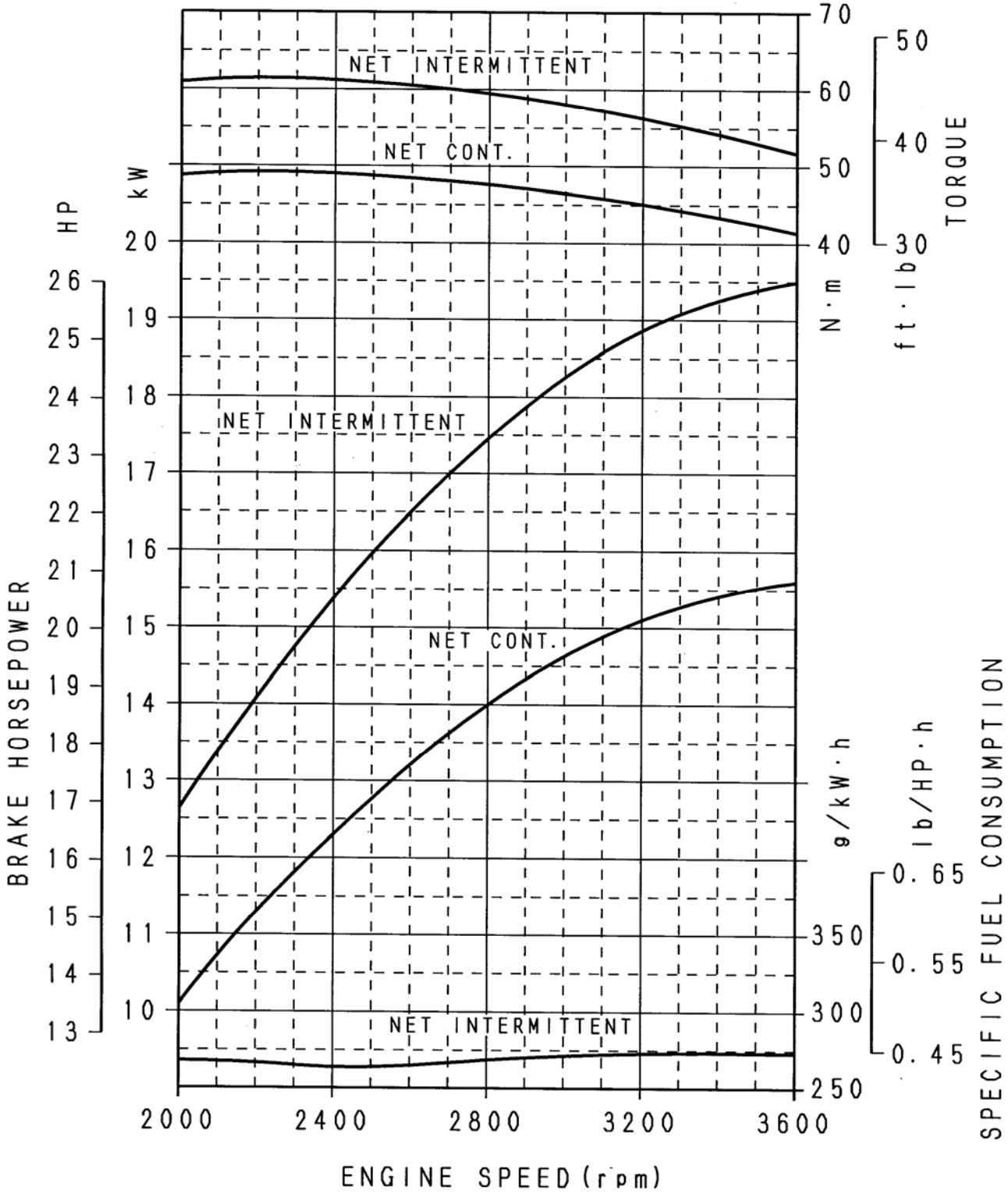
1. GENERAL SPECIFICATIONS

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

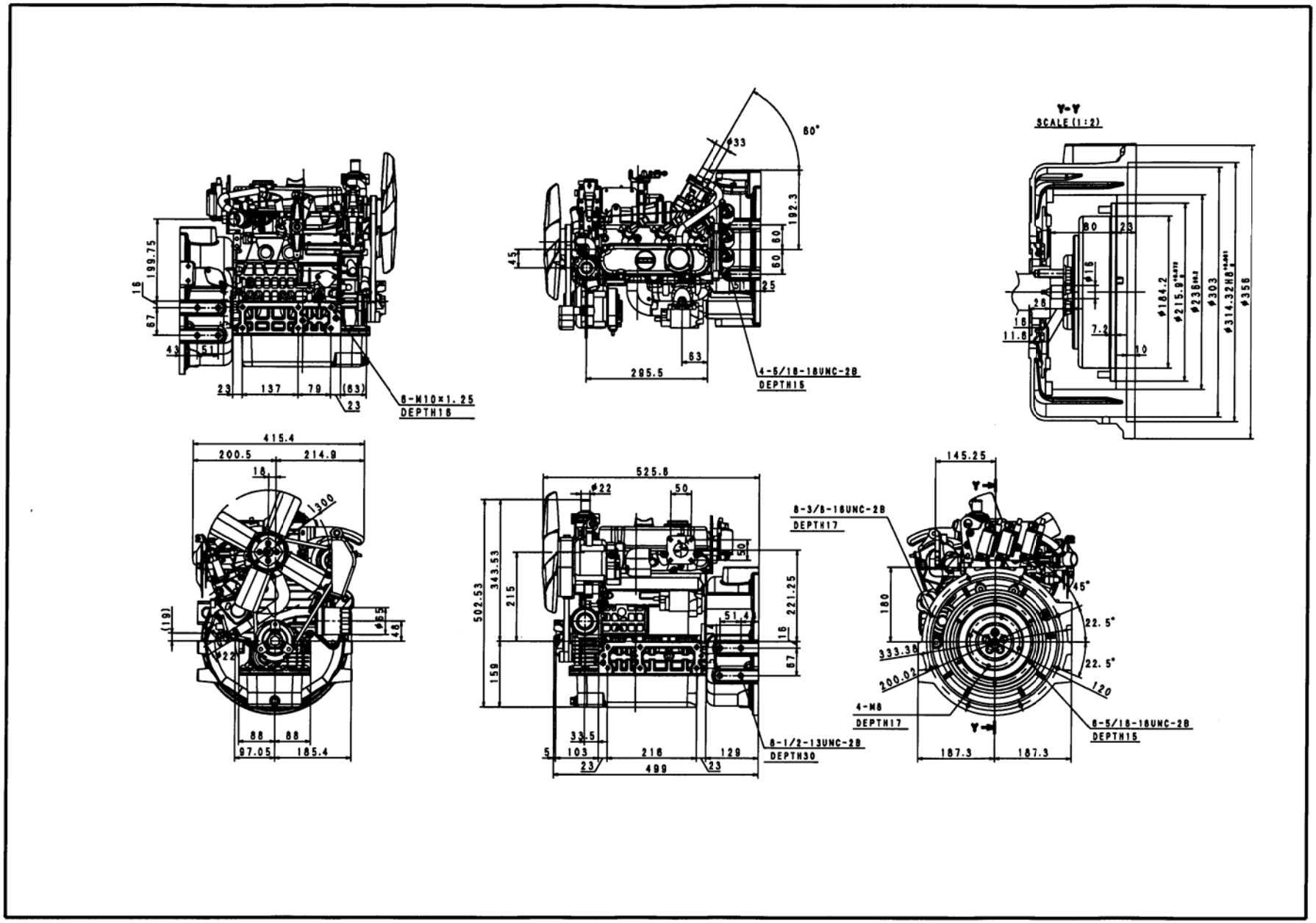
2. PERFORMANCE CURVES

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

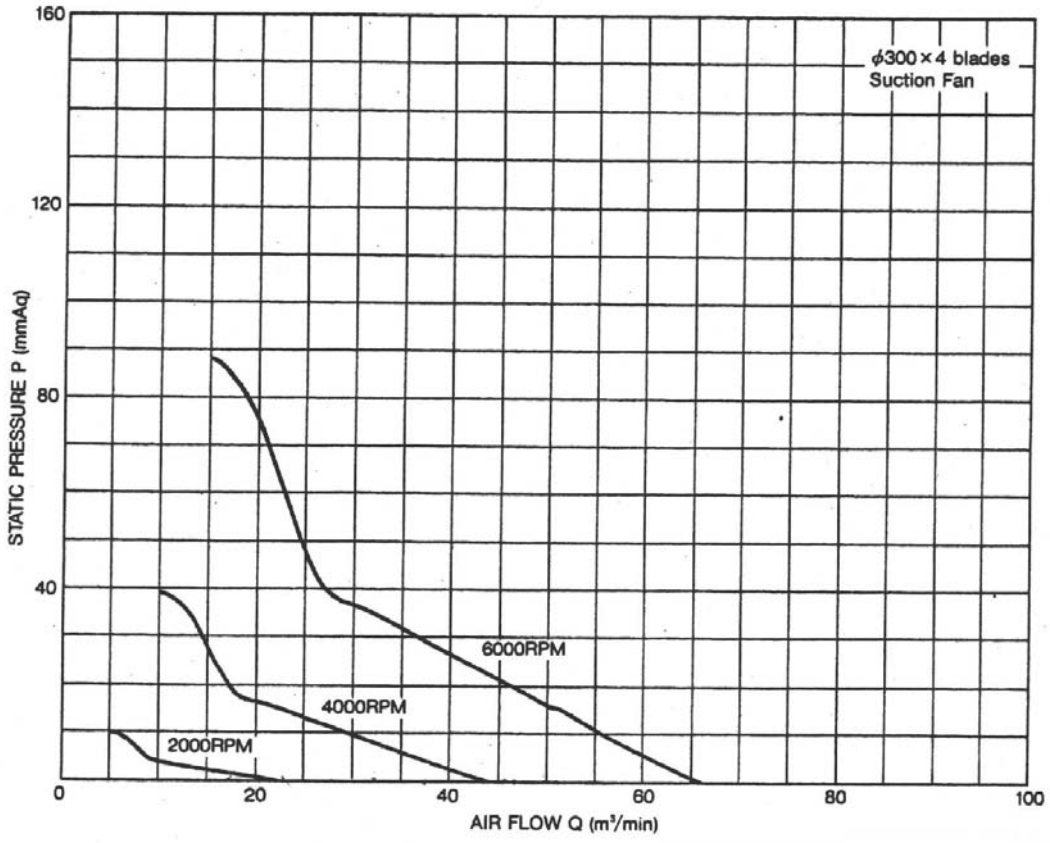
Be: Specific fuel consumption

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

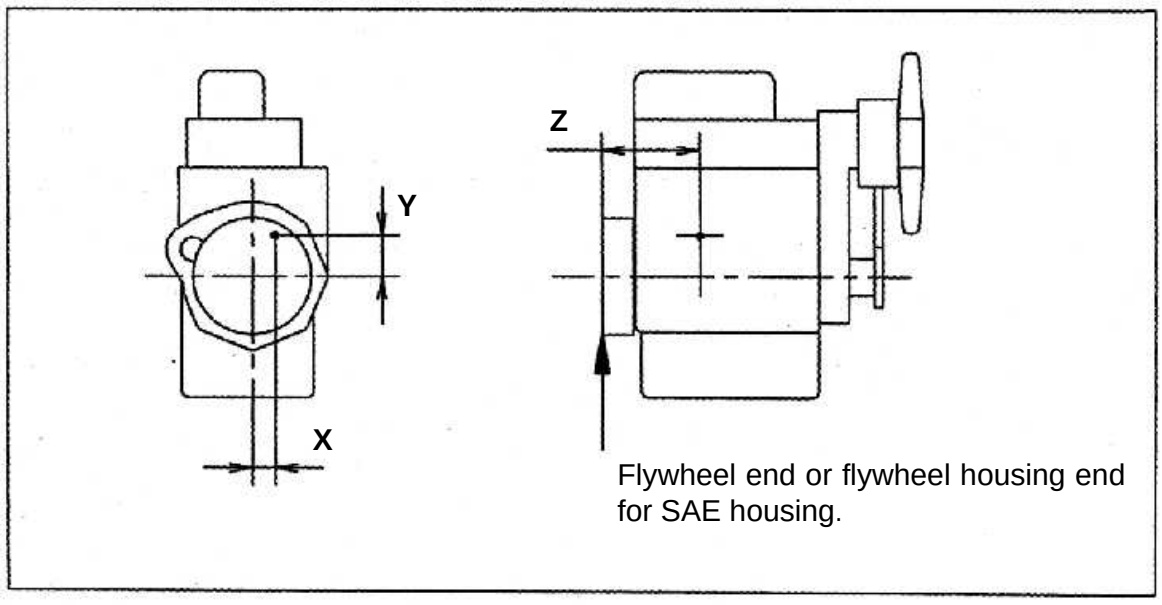
1. With standard flywheel and rear-end plate

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)

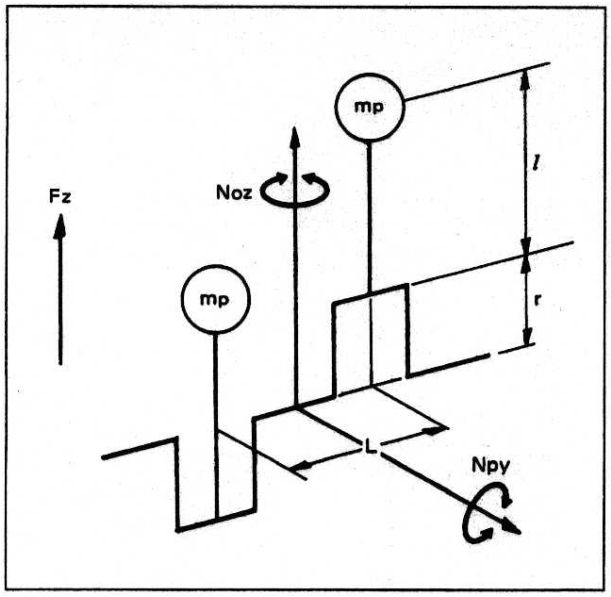
Note
Cooling water and lubricating oil weight is not included in above engine weight.



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

($x\omega^2$)

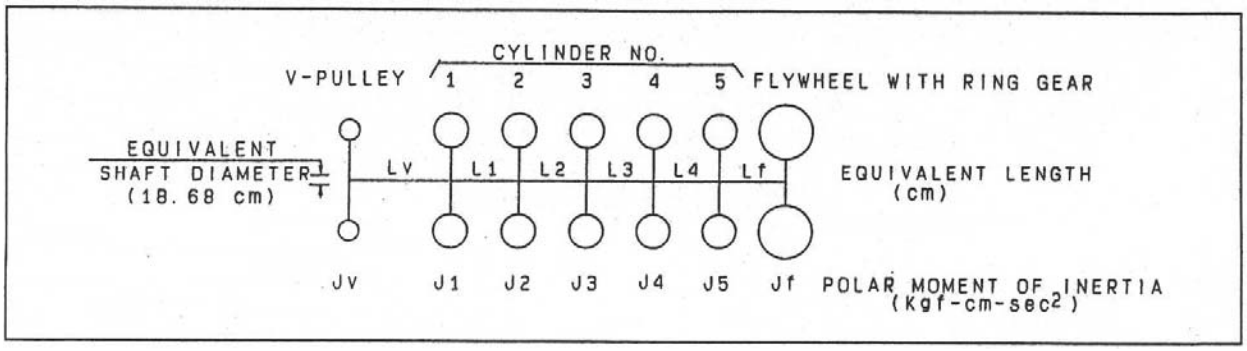
Model	No. of Cylinder	Cylinder Bore	Order	Fz	Npy	Noz
WG/DF/DG 972	3	74.5mm	1	0	0.000096	0.000096
			2	0	0.000072	0

▼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)

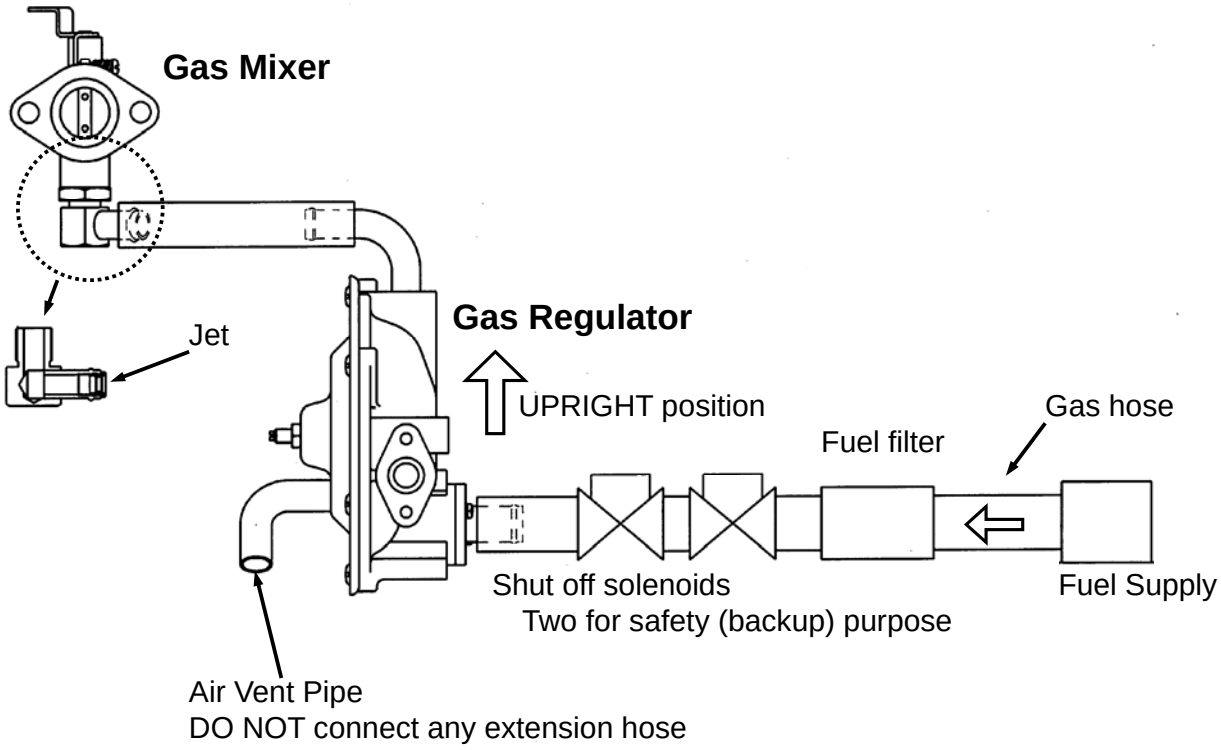
Equipments Vacuum Meter : Not KUBOTA supplied
Adjustable Jet : Service Tool

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

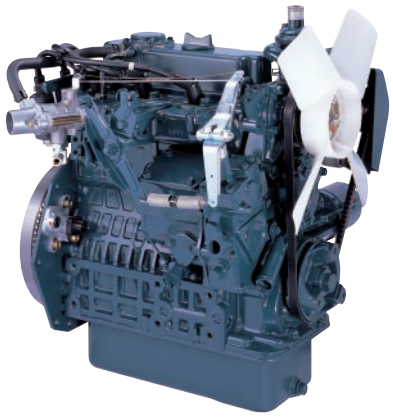
KUBOTA DG SERIES (3-cylinder)

DG972-E2

2 EPA Tier

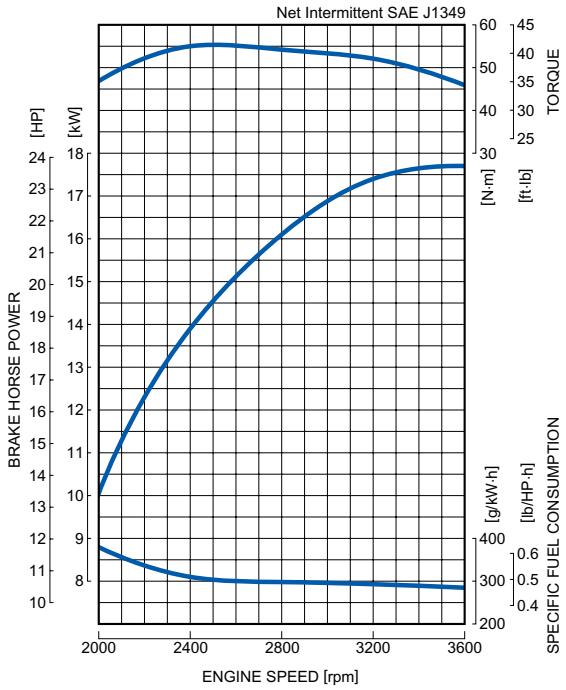
RATED POWER

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

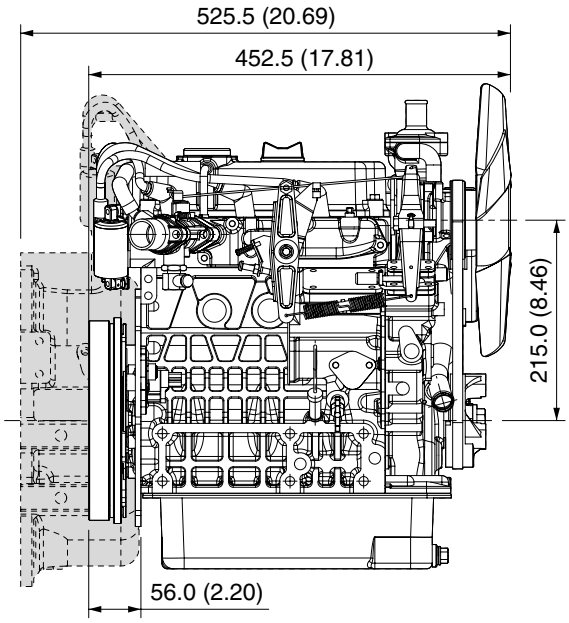
KUBOTA DG SERIES

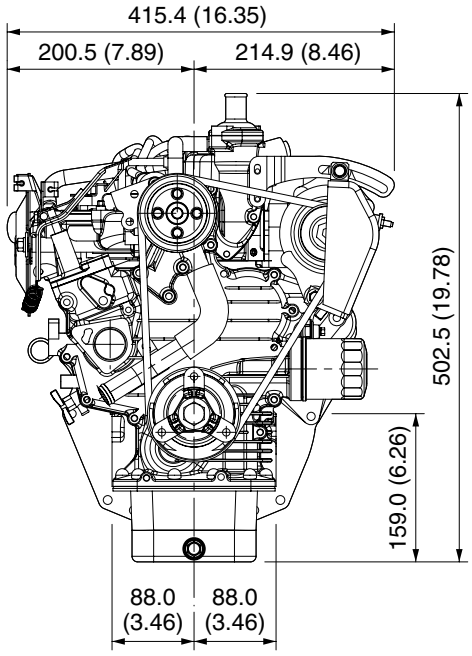
GENERAL SPECIFICATION

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	4	4	4	4
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)		18.14	20.58	
Max. Annual Throughput (1000 gal/yr.)		6622.56	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)		75.94	75.94	
True Vapor Pressure		2.48	0.49	
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.)	6.7626	0.0009	
	Annual (ton/yr.)	2.2215	0.0003	
Max HAP Emission Rate	Loading (lb./hr.)	0.0889	1.12E-06	
	Annual (ton/yr.)	0.0292	4.16E-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	5458 scfh / 131000 scfd	Maximum Design Heating Input (from mfg. spec sheet)	12.0 MMBTU/hr.
Design Heat Content	2300 BTU/scf		

Control Device Information

Type of Vapor Combustion Control?

