



October 12, 2015

Reference No. 082715

Mr. Jay Fedczak
Assistant Director of 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 Registration G70-A Modification Application
Rock Run Well Pad
Antero Resources Corporation**

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

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

1. Increase in condensate production.
2. Addition of 4 wells.
3. Addition of 4 gas production unit heaters.
4. Addition of 10 line heaters.
5. Addition of 4 condensate tanks.
6. Addition of 3 Cimarron enclosed combustors.

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.

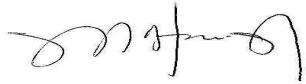
Enclosed are the following documents:

- Original copy of the G70-A General Permit Modification Application
- Two CD copies of the G70-A General Permit Modification Application
- The application fee with check no. 426122 in the amount of \$1,500.00

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

Sincerely,

GHD

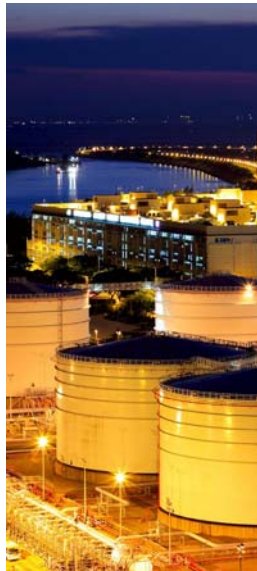
A handwritten signature in black ink, appearing to read 'Manuel Bautista', written in a cursive style.

Manuel Bautista

MB/ma/225

Encl.

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



General Permit Application G70-A Modification

Increase in production, and the addition of 4 wells, 4 gas production unit heaters, 10 line heaters, 4 condensate tanks, and 3 Cimarron enclosed combustors.

Rock Run Well Pad

Antero Resources Corporation

GHD Services, Inc.
6320 Rothway, Suite 100 Houston Texas 77040
082715 | Report No 225 | October 2015

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G70-A General Permit Modification

Attachment A	Current Business Certificate - No changes
Attachment B	Process Description
Attachment C	Description of Fugitive Emissions
Attachment D	Process Flow Diagram
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Attachment F	Area Map - No changes
Attachment G	Emission Unit Data Sheets/G70-A Section Applicability Form
Attachment H	Air Pollution Control Device Data Sheet
Attachment I	Emission Calculations
Attachment J	Class I Legal Advertisement
Attachment K	Electronic Submittal - Not Applicable
Attachment L	General Permit Modification Application Fee
Attachment M	Siting Criteria Waiver - Not Applicable
Attachment N	Material Safety Data Sheets - No changes
Attachment O	Emissions Summary Sheet
Attachment P	Other Supporting Documentation Not Described Above - No changes

* 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:

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

SECTION I. GENERAL INFORMATION

1. Name of applicant (as registered with the WV Secretary of State's Office): Antero Resources Corporation		2. Federal Employer ID No. (FEIN): 80-0162034	
3. Applicant's mailing address: 1615 Wynkoop Street Denver, CO, 80202		4. Applicant's physical address: 794 Tunnel Hill Rd. West Union, WV 26456	
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? <input type="checkbox"/> YES <input checked="" type="checkbox"/> 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.): Oil and Natural Gas Production facility	8a. Standard Industrial Classification Classification (SIC) code: 1311	AND	8b. North American Industry Classification System (NAICS) code: 211111
9. DAQ Plant ID No. (for existing facilities only): <u>017-00108</u>	10. List all current 45CSR13 and other General Permit numbers associated with this process (for existing facilities only): <u>G70-A058</u>		

A: PRIMARY OPERATING SITE INFORMATION

11A. Facility name of primary operating site: <u>Rock Run Well Pad</u>	12A. Address of primary operating site: Mailing: <u>N/A</u> Physical: <u>794 Tunnel Hill Rd. West Union, WV 26456</u>	
13A. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO – IF YES, please explain: <u>Antero is leasing the mineral rights for this site</u> _____ – 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 . At the intersection of Harrisville-Pullman Oxford Road/Co Rd 9 and Right-Fork-White Oak Road turn right on Harrisville-Pullman Oxford Road/Co Rd 9 and go for 3.4 miles. Entrance to the Facility will be on the left.		
15A. Nearest city or town: <u>West Union</u>	16A. County: <u>Doddridge</u>	17A. UTM Coordinates: Northing (KM): <u>4,350.6315</u> Easting (KM): <u>515.9808</u> Zone: <u>17N</u>
18A. Briefly describe the proposed new operation or change (s) to the facility: Increase in production, and the addition of 4 wells, 4 gas production unit heaters, 10 line heaters, 4 condensate tanks, and 3 Cimarron enclosed combustors.		19A. Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits): Latitude: <u>39.304923</u> Longitude: <u>-80.814648</u>

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

11B. Name of 1 st alternate operating site: _____ _____	12B. Address of 1 st alternate operating site: Mailing: _____ Physical: _____ _____	
13B. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? <input type="checkbox"/> YES <input type="checkbox"/> NO – 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 2 nd alternate operating site: _____	12C. Address of 2 nd alternate operating site: Mailing: _____ Physical: _____
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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: _____
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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: _____
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20. Provide the date of anticipated installation or change: <u>Upon issuance of the permit.</u> <input type="checkbox"/> If this is an After-The-Fact permit application, provide the date upon which the proposed change did happen: : _____/_____/_____	21. Date of anticipated Start-up if registration is granted: <u>Upon issuance of the permit.</u>
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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 _____ Date 10/12/2015
(please use blue ink) Authorized Representative (if applicable)

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

Rock Run Well Pad

Antero Resources Corporation

Doddridge County, West Virginia

A mixture of condensate, water, and entrained gas from the condensate and gas wells enters the facility through a series of line heaters (LH001-010) and gas production unit (GPU) heaters (H001-H010) which are 3-phase separators where the gas, condensate, and produced water are separated. The line heaters and GPUs are fueled by a slip stream of the separated gas. The separated gas from the three phase separators is metered and sent to the sales gas pipeline. The separated water flow to the produced water storage tanks (TANKPW001-002). The separated condensate is then sent to two phase low pressure separators where gas is further separated. The separated gas is routed to the compressor (ENG001), compressed, and sent to the sales gas line. The condensate from the two phase separators flow to the condensate storage tanks (TANKCOND001-010). The line heaters are only used during the first several months from start of production and will be removed once production has normalized.

The facility has ten (10) tanks (TANKCOND001-010) on site to store condensate and two (2) tanks (TANKPW001-002) to store produced water prior to removal from the site. The flashing, working and breathing losses from the tanks are routed to up to four enclosed combustors (EC001-004) to control the emissions. The enclosed combustor(s) that will be used to control emissions are designed to achieve a VOC destruction efficiency of 98 percent.

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

Emissions from the facility's emission sources were calculated using the extended analysis of the condensate and gas from Central No. 2H, one of the wells in Jonathan Davis Well Pad. These extended analyses are considered representative of the materials from Rock Run Well Pad, being in the same Marcellus rock formation.

Rock Run Well Pad calculation of potential to emit included all of the emission sources that belong to the same industrial grouping, are located on contiguous or adjacent properties, and are under the control of the same person. The nearest emission source that belongs to the same industrial grouping and under the control of the same person but not located on contiguous or adjacent property is the Diane Davis Well Pad. This is approximately 0.45 miles west of the facility.

Attachment C

Description of Fugitive Emissions

Attachment C

Description of Fugitive Emissions Rock Run Well Pad Antero Resources Corporation Doddridge County, West Virginia

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

Equipment Leaks

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

Pneumatic Control Valves

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

Loading Operations

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

Haul Road Emissions

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

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

FUGITIVE EMISSIONS SUMMARY	All Regulated Pollutants Chemical Name/CAS ¹	Maximum Potential Uncontrolled Emissions ²		Maximum Potential Controlled Emissions ³		Est. Method Used ⁴
		lb/hr	ton/yr	lb/hr	ton/yr	
Haul Road/Road Dust Emissions Paved Haul Roads	n/a					
Unpaved Haul Roads	PM, PM10, PM2.5	3.0733	4.0953	1.5367	2.0476	MB
Loading/Unloading Operations	VOCs	15.6547	11.9054	15.6547	11.9054	MB
	toluene (108883)	2.14E-03	1.63E-03	2.14E-03	1.63E-03	
	ethyl benzene (100414)	1.56E-03	1.19E-03	1.56E-03	1.19E-03	
	hexane (110543)	0.0364	0.0277	0.0364	0.0277	
	o,m,p-xylenes (95476,108383,106423)	3.83E-03	2.91E-03	3.83E-03	2.91E-03	
	CO2 Equivalent CO2 (124389), CH4	2.9289	2.9449	2.9289	2.9449	
	benzene (71432)	4.14E-04	3.16E-04	4.14E-04	3.16E-04	
	TAPs (benzene)	4.14E-04	3.16E-04	4.14E-04	3.16E-04	
Equipment Leaks (Components)	Benzene (71432)	Does not apply	0.0113	Does not apply	0.0113	MB
	Toluene (108883)		0.0976		0.0976	
	Ethyl benzene (100414)		0.1136		0.1136	
	Hexane (110543)		1.0263		1.0263	
	o,m,p-xylenes (95476,108383,106423)		0.2962		0.2962	
	CO2 Equivalent CO2 (124389)), CH4		367.1350		367.1350	
	VOCs		15.7930		15.7930	
	TAPs (benzene)		0.0113		0.0113	
Equipment Leaks (PCVs)	hexane (110543)	5.62E-03	0.0246	5.62E-03	0.0246	MB
	CO2 Equivalent CO2 (124389)), CH4	9.1343	40.0081	9.1343	40.0081	
	VOCs	0.0958	0.4194	0.0958	0.4194	

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

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

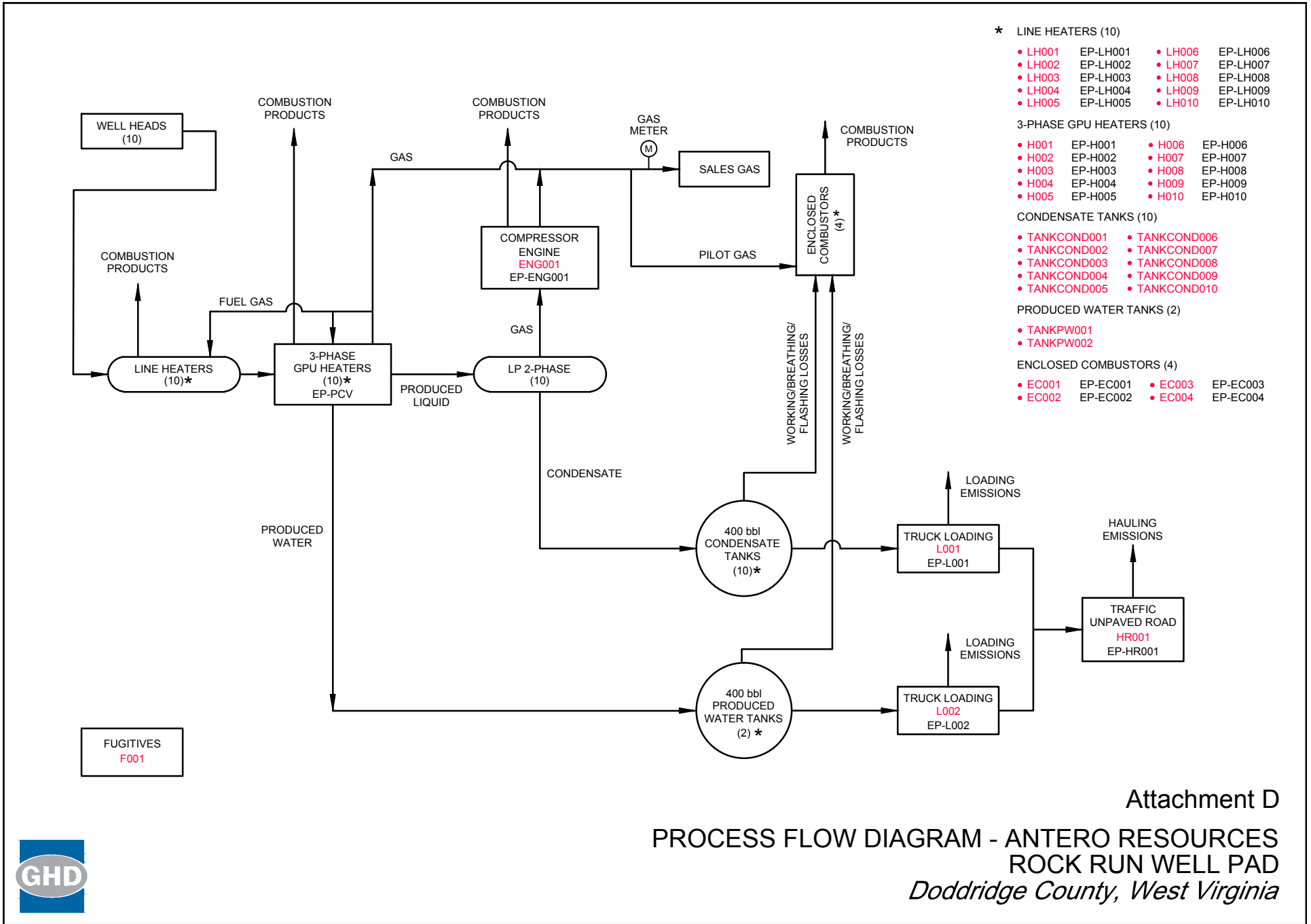
3 Give rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

