CONESTOGA-ROVERS
& ASSOCIATES

6320 Rothway, Suite 100, Houston, Texas 77040
Telephone: (713) 734-3090 Fax: (713) 734-3391
www.CRAworld.com

February 27, 2015 Reference No. 082715

Mr. Jay Fedczak
Assistant Director for Permitting
Division of Air Quality
WV Department of Environmental Protection
601 57th Street, SE
Charleston, West Virginia 25304

Dear Mr. Jay Fedczak:

Re: General Permit Application G70-A Class II Administrative Update
Bee Lewis Well pad
Antero Resources Corporation

Conestoga-Rovers & Associates (CRA) would like to submit this General Permit Class II Administrative Update application that we prepared on behalf of Antero Resources Corporation for an oil and gas facility identified as Bee Lewis Well pad.

A General Permit Registration Class II Administrative Update is requested for the proposed installation of a 24 HP Kubota engine. Please refer to Table 14 in Attachment I - 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-A General Permit Class II Administrative Update Application
- Two CD copies of the G70-A General Permit Class II Administrative Update Application
- The application fee with check no. 395943 in the amount of $300.00

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

Sincerely,

CONESTOGA-ROVERS & ASSOCIATES

Manuel Bautista

Encl.

cc: Barry Schatz, Antero Resources Corporation

CONESTOGA-ROVERS & ASSOCIATES

www.CRAworld.com



General Permit Application G70-A
Class II Administrative Update

(Installation of Compressor Engine)

Bee Lewis Well Pad

Prepared for: Antero Resources Corporation

Conestoga-Rovers & Associates
6320 Rothway, Suite 100
Houston, Texas 77040

February 2015 • 082715 • Report No. 172

Partners in Sustainability

Table of Contents *

G70-A General Permit Class II Administrative Update

* Note: Attachments which have no changes from previous permit application or not applicable were not included in this submittal. The Attachment letter identifiers consistent with the G70-A application were maintained for easier identification/reference.

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

APPLICATION FOR GENERAL PERMIT REGISTRATION

CONSTRUCT, MODIFY, RELOCATE OR ADMINISTRATIVELY UPDATE

A STATIONARY SOURCE OF AIR POLLUTANTS

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

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

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

SECTION I. GENERAL INFORMATION

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

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

3. Applicant's mailing address:
1615 Wynkoop Street
Denver, CO, 80202

4. Applicant's physical address:
In Doddridge County, approximately 1.6 mile southwest of the
Intersection of Co. Route 11/3 and 11/4

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

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

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

SECTION II. FACILITY INFORMATION

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

8a. Standard Industrial Classification (SIC) code: 1311

AND

8b. North American Industry System (NAICS) code: 211111

9. DAQ Plant ID No. (for existing facilities only):
017-00085

10. List all current 45CSR13 and other General Permit numbers associated with this process (for existing facilities only):
G70-A015

A: PRIMARY OPERATING SITE INFORMATION

11A. Facility name of primary operating site:	12A. Address of primary operating site:
Bee Lewis Well Pad	Mailing: N/A Physical: approximately 1.6 mi southwest of the intersection of Co. Route 11/3 and 11/4

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

- IF **YES**, please explain: Antero is leasing the mineral rights for this site
- IF **NO**, YOU ARE NOT ELIGIBLE FOR A PERMIT FOR THIS SOURCE.

14A.
- For **Modifications or Administrative Updates** at an existing facility, please provide directions to the present location of the facility from the nearest state road;
- For Construction or Relocation permits, please provide directions to the proposed new site location from the nearest state road. Include a **MAP** as **Attachment F**.

From Greenwood:
Head southwest on Co Rte 36/6 toward Co Rte 36/Ducksworth Rd for 43 feet
Turn right onto Co Rte 36/Ducksworth Rd for 0.1 miles
Take the 1st left toward County Rte 50/30/Old U.S 50 W/Sunnyside Rd for 112ft
Take the 1st left onto US-50E for 4.3 miles
Turn right onto Co Rte 11/Arnolds Creek Rd/Central Station Rd/Co Rte 1/1/Right Fork Run Rd 0.5miles
Turn right onto Co Rte 11/3 0.1 miles
Slight left to stay on Co Rte 11/3 1.5 miles

15A. Nearest city or town:	16A. County:	17A. UTM Coordinates:
New Milton	Doddridge	Northing (KM): 4345.070 Easting (KM): 515.275 Zone: 17S

18A. Briefly describe the proposed new operation or change (s) to the facility:	19A. Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits):
Installation of compressor engine (Kubota Engine)	Latitude: 39.254867 Longitude: -80.823017

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

11B. Name of 1st alternate operating site:	12B. Address of 1st alternate operating site:
	Mailing: Physical:

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

- IF **YES**, please explain:
- IF **NO**, YOU ARE NOT ELIGIBLE FOR A PERMIT FOR THIS SOURCE.

14B.
- For **Modifications or Administrative Updates** at an existing facility, please provide directions to the present location of the facility from the nearest state road;
- For Construction or Relocation permits, please provide directions to the proposed new site location from the nearest state road. Include a **MAP** as **Attachment F**.

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

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

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

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

- IF **YES**, please explain: _____
  _____
- IF **NO**, YOU ARE NOT ELIGIBLE FOR A PERMIT FOR THIS SOURCE.

14C.
- For **Modifications or Administrative Updates** at an existing facility, please provide directions to the present location of the facility from the nearest state road;
- For Construction or Relocation permits, please provide directions to the proposed new site location from the nearest state road. Include a **MAP** as **Attachment F**.

_____
_____
_____

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

20. Provide the date of anticipated installation or change: Upon issuance of the permit ☐ If this is an **After-The-Fact** permit application, provide the date upon which the proposed change did happen: : _____/_____/_____	21. Date of anticipated Start-up if registration is granted: Upon issuance of the permit

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

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

SECTION III. ATTACHMENTS AND SUPPORTING DOCUMENTS

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

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

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

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

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

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

SECTION IV. CERTIFICATION OF INFORMATION

This General Permit Registration Application shall be signed below by a Responsible Official. A Responsible Official is a President, Vice President, Secretary, Treasurer, General Partner, General Manager, a member of a Board of Directors, or Owner, depending on business structure. A business may certify an Authorized Representative who shall have authority to bind the Corporation, Partnership, Limited Liability Company, Association, Joint Venture or Sole Proprietorship. Required records of daily throughput, hours of operation and maintenance, general correspondence, Emission Inventory, Certified Emission Statement, compliance certifications and all required notifications must be signed by a Responsible Official or an Authorized Representative. If a business wishes to certify an Authorized Representative, the official agreement below shall be checked off and the appropriate names and signatures entered. Any administratively incomplete or improperly signed or unsigned Registration Application will be returned to the applicant.

FOR A CORPORATION (domestic or foreign)

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

FOR A PARTNERSHIP

☐ I certify that I am a General Partner

FOR A LIMITED LIABILITY COMPANY

☐ I certify that I am a General Partner or General Manager

FOR AN ASSOCIATION

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

FOR A JOINT VENTURE

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

FOR A SOLE PROPRIETORSHIP

☐ I certify that I am the Owner and Proprietor

☐ *I hereby certify that* (please print or type) _____

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

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

Signature _____
(please use blue ink) Responsible Official Date

Name & Title Barry Schatz, Senior Environmental & Regulatory Manager
(please print or type)

Signature Barry Schatz 2-27-2015
(please use blue ink) Authorized Representative (if applicable) Date

Applicant's Name Antero Resources Corporation

Phone & Fax 303-357-7276 303-357-7315
Phone Fax

Email bschatz@anteroresources.com

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

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

DATE: 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 B

Process Description

Attachment B

Process Description
Bee Lewis Well Pad
Antero Resources Corporation
Doddridge, West Virginia

A mixture of condensate and entrained gas from the wells enters the Facility through a number of low pressure separators where the gas phase is separated from the liquid phase. Gas Processing Units (GPU) heaters (H001-H004) are used in conjunction with the separators to help separate the gas from the liquid phases. These heaters are fueled by a slip stream of the separated gas. The separated gas from the low pressure separators is sent to a compressor (ENG001). The compressed gas is then metered and sent to the sales gas pipeline. The separated condensate and water from the separators flow to their respective storage tanks (TANKCOND001-004 and TANKPW001-002).

The Facility has four (4) tanks (TANKCOND001-004) 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 the flare to control emissions. The flare that will be used to control emissions is designed to achieve a VOC destruction efficiency of 98 percent.

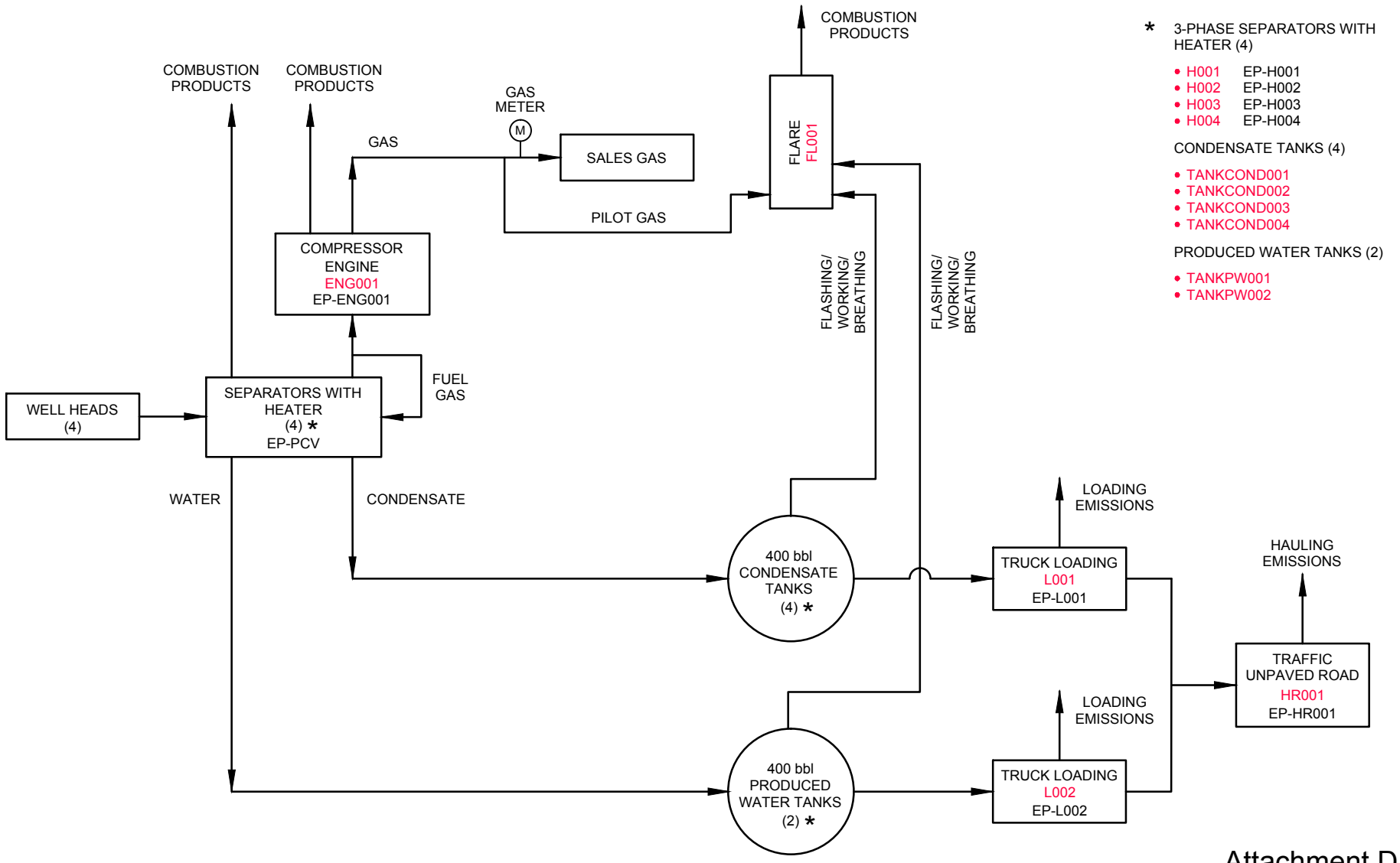
Condensate and produced water are transported off site on an as needed basis via tanker truck. Truck loading connections are in place to pump condensate (L001) and produced water (L002) from the storage tanks into tanker trucks. Emissions from the loading operations are vented to the atmosphere.

Emissions from the Facility's emission sources were calculated using the extended analysis of the condensate and produced water from Nero No. 2H, one of the wells in McGill pad. Gas analysis from Seaborne No. 1H, one of the wells in the Vogt pad, is used for emission calculation. These extended analyses are considered representative of the materials from Bee Lewis, being in the same Marcellus rock formation.

Bee Lewis Pad calculation of potential to emit included all of the emission sources that belong to the same industrial grouping, are located on contiguous or adjacent properties, and are under the control of the same person. The nearest emission source that belongs to the same industrial grouping and under the control of the same person but not located on contiguous or adjacent property is the McGill Pad. This is approximately 8.35 miles north east of the Facility.

Attachment D

Process Flow Diagram



Attachment D

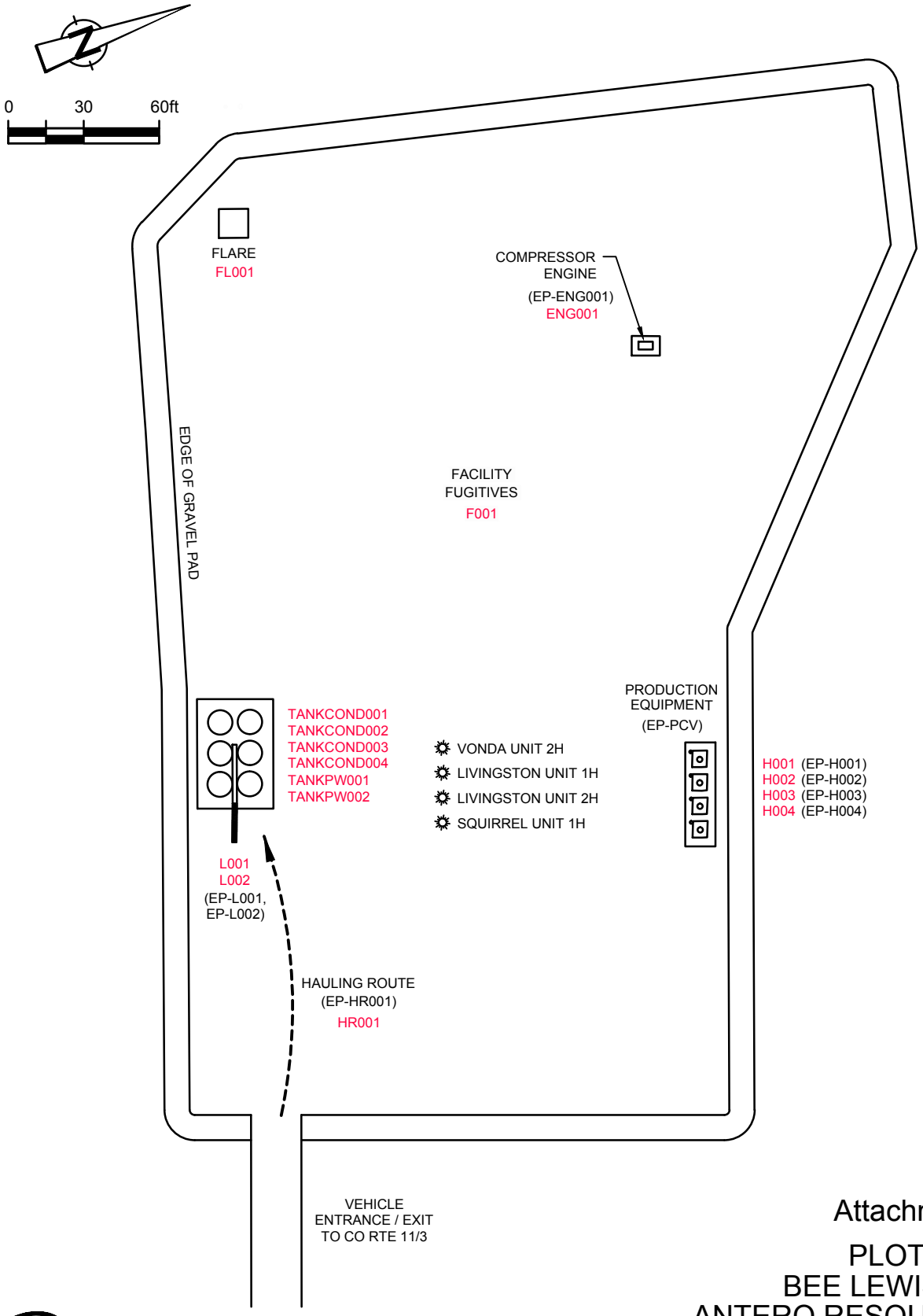
PROCESS FLOW DIAGRAM - ANTERO RESOURCES
BEE LEWIS PAD

Doddridge County, West Virginia

82715-00(172)GN-WA001 FEB 13/2015

Attachment E

Plot Plan



Attachment E

PLOT PLAN
BEE LEWIS PAD
ANTERO RESOURCES
Doddridge County, West Virginia

82715-00(172)GN-WA002 FEB 13/2015

Attachment G

Emission Unit Data Sheets/G70-A Section Applicability Form

General Permit G70-A Registration
Section Applicability Form

General Permit G70-A was developed to allow qualified applicants to seek registration for a variety of sources. These sources include natural gas well affected facilities, storage tanks, natural gas-fired compressor engines (RICE), natural gas producing units, natural gas-fired in-line heaters, pneumatic controllers, heater treaters, tank truck loading, glycol dehydration units, completion combustion devices, flares, enclosed combustion devices, and vapor recovery systems. All registered facilities will be subject to Sections 1.0, 2.0, 3.0, and 4.0.

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

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

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

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

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

NATURAL 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).

Please provide the API number(s) for each NG well at this facility:	
47-017-06225-00	
47-017-06223-00	
47-017-06224-00	
47-017-06258-00	

Note: This is the same API 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 (American Petroleum Institute) 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 G: Emission Units Data Sheet

(includes all emission units and air pollution control devices that will be part of this permit application review, regardless of permitting status)

Emission Unit ID1	Emission Point ID2	Emission Unit Description	Year Installed/ Modified	Design Capacity	Type3 and Date of Change	Control Device 4
H001, H002, H003, H004	EP-H001, EP-H002, EP-H003, EP-H004	Gas Processing Unit Heater	2014	1.5 MMBtu/hr (each)	Existing	N/A
F001	F001	Fugitives	2014	0	Existing	N/A
TANKCOND001-04	FL001	Condensate Tank F/W/B	2014	400 bbl each	Existing	FL001
TANKPW001-002	FL001	PW Tank F/W/B	2014	400 bbl each	Existing	FL001
L001	EP-L001	Loading (Condensate)	2014	200BBL capacity (each)	Existing	N/A
L002	EP-L002	Loading (Water)	2014	200BBL capacity (each)	Existing	N/A
HR001	EP-HR001	Haul Truck	2014	40 ton capacity	Existing	N/A
FL001	FL001	Flare	2014	90scf/min	Existing	N/A
PCV	EP-PCV	Pneumatic CV	2014	6.6 scf/day/PCV	Existing	N/A
ENG001	EP-ENG001	Compressor Engine	2015	24HP	New	N/A

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 New, modification, removal.
4 For Control Devices use the following numbering system: 1C, 2C, 3C,... or other appropriate designation.

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

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

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name CONDTANK	2. Tank Name TANKCOND001-04
3. Emission Unit ID number TANKCOND001-04	4. Emission Point ID number FL001
5. Date Installed or Modified *(for existing tanks)* 2014	6. Type of change: NA
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.* No	
7C. Provide any limitations on source operation affecting emissions. (production variation, etc.)	

II. TANK INFORMATION (required)

8. Design Capacity *(specify barrels or gallons).* Use the internal cross-sectional area multiplied by internal height. 400bbls	
9A. Tank Internal Diameter (ft.) 12	9B. Tank Internal Height (ft.) 20
10A. Maximum Liquid Height (ft.) 18	10B. Average Liquid Height (ft.) 10
11A. Maximum Vapor Space Height (ft.) 18	11B. Average Vapor Space Height (ft.) 10
12. Nominal Capacity *(specify barrels or gallons)* . This is also known as "working volume." 400bbls	
13A. Maximum annual throughput (gal/yr) 3,387,930	13B. Maximum daily throughput (gal/day) 9,282
14. Number of tank turnovers per year 51	15. Maximum tank fill rate (gal/min) 168
16. Tank fill method: Splash Fill	
17. Is the tank system a variable vapor space system? No If yes, (A) What is the volume expansion capacity of the system (gal)? (B) What are the number of transfers into the system per year?	
18. Type of tank (check all that apply): X Fixed Roof X vertical horizontal X flat roof cone roof dome roof other (describe) External Floating Roof pontoon roof double deck roof Domed External (or Covered) Floating Roof Internal Floating Roof vertical column support self-supporting Variable Vapor Space lifter roof diaphragm Pressurized spherical cylindrical Underground Other (describe)	

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

Refer to enclosed TANKS Summary Sheets

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

IV. SITE INFORMATION *(check which one applies)*

Refer to enclosed TANKS Summary Sheets

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

V. LIQUID INFORMATION *(check which one applies)*

Refer to enclosed TANKS Summary Sheets

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

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

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

VI. EMISSIONS AND CONTROL DEVICE DATA (required)

40. Emission Control Devices (check as many as apply):

Does Not Apply Rupture Disc (psig)

Carbon Adsorption[1] Inert Gas Blanket of _____

X Vent to Vapor Combustion Device[1] (vapor combustors, flares, thermal oxidizers) Condenser[1]

Conservation Vent (psig

Other[1] (describe) Vacuum Setting Pressure Setting Emergency Relief Valve (psig)

[1] Complete appropriate Air Pollution Control Device Sheet

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

Material Name and CAS No.	Flashing Loss		Breathing Loss		Working Loss		Total Emissions Loss		
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	
	Please see Tables 6 and 7								

1 EPA = EPA Emission Factor, MB = Material Balance, SS = Similar Source, ST = Similar Source Test, Throughput Data, O = Other (specify)

Remember to attach emissions calculations, including TANKS Summary Sheets and other modeling summary sheets if applicable.

SECTION VII (required if did not provide TANKS Summary Sheets)

TANK CONSTRUCTION AND OPERATION INFORMATION		
19. Tank Shell Construction: Steel		
20A. Shell Color: Green	20B. Roof Color: Green	20C. Year Last Painted: 2014
21. Shell Condition (if metal and unlined): No Rust		
22A. Is the tank heated? No	22B. If yes, operating temperature:	22C. If yes, how is heat provided to tank?
23. Operating Pressure Range (psig): 0		
24. Is the tank a **Vertical Fixed Roof Tank**? Yes	24A. If yes, for dome roof provide radius (ft):	24B. If yes, for cone roof, provide slop (ft/ft):
25. Complete item 25 for **Floating Roof Tanks** Does not apply		
25A. Year Internal Floaters Installed:		
25B. Primary Seal Type *(check one):* Metallic (mechanical) shoe seal Liquid mounted resilient seal		
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. Continuous sheet construction:		
26D. Deck seam length (ft.):	26E. Area of deck (ft2):	26F. For column supported	26G. For column supported

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

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

SITE INFORMATION:			
27. Provide the city and state on which the data in this section are based: Charleston, WV			
28. Daily Avg. Ambient Temperature (°F): 55.3		29. Annual Avg. Maximum Temperature (°F): 75.94	
30. Annual Avg. Minimum Temperature (°F): 65.9		31. Avg. Wind Speed (mph): 5.9	
32. Annual Avg. Solar Insulation Factor (BTU/ft2-day): 1030.235999		33. Atmospheric Pressure (psia): 14.8	
LIQUID INFORMATION:			
34. Avg. daily temperature range of bulk liquid (°F): 51.7	34A. Minimum (°F): 39.5	34B. Maximum (°F): 63.8	
35. Avg. operating pressure range of tank (psig): 0	35A. Minimum (psig): 0	35B. Maximum (psig): 0	
36A. Minimum liquid surface temperature (°F): 39.5		36B. Corresponding vapor pressure (psia):	1.1366
37A. Avg. liquid surface temperature (°F): 51.7		37B. Corresponding vapor pressure (psia):	1.4944
38A. Maximum liquid surface temperature (°F): 63.8		38B. Corresponding vapor pressure (psia):	1.9358

39. Provide the following for each liquid or gas to be stored in the tank. Add additional pages if necessary.

39A. Material name and composition:	Condensate		
39B. CAS number:	mix of HC		
39C. Liquid density (lb/gal):	5.96		
39D. Liquid molecular weight (lb/lb-mole):	112.4		
39E. Vapor molecular weight (lb/lb-mole):	40.10		
39F. Maximum true vapor pressure (psia):	2.2962		
39G. Max Reid vapor pressure (psi):	3.54000		
39H. Months Storage per year. From: To:	year round		

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

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

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name PWTANK	2. Tank Name TANKPW001-002
3. Emission Unit ID number TANKPW001-002	4. Emission Point ID number FL001
5. Date Installed or Modified *(for existing tanks)* 2014	6. Type of change: NA
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.* No	
7C. Provide any limitations on source operation affecting emissions. (production variation, etc.)	

