July 5, 2016 Reference No. 082715

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

Dear Ms. Beverly McKeone:

Re: General Permit Registration G70-C Modification Application
Melody 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 Melody Well Pad.

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

1. Increase in production.
2. Addition of 4 condensate tanks.
3. Addition 2 Cimarron enclosed combustors.
4. Addition of 9 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. 448515 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/252

Encl.

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

General Permit G70-C Modification Application

Increase in production, addition of 4 condensate tanks, 2 Cimarron enclosed combustors, and 9 line heaters.

Melody Well Pad

Antero Resources Corporation

GHD Services Inc.
6320 Rothway Suite 100 Houston Texas 77040
082715 | Report No 252 | July 2016

Table of Contents

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: Melody Well Pad

Operating Site Physical Address: 1131 Knights Fork Rd.

City: West Union	Zip Code: 26456	County: Doddridge

Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits):
Latitude: 39.35844
Longitude: -80.75917

SIC Code: 1311 NAICS Code: 211111	DAQ Facility ID No. (For existing facilities) 017-00129

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: 7/5/2016

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: Increase in production, addition of 4 condensate tanks, 2 Cimarron enclosed combustors, and 9 line heaters.	
Directions to the facility: From the intersection of Co Rte 24 and Co Rte 24/3, head north west on Co Rte 24 for 0.6 miles. The entrance to the facility will be towards left.	
ATTACHMENTS AND SUPPORTING DOCUMENTS	
I have enclosed the following required documents:	
Check payable to WVDEP – Division of Air Quality with the appropriate application fee (per 45CSR13 and 45CSR22). ☒ Check attached to front of application. ☐ I wish to pay by electronic transfer. Contact for payment (incl. name and email address): ☐ I wish to pay by credit card. Contact for payment (incl. name and email address): ☒$500 (Construction, Modification, and Relocation) ☐$300 (Class II Administrative Update) ☒$1,000 NSPS fee for 40 CFR60, Subpart IIII, JJJJ 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	448516	
CR53116	5/31/2016	401007716		1,500.00

TOTAL : 1,500.00

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

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

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

NO. 448515

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

⑈448515⑈ ⑆221370632⑆6000000118910⑈

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:

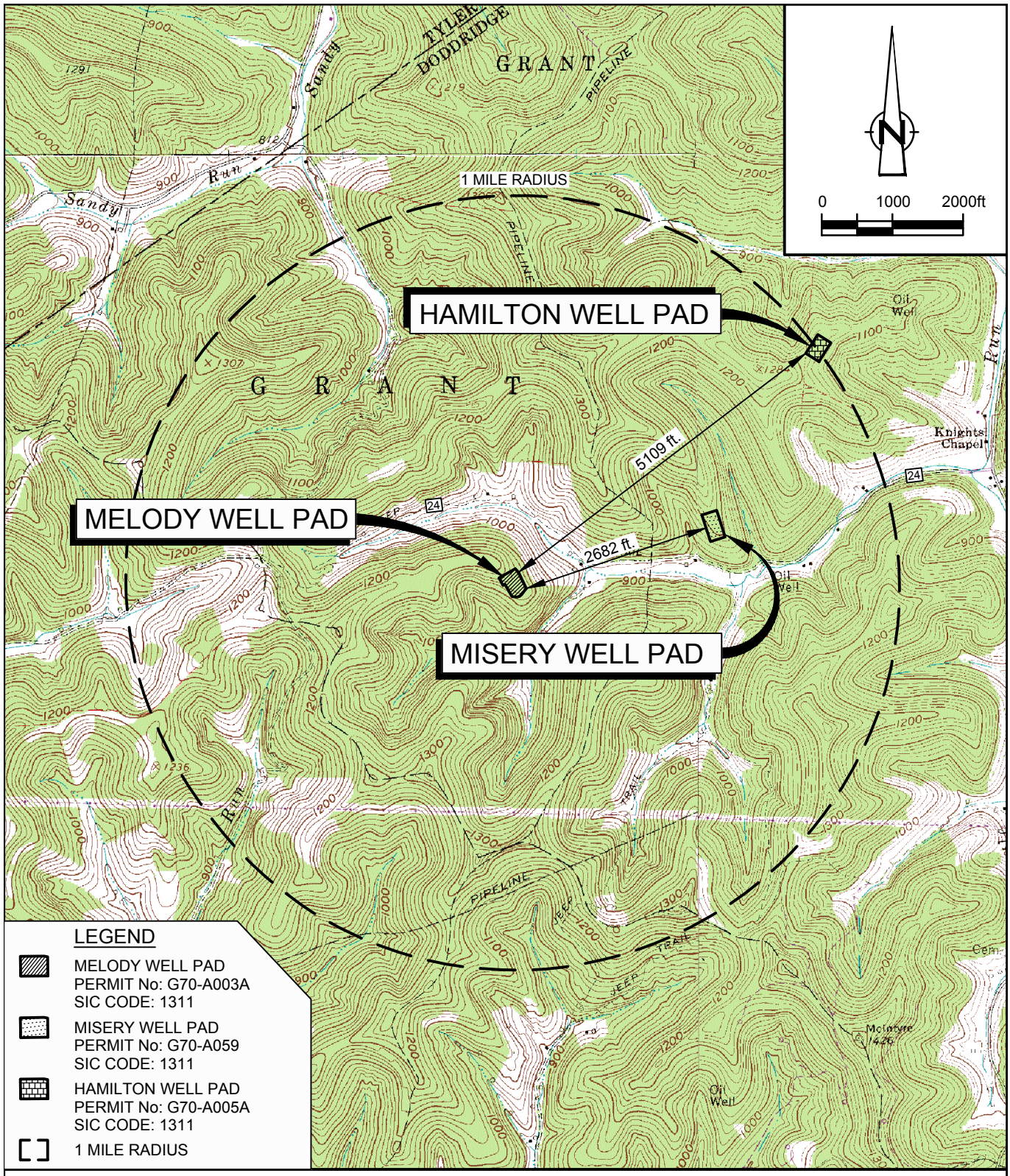
The Melody Well Pad calculation potential to emit included all the emissions sources that belong to the same industrial grouping, are located on contiguous or adjacent properties, and are under the control of the same person. The nearest emission source that belongs to the same industrial grouping and under the control of the same person but not located on contiguous or adjacent property is the Misery Well Pad. This operates independently and is approximately 0.50 mile northeast of the facility. There is one other nearby source, Hamilton Well Pad that belongs to the same industrial grouping and is under the same control but not located on contiguous or adjacent property. This well pad is located approximately 0.96 mile northeast of Melody Well Pad and operates completely independent.

ATTACHMENT A - SINGLE SOURCE DETERMINATION FORM

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

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

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



SOURCE: USGS QUADRANGLE MAPS;
WEST UNION, OXFORD, SMITHBURG, AND CENTER POINT, WEST VIRGINIA

SITE COORDINATES: LAT. 39.35844, LONG. -80.75917

Attachment A

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

82715-00(252)GN-WA004 JUN 9, 2016

Attachment B
Siting Criteria Waiver

Attachment B

Siting Waiver
Melody 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 Melody 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:

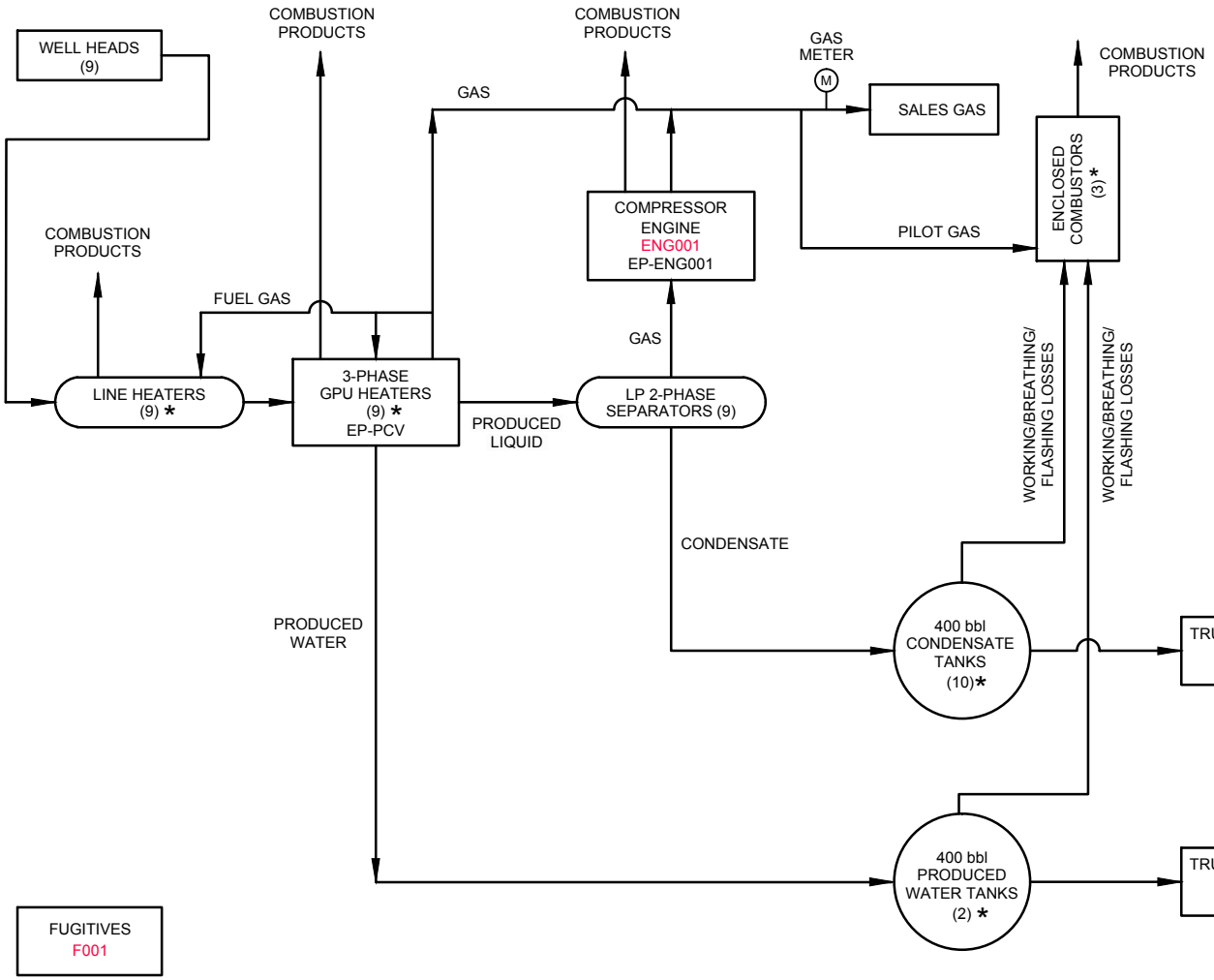
FIRST. The name of the Corporation is Antero Resources Corporation.

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 (9)

• 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		

3-PHASE GPU HEATERS (9)

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

CONDENSATE TANKS (10)

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

PRODUCED WATER TANKS (2)

- TANKPW001
- TANKPW002

ENCLOSED COMBUSTORS (3)

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

Attachment D

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

Attachment E
Process Description

Attachment E

Process Description
Melody 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 (LH001-009) and gas production units (GPU001-GPU009) 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.

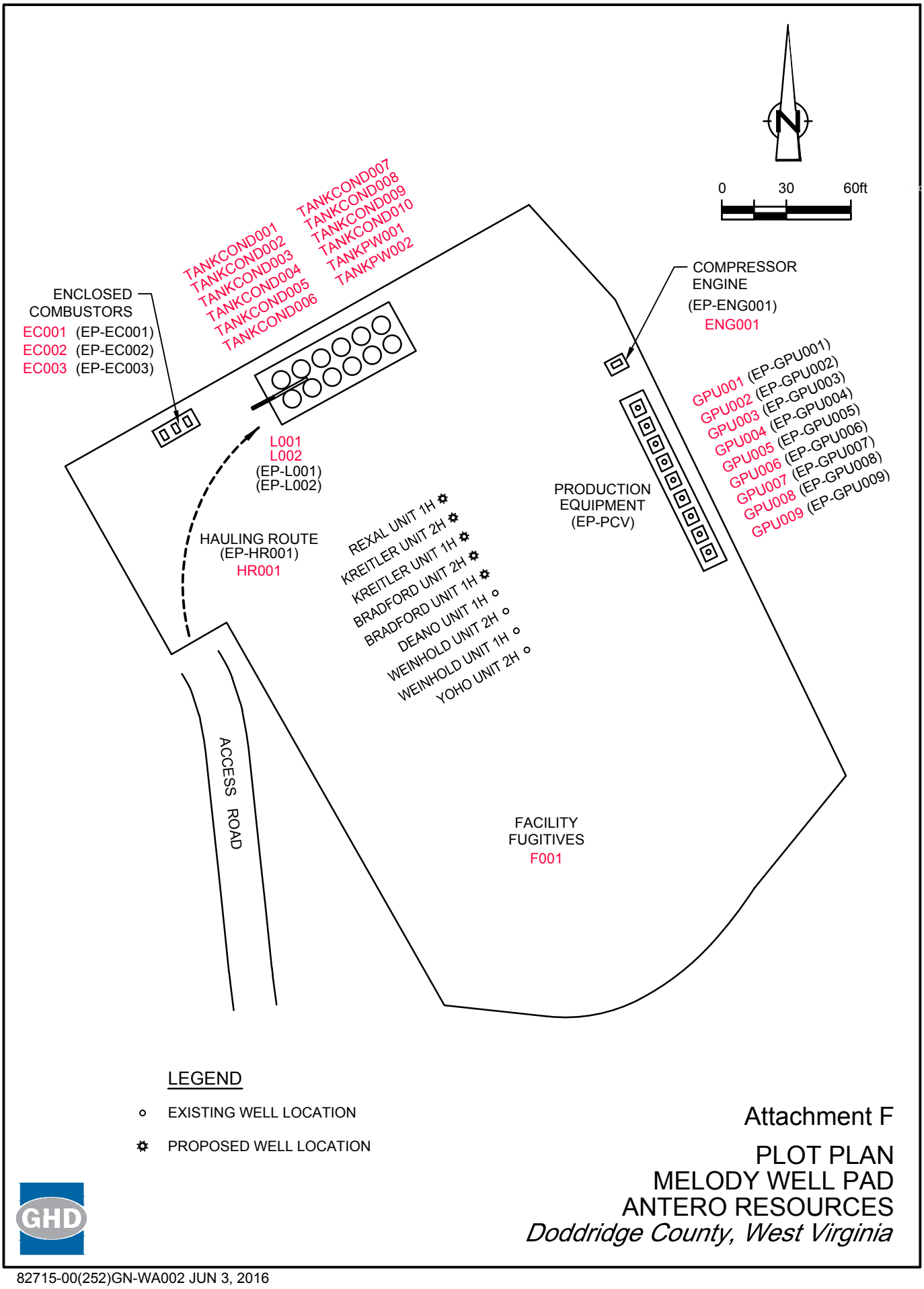
The gas from the three phase separators is metered and sent to the sales gas pipeline. The water flow to the produced water storage tanks (TANKPW001-002). The condensate is then sent to two phase low pressure separators where gas is further separated. The gas is routed to the gas fueled compressor engine (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 the condensate from Gaskins Unit 1H, one of the wells in the Hamilton Well Pad, and the gas from Deano Unit 2H, one of the wells in the Misery Well Pad. These extended analyses are considered representative of the materials from the Melody Well Pad, being in the same Marcellus rock formation.

Attachment F
Plot Plan



LEGEND

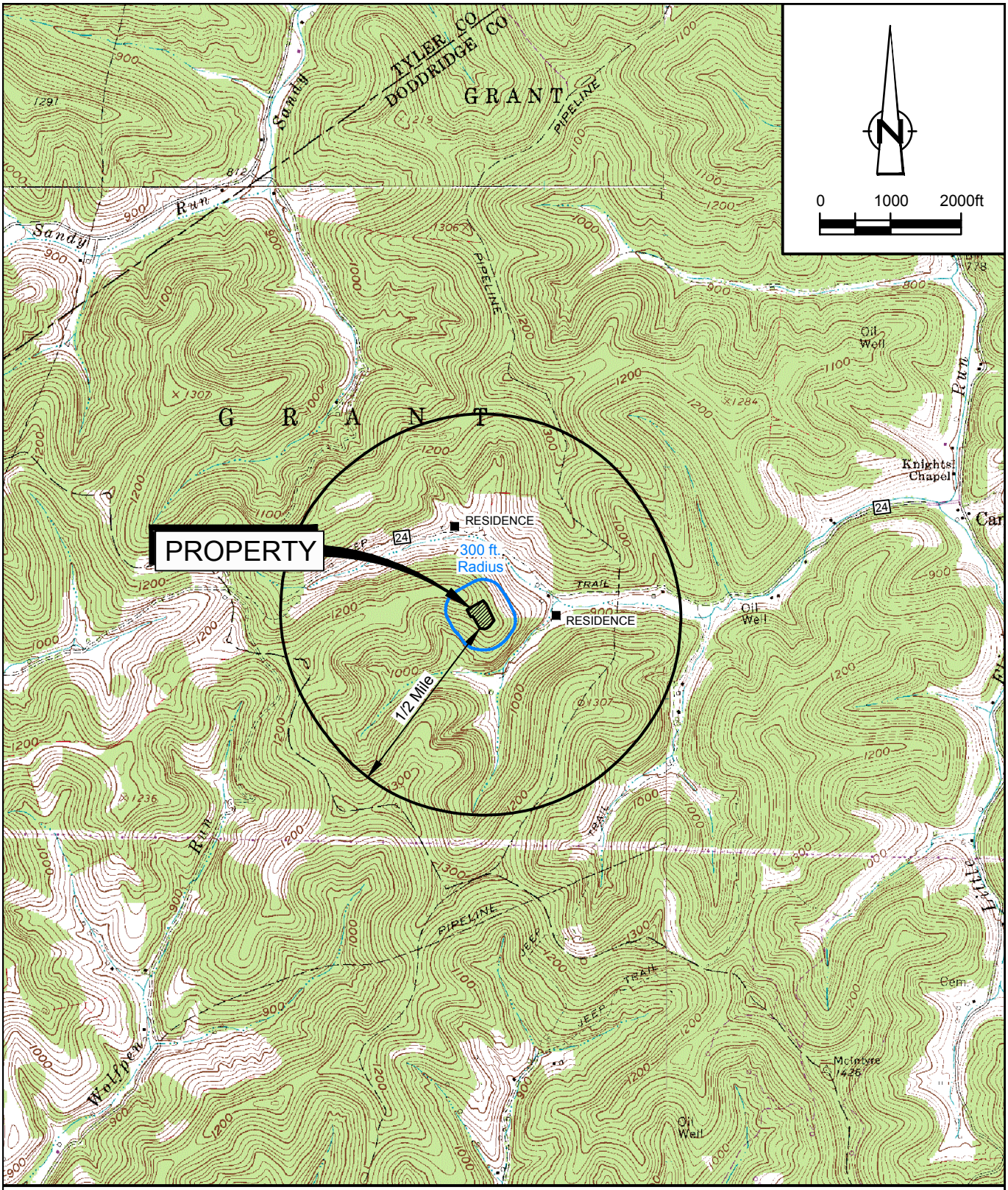
- EXISTING WELL LOCATION
- PROPOSED WELL LOCATION

Attachment F

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

82715-00(252)GN-WA002 JUN 3, 2016

Attachment G
Area Map



SOURCE: USGS QUADRANGLE MAPS;
WEST UNION, OXFORD, SMITHBURG, AND CENTER POINT, WEST VIRGINIA

SITE COORDINATES: LAT. 39.35844, LONG. -80.75917
SITE ELEVATION: 1135 ft AMSL

GHD

Attachment G

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

Attachment H
G70-C Section Applicability Form

ATTACHMENT H – G70-C SECTION APPLICABILITY FORM

General Permit G70-C Registration
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	EP-GPU001, EP-GPU002, EP-GPU003, EP-GPU004, EP-GPU005, EP-GPU006, EP-GPU007, EP-GPU008, EP-GPU009	Gas Production Unit Heater	2014		1.5 MMBtu/hr	Existing	N/A	
LH001, LH002, LH003, LH004, LH005, LH006, LH007, LH008, LH009	EP-LH001, EP-LH002, EP-LH003, EP-LH004, EP-LH005, EP-LH006, EP-LH007, EP-LH008, EP-LH009	Line Heater	2016		2.0 MMBtu/hr	New	N/A	
F001	F001	Fugitives	2014		N/A	Existing	N/A	
TANKCOND001-006	EP-EC001, EP-EC002, EP-EC003	Condensate Tank F/W/B	2014		400 bbl each	Existing	EC001, EC002, EC003	
TANKCOND007-010	EP-EC001, EP-EC002, EP-EC003	Condensate Tank F/W/B	2016		400 bbl each	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 (CO_2e)
Valves	☐ Yes ☑ No	450	EPA	gas	2.30	0.20	326.70
Valves	☐ Yes ☑ No	468	EPA	liquid	11.01	0.89	2.23
Connections (Not sampling)	☐ Yes ☑ No	531	EPA	gas	0.12	1.04E-02	17.13
Flanges	☐ Yes ☑ No	117	EPA	gas	0.05	4.47E-03	7.36
Loading	☐ Yes ☑ No	2	EPA	gas	3.58	2.55E-02	3.57

[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**
47-017-06497-00	1/21/2016	12/1/2015	Green
47-017-06495-00	1/30/2016	12/1/2015	Green
47-017-06496-00	1/22/2016	12/1/2015	Green
47-017-06533-00	2/6/2016	12/1/2015	Green
47-017-06477-00	1/1/2017	10/1/2016	Green
47-017-06480-00	1/1/2017	10/1/2016	Green
47-017-06479-00	1/1/2017	10/1/2016	Green
47-017-06534-00	1/1/2017	10/1/2016	Green
47-017-06535-00	1/1/2017	10/1/2016	Green

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

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

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

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

Where,

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

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

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

Attachment L
Storage Vessel Data Sheet

ATTACHMENT L – STORAGE VESSEL DATA SHEET

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

The following information is REQUIRED:

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

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

Additional information may be requested if necessary.

GENERAL INFORMATION (REQUIRED)

1. Bulk Storage Area Name: 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) 6-2014 4-2016 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): 5595450	13B. Maximum daily throughput (gal/day): 15330
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 34	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 6-2014 4-2016

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): 65.07	31. Annual Average Maximum Temperature (°F): 75.94
32. Annual Average Minimum Temperature (°F): 46.55	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)	2.90
39A. Average Liquid Surface Temperature (°F)	65.08	39B. Corresponding Vapor Pressure (psia)	4.13
40A. Maximum Liquid Surface Temperature (°F)	75.94	40B. Corresponding Vapor Pressure (psia)	5.03

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)	6.3300		
41D. Liquid Molecular Weight (lb/lb-mole)	106.50		
41E. Vapor Molecular Weight (lb/lb-mole)	38.8703		
Maximum Vapor Pressure 41F. True (psia)	5.0290		
41G. Reid (psia)	6.0900		
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.: Charleston, WV	
30. Daily Average Ambient Temperature (°F): 65.07	31. Annual Average Maximum Temperature (°F): 75.94
32. Annual Average Minimum Temperature (°F): 46.55	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)	18.4300		
Maximum Vapor Pressure 41F. True (psia)	0.4923		
41G. Reid (psia)	1.0229		
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	1201.3172
GPU002	EP-GPU002	Gas Production Unit Heater	2014	Existing	1.5	1201.3172
GPU003	EP-GPU003	Gas Production Unit Heater	2014	Existing	1.5	1201.3172
GPU004	EP-GPU004	Gas Production Unit Heater	2014	Existing	1.5	1201.3172
GPU005	EP-GPU005	Gas Production Unit Heater	2014	Existing	1.5	1201.3172
GPU006	EP-GPU006	Gas Production Unit Heater	2014	Existing	1.5	1201.3172
GPU007	EP-GPU007	Gas Production Unit Heater	2014	Existing	1.5	1201.3172
GPU008	EP-GPU008	Gas Production Unit Heater	2014	Existing	1.5	1201.3172
GPU009	EP-GPU009	Gas Production Unit Heater	2014	Existing	1.5	1201.3172
LH001	EP-LH001	Line Heater	2016	New	2	1201.3172
LH002	EP-LH002	Line Heater	2016	New	2	1201.3172
LH003	EP-LH003	Line Heater	2016	New	2	1201.3172
LH004	EP-LH004	Line Heater	2016	New	2	1201.3172
LH005	EP-LH005	Line Heater	2016	New	2	1201.3172
LH006	EP-LH006	Line Heater	2016	New	2	1201.3172
LH007	EP-LH007	Line Heater	2016	New	2	1201.3172
LH008	EP-LH008	Line Heater	2016	New	2	1201.3172
LH009	EP-LH009	Line Heater	2016	New	2	1201.3172

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	0.0068	0.0300				
AP	SO2	0.0001	0.0006				
AP	PM10	0.0022	0.0096				
AP	Formaldehyde	0.0047	0.0208				
AP	Total HAPs	0.0053	0.0232				
OT	GHG (CO2e)	26.7577	117.1986				

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.