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

Attachment C: Leak Source Data Sheet

Source Category	Pollutant	Number of Source Components (1)	Number of Components Monitored by Frequency (2)	Average Time to Repair (days) (3)	Estimated Annual Emission Rate (lb/yr) (4)
Pumps (5)	light liquid VOC ^(6,7)				
	heavy liquid VOC ⁸				
	Non-VOC ⁹				
Valves (10)	Gas VOC	500		First attempt within 5 days of detection and final repair within 15 days	7,081.25
	Light Liquid VOC	520		First attempt within 5 days of detection and final repair within 15 days	23,973.82
	Heavy Liquid VOC	--			--
	Non-VOC	--			--
Safety Relief Valves (11)	Gas VOC	See Valves		First attempt within 5 days of detection and final repair within 15 days	see Valves
	Non VOC	See Valves		First attempt within 5 days of detection and final repair within 15 days	see Valves
Open-ended Lines (12)	VOC				
	Non-VOC				
Sampling Connections (13)	VOC				
	Non-VOC				
Compressors	VOC				
	Non-VOC				
Flanges	VOC	130		First attempt within 5 days of detection and final repair within 15 days	159.56
	Non-VOC			First attempt within 5 days of detection and final repair within 15 days	817.53
Other	VOC	590		First attempt within 5 days of detection and final repair within 15 days	371.37
	Non-VOC				1,902.72

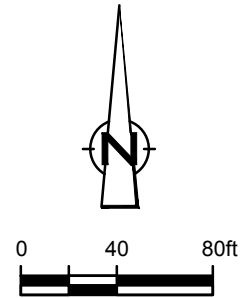
Attachment D Process Flow Diagram



Attachment E Plot Plan

LEGEND

- EXISTING WELL LOCATION
- ☀ PROPOSED WELL LOCATION



ENCLOSED
COMBUSTORS
EC001 (EP-EC001)
EC002 (EP-EC002)
EC003 (EP-EC003)
EC004 (EP-EC004)

TANK COND001 TANK COND007
TANK COND002 TANK COND008
TANK COND003 TANK COND009
TANK COND004 TANK COND010
TANK COND005 TANK PW001
TANK COND006 TANK PW002

PW
L001
L002
(EP-L001,
EP-L002)

HAULING
ROUTE
(EP-HR001)
HR001

FACILITY
FUGITIVES
F001

○ DEVONIAN UNIT 3H
○ DEVONIAN UNIT 2H
○ DEVONIAN UNIT 1H
○ WENTZ UNIT 2H
○ WENTZ UNIT 1H
○ TWYFORD UNIT 2H
○ TWYFORD UNIT 1H
☀ PROPOSED WELL
☀ PROPOSED WELL
☀ PROPOSED WELL

PRODUCTION
EQUIPMENT
(EP-PCV)

COMPRESSOR
ENGINE
ENG001
(EP-ENG001)

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

ACCESS ROAD



Attachment E
PLOT PLAN
ROCK RUN PAD
ANTERO RESOURCES
Doddridge County, West Virginia

Attachment G
G70-A Section Applicability Form/
Emission Unit Data Sheets

General Permit G70-A Registration Section Applicability Form

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

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

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

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

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

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

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:	
47-017-06476-00	
47-017-06402-00	
47-017-06718-00	
47-017-06719-00	
47-017-06720-00	
5 wells not permitted.	

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 Device⁴
H001, H002, H003, H004, H005, H006, H007, H008, H009, H010	EP-H001, EP-H002, EP-H003, EP-H004, EP-H005, EP-H006, EP-H007, EP-H008, EP-H009, EP-H010	Gas Production Unit Heaters	6-2014; 4-2015	1.5 MMBtu/hr (each)	New	N/A
LH001, LH002, LH003, LH004, LH005, LH006, LH007, LH008, LH009, LH010	EP-LH001, EP-LH002, EP-LH003, EP-LH004, EP-LH005, EP-LH006, EP-LH007, EP-LH008, EP-LH009, EP-LH010	Line Heaters	2015	2.0 MMBtu/hr (each)	New	N/A
F001	F001	Fugitives	2014-2015	N/A	New	N/A
TANKCOND001-010	EP-EC001, EP-EC002, EP-EC003, EP-EC004,	Condensate Tank F/W/B	6-2014; 4-2015	400 bbl each	New	EC001, EC002, EC003, EC004,
TANKPW001-002	EP-EC001, EP-EC002, EP-EC003, EP-EC004,	PW Tank F/W/B	2014	400 bbl each	New	EC001, EC002, EC003, EC004,
L001	EP-L001	Loading (Condensate)	2014	200 bbl capacity (each)	New	N/A
L002	EP-L002	Loading (Water)	2014	200 bbl capacity (each)	New	N/A
HR001	EP-HR001	Haul Truck	2014	40 ton capacity	New	N/A
EC001, EC002, EC003, EC004,	EP-EC001, EP-EC002, EP-EC003, EP-EC004,	Enclosed Combustor	1-2014; 3-2015	90scf/min	New	EC001, EC002, EC003, EC004,
PCV	EP-PCV	Pneumatic CV	2014-2015	6.6 scf/day/PCV	New	N/A
ENG001	EP-ENG001	Compressor Engine	2014	24 HP	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 COND TANK	2. Tank Name TANKCOND001-010
3. Emission Unit ID number TANKCOND001-010	4. Emission Point ID number EP-EC001, EP-EC002, EP-EC003, EP-EC004,
5. Date Installed or Modified (for existing tanks) 6-2014; 4-2015	6. Type of change: New
7A. Description of Tank Modification (if applicable) NA	
7B. Will more than one material be stored in this tank? If so, a separate form must be completed for each material. No	
7C. Provide any limitations on source operation affecting emissions. (production variation, etc.)	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. 400bbbls	
9A. Tank Internal Diameter (ft.) 12	9B. Tank Internal Height (ft.) 20
10A. Maximum Liquid Height (ft.) 18	10B. Average Liquid Height (ft.) 10
11A. Maximum Vapor Space Height (ft.) 18	11B. Average Vapor Space Height (ft.) 10
12. Nominal Capacity (specify barrels or gallons) . This is also known as "working volume." 400bbbls	
13A. Maximum annual throughput (gal/yr) 15,330,000	13B. Maximum daily throughput (gal/day) 42,000
14. Number of tank turnovers per year 92	15. Maximum tank fill rate (gal/min) 168
16. Tank fill method: Splash Fill	
17. Is the tank system a variable vapor space system? No If yes, (A) What is the volume expansion capacity of the system (gal)? (B) What are the number of transfers into the system per year?	
18. Type of tank (check all that apply): <input checked="" type="checkbox"/> Fixed Roof <input checked="" type="checkbox"/> vertical horizontal <input checked="" type="checkbox"/> flat roof cone roof dome roof other (describe) External Floating Roof pontoon roof double deck roof Domed External (or Covered) Floating Roof Internal Floating Roof vertical column support self-supporting Variable Vapor Space lifter roof diaphragm Pressurized spherical cylindrical Underground Other (describe)	

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

Refer to enclosed TANKS Summary Sheets

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

IV. SITE INFORMATION (check which one applies)

Refer to enclosed TANKS Summary Sheets

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

V. LIQUID INFORMATION (check which one applies)

Refer to enclosed TANKS Summary Sheets

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

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

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

VI. EMISSIONS AND CONTROL DEVICE DATA (required)

40. Emission Control Devices (check as many as apply):
 Does Not Apply Rupture Disc (psig)
 Carbon Adsorption¹ Inert Gas Blanket of _____
 Vent to Vapor Combustion Device¹ (vapor combustors, flares, thermal oxidizers) Condenser¹
 Conservation Vent (psig)
 Other¹ (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	
<i>Please see Tables 6 and 7</i>									

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: 6-2014; 4-2015	
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 (ft ²):	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: West Union, WV			
28. Daily Avg. Ambient Temperature (°F): 51.7		29. Annual Avg. Maximum Temperature (°F): 63.8	
30. Annual Avg. Minimum Temperature (°F): 39.5		31. Avg. Wind Speed (mph): 5.9	
32. Annual Avg. Solar Insulation Factor (BTU/ft ² -day): 1030.235999		33. Atmospheric Pressure (psia): 14.8	
LIQUID INFORMATION:			
34. Avg. daily temperature range of bulk liquid (°F): 51.7		34A. Minimum (°F): 39.5	34B. Maximum (°F): 63.8
35. Avg. operating pressure range of tank (psig): 0		35A. Minimum (psig): 0	35B. Maximum (psig): 0
36A. Minimum liquid surface temperature (°F): 39.5		36B. Corresponding vapor pressure (psia): 1.5694	
37A. Avg. liquid surface temperature (°F): 51.7		37B. Corresponding vapor pressure (psia): 2.0373	
38A. Maximum liquid surface temperature (°F): 63.8		38B. Corresponding vapor pressure (psia): 2.6074	
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):	5.49		
39D. Liquid molecular weight (lb/lb-mole):	83.0		
39E. Vapor molecular weight (lb/lb-mole):	45.92		
39F. Maximum true vapor pressure (psia):	3.0683		
39G. Max Reid vapor pressure (psi):	4.41000		
39H. Months Storage per year. From:	year round		
To:			

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

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

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name PWTANK	2. Tank Name TANKPW001-002
3. Emission Unit ID number TANKPW001-002	4. Emission Point ID number EP-EC001, EP-EC002, EP-EC003, EP-EC004,
5. Date Installed or Modified (for existing tanks) 2014	6. Type of change: New
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) 30,660,000	13B. Maximum daily throughput (gal/day) 84,000
14. Number of tank turnovers per year 913	15. Maximum tank fill rate (gal/min) 168
16. Tank fill method Splash Fill	
17. Is the tank system a variable vapor space system? No If yes, (A) What is the volume expansion capacity of the system (gal)? (B) What are the number of transfers into the system per year?	
18. Type of tank (check all that apply): <input checked="" type="checkbox"/> Fixed Roof <input checked="" type="checkbox"/> vertical horizontal <input checked="" type="checkbox"/> flat roof cone roof dome roof other (describe) External Floating Roof pontoon roof double deck roof Domed External (or Covered) Floating Roof Internal Floating Roof vertical column support self-supporting Variable Vapor Space lifter roof diaphragm Pressurized spherical cylindrical Underground Other (describe)	

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

Refer to enclosed TANKS Summary Sheets

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

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IV. SITE INFORMATION (check which one applies)

Refer to enclosed TANKS Summary Sheets

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

--

V. LIQUID INFORMATION (check which one applies)

Refer to enclosed TANKS Summary Sheets

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

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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 Adsorption¹ Inert Gas Blanket of _____
 Vent to Vapor Combustion Device¹ (vapor combustors, flares, thermal oxidizers) Condenser¹
 Conservation Vent (psig)
 Other¹ (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	
<i>Please see Tables 6 and 7</i>									

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 (ft ²):	
		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: West Union, WV			
28. Daily Avg. Ambient Temperature (°F): 51.7		29. Annual Avg. Maximum Temperature (°F): 63.8	
30. Annual Avg. Minimum Temperature (°F): 39.5		31. Avg. Wind Speed (mph): 5.9	
32. Annual Avg. Solar Insulation Factor (BTU/ft ² -day): 1030.235999		33. Atmospheric Pressure (psia): 14.8	
LIQUID INFORMATION:			
34. Avg. daily temperature range of bulk liquid (°F): 51.7		34A. Minimum (°F): 39.5	34B. Maximum (°F): 63.8
35. Avg. operating pressure range of tank (psig): 0		35A. Minimum (psig): 0	35B. Maximum (psig): 0
36A. Minimum liquid surface temperature (°F): 39.5		36B. Corresponding vapor pressure (psia): 0.1837	
37A. Avg. liquid surface temperature (°F): 51.7		37B. Corresponding vapor pressure (psia): 0.2596	
38A. Maximum liquid surface temperature (°F): 63.8		38B. Corresponding vapor pressure (psia): 0.3600	
39. Provide the following for each liquid or gas to be stored in the tank. Add additional pages if necessary.			
39A. Material name and composition:	Produced Water		
39B. CAS number:	mix of HC and water		
39C. Liquid density (lb/gal):	8.33		
39D. Liquid molecular weight (lb/lb-mole):	18.0157		
39E. Vapor molecular weight (lb/lb-mole):	18.4003		
39F. Maximum true vapor pressure (psia):	0.4467		
39G. Max Reid vapor pressure (psi):	1.02323		
39H. Months Storage per year. From:	year round		
To:			