II. TANK INFORMATION (required)

8. Design Capacity *(specify barrels or gallons).* Use the internal cross-sectional area multiplied by internal height. 400bbls	
9A. Tank Internal Diameter (ft.) 12	9B. Tank Internal Height (ft.) 20
10A. Maximum Liquid Height (ft.) 18	10B. Average Liquid Height (ft.) 10
11A. Maximum Vapor Space Height (ft.) 18	11B. Average Vapor Space Height (ft.) 10
12. Nominal Capacity *(specify barrels or gallons)* . This is also known as "working volume." 400bbls	
13A. Maximum annual throughput (gal/yr) 40,655,160	13B. Maximum daily throughput (gal/day) 111,384
14. Number of tank turnovers per year 1210	15. Maximum tank fill rate (gal/min) 168
16. Tank fill method Splash Fill	
17. Is the tank system a variable vapor space system? No If yes, (A) What is the volume expansion capacity of the system (gal)? (B) What are the number of transfers into the system per year?	
18. Type of tank (check all that apply): X Fixed Roof X vertical horizontal X flat roof cone roof dome roof other (describe) External Floating Roof pontoon roof double deck roof Domed External (or Covered) Floating Roof Internal Floating Roof vertical column support self-supporting Variable Vapor Space lifter roof diaphragm Pressurized spherical cylindrical Underground Other (describe)	

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

Refer to enclosed TANKS Summary Sheets

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

IV. SITE INFORMATION *(check which one applies)*

Refer to enclosed TANKS Summary Sheets

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

V. LIQUID INFORMATION *(check which one applies)*

Refer to enclosed TANKS Summary Sheets

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

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

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

VI. EMISSIONS AND CONTROL DEVICE DATA (required)

40. Emission Control Devices (check as many as apply):

Does Not Apply Rupture Disc (psig)

Carbon Adsorption[1] Inert Gas Blanket of _____

X Vent to Vapor Combustion Device1 (vapor combustors, flares, thermal oxidizers) Condenser[1]

Conservation Vent (psig

Other[1] (describe) Vacuum Setting Pressure Setting Emergency Relief Valve (psig)

[1] Complete appropriate Air Pollution Control Device Sheet

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

Material Name and CAS No.	Flashing Loss		Breathing Loss		Working Loss		Total Emissions Loss		
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	
	Please see Tables 6 and 7								

1 EPA = EPA Emission Factor, MB = Material Balance, SS = Similar Source, ST = Similar Source Test, Throughput Data, O = Other (specify)

Remember to attach emissions calculations, including TANKS Summary Sheets and other modeling summary sheets if applicable.

SECTION VII (required if did not provide TANKS Summary Sheets)

TANK CONSTRUCTION AND OPERATION INFORMATION		
19. Tank Shell Construction: Steel		
20A. Shell Color: Green	20B. Roof Color: Green	20C. Year Last Painted: 2014
21. Shell Condition (if metal and unlined): No Rust		
22A. Is the tank heated? No	22B. If yes, operating temperature:	22C. If yes, how is heat provided to tank?
23. Operating Pressure Range (psig): 0		
24. Is the tank a **Vertical Fixed Roof Tank**? Yes	24A. If yes, for dome roof provide radius (ft):	24B. If yes, for cone roof, provide slop (ft/ft):
25. Complete item 25 for **Floating Roof Tanks** Does not apply		
25A. Year Internal Floaters Installed:		
25B. Primary Seal Type *(check one):* Metallic (mechanical) shoe seal Liquid mounted resilient seal		
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. Continuous sheet construction:		
26D. Deck seam length (ft.):	26E. Area of deck (ft2):	26F. For column supported	26G. For column supported

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

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

SITE INFORMATION:			
27. Provide the city and state on which the data in this section are based: Charleston, WV			
28. Daily Avg. Ambient Temperature (°F): 55.3		29. Annual Avg. Maximum Temperature (°F): 75.94	
30. Annual Avg. Minimum Temperature (°F): 65.9		31. Avg. Wind Speed (mph): 5.9	
32. Annual Avg. Solar Insulation Factor (BTU/ft2-day): 1030.235999		33. Atmospheric Pressure (psia): 14.8	
LIQUID INFORMATION:			
34. Avg. daily temperature range of bulk liquid (°F): 51.7	34A. Minimum (°F): 39.5	34B. Maximum (°F): 63.8	
35. Avg. operating pressure range of tank (psig): 0	35A. Minimum (psig): 0	35B. Maximum (psig): 0	
36A. Minimum liquid surface temperature (°F): 39.5		36B. Corresponding vapor pressure (psia):	0.1837
37A. Avg. liquid surface temperature (°F): 51.7		37B. Corresponding vapor pressure (psia):	0.2596
38A. Maximum liquid surface temperature (°F): 63.8		38B. Corresponding vapor pressure (psia):	0.3600
39. Provide the following for each liquid or gas to be stored in the tank. Add additional pages if necessary.			
39A. Material name and composition:	Produced Water		
39B. CAS number:	mix of HC and water		
39C. Liquid density (lb/gal):	8.33		
39D. Liquid molecular weight (lb/lb-mole):	18.0157		
39E. Vapor molecular weight (lb/lb-mole):	18.3610		
39F. Maximum true vapor pressure (psia):	0.4467		
39G. Max Reid vapor pressure (psi):	1.02319		
39H. Months Storage per year. From: To:	year round		

Attachment G: Natural Gas Fired Fuel Burning Units

Emission Data Sheet

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

Emission Unit ID #[1]	Emission Point ID#[2]	Emission Unit Description (Manufacturer / Model #)	Year Installed/ Modified	Type[3] and Date of Change	Control Device[4]	Design Heat Input (mmBtu/hr)[5]	Fuel Heating Value (Btu/scf)[6]
H001	EP-H001	Gas Processing Unit Heater	2014	Existing	--	1.50	1,247.06
H002	EP-H002	Gas Processing Unit Heater	2014	Existing	--	1.50	1,247.06
H003	EP-H003	Gas Processing Unit Heater	2014	Existing	--	1.50	1,247.06
H004	EP-H004	Gas Processing Unit Heater	2014	Existing	--	1.50	1,247.06
FL001	FL001	Flare (Cimmaron 48",Model No. 700-TI-603-D-31C)	2014	Existing	FL001	--	1,247.06
ENG001	EP-ENG001	Compressor Engine	2015	New	--	--	1,247.06

1 Enter the appropriate Emission Unit (or Sources) identification numbers for each fuel burning unit located at the production pad. Gas Producing Unit Burners should be designated GPU-1, GPU-2, etc. Heater Treaters should be designated HT-1, HT-2, etc. Heaters or Line Heaters should be designated LH-1, LH-2, etc. For sources, use 1S, 2S, 3S…or other appropriate designation. Enter glycol dehydration unit Reboiler Vent data on the Glycol Dehydration Unit Data Sheet.

2 Enter the appropriate Emission Point identification numbers for each fuel burning unit located at the production pad. Gas Producing Unit Burners should be designated GPU-1, GPU-2, etc. Heater Treaters should be designated HT-1, HT-2, etc. Heaters or Line Heaters should be designated LH-1, LH-2, etc. For emission points, use 1E, 2E, 3E…or other appropriate designation.

3 New, modification, removal.

4 Complete appropriate air pollution control device sheet for any control device.

5 Enter design heat input capacity in mmBtu/hr.

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

Attachment G: Natural Gas-Fired Compressor Engine (RICE)

Emission Unit Data Sheet

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

Emission Unit (Source) ID No.		ENG001	
Emission Point ID No.		EP-ENG001	
Engine Manufacturer and Model		Engine (Kubota DG972-E2)	
Manufacturer's Rated bhp/rpm		24 HP @ 3600 rpm	
Source Status		NS	
Date Installed/Modified/Removed		2015	
Engine Manufactured/Reconstruction Date		2013	
Is this engine subject to 40CFR60, Subpart JJJJ?		Yes	
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60, Subpart JJJJ? (Yes or No)		Yes	
Is this engine subject to 40CFR63, Subpart ZZZZ? (yes or no)		Yes	
Engine, Fuel and Combustion Data	Engine Type	RB4S	
	APCD Type	-	
	Fuel Type	RG	
	H2S (gr/100 scf)	0	
	Operating bhp/rpm	16.5 HP @ 2400 rpm	
	BSFC (Btu/bhp-hr)	9773	
	Fuel throughput (ft^3/hr)	193	
	Fuel throughput ($MMft^3$/yr)	1.6907	
	Operation (hrs/yr)	8760	
Reference	Potential Emissions	lbs/hr	tons/yr
MD	NO_X	0.3158	1.3831
MD	CO	5.6445	24.7228
AP	VOC	0.0071	0.0311
AP	SO_2	0.0001	0.0006
AP	PM_{10}	0.0023	0.0100
AP	Formaldehyde	0.0049	0.0215
MRR	Proposed Monitoring:	Monitor engine setting adjustments to ensure these are consistent with manufacturer's instructions.	
	Proposed Recordkeeping:	1) Maintain records of maintenance performed on engines. 2) Documentation from manufacturer that engine is certified to meet emission standards	
	Proposed Reporting:	N/A	

Attachment G: Tank Truck Loading

Emissions Unit Data Sheet

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

1. Emission Unit ID: L001, L002	2. Emission Point ID: EP-L001, EP-L002	3. Year Installed/ Modified: 2014

4. Emission Unit Description: CONDENSATE AND PRODUCED WATER

5. Loading Area Data

5A. Number of pumps: 1	5B. Number of liquids loaded: 1	5C. Maximum number of tank trucks loading at one time: 1

6. Describe cleaning location, compounds and procedure for tank trucks: For hire tank trucks are used and are cleaned at the operator's dispatch terminal. These trucks are in dedicated service and cleaned only prior to repair or leak tests. Cleaning materials include water, steam, detergent, and solvents which are applied using hand held pressurized spray nozzles.

7. Are tank trucks pressure tested for leaks at this or any other location?
X Yes No
If YES, describe: Tank trucks are pressure tested for leaks at the location of the leak testing company. Trucks are tested using EPA Method 27-internal vapor valve test and issued certification that DOT requirements are met.

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

Maximum	Jan. - Mar.	Apr. - June	July - Sept.	Oct. - Dec.
hours/day	12	12	12	12
days/week	7	7	7	7

9. Bulk Liquid Data *(add pages as necessary)*

Liquid Name		Condensate	Produced Water	
Max. daily throughput (1000 gal/day)		9.282	111.384	
Max. annual throughput (1000 gal/yr)		3,387.93	40,655.16	
Loading Method [1]		BF	BF	
Max. Fill Rate (gal/min)		168	168	
Average Fill Time (min/loading)		50	50	
Max. Bulk Liquid Temperature (^{o}F)		72.1	72.1	
True Vapor Pressure [2]		2.30	0.45	
Cargo Vessel Condition [3]		U	U	
Control Equipment or Method [4]		None	None	
Minimum collection efficiency (%)		90	90	
Minimum control efficiency (%)		0	0	
Maximum Emission Rate	Loading (lb/hr)	13.05	1.16	
	Annual (ton/yr)	2.19	2.34	
Estimation Method [5]		Promax	Promax	

Notes:

1 BF = Bottom Fill SP = Splash Fill SUB = Submerged Fill

2 At maximum bulk liquid temperature

3 B = Ballasted Vessel, C = Cleaned, U = Uncleaned (dedicated service), O = other (describe)

4 List as many as apply (complete and submit appropriate *Air Pollution Control Device Sheets as Attachment "H"*):
CA = Carbon Adsorption
VB = Dedicated Vapor Balance (closed system) ECD = Enclosed Combustion Device
F = Flare
TO = Thermal Oxidation or Incineration

5 EPA = EPA Emission Factor as stated in AP-42

10. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**

MONITORING	RECORDKEEPING
1) Visual inspection to ensure that loading connections from storage tanks to trucks are leak-free.	1) Maintain records of condensate transferred from storage tanks. 2) Maintain records of produced water transferred from storage tanks.
REPORTING	**TESTING**
N/A	N/A

11. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty: N/A

Attachment I

Emission Calculations

Table 1

Facility Information
Bee Lewis 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	Bee Lewis Well Pad
Nearest City/Town	New Milton
API Number/SIC Code	1311
Latitude/Longitude	39.254867, -80.823017
County	Doddridge County

Technical Information	
Max Condensate Site Throughput (bbl/day):	221
Max Produced Water Site Throughput (bbl/day):	2,652
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	4
IC Engines	1
Turbines	0
Diesel Engines	0
Gas Production Unit Heaters	4
Condensate Tanks	4
Produced Water Tanks	2
Miscellaneous Tanks	0
Loading Jobs	2
Glycol Units	0
Amine Units	0
Flares	1

Table 2

Uncontrolled/Controlled Emissions Summary
Bee Lewis 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, Gas Production Unit Heaters)																								
Fugitive Emissions (Component Count, PCV and Hauling)[1]	1.4616	6.4017			31.532	138.11							0.4482	0.5536			0.1738	0.7612	0.0046	0.0200	0.00E+00	0.00E+00		
Flashing, Working and Breathing (F/W/B) Losses[2]	71.7058	314.0714															2.015	8.824	0.0424	0.1855	0.1438	0.6300		
Compressor Engine Emissions[3]	0.0071	0.0311	0.3158	1.3831	27.8	121.7	5.6445	24.7228	0.0001	0.0006	0.0024	0.0104	0.0023	0.0100			0.0055	0.0241	0.0004	0.0017	4.68E-05	2.05E-04	0.0049	0.0215
Gas Production Unit Heaters Emissions[4]	0.0265	0.1159	0.4811	2.1074	580.87	2,544.22	0.4042	1.7702	0.0029	0.0126	0.0366	0.1602	0.0366	0.1602	2.41E-06	1.05E-05	9.06E-03	3.97E-02	1.01E-05	4.43E-05			0.0004	0.0016
TOTALS:	**73.2009**	**320.6201**	**0.7969**	**3.4904**	**640.1804**	**2803.9903**	**6.0486**	**26.4930**	**0.0030**	**0.0133**	**0.0389**	**0.1706**	**0.4870**	**0.7238**	**2.41E-06**	**1.05E-05**	**2.2030**	**9.6492**	**0.0473**	**0.2073**	**0.1439**	**0.6303**	**0.0053**	**0.0231**
UNCONTROLLED (Truck Loading Emissions)																								
Truck Loading Emissions[5]	8.258	1.390			9.877	3.169											0.0199	0.0034	2.45E-04	4.26E-05	0.0039	0.0007		
CONTROLLED EMISSIONS																								
Flare Emissions (from F/W/B losses)[6]	1.4342	6.2817	0.1329	0.5820	353.8512	1549.8683	0.1116	0.4889	7.56E-06	3.31E-05	0.0076	0.0332	0.0101	1.76E-05	6.64E-07	2.91E-06	0.0403	0.1766	8.47E-04	3.71E-03	0.0029	0.0126	9.45E-07	4.14E-06
Controlled Fugitive Emissions from Hauling													0.2241	0.2768										
TOTALS:	**1.4342**	**6.2817**	**0.1329**	**0.5820**	**353.8512**	**1549.8683**	**0.1116**	**0.4889**	**7.56E-06**	**3.31E-05**	**0.0076**	**0.0332**	**0.2342**	**0.2768**	**6.64E-07**	**2.91E-06**	**0.0403**	**0.1766**	**0.0008**	**0.0037**	**0.0029**	**0.0126**	**9.45E-07**	**4.14E-06**
POTENTIAL TO EMIT[7]	**2.9293**	**14.2209**	**0.9298**	**4.0725**	**1003.9085**	**4357.0272**	**6.1602**	**26.9819**	**0.0030**	**0.0133**	**0.0465**	**0.2038**	**0.2730**	**0.4470**	**3.07E-06**	**1.34E-05**	**0.2287**	**1.0049**	**0.0058**	**0.0255**	**0.0029**	**0.0135**	**0.0053**	**0.0231**

Enter any notes here:

1 - See Tables 4 and 5 for fugitive emission calculations; Table 12 for PM emissions from hauling.
2 - See Tables 6 and 7 for tanks emission calculations
3 - See Table 13 for engine emissions
4 - See Table 9 for gas production unit heater emission calculations
5 - The maximum emission was calculated based on tank truck capacity of 200 barrels and actual fill rate of 50 minutes per tank truck. At a production rate of 221 barrels per day, VOC emissions would be 8.2579 pounds per hour. Average hourly VOC emissions from truck loading is 0.3175 pound per hour.
6- See Table 10 and 11 for flare emission calculations.
7 - The hourly potential to emit is the sum of emissions from gas production unit heaters, storage tanks, fugitives and flare. Does not include emissions from loading (see footnote 4). 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

Bee Lewis Well Pad

Doddridge County, West Virginia

Antero Resources Corporation

Pollutant		Emissions			Threshold Exceeded?	
		Uncontrolled	Controlled	Threshold	Uncontrolled	Controlled
VOC	lbs/hr	73.2009	2.9293	6	**Yes**	
	tons/yr	322.0106	14.2209	10	**Yes**	**Yes**
NO_X	lbs/hr	0.7969	0.9298	6		
	tons/yr	3.4904	4.0725	10		
CO	lbs/hr	6.0486	6.1602	6	**Yes**	**Yes**
	tons/yr	26.4930	26.9819	10	**Yes**	**Yes**
SO_2	lbs/hr	0.0030	0.0030	6		
	tons/yr	0.0133	0.0133	10		
$PM_{2.5}$	lbs/hr	3.89E-02	4.65E-02	6		
	tons/yr	1.71E-01	2.04E-01	10		
PM_{10}	lbs/hr	0.4870	0.2730	6		
	tons/yr	0.7238	0.4470	10		
Lead	lbs/hr	2.41E-06	3.07E-06	6		
	tons/yr	1.05E-05	1.34E-05	10		
Total HAPs	lbs/hr	2.2030	0.2287	2	**Yes**	
	tons/yr	9.6525	1.0049	5	**Yes**	
Total TAPs	lbs/hr	0.0526	0.0111	1.14		
n-Hexane	lbs/hr	1.7921	0.1821			
	tons/yr	7.8514	0.7999			
Toluene	lbs/hr	0.1329	0.0174			
	tons/yr	0.5823	0.0764			
Ethylbenzene	lbs/hr	0.0815	0.0151			
	tons/yr	0.3573	0.0664			
Xylenes	lbs/hr	0.1439	0.0029			
	tons/yr	0.6309	0.0135			
Benzene	lbs/hr	0.0473	0.0058			
	tons/yr	0.2073	0.0255			

Enter any notes here:	1. Emissions are based on 98% Flare DRE operating 100% of the time.

Table 4

Fugitive Emissions
Bee Lewis 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	0.165
	Benzene frac	0.000
	Toluene	0.000
	Ethylbenzene	0.000
	Xylenes	0.000
	n-Hexane	0.011
	Methane	0.625

Gas					
Number	Component	Pollutant	Emission Factor (kg/hr of THC per component)	kg/hr	lb/yr
200	Valves	Gas VOC	0.004500	0.15	2,869.19
		Non VOC	0.004500	0.75	14,475.61
236	Connectors	VOC	0.000200	0.01	150.47
		Non-VOC	0.000200	0.04	759.17
52	Flanges	VOC	0.000390	0.00	64.65
		Non-VOC	0.000390	0.02	326.18
			Total VOCs:	0.16	3,084.32
			Total THC:	0.97	18,645.27

Light Liquid Weight Fraction From Analysis:	VOC frac	0.936
	Benzene frac	0.004
	Toluene	0.013
	Ethylbenzene	0.012
	Xylenes	0.000
	n-hexane	0.101
	Methane	0.022

Light Liquid					
Number	Component	Pollutant	Emission Factor (kg/hr of THC per component)	kg/hr	lb/yr
208	Valves	Light Liquid VOC	0.002500	0.49	9,380.07
		Light Liquid Non-VOC		0.03	641.37
			Total VOC:	0.49	9,380.07
			Total THC:	0.52	10,021.44

Fugitive Total Emissions			
	Annual Emissions (lb/yr)	Annual Emissions (lb/hr)	Annual Emissions (tpy)
VOC	12,464.39	1.42	6.23
Ethylbenzene		0.01	0.06
Toluene		0.01	0.07
Xylenes		0.00	0.00
n-Hexane		0.14	0.60
TAPs (Benzene)		0.00	0.02
HAPs		0.17	0.75
CO_{2e}	249,318.65	28.46	124.66

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
Bee Lewis Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Number of PCVs	16
Bleed Rate (scf/day/PCV)	6.6
Total Bleed Rate (scf/day)	105.6

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	34.08	0	0.00	0.00	0.00	0.00
Nitrogen	0.564	14.01	0.595584	0.00	0.02	0.00	0.00
Carbon Dioxide	0.1647	44.01	0.1739232	0.00	0.02	0.00	0.00
Methane	78.61509	16.04	83.01753504	0.22	3.51	0.15	0.64
Ethane	14.0689	30.07	14.8567584	0.04	1.18	0.05	0.21
Propane	4.2164	44.1	4.4525184	0.01	0.52	0.02	0.09
Isobutane	0.5041	58.12	0.5323296	0.00	0.08	0.00	0.01
n-Butane	1.0298	58.12	1.0874688	0.00	0.17	0.01	0.03
Isopentane	0.2618	72.15	0.2764608	0.00	0.05	0.00	0.01
n-Pentane	0.2553	72.15	0.2695968	0.00	0.05	0.00	0.01
2-Methylpentane	0	86.18	0	0.00	0.00	0.00	0.00
3-Methylpentane	0	86.18	0	0.00	0.00	0.00	0.00
n-Hexane	0.2484	86.18	0.2623104	0.00	0.06	0.00	0.01
Methylcyclopentane	0	84.16	0	0.00	0.00	0.00	0.00
Benzene	0	78.11	0	0.00	0.00	0.00	0.00
2-Methylhexane	0	100.2	0	0.00	0.00	0.00	0.00
3-Methylhexane	0	100.2	0	0.00	0.00	0.00	0.00
Heptane	0	100.21	0	0.00	0.00	0.00	0.00
Methylcyclohexane	0	98.186	0	0.00	0.00	0.00	0.00
Toluene	0	92.14	0	0.00	0.00	0.00	0.00
Octane	0	114.23	0	0.00	0.00	0.00	0.00
Ethylbenzene	0	106.17	0	0.00	0.00	0.00	0.00
m & p-Xylene	0	106.16	0	0.00	0.00	0.00	0.00
o-Xylene	0	106.16	0	0.00	0.00	0.00	0.00
Nonane	0	128.2	0	0.00	0.00	0.00	0.00
C10+	0	174.28	0	0.00	0.00	0.00	0.00

	lb/hr	tpy
VOC Emissions	0.0387	0.1695
Benzene Emissions	0.0000	0.0000
Toluene Emissions	0.0000	0.0000
Ethylbenzene Emissions	0.0000	0.0000
Xylene Emissions	0.0000	0.0000
n-Hexane Emissions	0.0025	0.0109
HAPs Emissions	0.0025	0.0109
TAPs Emissions	0.0000	0.0000
CO_{2e} emissions	3.0712	13.4520

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
Bee Lewis 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	0.1753	0.1914	0.8382	2.6582	0.0000	0.0000
H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Nitrogen	0.0656	0.0716	0.3138	0.4486	0.0531	0.2325
Carbon Dioxide	0.2282	0.2492	1.0914	2.1988	0.2602	1.1395
Methane	13.2228	14.4361	63.2300	58.0688	6.8706	30.0933
Ethane	24.7464	27.0170	118.3346	22.5529	2.6684	11.6877
Propane	25.3440	27.6695	121.1925	9.7250	1.1506	5.0398
Isobutane	5.6896	6.2117	27.2072	0.5048	0.0597	0.2616
n-Butane	12.3746	13.5100	59.1739	2.0301	0.2402	1.0521
Isopentane	4.5646	4.9834	21.8274	0.4388	0.0519	0.2274
n-Pentane	6.2646	6.8394	29.9567	0.5667	0.0671	0.2937
2-Methylpentane	1.1191	1.2218	5.3515	0.0455	0.0054	0.0236
3-Methylpentane	0.7020	0.7664	3.3568	0.0748	0.0089	0.0388
n-Hexane	1.4955	1.6328	7.1515	0.0480	0.0057	0.0249
Methylcyclopentane	0.1407	0.1536	0.6730	0.0416	0.0049	0.0216
Benzene	0.0335	0.0366	0.1601	0.0483	0.0057	0.0250
2-Methylhexane	0.5576	0.6088	2.6664	0.0198	0.0023	0.0103
3-Methylhexane	0.4614	0.5038	2.2065	0.0171	0.0020	0.0088
Heptane	0.9091	0.9925	4.3471	0.0352	0.0042	0.0182
Methylcyclohexane	0.4765	0.5202	2.2785	0.0937	0.0111	0.0485
Toluene	0.0937	0.1023	0.4482	0.1271	0.0150	0.0659
Octane	0.8803	0.9611	4.2095	0.0202	0.0024	0.0105
Ethylbenzene	0.0538	0.0587	0.2571	0.0723	0.0086	0.0375
m & p-Xylene	0.0459	0.0501	0.2194	0.0610	0.0072	0.0316
o-Xylene	0.0680	0.0743	0.3252	0.0925	0.0109	0.0479
Nonane	0.2514	0.2744	1.2019	0.0089	0.0011	0.0046
C10+	0.0359	0.0392	0.1715	0.0011	0.0001	0.0006
Total VOCs	61.562	67.21	294.4	14.073	1.6651	7.2929
Total CO_{2e}		303.41	1,328.9		144.54	633.1
Total TAPs (Benzene)		0.0366	0.1601		0.0057	0.0250
Toluene		0.1023	0.4482		0.0150	0.0659
Ethylbenzene		0.0587	0.2571		0.0086	0.0375
Xylenes		0.1243	0.5446		0.0182	0.0796
n-Hexane		1.633	7.152		0.0057	0.0249
Total HAPs		1.955	8.562		0.0531	0.2328
Total	100.00	109.18	478.2	100.00	11.517	50.45

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

Table 7

Uncontrolled Working and Breathing Losses

Bee Lewis Well Pad

Doddridge County, West Virginia

Antero Resources Corporation

Condensate Tank Information	
Number of Tanks	4
Maximum Working Losses (lbs/hr)	2.6883
Maximum Breathing Losses (lbs/hr)	1.7845