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

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

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

Emission Unit ID#	Emission Source Description	Emission Unit ID#	Emission Source Description
TANKCOND001-010	Condensate Tanks		
TANKPW001-002	Produced Water Tanks		

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

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

Waste Gas Information

Maximum Waste Gas Flow Rate: 20.40 (scfm)	Heat Value of Waste Gas Stream: 2,165.31 BTU/ft^3	Exit Velocity of the Emission Stream: 0.0390 (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: 3	Fuel Flow Rate to Pilot Flame per Pilot: 12.6 scfh	Heat Input per Pilot: 12800 BTU/hr.	Will automatic re-ignition be used? ☑ Yes ☐ No

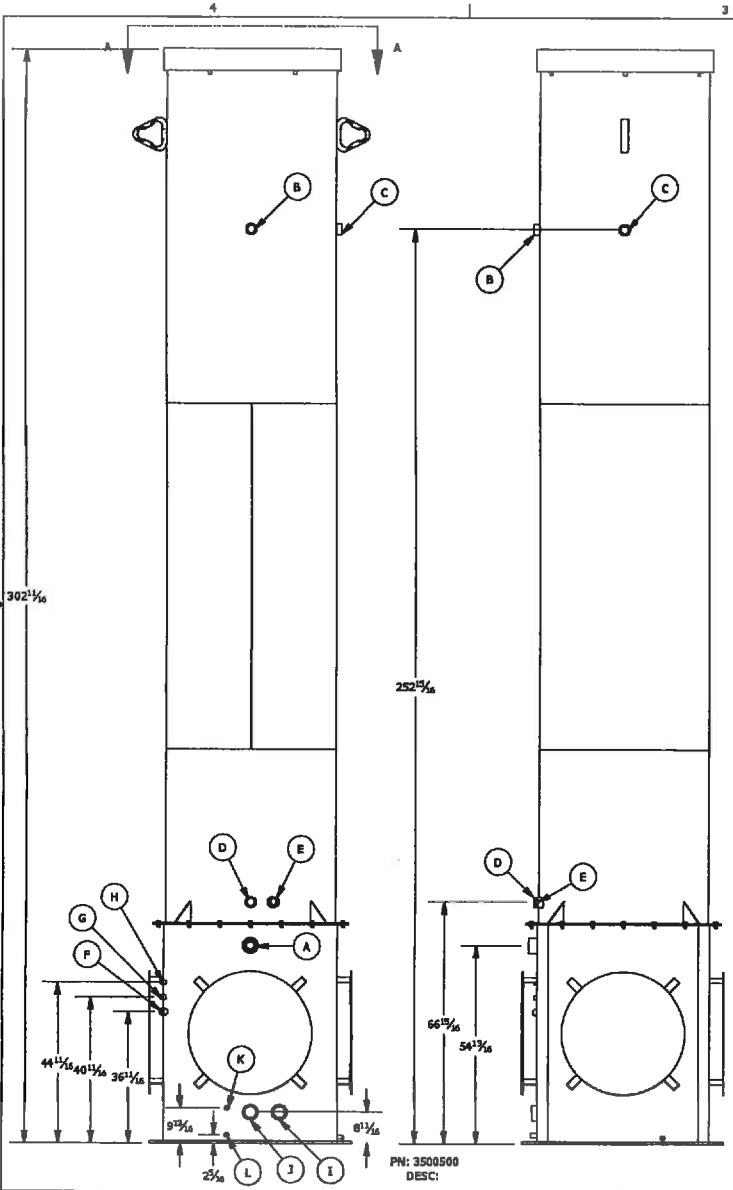
If automatic re-ignition is used, please describe the method. Flame Rectification, a thermocouple equivalent

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).*

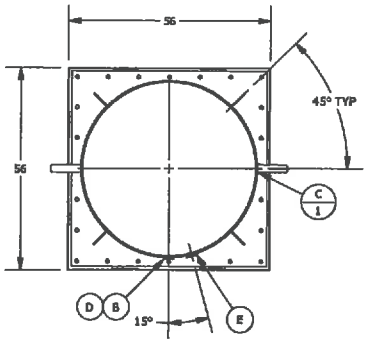
Additional information attached? ☑ Yes ☐ No Manufacturer's specs sheet

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
McGill 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	McGill Well Pad
Nearest City/Town	West Union
API Number/SIC Code	1311
Latitude/Longitude	39.274589, -80.848908
County	Doddridge County

Technical Information	
Max Condensate Site Throughput (bbl/day):	432
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	10
IC Engines	1
Gas Production Unit Heaters	10
Line Heaters	10
Condensate Tanks	10
Produced Water Tanks	2
Loading Jobs	2
Enclosed Combustors	3

Table 2

Uncontrolled/Controlled Emissions Summary
McGill 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]	3.6853	16.1418			95.897	420.03							1.2384	0.5194			0.3476	1.5223	0.0016	0.0070	6.99E-02	3.06E-01		
Flashing, Working and Breathing (F/W/B) Losses[2]	79.6473	348.8553			246.2720	1078.6712											12.8714	56.3767	0.0072	0.0314	0.0866	0.3795		
Engine Emissions[3]	7.00E-03	3.07E-02	3.16E-01	1.38E+00	2.74E+01	1.20E+02	5.64E+00	2.47E+01	1.39E-04	6.09E-04	2.25E-03	9.84E-03	2.25E-03	9.84E-03			5.43E-03	2.38E-02	3.74E-04	1.64E-03	4.61E-05	2.02E-04	4.85E-03	2.12E-02
Gas Production Unit Heater Emissions[4]	0.0671	0.2941	1.2207	5.3468	1,464.89	6,416.22	1.0254	4.4914	0.0073	0.0321	0.0928	0.4064	0.0928	0.4064	6.10E-06	2.67E-05	2.30E-02	1.01E-01	2.56E-05	1.12E-04			0.0009	0.0040
Line Heater Emissions[4]	0.0895	0.3921	1.6277	7.1291	1,953.19	8,554.96	1.3672	5.9885	0.0098	0.0428	0.1237	0.5418	0.1237	0.5418	8.14E-06	3.56E-05	3.06E-02	1.34E-01	3.42E-05	1.50E-04			0.0012	0.0053
TOTALS:	**83.4963**	**365.7139**	**3.1642**	**13.8591**	**3787.6133**	**16589.7461**	**8.0371**	**35.2026**	**0.0172**	**0.0755**	**0.2187**	**0.9580**	**1.4571**	**1.4774**	**1.42E-05**	**6.24E-05**	**13.2780**	**58.1576**	**0.0092**	**0.0403**	**0.1566**	**0.6859**	**0.0070**	**0.0306**
TOTALS (Excluding Fugitives):	**79.8110**	**349.5721**	**3.1642**	**13.8591**	**3691.7168**	**16169.7194**	**8.0371**	**35.2026**	**0.0172**	**0.0755**	**0.2187**	**0.9580**	**0.2187**	**0.9580**	**1.42E-05**	**6.24E-05**	**12.9304**	**56.6353**	**0.0076**	**0.0333**	**0.0867**	**0.3797**	**0.0070**	**0.0306**
UNCONTROLLED (Truck Loading Emissions)																								
Truck Loading Emissions[5]	6.7635	2.2219			6.2328	2.0848											0.0889	2.92E-02	0.0000	1.30E-05	0.0022	7.16E-04		
CONTROLLED EMISSIONS																								
Enclosed Combustor Emissions (from F/W/B losses)[6]	1.5932	6.9780	0.1262	0.5526	382.3473	1674.6811	0.1060	0.4642	2.27E-05	0.0001	0.0072	0.0315	0.0096	0.0420	6.31E-07	2.76E-06	0.2575	1.1278	0.0001	0.0006	0.0017	0.0076	2.84E-06	1.24E-05
Controlled Fugitive Emissions from Hauling													0.6192	0.2597										
TOTALS:	**1.59E+00**	**6.98E+00**	**1.26E-01**	**5.53E-01**	**3.82E+02**	**1.67E+03**	**1.06E-01**	**4.64E-01**	**2.27E-05**	**9.93E-05**	**7.19E-03**	**3.15E-02**	**6.29E-01**	**3.02E-01**	**6.31E-07**	**2.76E-06**	**2.57E-01**	**1.13E+00**	**1.44E-04**	**6.29E-04**	**1.73E-03**	**7.59E-03**	**2.84E-06**	**1.24E-05**
POTENTIAL TO EMIT[7]	**5.4422**	**26.0585**	**3.2903**	**14.4117**	**3923.6886**	**17187.8408**	**8.1431**	**35.6668**	**0.0173**	**0.0756**	**0.2259**	**0.9895**	**0.8475**	**1.2597**	**1.49E-05**	**6.51E-05**	**0.6641**	**2.9380**	**0.0022**	**0.0095**	**0.0717**	**0.3148**	**0.0070**	**0.0306**
POTENTIAL TO EMIT (Excluding Fugitives)	**1.7568**	**7.6949**	**3.2903**	**14.4117**	**3827.7921**	**16765.7293**	**8.1431**	**35.6668**	**0.0173**	**0.0756**	**0.2259**	**0.9895**	**0.2283**	**1.0000**	**1.49E-05**	**6.51E-05**	**0.3165**	**1.3864**	**0.0006**	**0.0025**	**0.0018**	**0.0078**	**0.0070**	**0.0306**

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 432 barrels per day, VOC emissions would be 6.7635 pounds per hour when there are truck loading activities. Average hourly VOC emissions from truck loading is 0.5073 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

McGill Well Pad

Doddridge County, West Virginia

Antero Resources Corporation

Pollutant		Emissions		Threshold Exceeded?		
		Uncontrolled	Controlled	Threshold	Uncontrolled	Controlled
VOC	lbs/hr	83.4963	5.4422	6	**Yes**	
	tons/yr	367.9358	26.0585	10	**Yes**	**Yes**
NO_X	lbs/hr	3.1642	3.2903	6		
	tons/yr	13.8591	14.4117	10	**Yes**	**Yes**
CO	lbs/hr	8.0371	8.1431	6	**Yes**	**Yes**
	tons/yr	35.2026	35.6668	10	**Yes**	**Yes**
SO_2	lbs/hr	0.0172	0.0173	6		
	tons/yr	0.0755	0.0756	10		
$PM_{2.5}$	lbs/hr	0.2187	0.2259	6		
	tons/yr	0.9580	0.9895	10		
PM_{10}	lbs/hr	1.4571	0.8475	6		
	tons/yr	1.4774	1.2597	10		
Lead	lbs/hr	1.42E-05	1.49E-05	6		
	tons/yr	6.24E-05	6.51E-05	10		
Total HAPs	lbs/hr	13.2780	0.6641	2	**Yes**	
	tons/yr	58.1868	2.9380	5	**Yes**	
Total TAPs	lbs/hr	0.0162	0.0092	1.14		
n-Hexane	lbs/hr	12.9816	0.5403			
	tons/yr	56.8876	2.3944			
Toluene	lbs/hr	0.0594	0.0163			
	tons/yr	0.2601	0.0717			
Ethylbenzene	lbs/hr	0.0641	0.0266			
	tons/yr	0.2812	0.1167			
Xylenes	lbs/hr	0.1566	0.0717			
	tons/yr	0.6867	0.3148			
Benzene	lbs/hr	0.0092	0.0022			
	tons/yr	0.0403	0.0095			

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
McGill 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
500	Valves	Gas VOC	0.004500	0.34	6,509.69
		Non VOC	0.004500	1.91	36,852.31
		HAPs	0.004500	0.06	1,106.91
		CO2e	0.004500	36.38	701,036.84
590	Connectors	VOC	0.000200	0.02	341.40
		Non-VOC	0.000200	0.10	1,932.70
		HAPs	0.000200	0.00	58.05
		CO2e	0.000200	1.91	36,765.49
130	Flanges	VOC	0.000390	0.01	146.69
		Non-VOC	0.000390	0.04	830.41
		HAPs	0.000390	0.00	24.94
		CO2e	0.000390	0.819671	15796.696684
			Total VOCs:	0.36	6997.77
			Total THC:	2.42	46613.19

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

Light Liquid					
Number	Component	Pollutant	Emission Factor (kg/hr of THC per component)	kg/hr	lb/yr
520	Valves	Light Liquid VOC	0.002500	1.27	24,524.89
		Light Liquid Non-VOC	0.002500	0.03	528.71
		Light Liquid HAPs	0.002500	0.09	1,725.35
		CO2e	0.002500	0.23	4493.06
			Total VOC:	1.27	24,524.89
			Total THC:	1.30	25,053.60

Fugitive Total Emissions			
	Annual Emissions (lb/yr)	Annual Emissions (lb/hr)	Annual Emissions (tpy)
VOC	31,522.67	3.60	15.76
Ethylbenzene		0.03	0.11
Toluene		0.02	0.07
Xylenes		0.07	0.31
n-Hexane		0.22	0.96
TAPs (Benzene)		0.00	0.01
HAPs		0.33	1.46
CO_{2e}	758,092.08	86.54	379.05

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
McGill Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

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

Component	Mol%	Molecular Weight (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	1.10352	2.91E-03	0.04	1.70E-03	0.01
Carbon Dioxide	0.1849	44.01	0.488136	1.29E-03	0.06	2.36E-03	1.03E-02
Methane	80.4725	16.04	212.4474	0.56	8.98	0.37	1.64
Ethane	13.4876	30.07	35.607264	0.09	2.82	0.12	0.51
Propane	2.8486	44.1	7.520304	0.02	0.87	0.04	0.16
Isobutane	0.5527	58.12	1.459128	3.85E-03	0.22	0.01	0.04
n-Butane	0.9447	58.12	2.494008	6.57E-03	0.38	0.02	0.07
Isopentane	0.2715	72.15	0.71676	1.89E-03	0.14	5.68E-03	0.02
n-Pentane	0.2282	72.15	0.602448	1.59E-03	0.11	4.77E-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	1.561032	4.11E-03	0.35	0.01	0.06
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	0.0869	0.3805
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	0.0148	0.0647
HAPs Emissions	0.0148	0.0647
TAPs Emissions	0.00E+00	0.00E+00
CO_{2e} emissions	9.3563	40.9807

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
McGill 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	0.1734	0.1913	0.8380	2.7181	0.0579	0.2538
H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Nitrogen	0.0098	0.0109	0.0476	0.2923	0.0062	0.0273
Carbon Dioxide	0.3208	0.3539	1.5499	3.0214	0.0644	0.2821
Methane	7.4991	8.2730	36.2359	61.2522	1.3057	5.7189
Ethane	27.2490	30.0612	131.6679	21.0561	0.4488	1.9659
Propane	21.2629	23.4573	102.7431	7.0601	0.1505	0.6592
Isobutane	7.3022	8.0558	35.2843	0.6303	0.0134	0.0588
n-Butane	13.3680	14.7477	64.5947	2.2236	0.0474	0.2076
Isopentane	5.0822	5.6067	24.5575	0.5346	0.0114	0.0499
n-Pentane	4.3984	4.8523	21.2530	0.4415	0.0094	0.0412
2-Methylpentane	0.1434	0.1581	0.6927	0.0067	0.0001	0.0006
3-Methylpentane	0.0984	0.1086	0.4755	0.0120	0.0003	0.0011
n-Hexane	11.4085	12.5859	55.1261	0.4201	0.0090	0.0392
Methylcyclopentane	0.0244	0.0270	0.1181	0.0083	0.0002	0.0008
Benzene	0.0063	0.0069	0.0303	0.0103	0.0002	0.0010
2-Methylhexane	0.1665	0.1837	0.8044	0.0068	0.0001	0.0006
3-Methylhexane	0.1421	0.1567	0.6864	0.0061	0.0001	0.0006
Heptane	0.3181	0.3509	1.5371	0.0142	0.0003	0.0013
Methylcyclohexane	0.1689	0.1864	0.8163	0.0384	0.0008	0.0036
Toluene	0.0381	0.0420	0.1841	0.0595	0.0013	0.0056
Octane	0.5044	0.5565	2.4373	0.0134	0.0003	0.0013
Ethylbenzene	0.0329	0.0363	0.1588	0.0510	0.0011	0.0048
m & p-Xylene	0.0293	0.0323	0.1416	0.0449	0.0010	0.0042
o-Xylene	0.0447	0.0493	0.2159	0.0701	0.0015	0.0065
Nonane	0.1780	0.1964	0.8603	0.0074	0.0002	0.0007
C10+	0.0304	0.0335	0.1468	0.0006	0.0000	0.0001
Total VOCs	64.748	71.43	312.9	11.660	0.2485	1.0886
Total CO_{2e}		207.18	907.4		32.71	143.3
Total TAPs (Benzene)		0.0069	0.0303		0.0002	0.0010
Toluene		0.0420	0.1841		0.0013	0.0056
Ethylbenzene		0.0363	0.1588		0.0011	0.0048
Xylenes		0.0816	0.3575		0.0025	0.0107
n-Hexane		12.586	55.126		0.0090	0.0392
Total HAPs		12.753	55.857		0.0140	0.0612
Total	100.00	110.32	483.2	100.00	2.132	9.34

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

Table 7

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

Condensate Tank Information	
Number of Tanks	10
Maximum Working Losses (lbs/hr)	6.9342
Maximum Breathing Losses (lbs/hr)	6.4606
# 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	3.41E-05	1.49E-04	0.0000	0.0001	0.0001	0.0003
Carbon Dioxide	0.4077	0.0283	0.1238	0.0263	0.1154	0.0546	0.2392
Methane	1.8795	0.1303	0.5708	0.1214	0.5318	0.2517	1.1027
Ethane	38.2219	2.6504	11.6086	2.4694	10.8158	5.1197	22.4244
Propane	25.1149	1.7415	7.6278	1.6226	7.1068	3.3641	14.7346
Isobutane	8.0735	0.5598	2.4520	0.5216	2.2846	1.0814	4.7366
n-Butane	14.5105	1.0062	4.4071	0.9375	4.1061	1.9436	8.5132
Isopentane	5.1949	0.3602	1.5778	0.3356	1.4700	0.6958	3.0478
n-Pentane	4.4215	0.3066	1.3429	0.2857	1.2512	0.5922	2.5940
2-Methylpentane	0.1395	0.0097	0.0424	0.0090	0.0395	0.0187	0.0818
3-Methylpentane	0.0953	0.0066	0.0289	0.0062	0.0270	0.0128	0.0559
n-Hexane	0.7506	0.0520	0.2280	0.0485	0.2124	0.1005	0.4404
Methylcyclopentane	0.0220	0.0015	0.0067	0.0014	0.0062	0.0029	0.0129
Benzene	0.0003	2.40E-05	0.0001	0.0000	0.0001	0.0000	0.0002
2-Methylhexane	0.0106	7.36E-04	0.0032	0.0007	0.0030	0.0014	0.0062
3-Methylhexane	0.1361	0.0094	0.0413	0.0088	0.0385	0.0182	0.0799
Heptane	0.2817	0.0195	0.0856	0.0182	0.0797	0.0377	0.1653
Methylcyclohexane	0.1469	0.0102	0.0446	0.0095	0.0416	0.0197	0.0862
Toluene	0.0046	3.16E-04	1.38E-03	0.0003	0.0013	0.0006	0.0027
Octane	0.4121	0.0286	0.1251	0.0266	0.1166	0.0552	0.2418
Ethylbenzene	0.0072	5.00E-04	2.19E-03	0.0005	0.0020	0.0010	0.0042
m & p-Xylene	0.0083	5.74E-04	2.51E-03	0.0005	0.0023	0.0011	0.0049
o-Xylene	0.0109	7.55E-04	0.0033	0.0007	0.0031	0.0015	0.0064
Nonane	0.1312	0.0091	0.0399	0.0085	0.0371	0.0176	0.0770
C10+	0.0177	1.23E-03	0.0054	0.0011	0.0050	0.0024	0.0104
Total VOCs	59.490	4.1252	18.068	3.8434	16.8341	7.9686	34.902
Total CO_{2e}		3.2864	14.3943	3.0619	13.4112	6.3483	27.805
Total TAPs (Benzene)		2.40E-05	1.05E-04	0.0000	0.0001	0.0000	0.0002
Toluene		3.16E-04	1.38E-03	0.0003	0.0013	0.0006	0.0027
Ethylbenzene		5.00E-04	2.19E-03	0.0005	0.0020	0.0010	0.0042
Xylenes		1.33E-03	0.0058	0.0012	0.0054	0.0026	0.0112
n-Hexane		0.0520	0.2280	0.0485	0.2124	0.1005	0.4404
Total HAPs		0.0542	0.2375	0.0505	0.2213	0.1047	0.4587
Total	100.00	6.9342	30.3716	6.4606	28.2973	13.3947	58.669