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

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

Emission Unit ID # ¹	Emission Point ID# ²	Emission Unit Description (Manufacturer / Model #)	Year Installed/ Modified	Type ³ and Date of Change	Control Device ⁴	Design Heat Input (mmBtu/hr) ⁵	Fuel Heating Value (Btu/scf) ⁶
H001	EP-H001	Gas Production Unit Heater	2014	New	--	1.50	1,221.91
H002	EP-H002	Gas Production Unit Heater	2014	New	--	1.50	1,221.91
H003	EP-H003	Gas Production Unit Heater	2014	New	--	1.50	1,221.91
H004	EP-H004	Gas Production Unit Heater	2014	New	--	1.50	1,221.91
H005	EP-H005	Gas Production Unit Heater	2014	New	--	1.50	1,221.91
H006	EP-H006	Gas Production Unit Heater	2014	New	--	1.50	1,221.91
H007	EP-H007	Gas Production Unit Heater	2015	New	--	1.50	1,221.91
H008	EP-H008	Gas Production Unit Heater	2015	New	--	1.50	1,221.91
H009	EP-H009	Gas Production Unit Heater	2015	New	--	1.50	1,221.91
H010	EP-H010	Gas Production Unit Heater	2015	New	--	1.50	1,221.91
LH001	EP-LH001	Line Heater	2015	New	--	2.00	1,221.91
LH002	EP-LH002	Line Heater	2015	New	--	2.00	1,221.91
LH003	EP-LH003	Line Heater	2015	New	--	2.00	1,221.91
LH004	EP-LH004	Line Heater	2015	New	--	2.00	1,221.91
LH005	EP-LH005	Line Heater	2015	New	--	2.00	1,221.91
LH006	EP-LH006	Line Heater	2015	New	--	2.00	1,221.91
LH007	EP-LH007	Line Heater	2015	New	--	2.00	1,221.91
LH008	EP-LH008	Line Heater	2015	New	--	2.00	1,221.91
LH009	EP-LH009	Line Heater	2015	New	--	2.00	1,221.91
LH010	EP-LH010	Line Heater	2015	New	--	2.00	1,221.91
ENG001	EP-ENG001	Compressor Engine (Kubota)	2014	New	--	24HP	1,221.91
EC001	EP-EC001	Enclosed Combustor (Cimarron 48")	2014	New	EC001	12	1,221.91
EC002	EP-EC002	Enclosed Combustor (Cimarron 48")	2015	New	EC002	12	1,221.91
EC003	EP-EC003	Enclosed Combustor (Cimarron 48")	2015	New	EC003	12	1,221.91
EC004	EP-EC004	Enclosed Combustor (Cimarron 48")	2015	New	EC004	12	1,221.91

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		2014	
Engine Manufactured/Reconstruction Date		2013	
Is this engine subject to 40CFR60, Subpart JJJJ?		Yes	
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60, Subpart JJJJ? (Yes or No)		Yes	
Is this engine subject to 40CFR63, Subpart ZZZZ? (yes or no)		Yes	
Engine, Fuel and Combustion Data	Engine Type	RB4S	
	APCD Type	-	
	Fuel Type	RG	
	H ₂ S (gr/100 scf)	0	
	Operating bhp/rpm	16.5 HP @ 2400 rpm	
	BSFC (Btu/bhp-hr)	9773	
	Fuel throughput (ft ³ /hr)	193	
	Fuel throughput (MMft ³ /yr)	1.6907	
	Operation (hrs/yr)	8760	
Reference	Potential Emissions	lbs/hr	tons/yr
MD	NO _x	0.3158	1.3831
MD	CO	5.6445	24.7228
AP	VOC	0.0070	0.0305
AP	SO ₂	0.0001	0.0006
AP	PM ₁₀	0.0022	0.0098
AP	Formaldehyde	0.0048	0.0211
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 processing facility. 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: 2		5B. Number of liquids loaded: 2		5C. Maximum number of tank trucks loading at one time: 2	
6. Describe cleaning location, compounds and procedure for tank trucks: For hire tank trucks are used and are cleaned at the operator's dispatch terminal. These trucks are in dedicated service and cleaned only prior to repair or leak tests. Cleaning materials include water, steam, detergent, and solvents which are applied using hand held pressurized spray nozzles.					
7. Are tank trucks pressure tested for leaks at this or any other location? 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	7	7	7	7	
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)		42	84		
Max. annual throughput (1000 gal/yr)		15,330.00	30,660.00		
Loading Method ¹		BF	BF		
Max. Fill Rate (gal/min)		168	168		
Average Fill Time (min/loading)		50	50		
Max. Bulk Liquid Temperature (°F)		72.1	72.1		
True Vapor Pressure ²		3.07	0.45		
Cargo Vessel Condition ³		U	U		
Control Equipment or Method ⁴		None	None		
Minimum collection efficiency (%)		0	0		
Minimum control efficiency (%)		0	0		
Maximum	Loading (lb/hr)	19.96	1.16		
Emission Rate	Annual (ton/yr)	15.18	1.77		
Estimation Method ⁵		Promax	Promax		
Notes:					
1 BF = Bottom Fill SP = Splash Fill SUB = Submerged Fill					
2 At maximum bulk liquid temperature					
3 B = Ballasted Vessel, C = Cleaned, U = Uncleaned (dedicated service), O = other (describe)					
4 List as many as apply (complete and submit appropriate Air Pollution Control Device Sheets as Attachment "H"): CA = Carbon Adsorption VB = Dedicated Vapor Balance (closed system) ECD = Enclosed Combustion Device F = Flare TO = Thermal Oxidation or Incineration					
5 EPA = EPA Emission Factor as stated in AP-42					
10. Proposed Monitoring, Recordkeeping, Reporting, and Testing					
MONITORING			RECORDKEEPING		
1) Visual inspection to ensure that loading connections from storage tanks to trucks are leak-free.			1) Maintain records of condensate transferred from storage tanks.		
			2) Maintain records of produced water transferred from storage tanks.		
REPORTING			TESTING		
N/A			N/A		
11. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty: N/A					

Attachment H

Air Pollution Control Device Data Sheet

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

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

IMPORTANT: READ THE INSTRUCTIONS ACCOMPANYING THIS FORM BEFORE COMPLETING.			
General Information			
1. Control Device ID#: EC001, EC002, EC003, EC004,	2. Installation Date: 1-2014; 3-2015		
3. Maximum Rated Total Flow Capacity: 131,000 scfd	4. Maximum Design Heat Input: 12 MMBtu/hr	5. Design Heat Content: 2300BTU/scf	
Control Device Information			
6. Select the type of vapor combustion control device being used: Enclosed Combustor			
7. Manufacturer: Model No. Cimarron, Model No. 48" HV ECD		8. Hours of operation per year: 8760	
9. List the emission units whose emissions are controlled by this vapor combustion control device: (Emission Point ID#:)			
10. Emission Unit ID#	Emission Source Description:	Emission Unit ID#	Emission Source Description:
TANKCOND001-010	Condensate Tank		
TANKPW001-002	PW Tanks		
<i>If this vapor combustor controls emissions from more than six emission units, please attach additional pages.</i>			
11. Assist Type		12. Flare Height (ft)	13. Tip Diameter (ft)
Steam - Air - Pressure - <input checked="" type="checkbox"/> Non -		25ft	3.33
14. Was the design per §60.18? Yes			
Waste Gas Information			
15. Maximum waste gas flow rate (scfm):	16. Heat value of waste gas stream (BTU/ft ³)	17. Temperature of the emissions stream (°F)	18. Exit Velocity of the emissions stream (ft/s)
105.40	2,372.37	900	1.74E-01
19. Provide an attachment with the characteristics of the waste gas stream to be burned.			
Pilot Information			
20. Type/Grade of pilot fuel:	21. Number of pilot lights:	22. Fuel flow rate to pilot flame per pilot (scf/hr):	23. Heat input per pilot (BTU/hr):
Natural Gas	1	12.6	12800
24. Will automatic re-ignition be used? Yes			
25. If automatic re-ignition will be used, describe the method: Based on a monitoring system			
26. Describe the method of controlling flame: Flame Rectification, a thermocouple equivalent			
27. Is pilot flame equipped with a monitor to detect the presence of the flame? Yes		28. If yes, what type? Thermocouple	
29. Pollutant(s) Controlled		30. % Capture Efficiency	31. Manufacturer's Guaranteed Control Efficiency (%)
F/W/B Emissions from TANKCOND		100	98
F/W/B Emissions from TANKPW		100	98

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

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

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

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

MONITORING

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

RECORDKEEPING

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

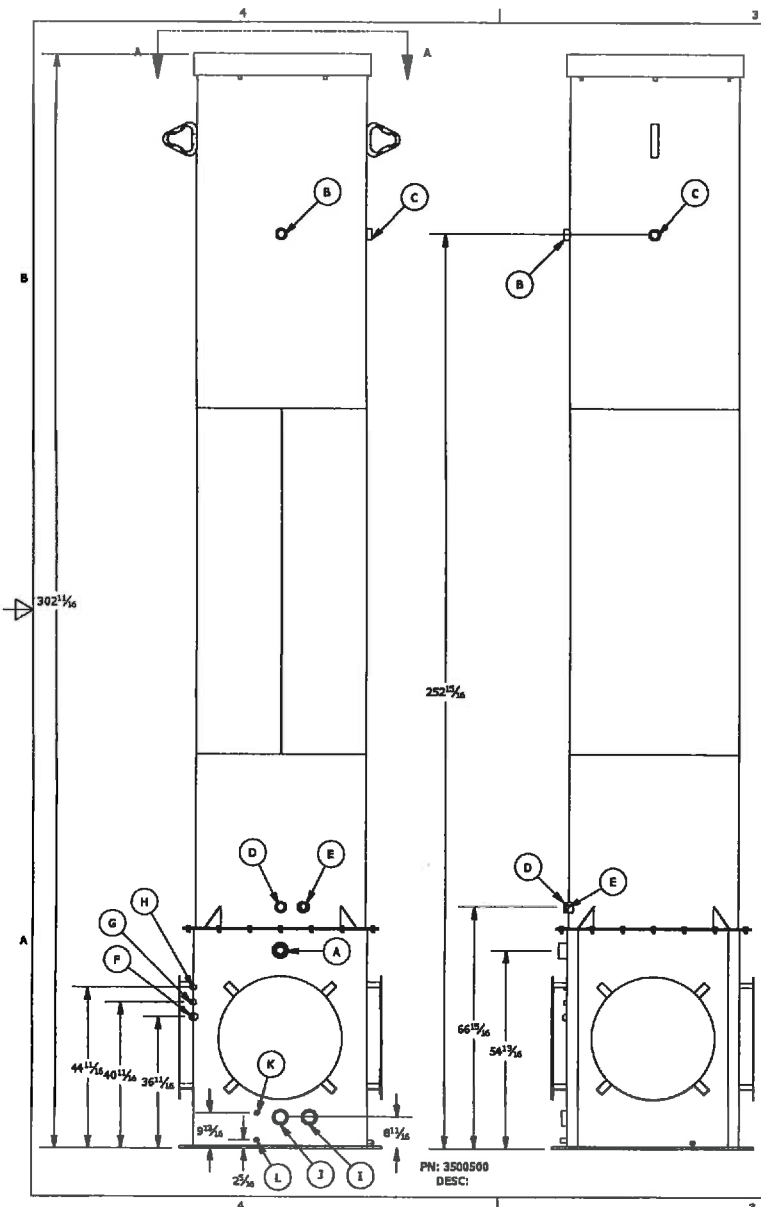
REPORTING

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

34. Additional Information Attached? **YES**

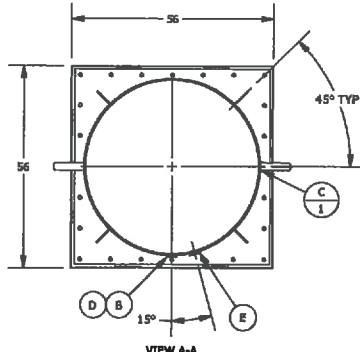
*Please attach a copy of manufacturer's data sheet. Please attach a copy of manufacturer's drawing.
Please attach a copy of the manufacturer's performance testing.*

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



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

- * >98% TVOC DRE, CERTIFIED USEPA 40 CFR 60, APPENDIX A, SOURCE EMISSIONS TEST METHODS REFERENCED. MEETS ALL EPA & CDPHE REGULATIONS.
- * DESTROYS OIL/CONDENSATE PRODUCTION TANK VAPORS W/ NO VISIBLE FLAME.
- * EXCELLENT OPACITY AND SMOKELESS OPERATION.
- * RELIABLE AND CUSTOMIZABLE IGNITION.
- * VERY LOW CAPITAL AND OPERATING COST.
- * EASY TO OPERATE AND MAINTAIN.
- * FIELD TESTED TO DESTROY UP TO 119.5 MDSCFD (131 MCFD) @ 10 oz/in²; 2300 BTU/CF WASTE GAS (SG 1.45)
- * STRUCTURE CERTIFIED FOR 90 MPH 3-SEC WIND GUST PER ASCE 7-05 & IBC 2006 STANDARDS. HIGHER WIND LOAD RATED STRUCTURES AVAILABLE.