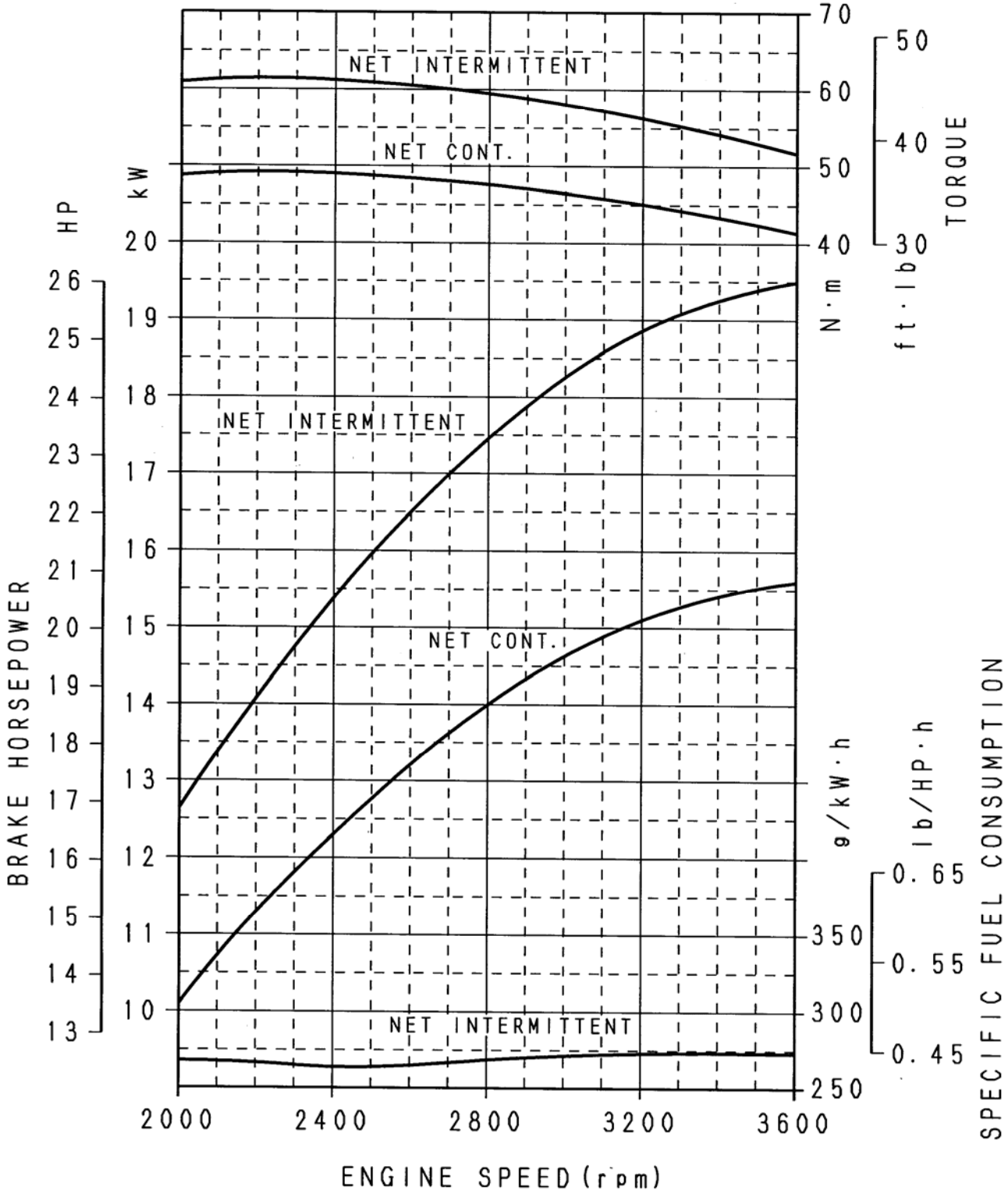
1. GENERAL SPECIFICATIONS

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

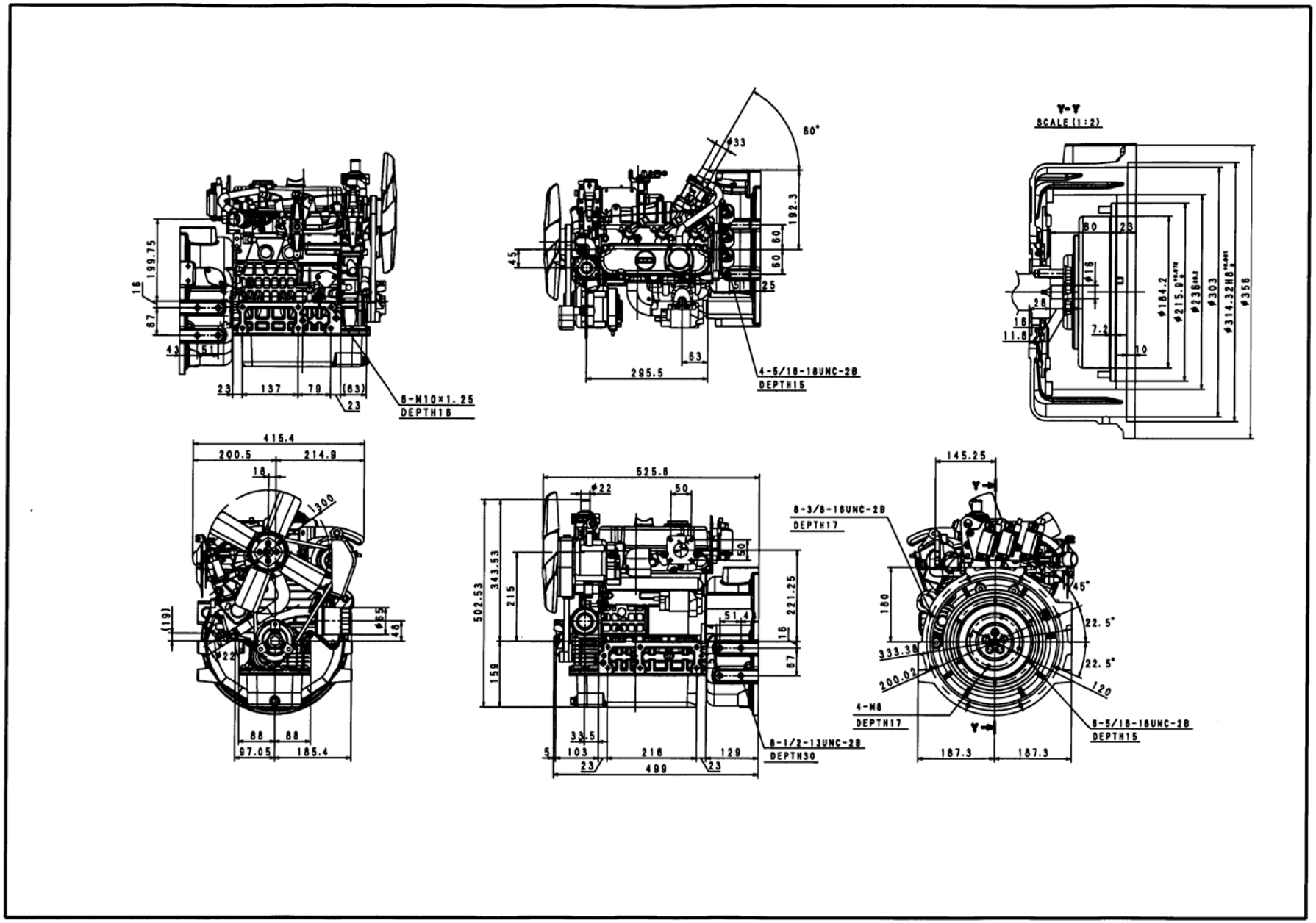
2. PERFORMANCE CURVES

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

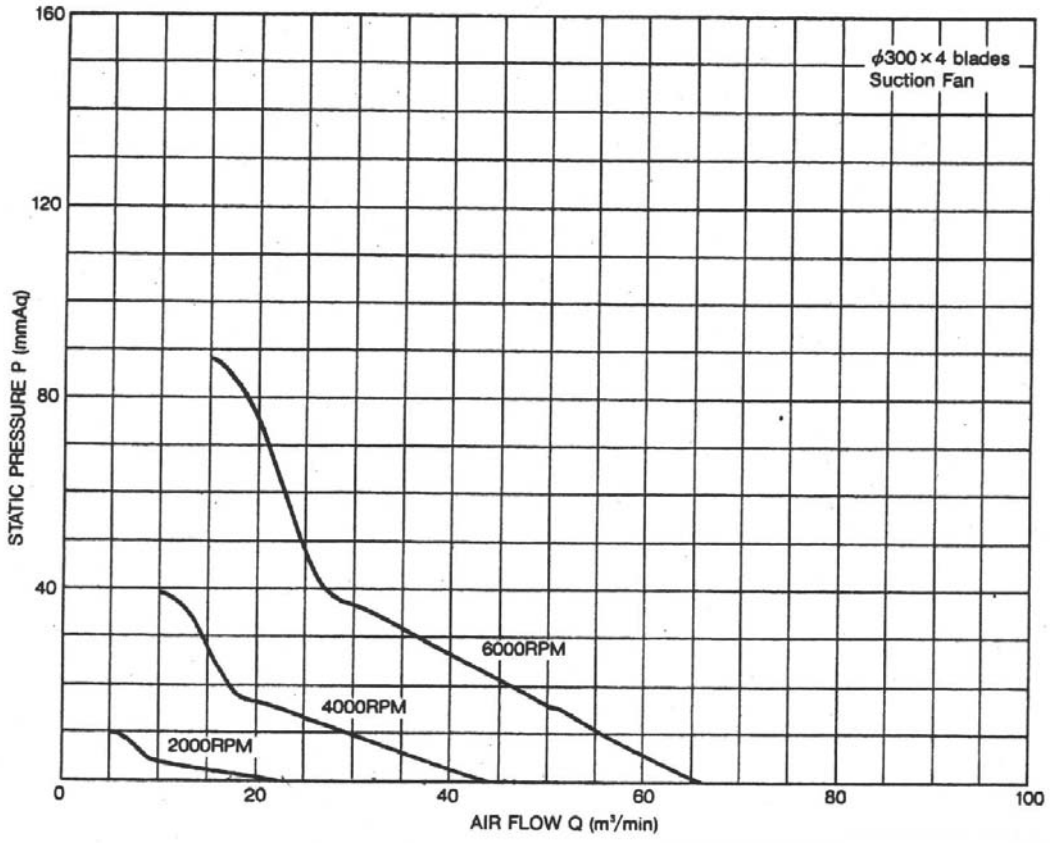
Be: Specific fuel consumption

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

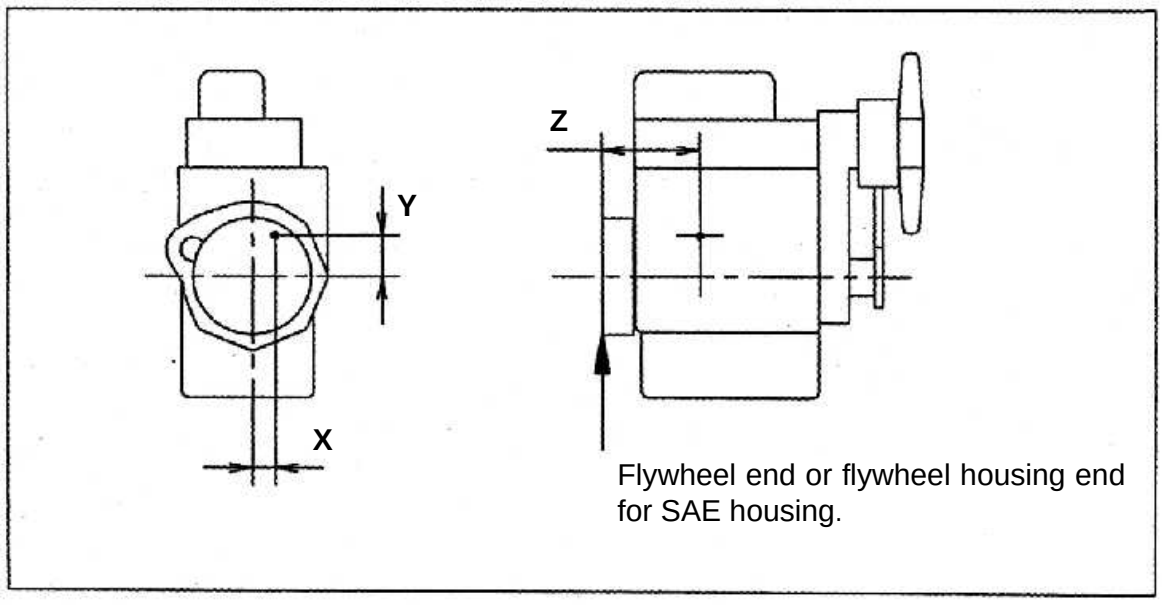
1. With standard flywheel and rear-end plate

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)

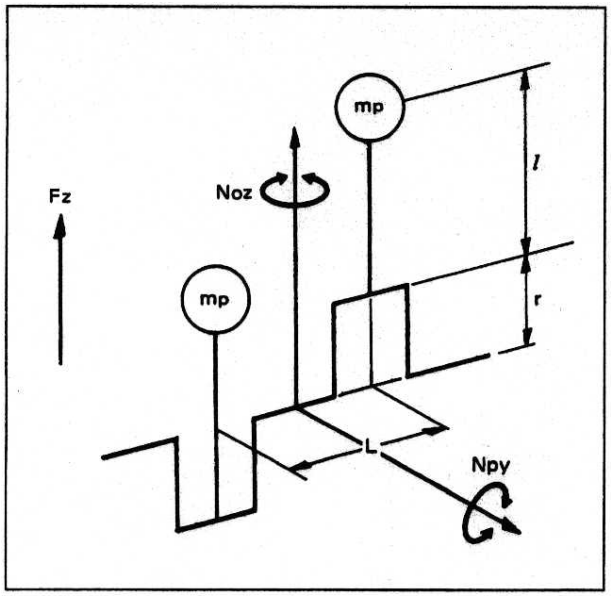
Note
Cooling water and lubricating oil weight is not included in above engine weight.



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

($x\omega^2$)

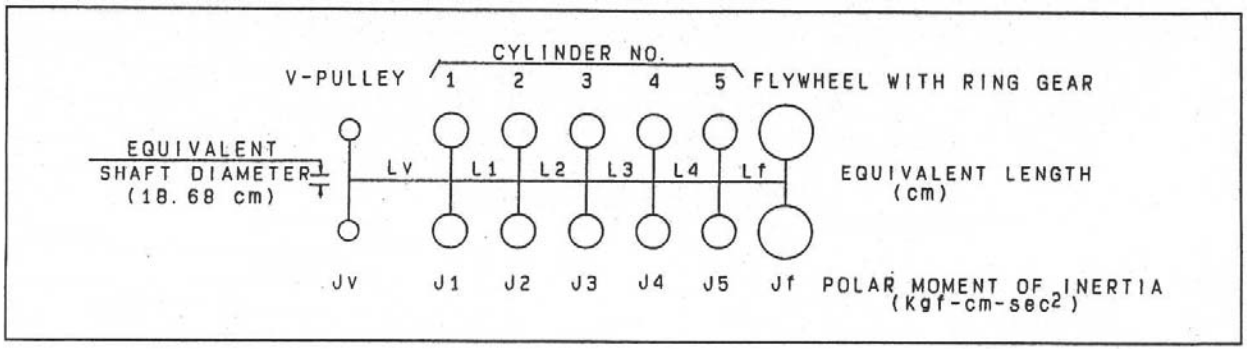
Model	No. of Cylinder	Cylinder Bore	Order	Fz	Npy	Noz
WG/DF/DG 972	3	74.5mm	1	0	0.000096	0.000096
			2	0	0.000072	0

▼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)

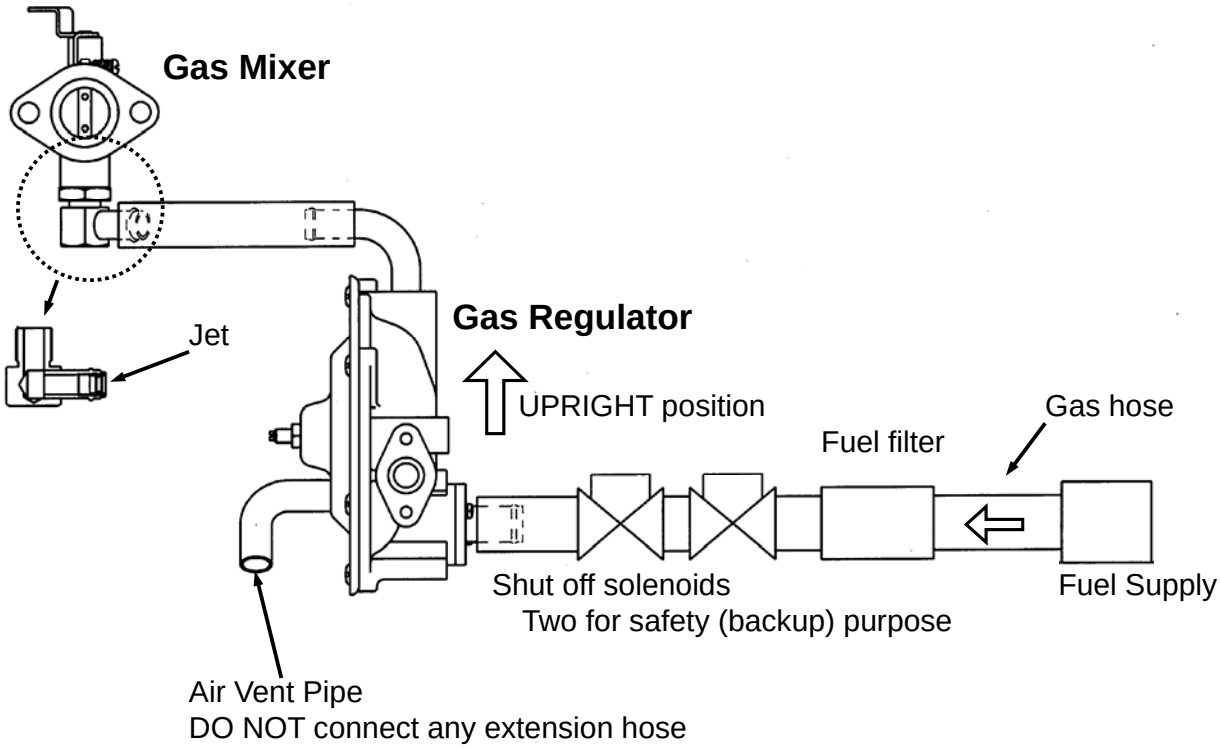
Equipments Vacuum Meter : Not KUBOTA supplied
Adjustable Jet : Service Tool

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

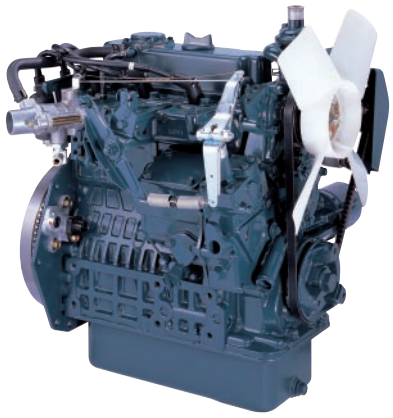
KUBOTA DG SERIES (3-cylinder)

DG972-E2

2 EPA Tier

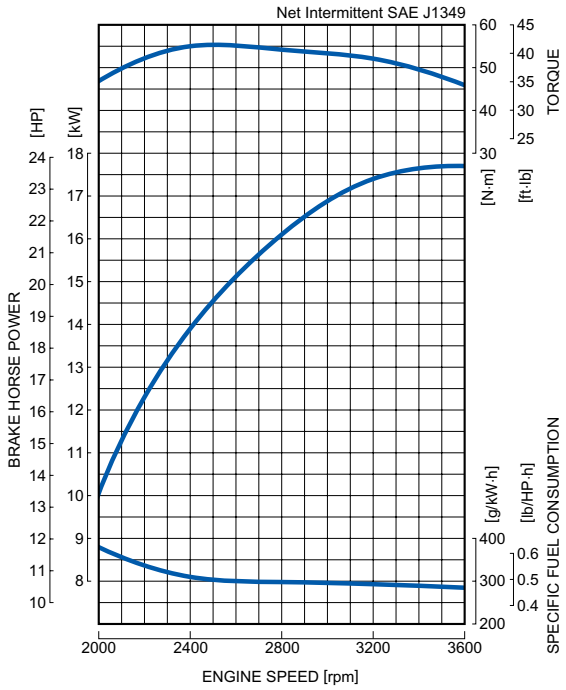
RATED POWER

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

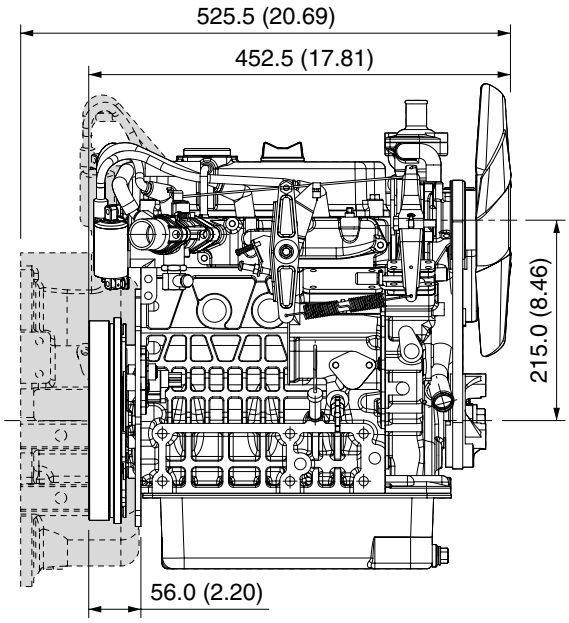
KUBOTA DG SERIES

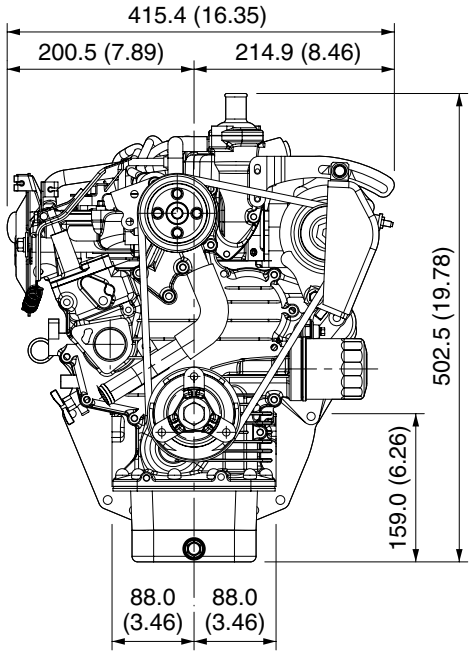
GENERAL SPECIFICATION

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	6	6	6	6
Days/week	2	2	2	2

Bulk Liquid Data (use extra pages as necessary)

Liquid Name		Condensate	Produced Water	
Max. Daily Throughput (1000 gal/day)		15.33	20.58	
Max. Annual Throughput (1000 gal/yr)		5595.45	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		5.03	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)	12.8820	0.0008	
	Annual (ton/yr)	3.5754	0.0003	
Max HAP Emission Rate	Loading (lb/hr)	0.0918	1.63E-06	
	Annual (ton/yr)	0.0255	6.06E-07	
Estimation Method		Promax	Promax	

1 BF Bottom Fill SP Splash Fill SUB Submerged Fill

2 At maximum bulk liquid temperature

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

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

CA Carbon Adsorption VB Dedicated Vapor Balance (closed system)

ECD Enclosed Combustion Device F Flare

TO Thermal Oxidization or Incineration

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

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

Attachment R
Air Pollution Control Device – Emission Reduction Device Sheets

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

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

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

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

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

VAPOR COMBUSTION (Including Enclosed Combustors)

General Information

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

Control Device Information

Type of Vapor Combustion Control?