Table 7

Uncontrolled Working and Breathing Losses
McGill 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	3.9149	0.0014	0.0061	0.0003	0.0014	0.0017	0.0075
Methane	3.2732	0.0012	0.0051	0.0003	0.0012	0.0014	0.0063
Ethane	1.0384	0.0004	0.0016	0.0001	0.0004	0.0005	0.0020
Propane	0.0849	3.01E-05	0.0001	7.05E-06	3.09E-05	3.72E-05	0.0002
Isobutane	0.0009	3.37E-07	1.47E-06	7.88E-08	3.45E-07	4.15E-07	1.82E-06
n-Butane	0.0050	1.79E-06	7.83E-06	4.18E-07	1.83E-06	2.21E-06	9.66E-06
Isopentane	0.0003	1.08E-07	4.72E-07	2.52E-08	1.10E-07	1.33E-07	5.82E-07
n-Pentane	0.0002	6.49E-08	2.84E-07	1.52E-08	6.65E-08	8.00E-08	3.51E-07
2-Methylpentane	5.26E-07	1.87E-10	8.18E-10	4.37E-11	1.92E-10	2.30E-10	1.01E-09
3-Methylpentane	2.30E-06	8.16E-10	3.57E-09	1.91E-10	8.37E-10	1.01E-09	4.41E-09
n-Hexane	1.29E-06	4.56E-10	2.00E-09	1.07E-10	4.68E-10	5.63E-10	2.47E-09
Methylcyclopentane	3.42E-06	1.21E-09	5.31E-09	2.84E-10	1.24E-09	1.50E-09	6.56E-09
Benzene	1.31E-05	4.63E-09	2.03E-08	1.08E-09	4.75E-09	5.72E-09	2.50E-08
2-Methylhexane	8.84E-09	3.14E-12	1.37E-11	7.35E-13	3.22E-12	3.87E-12	1.70E-11
3-Methylhexane	1.18E-07	4.18E-11	1.83E-10	9.79E-12	4.29E-11	5.16E-11	2.26E-10
Heptane	2.03E-07	7.20E-11	3.15E-10	1.69E-11	7.39E-11	8.89E-11	3.89E-10
Methylcyclohexane	3.38E-06	1.20E-09	5.25E-09	2.81E-10	1.23E-09	1.48E-09	6.48E-09
Toluene	3.62E-05	1.29E-08	5.63E-08	3.01E-09	1.32E-08	1.59E-08	6.95E-08
Octane	3.73E-08	1.32E-11	5.80E-11	3.10E-12	1.36E-11	1.63E-11	7.15E-11
Ethylbenzene	1.75E-05	6.20E-09	2.72E-08	1.45E-09	6.36E-09	7.65E-09	3.35E-08
m & p-Xylene	1.72E-05	6.10E-09	2.67E-08	1.43E-09	6.26E-09	7.53E-09	3.30E-08
o-Xylene	2.80E-05	9.95E-09	4.36E-08	2.33E-09	1.02E-08	1.23E-08	5.38E-08
Nonane	9.63E-09	3.42E-12	1.50E-11	8.00E-13	3.50E-12	4.22E-12	1.85E-11
C10+	8.05E-12	2.86E-15	1.25E-14	6.69E-16	2.93E-15	3.53E-15	1.54E-14
Total VOCs	0.0915	3.24E-05	0.0001	7.60E-06	3.33E-05	4.00E-05	0.0002
Total CO_{2e}		0.0304	0.1332	0.0071	0.0312	0.0375	0.1644
Total TAPs (Benzene)		4.63E-09	2.03E-08	1.08E-09	4.75E-09	5.72E-09	2.50E-08
Toluene		1.29E-08	5.63E-08	3.01E-09	1.32E-08	1.59E-08	6.95E-08
Ethylbenzene		6.20E-09	2.72E-08	1.45E-09	6.36E-09	7.65E-09	3.35E-08
Xylenes		1.61E-08	7.03E-08	3.76E-09	1.65E-08	1.98E-08	8.68E-08
n-Hexane		4.56E-10	2.00E-09	1.07E-10	4.68E-10	5.63E-10	2.47E-09
Total HAPs		4.02E-08	1.76E-07	9.41E-09	4.12E-08	4.96E-08	2.17E-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
McGill Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Annual Loading	Oil Truck Loading	Water Truck Loading
RVP	3.54	1.0225
Annual Average Temp (F)	65.1	65.1
S (saturation factor)	0.6	0.6
P (true vapor pressure)	1.99	0.37
M (MW of vapor)	39.82	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)	6,622,560	7,511,700
Loading Emissions (lbs/hr)	11.37	0.99
Loading Emissions (tpy)	3.73	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	5.59E-05	1.84E-05	0.0056	5.54E-05	2.07E-05
Carbon Dioxide	0.4077	0.0463	1.52E-02	3.9149	3.86E-02	1.44E-02
Methane	1.8795	0.2136	7.02E-02	3.2732	3.23E-02	1.20E-02
Ethane	38.2219	4.3449	1.4273	1.0384	1.02E-02	3.81E-03
Propane	25.1149	2.8550	9.38E-01	0.0849	8.37E-04	3.12E-04
Isobutane	8.0735	0.9178	3.01E-01	0.0009	9.35E-06	3.48E-06
n-Butane	14.5105	1.6495	5.42E-01	0.0050	4.97E-05	1.85E-05
Isopentane	5.1949	0.5905	1.94E-01	0.0003	2.99E-06	1.11E-06
n-Pentane	4.4215	0.5026	1.65E-01	0.0002	1.80E-06	6.71E-07
2-Methylpentane	0.1395	0.0159	5.21E-03	5.26E-07	5.19E-09	1.93E-09
3-Methylpentane	0.0953	0.0108	3.56E-03	2.30E-06	2.27E-08	8.45E-09
n-Hexane	0.7506	0.0853	2.80E-02	1.29E-06	1.27E-08	4.72E-09
Methylcyclopentane	0.0220	0.0025	8.21E-04	3.42E-06	3.37E-08	1.26E-08
Benzene	0.0003	0.0000	1.29E-05	0.0000	1.29E-07	4.80E-08
2-Methylhexane	0.0106	0.0012	3.96E-04	8.84E-09	8.72E-11	3.25E-11
3-Methylhexane	0.1361	0.0155	5.08E-03	1.18E-07	1.16E-09	4.33E-10
Heptane	0.2817	0.0320	1.05E-02	2.03E-07	2.00E-09	7.46E-10
Methylcyclohexane	0.1469	0.0167	5.49E-03	3.38E-06	3.33E-08	1.24E-08
Toluene	0.0046	0.0005	1.70E-04	0.0000	3.57E-07	1.33E-07
Octane	0.4121	0.0468	1.54E-02	3.73E-08	3.68E-10	1.37E-10
Ethylbenzene	0.0072	0.0008	2.69E-04	1.75E-05	1.72E-07	6.42E-08
m & p-Xylene	0.0083	0.0009	3.09E-04	1.72E-05	1.70E-07	6.32E-08
o-Xylene	0.0109	0.0012	4.07E-04	2.80E-05	2.76E-07	1.03E-07
Nonane	0.1312	0.0149	4.90E-03	9.63E-09	9.49E-11	3.54E-11
C10+	0.0177	0.0020	6.61E-04	8.05E-12	7.94E-14	2.96E-14
Total VOCs	59.4904	6.7626	2.2215	0.0915	9.02E-04	3.36E-04
Total CO_{2e}		5.3876	1.7698		0.8452	0.3149
Total TAPs (Benzene)		0.0000	1.29E-05		1.29E-07	4.80E-08
Toluene		0.0005	1.70E-04		3.57E-07	1.33E-07
Ethylbenzene		0.0008	2.69E-04		1.72E-07	6.42E-08
Xylenes		0.0022	7.16E-04		4.46E-07	1.66E-07
n-Hexane		0.0853	2.80E-02		1.27E-08	4.72E-09
Total HAPs		0.0889	2.92E-02		1.12E-06	4.16E-07
Total	100.0000	11.3676	3.7343	100.0000	0.9858	0.3673

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
McGill Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Gas Production Unit Heater Emissions

Number of Units	10
GPU Heater Rating (MMBtu/hr)	1.50
Operating hours/year	8760
Fuel Heat Value (Btu/scf)	1,229

Pollutant	Emission Factors (lb/MMscf)	lb/hr	tpy
NOx	100	1.221	5.347
CO	84	1.025	4.491
CO_2	120,000	1464.890	6416.217
Lead	0.0005	6.10E-06	2.67E-05
N_2O	2.2	0.027	0.118
PM (Total)	7.6	0.093	0.406
SO_2	0.6	0.007	0.032
TOC	11	0.134	0.588
Methane	2.3	0.028	0.123
VOC	5.5	0.067	0.294
HAPS			
2-Methylnaphthalene	2.40E-05	2.93E-07	1.28E-06
Benzene	2.10E-03	2.56E-05	1.12E-04
Dichlorobenzene	1.20E-03	1.46E-05	6.42E-05
Fluoranthene	3.00E-06	3.66E-08	1.60E-07
Fluorene	2.80E-06	3.42E-08	1.50E-07
Formaldehyde	7.50E-02	9.16E-04	4.01E-03
Hexane	1.80E+00	2.20E-02	9.62E-02
Naphthalene	6.10E-04	7.45E-06	3.26E-05
Phenanathrene	1.70E-05	2.08E-07	9.09E-07
Toluene	3.40E-03	4.15E-05	1.82E-04

Line Heater Emissions

Number of Units	10
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	1.628	7.129
CO	84	1.367	5.988
CO_2	120,000	1953.186	8554.956
Lead	0.0005	8.14E-06	3.56E-05
N_2O	2.2	0.036	0.157
PM (Total)	7.6	0.124	0.542
SO_2	0.6	0.010	0.043
TOC	11	0.179	0.784
Methane	2.3	0.037	0.164
VOC	5.5	0.090	0.392
HAPS			
2-Methylnaphthalene	2.40E-05	3.91E-07	1.71E-06
Benzene	2.10E-03	3.42E-05	1.50E-04
Dichlorobenzene	1.20E-03	1.95E-05	8.55E-05
Fluoranthene	3.00E-06	4.88E-08	2.14E-07
Fluorene	2.80E-06	4.56E-08	2.00E-07
Formaldehyde	7.50E-02	1.22E-03	5.35E-03
Hexane	1.80E+00	2.93E-02	1.28E-01
Naphthalene	6.10E-04	9.93E-06	4.35E-05
Phenanathrene	1.70E-05	2.77E-07	1.21E-06
Toluene	3.40E-03	5.53E-05	2.42E-04

	lb/hr	tpy
TOTAL Uncontrolled VOC	0.157	0.686
TOTAL Uncontrolled HAPs	0.054	0.235
TOTAL Uncontrolled TAPs (Benzene)	5.98E-05	2.62E-04
TOTAL Uncontrolled Toluene	9.68E-05	4.24E-04
TOTAL Uncontrolled Hexane	5.13E-02	2.25E-01
TOTAL Uncontrolled TAPs (Formaldehyde)	2.14E-03	9.36E-03
TOTAL CO_{2e} Emissions	3,438.39	15,060.14

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

Table 10

Enclosed Combustor Emissions
McGill 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	--	1,051.42	43.83	127.66	0.90	1,261.62
Maximum Expected Annual Volumetric Flow Rate of Stream (scf/yr)	331,128.00	--	9,210,471.46	383,970.53	1,118,303.38	7,886.82	11,051,760.18
Heating Content (Btu/ft3)	1,229		2,273.35	1,156.98	2,277.48	97.52	2,165.31

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	-	-	71.430	0.249	7.969	0.000	79.65
Benzene	-	-	0.007	0.000	0.000	0.000	0.007
Toluene	-	-	0.042	0.001	0.001	0.000	0.044
Ethylbenzene	-	-	0.036	0.001	0.001	0.000	0.038
Xylenes	-	-	0.082	0.002	0.003	0.000	0.087
n-Hexane	-	-	12.586	0.009	0.101	0.000	12.695
HAPs	-	-	12.753	0.014	0.105	0.000	12.871
Total Mass Flow	-	-	110.320	2.132	13.395	0.044	125.891
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	-	-	312.864	1.089	34.902	0.000	348.855
Benzene	-	-	0.030	0.001	0.000	0.000	0.031
Toluene	-	-	0.184	0.006	0.003	0.000	0.192
Ethylbenzene	-	-	0.159	0.005	0.004	0.000	0.168
Xylenes	-	-	0.357	0.011	0.011	0.000	0.379
n-Hexane	-	-	55.126	0.039	0.440	0.000	55.606
HAP	-	-	55.857	0.061	0.459	0.000	56.377
Total Mass Flow	-	-	483.203	9.337	58.669	0.192	551.401

Table 10

Enclosed Combustor Emissions
McGill 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	-	0.105	0.004	0.013	0.000	0.13
CO	0.003	-	0.088	0.004	0.011	0.000	0.11
PM2.5	0.000	-	0.006	0.000	0.001	0.000	0.01
PM10	0.000	-	0.008	0.000	0.001	0.000	0.01
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	-	1.429	0.005	0.159	0.000	1.59
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	-	0.252	0.000	0.002	0.000	0.25
HAP	0.000	-	0.255	0.000	0.002	0.000	0.26
N_2O	0.000	-	0.002	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	-	0.461	0.019	0.056	0.000	0.55
CO	0.014	-	0.387	0.016	0.047	0.000	0.46
PM2.5	0.001	-	0.026	0.001	0.003	0.000	0.03
PM10	0.001	-	0.035	0.001	0.004	0.000	0.04
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	-	6.257	0.022	0.698	0.000	6.98
Benzene	0.000	-	0.001	0.000	0.000	0.000	0.00
Toluene	0.000	-	0.004	0.000	0.000	0.000	0.00
Ethylbenzene	0.000	-	0.003	0.000	0.000	0.000	0.00
Xylenes	0.000	-	0.007	0.000	0.000	0.000	0.01
n-Hexane	0.000	-	1.103	0.001	0.009	0.000	1.11
HAP	0.000	-	1.117	0.001	0.009	0.000	1.13
N_2O	0.000	-	0.010	0.000	0.001	0.000	0.01
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	1.59	6.98
NOx	1.26E-01	5.53E-01
CO	1.06E-01	4.64E-01
PM2.5	7.19E-03	3.15E-02
PM10	9.59E-03	4.20E-02
H_2S	1.21E-05	5.28E-05
SO_2	2.27E-05	9.93E-05
Benzene (TAPs)	1.44E-04	6.29E-04
Toluene	8.78E-04	3.85E-03
Ethylbenzene	7.66E-04	3.36E-03
Xylenes	1.73E-03	7.59E-03
Hexanes	2.54E-01	1.11E+00
Formaldehyde (TAPs)	2.84E-06	1.24E-05
HAPs	0.26	1.13
CO_2e	382.35	1674.68
N_2O	2.78E-03	1.22E-02
Lead	6.31E-07	2.76E-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
McGill 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	9,210,471	0.0138	383,971	0.0037	1,118,303	0.016	7,887	36,265	1	0	--	36,265	27,648,671
Methane	0.186	9,210,471	0.7652	383,971	0.0467	1,118,303	0.038	7,887	2,060,868	1	0.98	2,019,651	41,217	41,217
Ethane	0.361	9,210,471	0.1403	383,971	0.5061	1,118,303	0.006	7,887	3,943,221	2	0.98	7,728,712	--	
Propane	0.192	9,210,471	0.0321	383,971	0.2268	1,118,303	0.000	7,887	2,034,156	3	0.98	5,980,419	--	
i-Butane	0.050	9,210,471	0.0022	383,971	0.0553	1,118,303	0.000	7,887	523,450	4	0.98	2,051,923	--	
n-Butane	0.092	9,210,471	0.0077	383,971	0.0994	1,118,303	0.000	7,887	957,628	4	0.98	3,753,902	--	
Pentane	0.052	9,210,471	0.0027	383,971	0.0531	1,118,303	0.000	7,887	542,285	5	0.98	2,657,196	--	
Hexane	0.054	9,210,471	0.0010	383,971	0.0046	1,118,303	0.000	7,887	501,254	6	0.98	2,947,374	--	
Benzene	0.000	9,210,471	0.0000	383,971	0.0000	1,118,303	0.000	7,887	306	6	0.98	1,802	--	
Heptanes	0.003	9,210,471	0.0001	383,971	0.0018	1,118,303	0.000	7,887	26,047	7	0.98	178,683	--	
Toluene	0.000	9,210,471	0.0001	383,971	0.0000	1,118,303	0.000	7,887	1,588	7	0.98	10,893	--	
Octane	0.002	9,210,471	0.0001	383,971	0.0020	1,118,303	0.000	7,887	24,815	8	0.98	194,551	--	
Ethyl benzene	0.000	9,210,471	0.0001	383,971	0.0000	1,118,303	0.000	7,887	1,203	8	0.98	9,428	--	
Xylenes	0.000	9,210,471	0.0002	383,971	0.0001	1,118,303	0.000	7,887	2,719	8	0.98	21,321	--	
Nonane	0.001	9,210,471	0.0000	383,971	0.0004	1,118,303	0.000	7,887	5,553	9	0.98	48,979	--	
Decane plus	0.000	9,210,471	0.0000	383,971	0.0000	1,118,303	0.000	7,887	773	10	0.98	7,572	--	
											Subtotal	**27,612,406**	--	

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	27,648,671	0.12	2000	1	366.01	1,603.11
CH_4	41,217	0.09	2000	25	0.44	1.92
				CO_2e Emissions	**377.0**	**1651.04**

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
McGill 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)	432
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	0.3500	1	789	0.3500	276.1500	3.8175	1.7179
Tanker Trucks PW	10	40	10	0.3500	1	895	0.3500	313.2500	3.8175	1.7179
Pick Up Truck	4	3	10	0.2300	1	730	0.2300	167.9000	0.3467	0.1560

	Uncontrolled Emissions						Controlled Emissions					
	PM			PM10			PM			PM10		
	(lbs/hr)	(lbs/year)	(tpy)	(lbs/hr)	(lbs/year)	(tpy)	(lbs/hr)	(lbs/year)	(tpy)	(lbs/hr)	(lbs/year)	(tpy)
Tanker Trucks Condensate	1.3361	1054.2107	0.5271	0.6013	474.3948	0.2372	0.6681	527.1054	0.2636	0.3006	237.1974	0.1186
Tanker Trucks PW	1.3361	1195.8411	0.5979	0.6013	538.1285	0.2691	0.6681	597.9205	0.2990	0.3006	269.0642	0.1345
Pick Up Truck	0.0797	58.2075	0.0291	0.0359	26.1934	0.0131	0.0399	29.1038	0.0146	0.0179	13.0967	0.0065
Total Emissions	2.7520	2,308.2593	1.1541	1.2384	1,038.7167	0.5194	1.3760	1,154.1297	0.5771	0.6192	519.3584	0.2597

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
McGill 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
$PM_{2.5}$		9.500E-03	0.0022	0.0098
PM_{10}		9.500E-03	0.0022	0.0098
PM (Total)		9.910E-03	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		1.58E-03	3.74E-04	1.64E-03
Ethylbenzene		2.48E-05	5.86E-06	2.57E-05
Formaldehyde		2.05E-02	4.85E-03	2.12E-02
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	7.00E-03	3.07E-02
TOTAL Uncontrolled NOx	3.16E-01	1.38E+00
TOTAL Uncontrolled HAPs	5.43E-03	2.38E-02
TOTAL Uncontrolled TAPs (Benzene)	3.74E-04	1.64E-03
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)	4.85E-03	2.12E-02
TOTAL CO_{2e} Emissions	2.74E+01	1.20E+02

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
McGill 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	1.6043	1.5771	1.5419	4.3970	6.24E-02	-2.8200
PM10	0.8475	1.2597	0.7850	2.2091	0.0625	-0.9495
VOC (uncontrolled)	83.4963	367.9358	681.4554	2990.0562	-597.9590	-2622.1205
CO	8.1431	35.6668	7.4528	32.6432	0.6903	3.0236
NOx	3.2903	14.4117	2.4685	10.8121	0.8218	3.5996
SO2	0.0173	0.0756	0.0075	0.0330	9.72E-03	4.26E-02
Pb	1.49E-05	6.51E-05	1.08E-05	4.71E-05	4.11E-06	1.80E-05
HAPs	0.6641	2.9380	0.9516	4.1867	-0.2875	-1.2487
TAPs	0.0092	0.0401	0.0283	0.1493	-1.91E-02	-0.1092

Notes:
1. Change in emissions due to the decrease in condensate production and the addition of 2 condensate tanks, 10 line heaters and 2 Cimarron enclosed combustor.
2. Change in permit from G70A to G70C.