	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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Nitrogen	0.0033	0.0001	0.0004	0.0001	0.0003	0.0001	0.0007
Carbon Dioxide	0.2917	0.0078	0.0344	0.0052	0.0228	0.0130	0.0572
Methane	3.2926	0.0885	0.3877	0.0588	0.2574	0.1473	0.6451
Ethane	33.1399	0.8909	3.9022	0.5914	2.5903	1.4823	6.4925
Propane	28.9013	0.7770	3.4031	0.5158	2.2590	1.2927	5.6621
Isobutane	6.0617	0.1630	0.7138	0.1082	0.4738	0.2711	1.1876
n-Butane	12.9588	0.3484	1.5259	0.2313	1.0129	0.5796	2.5388
Isopentane	4.5677	0.1228	0.5378	0.0815	0.3570	0.2043	0.8949
n-Pentane	6.1885	0.1664	0.7287	0.1104	0.4837	0.2768	1.2124
2-Methylpentane	1.0782	0.0290	0.1270	0.0192	0.0843	0.0482	0.2112
3-Methylpentane	0.6743	0.0181	0.0794	0.0120	0.0527	0.0302	0.1321
n-Hexane	0.0977	0.0026	0.0115	0.0017	0.0076	0.0044	0.0191
Methylcyclopentane	0.1257	0.0034	0.0148	0.0022	0.0098	0.0056	0.0246
Benzene	0.0019	0.0001	0.0002	0.0000	0.0001	0.0001	0.0004
2-Methylhexane	0.0343	0.0009	0.0040	0.0006	0.0027	0.0015	0.0067
3-Methylhexane	0.4275	0.0115	0.0503	0.0076	0.0334	0.0191	0.0838
Heptane	0.7768	0.0209	0.0915	0.0139	0.0607	0.0347	0.1522
Methylcyclohexane	0.4093	0.0110	0.0482	0.0073	0.0320	0.0183	0.0802
Toluene	0.0112	0.0003	0.0013	0.0002	0.0009	0.0005	0.0022
Octane	0.7123	0.0191	0.0839	0.0127	0.0557	0.0319	0.1396
Ethylbenzene	0.0119	0.0003	0.0014	0.0002	0.0009	0.0005	0.0023
m & p-Xylene	0.0131	0.0004	0.0015	0.0002	0.0010	0.0006	0.0026
o-Xylene	0.0168	0.0005	0.0020	0.0003	0.0013	0.0008	0.0033
Nonane	0.1825	0.0049	0.0215	0.0033	0.0143	0.0082	0.0358
C10+	0.0208	0.0006	0.0024	0.0004	0.0016	0.0009	0.0041
Total VOCs	63.272	1.7010	7.450	1.1291	4.9456	2.8301	12.396
Total CO_{2e}		2.2207	9.7268	1.4741	6.4568	3.6949	16.184
Total TAPs (Benzene)		0.0001	0.0002	0.0000	0.0001	0.0001	0.0004
Toluene		0.0003	0.0013	0.0002	0.0009	0.0005	0.0022
Ethylbenzene		0.0003	0.0014	0.0002	0.0009	0.0005	0.0023
Xylenes		0.0008	0.0035	0.0005	0.0023	0.0013	0.0059
n-Hexane		0.0026	0.0115	0.0017	0.0076	0.0044	0.0191
Total HAPs		0.0041	0.0180	0.0027	0.0119	0.0068	0.0299
Total	100.00	2.6883	11.7749	1.7845	7.8163	4.4729	19.591

Table 7

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

Produced Water Tank Information	
Number of Tanks	2
Maximum Working Losses (lbs/hr)	0.1248
Maximum Breathing Losses (lbs/hr)	0.0082

	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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Nitrogen	0.0089	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
Carbon Dioxide	2.9417	0.0037	0.0161	0.0002	0.0011	0.0039	0.0171
Methane	3.2041	0.0040	0.0175	0.0003	0.0012	0.0043	0.0187
Ethane	1.1483	0.0014	0.0063	0.0001	0.0004	0.0015	0.0067
Propane	0.1207	0.0002	0.0007	0.0000	0.0000	0.0002	0.0007
Isobutane	0.0008	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
n-Butane	0.0047	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Isopentane	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
n-Pentane	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2-Methylpentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3-Methylpentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
n-Hexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Methylcyclopentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Benzene	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2-Methylhexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3-Methylhexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Heptane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Methylcyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Toluene	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Octane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Ethylbenzene	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
m & p-Xylene	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
o-Xylene	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Nonane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
C10+	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total VOCs	0.1270	0.0002	0.0007	0.0000	0.0000	0.0002	0.0007
Total CO_{2e}		0.1036	0.4539	0.0068	0.0299	0.1105	0.4838
Total TAPs (Benzene)		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Toluene		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Ethylbenzene		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Xylenes		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
n-Hexane		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total HAPs		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	100.00	0.1248	0.5465	0.0082	0.0360	0.1330	0.5826

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

Table 8

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

Annual Loading	Oil Truck Loading	Water Truck Loading
RVP	3.54	1.0232
Annual Average Temp (F)	72.1	72.1
S (saturation factor)	0.6	0.6
P (true vapor pressure)	2.30	0.45
M (MW of vapor)	40.10	18.36
Collection Efficiency (%)	0	0
Loading Loss (lb/10^3 gal)*	1.29	0.12
Maximum Throughput (gallons/hr)	10,080	10,080
Average Throughput (gallons/yr)	3,387,930	40,655,160
Loading Emissions (lbs/hr)	13.05	1.16
Loading Emissions (tpy)	2.19	2.34

	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	0.00	0.00	0.0000	0.00E+00	0.00E+00
Nitrogen	0.0033	0.00	0.00	0.0089	1.04E-04	2.09E-04
Carbon Dioxide	0.2917	0.04	0.01	2.9417	3.42E-02	6.89E-02
Methane	3.2926	0.43	0.07	3.2041	3.72E-02	7.51E-02
Ethane	33.1399	4.32	0.73	1.1483	1.33E-02	2.69E-02
Propane	28.9013	3.77	0.63	0.1207	1.40E-03	2.83E-03
Isobutane	6.0617	0.79	0.13	0.0008	9.12E-06	1.84E-05
n-Butane	12.9588	1.69	0.28	0.0047	5.52E-05	1.11E-04
Isopentane	4.5677	0.60	0.10	0.0003	2.99E-06	6.03E-06
n-Pentane	6.1885	0.81	0.14	0.0002	2.81E-06	5.68E-06
2-Methylpentane	1.0782	0.14	0.02	0.0000	4.32E-08	8.71E-08
3-Methylpentane	0.6743	0.09	0.01	0.0000	1.72E-07	3.47E-07
n-Hexane	0.0977	0.01	0.00	0.0000	1.76E-09	3.55E-09
Methylcyclopentane	0.1257	0.02	0.00	0.0000	2.06E-07	4.15E-07
Benzene	0.0019	0.00	0.00	0.0001	7.34E-07	1.48E-06
2-Methylhexane	0.0343	0.00	0.00	0.0000	3.07E-10	6.20E-10
3-Methylhexane	0.4275	0.06	0.01	0.0000	3.97E-09	8.01E-09
Heptane	0.7768	0.10	0.02	0.0000	6.02E-09	1.21E-08
Methylcyclohexane	0.4093	0.05	0.01	0.0000	9.89E-08	1.99E-07
Toluene	0.0112	0.00	0.00	0.0001	9.29E-07	1.87E-06
Octane	0.7123	0.09	0.02	0.0000	6.73E-10	1.36E-09
Ethylbenzene	0.0119	0.00	0.00	0.0000	2.97E-07	5.99E-07
m & p-Xylene	0.0131	0.00	0.00	0.0000	2.80E-07	5.65E-07
o-Xylene	0.0168	0.00	0.00	0.0000	4.44E-07	8.95E-07
Nonane	0.1825	0.02	0.00	0.0000	1.40E-10	2.82E-10
C10+	0.0208	0.00	0.00	0.0000	3.72E-13	7.51E-13
Total VOCs	63.2724	8.256	1.388	0.1270	1.48E-03	2.98E-03
Total CO_{2e}		9.061	1.5227		0.8162	1.6459
Total TAPs (Benzene)		0.0002	0.0000		0.0000	0.0000
Toluene		0.0015	0.0002		0.0000	0.0000
Ethylbenzene		0.0016	0.0003		0.0000	0.0000
Xylenes		0.0039	0.0007		0.0000	0.0000
n-Hexane		0.0127	0.0021		0.0000	0.0000
Total HAPs		0.0199	0.0033		0.0000	0.0000
Total	100.0000	13.0490	2.1929	100.0000	1.1622	2.3437

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
Loading emissions are vented to the atmosphere.

Table 9

Gas Production Unit Heaters Emissions
Bee Lewis Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Number of Units	4
GPU Heaters Rating (MMBtu/hr)	1.50
Operating hours/year	8760
Fuel Heat Value (Btu/scf)	1,247

Pollutant	Emission Factors (lb/MMscf)	lb/hr	tpy
NOx	100	0.481	2.107
CO	84	0.404	1.770
CO_2	120,000	577.358	2528.828
Lead	0.0005	2.41E-06	1.05E-05
N_2O	2.2	0.011	0.046
PM (Total)	7.6	0.037	0.160
SO_2	0.6	0.003	0.013
TOC	11	0.053	0.232
Methane	2.3	0.011	0.048
VOC	5.5	0.026	0.116
HAPS			
2-Methylnaphthalene	2.40E-05	1.15E-07	5.06E-07
Benzene	2.10E-03	1.01E-05	4.43E-05
Dichlorobenzene	1.20E-03	5.77E-06	2.53E-05
Fluoranthene	3.00E-06	1.44E-08	6.32E-08
Fluorene	2.80E-06	1.35E-08	5.90E-08
Formaldehyde	7.50E-02	3.61E-04	1.58E-03
Hexane	1.80E+00	8.66E-03	3.79E-02
Naphthalene	6.10E-04	2.93E-06	1.29E-05
Phenanathrene	1.70E-05	8.18E-08	3.58E-07
Toluene	3.40E-03	1.64E-05	7.17E-05

	lb/hr	tpy
TOTAL Uncontrolled VOC	0.026	0.116
TOTAL Uncontrolled HAPs	0.009	0.040
TOTAL Uncontrolled TAPs (Benzene)	0.000	0.000
TOTAL Uncontrolled TAPs (Formaldehyde)	0.000	0.002
TOTAL CO_{2e} Emissions	580.87	2,544.22

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

Table 10

Flare Emissions
Bee Lewis Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

General Information	
Unit Name:	FL001

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

Flare operating hours	8760

Stream Information							
	1	2	3	4	5	6	Total
Stream Sent to Flare (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)	12.6	--	1,033.14	238.04	42.33	2.75	1,328.86
Maximum Expected Annual Volumetric Flow Rate of Stream (scf/yr)	110,376.00	--	9,050,321.30	2,085,216.76	370,787.47	24,081.11	11,640,782.64
Heating Content (Btu/ft3)	1,247		1,899.01	1,075.73	1,899.01	1,075.73	1,731.83

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 Flare	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	-	-	67.210	1.665	2.830	0.000	71.71
Benzene	-	-	0.037	0.006	0.000	0.000	0.042
Toluene	-	-	0.102	0.015	0.000	0.000	0.118
Ethylbenzene	-	-	0.059	0.009	0.001	0.000	0.068
Xylenes	-	-	0.124	0.018	0.001	0.000	0.144
n-Hexane	-	-	1.633	0.006	0.004	0.000	1.643
HAPs	-	-	1.955	0.053	0.007	0.000	2.015
Total Mass Flow			109.176	11.517	4.473	0.133	125.299
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	-	-	294.382	7.293	12.396	0.001	314.071
Benzene	-	-	0.160	0.025	0.000	0.000	0.186
Toluene	-	-	0.448	0.066	0.002	0.000	0.516
Ethylbenzene	-	-	0.257	0.037	0.002	0.000	0.297
Xylenes	-	-	0.545	0.080	0.006	0.000	0.630
n-Hexane	-	-	7.152	0.025	0.019	0.000	7.196
HAP	-	-	8.562	0.233	0.030	0.000	8.824
Total Mass Flow			478.190	50.446	19.591	0.583	548.809

Table 10

Flare Emissions
Bee Lewis Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Controlled Emissions							
Hourly (lb/hr)							
	1	2	3	4	5	6	Total
Stream Sent to Flare	pilot(s)	added fuel stream(s)	Oil Tank Flash Emissions	Water Tank Flash Emissions	Oil Tank W/B Emissions	Water Tank W/B Emissions	-
NOx	0.001	-	0.103	0.024	0.004	0.000	0.13
CO	0.001	-	0.087	0.020	0.004	0.000	0.11
PM2.5	0.000	-	0.006	0.001	0.000	0.000	0.01
PM10	0.000	-	0.008	0.002	0.000	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	1.512	-	-	-	-	-	1.51
Total VOC	0.000	-	1.344	0.033	0.057	0.000	1.43
Benzene	0.000	-	0.001	0.000	0.000	0.000	0.00
Toluene	0.000	-	0.002	0.000	0.000	0.000	0.00
Ethylbenzene	0.000	-	0.001	0.000	0.000	0.000	0.00
Xylenes	0.000	-	0.002	0.000	0.000	0.000	0.00
n-Hexane	0.000	-	0.033	0.000	0.000	0.000	0.03
HAP	0.000	-	0.039	0.001	0.000	0.000	0.04
N_2O	0.000	-	0.002	0.001	0.000	0.000	0.00
Lead	0.000	-	0.000	0.000	0.000	0.000	0.00
Formaldehyde	0.000	-	-	-	-	-	0.00
Annual (tpy)							
	1	2	3	4	5	6	Total
Stream Sent to Flare	pilot(s)	added fuel stream(s)	Oil Tank Flash Emissions	Water Tank Flash Emissions	Oil Tank W/B Emissions	Water Tank W/B Emissions	-
NOx	0.006	-	0.453	0.104	0.019	0.001	0.58
CO	0.005	-	0.380	0.088	0.016	0.001	0.49
PM2.5	0.000	-	0.026	0.006	0.001	0.000	0.03
PM10	0.000	-	0.034	0.008	0.001	0.000	0.04
H_2S	0.000	-	0.000	0.000	0.000	0.000	0.00
SO_2	0.000	-	0.000	0.000	0.000	0.000	0.00
CO_2	6.623	-	-	-	-	-	6.62
Total VOC	0.000	-	5.888	0.146	0.248	0.000	6.28
Benzene	0.000	-	0.003	0.001	0.000	0.000	0.00
Toluene	0.000	-	0.009	0.001	0.000	0.000	0.01
Ethylbenzene	0.000	-	0.005	0.001	0.000	0.000	0.01
Xylenes	0.000	-	0.011	0.002	0.000	0.000	0.01
n-Hexane	0.000	-	0.143	0.000	0.000	0.000	0.14
HAP	0.000	-	0.171	0.005	0.001	0.000	0.18
N_2O	0.000	-	0.010	0.002	0.000	0.000	0.01
Lead	0.000	-	0.000	0.000	0.000	0.000	0.00
Formaldehyde	0.000	-	-	-	-	-	0.00

Flare Total Emissions		
	Hourly Emissions (lb/hr)	Annual Emissions (tpy)
Total VOC	1.43	6.28
NOx	1.33E-01	5.82E-01
CO	1.12E-01	4.89E-01
PM2.5	7.57E-03	3.32E-02
PM10	1.01E-02	4.42E-02
H_2S	4.02E-06	1.76E-05
SO_2	7.56E-06	3.31E-05
Benzene (TAPs)	8.47E-04	3.71E-03
Formaldehyde (TAPs)	9.45E-07	4.14E-06
HAPs	0.04	0.18
CO_2e	353.85	1549.87
N_2O	2.92E-03	1.28E-02
Lead	6.64E-07	2.91E-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

Flare GHG Emissions
Bee Lewis Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Flare CO_2 and CH_4 Emissions

Components	Mole fraction of oil flash gas constituents[a]	Volume of oil flash gas sent to flare *scf/year*	Mole fraction of water flash gas constituents[a]	Volume of water flash gas sent to flare *scf/year*	Mole fraction of oil tank vapors constituents[a]	Volume of oil tank vapor sent to flare *scf/year*	Mole fraction of water tank vapors constituents[a]	Volume of water tank vapors sent to flare *scf/year*	Component volume of gas sent to flare *scf/year*	Number of carbon atoms	Combustion Efficiency	Combusted CO_2 Volume[b] *scf/year*	Uncombusted CO_2 and CH_4 Volume[b] *scf/year*	Volume GHGs Emitted *scf/year*
CO_2	0.002	9,050,321	0.0098	2,085,217	0.0027	370,787	0.012	24,081	38,577	1	0	--	38,577	24,865,179
Methane	0.297	9,050,321	0.7093	2,085,217	0.0823	370,787	0.037	24,081	4,194,368	1	0.98	4,110,481	83,887	83,887
Ethane	0.296	9,050,321	0.1469	2,085,217	0.4420	370,787	0.007	24,081	3,149,883	2	0.98	6,173,771	--	
Propane	0.207	9,050,321	0.0432	2,085,217	0.2628	370,787	0.001	24,081	2,058,687	3	0.98	6,052,541	--	
i-Butane	0.035	9,050,321	0.0017	2,085,217	0.0418	370,787	0.000	24,081	337,787	4	0.98	1,324,127	--	
n-Butane	0.077	9,050,321	0.0068	2,085,217	0.0894	370,787	0.000	24,081	740,642	4	0.98	2,903,318	--	
Pentane	0.054	9,050,321	0.0027	2,085,217	0.0598	370,787	0.000	24,081	516,544	5	0.98	2,531,066	--	
Hexane	0.014	9,050,321	0.0004	2,085,217	0.0086	370,787	0.000	24,081	129,292	6	0.98	760,237	--	
Benzene	0.000	9,050,321	0.0001	2,085,217	0.0000	370,787	0.000	24,081	1,652	6	0.98	9,714	--	
Heptanes	0.008	9,050,321	0.0002	2,085,217	0.0056	370,787	0.000	24,081	70,649	7	0.98	484,652	--	
Toluene	0.000	9,050,321	0.0003	2,085,217	0.0000	370,787	0.000	24,081	3,894	7	0.98	26,710	--	
Octane	0.005	9,050,321	0.0002	2,085,217	0.0042	370,787	0.000	24,081	42,900	8	0.98	336,339	--	
Ethyl benzene	0.000	9,050,321	0.0001	2,085,217	0.0000	370,787	0.000	24,081	1,943	8	0.98	15,236	--	
Xylenes	0.000	9,050,321	0.0003	2,085,217	0.0001	370,787	0.000	24,081	4,126	8	0.98	32,346	--	
Nonane	0.001	9,050,321	0.0000	2,085,217	0.0006	370,787	0.000	24,081	6,624	9	0.98	58,420	--	
Decane plus	0.000	9,050,321	0.0000	2,085,217	0.0001	370,787	0.000	24,081	780	10	0.98	7,644	--	
											Subtotal	**24,826,602**	--	

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	24,865,179	0.12	2000	1	329.16	1,441.72
CH_4	83,887	0.09	2000	21	0.89	3.90
				CO_2e Emissions	**351.4**	**1539.28**

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
Bee Lewis 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)	221
PW Production (bbl/day)	2,652
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	0.1200	1	404	0.1200	48.4800	3.8175	1.7179
Tanker Trucks PW	10	40	10	0.1200	1	4840	0.1200	580.8000	3.8175	1.7179
Pick Up Truck	4	3	10	0.2300	1	730	0.2300	167.9000	0.3467	0.1560

	Uncontrolled Emissions						Controlled Emissions					
	PM			PM10			PM			PM10		
	(lbs/hr)	(lbs/year)	(tpy)	(lbs/hr)	(lbs/year)	(tpy)	(lbs/hr)	(lbs/year)	(tpy)	(lbs/hr)	(lbs/year)	(tpy)
Tanker Trucks Condensate	0.4581	185.0738	0.0925	0.2061	83.2832	0.0416	0.2291	92.5369	0.0463	0.1031	41.6416	0.0208
Tanker Trucks PW	0.4581	2217.2211	1.1086	0.2061	997.7495	0.4989	0.2291	1108.6105	0.5543	0.1031	498.8747	0.2494
Pick Up Truck	0.0797	58.2075	0.0291	0.0359	26.1934	0.0131	0.0399	29.1038	0.0146	0.0179	13.0967	0.0065
Total Emissions	0.9959	2,460.5024	1.2303	0.4482	1,107.2261	0.5536	0.4980	1,230.2512	0.6151	0.2241	553.6130	0.2768

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
Bee Lewis Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Kubota DG972-E2

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

Pollutant	Emission Factors (g/hp-hr)	Emission Factors (lb/MMBtu)	lb/hr	tpy
NOx[1]	5.97		0.3158	1.3831
CO[2]	106.7		5.6445	24.7228
CO_2		110.000	26.3967	115.62
$PM_{2.5}$		9.910E-03	0.0024	0.0104
PM_{10}		9.500E-03	0.0023	0.0100
PM (Total)		9.910E-03	0.0024	0.0104
SO_2		5.880E-04	0.0001	0.0006
TOC		0.358	0.0859	0.3763
Methane		0.230	0.0552	0.2417
VOC[3]		0.0296	0.0071	0.0311
HAPS				
Benzene		1.58E-03	3.79E-04	1.66E-03
Ethylbenzene		2.48E-05	5.95E-06	2.61E-05
Formaldehyde		2.05E-02	4.92E-03	2.15E-02
Naphthalene		9.71E-05	2.33E-05	1.02E-04
Toluene		5.58E-04	1.34E-04	5.86E-04
Xylene		1.95E-04	4.68E-05	2.05E-04

	lb/hr	tpy
TOTAL Uncontrolled VOC	0.0071	0.0311
TOTAL Uncontrolled NOx	0.3158	1.3831
TOTAL Uncontrolled HAPs	0.0055	0.0241
TOTAL Uncontrolled TAPs (Benzene)	0.0004	0.0017
TOTAL Uncontrolled TAPs (Formaldehyde)	0.0049	0.0215
TOTAL CO_{2e} Emissions	27.7765	121.6612

Enter Any Notes Here:

1. Emission factor used for the 24 HP engine's Nox is the 40 CFR 1054 standard indicated on the EPA's Certificate of Conformity. See Appendix P.

2. Emission factor for CO was the Certification CO level taken from EPA's Non-Road Small SI 2013 Certification issued by Office of Transportation and Air Quality, March 2014.

3. Emission factors for all other contaminants including VOCs were obtained from AP-42, Section 3.2 "Natural Gas-fired Reciprocating Engines", Table 3.2-3.

Table 14

Antero Resources Corporation
Bee Lewis Well Pad
Registration Number: G70-A015
Facility ID: 017-00085

	Change in Regulated Air Pollutants Emissions					
	Potential Emissions [1]		Permitted Emissions		Change in Emissions	
Pollutant	Hourly PTE (lb/hr)	Yearly PTE (tpy)	Hourly PTE (lb/hr)	Yearly PTE (tpy)	Hourly PTE (lb/hr)	Yearly PTE (tpy)
PM	0.9959	1.2303	0.4279	0.4812	0.5681	0.7490
PM10	0.2730	0.4470	0.2365	0.3767	0.0365	0.0702
VOC	2.9293	14.2209	3.0128	15.6213	-0.0835	-1.4004
CO	6.1602	26.9819	0.4860	2.1286	5.6743	24.8533
NOx	0.9298	4.0725	0.5785	2.5340	0.3512	1.5385
SO2	0.0030	0.0133	0.0029	0.0127	0.0001	0.0006
Pb	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
HAPs	0.2287	1.0049	0.4525	2.3432	-0.2239	-1.3383
TAPs	0.0111	0.0486	0.0057	0.0259	0.0054	0.0227

Notes: 1) Potential to emit from proposed installation of compressor engine (Kubota Engine)

Bryan Research & Engineering, Inc.