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

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

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

Waste Gas Information

Maximum Waste Gas Flow Rate	Heat Value of Waste Gas Stream	Exit Velocity of the Emission Stream
15.09 (scfm)	2,020.88 BTU/ft^3	0.0289 (ft/s)

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

Pilot Gas Information

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

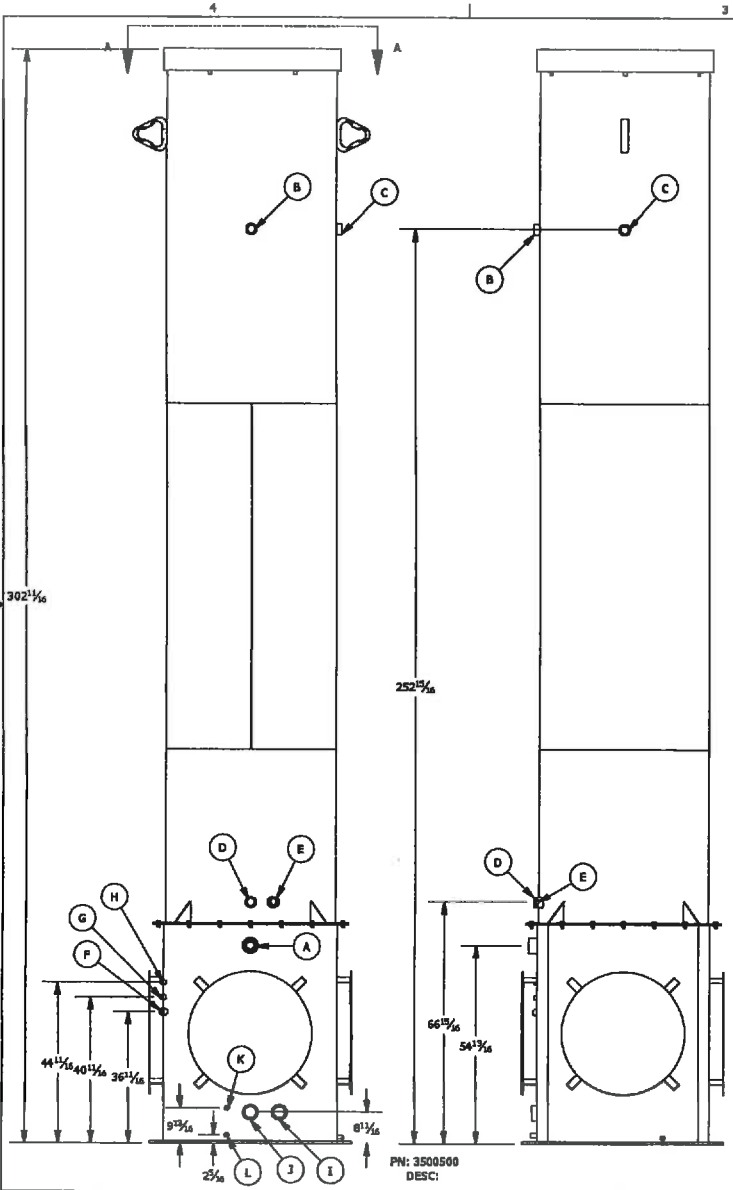
If automatic re-ignition is used, please describe the method. Flame Rectification, a thermocouple equivalent

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

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

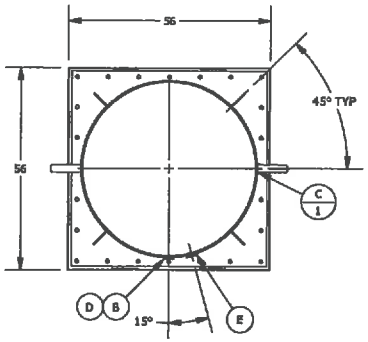
Additional information attached? ☑ Yes ☐ No Manufacturer's specs sheet

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



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

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



VIEW A-A

PN: 3500500
DESC:

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

UNLESS OTHERWISE SPECIFIED

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

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

CIMARRON
Energy Inc.

TITLE:
48" HIGH VOLUME ECD

DATE:	WO No.:	SHEET: 1 OF 1

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

Attachment S
Emissions Calculations

Table 1

Facility Information
Melody 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	Melody Well Pad
Nearest City/Town	West Union
SIC Code	1311
Latitude/Longitude	39.35844, -80.75927
County	Doddridge County

Technical Information	
Max Condensate Site Throughput (bbl/day):	365
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	9
IC Engines	1
Gas Production Unit Heaters	9
Line Heaters	9
Condensate Tanks	10
Produced Water Tanks	2
Loading Jobs	2
Enclosed Combustors	3

Table 2

Uncontrolled/Controlled Emissions Summary
Melody 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]	3.1380	13.7443			89.201	390.70							1.7522	0.6834			0.2576	1.1283	0.0025	0.0109	5.81E-02	2.55E-01		
Flashing, Working and Breathing (F/W/B) Losses[2]	51.5937	225.9805			202.2018	885.6441											4.4143	19.3348	0.0112	0.0490	0.0782	0.3427		
Engine Emissions[3]	6.84E-03	3.00E-02	3.16E-01	1.38E+00	2.68E+01	1.17E+02	5.64E+00	2.47E+01	1.36E-04	5.95E-04	2.20E-03	9.62E-03	2.20E-03	9.62E-03			5.31E-03	2.32E-02	3.65E-04	1.60E-03	4.51E-05	1.97E-04	4.74E-03	2.08E-02
Gas Production Unit Heater Emissions[4]	0.0618	0.2707	1.1238	4.9221	1,348.52	5,906.52	0.9440	4.1346	0.0067	0.0295	0.0854	0.3741	0.0854	0.3741	5.62E-06	2.46E-05	2.12E-02	9.27E-02	2.36E-05	1.03E-04			0.0008	0.0037
Line Heater Emissions[4]	0.0824	0.3610	1.4984	6.5628	1,798.03	7,875.36	1.2586	5.5127	0.0090	0.0394	0.1139	0.4988	0.1139	0.4988	7.49E-06	3.28E-05	2.82E-02	1.24E-01	3.15E-05	1.38E-04			0.0011	0.0049
TOTALS:	**54.8827**	**240.3864**	**2.9379**	**12.8680**	**3464.7063**	**15175.4135**	**7.8471**	**34.3701**	**0.0159**	**0.0695**	**0.2015**	**0.8825**	**1.9537**	**1.5658**	**1.31E-05**	**5.74E-05**	**4.7266**	**20.7026**	**0.0141**	**0.0618**	**0.1364**	**0.5976**	**0.0067**	**0.0294**
TOTALS (Excluding Fugitives):	**51.7448**	**226.6422**	**2.9379**	**12.8680**	**3375.5057**	**14784.7148**	**7.8471**	**34.3701**	**0.0159**	**0.0695**	**0.2015**	**0.8825**	**0.2015**	**0.8825**	**1.31E-05**	**5.74E-05**	**4.4690**	**19.5743**	**0.0116**	**0.0509**	**0.0783**	**0.3429**	**0.0067**	**0.0294**
UNCONTROLLED (Truck Loading Emissions)																								
Truck Loading Emissions[5]	12.8828	3.5757			12.5867	3.5742											0.0918	2.55E-02	0.0002	4.95E-05	0.0057	1.58E-03		
CONTROLLED EMISSIONS																								
Enclosed Combustor Emissions (from F/W/B losses)[6]	1.0321	4.5205	0.0943	0.4132	267.5321	1171.7904	0.0793	0.3471	2.27E-05	0.0001	0.0054	0.0236	0.0072	0.0314	4.72E-07	2.07E-06	0.0884	0.3870	0.0002	0.0010	0.0016	0.0069	2.84E-06	1.24E-05
Controlled Fugitive Emissions from Hauling													0.8761	0.3417										
TOTALS:	**1.03E+00**	**4.52E+00**	**9.43E-02**	**4.13E-01**	**2.68E+02**	**1.17E+03**	**7.93E-02**	**3.47E-01**	**2.27E-05**	**9.93E-05**	**5.38E-03**	**2.36E-02**	**8.83E-01**	**3.73E-01**	**4.72E-07**	**2.07E-06**	**8.84E-02**	**3.87E-01**	**2.24E-04**	**9.81E-04**	**1.56E-03**	**6.85E-03**	**2.84E-06**	**1.24E-05**
POTENTIAL TO EMIT[7]	**4.3211**	**22.5022**	**3.0322**	**13.2812**	**3530.0365**	**15465.1340**	**7.9263**	**34.7172**	**0.0159**	**0.0696**	**0.2069**	**0.9060**	**1.0848**	**1.2556**	**1.36E-05**	**5.95E-05**	**0.4006**	**1.7802**	**0.0031**	**0.0138**	**0.0598**	**0.2633**	**0.0067**	**0.0294**
POTENTIAL TO EMIT (Excluding Fugitives)	**1.1831**	**5.1822**	**3.0322**	**13.2812**	**3440.8359**	**15070.8611**	**7.9263**	**34.7172**	**0.0159**	**0.0696**	**0.2069**	**0.9060**	**0.2086**	**0.9139**	**1.36E-05**	**5.95E-05**	**0.1430**	**0.6264**	**0.0006**	**0.0028**	**0.0016**	**0.0071**	**0.0067**	**0.0294**

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 365 barrels per day, VOC emissions would be 12.8828 pounds per hour when there are truck loading activities. Average hourly VOC emissions from truck loading is 0.8164 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

Melody Well Pad

Doddridge County, West Virginia

Antero Resources Corporation

Pollutant		Emissions		Threshold Exceeded?		
		Uncontrolled	Controlled	Threshold	Uncontrolled	Controlled
VOC	lbs/hr	54.8827	4.3211	6	**Yes**	
	tons/yr	243.9622	22.5022	10	**Yes**	**Yes**
NO_X	lbs/hr	2.9379	3.0322	6		
	tons/yr	12.8680	13.2812	10	**Yes**	**Yes**
CO	lbs/hr	7.8471	7.9263	6	**Yes**	**Yes**
	tons/yr	34.3701	34.7172	10	**Yes**	**Yes**
SO_2	lbs/hr	0.0159	0.0159	6		
	tons/yr	0.0695	0.0696	10		
$PM_{2.5}$	lbs/hr	0.2015	0.2069	6		
	tons/yr	0.8825	0.9060	10		
PM_{10}	lbs/hr	1.9537	1.0848	6		
	tons/yr	1.5658	1.2556	10		
Lead	lbs/hr	1.31E-05	1.36E-05	6		
	tons/yr	5.74E-05	5.95E-05	10		
Total HAPs	lbs/hr	4.7266	0.4006	2	**Yes**	
	tons/yr	20.7281	1.7802	5	**Yes**	
Total TAPs	lbs/hr	0.0208	0.0098	1.14		
n-Hexane	lbs/hr	4.4387	0.2884			
	tons/yr	19.4643	1.2859			
Toluene	lbs/hr	0.0717	0.0192			
	tons/yr	0.3145	0.0845			
Ethylbenzene	lbs/hr	0.0589	0.0234			
	tons/yr	0.2586	0.1031			
Xylenes	lbs/hr	0.1364	0.0598			
	tons/yr	0.5991	0.2633			
Benzene	lbs/hr	0.0141	0.0031			
	tons/yr	0.0618	0.0138			

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
Melody 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	0.118
	Benzene frac	0.000
	Toluene	0.000
	Ethylbenzene	0.000
	Xylenes	0.000
	n-Hexane	0.010
	HAPs	0.010
	Methane	0.670

Gas					
Number	Component	Pollutant	Emission Factor (kg/hr of THC per component)	kg/hr	lb/yr
450	Valves	Gas VOC	0.004500	0.24	4,600.90
		Non VOC	0.004500	1.79	34,424.90
		HAPs	0.004500	0.02	397.12
		CO2e	0.004500	33.90	653,402.93
531	Connectors	VOC	0.000200	0.01	241.29
		Non-VOC	0.000200	0.09	1,805.39
		HAPs	0.000200	0.00	20.83
		CO2e	0.000200	1.78	34,267.35
117	Flanges	VOC	0.000390	0.01	103.67
		Non-VOC	0.000390	0.04	775.71
		HAPs	0.000390	0.00	8.95
		CO2e	0.000390	0.763976	14723.345962
			Total VOCs:	0.26	4945.87
			Total THC:	2.18	41951.87

Light Liquid Weight Fraction From Analysis:	VOC frac	0.976
	Benzene frac	0.001
	Toluene	0.007
	Ethylbenzene	0.009
	Xylenes	0.023
	n-hexane	0.040
	HAPs	0.079
	Methane	0.008

Light Liquid					
Number	Component	Pollutant	Emission Factor (kg/hr of THC per component)	kg/hr	lb/yr
468	Valves	Light Liquid VOC	0.002500	1.14	22,017.89
		Light Liquid Non-VOC	0.002500	0.03	530.35
		Light Liquid HAPs	0.002500	0.09	1,784.47
		CO2e	0.002500	0.23	4462.64
			Total VOC:	1.14	22,017.89
			Total THC:	1.17	22,548.24

Fugitive Total Emissions			
	Annual Emissions (lb/yr)	Annual Emissions (lb/hr)	Annual Emissions (tpy)
VOC	26,963.76	3.08	13.48
Ethylbenzene		0.02	0.10
Toluene		0.02	0.08
Xylenes		0.06	0.25
n-Hexane		0.15	0.66
TAPs (Benzene)		0.00	0.01
HAPs		0.25	1.11
CO_{2e}	706,856.26	80.69	353.43

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
Melody Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Number of PCVs	36
Bleed Rate (scf/day/PCV)	6.6
Total Bleed Rate (scf/day)	237.6

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	0.3903	14.01	0.9273528	2.44E-03	0.03	1.43E-03	0.01
Carbon Dioxide	0.1666	44.01	0.3958416	1.04E-03	0.05	1.91E-03	8.38E-03
Methane	81.3211	16.04	193.2189336	0.51	8.17	0.34	1.49
Ethane	13.757	30.07	32.686632	0.09	2.59	0.11	0.47
Propane	2.5368	44.1	6.0274368	0.02	0.70	0.03	0.13
Isobutane	0.4674	58.12	1.1105424	2.93E-03	0.17	0.01	0.03
n-Butane	0.7709	58.12	1.8316584	4.83E-03	0.28	0.01	0.05
Isopentane	0.2029	72.15	0.4820904	1.27E-03	0.09	3.82E-03	0.02
n-Pentane	0.157	72.15	0.373032	9.83E-04	0.07	2.96E-03	0.01
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	0.23	86.18	0.54648	1.44E-03	0.12	0.01	0.02
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	0.0599	0.2624
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	0.0052	0.0226
HAPs Emissions	0.0052	0.0226
TAPs Emissions	0.00E+00	0.00E+00
CO_{2e} emissions	8.5093	37.2705

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
Melody 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	0.2136	0.1601	0.7012	2.7492	0.0634	0.2779
H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Nitrogen	0.0100	0.0075	0.0329	0.2750	0.0063	0.0278
Carbon Dioxide	0.3533	0.2649	1.1601	2.8801	0.0665	0.2911
Methane	8.5006	6.3722	27.9102	62.3950	1.4398	6.3063
Ethane	31.9732	23.9676	104.9781	21.5756	0.4979	2.1806
Propane	22.0858	16.5558	72.5146	6.3196	0.1458	0.6387
Isobutane	7.1637	5.3700	23.5205	0.5345	0.0123	0.0540
n-Butane	12.6521	9.4842	41.5407	1.8312	0.0423	0.1851
Isopentane	4.5308	3.3964	14.8761	0.4154	0.0096	0.0420
n-Pentane	3.6672	2.7490	12.0407	0.3211	0.0074	0.0325
2-Methylpentane	0.2829	0.2120	0.9287	0.0115	0.0003	0.0012
3-Methylpentane	0.1901	0.1425	0.6241	0.0203	0.0005	0.0021
n-Hexane	5.5834	4.1854	18.3319	0.1794	0.0041	0.0181
Methylcyclopentane	0.0874	0.0655	0.2869	0.0263	0.0006	0.0027
Benzene	0.0141	0.0106	0.0464	0.0220	0.0005	0.0022
2-Methylhexane	0.2999	0.2248	0.9846	0.0107	0.0002	0.0011
3-Methylhexane	0.2489	0.1866	0.8172	0.0093	0.0002	0.0009
Heptane	0.5226	0.3918	1.7159	0.0204	0.0005	0.0021
Methylcyclohexane	0.3492	0.2618	1.1465	0.0700	0.0016	0.0071
Toluene	0.0671	0.0503	0.2203	0.0990	0.0023	0.0100
Octane	0.7991	0.5990	2.6237	0.0186	0.0004	0.0019
Ethylbenzene	0.0447	0.0335	0.1466	0.0655	0.0015	0.0066
m & p-Xylene	0.0392	0.0294	0.1288	0.0569	0.0013	0.0057
o-Xylene	0.0566	0.0424	0.1858	0.0841	0.0019	0.0085
Nonane	0.2426	0.1818	0.7965	0.0088	0.0002	0.0009
C10+	0.0220	0.0165	0.0721	0.0007	0.0000	0.0001
Total VOCs	58.949	44.19	193.5	10.125	0.2336	1.0234
Total CO_{2e}		159.57	698.9		36.06	157.9
Total TAPs (Benzene)		0.0106	0.0464		0.0005	0.0022
Toluene		0.0503	0.2203		0.0023	0.0100
Ethylbenzene		0.0335	0.1466		0.0015	0.0066
Xylenes		0.0718	0.3146		0.0033	0.0142
n-Hexane		4.185	18.332		0.0041	0.0181
Total HAPs		4.352	19.060		0.0117	0.0512
Total	100.00	74.96	328.3	100.00	2.308	10.11

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

Table 7

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

Condensate Tank Information	
Number of Tanks	10
Maximum Working Losses (lbs/hr)	6.5773
Maximum Breathing Losses (lbs/hr)	6.2698
# 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	3.12E-05	1.37E-04	0.0000	0.0001	0.0001	0.0003
Carbon Dioxide	0.4427	0.0291	0.1275	0.0278	0.1216	0.0569	0.2491
Methane	2.0165	0.1326	0.5809	0.1264	0.5538	0.2591	1.1347
Ethane	41.7232	2.7443	12.0198	2.6160	11.4579	5.3602	23.4778
Propane	24.6602	1.6220	7.1042	1.5461	6.7721	3.1681	13.8764
Isobutane	7.4873	0.4925	2.1570	0.4694	2.0561	0.9619	4.2131
n-Butane	12.9759	0.8535	3.7381	0.8136	3.5634	1.6670	7.3015
Isopentane	4.4382	0.2919	1.2786	0.2783	1.2188	0.5702	2.4974
n-Pentane	3.5433	0.2331	1.0208	0.2222	0.9730	0.4552	1.9938
2-Methylpentane	0.2653	0.0174	0.0764	0.0166	0.0729	0.0341	0.1493
3-Methylpentane	0.1777	0.0117	0.0512	0.0111	0.0488	0.0228	0.1000
n-Hexane	0.3548	0.0233	0.1022	0.0222	0.0974	0.0456	0.1996
Methylcyclopentane	0.0763	0.0050	0.0220	0.0048	0.0210	0.0098	0.0429
Benzene	0.0008	5.07E-05	0.0002	0.0000	0.0002	0.0001	0.0004
2-Methylhexane	0.0182	1.20E-03	0.0052	0.0011	0.0050	0.0023	0.0102
3-Methylhexane	0.2272	0.0149	0.0655	0.0142	0.0624	0.0292	0.1279
Heptane	0.4403	0.0290	0.1268	0.0276	0.1209	0.0566	0.2477
Methylcyclohexane	0.2938	0.0193	0.0846	0.0184	0.0807	0.0377	0.1653
Toluene	0.0078	5.16E-04	2.26E-03	0.0005	0.0022	0.0010	0.0044
Octane	0.6314	0.0415	0.1819	0.0396	0.1734	0.0811	0.3553
Ethylbenzene	0.0097	6.36E-04	2.79E-03	0.0006	0.0027	0.0012	0.0054
m & p-Xylene	0.0109	7.20E-04	3.15E-03	0.0007	0.0030	0.0014	0.0062
o-Xylene	0.0137	8.98E-04	0.0039	0.0009	0.0038	0.0018	0.0077
Nonane	0.1722	0.0113	0.0496	0.0108	0.0473	0.0221	0.0969
C10+	0.0121	7.94E-04	0.0035	0.0008	0.0033	0.0016	0.0068
Total VOCs	55.817	3.6712	16.080	3.4996	15.3283	7.1708	31.408
Total CO_{2e}		3.3449	14.6506	3.1885	13.9657	6.5334	28.616
Total TAPs (Benzene)		5.07E-05	2.22E-04	0.0000	0.0002	0.0001	0.0004
Toluene		5.16E-04	2.26E-03	0.0005	0.0022	0.0010	0.0044
Ethylbenzene		6.36E-04	2.79E-03	0.0006	0.0027	0.0012	0.0054
Xylenes		1.62E-03	0.0071	0.0015	0.0068	0.0032	0.0138
n-Hexane		0.0233	0.1022	0.0222	0.0974	0.0456	0.1996
Total HAPs		0.0262	0.1146	0.0249	0.1092	0.0511	0.2238
Total	100.00	6.5773	28.8085	6.2698	27.4617	12.8471	56.270

Table 7

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

Produced Water Tank Information	
Number of Tanks	2
Maximum Working Losses (lbs/hr)	0.0354
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	0.0052	1.85E-06	8.12E-06	4.34E-07	1.90E-06	2.29E-06	1.00E-05
Carbon Dioxide	3.6970	0.0013	0.0057	0.0003	0.0013	0.0016	0.0071
Methane	3.3032	0.0012	0.0051	0.0003	0.0012	0.0014	0.0063
Ethane	1.0542	0.0004	0.0016	0.0001	0.0004	0.0005	0.0020
Propane	0.0753	2.67E-05	0.0001	6.24E-06	2.73E-05	3.29E-05	0.0001
Isobutane	0.0008	2.82E-07	1.24E-06	6.61E-08	2.89E-07	3.48E-07	1.53E-06
n-Butane	0.0041	1.46E-06	6.37E-06	3.41E-07	1.49E-06	1.80E-06	7.87E-06
Isopentane	0.0002	8.28E-08	3.62E-07	1.94E-08	8.49E-08	1.02E-07	4.47E-07
n-Pentane	0.0001	4.66E-08	2.04E-07	1.09E-08	4.78E-08	5.76E-08	2.52E-07
2-Methylpentane	8.98E-07	3.18E-10	1.39E-09	7.44E-11	3.26E-10	3.92E-10	1.72E-09
3-Methylpentane	3.86E-06	1.37E-09	5.98E-09	3.20E-10	1.40E-09	1.69E-09	7.38E-09
n-Hexane	5.44E-07	1.93E-10	8.44E-10	4.51E-11	1.98E-10	2.38E-10	1.04E-09
Methylcyclopentane	1.07E-05	3.80E-09	1.66E-08	8.89E-10	3.89E-09	4.69E-09	2.05E-08
Benzene	2.76E-05	9.76E-09	4.28E-08	2.29E-09	1.00E-08	1.21E-08	5.28E-08
2-Methylhexane	1.38E-08	4.88E-12	2.14E-11	1.14E-12	5.01E-12	6.02E-12	2.64E-11
3-Methylhexane	1.79E-07	6.33E-11	2.77E-10	1.48E-11	6.49E-11	7.81E-11	3.42E-10
Heptane	2.89E-07	1.02E-10	4.48E-10	2.39E-11	1.05E-10	1.26E-10	5.52E-10
Methylcyclohexane	6.11E-06	2.16E-09	9.47E-09	5.06E-10	2.22E-09	2.67E-09	1.17E-08
Toluene	5.98E-05	2.12E-08	9.27E-08	4.96E-09	2.17E-08	2.61E-08	1.14E-07
Octane	5.11E-08	1.81E-11	7.93E-11	4.24E-12	1.86E-11	2.23E-11	9.79E-11
Ethylbenzene	2.22E-05	7.87E-09	3.45E-08	1.84E-09	8.07E-09	9.72E-09	4.26E-08
m & p-Xylene	2.16E-05	7.64E-09	3.34E-08	1.79E-09	7.83E-09	9.42E-09	4.13E-08
o-Xylene	3.33E-05	1.18E-08	5.17E-08	2.76E-09	1.21E-08	1.46E-08	6.38E-08
Nonane	1.14E-08	4.03E-12	1.76E-11	9.43E-13	4.13E-12	4.97E-12	2.18E-11
C10+	1.01E-11	3.59E-15	1.57E-14	8.40E-16	3.68E-15	4.43E-15	1.94E-14
Total VOCs	0.0807	2.86E-05	0.0001	6.69E-06	2.93E-05	3.53E-05	0.0002
Total CO_{2e}		0.0305	0.1338	0.0072	0.0313	0.0377	0.1651
Total TAPs (Benzene)		9.76E-09	4.28E-08	2.29E-09	1.00E-08	1.21E-08	5.28E-08
Toluene		2.12E-08	9.27E-08	4.96E-09	2.17E-08	2.61E-08	1.14E-07
Ethylbenzene		7.87E-09	3.45E-08	1.84E-09	8.07E-09	9.72E-09	4.26E-08
Xylenes		1.94E-08	8.52E-08	4.55E-09	1.99E-08	2.40E-08	1.05E-07
n-Hexane		1.93E-10	8.44E-10	4.51E-11	1.98E-10	2.38E-10	1.04E-09
Total HAPs		5.84E-08	2.56E-07	1.37E-08	5.99E-08	7.21E-08	3.16E-07
Total	100.00	0.0354	0.1551	0.0083	0.0363	0.0437	0.1914