Bryan Research & Engineering, Inc.

ProMax® 3.2

with

TSWEET® & PROSIM®

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Simulation Report

Project: PROMAX SCENARIO 3.pmx

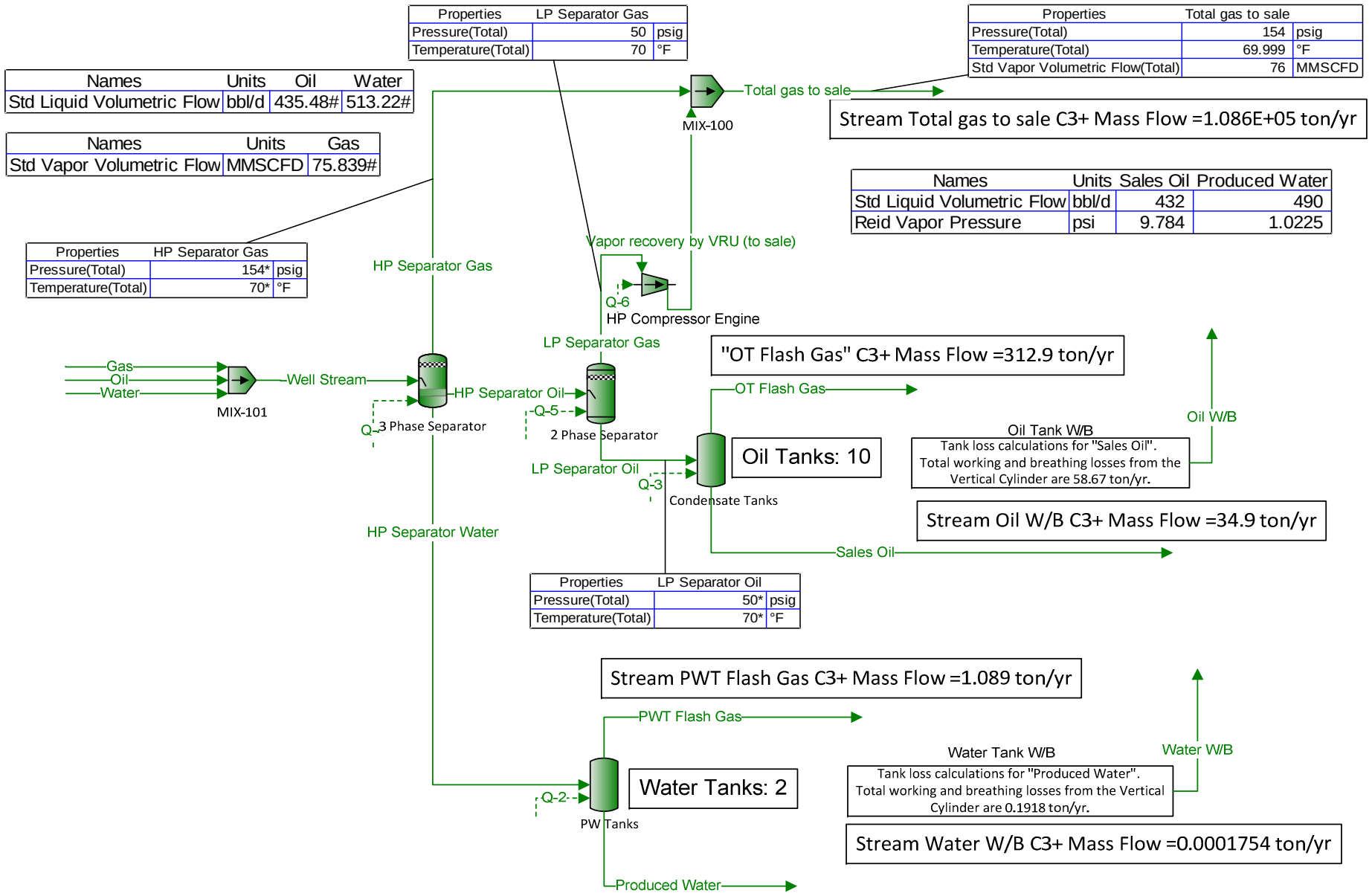
Licensed to Conestoga-Rovers & Associates, Inc. and Affiliates

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

ProMax Filename: P:\AirQuality\ANTERO RESOURCES\ProMax\Antero WV_Old_2 Ph Separator\ProMax Model\PROMAX SCENARIO 3.pmx
ProMax Version: 3.2.13330.0
Simulation Initiated: 6/3/2016 3:21:18 PM

Bryan Research & Engineering, Inc.
Chemical Engineering Consultants
P.O. Box 4747 Bryan, Texas 77805
Office: (979) 776-5220
FAX: (979) 776-4818
mailto:sales@bre.com
http://www.bre.com/

Report Navigator can be activated via the ProMax Navigator Toolbar.
An asterisk (*), throughout the report, denotes a user specified value.
A question mark (?) after a value, throughout the report, denotes an extrapolated or approximate value.


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) 76 MMSCFD
Names Units Oil Water
Std Liquid Volumetric Flow bbl/d 435.48# 513.22#
Total gas to sale
MIX-100
Stream Total gas to sale C3+ Mass Flow =1.086E+05 ton/yr
Names Units Gas
Std Vapor Volumetric Flow MMSCFD 75.839#
Names Units Sales Oil Produced Water
Std Liquid Volumetric Flow bbl/d 432 490
Reid Vapor Pressure psi 9.784 1.0225
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 =312.9 ton/yr
Gas
Oil
Water
Well Stream
MIX-101
HP Separator Oil
Q-5
3 Phase Separator
2 Phase Separator
OT Flash Gas
Oil W/B
Oil Tank W/B
Tank loss calculations for "Sales Oil".
Total working and breathing losses from the Vertical Cylinder are 58.67 ton/yr.
Oil Tanks: 10
LP Separator Oil
Q-3
Condensate Tanks
Stream Oil W/B C3+ Mass Flow =34.9 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 =1.089 ton/yr
PWT Flash Gas
Water Tank W/B
Water W/B
Tank loss calculations for "Produced Water".
Total working and breathing losses from the Vertical Cylinder are 0.1918 ton/yr.
Water Tanks: 2
Q-2
PW Tanks
Stream Water W/B C3+ Mass Flow =0.0001754 ton/yr
Produced Water

Process Streams		Gas	HP Separator Gas	HP Separator Oil	HP Separator Water	LP Separator Gas	LP Separator Oil	Oil	Oil W/B	OT Flash Gas	Produced Water	PWT Flash Gas	Sales Oil	Total gas to sale	Vapor recovery by VRU (to sale)	Water	Water W/B	Well Stream
Composition	Status:	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: **Total**	From Block:	--	3 Phase Separator	3 Phase Separator	3 Phase Separator	2 Phase Separator	2 Phase Separator	--	--	Condensate Tanks	PW Tanks	PW Tanks	Condensate Tanks	MIX-100	HP Compressor Engine	--	--	MIX-101
	To Block:	MIX-101	MIX-100	2 Phase Separator	PW Tanks	HP Compressor Engine	Condensate Tanks	MIX-101	--	--	--	--	--	--	MIX-100	MIX-101	--	3 Phase Separator
Mole Fraction		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water		0*	0.225606	0.0500523	99.9709	0.370561	0.0327947	0*	0.000199531*	0.383355	99.9968	3.03003	0.00758857	0.225645	0.370561	100*	93.9143*	4.73240
H2S		0*	0	0	0	0	0	0*	0*	0	0	0	0	0	0	0*	0*	0
Nitrogen		0.418*	0.417271	0.00779073	5.85014E-05	0.134655	0.000959776	0.0179876*	0.000699186*	0.0139972	2.45501E-06	0.209579	2.23506E-05	0.417195	0.134655	0*	0.00370394*	0.396387
Carbon Dioxide		0.1849*	0.184382	0.0382670	0.00103700	0.294231	0.0244848	0.0149897*	0.368848*	0.290245	0.000668471	1.37873	0.00537596	0.184411	0.294231	0*	1.64167*	0.175372
Methane		80.4725*	80.3226	4.42590	0.0223506	61.8821	1.33220	4.77371*	4.66476*	18.6154	0.00184557	76.6774	0.0894890	80.3177	61.8821	0*	3.76547*	76.3176
Ethane		13.4876*	13.4625	4.55470	0.00415517	25.0099	3.45330	4.94459*	50.6130*	36.0882	0.000394481	14.0629	1.10677	13.4656	25.0099	0*	0.637340*	12.8102
Propane		2.8486*	2.84839	3.51206	0.000959512	6.43979	3.35441	4.85965*	22.6781*	19.2027	9.96585E-05	3.21539	2.21488	2.84935	6.43979	0*	0.0355197*	2.72300
Isobutane		0.5527*	0.549358	1.70826	6.05890E-05	1.28137	1.73124	1.36806*	5.53079*	5.00316	2.54868E-06	0.217783	1.49598	0.549553	1.28137	0*	0.000301257*	0.530277
n-Butane		0.9447*	0.939881	4.17620	0.000223703	2.20255	4.28247	3.88432*	9.94054*	9.15926	1.82464E-05	0.768294	3.93182	0.940217	2.20255	0*	0.00159945*	0.913453
Isopentane		0.2715*	0.267422	2.95283	4.22196E-05	0.616796	3.07861	2.45431*	2.86696*	2.80518	2.42227E-06	0.148819	3.09827	0.267516	0.616796	0*	7.76452E-05*	0.268646
n-Pentane		0.2282*	0.226977	3.35004	3.48406E-05	0.523782	3.50222	3.45961*	2.44011*	2.42771	1.98034E-06	0.122878	3.57948	0.227056	0.523782	0*	4.67581E-05*	0.232197
2-Methylpentane		0*	0.00610194	0.213567	4.26813E-07	0.0138380	0.224321	1.49697*	0.0644379*	0.0662454	1.19070E-08	0.00155149	0.235687	0.00610400	0.0138380	0*	1.12727E-07*	0.00685426
3-Methylpentane		0*	0.00417940	0.162873	8.06175E-07	0.00947194	0.171132	1.04328*	0.0440187*	0.0454787	5.82370E-08	0.00279686	0.180167	0.00418081	0.00947194	0*	4.92688E-07*	0.00477693
n-Hexane		0.5913*	0.485503	23.4475	2.67772E-05	1.09268	24.6511	3.65548*	0.346826*	5.27204	5.97432E-07	0.0978961	26.0445	0.485665	1.09268	0*	2.75475E-07*	0.577347
Methylcyclopentane		0*	0.00105063	0.0534570	6.52969E-07	0.00238985	0.0562067	0.275810*	0.0103990*	0.0115612	1.23717E-07	0.00197918	0.0594168	0.00105098	0.00238985	0*	7.49738E-07*	0.00126287
Benzene		0*	0.000288898	0.0147175	8.96827E-06	0.000661228	0.0154744	0.0759476*	0.000176444*	0.00319517	8.26159E-06	0.00265078	0.0163573	0.000288997	0.000661228	0*	3.08572E-06*	0.000347746
2-Methylhexane		0*	0.00618555	0.710013	3.74902E-07	0.0135599	0.747513	2.05158*	0.00421774*	0.0661607	8.88457E-09	0.00136868	0.796504	0.00618752	0.0135599	0*	1.62890E-09*	0.00939372
3-Methylhexane		0*	0.00527712	0.634835	3.33767E-07	0.0115760	0.668394	1.78177*	0.0540918*	0.0564561	8.25970E-09	0.00121720	0.712393	0.00527880	0.0115760	0*	2.17114E-08*	0.00815831
Heptane		0*	0.0119410	1.79703	7.83016E-07	0.0259756	1.89239	4.42195*	0.111955*	0.126423	1.94806E-08	0.00285515	2.01937	0.0119447	0.0259756	0*	3.73929E-08*	0.0202471
Methylcyclohexane		0*	0.00635582	0.938671	2.42524E-06	0.0140254	0.988458	2.33439*	0.0595766*	0.0685175	3.24897E-07	0.00785425	1.05460	0.00635786	0.0140254	0*	6.35467E-07*	0.0106886
Toluene		0*	0.00151702	0.278597	3.68584E-05	0.00336130	0.293417	0.616575*	0.00196727*	0.0164642	3.34005E-05	0.0129636	0.313330	0.00151751	0.00336130	0*	7.26061E-06*	0.00282315
Octane		0*	0.0170704	7.77973	6.42005E-07	0.0359587	8.19669	11.9607*	0.143633*	0.175846	1.06306E-08	0.00236094	8.77341	0.0170754	0.0359587	0*	6.02552E-09*	0.0547654
Ethylbenzene		0*	0.00116991	0.613942	2.50524E-05	0.00250634	0.646864	0.907374*	0.00270348*	0.0123299	2.24791E-05	0.00964472	0.692489	0.00117027	0.00250634	0*	3.03835E-06*	0.00415465
m-Xylene		0*	0.00104577	0.653456	2.27820E-05	0.00222995	0.688521	0.924362*	0.00310369*	0.0109927	2.05139E-05	0.00850160	0.737237	0.00104608	0.00222995	0*	2.98998E-06*	0.00423244
o-Xylene		0*	0.00159296	1.11161	4.67810E-05	0.00339693	1.17128	1.53394*	0.00408374*	0.0167582	4.32472E-05	0.0132575	1.25429	0.00159345	0.00339693	0*	4.87489E-06*	0.00702356
Nonane		0*	0.00550666	7.44503	3.16610E-07	0.0112247	7.84530	9.19965*	0.0407439*	0.0552812	8.25745E-09	0.00115305	8.40543	0.00550819	0.0112247	0*	1.38578E-09*	0.0421230
C10+		0*	0.000765357	29.3689	1.73303E-08	0.00141406	30.9502	31.9430*	0.00408874*	0.00698886	2.02247E-10	6.40480E-05	33.1751	0.000765530	0.00141406	0*	8.58766E-13*	0.146259
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*	18.8211	0.0217838	396.799	0.00824011	0.0135437	0*	6.71235E-07*	0.0106199	396.795	0.00321623	0.00292373	18.8293	0.00824011	415.641*	0.00222812*	415.641
H2S		0*	0	0	0	0	0	0*	0*	0	0	0	0	0	0	0*	0*	0
Nitrogen		34.8070*	34.8106	0.00339068	0.000232200	0.00299431	0.000396371	0.00723366*	2.35211E-06*	0.000387760	9.74166E-06	0.000222459	8.61124E-06	34.8136	0.00299431	0*	8.78759E-08*	34.8142
Carbon Dioxide		15.3967*	15.3819	0.0166546	0.00411600	0.00654277	0.0101118	0.00602805*	0.00124083*	0.00804054	0.00265255	0.00146345	0.00207125	15.3885	0.00654277	0*	3.89486E-05*	15.4027
Methane		6700.97*	6700.87	1.92624	0.0887128	1.37606	0.550174	1.91973*	0.0156926*	0.515696	0.00732335	0.0813894	0.0344784	6702.25	1.37606	0*	8.93358E-05*	6702.89
Ethane		1123.12*	1123.11	1.98230	0.0164925	0.556143	1.42615	1.98845*	0.170266*	0.999738	0.00156533	0.0149271	0.426416	1123.66	0.556143	0*	1.51209E-05*	1125.10
Propane		237.204*	237.626	1.52852	0.00380844	0.143201	1.38532	1.95430*	0.0762905*	0.531965	0.000395453	0.00341299	0.853350	237.769	0.143201	0*	8.42705E-07*	239.158
Isobutane		46.0235*	45.8299	0.743467	0.000240486	0.0284937	0.714973	0.550160*	0.0186059*	0.138600	9.31974E-06	0.000231167	0.576373	45.8584	0.0284937	0*	7.14733E-09*	46.5736
n-Butane		78.6654*	78.4091	1.81757	0.000887910	0.0488778	1.76859	1.56207*	0.0384096*	0.253735	7.24032E-05	0.000815507	1.51485	78.4580	0.0488778	0*	3.79471E-08*	80.2275
Isopentane		22.6079*	22.3096	1.28513	0.000167576	0.0137156	1.27141	0.986993*	0.00964464*	0.0777108	9.61175E-06	0.000157964	1.19370	22.3233	0.0137156	0*	1.84213E-09*	23.5949
n-Pentane		19.0023*	18.9354	1.45801	0.000138287	0.0116473	1.44636	1.39127*	0.00820870*	0.0672538	7.85813E-06	0.000130429	1.37910	18.9471	0.0116473	0*	1.10934E-09*	20.3936
2-Methylpentane		0*	0.509051	0.0929485	1.69408E-06	0.000307715	0.0926408	0.602002*	0.000216773*	0.00183517	4.72480E-08	1.64683E-06	0.0908056	0.509359	0.000307715	0*	2.67446E-12*	0.602002
3-Methylpentane		0*	0.348664	0.0708854	3.19982E-06	0.000210626	0.0706748	0.419553*	0.000148082*	0.00125988	2.31089E-07	2.96873E-06	0.0694149	0.348875	0.000210626	0*	1.16890E-11*	0.419553
n-Hexane		49.2377*	40.5029	10.2048	0.000106283	0.0242978	10.1805	1.47004*	0.00116675*	0.146049	2.37066E-06	0.000103912	10.0344	40.5272	0.0242978	0*	6.53565E-12*	50.7078
Methylcyclopentane		0*	0.0876481	0.0232655	2.59173E-06	5.31427E-05	0.0232124	0.110916*	3.49830E-05*	0.000320276	4.90919E-07	2.10081E-06	0.0228921	0.0877012	5.31427E-05	0*	1.77875E-11*	0.110916
Benzene		0*	0.0241012	0.00640537	3.55963E-05	1.47036E-05	0.00639066	0.0305421*	5.93570E-07*	8.85144E-05	3.27826E-05	2.81368E-06	0.00630215	0.0241159	1.47036E-05	0*	7.32088E-11*	0.0305421
2-Methylhexane		0*	0.516027	0.309012	1.48804E-06	0.000301530	0.308710	0.825040*	1.41888E-05*	0.00183283	3.52547E-08	1.45278E-06	0.306877	0.516328	0.000301530	0*	3.86457E-14*	0.825040
3-Methylhexane		0*	0.440241	0.276293	1.32477E-06	0.000257414	0.276035	0.716535*	0.000181968*	0.0015639	3.27716E-08	1.29200E-06	0.274471	0.440498	0.000257414	0*	5.15104E-13*	0.716535
Heptane		0*	0.996170	0.782102	3.10790E-06	0.000577616	0.781525	1.77828*	0.000373622*	0.00350224	7.73005E-08	3.03060E-06	0.778023	0.996748	0.000577616	0*	8.87147E-13*	1.77828
Methylcyclohexane		0*	0.530231	0.408528	9.62613E-06	0.000311881	0.408216	0.938769*	0.000200420*	0.00189811	1.28922E-06	8.33691E-06	0.406318	0.530543	0.000311881	0*	1.50765E-11*	0.938769
Toluene		0*	0.126557	0.121251	0.000146296	7.47449E-05	0.121176	0.247954*	6.61803E-06*	0.000456101	0.000132536	1.37603E-05	0.120720	0.126632	7.47449E-05	0*	1.72258E-10*	0.247954
Octane		0*	1.42409	3.38589	2.54821E-06	0.000799609	3.38509	4.80999*	0.000483191*	0.00487140	4.21832E-08	2.50603E-06	3.38022	1.42489	0.000799609	0*	1.42955E-13*	4.80999
Ethylbenzene		0*	0.0975991	0.267200	9.94363E-05	5.57331E-05	0.267144	0.364898*	9.09468E-06*	0.000341572	8.91989E-05	1.02374E-05	0.266802	0.0976548	5.57331E-05	0*	7.20849E-11*	0.364898
m-Xylene		0*	0.0872428	0.284397	9.04250E-05	4.95872E-05	0.284347	0.371730*	1.04410E-05*	0.000304526	8.14009E-05	9.02404E-06	0.284043	0.0872923	4.95872E-05	0*	7.09373E-11*	0.371730
o-Xylene		0*	0.132892	0.483793	0.000185680	7.55371E-05	0.483717	0.616871*	1.37380E-05*	0.000464246	0.000171608	1.40722E-05	0.483253	0.132968	7.55371E-05	0*	1.15657E-10*	0.616871
Nonane		0*	0.459391	3.24023	1.25667E-06	0.000249602	3.23998	3.69962*	0.000137065*	0.00153143	3.27662E-08	1.22391E-06	3.23844	0.459640	0.000249602	0*	3.28776E-14*	3.69962
C10+		0*	0.0638495	12.7819	6.87864E-08	3.14443E-05	12.7819	12.8458*	1.36875E-05*	0.00619361	8.02531E-10	6.79839E-08	12.7817	0.0638809	3.14443E-05	0*	2.03742E-17*	12.8458
Mass Fraction		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water		0*	0.201784	0.00832326	99.9660	0.272836	0.00523524	0*	9.02780E-05*	0.173423	99.9950	2.71813	0.00115755	0.201807	0.272836	100*	91.6764*	4.16224
H2S		0*	0	0	0	0	0	0*	0*	0	0	0	0	0	0	0*	0*	0
Nitrogen		0.580824*	0.580334	0.00201452	9.09640E-05	0.154166	0.000238247	0.00446645*	0.000491914*	0.00984629	3.81742E-06	0.292346	5.30146E-06	0.580196	0.154166	0*	0.00562230*	0.542113
Carbon Dioxide		0.403632*	0.402864	0.0155453	0.00253316	0.529219	0.00954849	0.00584738*	0.407685*	0.320757	0.00163298	3.02140	0.00200329	0.402905	0.529219	0*	3.91487*	0.376800
Methane		64.0355*	63.9740	0.655390	0.0199021	40.5730	0.189379	0.678813*	1.87945*	7.49909	0.00164343	61.2522	0.0121557	63.9664	40.5730	0*	3.27322*	59.7724
Ethane		20.1167*	20.0975	1.26418	0.00693500	30.7350	0.920123	1.31787*	38.2219*	27.2490	0.000658410	21.0561	0.281784	20.1009	30.7350	0*	1.03843*	18.8053
Propane		6.23059*	6.23577	1.42950	0.00234846	11.6056	1.31070	1.89943*	25.1149*	21.2629	0.000243928	7.06012	0.826964	6.23750	11.6056	0*	0.0848691*	5.86203
Isobutane		1.59343*	1.58523	0.916480	0.000195467	3.04381	0.891645	0.704805*	8.07346*	7.30215	7.57734E-06	0.630303	0.736223	1.58570	3.04381	0*	0.000948778*	1.50470
n-Butane		2.72357*	2.71212	2.24053	0.000721693	5.23201	2.20561	2.00115*	14.5105*	13.3880	5.88668E-05	2.22358	1.93498	2.71294	5.23201	0*	0.00503731*	2.59199
Isopentane		0.973390*	0.957903	1.96650	0.000169076	1.81875	1.96823	1.56957*	14.9495*	5.08223	9.70606E-06	0.534649	1.89273	0.958381	1.81875	0*	0.000305549*	0.946268
n-Pentane		0.816670*	0.813026	2.23104	0.000139525	1.54448	2.23906	2.21248*	4.42150*	4.39835	7.93084E-06	0.441455	2.18670	0.813263	1.54448	0*	0.000182798*	0.817880
2-Methylpentane		0*	0.0261063	0.169881	2.04154E-06	0.0487370	0.171295	1.14345*	0.139462*	0.143352	5.69557E-08	0.00665755	0.171973	0.0261137	0.0487370	0*	5.26377E-07*	0.0288369
3-Methylpentane		0*	0.0178810	0.129556	3.85611E-06	0.0333598	0.130679	0.796907*	0.0952688*	0.0984138	2.78569E-07	0.0120015	0.131462	0.0178860	0.0333598	0*	2.30059E-06*	0.0200973
n-Hexane		2.52751*	2.07716	18.6512	0.000128082	3.84838	18.8240	2.79223*	0.750630*	11.4085	2.85774E-06	0.420079	19.0038	2.07773	3.84838	0*	1.28632E-06*	2.42899
Methylcyclopentane		0*	0.00438982	0.0415275	3.05024E-06	0.00822005	0.0419163	0.205748*	0.0219799*	0.0244327	5.77941E-07	0.00829414	0.0423402	0.00439106	0.00822005	0*	3.41899E-06*	0.00518878
Benzene		0*	0.00112036	0.0106116	3.88833E-05	0.00211091	0.0107108	0.0525841*	0.000346143*	0.00626722	3.58205E-05	0.0103103	0.0108186	0.00112068	0.00211091	0*	1.30605E-05*	0.00132612
2-Methylhexane		0*	0.0307715	0.656705	2.08512E-06	0.0555309	0.663723	1.82217*	0.0106142*	0.166472	4.94155E-08	0.00682904	0.675779	0.0307795	0.0555309	0*	8.84414E-09*	0.0459535
3-Methylhexane		0*	0.0262523	0.587171	1.85634E-06	0.0474063	0.593427	1.58253*	0.0136125*	0.142653	4.59344E-08	0.00607324	0.604417	0.0262592	0.0474063	0*	1.17883E-07*	0.0399099
Heptane		0*	0.0594033	1.66211	4.35497E-06	0.106376	1.68027	3.92747*	0.281740*	0.318102	1.08350E-07	0.0142458	1.71329	0.0594185	0.106376	0*	2.03809E-07*	0.0990473
Methylcyclohexane		0*	0.0309825	0.850729	1.32173E-05	0.0562816	0.860003	2.03164*	0.146912*	0.168934	1.77071E-06	0.0384005	0.876758	0.0309907	0.0562816	0*	3.38087E-06*	0.0512361
Toluene		0*	0.00693949	0.236943	0.000188502	0.0126576	0.239562	0.503558*	0.00455235*	0.0380931	0.000170822	0.0594771	0.244446	0.00694134	0.0126576	0*	3.62493E-05*	0.0126993
Octane		0*	0.0968083	8.20289	4.07053E-06	0.167873	8.29670	12.1103*	0.412059*	0.504397	6.74039E-08	0.0134290	8.48562	0.0968313	0.167873	0*	3.72953E-08*	0.305412
Ethylbenzene		0*	0.00616635	0.601640	0.000147628	0.0108748	0.608537	0.853868*	0.00720834*	0.0328706	0.000132468	0.0509864	0.622493	0.00616787	0.0108748	0*	1.74785E-05*	0.0215338
m-Xylene		0*	0.00551203	0.640362	0.000134249	0.00967561	0.647724	0.869855*	0.00827542*	0.0293055	0.000120888	0.0449433	0.662718	0.00551338	0.00967561	0*	1.72002E-05*	0.0219370
o-Xylene		0*	0.00839618	1.08933	0.000275669	0.0147390	1.10188	1.44349*	0.0108885*	0.0446759	0.000254853	0.0700851	1.12751	0.00839824	0.0147390	0*	2.80434E-05*	0.0364035
Nonane		0*	0.0350637	8.81392	2.25392E-06	0.0588370	8.91613	10.4585*	0.131241*	0.178040	5.87857E-08	0.00736385	9.12798	0.0350714	0.0588370	0*	9.63061E-09*	0.263754
C10+		0*	0.00657742	46.9259	1.66510E-07	0.0100038	47.4736	49.0112*	0.0176884*	0.0303786	1.94326E-09	0.000552059	48.6239	0.00657853	0.0100038	0*	8.05482E-12*	1.23602
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*	339.067	0.392441	7148.44	0.148448	0.243993	0*	1.20925E-05*	0.191321	7148.38	0.0579413	0.0526718	339.216	0.148448	7487.90*	0.0401401*	7487.90
H2S		0*	0	0	0	0	0	0*	0*	0	0	0	0	0	0	0*	0*	0
Nitrogen		975.062*	975.163	0.0949844	0.00650472	0.0838807	0.0111037	0.202640*	6.58905E-05*	0.0108625	0.000272897	0.00623182	0.000241230	975.247	0.0838807	0*	2.46170E-06*	975.264
Carbon Dioxide		677.600*	676.951	0.732959	0.181143	0.287944	0.445015	0.265292*	0.0546082*	0.353860	0.116737	0.0644059	0.0911548	677.239	0.287944	0*	0.00171411*	677.865
Methane		107500*	107498	30.9016	1.42317	22.0754	8.82615	30.7973*	0.251747*	8.27303	0.117485	1.30569	0.553118	107521	22.0754	0*	0.00143317*	107531
Ethane		33771.0*	33770.7	59.6057	0.495913	16.7227	42.8831	59.7909*	5.11972*	30.0612	0.0470680	0.448845	12.8219	33787.4	16.7227	0*	0.000454671*	33830.8
Propane		10459.6*	10478.3	67.4009	0.167935	6.31453	61.0863	86.1759*	3.36408*	23.4573	0.0174377	0.150498	37.6290	10484.6	6.31453	0*	3.71596E-05*	10545.8
Isobutane		2674.99*	2663.74	43.2119	0.0139776	1.65611	41.5558	31.9765*	1.08142*	8.05577	0.000541684	0.0134359	33.5001	2665.39	1.65611	0*	4.15419E-07*	2706.96
n-Butane		4572.21*	4557.31	105.641	0.0516073	2.84670	102.794	90.7909*	1.94364*	14.7477	0.00420823	0.0473991	88.0466	4560.15	2.84670	0*	2.20557E-06*	4663.00
Isopentane		1631.13*	1609.61	92.7205	0.0120904	0.989565	91.7309	71.2104*	0.695849*	5.60674	0.000693476	0.0313969	86.1242	1610.60	0.989565	0*	1.32908E-07*	1702.34
n-Pentane		1370.99*	1366.17	105.193	0.00997726	0.840337	104.353	100.379*	0.592248*	4.85228	0.000566955	0.00941030	99.5007	1367.01	0.840337	0*	8.00373E-08*	1471.37
2-Methylpentane		0*	43.8677	8.00987	0.000145988	0.0265174	7.98336	51.8777*	0.0186805*	0.158146	4.07161E-06	0.000141916	7.82521	43.8942	0.0265174	0*	2.30472E-10*	51.8777
3-Methylpentane		0*	30.0462	6.10857	0.000275746	0.0181508	6.09042	36.1551*	0.0127610*	0.108571	1.99142E-05	0.000255831	5.98185	30.0644	0.0181508	0*	1.00731E-09*	36.1551
n-Hexane		4243.08*	3490.35	879.402	0.00915894	2.09387	877.308	126.681*	0.100545*	12.5859	0.000204292	0.00895465	864.722	3492.44	2.09387	0*	5.63212E-10*	4369.76
Methylcyclopentane		0*	7.37641	1.95802	0.000218118	0.00447246	1.95354	9.33465*	0.00294415*	0.0269543	4.13155E-05	0.000176803	1.92659	7.38089	0.00447246	0*	1.49699E-09*	9.33465
Benzene		0*	1.88259	0.500335	0.00278049	0.00114853	0.499186	2.38570*	4.63649E-05*	0.00691403	0.00256071	0.000219781	0.492272	1.88374	0.00114853	0*	5.71847E-09*	2.38570
2-Methylhexane		0*	51.7069	30.9636	0.000149104	0.0302139	30.9334	82.6706*	0.00142174*	0.183653	3.53258E-06	0.000145572	30.7497	51.7371	0.0302139	0*	3.87237E-12*	82.6706
3-Methylhexane		0*	44.1130	27.6850	0.000132744	0.0257934	27.6593	71.7982*	0.0182336*	0.156714	3.28373E-06	0.000129461	27.5025	44.1388	0.0257934	0*	5.16144E-11*	71.7982
Heptane		0*	99.8182	78.3682	0.000311418	0.0578782	78.3103	178.187*	0.0377383*	0.350932	7.74566E-06	0.000303672	77.9594	99.8761	0.0578782	0*	8.88938E-11*	178.187
Methylcyclohexane		0*	52.0613	40.1118	0.000945151	0.0306224	40.0812	92.1740*	0.0196784*	0.186368	0.000126583	0.000818568	39.8948	52.0919	0.0306224	0*	1.48030E-09*	92.1740
Toluene		0*	11.6608	11.1719	0.0134795	0.00688687	11.1650	22.8461*	0.000609775*	0.0420244	0.0122116	0.00126785	11.1229	11.6676	0.00688687	0*	1.58716E-08*	22.8461
Octane		0*	162.672	386.766	0.000291078	0.0913381	386.674	549.437*	0.0551942*	0.556453	4.81853E-06	0.000286260	386.118	162.763	0.0913381	0*	1.63296E-11*	549.437
Ethylbenzene		0*	10.3616	28.3673	0.0105567	0.00591691	28.3613	38.7394*	0.000965537*	0.0362630	0.00946980	0.00108685	28.3251	10.3675	0.00591691	0*	7.65290E-09*	38.7394
m-Xylene		0*	9.26213	30.1930	0.00959997	0.00526442	30.1877	39.4647*	0.00110847*	0.0323300	0.00864193	0.000958038	30.1554	9.26739	0.00526442	0*	7.53106E-09*	39.4647