PN: 3500500
DESC:

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

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

APPROVED FOR A.S.M.E CODE, SECTION VIII DIV 1
ED, ADDENDA BY, DATE

CIMARRON
Energy Inc.

TITLE:
48" HIGH VOLLUME BCD

DATE: _____ WO No.: _____ SHEET: 1 OF 1

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

Attachment I Emission Calculations

Table 1

**Facility Information
Rock Run 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	Rock Run Well Pad
Nearest City/Town	West Union
API Number/SIC Code	1311
Latitude/Longitude	39.304923, -80.814648
County	Doddridge County

Technical Information	
Max Condensate Site Throughput (bbl/day):	1,000
Max Produced Water Site Throughput (bbl/day):	2,000
Are there any sour gas streams at this site?	No
Is this site currently operational/producing?	Yes

Equipment/Processes at Site	
Equipment/Process Types	How many for this site?
Fugitives	10
IC Engines	1
Gas Production Unit Heaters	10
Line Heaters	10
Condensate Tanks	10
Produced Water Tanks	2
Loading Jobs	2
Enclosed Combustors	4

Table 2

**Uncontrolled/Controlled Emissions Summary
Rock Run 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, Line Heaters)																								
Fugitive Emissions (Component Count, PCV and Hauling) ¹	3.7015	16.2124			92.955	407.14							1.3830	1.8429			0.3584	1.5697	0.0026	0.0113	6.76E-02	2.96E-01		
Flashing, Working and Breathing (F/W/B) Losses ²	596.76	2,613.8			541.2	2,370.4											22.668	99.284	0.2954	1.2940	0.5727	2.5083		
Engine Emissions ³	0.0070	0.0305	0.3158	1.3831	27.22	119.21	5.6445	24.7228	0.0001	0.0006	0.0023	0.0102	0.0022	0.0098			0.0054	0.0236	0.0004	0.0016	4.59E-05	2.01E-04	0.0048	0.0211
Gas Production Unit Heater Emissions ⁴	0.0675	0.2957	1.2276	5.3768	1,473.10	6,452.19	1.0312	4.5165	0.0074	0.0323	0.0933	0.4086	0.0933	0.4086	6.14E-06	2.69E-05	2.31E-02	1.01E-01	2.58E-05	1.13E-04			0.0009	0.0040
Line Heater Emissions ⁴	0.0900	0.3943	1.6368	7.1691	1,964.14	8,602.92	1.3749	6.0220	0.0098	0.0430	0.1244	0.5449	0.1244	0.5449	8.18E-06	3.58E-05	3.08E-02	1.35E-01	3.44E-05	1.51E-04			0.0012	0.0054
TOTALS:	600.6268	2630.7454	3.1801	13.9290	4098.5951	17951.8465	8.0505	35.2614	0.0173	0.0759	0.2200	0.9637	1.6029	2.8062	1.43E-05	6.27E-05	23.0853	101.1134	0.2985	1.3072	0.6403	2.8047	0.0070	0.0305

UNCONTROLLED (Truck Loading Emissions)																								
Truck Loading Emissions ⁵	15.655	11.905			2.929	2.945											0.0443	0.0337	4.14E-04	3.16E-04	0.0038	0.0029		

CONTROLLED EMISSIONS																								
Enclosed Combustor Emissions (from F/W/B losses) ⁶	11.9355	52.2775	0.6375	2.7920	2277.2906	9974.5326	0.5355	2.3453	3.02E-05	1.32E-04	0.0363	0.1591	0.0484	0.2122	3.19E-06	1.40E-05	0.4534	1.9861	5.91E-03	2.59E-02	0.0115	0.0502	3.78E-06	1.66E-05
Controlled Fugitive Emissions from Hauling													0.6915	0.9214										
TOTALS:	11.9355	52.2775	0.6375	2.7920	2277.2906	9974.5326	0.5355	2.3453	3.02E-05	1.32E-04	0.0363	0.1591	0.7399	1.1336	3.19E-06	1.40E-05	0.4534	1.9861	0.0059	0.0259	0.0115	0.0502	3.78E-06	1.66E-05

POTENTIAL TO EMIT⁷																								
	15.8015	81.1158	3.8176	16.7211	5834.7036	25558.9467	8.5860	37.6067	0.0174	0.0760	0.2564	1.1228	0.9599	2.0969	1.75E-05	7.67E-05	0.8711	3.8493	0.0089	0.0394	0.0791	0.3495	0.0070	0.0305

Enter any notes here:	<p>1 - See Tables 4 and 5 for fugitive emission calculations; Table 12 for PM emissions from hauling.</p> <p>2 - See Tables 6 and 7 for tanks emission calculations</p> <p>3 - See Table 13 for engine emissions</p> <p>4 - See Table 9 for gas production unit heater and line heaters emission calculations</p> <p>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 1000 barrels per day, VOC emissions would be 15.6547 pounds per hour when there are truck loading activities. Average hourly VOC emissions from truck loading is 2.7181 pound per hour.</p> <p>6 - See Table 10 and 11 for enclosed combustion emission calculations.</p> <p>7 - The hourly potential to emit is the sum of emissions from gas production unit heaters, line heaters, engine, storage tanks, fugitives and enclosed combustors. Does not include emissions from loading (see footnote 5). The total TPY PTE is the sum of all emissions. PM 10 TPY is the sum of uncontrolled hauling and other PM10 sources.</p>																							
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Table 3

**Permits Summary
Rock Run Well Pad
Doddridge County, West Virginia
Antero Resources Corporation**

Pollutant		Emissions			Threshold Exceeded?	
		Uncontrolled	Controlled	Threshold	Uncontrolled	Controlled
VOC	lbs/hr	600.6268	15.8015	6	Yes	Yes
	tons/yr	2642.6508	81.1158	10	Yes	Yes
NO _x	lbs/hr	3.1801	3.8176	6		
	tons/yr	13.9290	16.7211	10	Yes	Yes
CO	lbs/hr	8.0505	8.5860	6	Yes	Yes
	tons/yr	35.2614	37.6067	10	Yes	Yes
SO ₂	lbs/hr	0.0173	0.0174	6		
	tons/yr	0.0759	0.0760	10		
PM _{2.5}	lbs/hr	0.2200	0.2564	6		
	tons/yr	0.9637	1.1228	10		
PM ₁₀	lbs/hr	1.6029	0.9599	6		
	tons/yr	2.8062	2.0969	10		
Lead	lbs/hr	1.43E-05	1.75E-05	6		
	tons/yr	6.27E-05	7.67E-05	10		
Total HAPs	lbs/hr	23.0853	0.8711	2	Yes	
	tons/yr	101.1472	3.8493	5	Yes	
Total TAPs	lbs/hr	0.3054	0.0159	1.14		
n-Hexane	lbs/hr	21.0924	0.7076			
	tons/yr	92.4126	3.1269			
Toluene	lbs/hr	0.7427	0.0369			
	tons/yr	3.2547	0.1634			
Ethylbenzene	lbs/hr	0.3043	0.0315			
	tons/yr	1.3339	0.1392			
Xylenes	lbs/hr	0.6403	0.0791			
	tons/yr	2.8076	0.3495			
Benzene	lbs/hr	0.2985	0.0089			
	tons/yr	1.3076	0.0394			

Enter any notes here:	<p>1. Emissions are based on 98% Enclosed Combustor DRE operating 100% of the time. 2. Please see Attachment C/O- Fugitive Emissions Data Summary Sheet and Attachment O – Emission Points Data Summary Sheet for sitewide sources and breakdown of emission quantities.</p>
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Table 4

**Fugitive Emissions
Rock Run 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	0.163
	n-Hexane	0.010
	Methane	0.623

Gas					
Number	Component	Pollutant	Emission Factor (kg/hr of THC per component)	kg/hr	lb/yr
500	Valves	Gas VOC	0.004500	0.37	7,081.25
		Non VOC	0.004500	1.88	36,280.75
590	Connectors	VOC	0.000200	0.02	371.37
		Non-VOC	0.000200	0.10	1,902.72
130	Flanges	VOC	0.000390	0.01	159.56
		Non-VOC	0.000390	0.04	817.53
Total VOCs:				0.39	7,612.18
Total THC:				2.42	46,613.19

Light Liquid Weight Fraction From Analysis:	VOC frac	0.957
	Benzene frac	0.001
	Toluene	0.008
	Ethylbenzene	0.009
	Xylenes	0.024
	n-hexane	0.064
	Methane	0.013

Light Liquid					
Number	Component	Pollutant	Emission Factor (kg/hr of THC per component)	kg/hr	lb/yr
520	Valves	Light Liquid VOC	0.002500	1.24	23,973.82
		Light Liquid Non-VOC		0.06	1,079.78
Total VOC:				1.24	23,973.82
Total THC:				1.30	25,053.60

Fugitive Total Emissions			
	Annual Emissions (lb/yr)	Annual Emissions (lb/hr)	Annual Emissions (tpy)
VOC	31,586.00	3.61	15.79
Ethylbenzene		0.03	0.11
Toluene		0.02	0.10
Xylenes		0.07	0.30
n-Hexane		0.23	1.03
TAPs (Benzene)		0.00	0.01
HAPs		0.35	1.55
CO _{2e}	734,270.00	83.82	367.14

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

Table 5

**Pneumatic Control Valve Emissions
Rock Run Well Pad
Doddridge County, West Virginia
Antero Resources Corporation**

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

Component	Mol%	Molecular Weight (lb/lb-mole)	Component Flow (scf/day)	Component Moles (lb-moles)	Component Emissions		
					(lbs/day)	(lbs/hr)	(tons/year)
Nitrogen	0.3949	14.01	1.042536	2.75E-03	0.04	1.60E-03	0.01
Carbon Dioxide	0.1866	44.01	0.492624	1.30E-03	0.06	2.38E-03	0.01
Methane	78.5619	16.04	207.403416	0.55	8.77	0.37	1.60
Ethane	14.3741	30.07	37.947624	0.10	3.01	0.13	0.55
Propane	4.2467	44.1	11.211288	0.03	1.30	0.05	0.24
Isobutane	0.508	58.12	1.34112	3.53E-03	0.21	0.01	0.04
n-Butane	1.0206	58.12	2.694384	0.01	0.41	0.02	0.08
Isopentane	0.2715	72.15	0.71676	1.89E-03	0.14	0.01	0.02
n-Pentane	0.2111	72.15	0.557304	1.47E-03	0.11	4.41E-03	0.02
n-Hexane	0.225	86.18	0.594	1.57E-03	0.13	0.01	0.02

	lb/hr	tpy
VOC Emissions	0.0958	0.4194
n-Hexane Emissions	0.0056	0.0246
HAPs Emissions	0.0056	0.0246
CO _{2e} emissions	9.1343	40.0081

Enter any notes here:	<p>1. PCV bleed rate obtained from the user manual for PCV http://issuu.com/rmcprocesscontrols/docs/mizer-pilot-operation--parts---installation-manual</p> <p>2. Emissions per hour= Mol % x no. of PCV x bleed rate x MW / 379.48 / 24</p>
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Table 6

Uncontrolled Flashing Emissions
Rock Run Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