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

Table 8

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

Annual Loading	Oil Truck Loading	Water Truck Loading
RVP	6.09	1.0229
Annual Average Temp (F)	65.08	65.08
S (saturation factor)	0.6	0.6
P (true vapor pressure)	4.13	0.37
M (MW of vapor)	38.87	18.43
Collection Efficiency (%)	0.00	0.00
Loading Loss (lb/10^3 gal)*	2.29	0.10
Maximum Throughput (gallons/hr)**	10,080	10,080
Average Throughput (gallons/yr)	5,595,450	7,511,700
Loading Emissions (lbs/hr)	23.08	0.98
Loading Emissions (tpy)	6.41	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	1.09E-04	3.04E-05	0.0052	5.16E-05	1.92E-05
Carbon Dioxide	0.4427	0.1022	2.84E-02	3.6970	3.64E-02	1.36E-02
Methane	2.0165	0.4654	1.29E-01	3.3032	3.25E-02	1.21E-02
Ethane	41.7232	9.6293	2.6726	1.0542	1.04E-02	3.87E-03
Propane	24.6602	5.6913	1.58E+00	0.0753	7.41E-04	2.76E-04
Isobutane	7.4873	1.7280	4.80E-01	0.0008	7.85E-06	2.93E-06
n-Butane	12.9759	2.9947	8.31E-01	0.0041	4.05E-05	1.51E-05
Isopentane	4.4382	1.0243	2.84E-01	0.0002	2.30E-06	8.58E-07
n-Pentane	3.5433	0.8178	2.27E-01	0.0001	1.30E-06	4.84E-07
2-Methylpentane	0.2653	0.0612	1.70E-02	8.98E-07	8.85E-09	3.30E-09
3-Methylpentane	0.1777	0.0410	1.14E-02	3.86E-06	3.80E-08	1.42E-08
n-Hexane	0.3548	0.0819	2.27E-02	5.44E-07	5.36E-09	2.00E-09
Methylcyclopentane	0.0763	0.0176	4.89E-03	1.07E-05	1.06E-07	3.94E-08
Benzene	0.0008	0.0002	4.94E-05	0.0000	2.72E-07	1.01E-07
2-Methylhexane	0.0182	0.0042	1.16E-03	1.38E-08	1.36E-10	5.06E-11
3-Methylhexane	0.2272	0.0524	1.46E-02	1.79E-07	1.76E-09	6.56E-10
Heptane	0.4403	0.1016	2.82E-02	2.89E-07	2.84E-09	1.06E-09
Methylcyclohexane	0.2938	0.0678	1.88E-02	6.11E-06	6.01E-08	2.24E-08
Toluene	0.0078	0.0018	5.03E-04	0.0001	5.89E-07	2.19E-07
Octane	0.6314	0.1457	4.04E-02	5.11E-08	5.04E-10	1.88E-10
Ethylbenzene	0.0097	0.0022	6.20E-04	2.22E-05	2.19E-07	8.16E-08
m & p-Xylene	0.0109	0.0025	7.01E-04	2.16E-05	2.12E-07	7.92E-08
o-Xylene	0.0137	0.0032	8.75E-04	3.33E-05	3.28E-07	1.22E-07
Nonane	0.1722	0.0397	1.10E-02	1.14E-08	1.12E-10	4.18E-11
C10+	0.0121	0.0028	7.74E-04	1.01E-11	9.98E-14	3.72E-14
Total VOCs	55.8170	12.8820	3.5754	0.0807	7.95E-04	2.96E-04
Total CO_{2e}		11.7369	3.2576		0.8498	0.3166
Total TAPs (Benzene)		0.0002	4.94E-05		2.72E-07	1.01E-07
Toluene		0.0018	5.03E-04		5.89E-07	2.19E-07
Ethylbenzene		0.0022	6.20E-04		2.19E-07	8.16E-08
Xylenes		0.0057	1.58E-03		5.41E-07	2.02E-07
n-Hexane		0.0819	2.27E-02		5.36E-09	2.00E-09
Total HAPs		0.0918	2.55E-02		1.63E-06	6.06E-07
Total	100.0000	23.0791	6.4056	100.0000	0.9850	0.3670

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
Melody Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Gas Production Unit Heater Emissions

Number of Units	9
GPU Heater Rating (MMBtu/hr)	1.50
Operating hours/year	8760
Fuel Heat Value (Btu/scf)	1,201

Pollutant	Emission Factors (lb/MMscf)	lb/hr	tpy
NOx	100	1.124	4.922
CO	84	0.944	4.135
CO_2	120,000	1348.520	5906.517
Lead	0.0005	5.62E-06	2.46E-05
N_2O	2.2	0.025	0.108
PM (Total)	7.6	0.085	0.374
SO_2	0.6	0.007	0.030
TOC	11	0.124	0.541
Methane	2.3	0.026	0.113
VOC	5.5	0.062	0.271
HAPS			
2-Methylnaphthalene	2.40E-05	2.70E-07	1.18E-06
Benzene	2.10E-03	2.36E-05	1.03E-04
Dichlorobenzene	1.20E-03	1.35E-05	5.91E-05
Fluoranthene	3.00E-06	3.37E-08	1.48E-07
Fluorene	2.80E-06	3.15E-08	1.38E-07
Formaldehyde	7.50E-02	8.43E-04	3.69E-03
Hexane	1.80E+00	2.02E-02	8.86E-02
Naphthalene	6.10E-04	6.85E-06	3.00E-05
Phenanathrene	1.70E-05	1.91E-07	8.37E-07
Toluene	3.40E-03	3.82E-05	1.67E-04

Line Heater Emissions

Number of Units	9
Line Heater Rating (MMBtu/hr)	2.00
Operating hours/year	8760
Fuel Heat Value (Btu/scf)	1,201

Pollutant	Emission Factors (lb/MMscf)	lb/hr	tpy
NOx	100	1.498	6.563
CO	84	1.259	5.513
CO_2	120,000	1798.026	7875.355
Lead	0.0005	7.49E-06	3.28E-05
N_2O	2.2	0.033	0.144
PM (Total)	7.6	0.114	0.499
SO_2	0.6	0.009	0.039
TOC	11	0.165	0.722
Methane	2.3	0.034	0.151
VOC	5.5	0.082	0.361
HAPS			
2-Methylnaphthalene	2.40E-05	3.60E-07	1.58E-06
Benzene	2.10E-03	3.15E-05	1.38E-04
Dichlorobenzene	1.20E-03	1.80E-05	7.88E-05
Fluoranthene	3.00E-06	4.50E-08	1.97E-07
Fluorene	2.80E-06	4.20E-08	1.84E-07
Formaldehyde	7.50E-02	1.12E-03	4.92E-03
Hexane	1.80E+00	2.70E-02	1.18E-01
Naphthalene	6.10E-04	9.14E-06	4.00E-05
Phenanathrene	1.70E-05	2.55E-07	1.12E-06
Toluene	3.40E-03	5.09E-05	2.23E-04

	lb/hr	tpy
TOTAL Uncontrolled VOC	0.144	0.632
TOTAL Uncontrolled HAPs	0.049	0.216
TOTAL Uncontrolled TAPs (Benzene)	5.51E-05	2.41E-04
TOTAL Uncontrolled Toluene	8.92E-05	3.90E-04
TOTAL Uncontrolled Hexane	4.72E-02	2.07E-01
TOTAL Uncontrolled TAPs (Formaldehyde)	1.97E-03	8.61E-03
TOTAL CO_{2e} Emissions	3,165.24	13,863.77

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

Table 10

Enclosed Combustor Emissions
Melody 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	--	731.83	47.51	125.42	0.90	943.47
Maximum Expected Annual Volumetric Flow Rate of Stream (scf/yr)	331,128.00	--	6,410,843.35	416,216.25	1,098,706.27	7,881.82	8,264,775.68
Heating Content (Btu/ft3)	1,201		2,149.13	1,146.94	2,226.44	97.89	2,020.88

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	-	-	44.189	0.234	7.171	0.000	51.59
Benzene	-	-	0.011	0.001	0.000	0.000	0.011
Toluene	-	-	0.050	0.002	0.001	0.000	0.054
Ethylbenzene	-	-	0.033	0.002	0.001	0.000	0.036
Xylenes	-	-	0.072	0.003	0.003	0.000	0.078
n-Hexane	-	-	4.185	0.004	0.046	0.000	4.235
HAPs	-	-	4.352	0.012	0.051	0.000	4.414
Total Mass Flow	-	-	74.961	2.308	12.847	0.044	90.160
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	-	-	193.549	1.023	31.408	0.000	225.981
Benzene	-	-	0.046	0.002	0.000	0.000	0.049
Toluene	-	-	0.220	0.010	0.004	0.000	0.235
Ethylbenzene	-	-	0.147	0.007	0.005	0.000	0.159
Xylenes	-	-	0.315	0.014	0.014	0.000	0.343
n-Hexane	-	-	18.332	0.018	0.200	0.000	18.550
HAP	-	-	19.060	0.051	0.224	0.000	19.335
Total Mass Flow	-	-	328.331	10.107	56.270	0.191	394.900

Table 10

Enclosed Combustor Emissions
Melody 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	-	0.073	0.005	0.013	0.000	0.09
CO	0.003	-	0.061	0.004	0.011	0.000	0.08
PM2.5	0.000	-	0.004	0.000	0.001	0.000	0.01
PM10	0.000	-	0.006	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	-	0.884	0.005	0.143	0.000	1.03
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	-	0.001	0.000	0.000	0.000	0.00
n-Hexane	0.000	-	0.084	0.000	0.001	0.000	0.08
HAP	0.000	-	0.087	0.000	0.001	0.000	0.09
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	-	0.321	0.021	0.055	0.000	0.41
CO	0.014	-	0.269	0.017	0.046	0.000	0.35
PM2.5	0.001	-	0.018	0.001	0.003	0.000	0.02
PM10	0.001	-	0.024	0.002	0.004	0.000	0.03
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	-	3.871	0.020	0.628	0.000	4.52
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	-	0.006	0.000	0.000	0.000	0.01
n-Hexane	0.000	-	0.367	0.000	0.004	0.000	0.37
HAP	0.000	-	0.381	0.001	0.004	0.000	0.39
N_2O	0.000	-	0.007	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	1.03	4.52
NOx	9.43E-02	4.13E-01
CO	7.93E-02	3.47E-01
PM2.5	5.38E-03	2.36E-02
PM10	7.17E-03	3.14E-02
H_2S	1.21E-05	5.28E-05
SO_2	2.27E-05	9.93E-05
Benzene (TAPs)	2.24E-04	9.81E-04
Toluene	1.07E-03	4.69E-03
Ethylbenzene	7.25E-04	3.17E-03
Xylenes	1.56E-03	6.85E-03
Hexanes	8.48E-02	3.71E-01
Formaldehyde (TAPs)	2.84E-06	1.24E-05
HAPs	0.09	0.39
CO_2e	267.53	1171.79
N_2O	2.08E-03	9.09E-03
Lead	4.72E-07	2.07E-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
Melody 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	6,410,843	0.0130	416,216	0.0039	1,098,706	0.015	7,882	29,120	1	0	--	29,120	19,156,919
Methane	0.199	6,410,843	0.7708	416,216	0.0489	1,098,706	0.038	7,882	1,649,163	1	0.98	1,616,180	32,983	32,983
Ethane	0.399	6,410,843	0.1422	416,216	0.5393	1,098,706	0.006	7,882	3,208,617	2	0.98	6,288,890	--	
Propane	0.188	6,410,843	0.0284	416,216	0.2174	1,098,706	0.000	7,882	1,454,919	3	0.98	4,277,463	--	
i-Butane	0.046	6,410,843	0.0018	416,216	0.0501	1,098,706	0.000	7,882	352,158	4	0.98	1,380,460	--	
n-Butane	0.082	6,410,843	0.0062	416,216	0.0868	1,098,706	0.000	7,882	621,402	4	0.98	2,435,894	--	
Pentane	0.043	6,410,843	0.0020	416,216	0.0430	1,098,706	0.000	7,882	321,312	5	0.98	1,574,429	--	
Hexane	0.026	6,410,843	0.0005	416,216	0.0036	1,098,706	0.000	7,882	173,140	6	0.98	1,018,064	--	
Benzene	0.000	6,410,843	0.0001	416,216	0.0000	1,098,706	0.000	7,882	462	6	0.98	2,719	--	
Heptanes	0.004	6,410,843	0.0001	416,216	0.0030	1,098,706	0.000	7,882	31,576	7	0.98	216,612	--	
Toluene	0.000	6,410,843	0.0002	416,216	0.0000	1,098,706	0.000	7,882	1,876	7	0.98	12,868	--	
Octane	0.004	6,410,843	0.0002	416,216	0.0033	1,098,706	0.000	7,882	29,084	8	0.98	228,020	--	
Ethyl benzene	0.000	6,410,843	0.0001	416,216	0.0000	1,098,706	0.000	7,882	1,101	8	0.98	8,635	--	
Xylenes	0.000	6,410,843	0.0003	416,216	0.0001	1,098,706	0.000	7,882	2,379	8	0.98	18,650	--	
Nonane	0.001	6,410,843	0.0000	416,216	0.0005	1,098,706	0.000	7,882	5,129	9	0.98	45,237	--	
Decane plus	0.000	6,410,843	0.0000	416,216	0.0000	1,098,706	0.000	7,882	375	10	0.98	3,679	--	
											Subtotal	**19,127,799**	--	

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	19,156,919	0.12	2000	1	253.60	1,110.75
CH_4	32,983	0.09	2000	25	0.35	1.53
				CO_2e Emissions	**262.4**	**1149.10**

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
Melody 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)	365
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	0.5000	1	667	0.5000	333.5000	3.8175	1.7179
Tanker Trucks PW	10	40	10	0.5000	1	895	0.5000	447.5000	3.8175	1.7179
Pick Up Truck	4	3	10	0.2200	1	730	0.2200	160.6000	0.3467	0.1560

	Uncontrolled Emissions						Controlled Emissions					
	PM			PM10			PM			PM10		
	(lbs/hr)	(lbs/year)	(tpy)	(lbs/hr)	(lbs/year)	(tpy)	(lbs/hr)	(lbs/year)	(tpy)	(lbs/hr)	(lbs/year)	(tpy)
Tanker Trucks Condensate	1.9088	1273.1461	0.6366	0.8589	572.9157	0.2865	0.9544	636.5730	0.3183	0.4295	286.4579	0.1432
Tanker Trucks PW	1.9088	1708.3444	0.8542	0.8589	768.7550	0.3844	0.9544	854.1722	0.4271	0.4295	384.3775	0.1922
Pick Up Truck	0.0763	55.6768	0.0278	0.0343	25.0545	0.0125	0.0381	27.8384	0.0139	0.0172	12.5273	0.0063
Total Emissions	3.8938	3,037.1672	1.5186	1.7522	1,366.7252	0.6834	1.9469	1,518.5836	0.7593	0.8761	683.3626	0.3417

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
Melody 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)	1201.3172
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	25.4285	111.38
$PM_{2.5}$		9.500E-03	0.0022	0.0096
PM_{10}		9.500E-03	0.0022	0.0096
PM (Total)		9.910E-03	0.0023	0.0100
SO_2		5.880E-04	0.0001	0.0006
TOC		0.358	0.0828	0.3625
Methane		0.230	0.0532	0.2329
VOC[3]		0.0296	0.0068	0.0300
HAPS				
Benzene		1.58E-03	3.65E-04	1.60E-03
Ethylbenzene		2.48E-05	5.73E-06	2.51E-05
Formaldehyde		2.05E-02	4.74E-03	2.08E-02
Naphthalene		9.71E-05	2.24E-05	9.83E-05
Toluene		5.58E-04	1.29E-04	5.65E-04
Xylene		1.95E-04	4.51E-05	1.97E-04

	lb/hr	tpy
TOTAL Uncontrolled VOC	6.84E-03	3.00E-02
TOTAL Uncontrolled NOx	3.16E-01	1.38E+00
TOTAL Uncontrolled HAPs	5.31E-03	2.32E-02
TOTAL Uncontrolled TAPs (Benzene)	3.65E-04	1.60E-03
TOTAL Uncontrolled Toluene	1.29E-04	5.65E-04
TOTAL Uncontrolled Ethylbenzene	5.73E-06	2.51E-05
TOTAL Uncontrolled Xylenes	4.51E-05	1.97E-04
TOTAL Uncontrolled TAPs (Formaldehyde)	4.74E-03	2.08E-02
TOTAL CO_{2e} Emissions	2.68E+01	1.17E+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
Melody 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	2.1555	1.6732	2.0651	3.0794	0.0904	-1.4062
PM10	1.0848	1.2556	0.9942	1.5231	0.0905	-0.2675
VOC (uncontrolled)	54.8827	243.9622	351.3767	1540.2267	-296.4939	-1296.2645
CO	7.9263	34.7172	6.9247	30.3303	1.0016	4.3869
NOx	3.0322	13.2812	1.8399	8.0587	1.1924	5.2225
SO2	0.0159	0.0696	0.0066	0.0291	9.25E-03	4.05E-02
Pb	1.36E-05	5.95E-05	7.62E-06	3.34E-05	5.96E-06	2.61E-05
HAPs	0.4006	1.7802	1.7327	7.6074	-1.3320	-5.8272
TAPs	0.0098	0.0432	0.0087	0.0381	1.15E-03	0.0051

Notes:
1. Change in emissions due to the increase in production, addition of 4 condensate tanks, 2 Cimarron enclosed combustors, and 9 line heaters.
2. Change in permit from G70A to G70C.

Bryan Research & Engineering, Inc.

ProMax® 3.2

with

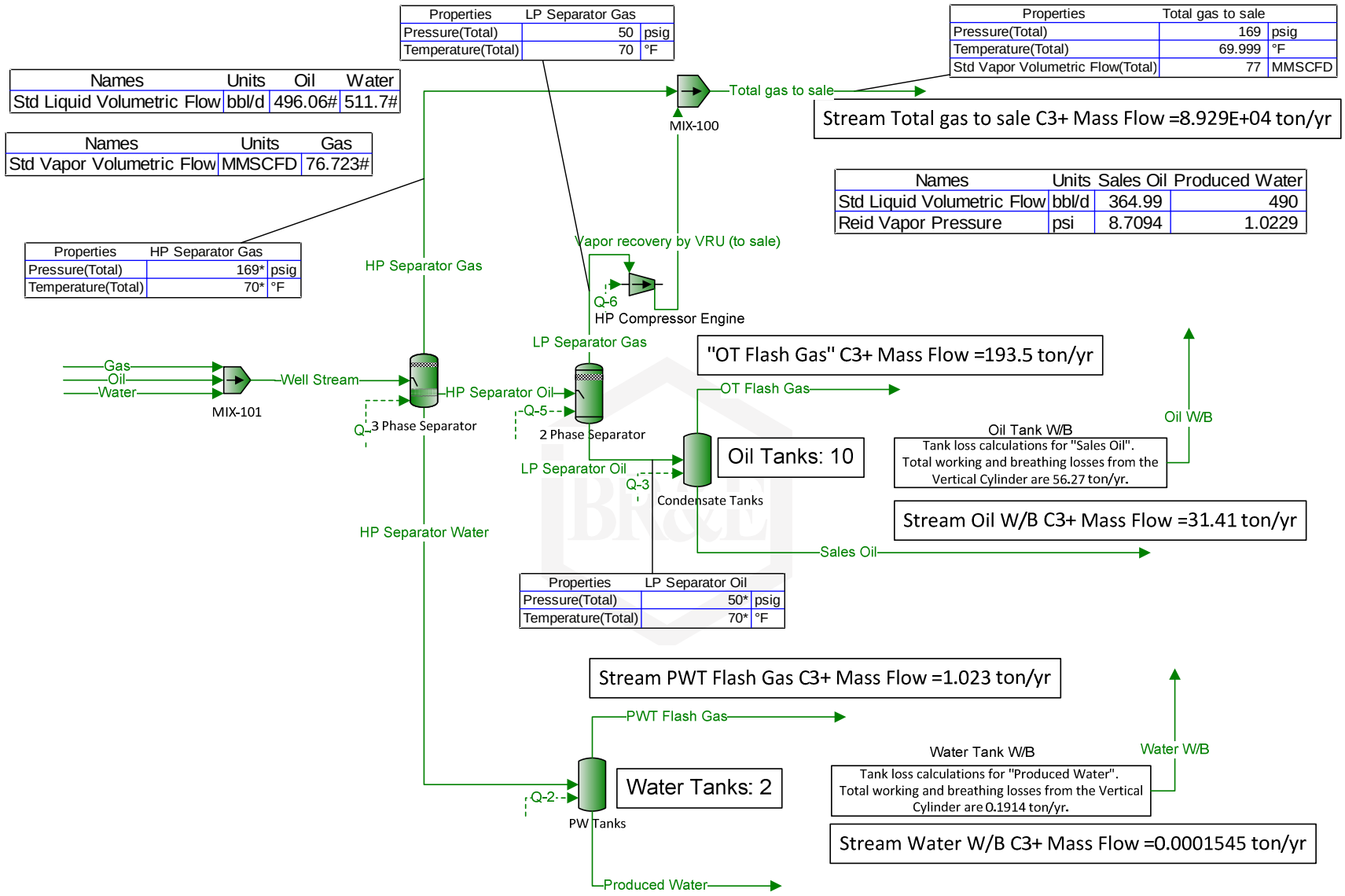
TSWEET® & PROSIM®

Copyright © BRE Group, Ltd. 2002-2011. All Rights Reserved.