ProMax® 3.2

with

TSWEET® & PROSIM®

Simulation Report	
Client Name:	Antero Resources Corporation
Location:	West Virginia
Job:	Bee Lewis

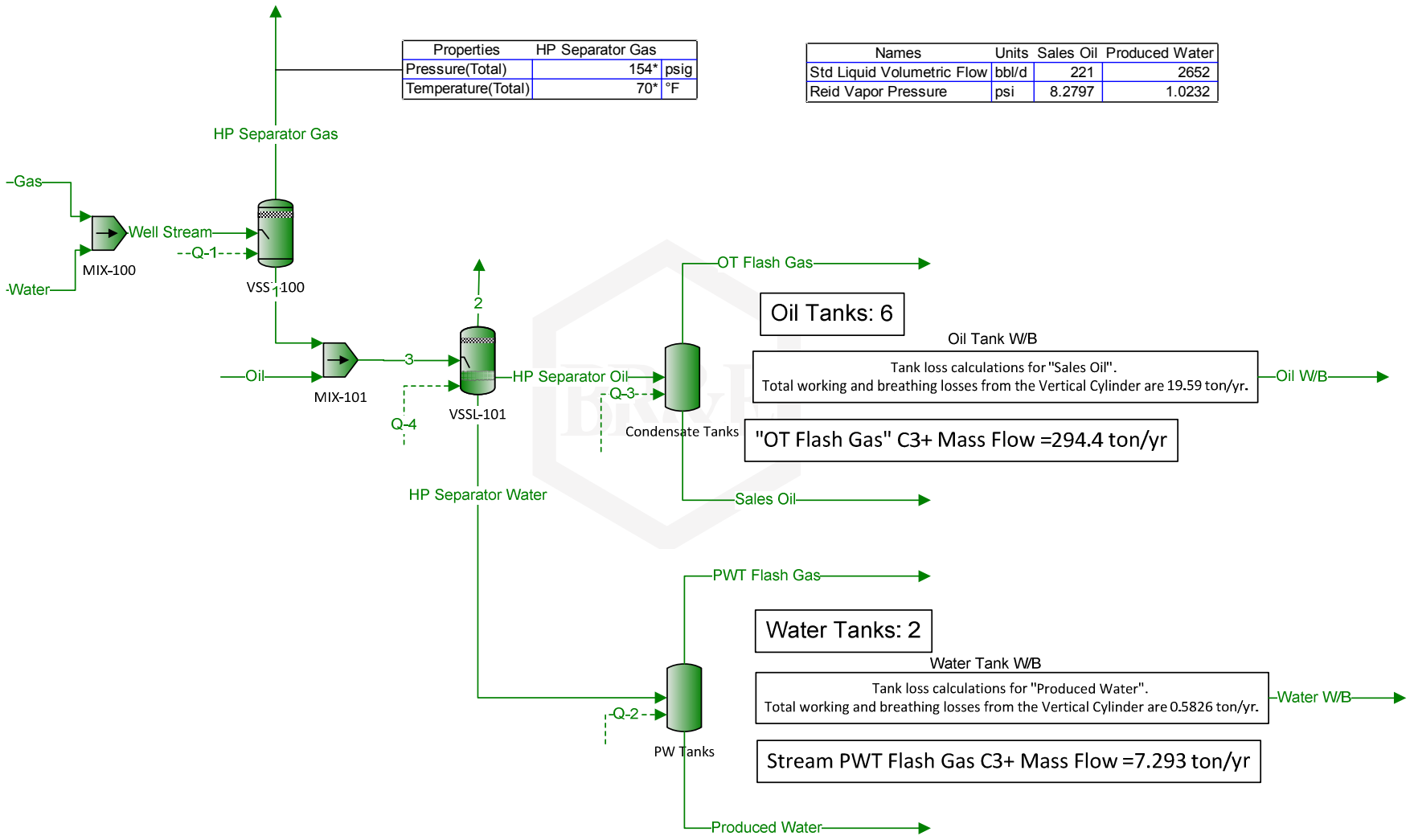
Project Name:	PROMAX SCENARIO 3
File Name:	ProMax@C:\Users\yichen\Documents\New Model\Antero ProMax\PROMAX SCENARIO 3.PMX
ProMax Version:	3.2.13330.0

Report Created:	2/17/2015 15:13

Stream HP Separator Gas C3+ Mass Flow =9.617E+04 ton/yr

Properties	HP Separator Gas	
Pressure(Total)	154*	psig
Temperature(Total)	70*	°F

Names	Units	Sales Oil	Produced Water
Std Liquid Volumetric Flow	bbl/d	221	2652
Reid Vapor Pressure	psi	8.2797	1.0232



Process Streams		Well Stream	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	1	2	3
Phase: Total	Status	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Mole Fraction		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water		24.7529	0.225520	99.9709	0.0549767	0.350329	0.00767183	0	100	0	99.9969	3.02989	0.000223634	94.3464	99.9710	0.225552	98.9519
H2S		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen		0.424697	0.563158	9.20601E-05	0.0117538	0.0843379	0.000128436	0.564404	0	0.018	3.85280E-06	0.328862	0.00479040	0.00583957	7.90161E-05	0.656059	0.000261706
Carbon Dioxide		0.124021	0.164161	0.000772497	0.0287952	0.186735	0.00349882	0.164818	0	0.015	0.000497445	1.02596	0.265840	1.22727	0.000923331	0.137335	0.00106683
Methane		59.1979	78.4942	0.0217253	4.21701	29.6779	0.139084	78.6713	0	4.777	0.00178915	74.3286	8.23043	3.66716	0.0218475	78.0482	0.0703223
Ethane		10.5940	14.0471	0.00456295	4.84681	29.6328	0.876979	14.0790	0	4.948	0.000432008	15.4016	44.1966	0.701181	0.00433302	14.7906	0.0547296
Propane		3.17499	4.20984	0.00135502	4.87337	20.6948	2.33934	4.21942	0	4.863	0.000140343	4.52876	26.2832	0.0502503	0.00141616	4.02738	0.0509760
Isobutane		0.379592	0.503353	4.97592E-05	1.37609	3.52470	1.03196	0.504461	0	1.369	1.92293E-06	0.178347	4.18225	0.000247782	5.54045E-05	0.451978	0.0140107
n-Butane		0.775449	1.02823	0.000209403	3.83957	7.66600	3.22671	1.03054	0	3.815	1.70295E-05	0.717234	8.94086	0.00149965	0.000244219	0.881444	0.0391325
Isopentane		0.197138	0.261408	3.55330E-05	2.47283	2.27800	2.50404	0.261987	0	2.456	2.03235E-06	0.124901	2.53881	6.54463E-05	4.11707E-05	0.225542	0.0250776
n-Pentane		0.192243	0.254918	4.58600E-05	4.40111	3.12641	4.60527	0.255483	0	4.372	2.59854E-06	0.161292	3.43963	6.16370E-05	3.90238E-05	0.299506	0.0446075
2-Methylpentane		0	0	2.99256E-06	1.50837	0.467599	1.67507	0	0	1.498	8.32071E-08	0.0108469	0.501732	7.91370E-07	0	0.0429326	0.0152709
3-Methylpentane		0	0	5.15447E-06	1.05095	0.293304	1.17230	0	0	1.044	3.71166E-07	0.0178337	0.313785	3.15453E-06	0	0.0268157	0.0106427
n-Hexane		0.187048	0.248036	3.13559E-06	2.77179	0.624878	3.11564	0.248578	0	2.751	6.97230E-08	0.0114304	0.0454537	3.22971E-08	1.36276E-05	0.0570595	0.0280576
Methylcyclopentane		0	0	3.36009E-06	0.277656	0.0602121	0.312483	0	0	0.276	6.34875E-07	0.0101609	0.0599150	3.86511E-06	0	0.00542460	0.00281359
Benzene		0	0	4.29502E-05	0.0723465	0.0154366	0.0814614	0	0	0.076	3.95555E-05	0.0126961	0.000962664	1.48420E-05	0	0.00138694	0.000774757
2-Methylhexane		0	0	1.11380E-06	2.06782	0.200366	2.36692	0	0	2.053	2.63047E-08	0.00405447	0.0137307	4.84490E-09	0	0.0184497	0.0209286
3-Methylhexane		0	0	9.61445E-07	1.79588	0.165810	2.05696	0	0	1.783	2.37085E-08	0.00349614	0.171101	6.26144E-08	0	0.0152612	0.0181762
Heptane		0	0	1.98421E-06	4.45707	0.326666	5.11861	0	0	4.425	4.91956E-08	0.00721426	0.310879	9.48652E-08	0	0.0303804	0.0451092
Methylcyclohexane		0	0	6.06371E-06	2.35244	0.174734	2.70123	0	0	2.336	8.09876E-07	0.0195884	0.167171	1.59133E-06	0	0.0159509	0.0238136
Toluene		0	0	8.05230E-05	0.613630	0.0366289	0.706045	0	0	0.617	7.29450E-05	0.0283254	0.00485632	1.59298E-05	0	0.00332516	0.00628980
Octane		0	0	9.91001E-07	12.0566	0.277484	13.9432	0	0	11.969	1.63510E-08	0.00363375	0.250068	9.31049E-09	0	0.0264759	0.122014
Ethylbenzene		0	0	3.63172E-05	0.911103	0.0182314	1.05411	0	0	0.908	3.25751E-05	0.0139841	0.00450823	4.42321E-06	0	0.00170233	0.00925630
m-Xylene		0	0	3.16155E-05	0.928690	0.0155608	1.07494	0	0	0.925	2.84579E-05	0.0118005	0.00495753	4.16693E-06	0	0.00145683	0.00942961
o-Xylene		0	0	6.31286E-05	1.54008	0.0230660	1.78305	0	0	1.535	5.83443E-05	0.0178955	0.00635966	6.60692E-06	0	0.00215784	0.0156480
Nonane		0	0	3.93508E-07	9.27352	0.0705648	10.7475	0	0	9.206	1.02254E-08	0.00142898	0.0570715	1.72394E-09	0	0.00688452	0.0938475
C10+		0	0	3.63466E-08	32.1997	0.00746073	37.3558	0	0	31.965	8.31061E-10	0.000132411	0.00481045	3.39773E-12	0	0.000804060	0.325857
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
Water		2162.43	14.8570	2147.56	0.0120747	0.0106224	0.00145237	0	2162.43	0	2147.55	0.0174580	2.49441E-07	0.00683449	2147.58	0.000385296	2147.58
H2S		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen		37.1019	37.1002	0.00197763	0.00258153	0.00255722	2.43146E-05	37.1019	0	0.00398244	8.27433E-05	0.00189488	5.34320E-06	4.23021E-07	0.00169742	0.00112070	0.00567986
Carbon Dioxide		10.8345	10.8147	0.0165947	0.00632439	0.00566202	0.000662370	10.8345	0	0.00331870	0.0106832	0.00591150	0.000296517	8.89043E-05	0.0198350	0.000234600	0.0231537
Methane		5171.58	5171.11	0.466701	0.926196	0.899866	0.0263303	5171.58	0	1.05689	0.0384240	0.428277	0.00918020	0.000265651	0.469327	0.133325	1.52622
Ethane		925.502	925.409	0.0980209	1.06452	0.898500	0.166023	925.502	0	1.09473	0.00927787	0.0887430	0.0492968	5.07939E-05	0.0930818	0.0252658	1.18781
Propane		277.370	277.339	0.0291084	1.07036	0.627489	0.442866	277.370	0	1.07592	0.00301402	0.0260944	0.0293163	3.64015E-06	0.0304220	0.00687970	1.10634
Isobutane		33.1615	33.1603	0.00106892	0.302236	0.106873	0.195363	33.1615	0	0.302886	4.12970E-05	0.00102763	0.00466487	1.79494E-08	0.00119020	0.000772085	0.304077
n-Butane		67.7439	67.7386	0.00449838	0.843298	0.232442	0.610856	67.7439	0	0.844055	0.000365727	0.00413265	0.00997261	1.08635E-07	0.00524631	0.00150571	0.849302
Isopentane		17.2221	17.2212	0.000763316	0.543117	0.0690714	0.474046	17.2221	0	0.543381	4.36471E-05	0.000719668	0.00283178	4.74096E-09	0.000884430	0.000385278	0.544266
n-Pentane		16.7945	16.7937	0.000985160	0.966631	0.0947963	0.871835	16.7945	0	0.967290	5.58067E-05	0.000929354	0.00383656	4.46501E-09	0.000838310	0.000511626	0.968128
2-Methylpentane		0	0	6.42860E-05	0.331290	0.0141781	0.317112	0	0	0.331427	1.78697E-06	6.24990E-05	0.000559631	5.73272E-11	0	7.33390E-05	0.331427
3-Methylpentane		0	0	0.000110728	0.230825	0.00889331	0.221932	0	0	0.230981	7.97122E-06	0.000102757	0.000349995	2.28516E-10	0	4.58075E-05	0.230981
n-Hexane		16.3406	16.3403	6.73584E-05	0.608777	0.0189470	0.589830	16.3406	0	0.608649	1.49738E-06	6.58610E-05	5.06990E-05	2.33962E-12	0.000292747	9.74710E-05	0.608942
Methylcyclopentane		0	0	7.21812E-05	0.0609826	0.00182570	0.0591569	0	0	0.0610640	1.36347E-05	5.85465E-05	6.68290E-05	2.79990E-10	0	9.26650E-06	0.0610640
Benzene		0	0	0.000922652	0.0158897	0.000468055	0.0154217	0	0	0.0168147	0.000849498	7.31539E-05	1.07375E-06	1.07516E-09	0	2.36922E-06	0.0168147
2-Methylhexane		0	0	2.39265E-05	0.454164	0.00607532	0.448088	0	0	0.454219	5.64923E-07	2.33616E-05	1.53152E-05	3.50967E-13	0	3.15165E-05	0.454219
3-Methylhexane		0	0	2.06537E-05	0.394436	0.00502755	0.389408	0	0	0.394483	5.09167E-07	2.01445E-05	0.000190846	4.53581E-12	0	2.60697E-05	0.394483
Heptane		0	0	4.26246E-05	0.978921	0.00990487	0.969016	0	0	0.979016	1.05653E-06	4.15681E-05	0.000346754	6.87208E-12	0	5.18968E-05	0.979016
Methylcyclohexane		0	0	0.000130260	0.516674	0.00529813	0.511376	0	0	0.516832	1.73930E-05	0.000112867	0.000186462	1.15276E-10	0	2.72478E-05	0.516832
Toluene		0	0	0.00172979	0.134774	0.00111063	0.133663	0	0	0.136509	0.00156658	0.000163209	5.41673E-06	1.15396E-09	0	5.68015E-06	0.136509
Octane		0	0	2.12886E-05	2.64803	0.00841363	2.63962	0	0	2.64810	3.51156E-07	2.09374E-05	0.000278925	6.74456E-13	0	4.52270E-05	2.64810
Ethylbenzene		0	0	0.000780163	0.200109	0.000552798	0.199556	0	0	0.200892	0.000699587	8.05754E-05	5.02847E-06	3.20420E-10	0	2.90798E-06	0.200892
m-Xylene		0	0	0.000679160	0.203971	0.000471820	0.203500	0	0	0.204653	0.000611167	6.79935E-05	5.52962E-06	3.01854E-10	0	2.48861E-06	0.204653
o-Xylene		0	0	0.00135612	0.338254	0.000699387	0.337554	0	0	0.339613	0.00125301	0.000103113	7.09355E-06	4.78608E-10	0	3.68610E-06	0.339613
Nonane		0	0	8.45330E-06	2.03678	0.00213960	2.03464	0	0	2.03680	2.19602E-07	8.23370E-06	6.36574E-05	1.24883E-13	0	1.17604E-05	2.03680
C10+		0	0	7.80794E-07	7.07214	0.000226218	7.07192	0	0	7.07214	1.78480E-08	7.62946E-07	5.36556E-06	2.46133E-16	0	1.37352E-06	7.07214
Mass Fraction		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water		22.4892	0.198965	99.9650	0.00873476	0.175281	0.00109880	0	100	0	99.9948	2.65818	0.000100466	92.5701	99.9661	0.198924	93.9140
H2S		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen		0.600001	0.772587	0.000143143	0.00290386	0.0656157	2.86045E-05	0.774087	0	0.00447306	5.99090E-06	0.448638	0.00334642	0.00890945	0.000122862	0.899722	0.000386228
Carbon Dioxide		0.275262	0.353807	0.00188702	0.0111763	0.228240	0.00122419	0.355128	0	0.00585604	0.00121518	2.19883	0.291749	2.94166	0.00225549	0.295888	0.00247348
Methane		47.8943	61.6680	0.0193451	0.596632	13.2228	0.0177390	61.7905	0	0.679818	0.00159319	58.0688	3.29258	3.20409	0.0194540	61.2962	0.0594332
Ethane		16.0652	20.6851	0.00761551	1.28531	24.7464	0.209647	20.7264	0	1.31982	0.000721043	22.5529	33.1399	1.14830	0.00723182	21.7723	0.0866976
Propane		7.06064	9.09100	0.00331646	1.89520	25.3440	0.820105	9.10923	0	1.90224	0.000343507	9.72502	28.9013	0.120681	0.00346614	8.69395	0.118420
Isobutane		1.11267	1.43273	0.000160527	0.705375	5.68962	0.476854	1.43550	0	0.705849	6.20375E-06	0.504806	6.06170	0.000784361	0.000178741	1.28605	0.0429009
n-Butane		2.27301	2.92673	0.000675552	1.96814	12.3746	1.49102	2.93251	0	1.96699	5.49406E-05	2.03011	12.9588	0.00474718	0.000787878	2.50805	0.119824
Isopentane		0.717308	0.923631	0.000142296	1.57346	4.56458	1.43632	0.925429	0	1.57190	8.13913E-06	0.438843	4.56774	0.000257169	0.000164875	0.796629	0.0953193
n-Pentane		0.699498	0.900700	0.000183652	2.80041	6.26461	2.64158	0.902453	0	2.79818	1.04066E-05	0.566706	6.18848	0.000242200	0.000156278	1.05787	0.169552
2-Methylpentane		0	0	1.43140E-05	1.14637	1.11912	1.14762	0	0	1.14515	3.98009E-07	0.0455202	1.07819	3.71421E-06	0	0.181122	0.0693286
3-Methylpentane		0	0	2.46547E-05	0.798726	0.701973	0.803162	0	0	0.798086	1.77542E-06	0.0748412	0.674306	1.48055E-05	0	0.113128	0.0483171
n-Hexane		0.812908	1.04676	1.49981E-05	2.10656	1.49554	2.13457	1.04877	0	2.10300	3.33510E-07	0.0479689	0.0976777	1.51583E-07	6.51837E-05	0.240719	0.127380
Methylcyclopentane		0	0	1.56960E-05	0.206083	0.140736	0.209079	0	0	0.206053	2.96579E-06	0.0416440	0.125742	1.77161E-05	0	0.0223497	0.0124747
Benzene		0	0	0.000186215	0.0498385	0.0334879	0.0505882	0	0	0.0526619	0.000171504	0.0482950	0.00187514	6.31414E-05	0	0.00530365	0.00318822
2-Methylhexane		0	0	6.19464E-06	1.82735	0.557595	1.88556	0	0	1.82487	1.46305E-07	0.0197845	0.0343092	2.64402E-08	0	0.0905036	0.110480
3-Methylhexane		0	0	5.34730E-06	1.58703	0.461431	1.63864	0	0	1.58487	1.31865E-07	0.0170601	0.427534	3.41708E-07	0	0.0748624	0.0959499
Heptane		0	0	1.10356E-05	3.93873	0.909073	4.07764	0	0	3.93329	2.73623E-07	0.0352033	0.776802	5.17711E-07	0	0.149028	0.238126
Methylcyclohexane		0	0	3.30462E-05	2.03704	0.476482	2.10859	0	0	2.03465	4.41385E-06	0.0936623	0.409312	8.50969E-06	0	0.0766715	0.123180

Toluene		0	0	0.000411807	0.498630	0.0937311	0.517194	0	0	0.504304	0.000373067	0.127096	0.0111581	7.99382E-05	0	0.0149987	0.0305312
Octane		0	0	6.28322E-06	12.1459	0.880302	12.6624	0	0	12.1283	1.03674E-07	0.0202137	0.712320	5.79231E-08	0	0.148056	0.734260
Ethylbenzene		0	0	0.000214007	0.853061	0.0537553	0.889708	0	0	0.855133	0.000191963	0.0722989	0.0119352	2.55755E-05	0	0.00884758	0.0517708
m-Xylene		0	0	0.000186301	0.869527	0.0458809	0.907290	0	0	0.871143	0.000167701	0.0610093	0.0131247	2.40936E-05	0	0.00757164	0.0527400
o-Xylene		0	0	0.000371999	1.44197	0.0680100	1.50496	0	0	1.44563	0.000343819	0.0925214	0.0168367	3.82019E-05	0	0.0112151	0.0875199
Nonane		0	0	2.80132E-06	10.4894	0.251351	10.9588	0	0	10.4740	7.27955E-08	0.00892519	0.182531	1.20421E-08	0	0.0432263	0.634107
C10+		0	0	3.49216E-07	49.1564	0.0358672	51.4086	0	0	49.0838	7.98509E-09	0.00111619	0.0207647	3.20325E-11	0	0.00681373	2.97159
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**
Water		38956.8	267.653	38689.0	0.217530	0.191365	0.0261649	0	38956.8	0	38688.7	0.314511	4.49374E-06	0.123125	38689.2	0.00694122	38689.2
H2S		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen		1039.35	1039.30	0.0554000	0.0723175	0.0716364	0.000681134	1039.35	0	0.111562	0.00231792	0.0530821	0.000149681	1.18503E-05	0.0475506	0.0313947	0.159112
Carbon Dioxide		476.823	475.950	0.730325	0.278333	0.249183	0.0291506	476.823	0	0.146054	0.470163	0.260162	0.0130496	0.00391263	0.872928	0.0103246	1.01898
Methane		82964.8	82957.3	7.48703	14.8585	14.4361	0.422404	82964.8	0	16.9552	0.616416	6.87061	0.147273	0.00426169	7.52916	2.13885	24.4843
Ethane		27829.0	27826.2	2.94739	32.0092	27.0170	4.99215	27829.0	0	32.9174	0.278977	2.66842	1.48231	0.00152732	2.79888	0.759718	35.7163
Propane		12230.8	12229.4	1.28355	47.1980	27.6695	19.5285	12230.8	0	47.4434	0.132905	1.15065	1.29272	0.000160515	1.34148	0.303365	48.7849
Isobutane		1927.42	1927.35	0.0621281	17.5666	6.21169	11.3549	1927.42	0	17.6044	0.00240027	0.0597279	0.271133	1.04326E-06	0.0691770	0.0448753	17.6736
n-Butane		3937.42	3937.12	0.261456	49.0143	13.5100	35.5043	3937.42	0	49.0584	0.0212569	0.240199	0.579630	6.31411E-06	0.304927	0.0875154	49.3633
Isopentane		1242.56	1242.49	0.0550723	39.1852	4.98342	34.2018	1242.56	0	39.2043	0.00314908	0.0519232	0.204310	3.42054E-07	0.0638105	0.0277974	39.2681
n-Pentane		1211.71	1211.64	0.0710781	69.7413	6.83944	62.9018	1211.71	0	69.7888	0.00402639	0.0670517	0.276803	3.22145E-07	0.0604831	0.0369132	69.8493
2-Methylpentane		0	0	0.00553987	28.5490	1.22180	27.3272	0	0	28.5609	0.000153992	0.00538587	0.0482264	4.94019E-09	0	0.00632001	28.5609
3-Methylpentane		0	0	0.00954201	19.8914	0.766384	19.1250	0	0	19.9049	0.000686922	0.00885508	0.0301609	1.96924E-08	0	0.00394747	19.9049
n-Hexane		1408.16	1408.13	0.00580464	52.4616	1.63276	50.8288	1408.16	0	52.4506	0.000129037	0.00567560	0.00436900	2.01617E-10	0.0252276	0.00839960	52.4758
Methylcyclopentane		0	0	0.00607473	5.13226	0.153650	4.97861	0	0	5.13912	0.00114749	0.00492725	0.00562430	2.35638E-08	0	0.000779864	5.13912
Benzene		0	0	0.0720701	1.24117	0.0365606	1.20461	0	0	1.31343	0.0663559	0.00571419	8.38728E-05	8.39829E-08	0	0.000185064	1.31343
2-Methylhexane		0	0	0.00239748	45.5081	0.608759	44.8993	0	0	45.5136	5.66064E-05	0.00234087	0.00153461	3.51676E-11	0	0.00315801	45.5136
3-Methylhexane		0	0	0.00206954	39.5232	0.503770	39.0195	0	0	39.5279	5.10195E-05	0.00201852	0.0191231	4.54497E-10	0	0.00261223	39.5279
Heptane		0	0	0.00427107	98.0898	0.992487	97.0973	0	0	98.0993	0.000105867	0.00416520	0.0347454	6.88596E-10	0	0.00520016	98.0993
Methylcyclohexane		0	0	0.0127897	50.7302	0.520203	50.2100	0	0	50.7457	0.00170775	0.0110820	0.0183080	1.13185E-08	0	0.00267536	50.7457
Toluene		0	0	0.159380	12.4178	0.102332	12.3155	0	0	12.5777	0.144342	0.0150378	0.000499089	1.06324E-07	0	0.000523360	12.5777
Octane		0	0	0.00243176	302.481	0.961076	301.520	0	0	302.488	4.01121E-05	0.00239165	0.0318612	7.70422E-11	0	0.00516621	302.488
Ethylbenzene		0	0	0.0828260	21.2445	0.0586878	21.1859	0	0	21.3277	0.0742717	0.00855429	0.000533847	3.40174E-08	0	0.000308725	21.3277
m-Xylene		0	0	0.0721030	21.6546	0.0500908	21.6045	0	0	21.7270	0.0648845	0.00721853	0.000587052	3.20463E-08	0	0.000264203	21.7270
o-Xylene		0	0	0.143973	35.9107	0.0742504	35.8364	0	0	36.0551	0.133026	0.0109470	0.000753087	5.08114E-08	0	0.000391335	36.0551
Nonane		0	0	0.00108418	261.227	0.274415	260.952	0	0	261.229	2.81651E-05	0.00105601	0.00816439	1.60169E-11	0	0.00150833	261.229
C10+		0	0	0.000135155	1224.19	0.0391583	1224.15	0	0	1224.19	3.08949E-06	0.000132066	0.000928779	4.26057E-14	0	0.000237757	1224.19