o-Xylene	0*	14.1085	51.3619	0.0197127	0.00801940	51.3539	65.4901*	0.00145849*	0.0492866	0.0182188	0.00149397	51.3046	14.1165	0.00801940	0*	1.22787E-08*	65.4901
Nonane	0*	58.9192	415.575	0.000161175	0.0320128	415.543	474.495*	0.0175793*	0.196414	4.20243E-06	0.000156972	415.347	58.9512	0.0320128	0*	4.21672E-12*	474.495
C10+	0*	11.0523	2212.55	1.19069E-05	0.00544300	2212.55	2223.61*	0.00236931*	0.0335138	1.38918E-07	1.17680E-05	2212.51	11.0578	0.00544300	0*	3.52677E-15*	2223.61

Process Streams		**Gas**	**HP Separator Gas**	**HP Separator Oil**	**HP Separator Water**	**LP Separator Gas**	**LP Separator Oil**	**Oil**	**Oil W/B**	**OT Flash Gas**	**Produced Water**	**PWT Flash Gas**	**Sales Oil**	**Total gas to sale**	**Vapor recovery by VRU (to sale)**	**Water**	**Water W/B**	**Well Stream**
Properties	**Status:**	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: **Total**	**From Block:**	--	3 Phase Separator	3 Phase Separator	3 Phase Separator	2 Phase Separator	2 Phase Separator	--	--	Condensate Tanks	PW Tanks	PW Tanks	Condensate Tanks	MIX-100	HP Compressor Engine	--	--	MIX-101
	To Block:	MIX-101	MIX-100	2 Phase Separator	PW Tanks	HP Compressor Engine	Condensate Tanks	MIX-101	--	--	--	--	--	--	MIX-100	MIX-101	--	3 Phase Separator
Property	**Units**																	
Temperature	°F	85*	70*	70	70	70	70*	85*	75.9425*	75.94*	75.94	75.94*	75.94	69.9985	70*	85*	75.9425*	85.7252
Pressure	psig	1000*	154*	154	154	50	50*	1000*	13.3697	0*	0	0*	0	154	154*	1000*	-14.2238	1000
Mole Fraction Vapor	%	100	100	0	0	100	0	0	100*	100	0	100	0	100	99.2416	0	100*	94.1422
Mole Fraction Light Liquid	%	0	0	100	100	0	100	100	0	0	100	0	100	0	0.611091	100	0	1.19473
Mole Fraction Heavy Liquid	%	0	0	0	0	0	0	0	0	0	0	0	0	0	0.147305	0	0	4.66308
Molecular Weight	lb/lbmol	20.1603	20.1421	108.336	18.0162	24.4680	112.852	112.818	39.8171	39.8231	18.0156	20.0825	118.103	20.1433	24.4680	18.0153	18.4550	20.4831
Mass Density	lb/ft^3	4.39572	0.623232	44.5701	62.2633	0.285228	44.8365	45.1345	0.199686	0.103211	62.2171	0.0515204	44.9835	0.623273	0.778755	62.1797	0.00151666	4.67501
Molar Flow	lbmol/h	8327.03	8342.45	43.5220	396.914	2.22369	41.2983	40.2148	0.336406	2.77026	396.808	0.106145	38.5280	8344.67	2.22369	415.641	0.00237250	8782.88
Mass Flow	lb/h	167876	168035	4714.99	7150.87	54.4092	4660.58	4536.93	13.3947*	110.320	7148.73	2.13166	4550.26	168089	54.4092	7487.90	0.0437846*	179901
Vapor Volumetric Flow	ft^3/h	38190.8	269618	105.788	114.849	190.757	103.946	100.520	67.0789	1068.88	114.900	41.3750	101.154	269688	69.8669	120.423	28.8692	38481.4
Liquid Volumetric Flow	gpm	4761.44	33614.7	13.1892	14.3188	23.7826	12.9595	12.5324	8.36308	133.263	14.3252	5.15845	12.6114	33623.4	8.71067	15.0138	3.59927	4797.68
Std Vapor Volumetric Flow	MMSCFD	75.8395*	75.9799	0.396382	3.61495	0.0202525	0.376129	0.366261	0.00306387	0.0252305	3.61398	0.000966731	0.350899	76.0002	0.0202525	3.78551	2.16079E-05	79.9912
Std Liquid Volumetric Flow	sgpm	998.934	998.931	13.3696	14.3041	0.295828	13.0738	12.7016*	0.0592341	0.473763	14.2917	0.0124264	12.6000	999.227	0.295828	14.9688*	9.67043E-05	1026.60
Compressibility		0.796171	0.959160	0.0721380	0.00858747	0.976368	0.0286473	0.433917	0.973601	0.986494	0.000740328	0.996605	0.00671260	0.959155	0.932465	0.0502957	0.999551	0.759581
Specific Gravity		0.696082	0.695453	0.714619	0.998306	0.844814	0.718890	0.723668	1.37478	1.37498	0.997564	0.693393	0.721248	0.695493		0.996965	0.637202	
API Gravity				65.1655	10.0408		64.0330	60.9245			10.0153		62.6828			9.89088		
Enthalpy	Btu/h	-2.88400E+08	-2.85373E+08	-4.12212E+06	-4.88147E+07	-80896.5	-4.03493E+06	-3.82181E+06	-14594.7	-122307	-4.87716E+07	-3971.97	-3.88255E+06	-2.85454E+08	-81381.1	-5.09995E+07	-241.714	-3.43221E+08
Mass Enthalpy	Btu/lb	-1717.94	-1698.30	-874.257	-6826.40	-1486.82	-865.757	-842.377	-1089.59	-1108.65	-6822.40	-1863.32	-853.260	-1698.23	-1495.72	-6810.92	-5520.52	-1907.84
Mass Cp	Btu/(lb*°F)	0.668388	0.504178	0.492457	0.983074	0.462600	0.490121	0.494230	0.412519	0.414865	0.982734	0.479559	0.491214	0.504169	0.481854	0.980410	0.441586	0.674225
Ideal Gas CpCv Ratio		1.25248	1.25676	1.05058	1.32582	1.21795	1.04857	1.04766	1.13964	1.13766	1.32555	1.26090	1.04595	1.25675	1.21795	1.32512	1.32235	1.25001
Dynamic Viscosity	cP	0.0131445	0.0107580	0.503137	0.995508	0.0101145	0.543948	0.548281	0.00870489	0.00872914	0.924432	0.0108104	0.572336	0.0107578		0.840365	0.0102841	
Kinematic Viscosity	cSt	0.186679	1.07760	0.704729	0.998140	2.21377	0.757365	0.758357	2.72141	5.27989	0.927565	13.0991	0.794285	1.07752		0.843719	423.312	
Thermal Conductivity	Btu/(h*ft*°F)	0.0225233	0.0178564	0.0687756	0.346639	0.0157946	0.0690595	0.0679026	0.0111459	0.0117280	0.349783	0.0173913	0.0690800	0.0178558		0.353848	0.0122322	
Surface Tension	lbf/ft			0.00141904?	0.00504048?		0.00149885?	0.00087532?			0.00499710?		0.00153120?			0.00492858		
Net Ideal Gas Heating Value	Btu/ft^3	1105.70	1102.50	5460.93	0.312253	1319.78	5683.91	5673.45	2092.54	2088.53	0.0323160	1046.82	5942.42	1102.55	1319.78	0	45.4469	1074.28
Net Liquid Heating Value	Btu/lb	20758.7	20715.1	18968.5	-1052.84	20375.0	18952.1	18915.6	19790.3	19754.7	-1059.03	19699.5	18932.7	20715.0	20375.0	-1059.76	-41.6697	19804.1
Gross Ideal Gas Heating Value	Btu/ft^3	1220.06	1216.66	5866.70	50.6397	1449.51	6104.54	6090.52	2277.48	2273.35	50.3437	1156.98	6380.01	1216.72	1449.51	50.31	97.5203	1187.00
Gross Liquid Heating Value	Btu/lb	22911.4	22865.9	20389.5	7.23296	22387.0	20366.2	20317.5	21552.8	21515.7	0.740254	21781.2	20338.3	22865.7	22387.0	0	1029.10	21892.4