# Hours Operational	8760
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	Condensate Tank Flashing Losses			Produced Water Tank Flashing Losses		
	Vapor Mass Fraction wt%	Flashing Losses		Vapor Mass Fraction wt%	Flashing Losses	
		lbs/hr	tpy		lbs/hr	tpy
Water	0.0386	0.2710	1.1871	2.6012	3.68E-01	1.61E+00
Nitrogen	0.0022	0.0156	0.0684	0.3155	0.0446	0.1953
Carbon Dioxide	0.0637	0.4477	1.9607	2.3566	0.3331	1.4588
Methane	1.9478	13.6800	59.9182	55.3591	7.8240	34.2691
Ethane	16.3511	114.8400	502.9992	23.4045	3.3078	14.4882
Propane	30.3170	212.9278	932.6236	11.1558	1.5767	6.9058
Isobutane	8.2753	58.1207	254.5685	0.5846	0.0826	0.3619
n-Butane	18.8093	132.1047	578.6184	2.4244	0.3426	1.5008
Isopentane	6.8253	47.9367	209.9627	0.4883	0.0690	0.3023
n-Pentane	7.0954	49.8336	218.2711	0.4788	0.0677	0.2964
2-Methylpentane	1.7828	12.5212	54.8428	0.0524	0.0074	0.0324
3-Methylpentane	1.1069	7.7742	34.0510	0.0868	0.0123	0.0537
n-Hexane	2.9532	20.7415	90.8479	0.0682	0.0096	0.0422
Methylcyclopentane	0.3391	2.3813	10.4302	0.0781	0.0110	0.0483
Benzene	0.0407	0.2857	1.2514	0.0648	0.0092	0.0401
2-Methylhexane	0.7304	5.1299	22.4689	0.0187	0.0026	0.0116
3-Methylhexane	0.5926	4.1617	18.2283	0.0158	0.0022	0.0098
Heptane	1.0134	7.1175	31.1748	0.0284	0.0040	0.0176
Methylcyclohexane	0.5441	3.8213	16.7374	0.0817	0.0116	0.0506
Toluene	0.0992	0.6965	3.0505	0.1471	0.0208	0.0911
Octane	0.7535	5.2920	23.1789	0.0125	0.0018	0.0078
Ethylbenzene	0.0382	0.2683	1.1752	0.0557	0.0079	0.0345
m & p-Xylene	0.0359	0.2523	1.1050	0.0519	0.0073	0.0321
o-Xylene	0.0425	0.2988	1.3087	0.0639	0.0090	0.0396
Nonane	0.1495	1.0501	4.5995	0.0038	0.0005	0.0023
C10+	0.0524	0.3681	1.6122	0.0012	0.0002	0.0008
Total VOCs	81.597	573.08	2,510.1	15.963	2.2561	9.8817
Total CO _{2e}		342.45	1,499.9		195.93	858.2
Total TAPs (Benzene)		0.2857	1.2514		0.0092	0.0401
Toluene		0.6965	3.0505		0.0208	0.0911
Ethylbenzene		0.2683	1.1752		0.0079	0.0345
Xylenes		0.5511	2.4137		0.0164	0.0717
n-Hexane		20.742	90.848		0.0096	0.0422
Total HAPs		22.543	98.739		0.0638	0.2796
Total	100.00	702.34	3,076.2	100.00	14.133	61.90

Enter any notes here:	Vapor mass fractions and Flashing losses from Promax output
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Table 7

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

Condensate Tank Information	
Number of Tanks	10
Maximum Working Losses (lbs/hr)	11.1719
Maximum Breathing Losses (lbs/hr)	16.1496

	Condensate Tank W/B Losses						
	Vapor Mass Fraction wt%	Working Losses		Breathing Losses		Max W/B Losses	
		lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
Water	1.62E-05	1.80E-06	7.91E-06	2.61E-06	1.14E-05	4.41E-06	1.93E-05
Nitrogen	6.54E-05	7.30E-06	3.20E-05	1.06E-05	4.62E-05	1.79E-05	7.82E-05
Carbon Dioxide	0.0606	0.0068	0.0296	0.0098	0.0429	0.0166	0.0725
Methane	0.3953	0.0442	0.1934	0.0638	0.2796	0.1080	0.4730
Ethane	21.1415	2.3619	10.3452	3.4143	14.9545	5.7762	25.2997
Propane	32.7895	3.6632	16.0449	5.2954	23.1938	8.9586	39.2386
Isobutane	8.3289	0.9305	4.0756	1.3451	5.8915	2.2756	9.9671
n-Butane	18.7471	2.0944	9.1735	3.0276	13.2608	5.1220	22.4343
Isopentane	6.3774	0.7125	3.1206	1.0299	4.5111	1.7424	7.6317
n-Pentane	6.5478	0.7315	3.2040	1.0574	4.6316	1.7890	7.8356
2-Methylpentane	1.6225	0.1813	0.7940	0.2620	1.1477	0.4433	1.9417
3-Methylpentane	1.0042	0.1122	0.4914	0.1622	0.7104	0.2744	1.2018
n-Hexane	0.1822	0.0204	0.0892	0.0294	0.1289	0.0498	0.2181
Methylcyclopentane	0.2821	0.0315	0.1380	0.0456	0.1995	0.0771	0.3376
Benzene	0.0021	0.0002	0.0010	0.0003	0.0015	0.0006	0.0025
2-Methylhexane	0.0418	0.0047	0.0204	0.0067	0.0295	0.0114	0.0500
3-Methylhexane	0.5101	0.0570	0.2496	0.0824	0.3608	0.1394	0.6104
Heptane	0.8033	0.0897	0.3931	0.1297	0.5682	0.2195	0.9613
Methylcyclohexane	0.4362	0.0487	0.2134	0.0704	0.3085	0.1192	0.5220
Toluene	0.0107	0.0012	0.0052	0.0017	0.0076	0.0029	0.0128
Octane	0.5585	0.0624	0.2733	0.0902	0.3950	0.1526	0.6683
Ethylbenzene	0.0078	0.0009	0.0038	0.0013	0.0055	0.0021	0.0094
m & p-Xylene	0.0095	0.0011	0.0046	0.0015	0.0067	0.0026	0.0113
o-Xylene	0.0097	0.0011	0.0047	0.0016	0.0069	0.0026	0.0116
Nonane	0.1008	0.0113	0.0493	0.0163	0.0713	0.0276	0.1207
C10+	0.0305	0.0034	0.0149	0.0049	0.0216	0.0083	0.0365
Total VOCs	78.403	8.7591	38.365	12.6617	55.4584	21.4208	93.823
Total CO _{2e}		1.1108	4.8655	1.6058	7.0333	2.7166	11.899
Total TAPs (Benzene)		0.0002	0.0010	0.0003	0.0015	0.0006	0.0025
Toluene		0.0012	0.0052	0.0017	0.0076	0.0029	0.0128
Ethylbenzene		0.0009	0.0038	0.0013	0.0055	0.0021	0.0094
Xylenes		0.0021	0.0094	0.0031	0.0136	0.0052	0.0229
n-Hexane		0.0204	0.0892	0.0294	0.1289	0.0498	0.2181
Total HAPs		0.0248	0.1086	0.0359	0.1570	0.0607	0.2657
Total	100.00	11.1719	48.9331	16.1496	70.7354	27.3216	119.668

Table 7

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

Produced Water Tank Information	
Number of Tanks	2
Maximum Working Losses (lbs/hr)	0.0980
Maximum Breathing Losses (lbs/hr)	0.0083

	Produced Water Tank W/B Losses						
	Vapor Mass Fraction wt%	Working Losses		Breathing Losses		Max W/B Losses	
		lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
Water	92.3056	0.0905	0.3963	0.0076	0.0334	0.0981	0.4297
Nitrogen	0.0064	6.26E-06	2.74E-05	5.27E-07	2.31E-06	6.79E-06	2.97E-05
Carbon Dioxide	3.2126	0.0031	0.0138	0.0003	0.0012	0.0034	0.0150
Methane	3.1127	0.0031	0.0134	0.0003	0.0011	0.0033	0.0145
Ethane	1.2142	0.0012	0.0052	0.0001	0.0004	0.0013	0.0057
Propane	0.1410	0.0001	0.0006	1.16E-05	5.10E-05	1.50E-04	6.57E-04
Isobutane	0.0009	9.07E-07	3.97E-06	7.64E-08	3.35E-07	9.83E-07	4.31E-06
n-Butane	0.0058	5.66E-06	2.48E-05	4.77E-07	2.09E-06	6.14E-06	2.69E-05
Isopentane	0.0003	2.86E-07	1.25E-06	2.41E-08	1.05E-07	3.10E-07	1.36E-06
n-Pentane	0.0002	2.04E-07	8.95E-07	1.72E-08	7.54E-08	2.22E-07	9.70E-07
2-Methylpentane	4.36E-06	4.27E-09	1.87E-08	3.60E-10	1.57E-09	4.63E-09	2.03E-08
3-Methylpentane	1.75E-05	1.71E-08	7.51E-08	1.44E-09	6.32E-09	1.86E-08	8.14E-08
n-Hexane	2.20E-07	2.15E-10	9.43E-10	1.81E-11	7.94E-11	2.33E-10	1.02E-09
Methylcyclopentane	3.38E-05	3.32E-08	1.45E-07	2.79E-09	1.22E-08	3.59E-08	1.57E-07
Benzene	0.0001	8.46E-08	3.71E-07	7.13E-09	3.12E-08	9.18E-08	4.02E-07
2-Methylhexane	2.55E-08	2.49E-11	1.09E-10	2.10E-12	9.20E-12	2.71E-11	1.18E-10
3-Methylhexane	3.23E-07	3.17E-10	1.39E-09	2.67E-11	1.17E-10	3.44E-10	1.50E-09
Heptane	4.26E-07	4.17E-10	1.83E-09	3.52E-11	1.54E-10	4.53E-10	1.98E-09
Methylcyclohexane	7.56E-06	7.41E-09	3.25E-08	6.24E-10	2.73E-09	8.04E-09	3.52E-08
Toluene	0.0001	9.24E-08	4.05E-07	7.78E-09	3.41E-08	1.00E-07	4.39E-07
Octane	3.66E-08	3.59E-11	1.57E-10	3.02E-12	1.32E-11	3.89E-11	1.70E-10
Ethylbenzene	2.01E-05	1.97E-08	8.62E-08	1.66E-09	7.26E-09	2.13E-08	9.35E-08
m & p-Xylene	2.09E-05	2.05E-08	8.96E-08	1.72E-09	7.55E-09	2.22E-08	9.72E-08
o-Xylene	2.69E-05	2.64E-08	1.15E-07	2.22E-09	9.72E-09	2.86E-08	1.25E-07
Nonane	5.20E-09	5.10E-12	2.23E-11	4.29E-13	1.88E-12	5.53E-12	2.42E-11
C10+	2.51E-10	2.46E-13	1.08E-12	2.07E-14	9.07E-14	2.67E-13	1.17E-12
Total VOCs	0.1486	0.0001	0.0006	1.23E-05	0.0001	0.0002	0.0007
Total CO _{2e}		0.0794	0.3479	0.0067	0.0293	0.0861	0.3772
Total TAPs (Benzene)		8.46E-08	3.71E-07	7.13E-09	3.12E-08	9.18E-08	4.02E-07
Toluene		9.24E-08	4.05E-07	7.78E-09	3.41E-08	1.00E-07	4.39E-07
Ethylbenzene		1.97E-08	8.62E-08	1.66E-09	7.26E-09	2.13E-08	9.35E-08
Xylenes		4.68E-08	2.05E-07	3.94E-09	1.73E-08	5.08E-08	2.22E-07
n-Hexane		2.15E-10	9.43E-10	1.81E-11	7.94E-11	2.33E-10	1.02E-09
Total HAPs		2.44E-07	1.07E-06	2.05E-08	8.99E-08	2.64E-07	1.16E-06
Total	100.00	0.0980	0.4293	0.0083	0.0362	0.1063	0.4655

Enter any notes here:	Vapor mass fractions, working losses and breathing losses from Promax output
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Table 8

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

Annual Loading	Oil Truck Loading	Water Truck Loading
RVP	4.41	1.0232
Annual Average Temp (F)	72.1	72.1
S (saturation factor)	0.6	0.6
P (true vapor pressure)	3.07	0.45
M (MW of vapor)	45.92	18.40
Collection Efficiency (%)	0	0
Loading Loss (lb/10 ³ gal)*	1.98	0.12
Maximum Throughput (gallons/hr)	10,080	10,080
Average Throughput (gallons/yr)	15,330,000	30,660,000
Loading Emissions (lbs/hr)	19.96	1.16
Loading Emissions (tpy)	15.18	1.77