Process Streams		**Well Stream**	**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**	**1**	**2**	**3**
Phase: Total	**Status**	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Property	**Units**																
Temperature	°F	186.4	70.0	70.0	70.0	75.9	75.9	200.0	300.0	200.0	75.9	75.94	75.9425	75.9425	70	70	74.3547
Pressure	psig	200	154	154	154	0	0	300	200	300	0	0	4.93503	-14.2259	154	154	154
Mole Fraction Vapor	%	78.5307	100	0	0	100	0	100	0	0.0801281	0	100	100	100	0	100	0.0105531
Mole Fraction Light Liquid	%	21.4693	0	100	100	0	100	0	100	99.9199	100	0	0	0	100	0	1.01026
Mole Fraction Heavy Liquid	%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	98.9792
Molecular Weight	lb/lbmol	19.8	20.4	18.0	113.4	36.0	125.8	20.4	18.0	112.7	18.0	20.5345	40.1012	18.3610	18.0162	20.4268	18.9817
Mass Density	lb/ft^3	0.8	0.6	62.3	45.4	0.1	45.9	0.9	57.3	41.1	62.2	0.0526896	0.139546	0.00150201	62.2632	0.632830	60.1917
Molar Flow	lbmol/h	8736.1	6587.9	2148.2	22.0	3.0	18.9	6573.6	2162.4	22.1	2147.6	0.576193	0.111540	0.00724405	2148.20	0.170823	2170.32
Mass Flow	lb/h	173224.9	134522.6	38702.5	2490.4	109.2	2381.2	134268.0	38956.8	2494.1	38690.7	11.8318	4.47288	0.133008	38702.3	3.48938	41196.4
Vapor Volumetric Flow	MCFH	216.3	212.6	0.6	0.1	1.2	0.1	142.8	0.7	0.1	0.6	0.224557	0.0320531	0.0885531	0.621592	0.00551393	0.684420
Liquid Volumetric Flow	Mbbl/d	924.6	909.0	2.7	0.2	5.0	0.2	610.4	2.9	0.3	2.7	0.959889	0.137014	0.378527	2.65705	0.0235697	2.92561
Std Vapor Volumetric Flow	MMSCFD	79.6	60.0	19.6	0.2	0.0	0.2	59.9	19.7	0.2	19.6	0.00524775	0.00101586	6.59761E-05	19.5650	0.00155580	19.7665
Std Liquid Volumetric Flow	Mbbl/d	29.9	27.2	2.7	0.2	0.0	0.2	27.2	2.7	0.2	2.7	0.00234396	0.000668427	1.00587E-05	2.65432	0.000706942	2.89275
Compressibility		0.767	0.958	0.009	0.074	0.989	0.007	0.966	0.008	0.122	0.001	0.996424	0.981449	0.999551	0.00858748	0.957963	0.00928276
Specific Gravity			0.705	0.998	0.728	1.243	0.737	0.705	0.920		0.998	0.709000	1.38459	0.633955	0.998304	0.705282	
API Gravity				10.0	61.6		58.7		10.0		10.0				10.0410		
Enthalpy	MMBtu/h	-472.4	-225.5	-264.2	-2.1	-0.1	-2.0	-215.4	-257.1	-1.9	-264.0	-0.0213605	-0.00485335	-0.000736196	-264.197	-0.00583021	-266.140
Mass Enthalpy	Btu/lb	-2727.2	-1676.2	-6826.3	-847.2	-1165.2	-823.1	-1604.0	-6598.5	-778.8	-6822.4	-1805.34	-1085.06	-5534.98	-6826.40	-1670.85	-6460.27
Mass Cp	Btu/(lb*°F)	0.6	0.5	1.0	0.5	0.4	0.5	0.6	1.0	0.6	1.0	0.476721	0.411463	0.443878	0.983077	0.500816	0.952789
Ideal Gas CpCv Ratio		1.242	1.254	1.326	1.049	1.152	1.044	1.220	1.316	1.040	1.326	1.25563	1.13826	1.32232	1.32582	1.25465	1.30782
Dynamic Viscosity	cP		0.0	1.0	0.6	0.0	0.7	0.0	0.2		0.9	0.0107267	0.00866201	0.0102403	0.995511	0.0107311	
Kinematic Viscosity	cSt		1.1	1.0	0.8	6.0	0.9	0.9	0.2		0.9	12.7093	3.87508	425.615	0.998145	1.05862	
Thermal Conductivity	Btu/(h*ft*°F)		0.0	0.3	0.1	0.0	0.1	0.0	0.4		0.3	0.0171768	0.0112238	0.0122365	0.346636	0.0176862	
Surface Tension	lbf/ft			0.005	0.001		0.002		0.003		0.005				0.00504041		
Net I.G. Heating Value	Btu/ft^3	840.8	1114.8	0.3	5696.2	1899.0	6304.3	1117.3	0.0	5664.4	0.0	1075.73	2108.36	45.9242	0.314202	1114.36	58.0551
Net Liquid Heating Value	Btu/lb	15807.6	20658.4	-1052.5	18895.2	19872.9	18850.3	20701.6	-1059.8	18900.1	-1058.9	19793.4	19798.9	-35.9802	-1052.80	20642.0	155.172
Gross I.G. Heating Value	Btu/ft^3	939.9	1229.8	50.7	6113.5	2070.1	6761.2	1232.5	50.3	6079.7	50.3	1187.97	2294.44	98.2417	50.6420	1229.28	112.103
Gross Liquid Heating Value	Btu/lb	17704.1	22795.5	7.5	20291.0	21676.0	20227.5	22840.8	0.0	20297.0	0.9	21867.6	21559.7	1045.3	7.3	22776.8	1235.6

Process Streams		**Well Stream**	**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**	**1**	**2**	**3**
Phase: Vapor	**Status**	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Mole Fraction		**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Water		4.18725	0.225520	0.225552	0.225552	0.350329	0.350329	0		0	3.02989	3.02989	0.000223634	94.3464	0.225520	0.225552	0.261055
H2S		0	0	0	0	0	0	0		0	0	0	0	0	0	0	0
Nitrogen		0.540786	0.563158	0.656059	0.656059	0.0843379	0.0843379	0.564404		0.532449	0.328862	0.328862	0.00479040	0.00583957	0.563158	0.656059	0.622105
Carbon Dioxide		0.157800	0.164161	0.137335	0.137335	0.186735	0.186735	0.164818		0.0834345	1.02596	1.02596	0.265840	1.22727	0.164161	0.137335	0.143125
Methane		75.3771	78.4942	78.0482	78.0482	29.6779	29.6779	78.6713		64.0912	74.3286	74.3286	8.23043	3.66716	78.4942	78.0482	77.1998
Ethane		13.4895	14.0471	14.7906	14.7906	29.6328	29.6328	14.0790		19.2002	15.4016	15.4016	44.1966	0.701181	14.0471	14.7906	15.2425
Propane		4.04284	4.20984	4.02738	4.02738	20.6948	20.6948	4.21942		7.83454	4.52876	4.52876	26.2832	0.0502503	4.20984	4.02738	4.24558

Isobutane		0.483360	0.503353	0.451978	0.451978	3.52470	3.52470	0.504461		1.17956	0.178347	0.178347	4.18225	0.000247782	0.503353	0.451978	0.482384
n-Butane		0.987407	1.02823	0.881444	0.881444	7.66600	7.66600	1.03054		2.59914	0.717234	0.717234	8.94086	0.00149965	1.02823	0.881444	0.945554
Isopentane		0.251028	0.261408	0.225542	0.225542	2.27800	2.27800	0.261987		0.894334	0.124901	0.124901	2.53881	6.54463E-05	0.261408	0.225542	0.244778
n-Pentane		0.244794	0.254918	0.299506	0.299506	3.12641	3.12641	0.255483		1.32547	0.161292	0.161292	3.43963	6.16370E-05	0.254918	0.299506	0.326564
2-Methylpentane		0	0	0.0429326	0.0429326	0.467599	0.467599	0		0.251735	0.0108469	0.0108469	0.501732	7.91370E-07	0	0.0429326	0.0473287
3-Methylpentane		0	0	0.0268157	0.0268157	0.293304	0.293304	0		0.162303	0.0178337	0.0178337	0.313785	3.15453E-06	0	0.0268157	0.0295974
n-Hexane		0.238182	0.248036	0.0570595	0.0570595	0.624878	0.624878	0.248578		0.377683	0.0114304	0.0114304	0.0454537	3.22971E-08	0.248036	0.0570595	0.0632109
Methylcyclopentane		0	0	0.00542460	0.00542460	0.0602121	0.0602121	0		0.0350098	0.0101609	0.0101609	0.0599150	3.86511E-06	0	0.00542460	0.00600245
Benzene		0	0	0.00138694	0.00138694	0.0154366	0.0154366	0		0.00937622	0.0126961	0.0126961	0.000962664	1.48420E-05	0	0.00138694	0.00153301
2-Methylhexane		0	0	0.0184497	0.0184497	0.200366	0.200366	0		0.168991	0.00405447	0.00405447	0.0137307	4.84490E-09	0	0.0184497	0.0207195
3-Methylhexane		0	0	0.0152612	0.0152612	0.165810	0.165810	0		0.139019	0.00349614	0.00349614	0.171101	6.26144E-08	0	0.0152612	0.0171283
Heptane		0	0	0.0303804	0.0303804	0.326666	0.326666	0		0.291884	0.00721426	0.00721426	0.310879	9.48652E-08	0	0.0303804	0.0341420
Methylcyclohexane		0	0	0.0159509	0.0159509	0.174734	0.174734	0		0.144900	0.0195884	0.0195884	0.167171	1.59133E-06	0	0.0159509	0.0178884
Toluene		0	0	0.00332516	0.00332516	0.0366289	0.0366289	0		0.0324582	0.0283254	0.0283254	0.00485632	1.59298E-05	0	0.00332516	0.00373534
Octane		0	0	0.0264759	0.0264759	0.277484	0.277484	0		0.374286	0.00363375	0.00363375	0.250068	9.31049E-09	0	0.0264759	0.0302039
Ethylbenzene		0	0	0.00170233	0.00170233	0.0182314	0.0182314	0		0.0236799	0.0139841	0.0139841	0.00450823	4.42321E-06	0	0.00170233	0.00193978
m-Xylene		0	0	0.00145683	0.00145683	0.0155608	0.0155608	0		0.0218734	0.0118005	0.0118005	0.00495753	4.16693E-06	0	0.00145683	0.00166531
o-Xylene		0	0	0.00215784	0.00215784	0.0230660	0.0230660	0		0.0330950	0.0178955	0.0178955	0.00635966	6.60692E-06	0	0.00215784	0.00246824
Nonane		0	0	0.00688452	0.00688452	0.0705648	0.0705648	0		0.141104	0.00142898	0.00142898	0.0570715	1.72394E-09	0	0.00688452	0.00796743
C10+		0	0	0.000804060	0.000804060	0.00746073	0.00746073	0		0.0523293	0.000132411	0.000132411	0.00481045	3.39773E-12	0	0.000804060	0.000973223
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**
Water		287.266	14.8570	0	0	0.0106224	0	0		0	0	0.0174580	2.49441E-07	0.00683449	0	0.000385296	0.000597912
H2S		0	0	0	0	0	0	0		0	0	0	0	0	0	0	0
Nitrogen		37.1007	37.1002	0	0	0.00255722	0	37.1019		9.43928E-05	0	0.00189488	5.34320E-06	4.23021E-07	0	0.00112070	0.00142485
Carbon Dioxide		10.8259	10.8147	0	0	0.00566202	0	10.8345		1.47913E-05	0	0.00591150	0.000296517	8.89043E-05	0	0.000234600	0.000327808
Methane		5171.25	5171.11	0	0	0.899866	0	5171.58		0.0113621	0	0.428277	0.00918020	0.000265651	0	0.133325	0.176816
Ethane		925.448	925.409	0	0	0.898500	0	925.502		0.00340382	0	0.0887430	0.0492968	5.07939E-05	0	0.0252658	0.0349110
Propane		277.359	277.339	0	0	0.627489	0	277.370		0.00138891	0	0.0260944	0.0293163	3.64015E-06	0	0.00687970	0.00972393
Isobutane		33.1610	33.1603	0	0	0.106873	0	33.1615		0.000209112	0	0.00102763	0.00466487	1.79494E-08	0	0.000772085	0.00110483
n-Butane		67.7412	67.7386	0	0	0.232442	0	67.7439		0.000460778	0	0.00413265	0.00997261	1.08635E-07	0	0.00150571	0.00216566
Isopentane		17.2218	17.2212	0	0	0.0690714	0	17.2221		0.000158548	0	0.000719668	0.00283178	4.74096E-09	0	0.000385278	0.000560631
n-Pentane		16.7941	16.7937	0	0	0.0947963	0	16.7945		0.000234980	0	0.000929354	0.00383656	4.46501E-09	0	0.000511626	0.000747950
2-Methylpentane		0	0	0	0	0.0141781	0	0		4.46277E-05	0	6.24990E-05	0.000559631	5.73272E-11	0	7.33390E-05	0.000108400
3-Methylpentane		0	0	0	0	0.00889331	0	0		2.87732E-05	0	0.000102757	0.000349995	2.28516E-10	0	4.58075E-05	6.77889E-05
n-Hexane		16.3405	16.3403	0	0	0.0189470	0	16.3406		6.69559E-05	0	6.58610E-05	5.06990E-05	2.33962E-12	0	9.74710E-05	0.000144776
Methylcyclopentane		0	0	0	0	0.00182570	0	0		6.20656E-06	0	5.85465E-05	6.68290E-05	2.79990E-10	0	9.26650E-06	1.37478E-05
Benzene		0	0	0	0	0.000468055	0	0		1.66222E-06	0	7.31539E-05	1.07375E-06	1.07516E-09	0	2.36922E-06	3.51115E-06
2-Methylhexane		0	0	0	0	0.00607532	0	0		2.99588E-05	0	2.33616E-05	1.53152E-05	3.50967E-13	0	3.15165E-05	4.74553E-05
3-Methylhexane		0	0	0	0	0.00502755	0	0		2.46454E-05	0	2.01445E-05	0.000190846	4.53581E-12	0	2.60697E-05	3.92300E-05
Heptane		0	0	0	0	0.00990487	0	0		5.17453E-05	0	4.15681E-05	0.000346754	6.87208E-12	0	5.18968E-05	7.81977E-05
Methylcyclohexane		0	0	0	0	0.00529813	0	0		2.56879E-05	0	0.000112867	0.000186462	1.15276E-10	0	2.72478E-05	4.09709E-05
Toluene		0	0	0	0	0.00111063	0	0		5.75421E-06	0	0.000163209	5.41673E-06	1.15396E-09	0	5.68015E-06	8.55528E-06
Octane		0	0	0	0	0.00841363	0	0		6.63536E-05	0	2.09374E-05	0.000278925	6.74456E-13	0	4.52270E-05	6.91779E-05
Ethylbenzene		0	0	0	0	0.000552798	0	0		4.19799E-06	0	8.05754E-05	5.02847E-06	3.20420E-10	0	2.90798E-06	4.44279E-06
m-Xylene		0	0	0	0	0.000471820	0	0		3.87773E-06	0	6.79935E-05	5.52962E-06	3.01854E-10	0	2.48861E-06	3.81416E-06
o-Xylene		0	0	0	0	0.000699387	0	0		5.86710E-06	0	0.000103113	7.09355E-06	4.78608E-10	0	3.68610E-06	5.65316E-06
Nonane		0	0	0	0	0.00213960	0	0		2.50150E-05	0	8.23370E-06	6.36574E-05	1.24883E-13	0	1.17604E-05	1.82483E-05
C10+		0	0	0	0	0.000226218	0	0		9.27697E-06	0	7.62946E-07	5.36556E-06	2.46133E-16	0	1.37352E-06	2.22903E-06
Mass Fraction		**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Water		3.71153	0.198965	0.198924	0.198924	0.175281	0.175281	0		0	2.65818	2.65818	0.000100466	92.5701	0.198965	0.198924	0.227862
H2S		0	0	0	0	0	0	0		0	0	0	0	0	0	0	0
Nitrogen		0.745375	0.772587	0.899722	0.899722	0.0656157	0.0656157	0.774087		0.578836	0.448638	0.448638	0.00334642	0.00890945	0.772587	0.899722	0.844361
Carbon Dioxide		0.341695	0.353807	0.295888	0.295888	0.228240	0.228240	0.355128		0.142496	2.19883	2.19883	0.291749	2.94166	0.353807	0.295888	0.305182
Methane		59.4969	61.6680	61.2962	61.2962	13.2228	13.2228	61.7905		39.9008	58.0688	58.0688	3.29258	3.20409	61.6680	61.2962	60.0048
Ethane		19.9572	20.6851	21.7723	21.7723	24.7464	24.7464	20.7264		22.4046	22.5529	22.5529	33.1399	1.14830	20.6851	21.7723	22.2063
Propane		8.77134	9.09100	8.69395	8.69395	25.3440	25.3440	9.10923		13.4067	9.72502	9.72502	28.9013	0.120681	9.09100	8.69395	9.07050
Isobutane		1.38228	1.43273	1.28605	1.28605	5.68962	5.68962	1.43550		2.66056	0.504806	0.504806	6.06170	0.000784361	1.43273	1.28605	1.35842
n-Butane		2.82372	2.92673	2.50805	2.50805	12.3746	12.3746	2.93251		5.86252	2.03011	2.03011	12.9588	0.00474718	2.92673	2.50805	2.66273
Isopentane		0.891117	0.923631	0.796629	0.796629	4.56458	4.56458	0.925429		2.50404	0.438843	0.438843	4.56774	0.000257169	0.923631	0.796629	0.855657
n-Pentane		0.868987	0.900700	1.05787	1.05787	6.26461	6.26461	0.902453		3.71117	0.566706	0.566706	6.18848	0.000242200	0.900700	1.05787	1.14155
2-Methylpentane		0	0	0.181122	0.181122	1.11912	1.11912	0		0.841857	0.0455202	0.0455202	1.07819	3.71421E-06	0	0.181122	0.197609
3-Methylpentane		0	0	0.113128	0.113128	0.701973	0.701973	0		0.542777	0.0748412	0.0748412	0.674306	1.48055E-05	0	0.113128	0.123576
n-Hexane		1.00989	1.04676	0.240719	0.240719	1.49554	1.49554	1.04877		1.26306	0.0479689	0.0479689	0.0976777	1.51583E-07	1.04676	0.240719	0.263921
Methylcyclopentane		0	0	0.0223497	0.0223497	0.140736	0.140736	0		0.114342	0.0416440	0.0416440	0.125742	1.77161E-05	0	0.0223497	0.0244754

Benzene		0	0	0.00530365	0.00530365	0.0334879	0.0334879	0		0.0284221	0.0482950	0.0482950	0.00187514	6.31414E-05	0	0.00530365	0.00580176
2-Methylhexane		0	0	0.0905036	0.0905036	0.557595	0.557595	0		0.657130	0.0197845	0.0197845	0.0343092	2.64402E-08	0	0.0905036	0.100590
3-Methylhexane		0	0	0.0748624	0.0748624	0.461431	0.461431	0		0.540583	0.0170601	0.0170601	0.427534	3.41708E-07	0	0.0748624	0.0831549
Heptane		0	0	0.149028	0.149028	0.909073	0.909073	0		1.13500	0.0352033	0.0352033	0.776802	5.17711E-07	0	0.149028	0.165754
Methylcyclohexane		0	0	0.0766715	0.0766715	0.476482	0.476482	0		0.552114	0.0936623	0.0936623	0.409312	8.50969E-06	0	0.0766715	0.0850980
Toluene		0	0	0.0149987	0.0149987	0.0937311	0.0937311	0		0.116059	0.127096	0.127096	0.0111581	7.99382E-05	0	0.0149987	0.0166751
Octane		0	0	0.148056	0.148056	0.880302	0.880302	0		1.65917	0.0202137	0.0202137	0.712320	5.79231E-08	0	0.148056	0.167161
Ethylbenzene		0	0	0.00884758	0.00884758	0.0537553	0.0537553	0		0.0975604	0.0722989	0.0722989	0.0119352	2.55755E-05	0	0.00884758	0.00997772
m-Xylene		0	0	0.00757164	0.00757164	0.0458809	0.0458809	0		0.0901177	0.0610093	0.0610093	0.0131247	2.40936E-05	0	0.00757164	0.00856593
o-Xylene		0	0	0.0112151	0.0112151	0.0680100	0.0680100	0		0.136350	0.0925214	0.0925214	0.0168367	3.82019E-05	0	0.0112151	0.0126960
Nonane		0	0	0.0432263	0.0432263	0.251351	0.251351	0		0.702306	0.00892519	0.00892519	0.182531	1.20421E-08	0	0.0432263	0.0495098
C10+		0	0	0.00681373	0.00681373	0.0358672	0.0358672	0		0.351523	0.00111619	0.00111619	0.0207647	3.20325E-11	0	0.00681373	0.00816221
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**
Water		5175.19	267.653	0	0	0.191365	0	0		0	0	0.314511	4.49374E-06	0.123125	0	0.00694122	0.0107716
H2S		0	0	0	0	0	0	0		0	0	0	0	0	0	0	0
Nitrogen		1039.32	1039.30	0	0	0.0716364	0	1039.35		0.00264426	0	0.0530821	0.000149681	1.18503E-05	0	0.0313947	0.0399148
Carbon Dioxide		476.443	475.950	0	0	0.249183	0	476.823		0.000650958	0	0.260162	0.0130496	0.00391263	0	0.0103246	0.0144266
Methane		82959.6	82957.3	0	0	14.4361	0	82964.8		0.182276	0	6.87061	0.147273	0.00426169	0	2.13885	2.83656
Ethane		27827.3	27826.2	0	0	27.0170	0	27829.0		0.102350	0	2.66842	1.48231	0.00152732	0	0.759718	1.04974
Propane		12230.3	12229.4	0	0	27.6695	0	12230.8		0.0612449	0	1.15065	1.29272	0.000160515	0	0.303365	0.428783
Isobutane		1927.39	1927.35	0	0	6.21169	0	1927.42		0.0121541	0	0.0597279	0.271133	1.04326E-06	0	0.0448753	0.0642154
n-Butane		3937.27	3937.12	0	0	13.5100	0	3937.42		0.0267814	0	0.240199	0.579630	6.31411E-06	0	0.0875154	0.125873
Isopentane		1242.53	1242.49	0	0	4.98342	0	1242.56		0.0114391	0	0.0519232	0.204310	3.42054E-07	0	0.0277974	0.0404488
n-Pentane		1211.67	1211.64	0	0	6.83944	0	1211.71		0.0169535	0	0.0670517	0.276803	3.22145E-07	0	0.0369132	0.0539637
2-Methylpentane		0	0	0	0	1.22180	0	0		0.00384581	0	0.00538587	0.0482264	4.94019E-09	0	0.00632001	0.00934140
3-Methylpentane		0	0	0	0	0.766384	0	0		0.00247954	0	0.00885508	0.0301609	1.96924E-08	0	0.00394747	0.00584173
n-Hexane		1408.15	1408.13	0	0	1.63276	0	1408.16		0.00576995	0	0.00567560	0.00436900	2.01617E-10	0	0.00839960	0.0124761
Methylcyclopentane		0	0	0	0	0.153650	0	0		0.000522341	0	0.00492725	0.00562430	2.35638E-08	0	0.000779864	0.00115701
Benzene		0	0	0	0	0.0365606	0	0		0.000129839	0	0.00571419	8.38728E-05	8.39829E-08	0	0.000185064	0.000274262
2-Methylhexane		0	0	0	0	0.608759	0	0		0.00300193	0	0.00234087	0.00153461	3.51676E-11	0	0.00315801	0.00475511
3-Methylhexane		0	0	0	0	0.503770	0	0		0.00246951	0	0.00201852	0.0191231	4.54497E-10	0	0.00261223	0.00393092
Heptane		0	0	0	0	0.992487	0	0		0.00518498	0	0.00416520	0.0347454	6.88596E-10	0	0.00520016	0.00783556
Methylcyclohexane		0	0	0	0	0.520203	0	0		0.00252219	0	0.0110820	0.0183080	1.13185E-08	0	0.00267536	0.00402277
Toluene		0	0	0	0	0.102332	0	0		0.000530184	0	0.0150378	0.000499089	1.06324E-07	0	0.000523360	0.000788270
Octane		0	0	0	0	0.961076	0	0		0.00757947	0	0.00239165	0.0318612	7.70422E-11	0	0.00516621	0.00790209
Ethylbenzene		0	0	0	0	0.0586878	0	0		0.000445679	0	0.00855429	0.000533847	3.40174E-08	0	0.000308725	0.000471669
m-Xylene		0	0	0	0	0.0500908	0	0		0.000411680	0	0.00721853	0.000587052	3.20463E-08	0	0.000264203	0.000404931
o-Xylene		0	0	0	0	0.0742504	0	0		0.000622880	0	0.0109470	0.000753087	5.08114E-08	0	0.000391335	0.000600168
Nonane		0	0	0	0	0.274415	0	0		0.00320830	0	0.00105601	0.00816439	1.60169E-11	0	0.00150833	0.00234044
C10+		0	0	0	0	0.0391583	0	0		0.00160584	0	0.000132066	0.000928779	4.26057E-14	0	0.000237757	0.000385846