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

Project Name:	PROMAX SCENARIO 3
File Name:	ProMax@V:\AirQuality\ANTERO RESOURCES\ProMax\Antero WV_Old_2 Ph Separator\ProMax Model\PROMAX SCENARIO 3.pmx
ProMax Version:	3.2.13330.0

Report Created:	6/3/2016 13:47


Properties LP Separator Gas
Pressure(Total) 50 psig
Temperature(Total) 70 °F
Properties Total gas to sale
Pressure(Total) 169 psig
Temperature(Total) 69.999 °F
Std Vapor Volumetric Flow(Total) 77 MMSCFD
Names Units Oil Water
Std Liquid Volumetric Flow bbl/d 496.06# 511.7#
Total gas to sale
MIX-100
Stream Total gas to sale C3+ Mass Flow =8.929E+04 ton/yr
Names Units Gas
Std Vapor Volumetric Flow MMSCFD 76.723#
Names Units Sales Oil Produced Water
Std Liquid Volumetric Flow bbl/d 364.99 490
Reid Vapor Pressure psi 8.7094 1.0229
Properties HP Separator Gas
Pressure(Total) 169* 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 =193.5 ton/yr
Gas
Oil
Water
MIX-101
Well Stream
HP Separator Oil
Q-5
2 Phase Separator
OT Flash Gas
Oil W/B
Q-3 3 Phase Separator
Oil Tanks: 10
Oil Tank W/B
Tank loss calculations for "Sales Oil". Total working and breathing losses from the Vertical Cylinder are 56.27 ton/yr.
LP Separator Oil
Q-3
Condensate Tanks
Stream Oil W/B C3+ Mass Flow =31.41 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 =1.023 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 0.1914 ton/yr.
Q-2
Water Tanks: 2
PW Tanks
Stream Water W/B C3+ Mass Flow =0.0001545 ton/yr
Produced Water

Process Streams		HP Separator Gas	HP Separator Water	HP Separator Oil	OT Flash Gas	Sales Oil	Gas	Water	Oil	Produced Water	PWT Flash Gas	Oil W/B	Water W/B	Well Stream	LP Separator Oil	LP Separator Gas	recovery by VRU (to	Total gas to sale
Phase: Total	Status	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Mole Fraction		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water		0.208105	99.9684	0.0550308	0.444685	0.00966384	0	100	0	99.9968	3.03006	0.000255088	93.9743	4.66345	0.0360985	0.370264	0.370264	0.208143
H2S		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen		0.388979	5.93463E-05	0.00764367	0.0134005	2.06715E-05	0.3903	0	0.0219998	2.28293E-06	0.194895	0.000658168	0.00344652	0.370112	0.000833713	0.121033	0.121033	0.388917
Carbon Dioxide		0.165873	0.00101028	0.0380580	0.301184	0.00568647	0.1666	0	0.0139999	0.000630011	1.29938	0.391004	1.54820	0.158008	0.0236428	0.278079	0.278079	0.165899
Methane		81.0347	0.0244693	4.72167	19.8780	0.0930696	81.3211	0	4.97995	0.00185875	77.2250	4.88590	3.79479	77.1169	1.29532	61.7722	61.7722	81.0302
Ethane		13.7168	0.00457098	4.83410	39.8896	1.17980	13.757	0	5.23595	0.000399667	14.2470	53.9357	0.646130	13.0695	3.53204	26.5140	26.5140	13.7198
Propane		2.54393	0.000921363	3.30814	18.7893	2.12561	2.5368	0	5.28795	8.82072E-05	2.84562	21.7380	0.0314584	2.43334	3.13820	6.13765	6.13765	2.54477
Isobutane		0.469183	5.54303E-05	1.53322	4.62365	1.35638	0.4674	0	1.72798	1.96944E-06	0.182590	5.00729	0.000252775	0.452403	1.55492	1.17198	1.17198	0.469347
n-Butane		0.777097	0.000198016	3.62447	8.16605	3.43761	0.7709	0	4.22196	1.48590E-05	0.625563	8.67785	0.00130335	0.753565	3.72494	1.95170	1.95170	0.777372
Isopentane		0.210073	3.53365E-05	2.45753	2.35580	2.58814	0.2029	0	3.18197	1.86130E-06	0.114332	2.39112	5.97016E-05	0.209508	2.57402	0.517847	0.517847	0.210145
n-Pentane		0.166843	2.72973E-05	2.61771	1.90679	2.80477	0.157	0	3.73996	1.42444E-06	0.0883668	1.90894	3.36541E-05	0.169006	2.75020	0.411688	0.411688	0.166900
2-Methylpentane		0.0106723	7.93506E-07	0.396924	0.123139	0.438367	0	0	2.17098	2.02729E-08	0.00264089	0.119657	1.92052E-07	0.0117108	0.419212	0.0258155	0.0258155	0.0106759
3-Methylpentane		0.00715584	1.46716E-06	0.296845	0.0827425	0.328572	0	0	1.47799	9.74356E-08	0.00467821	0.0801468	8.24838E-07	0.00797265	0.313634	0.0172976	0.0172976	0.00715821
n-Hexane		0.210944	1.23533E-05	10.8323	2.43055	12.0362	0.23	0	4.66295	2.52291E-07	0.0413298	0.160021	1.16405E-07	0.243187	11.4525	0.505833	0.505833	0.211012
Methylcyclopentane		0.00332844	2.20119E-06	0.181412	0.0389547	0.201712	0	0	0.718993	3.87356E-07	0.00619528	0.0352459	2.34892E-06	0.00387844	0.191822	0.00808302	0.00808302	0.00332955
Benzene		0.000575690	1.90401E-05	0.0320464	0.00678496	0.0356399	0	0	0.124999	1.74099E-05	0.00558496	0.000383820	6.50680E-06	0.000674277	0.0338865	0.00140811	0.00140811	0.000575884
2-Methylhexane		0.00993090	6.36963E-07	1.19006	0.112274	1.33441	0	0	2.61697	1.38197E-08	0.00212828	0.00705456	2.53532E-09	0.0141167	1.26014	0.0231167	0.0231167	0.00993398
3-Methylhexane		0.00823897	5.51549E-07	1.03662	0.0931789	1.16271	0	0	2.20698	1.24955E-08	0.00184108	0.0881401	3.28707E-08	0.0119050	1.09772	0.0191936	0.0191936	0.00824153
Heptane		0.0175027	1.21329E-06	2.74740	0.195662	3.08559	0	0	5.08495	2.76380E-08	0.00404947	0.170787	5.30850E-08	0.0274296	2.90998	0.0403858	0.0403858	0.0175080
Methylcyclohexane		0.0116933	4.72907E-06	1.83654	0.133415	2.06241	0	0	3.39797	5.85578E-07	0.0141521	0.116319	1.14607E-06	0.0183296	1.94519	0.0274333	0.0274333	0.0116969
Toluene		0.00237438	6.12154E-05	0.469891	0.0273134	0.528213	0	0	0.760992	5.49846E-05	0.0213354	0.00331101	1.19602E-05	0.00410500	0.497776	0.00559862	0.00559862	0.00237513
Octane		0.0242374	9.59914E-07	11.6653	0.262432	13.1455	0	0	12.7579	1.45437E-08	0.00322880	0.214857	8.24874E-09	0.0688194	12.3626	0.0539063	0.0539063	0.0242443
Ethylbenzene		0.00142057	3.21197E-05	0.806067	0.0157823	0.908533	0	0	0.836992	2.85433E-05	0.0122429	0.00354111	3.86048E-06	0.00451496	0.854284	0.00322194	0.00322194	0.00142099
m-Xylene		0.00125178	2.87768E-05	0.845667	0.0138619	0.953378	0	0	0.835992	2.56704E-05	0.0106353	0.00400705	3.74394E-06	0.00450957	0.896287	0.00282408	0.00282408	0.00125215
o-Xylene		0.00180402	5.59160E-05	1.36460	0.0199961	1.53859	0	0	1.31099	5.13256E-05	0.0157292	0.00500116	5.78920E-06	0.00707182	1.44631	0.00407057	0.00407057	0.00180455
Nonane		0.00676190	4.07558E-07	9.55757	0.0709533	10.7816	0	0	8.14292	9.73455E-09	0.00135872	0.0521762	1.63471E-09	0.0439251	10.1307	0.0144837	0.0144837	0.00676370
C10+		0.000493391	2.17071E-08	33.5432	0.00459992	37.8579	0	0	24.4798	4.33817E-10	7.26565E-05	0.00262095	1.04218E-12	0.132050	35.5577	0.000932086	0.000932086	0.000493494
Molar Flow		lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h
Water		17.5945	396.798	0.0191831	0.00888584	0.00298474	0	414.412	0	396.795	0.00352144	8.43095E-07	0.00222813	414.412	0.0118706	0.00731252	0.00731252	17.6018
H2S		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen		32.8866	0.000235559	0.00266449	0.000267773	6.38454E-06	32.8790	0	0.0105457	9.05882E-06	0.000226501	2.17532E-06	8.17168E-08	32.8895	0.000274157	0.00239034	0.00239034	32.8890
Carbon Dioxide		14.0239	0.00401003	0.0132666	0.00601836	0.00175630	14.0344	0	0.00671091	0.00249993	0.00151010	0.00129231	3.67079E-05	14.0412	0.00777466	0.00549191	0.00549191	14.0294
Methane		6851.16	0.0971242	1.64592	0.397208	0.0287452	6850.52	0	2.38717	0.00737565	0.0897486	0.0161484	8.99744E-05	6852.90	0.425953	1.21997	1.21997	6852.38
Ethane		1159.70	0.0181433	1.68511	0.797086	0.364388	1158.89	0	2.50988	0.00158591	0.0165574	0.178264	1.53197E-05	1161.40	1.16147	0.523637	0.523637	1160.22
Propane		215.079	0.00365711	1.15318	0.375453	0.656510	213.701	0	2.53481	0.000350013	0.00330709	0.0718466	7.45878E-07	216.236	1.03196	0.121215	0.121215	215.200
Isobutane		39.6676	0.000220016	0.534463	0.0923912	0.418926	39.3739	0	0.828318	7.81487E-06	0.000212201	0.0165496	5.99328E-09	40.2023	0.511317	0.0231460	0.0231460	39.6907
n-Butane		65.7005	0.000785972	1.26345	0.163177	1.06173	64.9409	0	2.02382	5.89617E-05	0.000727010	0.0286813	3.09025E-08	66.9647	1.22490	0.0385451	0.0385451	65.7390
Isopentane		17.7609	0.000140259	0.856665	0.0470744	0.799364	17.0924	0	1.52529	7.38576E-06	0.000132873	0.00790291	1.41552E-09	18.6177	0.846438	0.0102272	0.0102272	17.7711
n-Pentane		14.1059	0.000108349	0.912505	0.0381021	0.866272	13.2257	0	1.79277	5.65227E-06	0.000102697	0.00630927	7.97939E-10	15.0185	0.904374	0.00813063	0.00813063	14.1140
2-Methylpentane		0.902304	3.14961E-06	0.138363	0.00246060	0.135393	0	0	1.04067	8.04445E-08	3.06917E-06	0.000395480	4.55356E-12	1.04067	0.137853	0.000509843	0.000509843	0.902814
3-Methylpentane		0.604998	5.82350E-06	0.103477	0.00165339	0.101482	0	0	0.708480	3.86632E-07	5.43687E-06	0.000264894	1.95569E-11	0.708480	0.103135	0.000341619	0.000341619	0.605339
n-Hexane		17.8344	4.90333E-05	3.77601	0.0485681	3.71745	19.3753	0	2.23521	1.00111E-06	4.80322E-05	0.000528887	2.75997E-12	21.6105	3.76602	0.00998992	0.00998992	17.8444
Methylcyclopentane		0.281406	8.73703E-06	0.0632382	0.000778405	0.0623002	0	0	0.344653	1.53706E-06	7.19997E-06	0.000116492	5.56928E-11	0.344653	0.0630786	0.000159635	0.000159635	0.281566
Benzene		0.0486722	7.55746E-05	0.0111710	0.000135579	0.0110076	0	0	0.0599188	6.90839E-05	6.49067E-06	1.26857E-06	1.54276E-10	0.0599188	0.0111432	2.78094E-05	2.78094E-05	0.0487000
2-Methylhexane		0.839618	2.52826E-06	0.414841	0.00224349	0.412141	0	0	1.25446	5.48374E-08	2.47342E-06	2.33161E-05	6.01124E-14	1.25446	0.414384	0.000456542	0.000456542	0.840074
3-Methylhexane		0.696572	2.18923E-06	0.361353	0.00186193	0.359112	0	0	1.05793	4.95832E-08	2.13964E-06	0.000291313	7.79363E-13	1.05793	0.360974	0.000379063	0.000379063	0.696951
Heptane		1.47978	4.81584E-06	0.957713	0.00390978	0.953006	0	0	2.43750	1.09670E-07	4.70617E-06	0.000564469	1.25864E-12	2.43750	0.956916	0.000797597	0.000797597	1.48058
Methylcyclohexane		0.988619	1.87708E-05	0.640196	0.00266595	0.636988	0	0	1.62883	2.32362E-06	1.64472E-05	0.000384447	2.71732E-11	1.62883	0.639654	0.000541794	0.000541794	0.989161
Toluene		0.200744	0.000242978	0.163799	0.000545785	0.163142	0	0	0.364786	0.000218183	2.47954E-05	1.09433E-05	2.83577E-10	0.364786	0.163688	0.000110570	0.000110570	0.200855
Octane		2.04918	3.81012E-06	4.06638	0.00524400	4.06007	0	0	6.11556	5.77105E-08	3.75241E-06	0.000710128	1.95577E-13	6.11556	4.06531	0.00106462	0.00106462	2.05024
Ethylbenzene		0.120103	0.000127490	0.280986	0.000315367	0.280607	0	0	0.401217	0.000113262	1.42284E-05	1.17038E-05	9.15319E-11	0.401217	0.280922	6.36315E-05	6.36315E-05	0.120167
m-Xylene		0.105833	0.000114222	0.294790	0.000276993	0.294457	0	0	0.400737	0.000101862	1.23601E-05	1.32437E-05	8.87687E-11	0.400737	0.294734	5.57740E-05	5.57740E-05	0.105889
o-Xylene		0.152523	0.000221944	0.475684	0.000399569	0.475204	0	0	0.628429	0.000203664	1.82800E-05	1.65294E-05	1.37262E-10	0.628429	0.475603	8.03917E-05	8.03917E-05	0.152603
Nonane		0.571691	1.61769E-06	3.33166	0.00141781	3.32996	0	0	3.90335	3.86274E-08	1.57907E-06	0.000172448	3.87590E-14	3.90335	3.33137	0.000286046	0.000286046	0.571977
C10+		0.0417142	8.61606E-08	11.6928	9.19170E-05	11.6927	0	0	11.7345	1.72142E-09	8.44392E-08	8.66253E-06	2.47100E-17	11.7345	11.6928	1.84082E-05	1.84082E-05	0.0417326
Mass Fraction		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water		0.189790	99.9635	0.00850618	0.213551	0.00136458	0	100	0	99.9949	2.74924	0.000118226	91.8597	4.18896	0.00532575	0.278092	0.278092	0.189815
H2S		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen		0.551622	9.22778E-05	0.00183719	0.0100068	4.53887E-06	0.556097	0	0.00575811	3.54984E-06	0.274971	0.000474334	0.00523867	0.516960	0.000191264	0.141353	0.141353	0.551506
Carbon Dioxide		0.369548	0.00246789	0.0143708	0.353335	0.00196154	0.372913	0	0.00575660	0.00153902	2.88008	0.442700	3.69700	0.346723	0.00852111	0.510211	0.510211	0.369588
Methane		65.8099	0.0217886	0.649912	8.50062	0.0117027	66.3530	0	0.746434	0.00165517	62.3950	2.01649	3.30319	61.6849	0.170177	41.3142	41.3142	65.8030
Ethane		20.8796	0.00762898	1.24716	31.9732	0.278058	21.0392	0	1.47099	0.000667065	21.5756	41.7232	1.05418	19.5946	0.869755	33.2376	33.2376	20.8831
Propane		5.67871	0.00225509	1.25160	22.0858	0.734665	5.68942	0	2.17860	0.000215899	6.31965	24.6602	0.0752673	5.35003	1.13326	11.2832	11.2832	5.68030
Isobutane		1.38049	0.000178824	0.764600	7.16366	0.617919	1.38171	0	0.938377	6.35382E-06	0.534491	7.48732	0.000797169	1.31107	0.740117	2.83986	2.83986	1.38091
n-Butane		2.28648	0.000638822	1.80748	12.6521	1.56606	2.27891	0	2.29272	4.79383E-05	1.83119	12.9759	0.00411035	2.18384	1.77301	4.72923	4.72923	2.28717
Isopentane		0.767272	0.000141511	1.52130	4.53081	1.46361	0.744556	0	2.14497	7.45410E-06	0.415448	4.43825	0.000233717	0.753680	1.52087	1.55764	1.55764	0.767496
n-Pentane		0.609377	0.000109317	1.62046	3.66725	1.58612	0.576123	0	2.52111	5.70456E-06	0.321099	3.54326	0.000131748	0.607979	1.62497	1.23832	1.23832	0.609555
2-Methylpentane		0.0465578	3.79552E-06	0.293479	0.282869	0.296094	0	0	1.74797	9.69729E-08	0.0114618	0.265280	8.98003E-07	0.0503187	0.295848	0.0927468	0.0927468	0.0465709
3-Methylpentane		0.0312171	7.01775E-06	0.219483	0.190073	0.221934	0	0	1.19001	4.66070E-07	0.0203041	0.177685	3.85680E-06	0.0342566	0.221339	0.0621449	0.0621449	0.0312259
n-Hexane		0.920235	5.90888E-05	8.00922	5.58337	8.12981	1.00809	0	3.75439	1.20680E-06	0.179377	0.354766	5.44291E-07	1.04491	8.08227	1.81729	1.81729	0.920489
Methylcyclopentane		0.0141805	1.02825E-05	0.130996	0.0873918	0.133059	0	0	0.565358	1.80952E-06	0.0262594	0.0763122	1.07262E-05	0.0162749	0.132207	0.0283604	0.0283604	0.0141846
Benzene		0.00227643	8.25512E-05	0.0214775	0.0141277	0.0218204	0	0	0.0912259	7.54857E-05	0.0219714	0.000771305	2.75778E-05	0.00262611	0.0216768	0.00458552	0.00458552	0.00227709
2-Methylhexane		0.0503749	3.54265E-06	1.02313	0.299890	1.04803	0	0	2.45003	7.68642E-08	0.0107405	0.0181856	1.37843E-08	0.0705288	1.03406	0.0965689	0.0965689	0.0503880
3-Methylhexane		0.0417925	3.06759E-06	0.891215	0.248887	0.913184	0	0	2.06619	6.94994E-08	0.00929114	0.227212	1.78714E-07	0.0594792	0.900783	0.0801803	0.0801803	0.0418034
Heptane		0.0887829	6.74807E-06	2.36203	0.522626	2.42339	0	0	4.76056	1.53721E-07	0.0204360	0.440263	2.88618E-07	0.137042	2.38791	0.168710	0.168710	0.0888056
Methylcyclohexane		0.0581213	2.57729E-05	1.54717	0.349191	1.58721	0	0	3.11720	3.19143E-06	0.0699829	0.293820	6.10569E-06	0.0897345	1.56409	0.112296	0.112296	0.0581366
Toluene		0.0110749	0.000313068	0.371471	0.0670849	0.381469	0	0	0.655114	0.000281211	0.0990063	0.00784845	5.97936E-05	0.0188587	0.375600	0.0215059	0.0215059	0.0110779
Octane		0.140155	6.08617E-06	11.4329	0.799097	11.7696	0	0	13.6160	9.22147E-08	0.0185753	0.631403	5.11254E-08	0.391962	11.5648	0.256714	0.256714	0.140189
Ethylbenzene		0.00763472	0.000189273	0.734243	0.0446642	0.756017	0	0	0.830230	0.000168204	0.0654617	0.00967170	2.22381E-05	0.0238997	0.742737	0.0142605	0.0142605	0.00763660
m-Xylene		0.00672758	0.000169575	0.770315	0.0392295	0.793333	0	0	0.829238	0.000151274	0.0568660	0.0109443	2.15668E-05	0.0238712	0.779255	0.0124995	0.0124995	0.00672921

o-Xylene		0.00969556	0.000329499	1.24301	0.0565894	1.28031	0	0	1.30040	0.000302458	0.0841023	0.0136595	3.33484E-05	0.0374344	1.25746	0.0180166	0.0180166	0.00969792
Nonane		0.0439028	2.90136E-06	10.5174	0.242580	10.8384	0	0	9.75777	6.93012E-08	0.00877659	0.172159	1.13760E-08	0.280896	10.6406	0.0774445	0.0774445	0.0439123
C10+		0.00447338	2.15792E-07	51.5452	0.0219611	53.1449	0	0	40.9636	4.31273E-09	0.000655376	0.0120764	1.01277E-11	1.17922	52.1532	0.00695964	0.00695964	0.00447409
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		316.969	7148.43	0.345589	0.160081	0.0537710	0	7465.74	0	7148.37	0.0634398	1.51886E-05	0.0401404	7465.74	0.213852	0.131737	0.131737	317.101
H2S		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen		921.267	0.00659882	0.0746416	0.00750123	0.000178853	921.053	0	0.295421	0.000253768	0.00634505	6.09381E-05	2.28917E-06	921.348	0.00768008	0.0669615	0.0669615	921.334
Carbon Dioxide		617.184	0.176480	0.583855	0.264865	0.0772940	617.649	0	0.295344	0.110021	0.0664589	0.0568740	0.00161550	617.944	0.342159	0.241696	0.241696	617.425
Methane		109909	1.55811	26.4046	6.37219	0.461143	109899	0	38.2960	0.118324	1.43979	0.259061	0.00144341	109937	6.83333	19.5713	19.5713	109929
Ethane		34871.1	0.545552	50.6697	23.9676	10.9568	34846.8	0	75.4697	0.0476867	0.497865	5.36022	0.000460650	34922.3	34.9244	15.7453	15.7453	34886.8
Propane		9484.04	0.161262	50.8501	16.5558	28.9492	9423.27	0	111.774	0.0154340	0.145828	3.16812	3.28899E-05	9535.05	45.5051	5.34506	5.34506	9489.38
Isobutane		2305.57	0.0127878	31.0642	5.36998	24.3489	2288.50	0	48.1437	0.000454217	0.0123336	0.961902	3.48343E-07	2336.64	29.7189	1.34530	1.34530	2306.91
n-Butane		3818.66	0.0456824	73.4345	9.48419	61.7100	3774.51	0	117.629	0.00342698	0.0422554	1.66702	1.79612E-06	3892.14	71.1942	2.24032	2.24032	3820.90
Isopentane		1281.42	0.0101195	61.8074	3.39636	57.6731	1233.19	0	110.048	0.000532874	0.00958663	0.570185	1.02128E-07	1343.24	61.0695	0.737880	0.737880	1282.16
n-Pentane		1017.72	0.00781728	65.8361	2.74902	62.5005	954.220	0	129.346	0.000407804	0.00740948	0.455206	5.75703E-08	1083.57	65.2495	0.586615	0.586615	1018.31
2-Methylpentane		77.7564	0.000271419	11.9235	0.212043	11.6675	0	0	89.6801	6.93233E-06	0.000264487	0.0340807	3.92405E-10	89.6801	11.8795	0.0439359	0.0439359	77.8003
3-Methylpentane		52.1359	0.000501842	8.91714	0.142481	8.74522	0	0	61.0535	3.33181E-05	0.000468524	0.0228274	1.68532E-09	61.0535	8.88770	0.0294392	0.0294392	52.1653
n-Hexane		1536.89	0.00422546	325.399	4.18537	320.352	1669.67	0	192.620	8.62709E-05	0.00413919	0.0455770	2.37841E-10	1862.29	324.538	0.860885	0.860885	1537.75
Methylcyclopentane		23.6830	0.000735304	5.32210	0.0655101	5.24315	0	0	29.0058	0.000129358	0.000605946	0.00980389	4.68708E-09	29.0058	5.30866	0.0134348	0.0134348	23.6964
Benzene		3.80188	0.00590327	0.872589	0.0105903	0.859826	0	0	4.68037	0.00539627	0.000506998	9.90901E-05	1.20508E-08	4.68037	0.870417	0.00217225	0.00217225	3.80405
2-Methylhexane		84.1313	0.000253336	41.5678	0.224802	41.2973	0	0	125.699	5.49481E-06	0.000247841	0.00233632	6.02338E-12	125.699	41.5221	0.0457464	0.0457464	84.1771
3-Methylhexane		69.7978	0.000219365	36.2083	0.186569	35.9837	0	0	106.006	4.96833E-06	0.000214397	0.0291901	7.80937E-11	106.006	36.1703	0.0379829	0.0379829	69.8358
Heptane		148.277	0.000482557	95.9647	0.391768	95.4931	0	0	244.242	1.09891E-05	0.000471568	0.0565609	1.26119E-10	244.242	95.8848	0.0799208	0.0799208	148.357
Methylcyclohexane		97.0686	0.00184303	62.8583	0.261759	62.5434	0	0	159.929	0.000228147	0.00161488	0.0377473	2.66803E-09	159.929	62.8051	0.0531966	0.0531966	97.1218
Toluene		18.4963	0.0223877	15.0921	0.0502878	15.0317	0	0	33.6108	0.0201030	0.00228461	0.00100830	2.61283E-08	33.6108	15.0820	0.0101877	0.0101877	18.5064
Octane		234.074	0.000435225	464.496	0.599015	463.776	0	0	698.571	6.59218E-06	0.000428633	0.0811169	2.23405E-11	698.571	464.375	0.121610	0.121610	234.196
Ethylbenzene		12.7508	0.0135350	29.8308	0.0334809	29.7906	0	0	42.5952	0.0120245	0.00151055	0.00124253	9.71748E-09	42.5952	29.8241	0.00675544	0.00675544	12.7575
m-Xylene		11.2358	0.0121264	31.2964	0.0294070	31.2610	0	0	42.5443	0.0108142	0.00131221	0.00140602	9.42413E-09	42.5443	31.2905	0.00592125	0.00592125	11.2417
o-Xylene		16.1926	0.0235626	50.5010	0.0424202	50.4500	0	0	66.7171	0.0216219	0.00194069	0.00175484	1.45724E-08	66.7171	50.4924	0.00853478	0.00853478	16.2011
Nonane		73.3223	0.000207477	427.302	0.181842	427.084	0	0	500.625	4.95416E-06	0.000202523	0.0221174	4.97104E-12	500.625	427.266	0.0366869	0.0366869	73.3590
C10+		7.47102	1.54314E-05	2094.18	0.0164623	2094.16	0	0	2101.65	3.08306E-07	1.51231E-05	0.00155146	4.42556E-15	2101.65	2094.18	0.00329691	0.00329691	7.47432