	Condensate Tank Loading Losses			Produced Water Tank Loading Losses		
	Vapor Mass Fraction wt%	Loading Losses lbs/hr	Loading Losses tpy	Vapor Mass Fraction wt%	Loading Losses lbs/hr	Loading Losses tpy
Water	1.62E-05	3.23E-06	2.45E-06	92.3056	1.08E+00	1.64E+00
Nitrogen	0.0001	1.31E-05	9.92E-06	0.0064	7.44E-05	1.13E-04
Carbon Dioxide	0.0606	0.01	0.01	3.2126	3.74E-02	5.69E-02
Methane	0.3953	0.08	0.06	3.1127	3.63E-02	5.51E-02
Ethane	21.1415	4.22	3.21	1.2142	1.41E-02	2.15E-02
Propane	32.7895	6.55	4.98	0.1410	1.64E-03	2.50E-03
Isobutane	8.3289	1.66	1.26	0.0009	1.08E-05	1.64E-05
n-Butane	18.7471	3.74	2.85	0.0058	6.73E-05	1.02E-04
Isopentane	6.3774	1.27	0.97	0.0003	3.40E-06	5.16E-06
n-Pentane	6.5478	1.31	0.99	0.0002	2.43E-06	3.69E-06
2-Methylpentane	1.6225	0.32	0.25	4.36E-06	5.07E-08	7.72E-08
3-Methylpentane	1.0042	0.20	0.15	1.75E-05	2.04E-07	3.10E-07
n-Hexane	0.1822	0.04	0.03	2.20E-07	2.56E-09	3.89E-09
Methylcyclopentane	0.2821	0.06	0.04	3.38E-05	3.94E-07	5.99E-07
Benzene	0.0021	4.13E-04	3.14E-04	0.0001	1.01E-06	1.53E-06
2-Methylhexane	0.0418	0.01	0.01	2.55E-08	2.96E-10	4.51E-10
3-Methylhexane	0.5101	0.10	0.08	3.23E-07	3.77E-09	5.73E-09
Heptane	0.8033	0.16	0.12	4.26E-07	4.96E-09	7.54E-09
Methylcyclohexane	0.4362	0.09	0.07	7.56E-06	8.81E-08	1.34E-07
Toluene	0.0107	2.14E-03	1.63E-03	9.42E-05	1.10E-06	1.67E-06
Octane	0.5585	0.11	0.08	3.66E-08	4.26E-10	6.49E-10
Ethylbenzene	0.0078	1.56E-03	1.19E-03	2.01E-05	2.34E-07	3.56E-07
m & p-Xylene	0.0095	1.89E-03	1.44E-03	2.09E-05	2.43E-07	3.70E-07
o-Xylene	0.0097	1.94E-03	1.47E-03	2.69E-05	3.13E-07	4.76E-07
Nonane	0.1008	0.02	0.02	5.20E-09	6.06E-11	9.22E-11
C10+	0.0305	0.01	4.63E-03	2.51E-10	2.92E-12	4.44E-12
Total VOCs	78.4026	15.653	11.903	0.1486	1.73E-03	2.63E-03
Total CO _{2e}		1.985	1.5095		0.9438	1.4353
Total TAPs (Benzene)		0.0004	0.0003		1.01E-06	1.53E-06
Toluene		0.0021	0.0016		1.10E-06	1.67E-06
Ethylbenzene		0.0016	0.0012		2.34E-07	3.56E-07
Xylenes		0.0038	0.0029		5.56E-07	8.46E-07
n-Hexane		0.0364	0.0277		2.56E-09	3.89E-09
Total HAPs		0.0443	0.0337		2.90E-06	4.40E-06
Total	100.0000	19.9648	15.1816	100.0000	1.1647	1.7714

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 Heater Emissions
Rock Run Well Pad
Doddridge County, West Virginia
Antero Resources Corporation**

Gas Production Unit Heater Emissions

Number of Units	10
GPU Heater Rating (MMBtu/hr)	1.50
Operating hours/year	8760
Fuel Heat Value (Btu/scf)	1,222

Line Heater Emissions

Number of Units	10
Line Heater Rating (MMBtu/hr)	2.00
Operating hours/year	8760
Fuel Heat Value (Btu/scf)	1,222

Pollutant	Emission Factors (lb/MMscf)	lb/hr	tpy
NOx	100	1.228	5.377
CO	84	1.031	4.517
CO ₂	120,000	1473.104	6452.194
Lead	0.0005	6.14E-06	2.69E-05
N ₂ O	2.2	0.027	0.118
PM (Total)	7.6	0.093	0.409
SO ₂	0.6	0.007	0.032
TOC	11	0.135	0.591
Methane	2.3	0.028	0.124
VOC	5.5	0.068	0.296
HAPS			
2-Methylnaphthalene	2.40E-05	2.95E-07	1.29E-06
Benzene	2.10E-03	2.58E-05	1.13E-04
Dichlorobenzene	1.20E-03	1.47E-05	6.45E-05
Fluoranthene	3.00E-06	3.68E-08	1.61E-07
Fluorene	2.80E-06	3.44E-08	1.51E-07
Formaldehyde	7.50E-02	9.21E-04	4.03E-03
Hexane	1.80E+00	2.21E-02	9.68E-02
Naphthalene	6.10E-04	7.49E-06	3.28E-05
Phenanathrene	1.70E-05	2.09E-07	9.14E-07
Toluene	3.40E-03	4.17E-05	1.83E-04

Pollutant	Emission Factors (lb/MMscf)	lb/hr	tpy
NOx	100	1.637	7.169
CO	84	1.375	6.022
CO ₂	120,000	1964.138	8602.925
Lead	0.0005	8.18E-06	3.58E-05
N ₂ O	2.2	0.036	0.158
PM (Total)	7.6	0.124	0.545
SO ₂	0.6	0.010	0.043
TOC	11	0.180	0.789
Methane	2.3	0.038	0.165
VOC	5.5	0.090	0.394
HAPS			
2-Methylnaphthalene	2.40E-05	3.93E-07	1.72E-06
Benzene	2.10E-03	3.44E-05	1.51E-04
Dichlorobenzene	1.20E-03	1.96E-05	8.60E-05
Fluoranthene	3.00E-06	4.91E-08	2.15E-07
Fluorene	2.80E-06	4.58E-08	2.01E-07
Formaldehyde	7.50E-02	1.23E-03	5.38E-03
Hexane	1.80E+00	2.95E-02	1.29E-01
Naphthalene	6.10E-04	9.98E-06	4.37E-05
Phenanathrene	1.70E-05	2.78E-07	1.22E-06
Toluene	3.40E-03	5.57E-05	2.44E-04

	lb/hr	tpy
TOTAL Uncontrolled VOC	0.158	0.690
TOTAL Uncontrolled HAPs	0.054	0.236
TOTAL Uncontrolled TAPs (Benzene)	6.02E-05	2.63E-04
TOTAL Uncontrolled TAPs (Formaldehyde)	0.002	0.009
TOTAL CO _{2e} Emissions	3,457.67	15,144.58

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

Table 10

**Enclosed Combustor Emissions
Rock Run Well Pad
Doddridge County, West Virginia
Antero Resources Corporation**

General Information	
Unit Name:	EC001, EC002, EC003, EC004,

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 ₂ O	2.20
Lead	5.00E-04

Constants	
Btu/MMBtu	1,000,000
scf/MMscf	1,000,000
lb/ton	2,000
H ₂ S 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 ₂ S percent destruction efficiency (%)	98

Enclosed Combustor operating hours	8760
No. of Enclosed Combustors	4

Stream Information							
	1	2	3	4	5	6	Total
Stream Sent to Flare/Vapor Combustor (Enter Name of Each Stream Here)	pilot(s)	added fuel stream(s)	Oil Tank Flash Emissions	Water Tank Flash Emissions	Oil Tank W/B Emissions	Water Tank W/B Emissions	-
Maximum Expected Hourly Volumetric Flow Rate of Stream (scf/hr)	50.4	--	5,804.63	291.48	225.81	2.19	6,374.51
Maximum Expected Annual Volumetric Flow Rate of Stream (scf/yr)	441,504.00	--	50,848,574.18	2,553,349.28	1,978,054.75	19,200.50	55,840,682.72
Heating Content (Btu/ft3)	1,222		2,454.29	1,097.44	2,454.29	1,097.44	2,372.37

Mass Flow Rates of the Vapors Sent to this Control Device, Hourly Basis (lb/hr)							
	1	2	3	4	5	6	Total
Stream Sent to Enclosed Combustor/Vapor Combustor	pilot(s)	added fuel stream(s)	Oil Tank Flash Emissions	Water Tank Flash Emissions	Oil Tank W/B Emissions	Water Tank W/B Emissions	-
H ₂ S	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total VOC	-	-	573.084	2.256	21.421	1.58E-04	596.76
Benzene	-	-	0.286	0.009	0.001	9.18E-08	0.295
Toluene	-	-	0.696	0.021	0.003	1.00E-07	0.720
Ethylbenzene	-	-	0.268	0.008	0.002	2.13E-08	0.278
Xylenes	-	-	0.551	0.016	0.005	5.08E-08	0.573
n-Hexane	-	-	20.742	0.010	0.050	2.33E-10	20.801
HAPs	-	-	22.543	0.064	0.061	2.64E-07	22.668
Total Mass Flow	-	-	702.338	14.133	27.322	0.106	743.899
Mass Flow Rates of the Vapors Sent to this Control Device, Annual Basis (tpy)							
H ₂ S	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total VOC	-	-	2510.107	9.882	93.823	0.001	2613.813
Benzene	-	-	1.251	0.040	0.002	4.02E-07	1.294
Toluene	-	-	3.051	0.091	0.013	4.39E-07	3.154
Ethylbenzene	-	-	1.175	0.034	0.009	9.35E-08	1.219
Xylenes	-	-	2.414	0.072	0.023	2.22E-07	2.508
n-Hexane	-	-	90.848	0.042	0.218	1.02E-09	91.108
HAP	-	-	98.739	0.280	0.266	1.16E-06	99.284
Total Mass Flow	-	-	3076.241	61.903	119.668	0.465	3258.278

Table 10

**Enclosed Combustor Emissions
Rock Run Well Pad
Doddridge County, West Virginia
Antero Resources Corporation**

Controlled Emissions							
Hourly (lb/hr)							
	1	2	3	4	5	6	Total
Stream Sent to Enclosed Combustor/Vapor Combustor	pilot(s)	added fuel stream(s)	Oil Tank Flash Emissions	Water Tank Flash Emissions	Oil Tank W/B Emissions	Water Tank W/B Emissions	-
NOx	0.005	-	0.580	0.029	0.023	2.19E-04	0.64
CO	0.004	-	0.488	0.024	0.019	1.84E-04	0.54
PM2.5	2.87E-04	-	0.033	0.002	0.001	1.25E-05	0.04
PM10	3.83E-04	-	0.044	0.002	0.002	1.67E-05	0.05
H ₂ S	1.61E-05	-	0.000	0.00E+00	0.00E+00	0.00E+00	1.61E-05
SO ₂	3.02E-05	-	0.000	0.00E+00	0.00E+00	0.00E+00	3.02E-05
CO ₂	6.048	-	-	-	-	-	6.05
Total VOC	2.77E-04	-	11.462	0.045	0.428	3.16E-06	11.94
Benzene	1.06E-07	-	0.006	1.83E-04	1.13E-05	1.84E-09	0.01
Toluene	1.71E-07	-	0.014	4.16E-04	5.86E-05	2.00E-09	0.01
Ethylbenzene	0.00E+00	-	0.005	1.58E-04	4.27E-05	4.27E-10	0.01
Xylenes	0.00E+00	-	0.011	3.27E-04	1.05E-04	1.02E-09	0.01
n-Hexane	9.07E-05	-	0.415	1.93E-04	0.001	4.67E-12	0.42
HAP	9.10E-05	-	0.451	0.001	0.001	5.28E-09	0.45
N ₂ O	1.11E-04	-	0.013	0.001	4.97E-04	4.82E-06	0.01
Lead	2.52E-08	-	0.000	1.46E-07	1.13E-07	1.10E-09	3.19E-06
Formaldehyde	3.78E-06	-	-	-	-	-	3.78E-06
Annual (tpy)							
	1	2	3	4	5	6	Total
Stream Sent to Enclosed Combustor/Vapor Combustor	pilot(s)	added fuel stream(s)	Oil Tank Flash Emissions	Water Tank Flash Emissions	Oil Tank W/B Emissions	Water Tank W/B Emissions	-
NOx	0.022	-	2.542	0.128	0.099	0.001	2.79
CO	0.019	-	2.136	0.107	0.083	0.001	2.35
PM2.5	0.001	-	0.145	0.007	0.006	5.47E-05	0.16
PM10	0.002	-	0.193	0.010	0.008	7.30E-05	0.21
H ₂ S	7.05E-05	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.05E-05
SO ₂	1.32E-04	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.32E-04
CO ₂	26.490	-	-	-	-	-	26.49
Total VOC	0.001	-	50.202	0.198	1.876	1.38E-05	52.28
Benzene	4.64E-07	-	0.025	0.001	4.96E-05	8.04E-09	0.03
Toluene	7.51E-07	-	0.061	0.002	2.57E-04	8.77E-09	0.06
Ethylbenzene	0.00E+00	-	0.024	0.001	1.87E-04	1.87E-09	0.02
Xylenes	0.00E+00	-	0.048	0.001	4.59E-04	4.45E-09	0.05
n-Hexane	3.97E-04	-	1.817	0.001	0.004	2.04E-11	1.82
HAP	3.99E-04	-	1.975	0.006	0.005	2.31E-08	1.99
N ₂ O	4.86E-04	-	0.056	0.003	0.002	2.11E-05	0.06
Lead	1.10E-07	-	1.27E-05	6.38E-07	4.95E-07	4.80E-09	1.40E-05
Formaldehyde	1.66E-05	-	-	-	-	-	1.66E-05