Process Streams		**Well Stream**	**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**	**1**	**2**	**3**
Phase: Vapor	**Status**	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Property	**Units**																
Temperature	°F	186.4	70.0	70.0	70.0	75.9	75.9	200.0		200.0	75.9	75.94	75.9425	75.9425	70	70	74.3547
Pressure	psig	200	154	154	154	0	0	300		300	0	0	4.93503	-14.2259	154	154	154
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	20.3	20.4	20.4	20.4	36.0	36.0	20.4		25.8	20.5	20.5345	40.1012	18.3610	20.4197	20.4268	20.6396
Mass Density	lb/ft^3	0.6	0.6	0.6	0.6	0.1	0.1	0.9		1.2	0.1	0.0526896	0.139546	0.00150201	0.632606	0.632830	0.634075
Molar Flow	lbmol/h	6860.5	6587.9	0.0	0.0	3.0	0.0	6573.6		0.0	0.0	0.576193	0.111540	0.00724405	0	0.170823	0.229036
Mass Flow	lb/h	139435.2	134522.6	0.0	0.0	109.2	0.0	134268.0		0.5	0.0	11.8318	4.47288	0.133008	0	3.48938	4.72722
Vapor Volumetric Flow	MCFH	215.7	212.6	0.0	0.0	1.2	0.0	142.8		0.0	0.0	0.224557	0.0320531	0.0885531	0	0.00551393	0.00745530
Liquid Volumetric Flow	Mbbl/d	922.2	909.0	0.0	0.0	5.0	0.0	610.4		0.0	0.0	0.959889	0.137014	0.378527	0	0.0235697	0.0318683
Std Vapor Volumetric Flow	MMSCFD	62.5	60.0	0.0	0.0	0.0	0.0	59.9		0.0	0.0	0.00524775	0.00101586	6.59761E-05	0	0.00155580	0.00208598
Std Liquid Volumetric Flow	Mbbl/d	27.6	27.2	0.0	0.0	0.0	0.0	27.2		0.0	0.0	0.00234396	0.000668427	1.00587E-05	0	0.000706942	0.000952640
Compressibility		0.974	0.958	0.958	0.958	0.989	0.989	0.966		0.941	0.996	0.996424	0.981449	0.999551	0.957969	0.957963	0.958164
Specific Gravity		0.702	0.705	0.705	0.705	1.243	1.243	0.705		0.890	0.709	0.709000	1.38459	0.633955	0.705037	0.705282	0.712630
API Gravity																	
Enthalpy	MMBtu/h	-245.6	-225.5	0.0	0.0	-0.1	0.0	-215.4		0.0	0.0	-0.0213605	-0.00485335	-0.000736196	0	-0.00583021	-0.00783958
Mass Enthalpy	Btu/lb	-1761.5	-1676.2	-1670.8	-1670.8	-1165.2	-1165.2	-1604.0		-1362.9	-1805.3	-1805.34	-1085.06	-5534.98	-1676.15	-1670.85	-1658.39
Mass Cp	Btu/(lb**F)	0.5	0.5	0.5	0.5	0.4	0.4	0.6		0.5	0.5	0.476721	0.411463	0.443878	0.501367	0.500816	0.500760
Ideal Gas CpCv Ratio		1.227	1.254	1.255	1.255	1.152	1.152	1.220		1.176	1.256	1.25563	1.13826	1.32232	1.25440	1.25465	1.25125

Dynamic Viscosity	cP	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0107267	0.00866201	0.0102403	0.0107287	0.0107311	0.0107805
Kinematic Viscosity	cSt	1.2	1.1	1.1	1.1	6.0	6.0	0.9		0.6	12.7	12.7093	3.87508	425.615	1.05875	1.05862	1.06139
Thermal Conductivity	Btu/(h*ft*°F)	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0171768	0.0112238	0.0122365	0.0177045	0.0176862	0.0177772
Surface Tension	lbf/ft																
Net I.G. Heating Value	Btu/ft^3	1070.5	1114.8	1114.4	1114.4	1899.0	1899.0	1117.3		1385.8	1075.7	1075.73	2108.36	45.9242	1114.81	1114.36	1125.04
Net Liquid Heating Value	Btu/lb	19893.9	20658.4	20642.0	20642.0	19872.9	19872.9	20701.6		20311.7	19793.4	19793.4	19798.9	-35.9802	20658.4	20642.0	20622.4
Gross I.G. Heating Value	Btu/ft^3	1183.0	1229.8	1229.3	1229.3	2070.1	2070.1	1232.5		1520.0	1188.0	1187.97	2294.44	98.2417	1229.81	1229.28	1240.73
Gross Liquid Heating Value	Btu/lb	21993.1	22795.5	22776.8	22776.8	21676.0	21676.0	22840.8		22287.3	21867.6	21867.6	21559.7	1045.3	22795.5	22776.8	22749.5

Process Streams		Well Stream	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	1	2	3
Phase: Light Liquid	**Status**	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Mole Fraction		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water		99.9783	99.9710	99.9709	0.0549767	0.00767183	0.00767183		100	0	99.9969	99.9969	5.98235E-06	100.0000	99.9710	0.0549767	0.0615344
H2S		0	0	0	0	0	0		0	0	0	0	0	0	0	0	0
Nitrogen		6.73151E-05	7.90161E-05	9.20601E-05	0.0117538	0.000128436	0.000128436		0	0.0175875	3.85280E-06	3.85280E-06	1.00111E-05	2.18789E-09	7.90161E-05	0.0117538	0.0110926
Carbon Dioxide		0.000460588	0.000923331	0.000772497	0.0287952	0.00349882	0.00349882		0	0.0149451	0.000497445	0.000497445	0.00641906	1.91320E-05	0.000923331	0.0287952	0.0289887
Methane		0.0175409	0.0218475	0.0217253	4.21701	0.139084	0.139084		0	4.72943	0.00178915	0.00178915	0.0527989	2.83166E-06	0.0218475	4.21701	4.10737
Ethane		0.00288814	0.00433302	0.00456295	4.84681	0.876979	0.876979		0	4.93657	0.000432008	0.000432008	1.76918	6.34539E-07	0.00433302	4.84681	4.81495
Propane		0.000550887	0.00141616	0.00135502	4.87337	2.33934	2.33934		0	4.86062	0.000140343	0.000140343	3.99202	5.04784E-08	0.00141616	4.87337	4.87080
Isobutane		2.82269E-05	5.54045E-05	4.97592E-05	1.37609	1.03196	1.03196		0	1.36915	1.92293E-06	1.92293E-06	1.62346	8.69605E-11	5.54045E-05	1.37609	1.37689
n-Butane		0.000145220	0.000244219	0.000209403	3.83957	3.22671	3.22671		0	3.81598	1.70295E-05	1.70295E-05	4.99113	1.15981E-09	0.000244219	3.83957	3.84267
Isopentane		1.83434E-05	4.11707E-05	3.55330E-05	2.47283	2.50404	2.50404		0	2.45725	2.03235E-06	2.03235E-06	3.69193	3.48595E-11	4.11707E-05	2.47283	2.47620
n-Pentane		2.30912E-05	3.90238E-05	4.58600E-05	4.40111	4.60527	4.60527		0	4.37444	2.59854E-06	2.59854E-06	6.69328	3.25041E-11	3.90238E-05	4.40111	4.40739
2-Methylpentane		0	0	2.99256E-06	1.50837	1.67507	1.67507		0	1.49900	8.32071E-08	8.32071E-08	2.37282	1.99391E-13	0	1.50837	1.51078
3-Methylpentane		0	0	5.15447E-06	1.05095	1.17230	1.17230		0	1.04471	3.71166E-07	3.71166E-07	1.65362	2.15653E-12	0	1.05095	1.05263
n-Hexane		8.85112E-06	1.36276E-05	3.13559E-06	2.77179	3.11564	3.11564		0	2.75290	6.97230E-08	6.97230E-08	0.298713	6.47820E-15	1.36276E-05	2.77179	2.77629
Methylcyclopentane		0	0	3.36009E-06	0.277656	0.312483	0.312483		0	0.276193	6.34875E-07	6.34875E-07	0.407235	7.92279E-12	0	0.277656	0.278110
Benzene		0	0	4.29502E-05	0.0723465	0.0814614	0.0814614		0	0.0760534	3.95555E-05	3.95555E-05	0.00654567	1.51435E-09	0	0.0723465	0.0724131
2-Methylhexane		0	0	1.11380E-06	2.06782	2.36692	2.36692		0	2.05451	2.63047E-08	2.63047E-08	0.211462	1.03758E-15	0	2.06782	2.07128
3-Methylhexane		0	0	9.61445E-07	1.79588	2.05696	2.05696		0	1.78432	2.37085E-08	2.37085E-08	2.76464	1.40132E-14	0	1.79588	1.79889
Heptane		0	0	1.98421E-06	4.45707	5.11861	5.11861		0	4.42831	4.91956E-08	4.91956E-08	6.33238	2.13761E-14	0	4.45707	4.46456
Methylcyclohexane		0	0	6.06371E-06	2.35244	2.70123	2.70123		0	2.33776	8.09876E-07	8.09876E-07	3.36115	2.16788E-12	0	2.35244	2.35637
Toluene		0	0	8.05230E-05	0.613630	0.706045	0.706045		0	0.617469	7.29450E-05	7.29450E-05	0.121348	1.34999E-09	0	0.613630	0.614431
Octane		0	0	9.91001E-07	12.0566	13.9432	13.9432		0	11.9783	1.63510E-08	1.63510E-08	16.2821	1.39074E-15	0	12.0566	12.0771
Ethylbenzene		0	0	3.63172E-05	0.911103	1.05411	1.05411		0	0.908709	3.25751E-05	3.25751E-05	0.336605	3.40842E-10	0	0.911103	0.912582
m-Xylene		0	0	3.16155E-05	0.928690	1.07494	1.07494		0	0.925724	2.84579E-05	2.84579E-05	0.441932	3.32637E-10	0	0.928690	0.930174
o-Xylene		0	0	6.31286E-05	1.54008	1.78305	1.78305		0	1.53620	5.83443E-05	5.83443E-05	0.633465	7.12881E-10	0	1.54008	1.54248
Nonane		0	0	3.93508E-07	9.27352	10.7475	10.7475		0	9.21327	1.02254E-08	1.02254E-08	11.3254	4.11677E-16	0	9.27352	9.28932
C10+		0	0	3.63466E-08	32.1997	37.3558	37.3558		0	31.9906	8.31061E-10	8.31061E-10	30.6303	7.21080E-19	0	32.1997	32.2547
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
Water		1875.17	0	2147.56	0.0120747	0	0.00145237		2162.43	0	2147.55	0	0	0	2147.58	0	0.0134920
H2S		0	0	0	0	0	0		0	0	0	0	0	0	0	0	0
Nitrogen		0.00126254	0	0.00197763	0.00258153	0	2.43146E-05		0	0.00388804	8.27433E-05	0	0	0	0.00169742	0	0.00243215
Carbon Dioxide		0.00863867	0	0.0165947	0.00632439	0	0.000662370		0	0.00330391	0.0106832	0	0	0	0.0198350	0	0.00635604
Methane		0.328993	0	0.466701	0.926196	0	0.0263303		0	1.04553	0.0384240	0	0	0	0.469327	0	0.900578
Ethane		0.0541692	0	0.0980209	1.06452	0	0.166023		0	1.09132	0.00927787	0	0	0	0.0930818	0	1.05572
Propane		0.0103323	0	0.0291084	1.07036	0	0.442866		0	1.07453	0.00301402	0	0	0	0.0304220	0	1.06797
Isobutane		0.000529416	0	0.00106892	0.302236	0	0.195363		0	0.302677	4.12970E-05	0	0	0	0.00119020	0	0.301895
n-Butane		0.00272370	0	0.00449838	0.843298	0	0.610856		0	0.843595	0.000365727	0	0	0	0.00524631	0	0.842539
Isopentane		0.000344044	0	0.000763316	0.543117	0	0.474046		0	0.543223	4.36471E-05	0	0	0	0.000884430	0	0.542929
n-Pentane		0.000433093	0	0.000985160	0.966631	0	0.871835		0	0.967055	5.58067E-05	0	0	0	0.000838310	0	0.966359
2-Methylpentane		0	0	6.42860E-05	0.331290	0	0.317112		0	0.331383	1.78697E-06	0	0	0	0	0	0.331251
3-Methylpentane		0	0	0.000110728	0.230825	0	0.221932		0	0.230953	7.97122E-06	0	0	0	0	0	0.230798
n-Hexane		0.000166009	0	6.73584E-05	0.608777	0	0.589830		0	0.608582	1.49738E-06	0	0	0	0.000292747	0	0.608726
Methylcyclopentane		0	0	7.21812E-05	0.0609826	0	0.0591569		0	0.0610578	1.36347E-05	0	0	0	0	0	0.0609781
Benzene		0	0	0.000922652	0.0158897	0	0.0154217		0	0.0168131	0.000849498	0	0	0	0	0	0.0158772
2-Methylhexane		0	0	2.39265E-05	0.454164	0	0.448088		0	0.454189	5.64923E-07	0	0	0	0	0	0.454147
3-Methylhexane		0	0	2.06537E-05	0.394436	0	0.389408		0	0.394458	5.09167E-07	0	0	0	0	0	0.394422
Heptane		0	0	4.26246E-05	0.978921	0	0.969016		0	0.978964	1.05653E-06	0	0	0	0	0	0.978896
Methylcyclohexane		0	0	0.000130260	0.516674	0	0.511376		0	0.516806	1.73930E-05	0	0	0	0	0	0.516656
Toluene		0	0	0.00172979	0.134774	0	0.133663		0	0.136503	0.00156658	0	0	0	0	0	0.134720
Octane		0	0	2.12886E-05	2.64803	0	2.63962		0	2.64803	3.51156E-07	0	0	0	0	0	2.64801
Ethylbenzene		0	0	0.000780163	0.200109	0	0.199556		0	0.200888	0.000699587	0	0	0	0	0	0.200092
m-Xylene		0	0	0.000679160	0.203971	0	0.203500		0	0.204649	0.000611167	0	0	0	0	0	0.203949

o-Xylene		0	0	0.00135612	0.338254	0	0.337554		0	0.339608	0.00125301	0	0	0	0	0	0.338204
Nonane		0	0	8.45330E-06	2.03678	0	2.03464		0	2.03677	2.19602E-07	0	0	0	0	0	2.03677
C10+		0	0	7.80794E-07	7.07214	0	7.07192		0	7.07214	1.78480E-08	0	0	0	0	0	7.07214
Mass Fraction		**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Water		99.9762	99.9661	99.9650	0.00873476	0.00109880	0.00109880		100	0	99.9948	99.9948	9.12566E-07	99.9999	99.9661	0.00873476	0.00976348
H2S		0	0	0	0	0	0		0	0	0	0	0	0	0	0	0
Nitrogen		0.000104671	0.000122862	0.000143143	0.00290386	2.86045E-05	2.86045E-05		0	0.00436784	5.99090E-06	5.99090E-06	2.37464E-06	3.40212E-09	0.000122862	0.00290386	0.00273681
Carbon Dioxide		0.00112515	0.00225549	0.00188702	0.0111763	0.00122419	0.00122419		0	0.00583101	0.00121518	0.00121518	0.00239204	4.67376E-05	0.00225549	0.0111763	0.0112362
Methane		0.0156197	0.0194540	0.0193451	0.596632	0.0177390	0.0177390		0	0.672633	0.00159319	0.00159319	0.00717211	2.52157E-06	0.0194540	0.596632	0.580337
Ethane		0.00482045	0.00723182	0.00761551	1.28531	0.209647	0.209647		0	1.31596	0.000721043	0.000721043	0.450446	1.05910E-06	0.00723182	1.28531	1.27514
Propane		0.00134837	0.00346614	0.00331646	1.89520	0.820105	0.820105		0	1.90014	0.000343507	0.000343507	1.49053	1.23555E-07	0.00346614	1.89520	1.89165
Isobutane		9.10657E-05	0.000178741	0.000160527	0.705375	0.476854	0.476854		0	0.705491	6.20375E-06	6.20375E-06	0.798977	2.80558E-10	0.000178741	0.705375	0.704833
n-Butane		0.000468508	0.000787878	0.000675552	1.96814	1.49102	1.49102		0	1.96628	5.49406E-05	5.49406E-05	2.45636	3.74186E-09	0.000787878	1.96814	1.96707
Isopentane		7.34612E-05	0.000164875	0.000142296	1.57346	1.43632	1.43632		0	1.57172	8.13913E-06	8.13913E-06	2.25545	1.39608E-10	0.000164875	1.57346	1.57348
n-Pentane		9.24754E-05	0.000156278	0.000183652	2.80041	2.64158	2.64158		0	2.79801	1.04066E-05	1.04066E-05	4.08902	1.30174E-10	0.000156278	2.80041	2.80063
2-Methylpentane		0	0	1.43140E-05	1.14637	1.14762	1.14762		0	1.14520	3.98009E-07	3.98009E-07	1.73140	9.53781E-13	0	1.14637	1.14664
3-Methylpentane		0	0	2.46547E-05	0.798726	0.803162	0.803162		0	0.798133	1.77542E-06	1.77542E-06	1.20662	1.03157E-11	0	0.798726	0.798921
n-Hexane		4.23381E-05	6.51837E-05	1.49981E-05	2.10656	2.13457	2.13457		0	2.10316	3.33510E-07	3.33510E-07	0.217966	3.09882E-14	6.51837E-05	2.10656	2.10714
Methylcyclopentane		0	0	1.56960E-05	0.206083	0.209079	0.209079		0	0.206070	2.96579E-06	2.96579E-06	0.290201	3.70118E-11	0	0.206083	0.206141
Benzene		0	0	0.000186215	0.0498385	0.0505882	0.0505882		0	0.0526664	0.000171504	0.000171504	0.00432934	6.56603E-09	0	0.0498385	0.0498172
2-Methylhexane		0	0	6.19464E-06	1.82735	1.88556	1.88556		0	1.82508	1.46305E-07	1.46305E-07	0.179416	5.77109E-15	0	1.82735	1.82794
3-Methylhexane		0	0	5.34730E-06	1.58703	1.63864	1.63864		0	1.58506	1.31865E-07	1.31865E-07	2.34567	7.79421E-14	0	1.58703	1.58754
Heptane		0	0	1.10356E-05	3.93873	4.07764	4.07764		0	3.93380	2.73623E-07	2.73623E-07	5.37273	1.18895E-13	0	3.93873	3.94004
Methylcyclohexane		0	0	3.30462E-05	2.03704	2.10859	2.10859		0	2.03492	4.41385E-06	4.41385E-06	2.79441	1.18153E-11	0	2.03704	2.03770
Toluene		0	0	0.000411807	0.498630	0.517194	0.517194		0	0.504375	0.000373067	0.000373067	0.0946728	6.90445E-09	0	0.498630	0.498609
Octane		0	0	6.28322E-06	12.1459	12.6624	12.6624		0	12.1302	1.03674E-07	1.03674E-07	15.7484	8.81822E-15	0	12.1459	12.1502
Ethylbenzene		0	0	0.000214007	0.853061	0.889708	0.889708		0	0.855272	0.000191963	0.000191963	0.302589	2.00860E-09	0	0.853061	0.853294
m-Xylene		0	0	0.000186301	0.869527	0.907290	0.907290		0	0.871286	0.000167701	0.000167701	0.397272	1.96024E-09	0	0.869527	0.869744
o-Xylene		0	0	0.000371999	1.44197	1.50496	1.50496		0	1.44587	0.000343819	0.000343819	0.569449	4.20104E-09	0	1.44197	1.44227
Nonane		0	0	2.80132E-06	10.4894	10.9588	10.9588		0	10.4758	7.27955E-08	7.27955E-08	12.2993	2.93082E-15	0	10.4894	10.4931
C10+		0	0	3.49216E-07	49.1564	51.4086	51.4086		0	49.0927	7.98509E-09	7.98509E-09	44.8952	6.92851E-18	0	49.1564	49.1741
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**
Water		33781.7	0	38689.0	0.217530	0	0.0261649		38956.8	0	38688.7	0	0	0	38689.2	0	0.243062
H2S		0	0	0	0	0	0		0	0	0	0	0	0	0	0	0
Nitrogen		0.0353682	0	0.0554000	0.0723175	0	0.000681134		0	0.108917	0.00231792	0	0	0	0.0475506	0	0.0681328
Carbon Dioxide		0.380184	0	0.730325	0.278333	0	0.0291506		0	0.145403	0.470163	0	0	0	0.872928	0	0.279726
Methane		5.27786	0	7.48703	14.8585	0	0.422404		0	16.7729	0.616416	0	0	0	7.52916	0	14.4475
Ethane		1.62881	0	2.94739	32.0092	0	4.99215		0	32.8151	0.278977	0	0	0	2.79888	0	31.7445
Propane		0.455609	0	1.28355	47.1980	0	19.5285		0	47.3822	0.132905	0	0	0	1.34148	0	47.0926
Isobutane		0.0307708	0	0.0621281	17.5666	0	11.3549		0	17.5923	0.00240027	0	0	0	0.0691770	0	17.5468
n-Butane		0.158307	0	0.261456	49.0143	0	35.5043		0	49.0316	0.0212569	0	0	0	0.304927	0	48.9702
Isopentane		0.0248223	0	0.0550723	39.1852	0	34.2018		0	39.1929	0.00314908	0	0	0	0.0638105	0	39.1717
n-Pentane		0.0312472	0	0.0710781	69.7413	0	62.9018		0	69.7718	0.00402639	0	0	0	0.0604831	0	69.7217
2-Methylpentane		0	0	0.00553987	28.5490	0	27.3272		0	28.5570	0.000153992	0	0	0	0	0	28.5457
3-Methylpentane		0	0	0.00954201	19.8914	0	19.1250		0	19.9024	0.000686922	0	0	0	0	0	19.8891
n-Hexane		0.0143059	0	0.00580464	52.4616	0	50.8288		0	52.4448	0.000129037	0	0	0	0.0252276	0	52.4572
Methylcyclopentane		0	0	0.00607473	5.13226	0	4.97861		0	5.13859	0.00114749	0	0	0	0	0	5.13188
Benzene		0	0	0.0720701	1.24117	0	1.20461		0	1.31330	0.0663559	0	0	0	0	0	1.24020
2-Methylhexane		0	0	0.00239748	45.5081	0	44.8993		0	45.5106	5.66064E-05	0	0	0	0	0	45.5065
3-Methylhexane		0	0	0.00206954	39.5232	0	39.0195		0	39.5254	5.10195E-05	0	0	0	0	0	39.5219
Heptane		0	0	0.00427107	98.0898	0	97.0973		0	98.0941	0.000105867	0	0	0	0	0	98.0873
Methylcyclohexane		0	0	0.0127897	50.7302	0	50.2100		0	50.7432	0.00170775	0	0	0	0	0	50.7284
Toluene		0	0	0.159380	12.4178	0	12.3155		0	12.5772	0.144342	0	0	0	0	0	12.4129
Octane		0	0	0.00243176	302.481	0	301.520		0	302.481	4.01121E-05	0	0	0	0	0	302.478
Ethylbenzene		0	0	0.0828260	21.2445	0	21.1859		0	21.3272	0.0742717	0	0	0	0	0	21.2427
m-Xylene		0	0	0.0721030	21.6546	0	21.6045		0	21.7266	0.0648845	0	0	0	0	0	21.6523
o-Xylene		0	0	0.143973	35.9107	0	35.8364		0	36.0544	0.133026	0	0	0	0	0	35.9054
Nonane		0	0	0.00108418	261.227	0	260.952		0	261.226	2.81651E-05	0	0	0	0	0	261.226
C10+		0	0	0.000135155	1224.19	0	1224.15		0	1224.19	3.08949E-06	0	0	0	0	0	1224.19

Process Streams		**Well Stream**	**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**	**1**	**2**	**3**
Phase: Light Liquid	**Status**	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Property	**Units**																
Temperature	°F	186.4	70.0	70.0	70.0	75.9	75.9		300.0	200.0	75.9	75.94	75.9425	75.9425	70	70	74.3547

Pressure	psig	200	154	154	154	0	0		200	300	0	0	4.93503	-14.2259	154	154	154
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	18.0	18.0	18.0	113.4	125.8	125.8		18.0	112.8	18.0	18.0157	118.100	18.0153	18.0162	113.388	113.541
Mass Density	lb/ft^3	60.4	62.3	62.3	45.4	45.9	45.9		57.3	41.3	62.2	62.2170	45.1182	62.2179	62.2632	45.4113	45.2923
Molar Flow	lbmol/h	1875.6	0.0	2148.2	22.0	0.0	18.9		2162.4	22.1	2147.6	0	0	0	2148.20	0	21.9259
Mass Flow	lb/h	33789.7	0.0	38702.5	2490.4	0.0	2381.2		38956.8	2493.6	38690.7	0	0	0	38702.3	0	2489.50
Vapor Volumetric Flow	MCFH	0.6	0.0	0.6	0.1	0.0	0.1		0.7	0.1	0.6	0	0	0	0.621592	0	0.0549652
Liquid Volumetric Flow	Mbbl/d	2.4	0.0	2.7	0.2	0.0	0.2		2.9	0.3	2.7	0	0	0	2.65705	0	0.234953
Std Vapor Volumetric Flow	MMSCFD	17.1	0.0	19.6	0.2	0.0	0.2		19.7	0.2	19.6	0	0	0	19.5650	0	0.199693
Std Liquid Volumetric Flow	Mbbl/d	2.3	0.0	2.7	0.2	0.0	0.2		2.7	0.2	2.7	0	0	0	2.65432	0	0.237525
Compressibility		0.009	0.009	0.009	0.074	0.007	0.007		0.008	0.121	0.001	0.000740330	0.00893972	2.36760E-05	0.00858748	0.0741037	0.0737921
Specific Gravity		0.969	0.998	0.998	0.728	0.737	0.737		0.920	0.663	0.998	0.997563	0.723408	0.997577	0.998304	0.728107	0.726198
API Gravity		10.0	10.0	10.0	61.6	58.7	58.7		10.0	61.5	10.0	10.0154	62.1072	10.0135	10.0410	61.5671	61.5186
Enthalpy	MMBtu/h	-226.8	0.0	-264.2	-2.1	0.0	-2.0		-257.1	-1.9	-264.0	0	0	0	-264.197	0	-2.10334
Mass Enthalpy	Btu/lb	-6712.2	-6826.4	-6826.3	-847.2	-823.1	-823.1		-6598.5	-778.7	-6822.4	-6822.37	-862.384	-6822.67	-6826.40	-847.232	-844.883
Mass Cp	Btu/(lb*°F)	1.0	1.0	1.0	0.5	0.5	0.5		1.0	0.6	1.0	0.982733	0.489227	0.982746	0.983077	0.485193	0.487810
Ideal Gas CpCv Ratio		1.320	1.326	1.326	1.049	1.044	1.044		1.316	1.040	1.326	1.32555	1.04617	1.32556	1.32582	1.04891	1.04848
Dynamic Viscosity	cP	0.3	1.0	1.0	0.6	0.7	0.7		0.2	0.3	0.9	0.924438	0.581640	0.924435	0.995511	0.565351	0.550471
Kinematic Viscosity	cSt	0.3	1.0	1.0	0.8	0.9	0.9		0.2	0.4	0.9	0.927572	0.804788	0.927556	0.998145	0.777201	0.758734
Thermal Conductivity	Btu/(h*ft*°F)	0.4	0.3	0.3	0.1	0.1	0.1		0.4	0.1	0.3	0.349782	0.0690328	0.349835	0.346636	0.0689074	0.0686204
Surface Tension	lbf/ft	0.004	0.005	0.005	0.001	0.002	0.002		0.003	0.001	0.005	0.00499712	0.00153025	0.00499737	0.00504041	0.00147526	0.00145903
Net I.G. Heating Value	Btu/ft^3	0.2	0.3	0.3	5696.2	6304.3	6304.3		0.0	5667.9	0.0	0.0378116	5942.76	3.74143E-05	0.314202	5696.17	5703.62
Net Liquid Heating Value	Btu/lb	-1054.8	-1052.8	-1052.5	18895.2	18850.3	18850.3		-1059.8	18899.9	-1058.9	-1058.91	18929.7	-1059.76	-1052.80	18895.2	18894.4
Gross I.G. Heating Value	Btu/ft^3	50.5	50.6	50.7	6113.5	6761.2	6761.2		50.3	6083.3	50.3	50.3496	6382.20	50.3100	50.6420	6113.55	6121.49
Gross Liquid Heating Value	Btu/lb	5.3	7.3	7.5	20291.0	20227.5	20227.5		0.0	20296.6	0.9	0.861243	20341.0	0.000833863	7.28037	20291.0	20289.9