Process Streams		**HP Separator Gas**	**HP Separator Water**	**HP Separator Oil**	**OT Flash Gas**	**Sales Oil**	**Gas**	**Water**	**Oil**	**Produced Water**	**PWT Flash Gas**	**Oil W/B**	**Water W/B**	**Well Stream**	**LP Separator Oil**	**LP Separator Gas**	**recovery by VRU (to**	**Total gas to sale**
Phase: Total	**Status**	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Property	**Units**																	
Temperature	°F	70.0	70.0	70.0	75.9	75.9	85.0	85.0	85.0	75.9	75.9	75.9425	75.9425	84.0876	70	70	70	69.9993
Pressure	psig	169	169	169	0	0	1000	1000	1000	0	0	9.72544	-14.2241	1000	50	50	169	169
Mole Fraction Vapor	%	100	0	0	100	0	100	0	0	0	100	100	100	94.6460	0	100	99.5705	100
Mole Fraction Light Liquid	%	0	100	100	0	100	0	100	100	100	0	0	0	0.756396	100	0	0.265770	0
Mole Fraction Heavy Liquid	%	0	0	0	0	0	0	0	0	0	0	0	0	4.59758	0	0	0.163744	0
Molecular Weight	lb/lbmol	19.8	18.0	116.6	37.5	127.6	19.7	18.0	107.0	18.0	19.9	38.8703	18.4300	20.0559	122.109	23.9864	23.9864	19.7548
Mass Density	lb/ft^3	0.7	62.3	45.7	0.1	46.1	4.2	62.2	44.9	62.2	0.1	0.168852	0.00151363	4.55026	45.9756	0.279379	0.832160	0.666974
Molar Flow	lbmol/h	8454.6	396.9	34.9	2.0	30.9	8424.0	414.4	47.9	396.8	0.1	0.330511	0.00237100	8886.38	32.8839	1.97495	1.97495	8456.57
Mass Flow	lb/h	167010.5	7151.0	4062.8	75.0	3940.5	165628.0	7465.7	5130.5	7148.7	2.3	12.8471	0.0436975	178224	4015.43	47.3718	47.3718	167058
Vapor Volumetric Flow	MCFH	250.4	0.1	0.1	0.8	0.1	39.2	0.1	0.1	0.1	0.0	0.0760849	0.0288693	39.1680	0.0873382	0.169561	0.0569263	250.471
Liquid Volumetric Flow	Mbbl/d	1070.4	0.5	0.4	3.3	0.4	167.4	0.5	0.5	0.5	0.2	0.325231	0.123404	167.427	0.373334	0.724804	0.243336	1070.66
Std Vapor Volumetric Flow	MMSCFD	77.0	3.6	0.3	0.0	0.3	76.7	3.8	0.4	3.6	0.0	0.00301017	2.15942E-05	80.9339	0.299494	0.0179871	0.0179871	77.0193
Std Liquid Volumetric Flow	Mbbl/d	34.5	0.5	0.4	0.0	0.4	34.4	0.5	0.5	0.5	0.0	0.00198204	3.31016E-06	35.3674	0.376433	0.00896775	0.00896775	34.5005
Compressibility		0.957	0.009	0.082	0.988	0.007	0.807	0.050	0.414	0.001	0.997	0.978065	0.999551	0.766430	0.0302293	0.977191	0.931511	0.957181
Specific Gravity		0.682	0.998	0.733	1.295	0.739	0.679	0.997	0.719	0.998	0.686	1.34209	0.636338		0.737155	0.828185		0.682079
API Gravity			10.0	60.4		58.1		9.9	62.1	10.0					59.2512			
Enthalpy	MMBtu/h	-287.2	-48.8	-3.4	-0.1	-3.2	-288.9	-50.8	-4.4	-48.8	0.0	-0.0141313	-0.000241359	-344.173	-3.35783	-0.0711653	-0.0715605	-287.259
Mass Enthalpy	Btu/lb	-1719.6	-6826.2	-845.3	-1139.2	-824.7	-1744.5	-6810.9	-854.4	-6822.4	-1872.9	-1099.96	-5523.40	-1931.12	-836.232	-1502.27	-1510.61	-1719.52
Mass Cp	Btu/(lb*°F)	0.5	1.0	0.5	0.4	0.5	0.7	1.0	0.5	1.0	0.5	0.412201	0.442151	0.673946	0.481746	0.463961	0.484609	0.508647
Ideal Gas CpCv Ratio		1.261	1.326	1.048	1.147	1.043	1.258	1.325	1.051	1.326	1.263	1.14332	1.32238	1.25537	1.04536	1.22241	1.22241	1.26129
Dynamic Viscosity	cP	0.0	1.0	0.6	0.0	0.7	0.0	0.8	0.5	0.9	0.0	0.00876454	0.0102761		0.659794	0.0101542		0.0108137
Kinematic Viscosity	cSt	1.0	1.0	0.8	5.7	0.9	0.2	0.8	0.7	0.9	13.3	3.24043	423.828		0.895900	2.26899		1.01215
Thermal Conductivity	Btu/(h*ft*°F)	0.0	0.3	0.1	0.0	0.1	0.0	0.4	0.1	0.3	0.0	0.0112500	0.0122406		0.0696088	0.0158649		0.0180174
Surface Tension	lbf/ft		0.005	0.001		0.002		0.005	0.001	0.005					0.00158581			
Net I.G. Heating Value	Btu/ft^3	1084.2	0.3	5850.5	1972.7	6392.6	1081.7	0.0	5385.0	0.0	1037.4	2044.99	45.7508	1054.45	6124.01	1296.45	1296.45	1084.21
Net Liquid Heating Value	Btu/lb	20774.1	-1052.3	18886.5	19809.2	18850.5	20827.0	-1059.8	18920.4	-1059.0	19748.1	19812.0	-35.9265	19855.3	18868.4	20417.9	20417.9	20774.0
Gross I.G. Heating Value	Btu/ft^3	1197.0	50.7	6277.6	2149.1	6855.1	1194.3	50.3	5783.9	50.3	1146.9	2226.44	97.8881	1165.73	6569.12	1424.48	1424.48	1197.06
Gross Liquid Heating Value	Btu/lb	22941.9	7.8	20276.6	21593.4	20225.5	23001.3	0.0	20333.1	0.8	21840.7	21583.4	1037.6	21961.0	20251.1	22443.5	22443.5	22941.8

Process Streams		**HP Separator Gas**	**HP Separator Water**	**HP Separator Oil**	**OT Flash Gas**	**Sales Oil**	**Gas**	**Water**	**Oil**	**Produced Water**	**PWT Flash Gas**	**Oil W/B**	**Water W/B**	**Well Stream**	**LP Separator Oil**	**LP Separator Gas**	**recovery by VRU (to**	**Total gas to sale**
Phase: Vapor	**Status**	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Mole Fraction		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water		0.208105	0.208105	0.208105	0.444685	0.444685	0			3.03006	3.03006	0.000255088	93.9743	0.0751714	0.370264	0.370264	0.207362	0.208143
H2S		0	0	0	0	0	0			0	0	0	0	0	0	0	0	0
Nitrogen		0.388979	0.388979	0.388979	0.0134005	0.0134005	0.3903			0.194895	0.194895	0.000658168	0.00344652	0.390645	0.121033	0.121033	0.121548	0.388917
Carbon Dioxide		0.165873	0.165873	0.165873	0.301184	0.301184	0.1666			1.29938	1.29938	0.391004	1.54820	0.165723	0.278079	0.278079	0.279145	0.165899
Methane		81.0347	81.0347	81.0347	19.8780	19.8780	81.3211			77.2250	77.2250	4.88590	3.79479	81.2871	61.7722	61.7722	62.0279	81.0302
Ethane		13.7168	13.7168	13.7168	39.8896	39.8896	13.757			14.2470	14.2470	53.9357	0.646130	13.6877	26.5140	26.5140	26.6005	13.7198
Propane		2.54393	2.54393	2.54393	18.7893	18.7893	2.5368			2.84562	2.84562	21.7380	0.0314584	2.51420	6.13765	6.13765	6.14242	2.54477
Isobutane		0.469183	0.469183	0.469183	4.62365	4.62365	0.4674			0.182590	0.182590	5.00729	0.000252775	0.458226	1.17198	1.17198	1.16686	0.469347
n-Butane		0.777097	0.777097	0.777097	8.16605	8.16605	0.7709			0.625563	0.625563	8.67785	0.00130335	0.753391	1.95170	1.95170	1.93597	0.777372
Isopentane		0.210073	0.210073	0.210073	2.35580	2.35580	0.2029			0.114332	0.114332	2.39112	5.97016E-05	0.200429	0.517847	0.517847	0.504973	0.210145
n-Pentane		0.166843	0.166843	0.166843	1.90679	1.90679	0.157			0.0883668	0.0883668	1.90894	3.36541E-05	0.157536	0.411688	0.411688	0.397701	0.166900
2-Methylpentane		0.0106723	0.0106723	0.0106723	0.123139	0.123139	0			0.00264089	0.00264089	0.119657	1.92052E-07	0.00986570	0.0258155	0.0258155	0.0236768	0.0106759
3-Methylpentane		0.00715584	0.00715584	0.00715584	0.0827425	0.0827425	0			0.00467821	0.00467821	0.0801468	8.24838E-07	0.00658846	0.0172976	0.0172976	0.0157113	0.00715821

n-Hexane		0.210944	0.210944	0.210944	2.43055	2.43055	0.23			0.0413298	0.0413298	0.160021	1.16405E-07	0.194541	0.505833	0.505833	0.449278	0.211012
Methylcyclopentane		0.00332844	0.00332844	0.00332844	0.0389547	0.0389547	0			0.00619528	0.00619528	0.0352459	2.34892E-06	0.00301022	0.00808302	0.00808302	0.00715314	0.00332955
Benzene		0.000575690	0.000575690	0.000575690	0.00678496	0.00678496	0			0.00558496	0.00558496	0.000383820	6.50680E-06	0.000516984	0.00140811	0.00140811	0.00125211	0.000575884
2-Methylhexane		0.00993090	0.00993090	0.00993090	0.112274	0.112274	0			0.00212828	0.00212828	0.00705456	2.53532E-09	0.00951288	0.0231167	0.0231167	0.0179237	0.00993398
3-Methylhexane		0.00823897	0.00823897	0.00823897	0.0931789	0.0931789	0			0.00184108	0.00184108	0.0881401	3.28707E-08	0.00787583	0.0191936	0.0191936	0.0147201	0.00824153
Heptane		0.0175027	0.0175027	0.0175027	0.195662	0.195662	0			0.00404947	0.00404947	0.170787	5.30850E-08	0.0171465	0.0403858	0.0403858	0.0293148	0.0175080
Methylcyclohexane		0.0116933	0.0116933	0.0116933	0.133415	0.133415	0			0.0141521	0.0141521	0.116319	1.14607E-06	0.0109979	0.0274333	0.0274333	0.0199090	0.0116969
Toluene		0.00237438	0.00237438	0.00237438	0.0273134	0.0273134	0			0.0213354	0.0213354	0.00331101	1.19602E-05	0.00222167	0.00559862	0.00559862	0.00385736	0.00237513
Octane		0.0242374	0.0242374	0.0242374	0.262432	0.262432	0			0.00322880	0.00322880	0.214857	8.24874E-09	0.0288405	0.0539063	0.0539063	0.0255372	0.0242443
Ethylbenzene		0.00142057	0.00142057	0.00142057	0.0157823	0.0157823	0			0.0122429	0.0122429	0.00354111	3.86048E-06	0.00161079	0.00322194	0.00322194	0.00139647	0.00142099
m-Xylene		0.00125178	0.00125178	0.00125178	0.0138619	0.0138619	0			0.0106353	0.0106353	0.00400705	3.74394E-06	0.00147989	0.00282408	0.00282408	0.00110706	0.00125215
o-Xylene		0.00180402	0.00180402	0.00180402	0.0199961	0.0199961	0			0.0157292	0.0157292	0.00500116	5.78920E-06	0.00215957	0.00407057	0.00407057	0.00149056	0.00180455
Nonane		0.00676190	0.00676190	0.00676190	0.0709533	0.0709533	0			0.00135872	0.00135872	0.0521762	1.63471E-09	0.0108211	0.0144837	0.0144837	0.00331360	0.00676370
C10+		0.000493391	0.000493391	0.000493391	0.00459992	0.00459992	0			7.26565E-05	7.26565E-05	0.00262095	1.04218E-12	0.00268314	0.000932086	0.000932086	6.60058E-06	0.000493494
Molar Flow		**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**
Water		17.5945	0	0	0.00888584	0	0			0	0.00352144	8.43095E-07	0.00222813	6.32237	0	0.00731252	0.00407769	17.6018
H2S		0	0	0	0	0	0			0	0	0	0	0	0	0	0	0
Nitrogen		32.8866	0	0	0.000267773	0	32.8790			0	0.000226501	2.17532E-06	8.17168E-08	32.8556	0	0.00239034	0.00239021	32.8890
Carbon Dioxide		14.0239	0	0	0.00601836	0	14.0344			0	0.00151010	0.00129231	3.67079E-05	13.9383	0	0.00549191	0.00548929	14.0294
Methane		6851.16	0	0	0.397208	0	6850.52			0	0.0897486	0.0161484	8.99744E-05	6836.74	0	1.21997	1.21976	6852.38
Ethane		1159.70	0	0	0.797086	0	1158.89			0	0.0165574	0.178264	1.53197E-05	1151.22	0	0.523637	0.523089	1160.22
Propane		215.079	0	0	0.375453	0	213.701			0	0.00330709	0.0718466	7.45878E-07	211.460	0	0.121215	0.120789	215.200
Isobutane		39.6676	0	0	0.0923912	0	39.3739			0	0.000212201	0.0165496	5.99328E-09	38.5396	0	0.0231460	0.0229460	39.6907
n-Butane		65.7005	0	0	0.163177	0	64.9409			0	0.000727010	0.0286813	3.09025E-08	63.3647	0	0.0385451	0.0380702	65.7390
Isopentane		17.7609	0	0	0.0470744	0	17.0924			0	0.000132873	0.00790291	1.41552E-09	16.8573	0	0.0102272	0.00993012	17.7711
n-Pentane		14.1059	0	0	0.0381021	0	13.2257			0	0.000102697	0.00630927	7.97939E-10	13.2497	0	0.00813063	0.00782064	14.1140
2-Methylpentane		0.902304	0	0	0.00246060	0	0			0	3.06917E-06	0.000395480	4.55356E-12	0.829765	0	0.000509843	0.000465595	0.902814
3-Methylpentane		0.604998	0	0	0.00165339	0	0			0	5.43687E-06	0.000264894	1.95569E-11	0.554130	0	0.000341619	0.000308958	0.605339
n-Hexane		17.8344	0	0	0.0485681	0	19.3753			0	4.80322E-05	0.000528887	2.75997E-12	16.3620	0	0.00998992	0.00883488	17.8444
Methylcyclopentane		0.281406	0	0	0.000778405	0	0			0	7.19997E-06	0.000116492	5.56928E-11	0.253178	0	0.000159635	0.000140664	0.281566
Benzene		0.0486722	0	0	0.000135579	0	0			0	6.49067E-06	1.26857E-06	1.54276E-10	0.0434815	0	2.78094E-05	2.46224E-05	0.0487000
2-Methylhexane		0.839618	0	0	0.00224349	0	0			0	2.47342E-06	2.33161E-05	6.01124E-14	0.800091	0	0.000456542	0.000352463	0.840074
3-Methylhexane		0.696572	0	0	0.00186193	0	0			0	2.13964E-06	0.000291313	7.79363E-13	0.662405	0	0.000379063	0.000289465	0.696951
Heptane		1.47978	0	0	0.00390978	0	0			0	4.70617E-06	0.000564469	1.25864E-12	1.44212	0	0.000797597	0.000576465	1.48058
Methylcyclohexane		0.988619	0	0	0.00266595	0	0			0	1.64472E-05	0.000384447	2.71732E-11	0.924989	0	0.000541794	0.000391504	0.989161
Toluene		0.200744	0	0	0.000545785	0	0			0	2.47954E-05	1.09433E-05	2.83577E-10	0.186856	0	0.000110570	7.58537E-05	0.200855
Octane		2.04918	0	0	0.00524400	0	0			0	3.75241E-06	0.000710128	1.95577E-13	2.42566	0	0.00106462	0.000502179	2.05024
Ethylbenzene		0.120103	0	0	0.000315367	0	0			0	1.42284E-05	1.17038E-05	9.15319E-11	0.135477	0	6.36315E-05	2.74611E-05	0.120167
m-Xylene		0.105833	0	0	0.000276993	0	0			0	1.23601E-05	1.32437E-05	8.87687E-11	0.124468	0	5.57740E-05	2.17699E-05	0.105889
o-Xylene		0.152523	0	0	0.000399569	0	0			0	1.82800E-05	1.65294E-05	1.37262E-10	0.181633	0	8.03917E-05	2.93114E-05	0.152603
Nonane		0.571691	0	0	0.00141781	0	0			0	1.57907E-06	0.000172448	3.87590E-14	0.910116	0	0.000286046	6.51609E-05	0.571977
C10+		0.0417142	0	0	9.19170E-05	0	0			0	8.44392E-08	8.66253E-06	2.47100E-17	0.225668	0	1.84082E-05	1.29798E-07	0.0417326
Mass Fraction		**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Water		0.189790	0.189790	0.189790	0.213551	0.213551	0			2.74924	2.74924	0.000118226	91.8597	0.0686987	0.278092	0.278092	0.156581	0.189815
H2S		0	0	0	0	0	0			0	0	0	0	0	0	0	0	0
Nitrogen		0.551622	0.551622	0.551622	0.0100068	0.0100068	0.556097			0.274971	0.274971	0.000474334	0.00523867	0.555141	0.141353	0.141353	0.142720	0.551506
Carbon Dioxide		0.369548	0.369548	0.369548	0.353335	0.353335	0.372913			2.88008	2.88008	0.442700	3.69700	0.369985	0.510211	0.510211	0.514928	0.369588
Methane		65.8099	65.8099	65.8099	8.50062	8.50062	66.3530			62.3950	62.3950	2.01649	3.30319	66.1526	41.3142	41.3142	41.7088	65.8030
Ethane		20.8796	20.8796	20.8796	31.9732	31.9732	21.0392			21.5756	21.5756	41.7232	1.05418	20.8788	33.2376	33.2376	33.5258	20.8831
Propane		5.67871	5.67871	5.67871	22.0858	22.0858	5.68942			6.31965	6.31965	24.6602	0.0752673	5.62406	11.2832	11.2832	11.3529	5.68030
Isobutane		1.38049	1.38049	1.38049	7.16366	7.16366	1.38171			0.534491	0.534491	7.48732	0.000797169	1.35106	2.83986	2.83986	2.84271	1.38091
n-Butane		2.28648	2.28648	2.28648	12.6521	12.6521	2.27891			1.83119	1.83119	12.9759	0.00411035	2.22135	4.72923	4.72923	4.71641	2.28717
Isopentane		0.767272	0.767272	0.767272	4.53081	4.53081	0.744556			0.415448	0.415448	4.43825	0.000233717	0.733574	1.55764	1.55764	1.52710	0.767496
n-Pentane		0.609377	0.609377	0.609377	3.66725	3.66725	0.576123			0.321099	0.321099	3.54326	0.000131748	0.576584	1.23832	1.23832	1.20269	0.609555
2-Methylpentane		0.0465578	0.0465578	0.0465578	0.282869	0.282869	0			0.0114618	0.0114618	0.265280	8.98003E-07	0.0431286	0.0927468	0.0927468	0.0855215	0.0465709
3-Methylpentane		0.0312171	0.0312171	0.0312171	0.190073	0.190073	0			0.0203041	0.0203041	0.177685	3.85680E-06	0.0288019	0.0621449	0.0621449	0.0567500	0.0312259
n-Hexane		0.920235	0.920235	0.920235	5.58337	5.58337	1.00809			0.179377	0.179377	0.354766	5.44291E-07	0.850448	1.81729	1.81729	1.62281	0.920489
Methylcyclopentane		0.0141805	0.0141805	0.0141805	0.0873918	0.0873918	0			0.0262594	0.0262594	0.0763122	1.07262E-05	0.0128516	0.0283604	0.0283604	0.0252331	0.0141846
Benzene		0.00227643	0.00227643	0.00227643	0.0141277	0.0141277	0			0.0219714	0.0219714	0.000771305	2.75778E-05	0.00204856	0.00458552	0.00458552	0.00409950	0.00227709
2-Methylhexane		0.0503749	0.0503749	0.0503749	0.299890	0.299890	0			0.0107405	0.0107405	0.0181856	1.37843E-08	0.0483551	0.0965689	0.0965689	0.0752789	0.0503880
3-Methylhexane		0.0417925	0.0417925	0.0417925	0.248887	0.248887	0			0.00929114	0.00929114	0.227212	1.78714E-07	0.0400338	0.0801803	0.0801803	0.0618239	0.0418034
Heptane		0.0887829	0.0887829	0.0887829	0.522626	0.522626	0			0.0204360	0.0204360	0.440263	2.88618E-07	0.0871576	0.168710	0.168710	0.123121	0.0888056
Methylcyclohexane		0.0581213	0.0581213	0.0581213	0.349191	0.349191	0			0.0699829	0.0699829	0.293820	6.10569E-06	0.0547789	0.112296	0.112296	0.0819351	0.0581366
Toluene		0.0110749	0.0110749	0.0110749	0.0670849	0.0670849	0			0.0990063	0.0990063	0.00784845	5.97936E-05	0.0103843	0.0215059	0.0215059	0.0148971	0.0110779
Octane		0.140155	0.140155	0.140155	0.799097	0.799097	0			0.0185753	0.0185753	0.631403	5.11254E-08	0.167121	0.256714	0.256714	0.122269	0.140189
Ethylbenzene		0.00763472	0.00763472	0.00763472	0.0446642	0.0446642	0			0.0654617	0.0654617	0.00967170	2.22381E-05	0.00867512	0.0142605	0.0142605	0.00621418	0.00763660
m-Xylene		0.00672758	0.00672758	0.00672758	0.0392295	0.0392295	0			0.0568660	0.0568660	0.0109443	2.15668E-05	0.00797012	0.0124995	0.0124995	0.00492632	0.00672921

o-Xylene		0.00969556	0.00969556	0.00969556	0.0565894	0.0565894	0			0.0841023	0.0841023	0.0136595	3.33484E-05	0.0116306	0.0180166	0.0180166	0.00663288	0.00969792
Nonane		0.0439028	0.0439028	0.0439028	0.242580	0.242580	0			0.00877659	0.00877659	0.172159	1.13760E-08	0.0704042	0.0774445	0.0774445	0.0178133	0.0439123
C10+		0.00447338	0.00447338	0.00447338	0.0219611	0.0219611	0			0.000655376	0.000655376	0.0120764	1.01277E-11	0.0243777	0.00695964	0.00695964	4.95505E-05	0.00447409
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		316.969	0	0	0.160081	0	0			0	0.0634398	1.51886E-05	0.0401404	113.899	0	0.131737	0.0734607	317.101
H2S		0	0	0	0	0	0			0	0	0	0	0	0	0	0	0
Nitrogen		921.267	0	0	0.00750123	0	921.053			0	0.00634505	6.09381E-05	2.28917E-06	920.398	0	0.0669615	0.0669578	921.334
Carbon Dioxide		617.184	0	0	0.264865	0	617.649			0	0.0664589	0.0568740	0.00161550	613.418	0	0.241696	0.241581	617.425
Methane		109909	0	0	6.37219	0	109899			0	1.43979	0.259061	0.00144341	109678	0	19.5713	19.5679	109929
Ethane		34871.1	0	0	23.9676	0	34846.8			0	0.497865	5.36022	0.000460650	34616.1	0	15.7453	15.7288	34886.8
Propane		9484.04	0	0	16.5558	0	9423.27			0	0.145828	3.16812	3.28899E-05	9324.44	0	5.34506	5.32625	9489.38
Isobutane		2305.57	0	0	5.36998	0	2288.50			0	0.0123336	0.961902	3.48343E-07	2240.00	0	1.34530	1.33367	2306.91
n-Butane		3818.66	0	0	9.48419	0	3774.51			0	0.0422554	1.66702	1.79612E-06	3682.90	0	2.24032	2.21272	3820.90
Isopentane		1281.42	0	0	3.39636	0	1233.19			0	0.00958663	0.570185	1.02128E-07	1216.23	0	0.737880	0.716446	1282.16
n-Pentane		1017.72	0	0	2.74902	0	954.220			0	0.00740948	0.455206	5.75703E-08	955.950	0	0.586615	0.564250	1018.31
2-Methylpentane		77.7564	0	0	0.212043	0	0			0	0.000264487	0.0340807	3.92405E-10	71.5053	0	0.0439359	0.0401228	77.8003
3-Methylpentane		52.1359	0	0	0.142481	0	0			0	0.000468524	0.0228274	1.68532E-09	47.7523	0	0.0294392	0.0266245	52.1653
n-Hexane		1536.89	0	0	4.18537	0	1669.67			0	0.00413919	0.0455770	2.37841E-10	1410.00	0	0.860885	0.761349	1537.75
Methylcyclopentane		23.6830	0	0	0.0655101	0	0			0	0.000605946	0.00980389	4.68708E-09	21.3073	0	0.0134348	0.0118382	23.6964
Benzene		3.80188	0	0	0.0105903	0	0			0	0.000506998	9.90901E-05	1.20508E-08	3.39642	0	0.00217225	0.00192330	3.80405
2-Methylhexane		84.1313	0	0	0.224802	0	0			0	0.000247841	0.00233632	6.02338E-12	80.1707	0	0.0457464	0.0353175	84.1771
3-Methylhexane		69.7978	0	0	0.186569	0	0			0	0.000214397	0.0291901	7.80937E-11	66.3743	0	0.0379829	0.0290049	69.8358
Heptane		148.277	0	0	0.391768	0	0			0	0.000471568	0.0565609	1.26119E-10	144.503	0	0.0799208	0.0577629	148.357
Methylcyclohexane		97.0686	0	0	0.261759	0	0			0	0.00161488	0.0377473	2.66803E-09	90.8210	0	0.0531966	0.0384402	97.1218
Toluene		18.4963	0	0	0.0502878	0	0			0	0.00228461	0.00100830	2.61283E-08	17.2166	0	0.0101877	0.00698904	18.5064
Octane		234.074	0	0	0.599015	0	0			0	0.000428633	0.0811169	2.23405E-11	277.079	0	0.121610	0.0573632	234.196
Ethylbenzene		12.7508	0	0	0.0334809	0	0			0	0.00151055	0.00124253	9.71748E-09	14.3830	0	0.00675544	0.00291541	12.7575
m-Xylene		11.2358	0	0	0.0294070	0	0			0	0.00131221	0.00140602	9.42413E-09	13.2141	0	0.00592125	0.00231120	11.2417
o-Xylene		16.1926	0	0	0.0424202	0	0			0	0.00194069	0.00175484	1.45724E-08	19.2831	0	0.00853478	0.00311184	16.2011
Nonane		73.3223	0	0	0.181842	0	0			0	0.000202523	0.0221174	4.97104E-12	116.727	0	0.0366869	0.00835721	73.3590
C10+		7.47102	0	0	0.0164623	0	0			0	1.51231E-05	0.00155146	4.42556E-15	40.4172	0	0.00329691	2.32468E-05	7.47432