Enclosed Combustor/Vapor Combustor Total Emissions		
	Hourly Emissions (lb/hr)	Annual Emissions (tpy)
Total VOC	11.94	52.28
NOx	6.37E-01	2.79E+00
CO	5.35E-01	2.35E+00
PM2.5	3.63E-02	1.59E-01
PM10	4.84E-02	2.12E-01
H ₂ S	1.61E-05	7.05E-05
SO ₂	3.02E-05	1.32E-04
Benzene (TAPs)	5.91E-03	2.59E-02
Formaldehyde (TAPs)	3.78E-06	1.66E-05
HAPs	0.45	1.99
CO ₂ e	2277.29	9974.53
N ₂ O	1.40E-02	6.14E-02
Lead	3.19E-06	1.40E-05

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

Table 11

**Enclosed Combustor GHG Emissions
Rock Run Well Pad
Doddridge County, West Virginia
Antero Resources Corporation**

Enclosed Combustor CO₂ and CH₄ Emissions

Components	Mole fraction of oil flash gas constituents ^a	Volume of oil flash gas sent to Enclosed Combustor scf/year	Mole fraction of water flash gas constituents ^a	Volume of water flash gas sent to Enclosed Combustor scf/year	Mole fraction of oil tank vapors constituents ^a	Volume of oil tank vapor sent to Enclosed Combustor scf/year	Mole fraction of water tank vapors constituents ^a	Volume of water tank vapors sent to Enclosed Combustor scf/year	Component volume of gas sent to Enclosed Combustor scf/year	Number of carbon atoms	Combustion Efficiency	Combusted CO ₂ Volume ^b scf/year	Uncombusted CO ₂ and CH ₄ Volume ^b scf/year	Volume GHGs Emitted scf/year
CO ₂	0.001	50,848,574	0.0112	2,553,349	0.0006	1,978,055	0.013	19,200	64,753	1	0.00	--	64,753	169,330,447
Methane	0.057	50,848,574	0.7225	2,553,349	0.0113	1,978,055	0.036	19,200	4,770,954	1	0.98	4,675,535	95,419	95,419
Ethane	0.256	50,848,574	0.1629	2,553,349	0.3228	1,978,055	0.007	19,200	14,055,121	2	0.98	27,548,037	--	
Propane	0.323	50,848,574	0.0530	2,553,349	0.3414	1,978,055	0.001	19,200	17,246,385	3	0.98	50,704,372	--	
i-Butane	0.067	50,848,574	0.0021	2,553,349	0.0658	1,978,055	2.93E-06	19,200	3,539,625	4	0.98	13,875,331	--	
n-Butane	0.152	50,848,574	0.0087	2,553,349	0.1481	1,978,055	1.83E-05	19,200	8,052,548	4	0.98	31,565,990	--	
Pentane	0.091	50,848,574	0.0028	2,553,349	0.0823	1,978,055	1.27E-06	19,200	4,782,703	5	0.98	23,435,246	--	
Hexane	0.032	50,848,574	0.0005	2,553,349	0.0150	1,978,055	4.71E-08	19,200	1,651,825	6	0.98	9,712,728	--	
Benzene	2.45E-04	50,848,574	0.0002	2,553,349	0.0000	1,978,055	2.03E-07	19,200	12,919	6	0.98	75,963	--	
Heptanes	0.013	50,848,574	0.0003	2,553,349	0.0077	1,978,055	7.53E-08	19,200	669,915	7	0.98	4,595,617	--	
Toluene	0.001	50,848,574	0.0003	2,553,349	0.0001	1,978,055	1.88E-07	19,200	26,689	7	0.98	183,089	--	
Octane	0.006	50,848,574	0.0002	2,553,349	0.0043	1,978,055	1.42E-08	19,200	299,164	8	0.98	2,345,442	--	
Ethyl benzene	1.69E-04	50,848,574	0.0001	2,553,349	3.38E-05	1,978,055	3.48E-08	19,200	8,950	8	0.98	70,168	--	
Xylenes	3.48E-04	50,848,574	0.0002	2,553,349	0.0001	1,978,055	8.27E-08	19,200	18,417	8	0.98	144,391	--	
Nonane	0.001	50,848,574	6.18E-06	2,553,349	0.0004	1,978,055	7.46E-12	19,200	28,613	9	0.98	252,370	--	
Decane plus	0.000	50,848,574	1.70E-06	2,553,349	0.0001	1,978,055	2.90E-13	19,200	8,308	10	0.98	81,414	--	
Subtotal												169,265,694	--	

Pollutant	Volume Emitted scf/year	Density of GHG ^c lb/scf	Conversion Factor lb/ton	GWF	Emissions ^c	
					lbs/hr	(tons/yr)
CO ₂	169,330,447	0.12	2000	1	2241.56	9,818.03
CH ₄	95,419	0.09	2000	25	1.01	4.44
CO₂e Emissions					2,266.9	9929.00

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
Rock Run 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)	1,000
PW Production (bbl/day)	2,000
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		PM (lbs/VMT)	PM10 (lbs/VMT)
							(miles/hr)	(miles/year)		
Tanker Trucks Condensate	10	40	10	0.3880	1	1825	0.3880	708.1000	3.8175	1.7179
Tanker Trucks PW	10	40	10	0.3880	1	3650	0.3880	1416.2000	3.8175	1.7179
Pick Up Truck	4	3	10	0.3200	1	730	0.3200	233.6000	0.3467	0.1560

	Uncontrolled Emissions						Controlled Emissions					
	PM			PM10			PM			PM10		
	(lbs/hr)	(lbs/year)	(tpy)	(lbs/hr)	(lbs/year)	(tpy)	(lbs/hr)	(lbs/year)	(tpy)	(lbs/hr)	(lbs/year)	(tpy)
Tanker Trucks Condensate	1.4812	2703.1926	1.3516	0.6665	1216.4367	0.6082	0.7406	1351.5963	0.6758	0.3333	608.2183	0.3041
Tanker Trucks PW	1.4812	5406.3851	2.7032	0.6665	2432.8733	1.2164	0.7406	2703.1926	1.3516	0.3333	1216.4367	0.6082
Pick Up Truck	0.1109	80.9844	0.0405	0.0499	36.4430	0.0182	0.0555	40.4922	0.0202	0.0250	18.2215	0.0091
Total Emissions	3.0733	8,190.5621	4.0953	1.3830	3,685.7529	1.8429	1.5367	4,095.2810	2.0476	0.6915	1,842.8765	0.9214

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
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Table 13

**Engine Emissions
Rock Run 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)	1221.91
Density of NG (lb/scf)	0.056
Operating Hours/year	8760

Pollutant	Emission Factors		lb/hr	tpy
	(g/hp-hr)	(lb/MMBtu)		
NOx ¹	5.97		0.3158	1.3831
CO ²	106.7		5.6445	24.7228
CO ₂		110.000	25.8643	113.29
PM _{2.5}		9.910E-03	0.0023	0.0102
PM ₁₀		9.500E-03	0.0022	0.0098
PM (Total)		9.910E-03	0.0023	0.0102
SO ₂		5.880E-04	0.0001	0.0006
TOC		0.358	0.0842	0.3687
Methane		0.230	0.0541	0.2369
VOC ³		0.0296	0.0070	0.0305
HAPS				
Benzene		1.58E-03	3.72E-04	1.63E-03
Ethylbenzene		2.48E-05	5.83E-06	2.55E-05
Formaldehyde		2.05E-02	4.82E-03	2.11E-02
Naphthalene		9.71E-05	2.28E-05	1.00E-04
Toluene		5.58E-04	1.31E-04	5.75E-04
Xylene		1.95E-04	4.59E-05	2.01E-04

	lb/hr	tpy
TOTAL Uncontrolled VOC	0.007	0.030
TOTAL Uncontrolled NOx	0.316	1.383
TOTAL Uncontrolled HAPs	0.005	0.024
TOTAL Uncontrolled TAPs (Benzene)	3.72E-04	0.002
TOTAL Uncontrolled TAPs (Formaldehyde)	0.005	0.021
TOTAL CO _{2e} Emissions	27.22	119.2

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

**Change in Regulated Air Pollutants Emissions
Rock Run Well Pad
Doddridge County, West Virginia
Antero Resources Corporation**

Pollutant	Potential Emissions		Initial Permit Application Emissions		Change in Emissions	
	Hourly PTE	Yearly PTE	Hourly PTE	Yearly PTE	Hourly PTE	Yearly PTE
PM	1.8050	3.2231	1.6130	1.3299	1.92E-01	1.8932
PM10	0.9599	2.0969	1.4592	1.7055	-0.4993	0.3914
VOC (uncontrolled)	600.6268	2642.6508	175.4379	769.6298	425.1889	1873.0210
CO	8.5860	37.6067	6.4622	28.3046	2.1238	9.3021
NOx	3.8176	16.7211	1.2893	5.6471	2.5283	11.0739
SO2	0.0174	0.0760	0.0046	0.0200	1.28E-02	5.60E-02
Pb	1.75E-05	7.67E-05	4.87E-06	2.13E-05	1.26E-05	5.54E-05
HAPs	0.8711	3.8493	0.5568	2.4474	0.3144	1.4019
TAPs	0.0159	0.0700	0.0029	0.0364	1.30E-02	0.0336

Notes: 1.) Change in emissions due to the increase in production and the addition of 4 wells, 4 gas production unit heaters, 10 line heaters, 4 condensate tanks, and 3 Cimarron enclosed combustors.



Bryan Research & Engineering, Inc.

ProMax[®] 3.2

with
TSWEET[®] & PROSIM[®]

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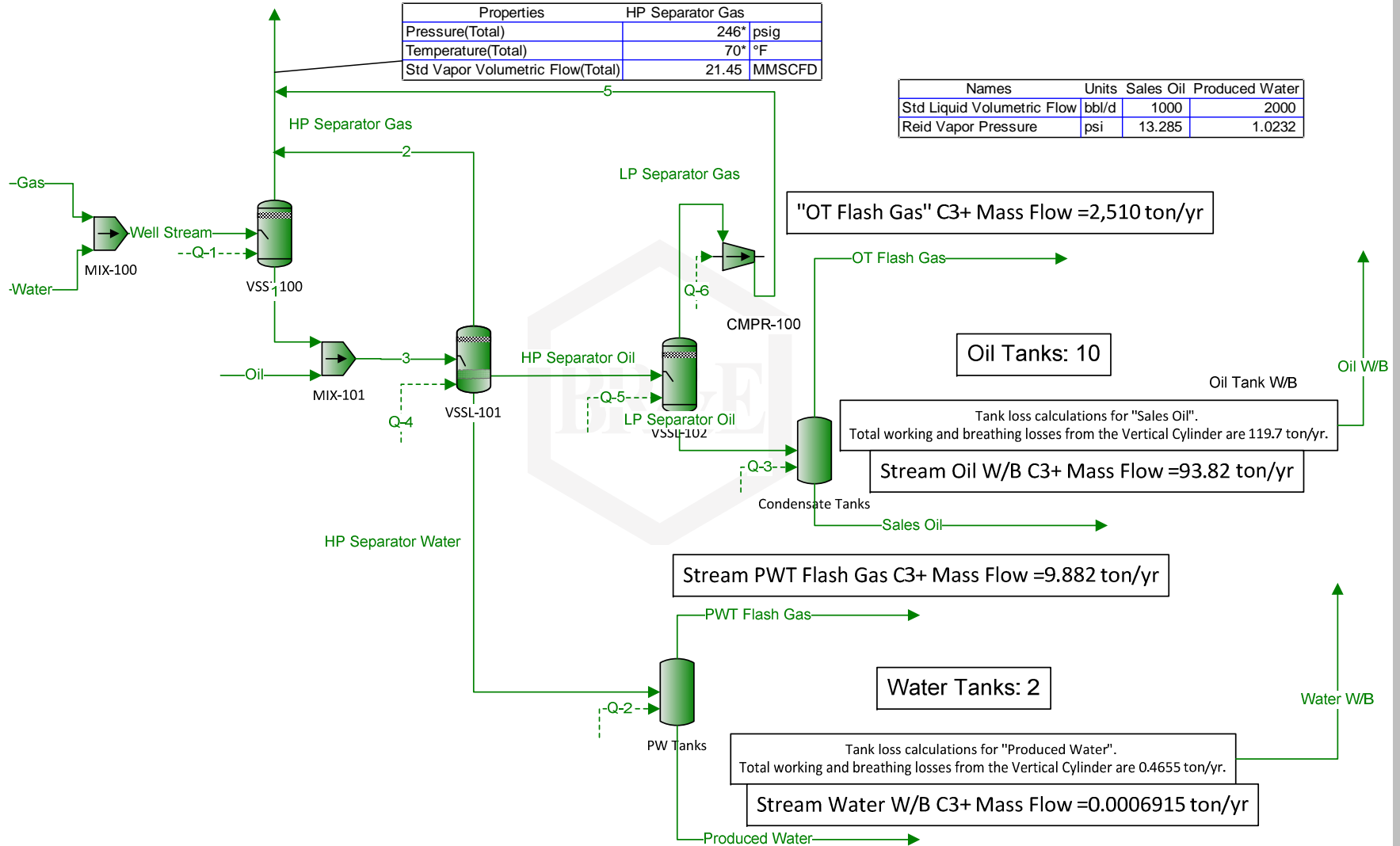
Simulation Report