Process Streams		Well Stream	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	1	2	3
Phase: Heavy Liquid	**Status**	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Mole Fraction		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water					99.9709											99.9709	99.9718
H2S					0											0	0
Nitrogen					9.20601E-05											9.20601E-05	8.48565E-05
Carbon Dioxide					0.000772497											0.000772497	0.000766692
Methane					0.0217253											0.0217253	0.0208935
Ethane					0.00456295											0.00456295	0.00452371
Propane					0.00135502											0.00135502	0.00133387
Isobutane					4.97592E-05											4.97592E-05	5.01256E-05
n-Butane					0.000209403											0.000209403	0.000213998
Isopentane					3.55330E-05											3.55330E-05	3.61287E-05
n-Pentane					4.58600E-05											4.58600E-05	4.75096E-05
2-Methylpentane					2.99256E-06											2.99256E-06	3.14898E-06
3-Methylpentane					5.15447E-06											5.15447E-06	5.36411E-06
n-Hexane					3.13559E-06											3.13559E-06	3.30435E-06
Methylcyclopentane					3.36009E-06											3.36009E-06	3.36111E-06
Benzene					4.29502E-05											4.29502E-05	4.34785E-05
2-Methylhexane					1.11380E-06											1.11380E-06	1.12542E-06
3-Methylhexane					9.61445E-07											9.61445E-07	9.73713E-07
Heptane					1.98421E-06											1.98421E-06	1.94695E-06
Methylcyclohexane					6.06371E-06											6.06371E-06	6.26530E-06
Toluene					8.05230E-05											8.05230E-05	8.29037E-05
Octane					9.91001E-07											9.91001E-07	1.05441E-06
Ethylbenzene					3.63172E-05											3.63172E-05	3.70373E-05
m-Xylene					3.16155E-05											3.16155E-05	3.25893E-05
o-Xylene					6.31286E-05											6.31286E-05	6.53580E-05
Nonane					3.93508E-07											3.93508E-07	4.18954E-07
C10+					3.63466E-08											3.63466E-08	3.91763E-08
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
Water					0											0	2147.56
H2S					0											0	0
Nitrogen					0											0	0.00182286
Carbon Dioxide					0											0	0.0164698
Methane					0											0	0.448828

Ethane					0											0	0.0971768
Propane					0											0	0.0286538
Isobutane					0											0	0.00107678
n-Butane					0											0	0.00459705
Isopentane					0											0	0.000776105
n-Pentane					0											0	0.00102059
2-Methylpentane					0											0	6.76453E-05
3-Methylpentane					0											0	0.000115230
n-Hexane					0											0	7.09831E-05
Methylcyclopentane					0											0	7.22022E-05
Benzene					0											0	0.000933992
2-Methylhexane					0											0	2.41759E-05
3-Methylhexane					0											0	2.09170E-05
Heptane					0											0	4.18237E-05
Methylcyclohexane					0											0	0.000134589
Toluene					0											0	0.00178091
Octane					0											0	2.26506E-05
Ethylbenzene					0											0	0.000795623
m-Xylene					0											0	0.000700074
o-Xylene					0											0	0.00140400
Nonane					0											0	8.99985E-06
C10+					0											0	8.41574E-07
Mass Fraction		**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Water					99.9650											99.9650	99.9658
H2S					0											0	0
Nitrogen					0.000143143											0.000143143	0.000131942
Carbon Dioxide					0.00188702											0.00188702	0.00187284
Methane					0.0193451											0.0193451	0.0186044
Ethane					0.00761551											0.00761551	0.00755000
Propane					0.00331646											0.00331646	0.00326470
Isobutane					0.000160527											0.000160527	0.000161709
n-Butane					0.000675552											0.000675552	0.000690376
Isopentane					0.000142296											0.000142296	0.000144682
n-Pentane					0.000183652											0.000183652	0.000190258
2-Methylpentane					1.43140E-05											1.43140E-05	1.50621E-05
3-Methylpentane					2.46547E-05											2.46547E-05	2.56575E-05
n-Hexane					1.49981E-05											1.49981E-05	1.58053E-05
Methylcyclopentane					1.56960E-05											1.56960E-05	1.57007E-05
Benzene					0.000186215											0.000186215	0.000188506
2-Methylhexane					6.19464E-06											6.19464E-06	6.25928E-06
3-Methylhexane					5.34730E-06											5.34730E-06	5.41552E-06
Heptane					1.10356E-05											1.10356E-05	1.08284E-05
Methylcyclohexane					3.30462E-05											3.30462E-05	3.41448E-05
Toluene					0.000411807											0.000411807	0.000423982
Octane					6.28322E-06											6.28322E-06	6.68526E-06
Ethylbenzene					0.000214007											0.000214007	0.000218250
m-Xylene					0.000186301											0.000186301	0.000192039
o-Xylene					0.000371999											0.000371999	0.000385135
Nonane					2.80132E-06											2.80132E-06	2.98246E-06
C10+					3.49216E-07											3.49216E-07	3.76404E-07
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**
Water					0											0	38688.9
H2S					0											0	0
Nitrogen					0											0	0.0510645
Carbon Dioxide					0											0	0.724830
Methane					0											0	7.20031
Ethane					0											0	2.92201
Propane					0											0	1.26351
Isobutane					0											0	0.0625850
n-Butane					0											0	0.267191
Isopentane					0											0	0.0559951
n-Pentane					0											0	0.0736341
2-Methylpentane					0											0	0.00582936
3-Methylpentane					0											0	0.00993000

n-Hexane					0											0	0.00611699
Methylcyclopentane					0											0	0.00607650
Benzene					0											0	0.0729558
2-Methylhexane					0											0	0.00242248
3-Methylhexane					0											0	0.00209593
Heptane					0											0	0.00419082
Methylcyclohexane					0											0	0.0132148
Toluene					0											0	0.164090
Octane					0											0	0.00258734
Ethylbenzene					0											0	0.0844673
m-Xylene					0											0	0.0743234
o-Xylene					0											0	0.149056
Nonane					0											0	0.00115428
C10+					0											0	0.000145676

Process Streams		Well Stream	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	1	2	3
Phase: Heavy Liquid	Status	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Property	Units																
Temperature	°F				70.0											70	74.3547
Pressure	psig				154											154	154
Mole Fraction Vapor	%				0											0	0
Mole Fraction Light Liquid	%				0											0	0
Mole Fraction Heavy Liquid	%				100											100	100
Molecular Weight	lb/lbmol				18.0											18.0163	18.0163
Mass Density	lb/ft^3				62.3											62.2632	62.2222
Molar Flow	lbmol/h				0.0											0	2148.17
Mass Flow	lb/h				0.0											0	38702.2
Vapor Volumetric Flow	MCFH				0.0											0	0.621999
Liquid Volumetric Flow	Mbbl/d				0.0											0	2.65879
Std Vapor Volumetric Flow	MMSCFD				0.0											0	19.5647
Std Liquid Volumetric Flow	Mbbl/d				0.0											0	2.65427
Compressibility					0.009											0.00858756	0.00852316
Specific Gravity					0.998											0.998304	0.997646
API Gravity					10.0											10.0410	10.0394
Enthalpy	MMBtu/h				0.0											0	-264.029
Mass Enthalpy	Btu/lb				-6826.3											-6826.31	-6822.07
Mass Cp	Btu/(lb*°F)				1.0											0.983074	0.982754
Ideal Gas CpCv Ratio					1.326											1.32581	1.32560
Dynamic Viscosity	cP				1.0											0.995514	0.942710
Kinematic Viscosity	cSt				1.0											0.998148	0.945827
Thermal Conductivity	Btu/(h*ft*°F)				0.3											0.346630	0.348651
Surface Tension	lbf/ft				0.005											0.00504041	0.00500718
Net I.G. Heating Value	Btu/ft^3				0.3											0.326336	0.318233
Net Liquid Heating Value	Btu/lb				-1052.5											-1052.54	-1052.72
Gross I.G. Heating Value	Btu/ft^3				50.7											50.6547	50.6461
Gross Liquid Heating Value	Btu/lb				7.5											7.5	7.4

November 6, 2014

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

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

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

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

CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2186-M

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

Characteristics of Heptanes Plus:

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

Characteristics of Total Sample:

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

Base Conditions: 14.850 PSI & 60 °F

Certified: FESCO, Ltd. - Alice, Texas

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

David Dannhaus 361-661-7015

TANKS DATA INPUT REPORT - GPA 2186-M

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

Characteristics of Total Sample:

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

Characteristics of Decanes (C10) Plus:

Specific Gravity	0.7759	(Water=1)
Molecular Weight	173.1	

Characteristics of Atmospheric Sample:

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

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

* Sample used for analysis

TOTAL EXTENDED REPORT - GPA 2186-M

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

November 6, 2014

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

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

Date Sampled: 10/14/14

Date Analyzed: 10/24/14

Sample: Nero No. 2H

Job Number: J45832

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

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

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

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

Certified: FESCO, Ltd. - Alice, Texas

David Dannhaus 361-661-7015

October 28, 2014

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

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

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

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

CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2286

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

Computed Real Characteristics Of Heptanes Plus:

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

Computed Real Characteristics Of Total Sample:

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

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

Base Conditions: 14.850 PSI & 60 Deg F

Certified: FESCO, Ltd. - Alice, Texas

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

David Dannhaus 361-661-7015

CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2286
TOTAL REPORT

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

Computed Real Characteristics Of Total Sample:

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

Antero Resources
Seaborn Unit 1H - Vogt Pad

Tag Name	Value	Units	Timestamp
Accumulated Gas Flow	683627.1	MCF	12/5/2013 08:05:40
Casing Pressure	352.52	PSIA	12/5/2013 08:05:48
Current Day Gas Flow	49.19	MCF	12/5/2013 08:05:40
Differential Pressure	38.91	inH2O	12/5/2013 08:05:40
Flow Rate	6834.16	MCF Per Day	12/5/2013 08:05:40
Pressure	135.66	PSIA	12/5/2013 08:05:40
Previous Day Energy	8199.34	MBTU	12/5/2013 08:05:41
Previous Day Gas Flow	6726.57	MCF	12/5/2013 08:05:41
Temperature	68.72	F	12/5/2013 08:05:40
Tubing Pressure	606.04	PSIA	12/5/2013 08:05:48
Daily AP	37.24	PSIA	12/5/2013 09:00:00
Daily DP	137.62	inH2O	12/5/2013 09:00:00
Daily Energy	8199.34	MBTU	12/5/2013 09:00:00
Daily Flow	6726.57	MCF	12/5/2013 09:00:00
Daily Tf	68.49	F	12/5/2013 09:00:00
Hourly AP	134.4	PSIA	12/5/2013 09:00:00
Hourly DP	37.66	Inches	12/5/2013 09:00:00
Hourly Energy	339.8	MBTU	12/5/2013 09:00:00
Hourly Flow Time	3600	Seconds	12/5/2013 09:00:00
Hourly Tf	68.6	F	12/5/2013 09:00:00
Hourly Volume	278.8	MCF	12/5/2013 09:00:00
Audited Accumulated Gas Volume		MCF	
Audited Casing Pressure	383	PSI	12/2/2013 09:00:00
Audited Gas Volume	6544.49	MCF	12/2/2013 09:00:00
Audited Oil Volume	0	Barrels	12/2/2013 09:00:00
Audited Tubing Pressure	627	PSI	12/2/2013 09:00:00
Audited Water Volume	0	Barrels	12/2/2013 09:00:00
Argon	0	%	12/5/2013 08:05:47
BTU	1218.948	BTU	12/5/2013 08:05:40
C02	0.1647	%	12/5/2013 08:05:47
Carbon Monoxide	0	%	12/5/2013 08:05:47
Decane	0	%	12/5/2013 08:05:47
Ethane	14.0689	%	12/5/2013 08:05:47
Helium	0	%	12/5/2013 08:05:47
Heptane	0	%	12/5/2013 08:05:47
Hexane	0.2484	%	12/5/2013 08:05:47
Hydrogen	0	%	12/5/2013 08:05:47
Hydrogen Sulfide	0	%	12/5/2013 08:05:47
Iso-Butane	0.5041	%	12/5/2013 08:05:47
Iso-Pentane	0.2618	%	12/5/2013 08:05:47
Methane	78.61509	%	12/5/2013 08:05:47
N2	0.564	%	12/5/2013 08:05:47
N-Butane	1.0298	%	12/5/2013 08:05:47
Nonane	0	%	12/5/2013 08:05:47
N-Pentane	0.2553	%	12/5/2013 08:05:47
Octane	0	%	12/5/2013 08:05:47
Oxygen	0.0715	%	12/5/2013 08:05:47
Plate Size	3.75	Inches	12/5/2013 08:05:45
Propane	4.2164	%	12/5/2013 08:05:47
SPG	0.7062		12/5/2013 08:05:40
Water	0	%	12/5/2013 08:05:47

Attachment J

Class I Legal Advertisement

Attachment J

Air Quality Permit Notice
Notice of Application
Bee Lewis 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 General Permit Class II Administrative Update for an Oil and Natural Gas facility located near 1.6 mi southwest of the intersection of Co. Route 11/3 and 11/4 in Doddridge County, West Virginia.

The latitude and longitude coordinates are: 39.254867 degrees N and -80.823017 degrees W

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

Pollutants	TOTALS (tpy):
VOC	14.2210
NO_X	4.0725
CO_{2e}	4357.0000
CO	26.9819
SO_2	0.0133
$PM_{2.5}$	0.2038
PM_{10}	0.4470
Lead	1.34E-05
Total HAPs	1.0049
Benzene	0.0255
Formaldehyde	0.0231
Xylenes	0.0135

Startup of operation is planned to begin upon issuance of the permit. Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57th Street, SE, Charleston, WV 25304, for at least 30 calendar days from the date of publication of this notice.

Any questions regarding this permit application should be directed to the DAQ at (304) 926-0499, extension 1227, during normal business hours.
Dated this the __ day of _____, 2015

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

Attachment L

General Permit Registration Application Fee

Conestoga-Rovers & Associates, Inc.

▼ PLEASE DETACH AND RETAIN FOR YOUR RECORDS ▼

INVOICE NUMBER	DATE		VOUCHER NO.	AMOUNT
Account Number:		40WVDEPAQ	395943	
CR11915	1/19/2015	400932155		300.00
		TOTAL:		300.00

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

Conestoga-Rovers & Associates, 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

1/20/2015 NO. 395943

PAY **********300 DOLLARS AND **********00 CENTS $ **********300.00

TO THE ORDER OF
WV Dept. of Environmental Protectio
Division Air Quality
601 57th Street SE
Charleston,, WV 25304 US

Conestoga-Rovers & Associates, Inc.

AUTHORIZED SIGNATURES

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

⑈395943⑈ ⑆221370632⑆6100000011891O⑈

Attachment O

Emissions Summary Sheet

Attachment O: G70-A Emissions Summary Sheet

Emission Points Data Summary Sheet

Table 1: Emissions Data

Emission Point ID No. *(Must match Emission Units Table & Plot Plan)*	Emission Point Type[1]	Emission Unit Vented Through This Point *(Must match Emission Units Table & Plot Plan)*		Air Pollution Control Device *(Must match Emission Units Table & Plot Plan)*		All Regulated Pollutants - Chemical Name/CAS[3] *(Speciate VOCs & HAPS)*	Maximum Potential Uncontrolled Emissions [4]		Maximum Potential Controlled Emissions [5]		Emission Form or Phase *(At exit conditions, Solid, Liquid or Gas/Vapor)*	Est. Method Used [6]
		ID No.	Source	ID No.	Device Type		lb/hr	ton/yr	lb/hr	ton/yr		
EP-H001, EP-H002, EP-H003, EP-H004	Vertical Stack	H001, H002, H003, H004	Gas Processing Unit Heater	N/A		CO (630080)	0.4042	1.7702	0.4042	1.7702	Gas/Vapor /Solid (for PM)	MB AP-42
						NOx (10102439)	0.4811	2.1074	0.4811	2.1074		
						Pb (7439-92-1)	2.41E-06	1.05E-05	2.41E-06	1.05E-05		
						CO2 Equivalent N2O (10024972), CO2 (124389), CH4 (74828)	580.8717	2544.2178	580.8717	2544.2178		
						SO2 (7446095)	0.0029	0.0126	0.0029	0.0126		
						PM, PM10, PM2.5	0.0366	0.1602	0.0366	0.1602		
						Benzene (71432)	1.01E-05	0.0000	1.01E-05	0.0000		
						Toluene (108883)	1.64E-05	0.0001	1.64E-05	0.0001		
						Hexane (110543)	0.0087	0.0379	0.0087	0.0379		
						Formaldehyde (50000)	0.0004	0.0016	0.0004	0.0016		
						2-Methylnaphthalene (91576)	1.15E-07	5.06E-07	1.15E-07	5.06E-07		
						Dichlorobenzene (95501)	5.77E-06	2.53E-05	5.77E-06	2.53E-05		
						Fluoranthene (206440)	1.44E-08	6.32E-08	1.44E-08	6.32E-08		
						Fluorene (86737)	1.35E-08	5.90E-08	1.35E-08	5.90E-08		
						Naphthalene (91203)	2.93E-06	1.29E-05	2.93E-06	1.29E-05		
						Phenanathrene (85018)	8.18E-08	3.58E-07	8.18E-08	3.58E-07		
						Total VOCs	0.0265	0.1159	0.0265	0.1159		
F001	n/a	F001	Fugitives	N/A		Benzene (71432)	0.0046	0.0200	0.0046	0.0200	Gas/Vapor	MB
						Toluene (108883)	0.0149	0.0651	0.0149	0.0651		
						Ethyl benzene (100414)	0.0137	0.0601	0.0137	0.0601		
						Hexane (110543)	0.1381	0.6050	0.1381	0.6050		
						o,m,p-xylenes (95476,108383,106423)	0.0000	0.0000	0.0000	0.0000		
						CO2 Equivalent CO2 (124389)), CH4	28.4610	124.6593	28.4610	124.6593		
						VOCs	1.4229	6.2322	1.4229	6.2322		
						TAPs (benzene)	0.0046	0.0200	0.0046	0.0200		

Attachment O: G70-A Emissions Summary Sheet

Emission Points Data Summary Sheet

Table 1: Emissions Data

Emission Point ID No. *(Must match Emission Units Table & Plot Plan)*	Emission Point Type[1]	Emission Unit Vented Through This Point *(Must match Emission Units Table & Plot Plan)*		Air Pollution Control Device *(Must match Emission Units Table & Plot Plan)*		All Regulated Pollutants - Chemical Name/CAS[3] *(Speciate VOCs & HAPS)*	Maximum Potential Uncontrolled Emissions [4]		Maximum Potential Controlled Emissions [5]		Emission Form or Phase *(At exit conditions, Solid, Liquid or Gas/Vapor)*	Est. Method Used [6]
		ID No.	Source	ID No.	Device Type		lb/hr	ton/yr	lb/hr	ton/yr		
EP-L001, EP-L002	n/a	L001, L002	Loading (Condensate), Loading (Water)	N/A		VOCs	8.2579	1.3905	8.2579	1.3905	Gas/Vapor	MB
						toluene (108883)	0.0015	0.0002	0.0015	0.0002		
						ethyl benzene (100414)	0.0016	0.0003	0.0016	0.0003		
						hexane (110543)	0.0127	0.0021	0.0127	0.0021		
						o,m,p-xylenes (95476,108383,106423)	0.0039	0.0007	0.0039	0.0007		
						CO2 Equivalent CO2 (124389), CH4	9.8768	3.1686	9.8768	3.1686		
						benzene (71432)	0.0002	0.0000	0.0002	0.0000		
						TAPs (benzene)	0.0002	0.0000	0.0002	0.0000		
EP-HR001	n/a	HR001	Haul Truck	N/A		PM, PM10, PM2.5	0.9959	1.2303	0.4980	0.6151	Solid	MB
FL001	n/a	TANKCOND001-04 and TANKPW001-002 and FL001	Condensate Tank F/W/B and PW Tank F/W/B and Flare	N/A	Flare	CO (630080)	0.00E+00	0.00E+00	0.1116	0.4889	Gas/Vapor/ Solid (for PM)	MB
						NOx (10102439)	0.00E+00	0.00E+00	0.1329	0.5820		
						Pb (7439-92-1)	0.00E+00	0.00E+00	6.64E-07	2.91E-06		
						CO2 Equivalent N2O (10024972), CO2 (124389), CH4	0.0000	0.0000	353.8512	1549.8683		
						SO2 (7446095)	0.00E+00	0.00E+00	7.56E-06	3.31E-05		
						PM, PM10, PM2.5	0.00E+00	0.00E+00	0.0177	0.0332		
						Benzene (71432)	0.0424	0.1855	0.0008	0.0037		
						Toluene (108883)	0.1179	0.5163	0.0024	0.0103		
						ethyl benzene (100414)	0.0678	0.2969	0.0014	0.0059		
						hexane (110543)	1.6428	7.1955	0.0329	0.1439		
						o,m,p-xylenes (95476,108383,106423)	0.0696	0.3048	0.0014	0.0061		
						Formaldehyde (50000)	0.00E+00	0.00E+00	9.45E-07	4.14E-06		
						VOCs	71.7058	314.0714	1.4342	6.2817		

Attachment O: G70-A Emissions Summary Sheet

Emission Points Data Summary Sheet

Table 1: Emissions Data

Emission Point ID No. *(Must match Emission Units Table & Plot Plan)*	Emission Point Type[1]	Emission Unit Vented Through This Point *(Must match Emission Units Table & Plot Plan)*		Air Pollution Control Device *(Must match Emission Units Table & Plot Plan)*		All Regulated Pollutants - Chemical Name/CAS[3] *(Speciate VOCs & HAPS)*	Maximum Potential Uncontrolled Emissions [4]		Maximum Potential Controlled Emissions [5]		Emission Form or Phase *(At exit conditions, Solid, Liquid or Gas/Vapor)*	Est. Method Used [6]
		ID No.	Source	ID No.	Device Type		lb/hr	ton/yr	lb/hr	ton/yr		
EP-PCV	valve	PCV	Pneumatic CV	N/A		toluene (108883)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	Gas/Vapor	MB
						ethyl benzene (100414)	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
						hexane (110543)	0.0025	0.0109	0.0025	0.0109		
						o,m,p-xylenes (95476,108383,106423)	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
						CO2 Equivalent CO2 (124389)), CH4	3.0712	13.4520	3.0712	13.4520		
						VOCs	0.0387	0.1695	0.0387	0.1695		
						TAPs (benzene)	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
EP-ENG001	Vertical Stack	ENG001	Compressor Engine	N/A		CO (630080)	5.6445	24.7228	5.6445	24.7228	Gas/Vapor/ Solid (for PM)	MB
						NOx (10102439)	0.3158	1.3831	0.3158	1.3831		
						CO2 Equivalent N2O (10024972), CO2 (124389), CH4 (74828)	27.7765	121.6612	27.7765	121.6612		
						SO2 (7446095)	0.0001	0.0006	0.0001	0.0006		
						PM, PM10, PM2.5	0.0023	0.0100	0.0023	0.0100		
						TAPs Benzene (71432)	0.0004	0.0017	0.0004	0.0017		
						Toluene (108883)	0.0001	0.0006	0.0001	0.0006		
						TAPs Formaldehyde (50000)	0.0049	0.0215	0.0049	0.0215		
						Ethyl Benzene (100414)	5.95E-06	2.61E-05	5.95E-06	2.61E-05		
						Naphthalene (91203)	2.33E-05	1.02E-04	2.33E-05	1.02E-04		
						o,m,p-xylenes (95476,108383,106423)	4.68E-05	2.05E-04	4.68E-05	2.05E-04		
						Total VOCs	0.0071	0.0311	0.0071	0.0311		

Attachment C/O: G70-A Emissions Summary Sheet

Fugitive Emissions Data Summary Sheet

FUGITIVE EMISSIONS SUMMARY	All Regulated Pollutants Chemical Name/CAS [1]	Maximum Potential Uncontrolled Emissions [2]		Maximum Potential Controlled Emissions [3]		Est. Method Used [4]
		lb/hr	ton/yr	lb/hr	ton/yr	
Haul Road/Road Dust Emissions Paved Haul Roads	n/a					
Unpaved Haul Roads	PM, PM10, PM2.5	0.9959	1.2303	0.4980	0.6151	MB
Loading/Unloading Operations	VOCs	8.2579	1.3905	8.2579	1.3905	MB
	toluene (108883)	0.0015	0.0002	0.0015	0.0002	
	ethyl benzene (100414)	0.0016	0.0003	0.0016	0.0003	
	hexane (110543)	0.0127	0.0021	0.0127	0.0021	
	o,m,p-xylenes (95476,108383,106423)	0.0039	0.0007	0.0039	0.0007	
	CO2 Equivalent CO2 (124389), CH4	9.8768	3.1686	9.8768	3.1686	
	benzene (71432)	0.0002	0.0000	0.0002	0.0000	
	TAPs (benzene)	0.0002	0.0000	0.0002	0.0000	
Equipment Leaks (Components)	Benzene (71432)	Does not apply	0.0200	Does not apply	0.0200	MB
	Toluene (108883)		0.0651		0.0651	
	Ethyl benzene (100414)		0.0601		0.0601	
	Hexane (110543)		0.6050		0.6050	
	o,m,p-xylenes (95476,108383,106423)		0.0000		0.0000	
	CO2 Equivalent CO2 (124389)), CH4		124.6593		124.6593	
	VOCs		6.2322		6.2322	
	TAPs (benzene)		0.0200		0.0200	
Equipment Leaks (PCVs)	toluene (108883)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MB
	ethyl benzene (100414)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	hexane (110543)	0.0025	0.0109	0.0025	0.0109	
	o,m,p-xylenes (95476,108383,106423)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	CO2 Equivalent CO2 (124389)), CH4	3.0712	13.4520	3.0712	13.4520	
	VOCs	0.0387	0.1695	0.0387	0.1695	
	TAPs (benzene)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	

[1] List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS_2, VOCs, H_2S, Inorganics, Lead, Organics, O_3, NO, NO_2, SO_2, SO_3, all applicable Greenhouse Gases (including CO_2 and methane), etc. DO NOT LIST H_2, H_2O, N_2, O_2, and Noble Gases.