Process Streams		**Gas**	**HP Separator Gas**	**HP Separator Oil**	**HP Separator Water**	**LP Separator Gas**	**LP Separator Oil**	**Oil**	**Oil W/B**	**OT Flash Gas**	**Produced Water**	**PWT Flash Gas**	**Sales Oil**	**Total gas to sale**	**Vapor recovery by VRU (to sale)**	**Water**	**Water W/B**	**Well Stream**
Composition	**Status:**	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: **Vapor**	**From Block:**	--	3 Phase Separator	3 Phase Separator	3 Phase Separator	2 Phase Separator	2 Phase Separator	--	--	Condensate Tanks	PW Tanks	PW Tanks	Condensate Tanks	MIX-100	HP Compressor Engine	--	--	MIX-101
	To Block:	MIX-101	MIX-100	2 Phase Separator	PW Tanks	HP Compressor Engine	Condensate Tanks	MIX-101	--	--	--	--	--	--	MIX-100	MIX-101	--	3 Phase Separator
Mole Fraction		%	%			%			%	%		%		%	%		%	%
Water		0	0.225606			0.370561			0.000199531	0.383355		3.03003		0.225645	0.224790		93.9143	0.0790097
H2S		0	0			0			0	0		0		0	0		0	0
Nitrogen		0.418	0.417271			0.134655			0.000699186	0.0139972		0.209579		0.417195	0.135668		0.00370394	0.420328
Carbon Dioxide		0.1849	0.184382			0.294231			0.368848	0.290245		1.37873		0.184411	0.296181		1.64167	0.184323
Methane		80.4725	80.3226			61.8821			4.66476	18.6154		76.6774		80.3177	62.3316		3.76547	80.7514
Ethane		13.4876	13.4625			25.0099			50.6130	36.0882		14.0629		13.4656	25.1427		0.637340	13.4136
Propane		2.8486	2.84839			6.43979			22.6781	19.2027		3.21539		2.84935	6.43932		0.0355197	2.79299
Isobutane		0.5527	0.549358			1.28137			5.53079	5.00316		0.217783		0.549553	1.26688		0.000301257	0.527748
n-Butane		0.9447	0.939881			2.20255			9.94054	9.15926		0.768294		0.940217	2.15979		0.00159945	0.891754
Isopentane		0.2715	0.267422			0.616796			2.86696	2.80518		0.148819		0.267516	0.583578		7.76452E-05	0.246236
n-Pentane		0.2282	0.226977			0.523782			2.44011	2.42771		0.122878		0.227056	0.486134		4.67581E-05	0.205472
2-Methylpentane		0	0.00610194			0.0138380			0.0644379	0.0662454		0.00155149		0.00610400	0.0115752		1.12727E-07	0.00528643
3-Methylpentane		0	0.00417940			0.00947194			0.0440187	0.0454787		0.00279686		0.00418081	0.00777641		4.92688E-07	0.00359433
n-Hexane		0.5913	0.485503			1.09268			0.346826	5.27204		0.0978961		0.485665	0.859299		2.75475E-07	0.416205
Methylcyclopentane		0	0.00105063			0.00238985			0.0103990	0.0115612		0.00197918		0.00105098	0.00186508		7.49738E-07	0.000879558
Benzene		0	0.00288898			0.00661228			0.00176444	0.00319517		0.00265078		0.00288997	0.000523538		3.08572E-06	0.000240766
2-Methylhexane		0	0.00618555			0.0135599			0.00421774	0.0661607		0.00136868		0.00618752	0.00822871		1.62890E-09	0.00543106
3-Methylhexane		0	0.00527712			0.0115760			0.0540918	0.0564561		0.00121720		0.00527880	0.00689665		2.17114E-08	0.00461524
Heptane		0	0.0119410			0.0259756			0.111955	0.126423		0.00285515		0.0119447	0.0140704		3.73929E-08	0.0106792
Methylcyclohexane		0	0.00635582			0.0140254			0.0595766	0.0685175		0.00785425		0.00635786	0.00767976		6.35467E-07	0.00542212
Toluene		0	0.00151702			0.00336130			0.00196727	0.0164642		0.0129636		0.00151751	0.00169798		7.26061E-06	0.00128416
Octane		0	0.0170704			0.0359587			0.143633	0.175846		0.00236094		0.0170754	0.0105214		6.02552E-09	0.0183764
Ethylbenzene		0	0.00116991			0.00250634			0.00270348	0.0123299		0.00964472		0.00117027	0.000662358		3.03835E-06	0.00118872
m-Xylene		0	0.00104577			0.00222995			0.00310369	0.0109927		0.00850160		0.00104608	0.000518132		2.98998E-06	0.00110730
o-Xylene		0	0.00159296			0.00339693			0.00408374	0.0167582		0.0132575		0.00159345	0.000725675		4.87489E-06	0.00170595
Nonane		0	0.00552666			0.0117247			0.00407439	0.0552812		0.00115305		0.00552819	0.00133360		1.38578E-09	0.00787395
C10+		0	0.000765357			0.00141406			0.00406874	0.00698886		6.40480E-05		0.000765530	7.59720E-06		8.58764E-13	0.00330313
Molar Flow		lbmol/h	lbmol/h			lbmol/h			lbmol/h	lbmol/h		lbmol/h		lbmol/h	lbmol/h		lbmol/h	lbmol/h
Water		0	18.8211			0.00824011			6.71235E-07	0.0106199		0.00321623		18.8293	0.00496072		0.00222812	6.53284
H2S		0	0			0			0	0		0		0	0		0	0
Nitrogen		34.8070	34.8106			0.00299431			2.35211E-06	0.000387760		0.000222459		34.8136	0.00299395		8.78759E-08	34.7544
Carbon Dioxide		15.3967	15.3819			0.00654277			0.00124083	0.00804054		0.00146345		15.3885	0.00653620		3.89486E-05	15.2405
Methane		6700.97	6700.87			1.37606			0.0156926	0.515696		0.0813894		6702.25	1.37555		8.93358E-05	6676.85
Ethane		1123.12	1123.11			0.556143			0.170266	0.999738		0.0149271		1123.66	0.554855		1.51209E-05	1109.09
Propane		237.204	237.626			0.143201			0.0762905	0.531965		0.00341299		237.769	0.142104		8.42705E-07	230.934
Isobutane		46.0235	45.8299			0.0284937			0.0186059	0.138600		0.000231167		45.8584	0.0279577		7.14733E-09	43.6363
n-Butane		78.6654	78.4091			0.0489778			0.0334406	0.253735		0.000815507		78.4580	0.0476627		3.79471E-08	73.7337
Isopentane		22.6079	22.3096			0.0137156			0.00964464	0.0777108		0.000157964		22.3233	0.0128785		1.84213E-09	20.3598
n-Pentane		19.0023	18.9354			0.0116473			0.00820870	0.0672538		0.000130429		18.9471	0.0107281		1.10934E-09	16.9893
2-Methylpentane		0	0.509051			0.000307715			0.000216773	0.00183517		1.64683E-06		0.509359	0.000255444		2.67446E-12	0.437103
3-Methylpentane		0	0.348664			0.000210626			0.000148082	0.00125988		2.96873E-06		0.348875	0.000171612		1.16890E-11	0.297193
n-Hexane		49.2377	40.5029			0.0242978			0.00116675	0.146049		0.000103912		40.5272	0.0189632		6.53565E-12	34.4135
Methylcyclopentane		0	0.0876481			5.31427E-05			3.49830E-05	0.000320276		2.10081E-06		0.0877012	4.11590E-05		1.77875E-11	0.0727254
Benzene		0	0.0241012			1.47036E-05			5.93570E-07	8.85144E-05		2.81368E-06		0.0241159	1.15536E-05		7.32088E-11	0.0199075
2-Methylhexane		0	0.516027			0.000301530			1.41885E-05	0.00183283		1.45278E-06		0.516328	0.000181593		3.86457E-14	0.449061
3-Methylhexane		0	0.440241			0.000257414			0.000181968	0.00152898		1.29200E-06		0.440498	0.000152197		5.15104E-13	0.381600
Heptane		0	0.996170			0.000577616			0.000376622	0.00350224		3.03060E-06		0.996748	0.000310508		8.87147E-13	0.882998
Methylcyclohexane		0	0.530231			0.000311881			0.000200420	0.00189811		8.33691E-06		0.530543	0.000169479		1.50765E-11	0.448322
Toluene		0	0.126557			7.47449E-05			6.61803E-06	0.000456101		1.37603E-05		0.126632	3.74713E-05		1.72258E-10	0.106179
Octane		0	1.42409			0.000799609			0.000483191	0.00487140		2.50603E-06		1.42489	0.000232189		1.42955E-13	1.51943
Ethylbenzene		0	0.0975991			5.57331E-05			9.09468E-06	0.000341572		1.02374E-05		0.0976548	1.46171E-05		7.20849E-11	0.0982883
m-Xylene		0	0.0872428			4.95872E-05			1.04410E-05	0.000304526		9.02404E-06		0.0872923	1.14343E-05		7.09373E-11	0.0915559
o-Xylene		0	0.132892			7.55371E-05			1.37380E-05	0.000464246		1.40722E-05		0.132968	1.60144E-05		1.15657E-10	0.141054
Nonane		0	0.459391			0.000249402			0.000137065	0.00153143		1.22391E-06		0.459640	2.94302E-05		3.28776E-14	0.651050
C10+		0	0.0638495			3.14443E-05			1.36875E-05	0.00019361		6.79839E-08		0.0638809	1.67657E-07		2.03742E-17	0.273116
Mass Fraction		%	%			%			%	%		%		%	%		%	%
Water		0	0.201784			0.272836			9.02780E-05	0.173423		2.71813		0.201807	0.167447		91.6764	0.0711014
H2S		0	0			0			0	0		0		0	0		0	0
Nitrogen		0.580824	0.580334			0.154166			0.000491914	0.00984629		0.292346		0.580196	0.157145		0.00562230	0.588181
Carbon Dioxide		0.403632	0.402864			0.529219			0.407685	0.320757		3.02140		0.402905	0.538968		3.91487	0.405211
Methane		64.0355	63.9740			40.5730			1.87945	7.49909		61.2522		63.9664	41.3464		3.27322	64.7109
Ethane		20.1167	20.0975			30.7350			38.2219	27.2490		21.0561		20.1009	31.2601		1.03843	20.1475
Propane		6.23059	6.23577			11.6056			25.1149	21.2629		7.06012		6.23750	11.7407		0.0848691	6.15204
Isobutane		1.59343	1.58523			3.04381			8.07346	7.30215		0.630303		1.58570	3.04464		0.00948778	1.53223
n-Butane		2.72357	2.71212			5.23201			14.5105	13.3680		2.22358		2.71294	5.19054		0.00503731	2.58907
Isopentane		0.971630	0.957903			1.81875			5.19495	5.08223		0.534649		0.958181	1.74095		0.000303549	0.887438
n-Pentane		0.816670	0.813026			1.54448			4.42150	4.39835		0.441455		0.813263	1.45025		0.000182798	0.740523

2-Methylpentane	0	0.0261063	0.0487370	0.139462	0.143352	0.00665755	0.0261137	0.0412449	5.26377E-07	0.0227563	
3-Methylpentane	0	0.0178810	0.0333598	0.0952688	0.0984138	0.0120015	0.0178860	0.0277090	2.30059E-06	0.0154724	
n-Hexane	2.52751	2.07716	3.84838	0.750630	11.4085	0.420079	2.07773	3.06187	1.28632E-06	1.79163	
Methylcyclopentane	0	0.00439882	0.00822005	0.0219799	0.0244327	0.00829414	0.00439106	0.00649022	3.41899E-06	0.00369763	
Benzene	0	0.00112036	0.00211091	0.000346143	0.00626722	0.0103103	0.00112068	0.00169092	1.30605E-05	0.000939941	
2-Methylhexane	0	0.0307715	0.0555309	0.0106142	0.166472	0.00682904	0.0307795	0.0340931	8.84414E-09	0.0271842	
3-Methylhexane	0	0.0262523	0.0474063	0.136125	0.142053	0.00607324	0.0262592	0.0285741	1.17883E-07	0.0231008	
Heptane	0	0.0594033	0.106376	0.281740	0.318102	0.0142458	0.0594185	0.0582963	2.03025E-07	0.0534528	
Methylcyclohexane	0	0.0309825	0.0562816	0.146912	0.168934	0.0384005	0.0309907	0.0311786	3.38087E-06	0.0265935	
Toluene	0	0.00693949	0.0126576	0.00455235	0.0380931	0.0594771	0.00694134	0.00646892	3.62493E-05	0.00591039	
Octane	0	0.0968083	0.167873	0.412059	0.504397	0.0134290	0.0968313	0.0496944	3.72953E-08	0.104855	
Ethylbenzene	0	0.00616635	0.0108748	0.00720834	0.0328706	0.0509864	0.00616787	0.00290759	1.74785E-05	0.00630403	
m-Xylene	0	0.00551203	0.00967561	0.00827542	0.0293055	0.0449433	0.00551338	0.00227448	1.72002E-05	0.00587222	
o-Xylene	0	0.00839618	0.0147390	0.0108885	0.0446759	0.0700851	0.00839824	0.00318553	2.80434E-05	0.00904697	
Nonane	0	0.0350637	0.0588370	0.131241	0.178040	0.00736385	0.0350714	0.00707227	9.63061E-09	0.0504457	
C10+	0	0.00657742	0.0100038	0.0176884	0.0303786	0.000552059	0.00657853	5.43763E-05	8.05482E-12	0.0285614	
Mass Flow	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	
Water	0	339.067	0.148448	1.20925E-05	0.191321	0.0579413	339.216	0.0893687	0.0401401	117.691	
H2S	0	0	0	0	0	0	0	0	0	0	
Nitrogen	975.062	975.163	0.0838807	6.58905E-05	0.0108625	0.00623182	975.247	0.0838706	2.46170E-06	973.589	
Carbon Dioxide	677.600	676.951	0.287944	0.0546082	0.353860	0.0644059	677.239	0.287655	0.00171411	670.728	
Methane	107500	107498	22.0754	0.251747	8.27303	1.30569	107521	22.0672	0.00143317	107113	
Ethane	33771.0	33770.7	16.7227	5.11972	30.0612	0.448845	33787.4	16.6840	0.000454671	33349.3	
Propane	10459.6	10478.3	6.31453	3.36408	23.4573	0.150498	10484.6	6.26618	3.71596E-05	10183.2	
Isobutane	2674.99	2663.74	1.65611	1.08142	8.05577	0.0134359	2665.39	1.62496	4.15419E-07	2536.24	
n-Butane	4572.21	4557.31	2.84670	1.94364	14.7477	0.0473991	4560.15	2.77026	2.20557E-06	4285.57	
Isopentane	1631.13	1609.61	0.989565	0.695849	5.60674	0.0113969	1610.60	0.929171	1.32908E-07	1468.94	
n-Pentane	1370.99	1366.17	0.840337	0.592248	4.85228	0.00941030	1367.01	0.774021	8.00373E-08	1225.75	
2-Methylpentane	0	43.8677	0.0265174	0.0186805	0.158146	0.000141916	43.8942	0.0220130	2.30472E-10	37.6675	
3-Methylpentane	0	30.0462	0.0181508	0.0127610	0.108571	0.000255831	30.0644	0.0147887	1.00731E-09	25.6107	
n-Hexane	4243.08	3490.35	2.09387	0.100545	12.5859	0.00895465	3492.44	1.63416	5.63212E-10	2965.60	
Methylcyclopentane	0	7.37641	0.00447246	0.00294415	0.0269543	0.000176803	7.38089	0.00346392	1.49699E-09	6.12053	
Benzene	0	1.88259	0.00114853	4.63649E-05	0.00691403	0.000219781	1.88374	0.000902469	5.71847E-09	1.55501	
2-Methylhexane	0	51.7069	0.0302139	0.00142174	0.183653	0.000145572	51.7371	0.0181960	3.87237E-12	44.9968	
3-Methylhexane	0	44.1130	0.0257934	0.0182336	0.156714	0.000129461	44.1388	0.0152504	5.16144E-11	38.2377	
Heptane	0	99.8182	0.0578782	0.0377383	0.350932	0.000303672	99.8761	0.0311135	8.88938E-11	88.4781	
Methylcyclohexane	0	52.0613	0.0306224	0.0196784	0.186368	0.000818568	52.0919	0.0166404	1.48030E-09	44.0190	
Toluene	0	11.6608	0.00688687	0.000609775	0.0420244	0.00126785	11.6676	0.00345255	1.58716E-08	9.78320	
Octane	0	162.672	0.0913381	0.0551942	0.556453	0.000286260	162.763	0.0265226	1.63296E-11	173.563	
Ethylbenzene	0	10.3616	0.00591691	0.000965537	0.0362630	0.00108685	10.3675	0.00155182	7.65290E-09	10.4348	
m-Xylene	0	9.26213	0.00526442	0.00110847	0.0323300	0.000958038	9.26739	0.00121392	7.53106E-09	9.72003	
o-Xylene	0	14.1085	0.00801940	0.0014849	0.0492866	0.0014997	14.1165	0.00170016	1.22787E-08	14.9750	
Nonane	0	58.9192	0.0320128	0.0175793	0.196414	0.000156972	58.9512	0.0037457	4.21672E-12	83.5004	
C10+	0	11.0523	0.00544300	0.00236931	0.0335138	1.17680E-05	11.0578	2.90214E-05	3.52677E-15	47.2764	

Process Streams		**Gas**	**HP Separator Gas**	**HP Separator Oil**	**HP Separator Water**	**LP Separator Gas**	**LP Separator Oil**	**Oil**	**Oil W/B**	**OT Flash Gas**	**Produced Water**	**PWT Flash Gas**	**Sales Oil**	**Total gas to sale**	**Vapor recovery by VRU (to sale)**	**Water**	**Water W/B**	**Well Stream**
Properties	**Status:**	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: **Vapor**	**From Block:**	--	3 Phase Separator	3 Phase Separator	3 Phase Separator	2 Phase Separator	2 Phase Separator	--	--	Condensate Tanks	PW Tanks	PW Tanks	Condensate Tanks	MIX-100	HP Compressor Engine	--	--	MIX-101
	To Block:	MIX-101	MIX-100	2 Phase Separator	PW Tanks	HP Compressor Engine	Condensate Tanks	MIX-101	--	--	--	--	--	--	MIX-100	MIX-101	--	3 Phase Separator
Property	**Units**																	
Temperature	°F	85	70			70		75.9425	75.94			75.94		69.9985	70		75.9425	85.7252
Pressure	psig	1000	154			50		13.3697	0			154		154	154		-14.2238	1000
Mole Fraction Vapor	%	100	100			100		100	100			100		100	100		100	100
Mole Fraction Light Liquid	%	0	0			0		0	0			0		0	0		0	0
Mole Fraction Heavy Liquid	%	0	0			0		0	0			0		0	0		0	0
Molecular Weight	lb/lbmol	20.1603	20.1421			24.4680		39.8171	39.8231			20.0825		20.1433	24.1847		18.4550	20.0191
Mass Density	lb/ft^3	4.39572	0.623232			0.285228		0.199686	0.103211			0.0515204		0.623273	0.764183		0.00151666	4.33529
Molar Flow	lbmol/h	8327.03	8342.45			2.22369		0.336406	2.77026			0.106145		8344.67	2.20682		0.00237250	8268.40
Mass Flow	lb/h	167876	168035			54.4092		13.3947	110.320			2.13166		168089	53.3714		0.0437846	165526
Vapor Volumetric Flow	ft^3/h	38190.8	269618			190.757		67.0789	1068.88			41.3750		269688	69.8411		28.8692	38180.9
Liquid Volumetric Flow	gpm	4761.44	33614.7			23.7826		8.36308	133.263			5.15845		33623.4	8.70746		3.59927	4760.22
Std Vapor Volumetric Flow	MMSCFD	75.8395	75.9799			0.0202525		0.00306387	0.0252305			0.000966731		76.0002	0.0200989		2.16079E-05	75.3055
Std Liquid Volumetric Flow	sgpm	998.934	998.931			0.295828		0.0592341	0.473763			0.0124264		999.227	0.292565		9.67043E-05	988.580
Compressibility		0.796171	0.959160			0.976368		0.973601	0.986494			0.996605		0.959155	0.939245		0.999551	0.800545
Specific Gravity		0.696082	0.695453			0.844814		1.37478	1.37498			0.693393		0.695493	0.835033		0.637202	0.691204
API Gravity																		
Enthalpy	Btu/h	-2.88400E+08	-2.85373E+08			-80896.5		-14594.7	-122307			-3971.97		-2.85454E+08	-79979.3		-241.714	-2.85972E+08
Mass Enthalpy	Btu/lb	-1717.94	-1698.30			-1486.82		-1089.59	-1108.65			-1863.32		-1698.23	-1498.54		-5520.52	-1727.66
Mass Cp	Btu/(lb*°F)	0.668388	0.504178			0.462600		0.412519	0.414865			0.479559		0.504169	0.480409		0.441586	0.665858
Ideal Gas CpCv Ratio		1.25248	1.25676			1.21795		1.13964	1.13766			1.26090		1.25675	1.22038		1.32235	1.25397
Dynamic Viscosity	cP	0.0131445	0.0107580			0.0101145		0.00870489	0.00872914			0.0108104		0.0107578	0.0103194		0.0102841	0.0131338
Kinematic Viscosity	cSt	0.186679	1.07760			2.21377		2.72141	5.27989			13.0991		1.07752	0.843014		423.312	0.189126
Thermal Conductivity	Btu/(h*ft*°F)	0.0225233	0.0178564			0.0157946		0.0111459	0.0117280			0.0173913		0.0178558	0.0162643		0.0122322	0.0225567
Surface Tension	lbf/ft																	
Net Ideal Gas Heating Value	Btu/ft^3	1105.70	1102.50			1319.78		2092.54	2088.53			1046.82		1102.55	1307.14		45.4469	1097.79
Net Liquid Heating Value	Btu/lb	20758.7	20715.1			20375.0		19790.3	19754.7			19699.5		20715.0	20418.8		-41.6697	20755.9
Gross Ideal Gas Heating Value	Btu/ft^3	1220.06	1216.66			1449.51		2277.48	2273.35			1156.98		1216.72	1435.95		97.5203	1211.58
Gross Liquid Heating Value	Btu/lb	22911.4	22865.9			22387.0		21552.8	21515.7			21781.2		22865.7	22439.9		1029.10	22913.0