Process Streams		**HP Separator Gas**	**HP Separator Water**	**HP Separator Oil**	**OT Flash Gas**	**Sales Oil**	**Gas**	**Water**	**Oil**	**Produced Water**	**PWT Flash Gas**	**Oil W/B**	**Water W/B**	**Well Stream**	**LP Separator Oil**	**LP Separator Gas**	**recovery by VRU (to**	**Total gas to sale**
Phase: Vapor	**Status**	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Property	**Units**																	
Temperature	°F	70.0	70.0	70.0	75.9	75.9	85.0			75.9	75.9	75.9425	75.9425	84.0876	70	70	70	69.9993
Pressure	psig	169	169	169	0	0	1000			0	0	9.72544	-14.2241	1000	50	50	169	169
Mole Fraction Vapor	%	100	100	100	100	100	100			100	100	100	100	100	100	100	100	100
Mole Fraction Light Liquid	%	0	0	0	0	0	0			0	0	0	0	0	0	0	0	0
Mole Fraction Heavy Liquid	%	0	0	0	0	0	0			0	0	0	0	0	0	0	0	0
Molecular Weight	lb/lbmol	19.8	19.8	19.8	37.5	37.5	19.7			19.9	19.9	38.8703	18.4300	19.7127	23.9864	23.9864	23.8578	19.7548
Mass Density	lb/ft^3	0.7	0.7	0.7	0.1	0.1	4.2			0.1	0.1	0.168852	0.00151363	4.25935	0.279379	0.279379	0.824299	0.666974
Molar Flow	lbmol/h	8454.6	0.0	0.0	2.0	0.0	8424.0			0.0	0.1	0.330511	0.00237100	8410.61	0	1.97495	1.96646	8456.57
Mass Flow	lb/h	167010.5	0.0	0.0	75.0	0.0	165628.0			0.0	2.3	12.8471	0.0436975	165796	0	47.3718	46.9155	167058
Vapor Volumetric Flow	MCFH	250.4	0.0	0.0	0.8	0.0	39.2			0.0	0.0	0.0760849	0.0288693	38.9251	0	0.169561	0.0569156	250.471
Liquid Volumetric Flow	Mbbl/d	1070.4	0.0	0.0	3.3	0.0	167.4			0.0	0.2	0.325231	0.123404	166.389	0	0.724804	0.243290	1070.66
Std Vapor Volumetric Flow	MMSCFD	77.0	0.0	0.0	0.0	0.0	76.7			0.0	0.0	0.00301017	2.15942E-05	76.6007	0	0.0179871	0.0179098	77.0193
Std Liquid Volumetric Flow	Mbbl/d	34.5	0.0	0.0	0.0	0.0	34.4			0.0	0.0	0.00198204	3.31016E-06	34.3114	0	0.00896775	0.00892083	34.5005
Compressibility		0.957	0.957	0.957	0.988	0.988	0.807			0.997	0.997	0.978065	0.999551	0.804765	0.977191	0.977191	0.935352	0.957181
Specific Gravity		0.682	0.682	0.682	1.295	1.295	0.679			0.686	0.686	1.34209	0.636338	0.680625	0.828185	0.828185	0.823744	0.682079
API Gravity																		
Enthalpy	MMBtu/h	-287.2	0.0	0.0	-0.1	0.0	-288.9			0.0	0.0	-0.0141313	-0.000241359	-289.256	0	-0.0711653	-0.0707712	-287.258
Mass Enthalpy	Btu/lb	-1719.6	-1719.6	-1719.6	-1139.2	-1139.2	-1744.5			-1872.9	-1872.9	-1099.96	-5523.40	-1744.65	-1502.27	-1502.27	-1508.48	-1719.52
Mass Cp	Btu/(lb*°F)	0.5	0.5	0.5	0.4	0.4	0.7			0.5	0.5	0.412201	0.442151	0.664780	0.463961	0.463961	0.483685	0.508647
Ideal Gas CpCv Ratio		1.261	1.261	1.261	1.147	1.147	1.258			1.263	1.263	1.14332	1.32238	1.25799	1.22241	1.22241	1.22352	1.26129
Dynamic Viscosity	cP	0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.00876454	0.0102761	0.0130867	0.0101542	0.0101542	0.0103706	0.0108137
Kinematic Viscosity	cSt	1.0	1.0	1.0	5.7	5.7	0.2			13.3	13.3	3.24043	423.828	0.191808	2.26899	2.26899	0.785415	1.01215
Thermal Conductivity	Btu/(h*ft*°F)	0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.0112500	0.0122406	0.0225519	0.0158649	0.0158649	0.0163626	0.0180174
Surface Tension	lbf/ft																	
Net I.G. Heating Value	Btu/ft^3	1084.2	1084.2	1084.2	1972.7	1972.7	1081.7			1037.4	1037.4	2044.99	45.7508	1083.42	1296.45	1296.45	1291.71	1084.21
Net Liquid Heating Value	Btu/lb	20774.1	20774.1	20774.1	19809.2	19809.2	20827.0			19748.1	19748.1	19812.0	-35.9265	20804.9	20417.9	20417.9	20455.0	20774.0
Gross I.G. Heating Value	Btu/ft^3	1197.0	1197.0	1197.0	2149.1	2149.1	1194.3			1146.9	1146.9	2226.44	97.8881	1196.19	1424.48	1424.48	1419.39	1197.06
Gross Liquid Heating Value	Btu/lb	22941.9	22941.9	22941.9	21593.4	21593.4	23001.3			21840.7	21840.7	21583.4	1037.6	22975.9	22443.5	22443.5	22486.0	22941.8

Process Streams		**HP Separator Gas**	**HP Separator Water**	**HP Separator Oil**	**OT Flash Gas**	**Sales Oil**	**Gas**	**Water**	**Oil**	**Produced Water**	**PWT Flash Gas**	**Oil W/B**	**Water W/B**	**Well Stream**	**LP Separator Oil**	**LP Separator Gas**	**recovery by VRU (to**	**Total gas to sale**
Phase: Light Liquid	**Status**	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Mole Fraction		**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**

Water		0.0550308	99.9684	0.0550308	0.00966384	0.00966384		100	0	99.9968	99.9968	8.68270E-06	100.0000	0.0679840	0.0360985	0.0360985	0.0387880	
H2S		0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	
Nitrogen		0.00764367	5.93463E-05	0.00764367	2.06715E-05	2.06715E-05		0	0.0219998	2.28293E-06	2.28293E-06	1.72784E-06	1.29641E-09	0.0485468	0.000833713	0.000833713	0.00246312	
Carbon Dioxide		0.0380580	0.00101028	0.0380580	0.00568647	0.00568647		0	0.0139999	0.000630011	0.000630011	0.0119546	2.42306E-05	0.131364	0.0236428	0.0236428	0.0490260	
Methane		4.72167	0.0244693	4.72167	0.0930696	0.0930696		0	4.97995	0.00185875	0.00185875	0.0389029	2.94182E-06	23.4074	1.29532	1.29532	4.02703	
Ethane		4.83410	0.00457098	4.83410	1.17980	1.17980		0	5.23595	0.000399667	0.000399667	2.64706	5.87036E-07	15.0691	3.53204	3.53204	10.4282	
Propane		3.30814	0.000921363	3.30814	2.12561	2.12561		0	5.28795	8.82072E-05	8.82072E-05	4.07660	3.17263E-08	7.09422	3.13820	3.13820	8.12842	
Isobutane		1.53322	5.54303E-05	1.53322	1.35638	1.35638		0	1.72798	1.96944E-06	1.96944E-06	2.39280	8.90640E-11	2.47308	1.55492	1.55492	3.81070	
n-Butane		3.62447	0.000198016	3.62447	3.43761	3.43761		0	4.22196	1.48590E-05	1.48590E-05	5.94549	1.01199E-09	5.35388	3.72494	3.72494	9.04661	
Isopentane		2.45753	3.53365E-05	2.45753	2.58814	2.58814		0	3.18197	1.86130E-06	1.86130E-06	4.27776	3.19255E-11	2.61874	2.57402	2.57402	5.66001	
n-Pentane		2.61771	2.72973E-05	2.61771	2.80477	2.80477		0	3.73996	1.42444E-06	1.42444E-06	4.56592	1.78177E-11	2.63131	2.75020	2.75020	5.90574	
2-Methylpentane		0.396924	7.93506E-07	0.396924	0.438367	0.438367		0	2.17098	2.02729E-08	2.02729E-08	0.692404	4.85806E-14	0.313767	0.419212	0.419212	0.843006	
3-Methylpentane		0.296845	1.46716E-06	0.296845	0.328572	0.328572		0	1.47799	9.74356E-08	9.74356E-08	0.516680	5.66116E-13	0.229625	0.313634	0.313634	0.622265	
n-Hexane		10.8323	1.23533E-05	10.8323	12.0362	12.0362		0	4.66295	2.52291E-07	2.52291E-07	1.28550	2.34412E-14	7.80824	11.4525	11.4525	22.0058	
Methylcyclopentane		0.181412	2.20119E-06	0.181412	0.201712	0.201712		0	0.718993	3.87356E-07	3.87356E-07	0.293717	4.83393E-12	0.136080	0.191822	0.191822	0.361438	
Benzene		0.0320464	1.90401E-05	0.0320464	0.0356399	0.0356399		0	0.124999	1.74099E-05	1.74099E-05	0.00321417	6.66527E-10	0.0243447	0.0338865	0.0338865	0.0606951	
2-Methylhexane		1.19006	6.36963E-07	1.19006	1.33441	1.33441		0	2.61697	1.38197E-08	1.38197E-08	0.132930	5.45114E-16	0.675980	1.26014	1.26014	1.98292	
3-Methylhexane		1.03662	5.51549E-07	1.03662	1.16271	1.16271		0	2.20698	1.24955E-08	1.24955E-08	1.74234	7.38563E-15	0.588430	1.09772	1.09772	1.70702	
Heptane		2.74740	1.21329E-06	2.74740	3.08559	3.08559		0	5.08495	2.76380E-08	2.76380E-08	4.25127	1.20091E-14	1.48085	2.90998	2.90998	4.21300	
Methylcyclohexane		1.83654	4.72907E-06	1.83654	2.06241	2.06241		0	3.39797	5.85578E-07	5.85578E-07	2.85970	1.56748E-12	1.04711	1.94519	1.94519	2.86331	
Toluene		0.469891	6.12154E-05	0.469891	0.528213	0.528213		0	0.760992	5.49846E-05	5.49846E-05	0.101776	1.01760E-09	0.264430	0.497776	0.497776	0.661350	
Octane		11.6653	9.59914E-07	11.6653	13.1455	13.1455		0	12.7579	1.45437E-08	1.45437E-08	17.0476	1.23702E-15	5.48959	12.3626	12.3626	10.7156	
Ethylbenzene		0.806067	3.21197E-05	0.806067	0.908533	0.908533		0	0.836992	2.85433E-05	2.85433E-05	0.322926	2.98657E-10	0.395227	0.854284	0.854284	0.689099	
m-Xylene		0.845667	2.87768E-05	0.845667	0.953378	0.953378		0	0.835992	2.56704E-05	2.56704E-05	0.436122	3.00053E-10	0.410903	0.896287	0.896287	0.647830	
o-Xylene		1.36460	5.59160E-05	1.36460	1.53859	1.53859		0	1.31099	5.13256E-05	5.13256E-05	0.608071	6.27122E-10	0.664488	1.44631	1.44631	0.973153	
Nonane		9.55757	4.07558E-07	9.55757	10.7816	10.7816		0	8.14292	9.73455E-09	9.73455E-09	12.6020	3.91915E-16	4.45314	10.1307	10.1307	4.20829	
C10+		33.5432	2.17071E-08	33.5432	37.8579	37.8579		0	24.4798	4.33817E-10	4.33817E-10	33.1472	2.11301E-19	17.1221	35.5577	35.5577	0.348239	
Molar Flow		**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**
Water		0	396.798	0.0191831	0	0.00298474		414.412	0	396.795	0	0	0	0.0456963	0.0118706	0	2.03591E-06	
H2S		0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	
Nitrogen		0	0.000235559	0.00266449	0	6.38454E-06		0	0.0105457	9.05882E-06	0	0	0	0.0326313	0.000274157	0	1.29285E-07	
Carbon Dioxide		0	0.00401003	0.0132666	0	0.00175630		0	0.00671091	0.00249993	0	0	0	0.0882980	0.00777466	0	2.57328E-06	
Methane		0	0.0971242	1.64592	0	0.0287452		0	2.38717	0.00737565	0	0	0	15.7336	0.425953	0	0.000211371	
Ethane		0	0.0181433	1.68511	0	0.364388		0	2.50988	0.00158591	0	0	0	10.1289	1.16147	0	0.000547358	
Propane		0	0.00365711	1.15318	0	0.656510		0	2.53481	0.000350013	0	0	0	4.76847	1.03196	0	0.000426645	
Isobutane		0	0.000220016	0.534463	0	0.418926		0	0.828318	7.81487E-06	0	0	0	1.66231	0.511317	0	0.000200017	
n-Butane		0	0.000785972	1.26345	0	1.06173		0	2.02382	5.89617E-05	0	0	0	3.59867	1.22490	0	0.000474839	
Isopentane		0	0.000140259	0.856665	0	0.799364		0	1.52529	7.38576E-06	0	0	0	1.76021	0.846438	0	0.000297083	
n-Pentane		0	0.000108349	0.912505	0	0.866272		0	1.79277	5.65227E-06	0	0	0	1.76867	0.904374	0	0.000309981	
2-Methylpentane		0	3.14961E-06	0.138363	0	0.135393		0	1.04067	8.04445E-08	0	0	0	0.210902	0.137853	0	4.42477E-05	
3-Methylpentane		0	5.82350E-06	0.103477	0	0.101482		0	0.708480	3.86632E-07	0	0	0	0.154345	0.103135	0	3.26615E-05	
n-Hexane		0	4.90333E-05	3.77601	0	3.71745		0	2.23521	1.00111E-06	0	0	0	5.24840	3.76602	0	0.00115504	
Methylcyclopentane		0	8.73703E-06	0.0632382	0	0.0623002		0	0.344653	1.53706E-06	0	0	0	0.0914676	0.0630786	0	1.89712E-05	
Benzene		0	7.55746E-05	0.0111710	0	0.0110076		0	0.0599188	6.90839E-05	0	0	0	0.0163636	0.0111432	0	3.18577E-06	
2-Methylhexane		0	2.52826E-06	0.414841	0	0.412141		0	1.25446	5.48374E-08	0	0	0	0.454368	0.414384	0	0.000104079	
3-Methylhexane		0	2.18923E-06	0.361353	0	0.359112		0	1.05793	4.95832E-08	0	0	0	0.395520	0.360974	0	8.95984E-05	
Heptane		0	4.81584E-06	0.957713	0	0.953006		0	2.43750	1.09670E-07	0	0	0	0.995374	0.956916	0	0.000221132	
Methylcyclohexane		0	1.87708E-05	0.640196	0	0.636988		0	1.62883	2.32362E-06	0	0	0	0.703831	0.639654	0	0.000150289	
Toluene		0	0.000242978	0.163799	0	0.163142		0	0.364786	0.000218183	0	0	0	0.177740	0.163688	0	3.47130E-05	
Octane		0	3.81012E-06	4.06638	0	4.06007		0	6.11556	5.77105E-08	0	0	0	3.68990	4.06531	0	0.000562441	
Ethylbenzene		0	0.000127490	0.280986	0	0.280607		0	0.401217	0.000113262	0	0	0	0.265657	0.280922	0	3.61695E-05	
m-Xylene		0	0.000114222	0.294790	0	0.294457		0	0.400737	0.000101862	0	0	0	0.276194	0.294734	0	3.40033E-05	
o-Xylene		0	0.000221944	0.475684	0	0.475204		0	0.628429	0.000203664	0	0	0	0.446643	0.475603	0	5.10789E-05	
Nonane		0	1.61769E-06	3.33166	0	3.32996		0	3.90335	3.86274E-08	0	0	0	2.99324	3.33137	0	0.000220885	
C10+		0	8.61606E-08	11.6928	0	11.6927		0	11.7345	1.72142E-09	0	0	0	11.5088	11.6928	0	1.82784E-05	

Process Streams		**HP Separator Gas**	**HP Separator Water**	**HP Separator Oil**	**OT Flash Gas**	**Sales Oil**	**Gas**	**Water**	**Oil**	**Produced Water**	**PWT Flash Gas**	**Oil W/B**	**Water W/B**	**Well Stream**	**LP Separator Oil**	**LP Separator Gas**	**r recovery by VRU (to**	**Total gas to sale**
Phase: Light Liquid	**Status**	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Property	**Units**																	
Temperature	°F	70.0	70.0	70.0	75.9	75.9		85.0	85.0	75.9	75.9	75.9425	75.9425	84.0876	70	70	70	
Pressure	psig	169	169	169	0	0		1000	1000	0	0	9.72544	-14.2241	1000	50	50	169	
Mole Fraction Vapor	%	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	
Mole Fraction Light Liquid	%	100	100	100	100	100		100	100	100	100	100	100	100	100	100	100	
Mole Fraction Heavy Liquid	%	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	
Molecular Weight	lb/lbmol	116.6	18.0	116.6	127.6	127.6		18.0	107.0	18.0	18.0	121.726	18.0153	75.3974	122.109	122.109	75.8440	
Mass Density	lb/ft^3	45.7	62.3	45.7	46.1	46.1		62.2	44.9	62.2	62.2	45.5004	62.2179	40.7657	45.9756	45.9756	40.5018	
Molar Flow	lbmol/h	0.0	396.9	34.9	0.0	30.9		414.4	47.9	396.8	0.0	0	0	67.2162	32.8839	0	0.0052881	

Mass Flow	lb/h	0.0	7151.0	4062.8	0.0	3940.5		7465.7	5130.5	7148.7	0.0	0	0	5067.93	4015.43	0	0.398091	
Vapor Volumetric Flow	MCFH	0.0	0.1	0.1	0.0	0.1		0.1	0.1	0.1	0.0	0	0	0.124318	0.0873382	0	9.82895E-06	
Liquid Volumetric Flow	Mbbl/d	0.0	0.5	0.4	0.0	0.4		0.5	0.5	0.5	0.0	0	0	0.531409	0.373334	0	4.20147E-05	
Std Vapor Volumetric Flow	MMSCFD	0.0	3.6	0.3	0.0	0.3		3.8	0.4	3.6	0.0	0	0	0.612180	0.299494	0	4.78042E-05	
Std Liquid Volumetric Flow	Mbbl/d	0.0	0.5	0.4	0.0	0.4		0.5	0.5	0.5	0.0	0	0	0.550115	0.376433	0	4.29269E-05	
Compressibility		0.082	0.009	0.082	0.007	0.007		0.050	0.414	0.001	0.001	0.0113664	2.37698E-05	0.321609	0.0302293	0.0302293	0.0605169	
Specific Gravity		0.733	0.998	0.733	0.739	0.739		0.997	0.719	0.998	0.998	0.729535	0.997577	0.653621	0.737155	0.737155	0.649390	
API Gravity		60.4	10.0	60.4	58.1	58.1		9.9	62.1	10.0	10.0	60.5079	10.0135	80.3166	59.2512	59.2512	84.5210	
Enthalpy	MMBtu/h	0.0	-48.8	-3.4	0.0	-3.2		-50.8	-4.4	-48.8	0.0	0	0	-4.82230	-3.35783	0	-0.000391567	
Mass Enthalpy	Btu/lb	-845.3	-6826.2	-845.3	-824.7	-824.7		-6810.9	-854.4	-6822.4	-6822.4	-853.997	-6822.66	-951.533	-836.232	-836.232	-983.612	
Mass Cp	Btu/(lb*°F)	0.5	1.0	0.5	0.5	0.5		1.0	0.5	1.0	1.0	0.487532	0.982746	0.527227	0.481746	0.481746	0.520483	
Ideal Gas CpCv Ratio		1.048	1.326	1.048	1.043	1.043		1.325	1.051	1.326	1.326	1.04482	1.32556	1.07150	1.04536	1.04536	1.07283	
Dynamic Viscosity	cP	0.6	1.0	0.6	0.7	0.7		0.8	0.5	0.9	0.9	0.625803	0.924434	0.258282	0.659794	0.659794	0.260849	
Kinematic Viscosity	cSt	0.8	1.0	0.8	0.9	0.9		0.8	0.7	0.9	0.9	0.858621	0.927556	0.395529	0.895900	0.895900	0.402063	
Thermal Conductivity	Btu/(h*ft*°F)	0.1	0.3	0.1	0.1	0.1		0.4	0.1	0.3	0.3	0.0692135	0.349835	0.0647229	0.0696088	0.0696088	0.0667958	
Surface Tension	lbf/ft	0.001	0.005	0.001	0.002	0.002		0.005	0.001	0.005	0.005	0.00156035	0.00499737	0.000669134	0.00158581	0.00158581	0.00106661	
Net I.G. Heating Value	Btu/ft^3	5850.5	0.3	5850.5	6392.6	6392.6		0.0	5385.0	0.0	0.0	6116.87	3.71550E-05	3830.87	6124.01	6124.01	3869.80	
Net Liquid Heating Value	Btu/lb	18886.5	-1052.3	18886.5	18850.5	18850.5		-1059.8	18920.4	-1059.0	-1059.0	18907.6	-1059.76	19126.2	18868.4	18868.4	19186.0	
Gross I.G. Heating Value	Btu/ft^3	6277.6	50.7	6277.6	6855.1	6855.1		50.3	5783.9	50.3	50.3	6566.07	50.3100	4126.67	6569.12	6569.12	4177.83	
Gross Liquid Heating Value	Btu/lb	20276.6	7.8	20276.6	20225.5	20225.5		0.0	20333.1	0.8	0.8	20307.5	0.000819263	20614.5	20251.1	20251.1	20725.7	