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

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

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

Attachment P

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

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

OFFICE OF TRANSPORTATION AND AIR QUALITY
ANN ARBOR, MICHIGAN 48105

Certificate Issued To: **Kubota Corporation**
(U.S. Manufacturer or Importer)

Certificate Number: DKBXS.9622HP-002

Effective Date: 11/20/2012

Expiration Date: 12/31/2013

Byron J. Bunker, Division Director
Compliance Division

Issue Date: 11/20/2012

Revision Date: N/A

Manufacturer: Kubota Corporation
Engine Family: DKBXS.9622HP
Certificate Number: DKBXS.9622HP-002
Useful Life : 1000 Hours / 5 Years
Engine Class : Nonhandheld-Class II
Fuel : Natural Gas (CNG/LNG)
Emission Standards : NMHC + NOx (g/kW-hr) : 8
CO (g/kW-hr) : 610

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

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

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

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

TECHNICAL INFORMATION

DG972-SAEH-S1

NATURAL GAS FUEL ENGINE

July, 2006

KUBOTA Corporation

CONTENTS

Specifications and dimensions are subject to change without prior notice.

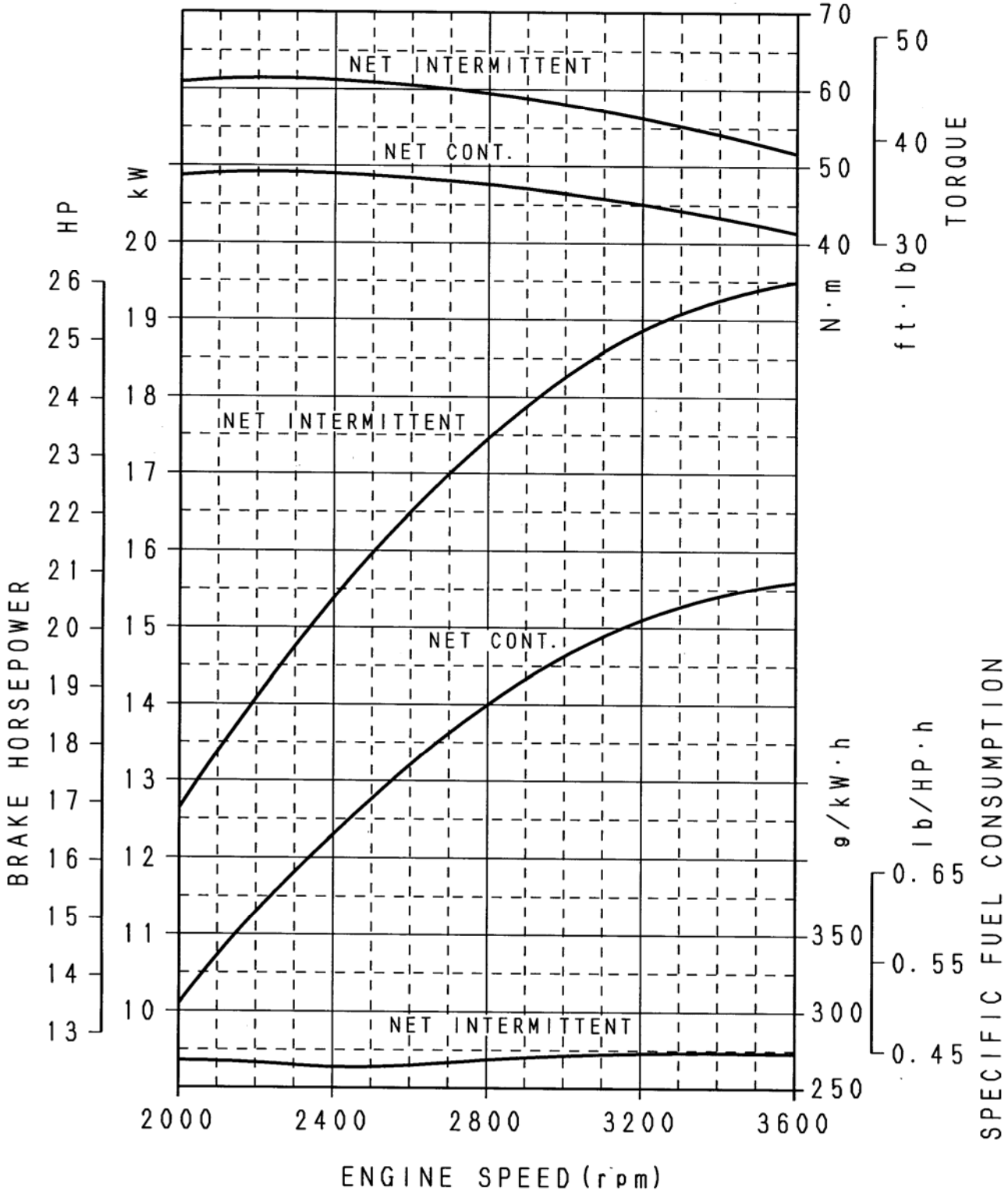
1. GENERAL SPECIFICATIONS

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

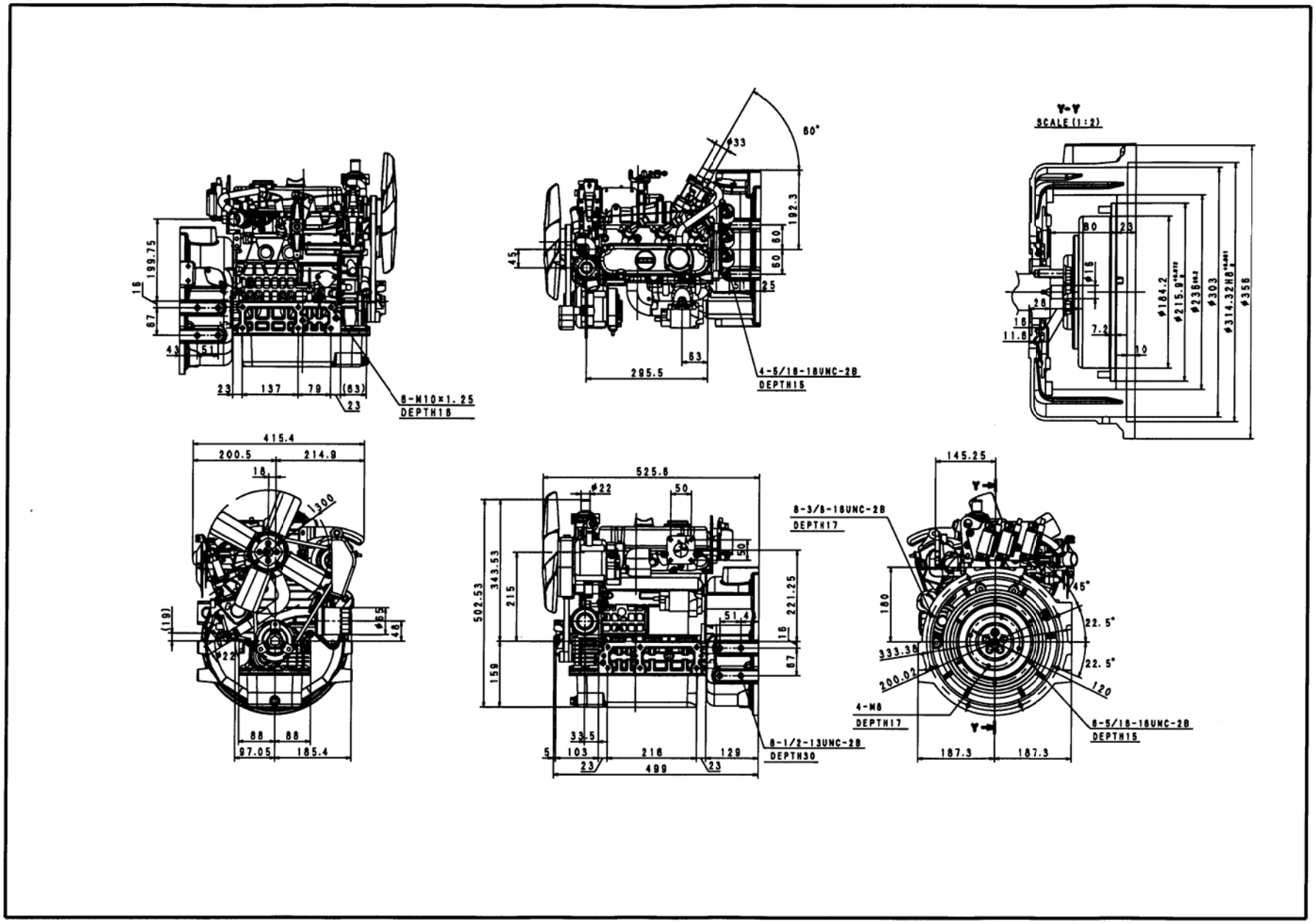
2. PERFORMANCE CURVES

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

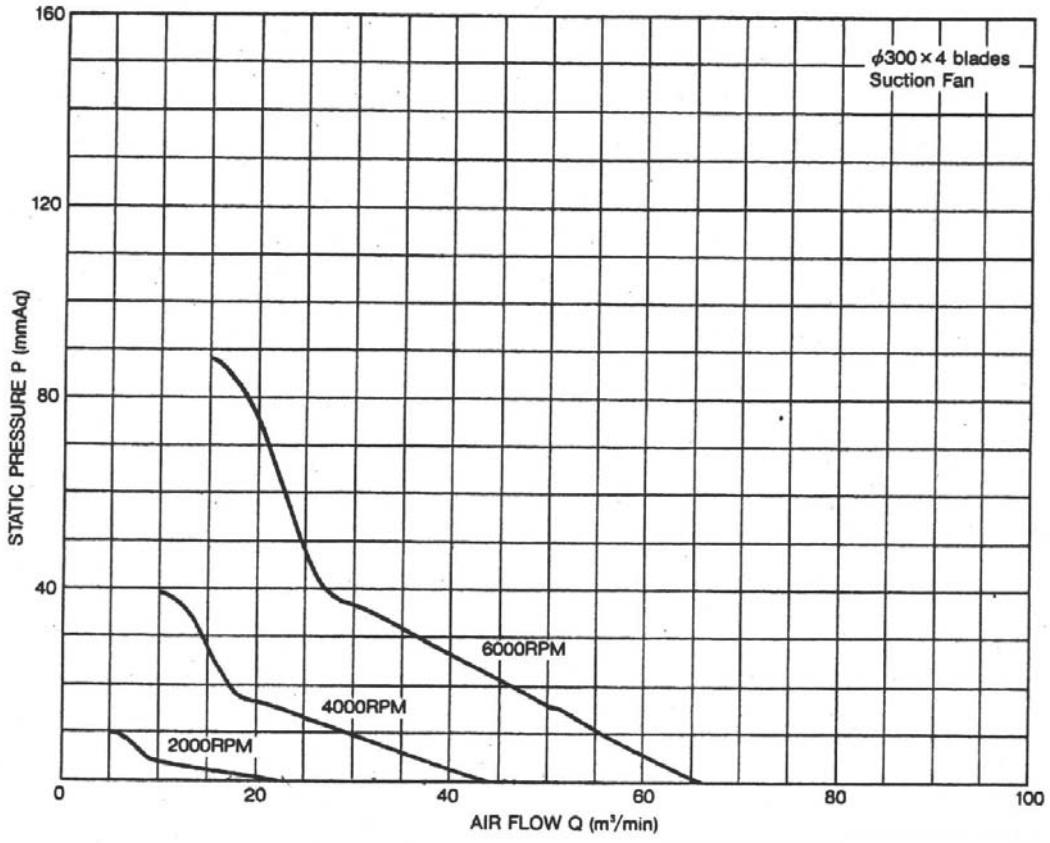
Be: Specific fuel consumption

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

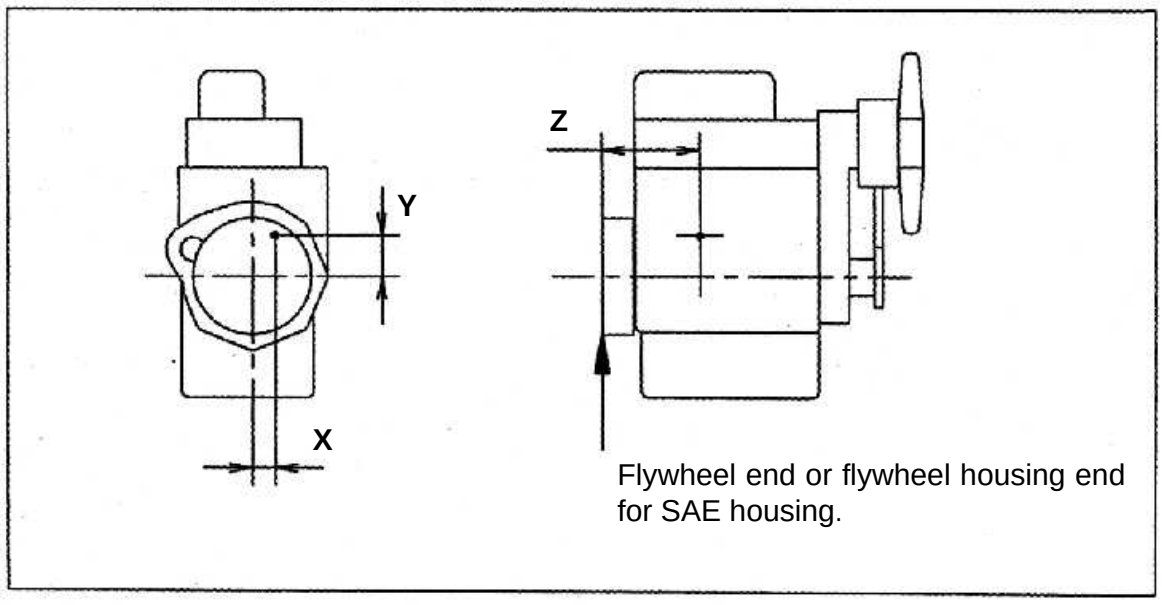
1. With standard flywheel and rear-end plate

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)

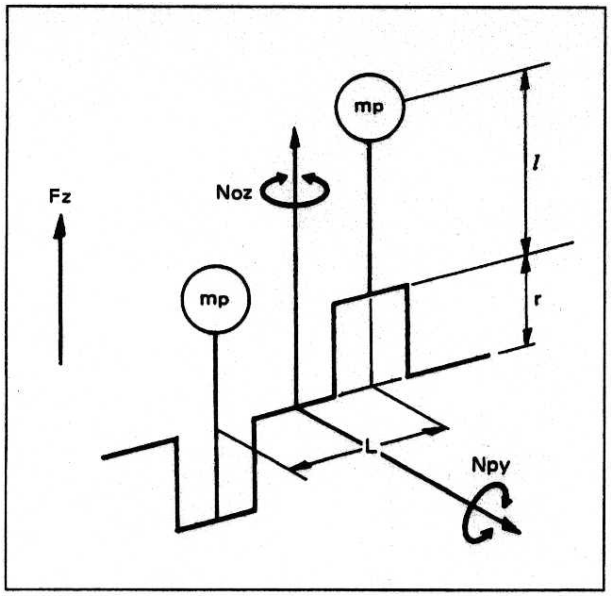
Note
Cooling water and lubricating oil weight is not included in above engine weight.



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

($x\omega^2$)

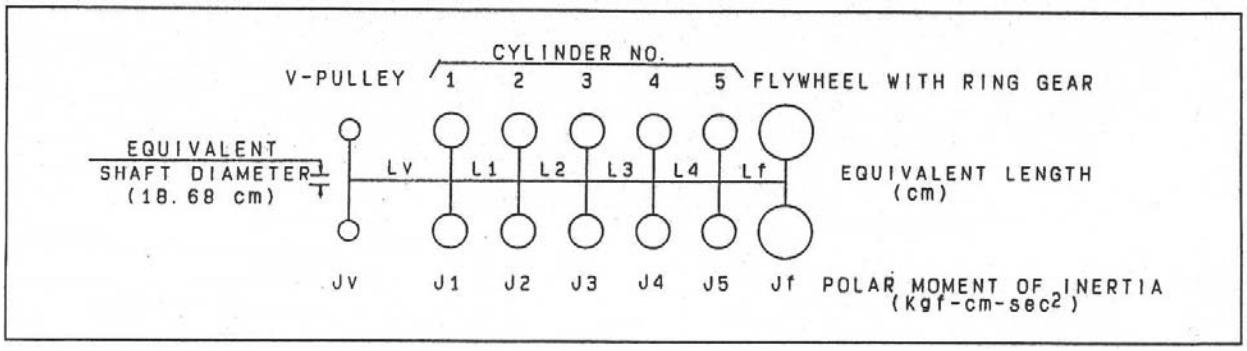
Model	No. of Cylinder	Cylinder Bore	Order	Fz	Npy	Noz
WG/DF/DG 972	3	74.5mm	1	0	0.000096	0.000096
			2	0	0.000072	0

▼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)

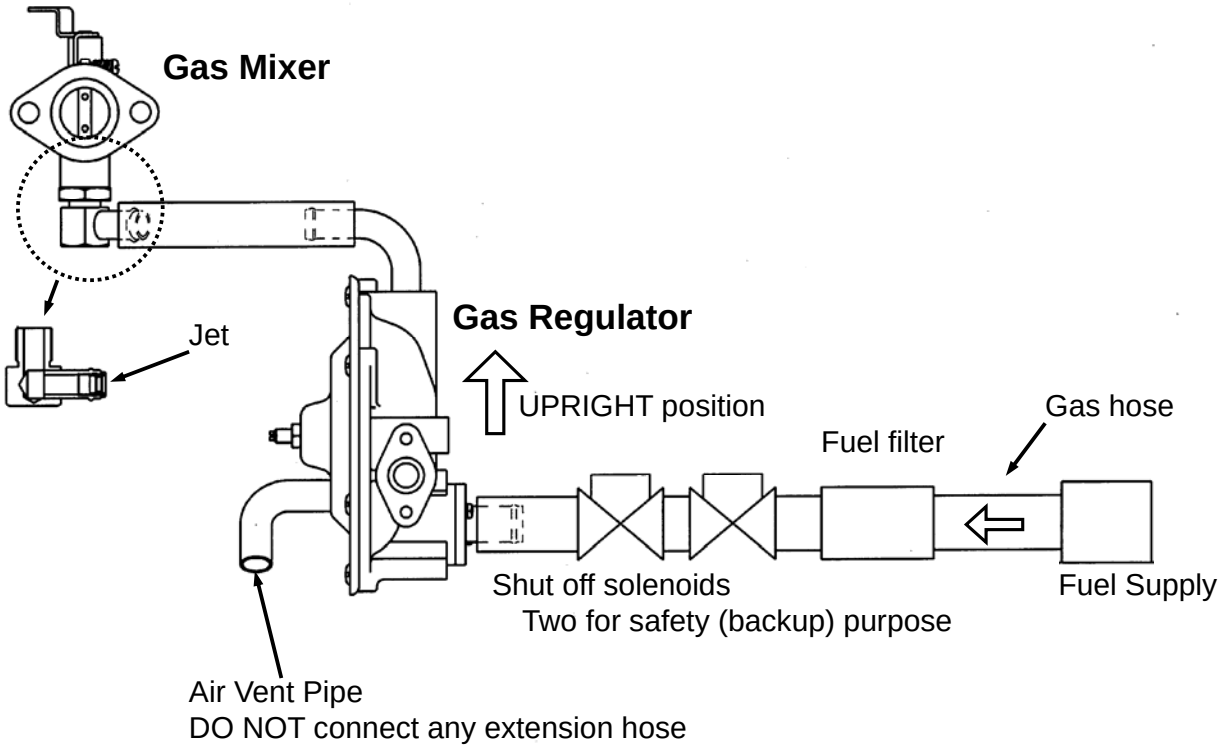
Equipments Vacuum Meter : Not KUBOTA supplied
Adjustable Jet : Service Tool

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

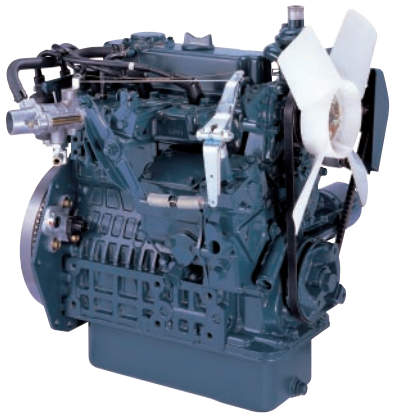
KUBOTA DG SERIES (3-cylinder)

DG972-E2

2 EPA Tier

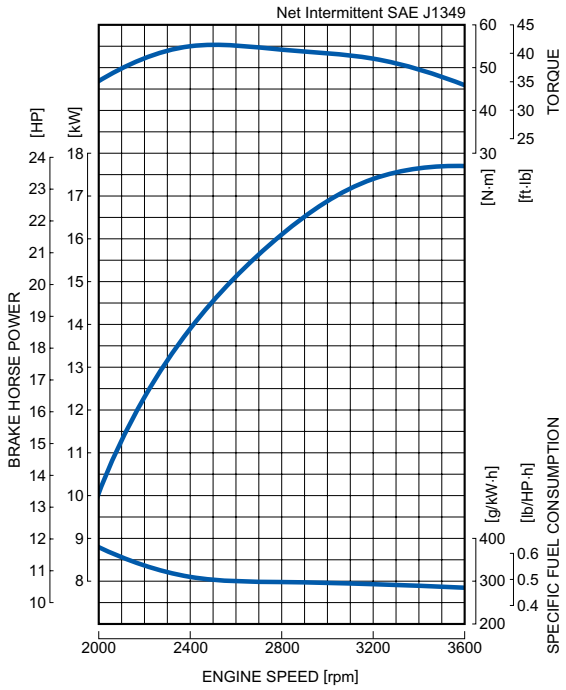
RATED POWER

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

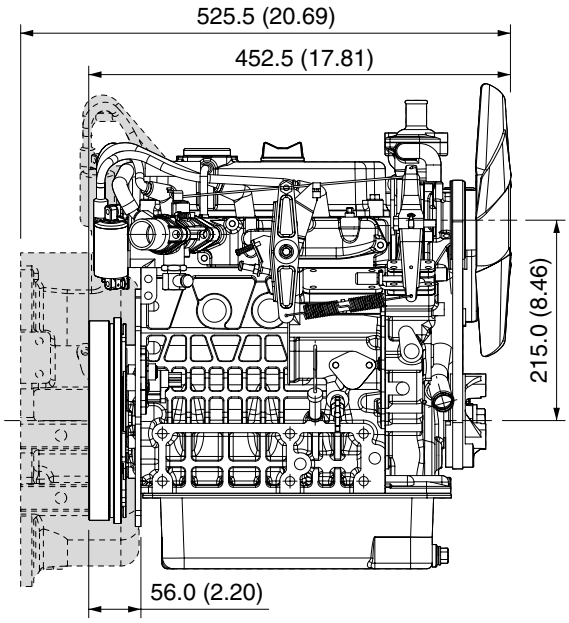
KUBOTA DG SERIES

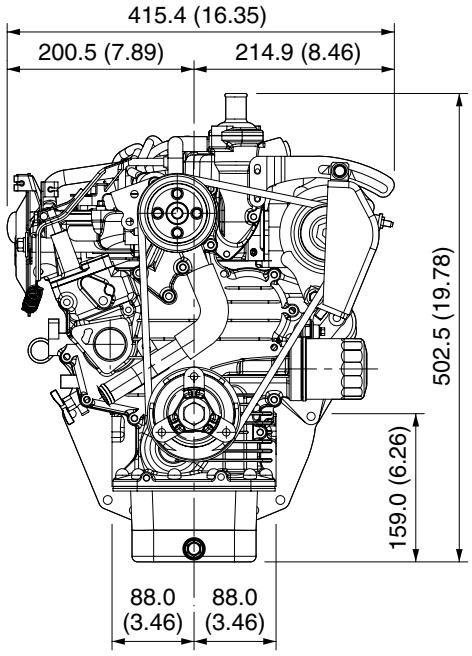
GENERAL SPECIFICATION

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