Process Streams		**Gas**	**HP Separator Gas**	**HP Separator Oil**	**HP Separator Water**	**LP Separator Gas**	**LP Separator Oil**	**Oil**	**Oil W/B**	**OT Flash Gas**	**Produced Water**	**PWT Flash Gas**	**Sales Oil**	**Total gas to sale**	**Vapor recovery by VRU (to sale)**	**Water**	**Water W/B**	**Well Stream**
Composition	**Status:**	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: **Light Liquid**	**From Block:**	--	3 Phase Separator	3 Phase Separator	3 Phase Separator	2 Phase Separator	2 Phase Separator	--	--	Condensate Tanks	PW Tanks	PW Tanks	Condensate Tanks	MIX-100	HP Compressor Engine	--	--	MIX-101
	To Block:	MIX-101	MIX-100	2 Phase Separator	PW Tanks	HP Compressor Engine	Condensate Tanks	MIX-101	--	--	--	--	--	--	MIX-100	MIX-101	--	3 Phase Separator
Mole Fraction				%	%		%	%			%		%		%	%		%
Water				0.0500523	99.9709		0.0327947	0			99.9968		0.00758857		0.0351436	100		0.0634398
H2S				0	0		0	0			0		0		0	0		0
Nitrogen				0.00779073	5.85014E-05		0.000959776	0.0179876			2.45501E-06		2.23506E-05		0.00264847	0		0.0556881
Carbon Dioxide				0.0382670	0.00103700		0.0244848	0.0149897			0.000668471		0.00537596		0.0479404	0		0.139339
Methane				4.42590	0.0223506		1.33220	4.77371			0.00184557		0.0894890		3.79188	0		24.4094
Ethane				4.55470	0.00415517		3.45330	4.94459			0.000394481		1.10677		9.47543	0		15.2111
Propane				3.51206	0.000959512		3.35441	4.85965			9.96585E-05		2.21488		8.06823	0		7.82921
Isobutane				1.70826	6.05890E-05		1.73124	1.36806			2.34868E-06		1.49598		3.94404	0		2.79887
n-Butane				4.17620	0.000223703		4.28247	3.88432			1.82464E-05		3.93182		9.67743	0		6.18711
Isopentane				2.95283	4.22196E-05		3.07861	2.45431			2.42227E-06		3.09827		6.16007	0		3.08283
n-Pentane				3.35004	3.48406E-05		3.50222	3.45961			1.98034E-06		3.57948		6.76412	0		3.24413
2-Methylpentane				0.213567	4.26813E-07		0.224321	1.49697			1.19070E-08		0.235687		0.384659	0		0.157147
3-Methylpentane				0.162873	8.06175E-07		0.171132	1.04328			5.82370E-08		0.180167		0.287110	0		0.116606
n-Hexane				23.4475	2.67772E-05		24.6511	3.65548			5.97432E-07		26.0445		39.2577	0		15.5283
Methylcyclopentane				0.0534570	6.52969E-07		0.0562067	0.275810			1.23717E-07		0.0594168		0.0881880	0		0.0363938
Benzene				0.0147175	8.96827E-06		0.0154744	0.0759476			8.26159E-06		0.0163573		0.0231779	0		0.0101033
2-Methylhexane				0.710013	3.74902E-07		0.747513	2.05158			8.88457E-09		0.796504		0.882620	0		0.358306
3-Methylhexane				0.634835	3.33767E-07		0.668394	1.78177			8.25870E-09		0.712393		0.774296	0		0.319186
Heptane				1.79703	7.83016E-07		1.89239	4.42195			1.94806E-08		2.01937		1.96565	0		0.853199
Methylcyclohexane				0.938671	2.42524E-06		0.988458	2.33439			3.24897E-07		1.05460		1.04794	0		0.467389
Toluene				0.278597	3.68584E-05		0.293417	0.616575			3.34005E-05		0.313330		0.274288	0		0.135011
Octane				7.77973	6.42005E-07		8.19669	11.9607			1.06306E-08		8.77341		4.17566	0		3.13590
Ethylbenzene				0.613942	2.50524E-05		0.646864	0.907374			2.24791E-05		0.692489		0.302571	0		0.254024
m-Xylene				0.653456	2.27820E-05		0.688521	0.924362			2.05139E-05		0.737237		0.280766	0		0.266954
o-Xylene				1.11161	4.67810E-05		1.17128	1.53394			4.32472E-05		1.25429		0.438025	0		0.453344
Nonane				7.44503	3.16610E-07		7.84530	9.19965			8.25745E-09		8.40543		1.62025	0		2.90529

C10+		29.3689	1.73303E-08	30.9502	31.9430	2.02247E-10	33.1751	0.230166	0	11.9818	
Molar Flow		**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	
Water		0.0217838	396.799	0.0135437	0	396.795	0.00292373	4.77558E-06	415.641	0.0665685	
H2S		0	0	0	0	0	0	0	0	0	
Nitrogen		0.00339068	0.000232200	0.000396371	0.00723366	9.74166E-06	8.61124E-06	3.59893E-07	0	0.0584345	
Carbon Dioxide		0.0166546	0.00411600	0.0101118	0.00602805	0.00265255	0.00207125	6.51450E-06	0	0.146211	
Methane		1.92624	0.0887128	0.550174	1.91973	0.00732335	0.0344784	0.000515269	0	25.6132	
Ethane		1.98230	0.0164925	1.42615	1.98845	0.00156533	0.426416	0.00128759	0	15.9613	
Propane		1.52852	0.00380844	1.38532	1.95430	0.000395453	0.853350	0.00109637	0	8.21533	
Isobutane		0.743467	0.000240486	0.714973	0.550160	9.31974E-06	0.576373	0.000535945	0	2.93690	
n-Butane		1.81757	0.000887910	1.76859	1.56207	7.24032E-05	1.51485	0.00131504	0	6.49224	
Isopentane		1.28513	0.000167576	1.27141	0.986993	9.61175E-06	1.19370	0.000837076	0	3.23487	
n-Pentane		1.45801	0.000138287	1.44636	1.39127	7.85813E-06	1.37910	0.000919158	0	3.40412	
2-Methylpentane		0.0929485	1.69408E-06	0.0926408	0.602002	4.72480E-08	0.0908056	5.22703E-05	0	0.164897	
3-Methylpentane		0.0708854	3.19982E-06	0.0706748	0.419553	2.31089E-07	0.0694149	3.90147E-05	0	0.122356	
n-Hexane		10.2048	0.000106283	10.1805	1.47004	2.37066E-06	10.0344	0.00533463	0	16.2941	
Methylcyclopentane		0.0232655	2.59173E-06	0.0232124	0.110916	4.90919E-07	0.0228921	1.19836E-05	0	0.0381887	
Benzene		0.00640537	3.55963E-05	0.00639066	0.0305421	3.27826E-05	0.00630215	3.14958E-06	0	0.0106016	
2-Methylhexane		0.309012	1.48804E-06	0.308710	0.825040	3.52547E-08	0.306877	0.000119937	0	0.375977	
3-Methylhexane		0.276293	1.32477E-06	0.276035	0.716535	3.27712E-08	0.274471	0.000105217	0	0.334927	
Heptane		0.782102	3.10790E-06	0.781525	1.77828	7.73005E-08	0.778023	0.000267107	0	0.895276	
Methylcyclohexane		0.408528	9.62613E-06	0.408216	0.938769	1.28922E-06	0.406318	0.000142402	0	0.490440	
Toluene		0.121251	0.000146296	0.121176	0.247954	0.000132536	0.120720	3.72722E-05	0	0.141669	
Octane		3.38589	2.54821E-06	3.38509	4.80999	4.21832E-08	3.38022	0.000567420	0	3.29055	
Ethylbenzene		0.267200	9.94363E-05	0.267144	0.364898	8.91989E-05	0.266802	4.11156E-05	0	0.266552	
m-Xylene		0.284397	9.04250E-05	0.284347	0.371730	8.14009E-05	0.284043	3.81525E-05	0	0.280120	
o-Xylene		0.483793	0.000185680	0.483717	0.616871	0.000171608	0.483253	5.95221E-05	0	0.475702	
Nonane		3.24023	1.25667E-06	3.23998	3.69962	3.27662E-08	3.23844	0.000220172	0	3.04857	
C10+		12.7819	6.87864E-08	12.7819	12.8458	8.02531E-10	12.7817	3.12766E-05	0	12.5727	
Mass Fraction		**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	
Water		0.00832326	99.9660	0.00523524	0	99.9950	0.00115755	0.00878983	100	0.0171413	
H2S		0	0	0	0	0	0	0	0	0	
Nitrogen		0.00201452	9.09640E-05	0.000238247	0.00446645	3.81742E-06	5.30146E-06	0.00103004	0	0.0233975	
Carbon Dioxide		0.0155453	0.00253316	0.00954849	0.00584738	0.00163298	0.00200329	0.0292915	0	0.0919732	
Methane		0.655390	0.0199021	0.189379	0.678813	0.00164343	0.0121557	0.844537	0	5.87313	
Ethane		1.26418	0.00693500	0.920123	1.31787	0.000658410	0.281784	3.95559	0	6.85996	
Propane		1.42950	0.00234846	1.31070	1.89943	0.000243928	0.826964	4.93931	0	5.17792	
Isobutane		0.916480	0.000195467	0.891645	0.704805	7.57734E-06	0.736223	3.18256	0	2.43987	
n-Butane		2.24053	0.000721693	2.20561	2.00115	5.88668E-05	1.93498	7.80899	0	5.39351	
Isopentane		1.96650	0.000169076	1.96823	1.56957	9.70069E-06	1.89273	6.17031	0	3.33596	
n-Pentane		2.23104	0.000139525	2.23906	2.21248	7.93084E-06	2.18670	6.77537	0	3.51050	
2-Methylpentane		0.169881	2.04154E-06	0.171295	1.14345	5.69557E-08	0.171973	0.460205	0	0.203110	
3-Methylpentane		0.129556	3.85611E-06	0.130679	0.796907	2.78569E-07	0.131462	0.343498	0	0.150711	
n-Hexane		18.6512	0.000128082	18.8240	2.79223	2.85774E-06	19.0038	46.9679	0	20.0701	
Methylcyclopentane		0.0415275	3.05024E-06	0.0419163	0.205748	5.77941E-07	0.0423402	0.103040	0	0.0459381	
Benzene		0.0106116	3.88833E-05	0.0107108	0.0525841	3.58205E-05	0.0108186	0.0251353	0	0.0118365	
2-Methylhexane		0.656705	2.08512E-06	0.663723	1.82217	4.94155E-08	0.675779	1.22784	0	0.538484	
3-Methylhexane		0.587171	1.85634E-06	0.593472	1.58253	4.59345E-08	0.604417	1.07715	0	0.479691	
Heptane		1.66211	4.35497E-06	1.68027	3.92747	1.08350E-07	1.71329	2.73449	0	1.28224	
Methylcyclohexane		0.850729	1.32173E-05	0.860003	2.03164	1.77071E-06	0.876758	1.42850	0	0.688289	
Toluene		0.236943	0.000188502	0.239562	0.503558	0.000170822	0.244446	0.350865	0	0.186574	
Octane		8.20289	4.07053E-06	8.29670	12.1103	6.74039E-08	8.48562	6.62205	0	5.37252	
Ethylbenzene		0.601640	0.000147628	0.608537	0.853868	0.000202468	0.622493	0.445966	0	0.404481	
m-Xylene		0.640362	0.000134249	0.647724	0.869855	0.000120888	0.662718	0.413827	0	0.425070	
o-Xylene		1.08933	0.000275669	1.10188	1.44349	0.000254853	1.12751	0.645614	0	0.721857	
Nonane		8.81392	2.25392E-06	8.91613	10.4585	5.87857E-08	9.12798	2.88503	0	5.58863	
C10+		46.9259	1.66510E-07	47.4736	49.0112	1.94326E-09	48.6239	0.553134	0	31.1071	
Mass Flow		**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	
Water		0.392441	7148.44	0.243993	0	7148.38	0.0526718	8.60334E-05	7487.90	1.19925	
H2S		0	0	0	0	0	0	0	0	0	
Nitrogen		0.0949844	0.00650472	0.0111037	0.202640	0.000272897	0.000241230	1.00818E-05	0	1.63695	
Carbon Dioxide		0.732959	0.181143	0.445015	0.265292	0.116737	0.0911548	0.000286700	0	6.43467	
Methane		30.9016	1.42317	8.82615	30.7973	0.117485	0.553118	0.00826618	0	410.899	
Ethane		59.6057	0.495913	42.8831	59.7909	0.0470680	12.8219	0.0387167	0	479.940	
Propane		67.4009	0.167935	61.0863	86.1759	0.0174377	37.6290	0.0483452	0	362.260	
Isobutane		43.2119	0.0139776	41.5558	31.9765	0.000541684	33.5001	0.0311503	0	170.699	
n-Butane		105.641	0.0516073	102.794	90.7909	0.00420823	88.0466	0.0764331	0	377.343	
Isopentane		92.7205	0.0120904	91.7309	71.2104	0.000693476	86.1242	0.0603940	0	233.392	
n-Pentane		105.193	0.00997726	104.353	100.379	0.000566955	99.5007	0.0663162	0	245.603	
2-Methylpentane		8.00987	0.000145988	7.98336	51.8777	4.07161E-06	7.82521	0.00450441	0	14.2101	
3-Methylpentane		6.10857	0.000275746	6.09042	36.1551	1.99142E-05	5.98185	0.00336210	0	10.5441	
n-Hexane		879.402	0.00915894	877.308	126.681	0.000204292	864.722	0.459714	0	1404.15	
Methylcyclopentane		1.95802	0.000218118	1.95354	9.33465	4.13155E-05	1.92659	0.00100854	0	3.21394	
Benzene		0.500335	0.00278049	0.499186	2.38570	0.00256071	0.492272	0.000246020	0	0.828108	
2-Methylhexane		30.9636	0.000149104	30.9334	82.6706	3.53258E-06	30.7497	0.0120179	0	37.6737	
3-Methylhexane		27.6850	0.000132744	27.6593	71.7982	3.28373E-06	27.5025	0.0105430	0	33.5604	
Heptane		78.3682	0.000311418	78.3103	178.187	7.74566E-06	77.9594	0.0267647	0	89.7084	
Methylcyclohexane		40.1118	0.000945151	40.0812	92.1740	0.000126583	39.8948	0.0139819	0	48.1544	
Toluene		11.1719	0.0134795	11.1650	22.8461	0.0122116	11.1229	0.00343420	0	13.0532	
Octane		386.766	0.000291078	386.674	549.437	4.81853E-06	386.118	0.0648155	0	375.875	
Ethylbenzene		28.3673	0.0105567	28.3613	38.7394	0.00946890	28.3251	0.00436504	0	28.2985	
m-Xylene		30.1930	0.00959997	30.1877	39.4647	0.00864193	30.1554	0.00405046	0	29.7389	
o-Xylene		51.3619	0.0197127	51.3539	65.4901	0.0182188	51.3046	0.00631916	0	50.5029	
Nonane		415.575	0.000161175	415.543	474.495	4.20243E-06	415.347	0.0282382	0	390.994	
C10+		2212.55	1.19069E-05	2212.55	2223.61	1.38918E-07	2212.51	0.00541398	0	2176.33	

Process Streams		**Gas**	**HP Separator Gas**	**HP Separator Oil**	**HP Separator Water**	**LP Separator Gas**	**LP Separator Oil**	**Oil**	**Oil W/B**	**OT Flash Gas**	**Produced Water**	**PWT Flash Gas**	**Sales Oil**	**Total gas to sale**	**Vapor recovery by VRU (to sale)**	**Water**	**Water W/B**	**Well Stream**
Properties	**Status:**	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: **Light Liquid**	**From Block:**	--	3 Phase Separator	3 Phase Separator	3 Phase Separator	2 Phase Separator	2 Phase Separator	--	--	Condensate Tanks	PW Tanks	PW Tanks	Condensate Tanks	MIX-100	HP Compressor Engine	--	--	MIX-101
	To Block:	MIX-101	MIX-100	2 Phase Separator	PW Tanks	HP Compressor Engine	Condensate Tanks	MIX-101	--	--	--	--	--	--	MIX-100	MIX-101	--	3 Phase Separator
Property	**Units**																	
Temperature	°F			70	70		70	85			75.94		75.94		70	85		85.7252
Pressure	psig			154	154		50	1000			0		0		154	1000		1000
Mole Fraction Vapor	%			0	0		0	0			0		0		0	0		0
Mole Fraction Light Liquid	%			100	100		100	100			100		100		100	100		100
Mole Fraction Heavy Liquid	%			0	0		0	0			0		0		0	0		0
Molecular Weight	lb/lbmol			108.336	18.0162		112.852	112.818			18.0156		118.103		72.0290	18.0153		66.6742
Mass Density	lb/ft^3			44.5701	62.2633		44.8365	45.1345			62.2171		44.9835		39.4924	62.1797		38.5334
Molar Flow	lbmol/h			43.5220	396.914		41.2983	40.2148			396.808		38.5280		0.0135987	415.641		104.932
Mass Flow	lb/h			4714.99	7150.87		4660.58	4536.93			7148.73		4550.26		0.978783	7487.90		6996.24
Vapor Volumetric Flow	ft^3/h			105.788	114.849		103.946	100.520			114.900		101.154		0.0247841	120.423		181.563
Liquid Volumetric Flow	gpm			13.1892	14.3188		12.9595	12.5324			14.3252		12.6114		0.00308997	15.0138		22.6364
Std Vapor Volumetric Flow	MMSCFD			0.396382	3.61495		0.376129	0.366261			3.61398		0.350899		0.000123761	3.78551		0.955680
Std Liquid Volumetric Flow	sgpm			13.3696	14.3041		13.0738	12.7016			14.2917		12.6000		0.00314532	14.9688		23.2348
Compressibility				0.0721380	0.00858747		0.0286473	0.433917			0.000740328		0.00671260		0.0541289	0.0502957		0.299972
Specific Gravity				0.714619	0.998306		0.718890	0.723668			0.997564		0.721248		0.633205	0.996965		0.617830
API Gravity				65.1655	10.0408		64.0330	60.9245			10.0153		62.6828		89.9496	9.89088		91.6325
Enthalpy	Btu/h			-4.12212E+06	-4.88147E+07		-4.03493E+06	-3.82181E+06			-4.87716E+07		-3.88255E+06		-998.937	-5.09995E+07		-7.04395E+06
Mass Enthalpy	Btu/lb			-874.257	-6826.40		-865.757	-842.377			-6822.40		-853.260		-1020.59	-6810.92		-1006.82
Mass Cp	Btu/(lb*°F)			0.492457	0.983074		0.490121	0.494230			0.982734		0.491214		0.530403	0.980410		0.548252
Ideal Gas CpCv Ratio				1.05058	1.32582		1.04857	1.04766			1.32555		1.04595		1.07595	1.32512		1.07993
Dynamic Viscosity	cP			0.503137	0.995508		0.543948	0.548281			0.924432		0.572336		0.234738	0.840365		0.207172

Kinematic Viscosity	cSt		0.704729	0.998140	0.757365	0.758357	0.927565	0.794285	0.371064	0.843719	0.335639							
Thermal Conductivity	Btu/(h*ft*°F)		0.0687756	0.346639	0.0690595	0.0679026	0.349783	0.0690800	0.0661518	0.353848	0.0635914							
Surface Tension	lbf/ft		0.00141904?	0.00504048?	0.00149885?	0.000853232?	0.00499710?	0.00153120?	0.00101233?	0.00492858	0.00055780?							
Net Ideal Gas Heating Value	Btu/ft^3		5460.93	0.312253	5683.91	5673.45	0.0323160	5942.42	3691.05	0	3410.59							
Net Liquid Heating Value	Btu/lb		18968.5	-1052.84	18952.1	18915.6	-1059.03	18932.7	19279.5	-1059.76	19260.2							
Gross Ideal Gas Heating Value	Btu/ft^3		5866.70	50.6397	6104.54	6090.52	50.3437	6380.01	3989.30	50.31	3681.74							
Gross Liquid Heating Value	Btu/lb		20389.5	7.23296	20366.2	20317.5	0.740254	20338.3	20850.1	0	20803.2							