Process Streams		HP Separator Gas	HP Separator Water	HP Separator Oil	OT Flash Gas	Sales Oil	Gas	Water	Oil	Produced Water	PWT Flash Gas	Oil W/B	Water W/B	Well Stream	LP Separator Oil	LP Separator Gas	recovery by VRU (to	Total gas to sale
Phase: Heavy Liquid	Status	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Mole Fraction		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water		99.9684		99.9684										99.8739			99.9674	
H2S		0		0										0			0	
Nitrogen		5.93463E-05		5.93463E-05										0.000311602			1.88210E-05	
Carbon Dioxide		0.00101028		0.00101028										0.00355712			0.00170356	
Methane		0.0244693		0.0244693										0.106071			0.0188550	
Ethane		0.00457098		0.00457098										0.0135968			0.00878722	
Propane		0.000921363		0.000921363										0.00188490			0.00217679	
Isobutane		5.54303E-05		5.54303E-05										9.15836E-05			0.000133407	
n-Butane		0.000198016		0.000198016										0.000320397			0.000476745	
Isopentane		3.53365E-05		3.53365E-05										3.98929E-05			8.14707E-05	
n-Pentane		2.72973E-05		2.72973E-05										3.22672E-05			6.20971E-05	
2-Methylpentane		7.93506E-07		7.93506E-07										7.75359E-07			1.65555E-06	
3-Methylpentane		1.46716E-06		1.46716E-06										1.36695E-06			3.02901E-06	
n-Hexane		1.23533E-05		1.23533E-05										1.11037E-05			2.46884E-05	
Methylcyclopentane		2.20119E-06		2.20119E-06										1.86337E-06			4.46438E-06	
Benzene		1.90401E-05		1.90401E-05										1.80492E-05			3.94884E-05	
2-Methylhexane		6.36963E-07		6.36963E-07										4.03560E-07			1.06878E-06	
3-Methylhexane		5.51549E-07		5.51549E-07										3.54858E-07			9.16627E-07	
Heptane		1.21329E-06		1.21329E-06										6.69233E-07			1.88688E-06	
Methylcyclohexane		4.72907E-06		4.72907E-06										3.43236E-06			7.52610E-06	
Toluene		6.12154E-05		6.12154E-05										4.64150E-05			9.32486E-05	
Octane		9.59914E-07		9.59914E-07										6.15201E-07			9.26670E-07	
Ethylbenzene		3.21197E-05		3.21197E-05										2.01791E-05			2.93106E-05	
m-Xylene		2.87768E-05		2.87768E-05										1.85952E-05			2.35843E-05	
o-Xylene		5.59160E-05		5.59160E-05										3.72568E-05			4.28336E-05	
Nonane		4.07558E-07		4.07558E-07										2.50860E-07			1.80250E-07	
C10+		2.17071E-08		2.17071E-08										1.74079E-08			2.51289E-10	
Mass Fraction		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water		99.9635		99.9635										99.8666			99.9550	
H2S		0		0										0			0	
Nitrogen		9.22778E-05		9.22778E-05										0.000484499			2.92627E-05	
Carbon Dioxide		0.00246789		0.00246789										0.00868903			0.00416111	
Methane		0.0217886		0.0217886										0.0944481			0.0167882	
Ethane		0.00762898		0.00762898										0.0226925			0.0146648	
Propane		0.00225509		0.00225509										0.00461328			0.00532742	
Isobutane		0.000178824		0.000178824										0.000295452			0.000430353	
n-Butane		0.000638822		0.000638822										0.00103361			0.00153792	
Isopentane		0.000141511		0.000141511										0.000159754			0.000326239	
n-Pentane		0.000109317		0.000109317										0.000129216			0.000248660	
2-Methylpentane		3.79552E-06		3.79552E-06										3.70863E-06			7.91829E-06	
3-Methylpentane		7.01775E-06		7.01775E-06										6.53828E-06			1.44873E-05	
n-Hexane		5.90888E-05		5.90888E-05										5.31102E-05			0.000118081	
Methylcyclopentane		1.02825E-05		1.02825E-05										8.70419E-06			2.08530E-05	

Benzene		8.25512E-05		8.25512E-05									7.82534E-05			0.000171195		
2-Methylhexane		3.54265E-06		3.54265E-06									2.24446E-06			5.94387E-06		
3-Methylhexane		3.06759E-06		3.06759E-06									1.97359E-06			5.09770E-06		
Heptane		6.74807E-06		6.74807E-06									3.72203E-06			1.04936E-05		
Methylcyclohexane		2.57729E-05		2.57729E-05									1.87055E-05			4.10133E-05		
Toluene		0.000313068		0.000313068									0.000237370			0.000476857		
Octane		6.08617E-06		6.08617E-06									3.90048E-06			5.87496E-06		
Ethylbenzene		0.000189273		0.000189273									0.000118908			0.000172708		
m-Xylene		0.000169575		0.000169575									0.000109575			0.000138966		
o-Xylene		0.000329499		0.000329499									0.000219540			0.000252389		
Nonane		2.90136E-06		2.90136E-06									1.78580E-06			1.28308E-06		
C10+		2.15792E-07		2.15792E-07									1.73049E-07			2.49789E-09		
Mass Flow		**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**
Water		0		0									7351.02			0.0582398		
H2S		0		0									0			0		
Nitrogen		0		0									0.0356632			1.70502E-08		
Carbon Dioxide		0		0									0.639586			2.42451E-06		
Methane		0		0									6.95218			9.78179E-06		
Ethane		0		0									1.67036			8.54458E-06		
Propane		0		0									0.339577			3.10407E-06		
Isobutane		0		0									0.0217478			2.50749E-07		
n-Butane		0		0									0.0760825			8.96083E-07		
Isopentane		0		0									0.0117592			1.90086E-07		
n-Pentane		0		0									0.00951141			1.44884E-07		
2-Methylpentane		0		0									0.000272986			4.61367E-09		
3-Methylpentane		0		0									0.000481273			8.44119E-09		
n-Hexane		0		0									0.00390936			6.88011E-08		
Methylcyclopentane		0		0									0.000640702			1.21502E-08		
Benzene		0		0									0.00576011			9.97486E-08		
2-Methylhexane		0		0									0.000165211			3.46325E-09		
3-Methylhexane		0		0									0.000145273			2.97022E-09		
Heptane		0		0									0.000273973			6.11422E-09		
Methylcyclohexane		0		0									0.00137688			2.38968E-08		
Toluene		0		0									0.0174724			2.77845E-07		
Octane		0		0									0.000287109			3.42310E-09		
Ethylbenzene		0		0									0.00875262			1.00630E-07		
m-Xylene		0		0									0.00806561			8.09701E-08		
o-Xylene		0		0									0.0161600			1.47057E-07		
Nonane		0		0									0.000131450			7.47599E-10		
C10+		0		0									1.27379E-05			1.45542E-12		

Process Streams		**HP Separator Gas**	**HP Separator Water**	**HP Separator Oil**	**OT Flash Gas**	**Sales Oil**	**Gas**	**Water**	**Oil**	**Produced Water**	**PWT Flash Gas**	**Oil W/B**	**Water W/B**	**Well Stream**	**LP Separator Oil**	**LP Separator Gas**	**r recovery by VRU (to**	**Total gas to sale**
Phase: Heavy Liquid	**Status**	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Property	**Units**																	
Temperature	°F	70.0		70.0										84.0876			70	
Pressure	psig	169		169										1000			169	
Mole Fraction Vapor	%	0		0										0			0	
Mole Fraction Light Liquid	%	0		0										0			0	
Mole Fraction Heavy Liquid	%	100		100										100			100	
Molecular Weight	lb/lbmol	18.0		18.0										18.0166			18.0175	
Mass Density	lb/ft^3	62.3		62.3										62.0941			62.2630	
Molar Flow	lbmol/h	0.0		0.0										408.559			0.00323385	
Mass Flow	lb/h	0.0		0.0										7360.84			0.0582659	
Vapor Volumetric Flow	MCFH	0.0		0.0										0.118543			9.35804E-07	
Liquid Volumetric Flow	Mbbl/d	0.0		0.0										0.506724			4.00017E-06	
Std Vapor Volumetric Flow	MMSCFD	0.0		0.0										3.72100			2.94527E-05	
Std Liquid Volumetric Flow	Mbbl/d	0.0		0.0										0.505868			3.99648E-06	
Compressibility		0.009		0.009										0.0504533			0.00935180	
Specific Gravity		0.998		0.998										0.995592			0.998300	
API Gravity		10.0		10.0										10.1029			10.0416	
Enthalpy	MMBtu/h	0.0		0.0										-50.0945			-0.000397709	
Mass Enthalpy	Btu/lb	-6826.2		-6826.2										-6805.54			-6825.76	
Mass Cp	Btu/(lb*°F)	1.0		1.0										0.981431			0.983057	
Ideal Gas CpCv Ratio		1.326		1.326										1.32509			1.32580	
Dynamic Viscosity	cP	1.0		1.0										0.840804			0.995513	
Kinematic Viscosity	cSt	1.0		1.0										0.845325			0.998152	
Thermal Conductivity	Btu/(h*ft*°F)	0.3		0.3										0.351606			0.346538	

Surface Tension	lbf/ft	0.005		0.005									0.00492475			0.00503941	
Net I.G. Heating Value	Btu/ft^3	0.3		0.3									1.25080			0.400060	
Net Liquid Heating Value	Btu/lb	-1052.3		-1052.3									-1032.05			-1050.90	
Gross I.G. Heating Value	Btu/ft^3	50.7		50.7									51.6300			50.7329	
Gross Liquid Heating Value	Btu/lb	7.8		7.8									29.1			9.2	

November 5, 2014

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

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

Sample: Gaskins No. 1H
First Stage Separator Hydrocarbon Liquid
Sampled @ 174 psig & 75 °F

Date Sampled: 10/14/14 Job Number: 45834.002

CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2186-M

COMPONENT	MOL %	LIQ VOL %	WT %
Nitrogen	0.022	0.005	0.006
Carbon Dioxide	0.014	0.005	0.006
Methane	4.980	1.779	0.750
Ethane	5.236	2.952	1.478
Propane	5.288	3.071	2.189
Isobutane	1.728	1.192	0.943
n-Butane	4.222	2.806	2.303
2,2 Dimethylpropane	0.118	0.095	0.080
Isopentane	3.182	2.453	2.155
n-Pentane	3.622	2.768	2.453
2,2 Dimethylbutane	0.207	0.182	0.167
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.334	0.289	0.270
2 Methylpentane	2.171	1.900	1.756
3 Methylpentane	1.478	1.272	1.195
n-Hexane	3.401	2.949	2.751
Heptanes Plus	63.998	76.283	81.498
Totals:	100.000	100.000	100.000

Characteristics of Heptanes Plus:

Specific Gravity	0.7603	(Water=1)
°API Gravity	54.61	@ 60°F
Molecular Weight	135.7	
Vapor Volume	17.79	CF/Gal
Weight	6.33	Lbs/Gal

Characteristics of Total Sample:

Specific Gravity	0.7117	(Water=1)
°API Gravity	67.33	@ 60°F
Molecular Weight	106.5	
Vapor Volume	21.20	CF/Gal
Weight	5.93	Lbs/Gal

Base Conditions: 14.850 PSI & 60 °F

Certified: FESCO, Ltd. - Alice, Texas

Analyst: XG
Processor: XGdjv
Cylinder ID: W-1001

David Dannhaus 361-661-7015

TANKS DATA INPUT REPORT - GPA 2186-M

COMPONENT	Mol %	LiqVol %	Wt %
Carbon Dioxide	0.014	0.005	0.006
Nitrogen	0.022	0.005	0.006
Methane	4.980	1.779	0.750
Ethane	5.236	2.952	1.478
Propane	5.288	3.071	2.189
Isobutane	1.728	1.192	0.943
n-Butane	4.340	2.901	2.383
Isopentane	3.182	2.453	2.155
n-Pentane	3.622	2.768	2.453
Other C-6's	4.190	3.642	3.389
Heptanes	11.349	10.668	10.446
Octanes	16.156	16.097	16.471
Nonanes	8.143	9.394	9.702
Decanes Plus	24.480	37.097	41.155
Benzene	0.125	0.074	0.091
Toluene	0.761	0.537	0.658
E-Benzene	0.837	0.681	0.834
Xylenes	2.148	1.735	2.140
n-Hexane	3.401	2.949	2.751
2,2,4 Trimethylpentane	0.000	0.000	0.000
Totals:	100.000	100.000	100.000

Characteristics of Total Sample:

Specific Gravity	0.7117	(Water=1)
°API Gravity	67.33	@ 60°F
Molecular Weight	106.5	
Vapor Volume	21.20	CF/Gal
Weight	5.93	Lbs/Gal

Characteristics of Decanes (C10) Plus:

Specific Gravity	0.7895	(Water=1)
Molecular Weight	179.1	

Characteristics of Atmospheric Sample:

°API Gravity	60.81	@ 60°F
Reid Vapor Pressure (ASTM D-5191)	6.09	psi

QUALITY CONTROL CHECK			
	Sampling Conditions	Test Samples	
Cylinder Number	------	W-1001*	W-1020
Pressure, PSIG	174	169	167
Temperature, °F	75	70	70

* Sample used for analysis

TOTAL EXTENDED REPORT - GPA 2186-M

COMPONENT	Mol %	LiqVol %	Wt %
Nitrogen	0.022	0.005	0.006
Carbon Dioxide	0.014	0.005	0.006
Methane	4.980	1.779	0.750
Ethane	5.236	2.952	1.478
Propane	5.288	3.071	2.189
Isobutane	1.728	1.192	0.943
n-Butane	4.222	2.806	2.303
2,2 Dimethylpropane	0.118	0.095	0.080
Isopentane	3.182	2.453	2.155
n-Pentane	3.622	2.768	2.453
2,2 Dimethylbutane	0.207	0.182	0.167
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.334	0.289	0.270
2 Methylpentane	2.171	1.900	1.756
3 Methylpentane	1.478	1.272	1.195
n-Hexane	3.401	2.949	2.751
Methylcyclopentane	0.719	0.536	0.568
Benzene	0.125	0.074	0.091
Cyclohexane	0.721	0.517	0.570
2-Methylhexane	2.617	2.565	2.462
3-Methylhexane	2.207	2.135	2.075
2,2,4 Trimethylpentane	0.000	0.000	0.000
Other C-7's	1.175	1.111	1.094
n-Heptane	3.910	3.803	3.678
Methylcyclohexane	3.398	2.880	3.132
Toluene	0.761	0.537	0.658
Other C-8's	9.031	9.193	9.343
n-Octane	3.727	4.025	3.996
E-Benzene	0.837	0.681	0.834
M & P Xylenes	0.836	0.684	0.833
O-Xylene	1.311	1.051	1.307
Other C-9's	5.402	6.142	6.401
n-Nonane	2.741	3.252	3.300
Other C-10's	5.326	6.654	7.062
n-decane	1.836	2.375	2.452
Undecanes(11)	4.811	6.168	6.639
Dodecanes(12)	3.141	4.350	4.747
Tridecanes(13)	2.308	3.427	3.792
Tetradecanes(14)	1.592	2.532	2.839
Pentadecanes(15)	1.165	1.986	2.254
Hexadecanes(16)	0.846	1.540	1.762
Heptadecanes(17)	0.634	1.221	1.410
Octadecanes(18)	0.560	1.134	1.318
Nonadecanes(19)	0.448	0.946	1.106
Eicosanes(20)	0.328	0.719	0.845
Heneicosanes(21)	0.269	0.621	0.735
Docosanes(22)	0.225	0.542	0.645
Tricosanes(23)	0.175	0.436	0.522
Tetracosanes(24)	0.146	0.378	0.455
Pentacosanes(25)	0.100	0.269	0.324
Hexacosanes(26)	0.099	0.276	0.334
Heptacosanes(27)	0.089	0.255	0.311
Octacosanes(28)	0.064	0.192	0.235
Nonacosanes(29)	0.061	0.188	0.230
Triacontanes(30)	0.048	0.151	0.186
Hentriacontanes Plus(31+)	0.209	0.737	0.950
Total	100.000	100.000	100.000

October 30, 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: 10/25/14

Sample: Gaskins No. 1H

Job Number: J45834

FLASH LIBERATION OF HYDROCARBON LIQUID		
	First Stage Separator HC Liquid	**Stock Tank**
Pressure, psig	174	0
Temperature, °F	75	70
Gas Oil Ratio (1)	------	136
Gas Specific Gravity (2)	------	1.226
Separator Volume Factor (3)	1.0823	1.000

STOCK TANK FLUID PROPERTIES	
Shrinkage Recovery Factor (4)	0.9240
Oil API Gravity at 60 °F	60.81
Reid Vapor Pressure, psi (5)	6.09

Quality Control Check			
	Sampling Conditions	**Test Samples**	
Cylinder No.	------	W-1001*	W-1020
Pressure, psig	174	169	167
Temperature, °F	75	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: Gaskins No. 1H
Gas Evolved from Hydrocarbon Liquid Flashed
From 174 psig & 75 °F to 0 psig & 70 °F

Date Sampled: 10/14/14 Job Number: 45834.001

CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2286

COMPONENT	MOL%	GPM
Hydrogen Sulfide*	< 0.001	
Nitrogen	0.065	
Carbon Dioxide	0.114	
Methane	33.358	
Ethane	29.183	7.866
Propane	19.082	5.299
Isobutane	3.640	1.201
n-Butane	6.763	2.149
2-2 Dimethylpropane	0.092	0.035
Isopentane	2.212	0.815
n-Pentane	1.818	0.664
Hexanes	1.906	0.792
Heptanes Plus	1.767	0.789
Totals	100.000	19.609

Computed Real Characteristics Of Heptanes Plus:

Specific Gravity	3.585	(Air=1)
Molecular Weight	102.61	
Gross Heating Value	5482	BTU/CF

Computed Real Characteristics Of Total Sample:

Specific Gravity	1.226	(Air=1)
Compressibility (Z)	0.9883	
Molecular Weight	35.09	
Gross Heating Value		
Dry Basis	2069	BTU/CF
Saturated Basis	2034	BTU/CF

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

Base Conditions: 14.850 PSI & 60 Deg F

Certified: FESCO, Ltd. - Alice, Texas

Analyst: MR
Processor: IM
Cylinder ID: FL-11S

David Dannhaus 361-661-7015

CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2286
TOTAL REPORT

COMPONENT	MOL %	GPM	WT %
Hydrogen Sulfide*	< 0.001		< 0.001
Nitrogen	0.065		0.052
Carbon Dioxide	0.114		0.143
Methane	33.358		15.252
Ethane	29.183	7.866	25.011
Propane	19.082	5.299	23.982
Isobutane	3.640	1.201	6.030
n-Butane	6.763	2.149	11.204
2,2 Dimethylpropane	0.092	0.035	0.189
Isopentane	2.212	0.815	4.549
n-Pentane	1.818	0.664	3.738
2,2 Dimethylbutane	0.090	0.038	0.221
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.134	0.055	0.329
2 Methylpentane	0.608	0.254	1.493
3 Methylpentane	0.376	0.155	0.924
n-Hexane	0.698	0.289	1.714
Methylcyclopentane	0.073	0.025	0.175
Benzene	0.024	0.007	0.053
Cyclohexane	0.092	0.032	0.221
2-Methylhexane	0.188	0.088	0.537
3-Methylhexane	0.185	0.085	0.528
2,2,4 Trimethylpentane	0.000	0.000	0.000
Other C7's	0.199	0.087	0.563
n-Heptane	0.245	0.114	0.700
Methylcyclohexane	0.199	0.081	0.557
Toluene	0.041	0.014	0.108
Other C8's	0.273	0.128	0.858
n-Octane	0.078	0.040	0.254
Ethylbenzene	0.003	0.001	0.009
M & P Xylenes	0.019	0.007	0.057
O-Xylene	0.003	0.001	0.009
Other C9's	0.088	0.045	0.317
n-Nonane	0.020	0.011	0.073
Other C10's	0.028	0.016	0.113
n-Decane	0.006	0.004	0.024
Undecanes (11)	0.003	0.002	0.013
Totals	100.000	19.609	100.000

Computed Real Characteristics Of Total Sample:

Specific Gravity	1.226	(Air=1)
Compressibility (Z)	0.9883	
Molecular Weight	35.09	
Gross Heating Value		
Dry Basis	2069	BTU/CF
Saturated Basis	2034	BTU/CF

GAS ANALYTICAL SERVICES

C6+ Gas Analysis Report

Gas Analytical

Report Date: Feb 3, 2016 8:50a

Client:	Antero Resources	Date Sampled:	Jan 28, 2016 8:55a
Site:	Deano Unit 2H	Analysis Date:	Feb 2, 2016 3:01p
Field No:	9998	Collected By:	Jason Swiger
Meter:	40675	Date Effective:	Jan 28, 2016 12:00a
Source Laboratory	Clarksburg (Bridgeport), WV	Sample Pressure (PSI):	200.0
Lab File No:	**X_CH1-9282.CHR**	Sample Temp (°F):	64
Sample Type:	Spot	Field H2O:	64
Reviewed By:		Field H2S:	No Test

Component	Mol %	Gal/MSCF
Methane	81.3211	
Ethane	13.7570	3.66
Propane	2.5368	0.70
I-Butane	0.4674	0.15
N-Butane	0.7709	0.24
I-Pentane	0.2029	0.07
N-Pentane	0.1570	0.06
Nitrogen	0.3903	
Oxygen	<MDL	
Carbon Dioxide	0.1666	
Hexanes+	0.2300	0.09
TOTAL	100.0000	4.98

Analytical Results at Base Conditions (Real)		
BTU/SCF (Dry):	1,201.3172	BTU/ft³
BTU/SCF (Saturated):	1,181.2867	BTU/ft³
PSIA:	14.730	PSI
Temperature (°F):	60.00	°F
Z Factor (Dry):	0.99686	
Z Factor (Saturated):	0.99647	

Analytical Results at Contract Conditions (Real)		
BTU/SCF (Dry):	1,201.3172	BTU/ft³
BTU/SCF (Saturated):	1,181.2867	BTU/ft³
PSIA:	14.730	PSI
Temperature (°F):	60.00	°F
Z Factor (Dry):	0.99686	
Z Factor (Saturated):	0.99647	

Calculated Specific Gravities			
Ideal Gravity:	0.6794	Real Gravity:	0.6813
Molecular Wt:	19.6775	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									0.8761	0.3417				
EP-PCV					0.0599	0.2624							8.5093	37.2705
F001					3.0781	13.4819							80.6914	353.4281
EP-ENG001	3.16E-01	1.38E+00	5.64E+00	2.47E+01	6.84E-03	3.00E-02	1.36E-04	5.95E-04	2.20E-03	9.62E-03	2.20E-03	9.62E-03	26.76	117.20
EP-GPU001, EP-GPU002, EP-GPU003, EP-GPU004, EP-GPU005, EP-GPU006, EP-GPU007, EP-GPU008, EP-GPU009	1.1238	4.9221	0.9440	4.1346	0.0618	0.2707	0.0067	0.0295	0.0854	0.3741	0.0854	0.3741	1348.5198	5906.5166
EP-LH001, EP-LH002, EP-LH003, EP-LH004, EP-LH005, EP-LH006, EP-LH007, EP-LH008, EP-LH009	1.4984	6.5628	1.2586	5.5127	0.0824	0.3610	0.0090	0.0394	0.1139	0.4988	0.1139	0.4988	1798.0264	7875.3555
EP-L001					12.8820	3.5754							11.7369	3.2576
EP-L002					7.95E-04	2.96E-04							0.8498	0.3166
EP-EC001, EP-EC002, EP-EC003	0.0943	0.4132	0.0793	0.3471	1.0321	4.5205	2.27E-05	9.93E-05	0.0072	0.0314	0.0054	0.0236	267.5321	1171.7904
TOTAL	3.0322	13.2812	7.9263	34.7172	1.1831	5.1822	0.0159	0.0696	0.2086	0.9139	0.2069	0.9060	3440.8359	15070.8611

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	0.0052	0.0226	0.0052	0.0226
F001			0.0025	0.0109	0.0179	0.0783	0.0227	0.0993	0.0581	0.2547	0.1512	0.6625	0.2524	1.1057
EP-ENG001	4.74E-03	2.08E-02	3.65E-04	1.60E-03	1.29E-04	5.65E-04	5.73E-06	2.51E-05	4.51E-05	1.97E-04			5.31E-03	2.32E-02
EP-GPU001, EP-GPU002, EP-GPU003, EP-GPU004, EP-GPU005, EP-GPU006, EP-GPU007, EP-GPU008, EP-GPU009	0.0008	0.0037	2.36E-05	1.03E-04	3.82E-05	0.0002			0.00E+00	0.00E+00	0.0202	0.0886	0.0212	0.0927
EP-LH001, EP-LH002, EP-LH003, EP-LH004, EP-LH005, EP-LH006, EP-LH007, EP-LH008, EP-LH009	0.0011	0.0049	3.15E-05	0.0001	5.09E-05	2.23E-04			0.00E+00	0.00E+00	0.0270	0.1181	0.0282	0.1235
EP-L001			1.78E-04	4.94E-05	1.81E-03	5.03E-04	2.23E-03	6.20E-04	5.68E-03	1.58E-03	8.19E-02	2.27E-02	9.18E-02	2.55E-02
EP-L002			2.72E-07	1.01E-07	5.89E-07	2.19E-07	2.19E-07	8.16E-08	5.41E-07	2.02E-07	5.36E-09	2.00E-09	1.63E-06	6.06E-07
EP-EC001, EP-EC002, EP-EC003	2.84E-06	1.24E-05	0.0002	0.0010	0.0011	0.0047	0.0007	0.0032	0.0016	0.0069	0.0848	0.3713	0.0884	0.3870
TOTAL	0.0067	0.0294	0.0006	0.0028	0.0013	0.0056	0.0007	0.0032	0.0016	0.0071	0.1320	0.5780	0.1430	0.6264

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
Melody 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 1131 Knights Ford Rd., near West Union in Doddridge County, West Virginia.

The latitude and longitude coordinates are: 39.35844 and -80.75927

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

Pollutants	TOTALS (tpy):
NO_X	13.2812
CO	34.7172
$PM_{2.5}$	0.9060
PM_{10}	0.9139
VOC	5.1822
SO_2	0.0696
Formaldehyde	0.0294
Benzene	0.0028
Toluene	0.0056
Ethylbenzene	0.0032
Xylenes	0.0071
Hexane	0.5780
Total HAPs	0.6264

Proposed new equipment will be installed upon permit issuance. Startup of operation using new equipment is planned to begin January 01, 2017. Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57th Street, SE, Charleston, WV 25304, for at least 30

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