Process Streams		**Gas**	**HP Separator Gas**	**HP Separator Oil**	**HP Separator Water**	**LP Separator Gas**	**LP Separator Oil**	**Oil**	**Oil W/B**	**OT Flash Gas**	**Produced Water**	**PWT Flash Gas**	**Sales Oil**	**Total gas to sale**	**Vapor recovery by VRU (to sale)**	**Water**	**Water W/B**	**Well Stream**
Composition	**Status:**	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: **Heavy Liquid**	**From Block:**	--	3 Phase Separator	3 Phase Separator	3 Phase Separator	2 Phase Separator	2 Phase Separator	--	--	Condensate Tanks	PW Tanks	PW Tanks	Condensate Tanks	MIX-100	HP Compressor Engine	--	--	MIX-101
	To Block:	MIX-101	MIX-100	2 Phase Separator	PW Tanks	HP Compressor Engine	Condensate Tanks	MIX-101	--	--	--	--	--	--	MIX-100	MIX-101	--	3 Phase Separator
Mole Fraction															%			%
Water															99.9701			99.8752
H2S															0			0
Nitrogen															1.92794E-05			0.000333892
Carbon Dioxide															0.00166918			0.00389670
Methane															0.0174530			0.104695
Ethane															0.00770164			0.0131406
Propane															0.00212779			0.00203807
Isobutane															0.000135711			0.000102839
n-Butane															0.000498649			0.000370603
Isopentane															8.87621E-05			4.75541E-05
n-Pentane															7.15743E-05			4.09948E-05
2-Methylpentane															7.66529E-07			4.04294E-07
3-Methylpentane															1.41996E-06			7.22430E-07
n-Hexane															4.47790E-05			2.30774E-05
Methylcyclopentane															1.10085E-06			5.19632E-07
Benzene															1.55765E-05			8.06629E-06
2-Methylhexane															4.67272E-07			2.19107E-07
3-Methylhexane															4.08882E-07			1.97930E-07
Heptane															8.63482E-07			3.91998E-07
Methylcyclohexane															2.75893E-06			1.62211E-06
Toluene															3.89497E-05			2.56642E-05
Octane															3.65902E-07			3.76109E-07
Ethylbenzene															1.32708E-05			1.41031E-05
m-Xylene															1.05447E-05			1.32074E-05
o-Xylene															1.99172E-05			2.79701E-05
Nonane															6.99458E-08			1.73727E-07
C10+															1.51665E-10			1.19984E-08
Molar Flow															**lbmol/h**			**lbmol/h**
Water															0.00327462			409.042
H2S																		0
Nitrogen															6.31515E-10			0.00136746
Carbon Dioxide															5.46757E-08			0.0159591
Methane															5.71689E-07			0.428783
Ethane															2.52275E-07			0.0538176
Propane															6.96980E-08			0.00834696
Isobutane															4.44535E-09			0.000421179
n-Butane															1.63337E-08			0.00151781
Isopentane															2.90749E-09			0.000194759
n-Pentane															2.34449E-09			0.000167895
2-Methylpentane															2.51084E-11			1.65580E-06
3-Methylpentane															4.65121E-11			2.95873E-06
n-Hexane															1.46678E-09			9.45141E-05
Methylcyclopentane															3.60594E-11			2.12817E-06
Benzene															5.10225E-10			3.30357E-05
2-Methylhexane															1.53060E-11			8.97360E-07
3-Methylhexane															1.33933E-11			8.10630E-07
Heptane															2.82842E-11			1.60544E-06
Methylcyclohexane															9.03714E-11			6.64341E-06
Toluene															1.27583E-09			0.000105109
Octane															1.19855E-11			1.54037E-06
Ethylbenzene															4.34700E-10			5.77598E-05
m-Xylene															3.45403E-10			5.40913E-05
o-Xylene															6.52409E-10			0.000114552
Nonane															2.29115E-12			7.11502E-07
C10+															4.96795E-15			4.91397E-08
Mass Fraction															%			%
Water															99.9588			99.8673
H2S															0			0
Nitrogen															2.99757E-05			0.000519154
Carbon Dioxide															0.00407718			0.00951849
Methane															0.0155400			0.0932230
Ethane															0.0128533			0.0219310
Propane															0.00520757			0.00498814
Isobutane															0.000437791			0.000331760
n-Butane															0.00160860			0.00119557
Isopentane															0.000355440			0.000190433
n-Pentane															0.000286613			0.000164165
2-Methylpentane															3.66625E-06			1.93377E-06
3-Methylpentane															6.79154E-06			3.45544E-06
n-Hexane															0.000214174			0.000110381
Methylcyclopentane															5.14210E-06			2.42730E-06
Benzene															6.75302E-05			3.49716E-05
2-Methylhexane															2.59870E-06			1.21859E-06
3-Methylhexane															2.27397E-06			1.10081E-06
Heptane															4.80219E-06			2.18014E-06
Methylcyclohexane															1.50349E-05			8.84007E-06
Toluene															0.000199184			0.000131248
Octane															2.31979E-06			2.38459E-06
Ethylbenzene															7.81970E-05			8.31039E-05
m-Xylene															6.21337E-05			7.78257E-05
o-Xylene															0.000117360			0.000164816
Nonane															4.97905E-07			1.23670E-06
C10+															1.45711E-09			1.15277E-07
Mass Flow															**lb/h**			**lb/h**
Water															0.0589932			7369.01
H2S																		0
Nitrogen															1.76909E-08			0.0383073
Carbon Dioxide															2.40625E-06			0.702350
Methane															9.17131E-06			6.87874
Ethane															7.58566E-06			1.61824
Propane															3.07338E-06			0.368065
Isobutane															2.58373E-07			0.0244799
n-Butane															9.49353E-07			0.0882187
Isopentane															2.09772E-07			0.0140516
n-Pentane															1.69152E-07			0.0121134
2-Methylpentane															2.16373E-09			0.000142689
3-Methylpentane															4.00819E-09			0.000254970
n-Hexane															1.26400E-07			0.00814479
Methylcyclopentane															3.03474E-09			0.000179106

Benzene															3.98546E-08			0.00258048
2-Methylhexane															1.53369E-09			8.99172E-05
3-Methylhexane															1.34204E-09			8.12267E-05
Heptane															2.83413E-09			0.000160868
Methylcyclohexane															8.87321E-09			0.000652290
Toluene															1.17553E-07			0.00968455
Octane															1.36908E-09			0.000175954
Ethylbenzene															4.61499E-08			0.00613207
m-Xylene															3.66697E-08			0.00574260
o-Xylene															6.92630E-08			0.0121614
Nonane															2.93851E-10			9.12538E-05
C10+															8.59952E-13			8.50608E-06

Process Streams		**Gas**	**HP Separator Gas**	**HP Separator Oil**	**HP Separator Water**	**LP Separator Gas**	**LP Separator Oil**	**Oil**	**Oil W/B**	**OT Flash Gas**	**Produced Water**	**PWT Flash Gas**	**Sales Oil**	**Total gas to sale**	**Vapor recovery by VRU (to sale)**	**Water**	**Water W/B**	**Well Stream**
Properties	**Status:**	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: **Heavy Liquid**	**From Block:**	--	3 Phase Separator	3 Phase Separator	3 Phase Separator	2 Phase Separator	2 Phase Separator	--	--	Condensate Tanks	PW Tanks	PW Tanks	Condensate Tanks	MIX-100	HP Compressor Engine	--	--	MIX-101
	To Block:	MIX-101	MIX-100	2 Phase Separator	PW Tanks	HP Compressor Engine	Condensate Tanks	MIX-101	--	--	--	--	--	--	MIX-100	MIX-101	--	3 Phase Separator
Property	**Units**																	
Temperature	°F														70			85.7252
Pressure	psig														154			1000
Mole Fraction Vapor	%														0			0
Mole Fraction Light Liquid	%														0			0
Mole Fraction Heavy Liquid	%														100			100
Molecular Weight	lb/lbmol														18.0173			18.0167
Mass Density	lb/ft^3														62.2640			62.0775
Molar Flow	lbmol/h														0.00327560			409.553
Mass Flow	lb/h														0.0590175			7378.80
Vapor Volumetric Flow	ft^3/h														0.000947859			118.864
Liquid Volumetric Flow	gpm														0.000118175			14.8195
Std Vapor Volumetric Flow	MMSCFD														2.98329E-05			3.73006
Std Liquid Volumetric Flow	sgpm														0.000118060			14.7900
Compressibility															0.00858793			0.0503155
Specific Gravity															0.998316			0.995325
API Gravity															10.0393			10.0998
Enthalpy	Btu/h														-402.853			-5.02053E+07
Mass Enthalpy	Btu/lb														-6826.00			-6803.99
Mass Cp	Btu/(lb*°F)														0.983067			0.981342
Ideal Gas CpCv Ratio															1.32580			1.32501
Dynamic Viscosity	cP														0.995525			0.824991
Kinematic Viscosity	cSt														0.998147			0.829649
Thermal Conductivity	Btu/(h*ft*°F)														0.346585			0.352329
Surface Tension	lbf/ft														0.00503970?			0.00491217?
Net Ideal Gas Heating Value	Btu/ft^3														0.364444			1.23492
Net Liquid Heating Value	Btu/lb														-1051.68			-1032.39
Gross Ideal Gas Heating Value	Btu/ft^3														50.6953			51.6131
Gross Liquid Heating Value	Btu/lb														8.39622			28.7178

Process Streams		**Gas**	**HP Separator Gas**	**HP Separator Oil**	**HP Separator Water**	**LP Separator Gas**	**LP Separator Oil**	**Oil**	**Oil W/B**	**OT Flash Gas**	**Produced Water**	**PWT Flash Gas**	**Sales Oil**	**Total gas to sale**	**Vapor recovery by VRU (to sale)**	**Water**	**Water W/B**	**Well Stream**
Composition	**Status:**	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: **Mixed Liquid**	**From Block:**	--	3 Phase Separator	3 Phase Separator	3 Phase Separator	2 Phase Separator	2 Phase Separator	--	--	Condensate Tanks	PW Tanks	PW Tanks	Condensate Tanks	MIX-100	HP Compressor Engine	--	--	MIX-101
	To Block:	MIX-101	MIX-100	2 Phase Separator	PW Tanks	HP Compressor Engine	Condensate Tanks	MIX-101	--	--	--	--	--	--	MIX-100	MIX-101	--	3 Phase Separator
Mole Fraction															**%**			**%**
Water															19.4457			79.5181
H2S															0			0
Nitrogen															0.00213779			0.0116237
Carbon Dioxide															0.0389530			0.0315209
Methane															3.05877			5.06176
Ethane															7.63649			3.11284
Propane															6.50153			1.59843
Isobutane															3.17801			0.570925
n-Butane															7.79785			1.26219
Isopentane															4.96360			0.628796
n-Pentane															5.45032			0.661689
2-Methylpentane															0.309946			0.0320512
3-Methylpentane															0.231345			0.0237829
n-Hexane															31.6326			3.16710
Methylcyclopentane															0.0710593			0.00742312
Benzene															0.0186790			0.00206704
2-Methylhexane															0.711187			0.0730786
3-Methylhexane															0.623903			0.0650997
Heptane															1.58386			0.174014
Methylcyclohexane															0.844400			0.0953277
Toluene															0.221020			0.0275566
Octane															3.36461			0.639582
Ethylbenzene															0.243805			0.0518207
m-Xylene															0.226234			0.0544572
o-Xylene															0.352950			0.0924841
Nonane															1.30555			0.592546
C10+															0.185460			2.44374
Molar Flow															**lbmol/h**			**lbmol/h**
Water															0.00327939			409.109
H2S															0			0
Nitrogen															3.60525E-07			0.0598019
Carbon Dioxide															6.56918E-06			0.162170
Methane															0.000515841			26.0420
Ethane															0.00128784			16.0151
Propane															0.00109644			8.22368
Isobutane															0.00053595			2.93732
n-Butane															0.00131506			6.49376
Isopentane															0.000837079			3.23506
n-Pentane															0.000919161			3.40429
2-Methylpentane															5.22703E-05			0.164899
3-Methylpentane															3.90147E-05			0.122359
n-Hexane															0.00533463			16.2942
Methylcyclopentane															1.19837E-05			0.0381908
Benzene															3.15009E-06			0.0106346
2-Methylhexane															0.000119937			0.375978
3-Methylhexane															0.000105217			0.334928
Heptane															0.000267107			0.895278
Methylcyclohexane															0.000142402			0.490447
Toluene															3.72735E-05			0.141775
Octane															0.000567420			3.29055
Ethylbenzene															4.11161E-05			0.266610
m-Xylene															3.81529E-05			0.280174
o-Xylene															5.95227E-05			0.475816
Nonane															0.000220172			3.04857
C10+															3.12766E-05			12.5727
Mass Fraction															**%**			**%**
Water															5.69273			51.2708
H2S															0			0

Nitrogen		0.000973167	0.0116539
Carbon Dioxide		0.0278576	0.0496487
Methane		0.797394	2.90627
Ethane		3.73139	3.34996
Propane		4.65872	2.52262
Isobutane		3.00160	1.18764
n-Butane		7.36500	2.62560
Isopentane		5.81944	1.62369
n-Pentane		6.39008	1.70862
2-Methylpentane		0.434035	0.0988533
3-Methylpentane		0.323965	0.0733518
n-Hexane		44.2969	9.76806
Methylcyclopentane		0.0971806	0.0223590
Benzene		0.0237097	0.00577869
2-Methylhexane		1.15802	0.262077
3-Methylhexane		1.01589	0.233463
Heptane		2.57898	0.624058
Methylcyclohexane		1.34727	0.334990
Toluene		0.330923	0.0908720
Octane		6.24547	2.61477
Ethylbenzene		0.420609	0.196901
m-Xylene		0.390297	0.206919
o-Xylene		0.608906	0.351408
Nonane		2.72097	2.71995
C10+		0.521678	15.1396
Mass Flow		**lb/h**	**lb/h**
Water		0.0590792	7370.21
H2S		0	0
Nitrogen		1.00995E-05	1.67526
Carbon Dioxide		0.000289106	7.13702
Methane		0.00827536	417.778
Ethane		0.0387242	481.558
Propane		0.0483483	362.628
Isobutane		0.0311506	170.724
n-Butane		0.0764340	377.432
Isopentane		0.0603942	233.406
n-Pentane		0.0663163	245.615
2-Methylpentane		0.00450442	14.2102
3-Methylpentane		0.00336211	10.5444
n-Hexane		0.459714	1404.16
Methylcyclopentane		0.00100854	3.21412
Benzene		0.000246059	0.830688
2-Methylhexane		0.0120179	37.6737
3-Methylhexane		0.0105430	33.5605
Heptane		0.0267647	89.7086
Methylcyclohexane		0.0139819	48.1550
Toluene		0.00343432	13.0629
Octane		0.0648155	375.875
Ethylbenzene		0.00436509	28.3046
m-Xylene		0.00405050	29.7447
o-Xylene		0.00631923	50.5150
Nonane		0.0282382	390.994
C10+		0.00541398	2176.33

Process Streams		**Gas**	**HP Separator Gas**	**HP Separator Oil**	**HP Separator Water**	**LP Separator Gas**	**LP Separator Oil**	**Oil**	**Oil W/B**	**OT Flash Gas**	**Produced Water**	**PWT Flash Gas**	**Sales Oil**	**Total gas to sale**	**Vapor recovery by VRU (to sale)**	**Water**	**Water W/B**	**Well Stream**
Properties	**Status:**	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: **Mixed Liquid**	**From Block:**	--	3 Phase Separator	3 Phase Separator	3 Phase Separator	2 Phase Separator	2 Phase Separator	--	--	Condensate Tanks	PW Tanks	PW Tanks	Condensate Tanks	MIX-100	HP Compressor Engine	--	--	MIX-101
	To Block:	MIX-101	MIX-100	2 Phase Separator	PW Tanks	HP Compressor Engine	Condensate Tanks	MIX-101	--	--	--	--	--	--	MIX-100	MIX-101	--	3 Phase Separator
Property	**Units**																	
Temperature	°F														70			85.7252
Pressure	psig														154			1000
Mole Fraction Vapor	%														0			0
Mole Fraction Light Liquid	%														80.5768			20.3955
Mole Fraction Heavy Liquid	%														19.4232			79.6045
Molecular Weight	lb/lbmol														61.5382			27.9407
Mass Density	lb/ft^3														40.3312			47.8487
Molar Flow	lbmol/h														0.0168643			514.485
Mass Flow	lb/h														1.03780			14375.0
Vapor Volumetric Flow	ft^3/h														0.0257320			300.427
Liquid Volumetric Flow	gpm														0.00320814			37.4559
Std Vapor Volumetric Flow	MMSCFD														0.000153594			4.68574
Std Liquid Volumetric Flow	sgpm														0.00326338			38.0247
Compressibility															0.0452834			0.101234
Specific Gravity															0.646654			0.767186
API Gravity															85.4380			50.2315
Enthalpy	Btu/h														-1401.79			-5.72492E+07
Mass Enthalpy	Btu/lb														-1350.73			-3982.54
Mass Cp	Btu/(lb*°F)														0.556145			0.770560
Ideal Gas CpCv Ratio															1.08924			1.19996
Dynamic Viscosity	cP														0.262762			0.451613
Kinematic Viscosity	cSt														0.394163			0.531095
Thermal Conductivity	Btu/(h*ft*°F)														0.0764818			0.177831
Surface Tension	lbf/ft														0.00116068?			0.00228061?
Net Ideal Gas Heating Value	Btu/ft^3														2974.20			696.590
Net Liquid Heating Value	Btu/lb														18123.3			8843.91
Gross Ideal Gas Heating Value	Btu/ft^3														3224.29			791.997
Gross Liquid Heating Value	Btu/lb														19664.8			10139.6

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									0.6192	0.2597				
EP-PCV					0.0869	0.3805							9.3563	40.9807
F001					3.5985	15.7613							86.5402	379.0460
EP-ENG001	0.3158	1.3831	5.6445	24.7228	0.0070	0.0307	0.0001	0.0006	0.0022	0.0098	0.0022	0.0098	27.37	119.88
EP-GPU001, EP-GPU002, EP-GPU003, EP-GPU004, EP-GPU005, EP-GPU006, EP-GPU007, EP-GPU008, EP-GPU009, EP-GPU010	1.2207	5.3468	1.0254	4.4914	0.0671	0.2941	0.0073	0.0321	0.0928	0.4064	0.0928	0.4064	1464.8896	6416.2167
EP-LH001, EP-LH002, EP-LH003, EP-LH004, EP-LH005, EP-LH006, EP-LH007, EP-LH008, EP-LH009, EP-LH010	1.6277	7.1291	1.3672	5.9885	0.0895	0.3921	0.0098	0.0428	0.1237	0.5418	0.1237	0.5418	1953.1862	8554.9555
EP-L001					6.7626	2.2215							5.3876	1.7698
EP-L002					9.02E-04	3.36E-04							0.8452	0.3149
EP-EC001, EP-EC002, EP-EC003	0.1262	0.5526	0.1060	0.4642	1.5932	6.9780	2.27E-05	9.93E-05	0.0096	0.0420	0.0072	0.0315	382.3473	1674.6811
TOTAL	3.2903	14.4117	8.1431	35.6668	1.7568	7.6949	0.0173	0.0756	0.2283	1.0000	0.2259	0.9895	3827.7921	16765.7293

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	0.0148	0.0647	0.0148	0.0647
F001			0.0016	0.0070	0.0152	0.0667	0.0258	0.1131	0.0699	0.3063	0.2202	0.9647	0.3328	1.4576
EP-ENG001	0.0048	0.0212	3.74E-04	0.0016	1.32E-04	5.78E-04	5.86E-06	2.57E-05	4.61E-05	2.02E-04			0.0054	0.0238
EP-GPU001, EP-GPU002, EP-GPU003, EP-GPU004, EP-GPU005, EP-GPU006, EP-GPU007, EP-GPU008, EP-GPU009, EP-GPU010	0.0009	0.0040	2.56E-05	1.12E-04	4.15E-05	0.0002			0.00E+00	0.00E+00	0.0220	0.0962	0.0230	0.1006
EP-LH001, EP-LH002, EP-LH003, EP-LH004, EP-LH005, EP-LH006, EP-LH007, EP-LH008, EP-LH009, EP-LH010	0.0012	0.0053	3.42E-05	0.0001	5.53E-05	2.42E-04			0.00E+00	0.00E+00	0.0293	0.1283	0.0306	0.1342
EP-L001			3.93E-05	1.29E-05	5.17E-04	1.70E-04	8.19E-04	2.69E-04	2.18E-03	7.16E-04	8.53E-02	2.80E-02	8.89E-02	2.92E-02
EP-L002			1.29E-07	4.80E-08	3.57E-07	1.33E-07	1.72E-07	6.42E-08	4.46E-07	1.66E-07	1.27E-08	4.72E-09	1.12E-06	4.16E-07
EP-EC001, EP-EC002, EP-EC003	2.84E-06	1.24E-05	0.0001	0.0006	0.0009	0.0038	0.0008	0.0034	0.0017	0.0076	0.2540	1.1124	0.2575	1.1278
TOTAL	0.0070	0.0306	0.0006	0.0025	0.0011	0.0048	0.0008	0.0034	0.0018	0.0078	0.3052	1.3370	0.3165	1.3864

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
McGill 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 498 Wilhelm Run Rd Greenwood, WV 26415 , near West Union in Doddridge County, West Virginia.

The latitude and longitude coordinates are: 39.274589 and -80.848908

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

Pollutants	TOTALS (tpy):
NO_X	14.4117
CO	35.6668
$PM_{2.5}$	0.9895
PM_{10}	1.0000
VOC	7.6949
SO_2	0.0756
Formaldehyde	0.0306
Benzene	0.0025
Toluene	0.0048
Ethylbenzene	0.0034
Xylenes	0.0078
Hexane	1.3370
Total HAPs	1.3864

Proposed new equipment will be installed upon permit issuance. Startup of operation using new equipment is planned to begin on or about November 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

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

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

www.ghd.com