Client Name:	Antero Resources Corporation
Location:	West Virginia
Job:	Rock Run Well Pad
Project Name:	PROMAX SCENARIO 3
File Name:	ProMax@V:\AirQuality\ANTERO RESOURCES\ProMax\Antero WV_Updated 2Ph Separator\PROMAX SCENARIO 3.PMX
ProMax Version:	3.2.13330.0
Report Created:	10/1/2015 10:01

Stream HP Separator Gas C3+ Mass Flow = 3.402E+04 ton/yr

Properties		HP Separator Gas
Pressure(Total)		246* psig
Temperature(Total)		70* °F
Std Vapor Volumetric Flow(Total)		21.45 MMSCFD

Names	Units	Sales Oil	Produced Water
Std Liquid Volumetric Flow	bbl/d	1000	2000
Reid Vapor Pressure	psi	13.285	1.0232



"OT Flash Gas" C3+ Mass Flow = 2,510 ton/yr

Oil Tanks: 10

Tank loss calculations for "Sales Oil".
Total working and breathing losses from the Vertical Cylinder are 119.7 ton/yr.

Stream Oil W/B C3+ Mass Flow = 93.82 ton/yr

Stream PWT Flash Gas C3+ Mass Flow = 9.882 ton/yr

Water Tanks: 2

Tank loss calculations for "Produced Water".
Total working and breathing losses from the Vertical Cylinder are 0.4655 ton/yr.

Stream Water W/B C3+ Mass Flow = 0.0006915 ton/yr

Toluene	0	0	0.000511989	0.780855	0.0991637	0.873856	0	0	0.781429	0.000440992	0.147087	0.0107241	9.42231E-05	0	0.221242	0.823895
Octane	0	0	6.14023E-06	15.4957	0.753481	17.4515	0	0	15.4813	6.57198E-08	0.0125472	0.558458	3.66132E-08	0	4.38313	16.3747
Ethylbenzene	0	0	0.000178019	0.909693	0.00382022	1.02505	0	0	0.909291	0.000511114	0.0057248	0.00782220	2.00756E-05	0	0.257441	0.961411
m-Xylene	0	0	0.000170816	1.02046	0.0359189	1.15049	0	0	1.01993	0.000145752	0.0519171	0.00946735	2.08804E-05	0	0.288768	1.07861
o-Xylene	0	0	0.000273481	1.35116	0.00425422	1.52379	0	0	1.35058	0.000242646	0.00692323	0.00969748	2.68836E-05	0	0.382384	1.42826
Nonane	0	0	1.86523E-06	9.42516	0.149517	10.6428	0	0	9.41629	3.15443E-08	0.00378758	0.100840	5.20326E-09	0	2.66599	9.96603
C10+	0	0	6.14302E-07	17.8079	0.0524066	20.1292	0	0	17.7911	9.51697E-09	0.00124922	0.0304681	2.50778E-10	0	5.03712	18.8344
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
Water	29241.9	63.5355	29177.3	1.09840	0.271029	0.0336003	0	0	29241.9	0	29176.9	0.367626	4.41399E-06	0.0981002	29178.4	0.304709
H2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	260.228	260.189	0.0458489	0.502916	0.0156169	0.000159250	260.228	0	0.580350	0.00125642	0.0445925	1.78601E-05	6.78626E-06	0.0389369	0.619287	0.0157761
Carbon Dioxide	193.178	192.069	0.721394	1.93666	0.447655	0.0488320	193.178	0	1.58035	0.388335	0.333059	0.0165538	0.00341424	1.10955	2.68989	0.496487
Methane	29647.2	29638.6	8.27689	146.327	13.6800	0.459622	29647.2	0	152.571	0.452900	7.82399	0.108002	0.00330809	8.60778	161.178	14.1396
Ethane	10167.2	10164.0	3.53090	342.571	114.840	24.7698	10167.2	0	345.605	0.223100	3.30780	5.77618	0.00129042	3.14224	348.747	139.610
Propane	4405.01	4403.58	1.69414	532.093	212.928	168.231	4405.01	0	533.558	0.117475	1.57667	8.95859	0.000149894	1.43624	534.994	381.159
Isobutane	694.554	694.482	0.0847620	203.050	58.1207	117.785	694.554	0	203.254	0.00214162	0.0826204	2.27559	9.83425E-07	0.0720000	203.326	175.906
n-Butane	1395.40	1395.09	0.362198	574.732	132.105	387.310	1395.40	0	575.163	0.0195584	0.342440	5.12199	6.13779E-06	0.310581	575.474	519.414
Isopentane	440.786	440.720	0.0717141	424.470	47.9367	359.516	440.786	0	424.593	0.00269964	0.0690144	1.74240	3.09802E-07	0.0656906	424.659	407.452
n-Pentane	358.276	358.226	0.0702917	567.945	49.8336	500.945	358.276	0	568.084	0.0022081	0.0676709	1.78896	2.21533E-07	0.0496762	568.134	550.779
2-Methylpentane	0	0	0.00754435	325.956	12.5212	309.392	0	0	325.993	0.000136587	0.00740776	0.0433000	4.62935E-09	0	325.993	321.914
3-Methylpentane	0	0	0.0128807	224.558	7.77421	214.285	0	0	224.589	0.000613665	0.01027670	0.274376	1.85862E-08	0	224.589	222.059
n-Hexane	456.106	456.084	0.00978403	740.738	20.7415	713.388	456.106	0	740.773	0.000141375	0.00964265	0.0497892	2.33374E-10	0.0219845	740.795	734.129
Methylcyclopentane	0	0	0.0126902	87.1579	2.38132	84.0170	0	0	87.1760	0.00165703	0.0110331	0.0770665	3.59498E-08	0	87.1760	86.3983
Benzene	0	0	0.0777804	10.3861	0.285708	10.0083	0	0	10.4646	0.0686183	0.00916203	0.000565809	9.17527E-08	0	10.4646	10.2940
2-Methylhexane	0	0	0.00268424	417.788	5.12990	411.050	0	0	417.803	4.12126E-05	0.00264303	0.0114089	2.70504E-11	0	417.803	416.180
3-Methylhexane	0	0	0.00227636	355.653	4.16171	350.236	0	0	355.666	3.65061E-05	0.00223985	0.139370	3.43580E-10	0	355.666	354.348
Heptane	0	0	0.00406494	764.590	7.11753	755.233	0	0	764.612	6.58700E-05	0.00401907	0.219469	4.52648E-10	0	764.612	762.350
Methylcyclohexane	0	0	0.0127015	407.478	3.82133	402.457	0	0	407.499	0.00114810	0.0115534	0.119171	8.03917E-09	0	407.499	406.278
Toluene	0	0	0.149463	89.9451	0.696464	89.0292	0	0	90.0962	0.102875	0.0202998	0.00292998	1.00138E-07	0	90.0962	89.7257
Octane	0	0	0.00179249	1784.92	5.29199	1771.98	0	0	1784.94	1.91760E-05	0.00177332	0.152579	3.89116E-11	0	1784.94	1783.27
Ethylbenzene	0	0	0.0519684	104.786	0.268309	104.433	0	0	104.838	0.0440927	0.00787568	0.00213715	2.13359E-08	0	104.838	104.702
m-Xylene	0	0	0.0498656	117.544	0.25272	117.213	0	0	117.595	0.00733752	0.00258663	0.00259208	2.21912E-08	0	117.595	117.466
o-Xylene	0	0	0.0798362	155.637	0.298790	155.245	0	0	155.718	0.0708005	0.00903566	0.00264951	2.85712E-08	0	155.718	155.544
Nonane	0	0	0.000544509	1085.66	1.05012	1084.29	0	0	1085.67	9.20415E-06	0.000535305	0.0275511	5.52990E-12	0	1085.67	1085.34
C10+	0	0	0.000179331	2051.26	0.368071	2050.78	0	0	2051.26	2.77691E-06	0.000176554	0.00832436	2.66521E-13	0	2051.26	2051.15

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	3	LP Separator Oil
Phase: Total	Status	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Property	Units																
Temperature	°F	61.9	70.0	70.0	70.0	75.9	75.9	67.0	67.0	67.0	75.9	75.94	75.9425	75.9425	70	69.4766	70
Pressure	psig	200	246	246	246	0	0	300	200	300	0	7.81169	-14.2256	246	246	40	0
Mole Fraction Vapor	%	59.2354	100	0	0	100	0	100	0	0	100	0	100	0	0.0281530	0	0
Mole Fraction Liquid	%	40.7646	0	100	100	0	100	0	100	100	0	0	0	100	7.82945	100	0
Mole Fraction Heavy Liquid	%	0	0	0	0	0	0	0	0	0	0	0	0	0	92.1424	0	0
Molecular Weight	lb/lbmol	19.4	20.4	18.0	83.7	47.0	99.8	20.4	83.5	18.0	20.9842	45.9159	18.4003	18.0166	23.1582	93.0299	
Mass Density	lb/ft³	1.3	62.3	41.9	0.1	43.4	1.2	62.3	42.0	62.2	0.0538524	0.184894	0.00150632	62.2575	54.0300	42.9269	
Molar Flow	lbmol/h	3975.5	2355.2	1620.3	137.6	14.9	102.0	2352.4	1623.2	1619.6	0.673515	0.959036	0.00577587	1620.35	1758.47	116.985	
Mass Flow	lb/h	77279.8	48086.6	29192.6	11518.8	702.3	10881.1	48037.9	29241.9	11529.7	29178.5	14.1332	27.3216	40722.9	10890.4	116.985	
Vapor Volumetric Flow	MCFH	58.4	48.0	0.5	0.3	5.7	0.2	38.9	0.5	0.3	0.5	0.262443	0.147769	0.0705547	0.468911	0.753654	0.253697
Liquid Volumetric Flow	Mbbbl/d	249.6	205.2	1.2	24.5	1.0	16.2	2.0	1.2	1.2	1.12183	0.631650	0.301592	2.00440	1.08445	1.08445	
Std Vapor Volumetric Flow	MMSCFD	36.2	21.5	14.8	1.3	0.1	0.9	21.4	14.8	1.3	14.8	0.00613412	0.00541936	5.26045E-05	14.7576	16.0155	1.06545
Std Liquid Volumetric Flow	Mbbbl/d	111.8	9.8	2.0	1.1	1.0	1.2	2.0	1.2	2.0	0.00277025	0.00376390	8.03626E-06	2.00280	1.09450	1.09450	
Compressibility		0.563	0.935	0.013	0.092	0.981	0.006	0.920	0.011	0.111	0.001	0.996260	0.972423	0.999551	0.0132723	0.0196758	0.0208676
Specific Gravity		0.705	0.998	0.672	1.623	0.696	0.705	0.999	0.674	0.998	0.724527	1.58535	0.635312	0.98213	0.688272	0.688272	
API Gravity			10.1	77.4		69.5		10.0	77.4	10.0				10.0540		72.5750	
Enthalpy	MMBtu/h	-280.5	-80.9	-199.2	-10.8	-0.7	-9.1	-80.7	-199.7	-10.9	-199.1	-0.0252012	-0.0278347	-0.000587643	-199.254	-210.112	-9.93978
Mass Enthalpy	Btu/lb	-3629.1	-1681.5	-6825.2	-940.2	-1013.8	-891.9	-1680.1	-6830.9	-941.8	-6822.4	-1783.13	-1018.78	-5529.32	-6825.34	-5159.56	-912.709
Mass Cp	Btu/(lb*°F)	0.7	1.0	0.5	0.4	0.5	0.5	1.0	0.5	1.0	0.5	0.473175	0.407027	0.443106	0.983024	0.488705	0.499725
Ideal Gas Cp/Cv Ratio		1.281	1.254	1.326	1.066	1.117	1.055	1.255	1.326	1.067	1.326	1.25114	1.12051	1.32215	1.32580	1.24927	1.05950
Dynamic Viscosity	cP	0.0	1.0	0.3	0.3	0.4	0.0	0.3	0.0	0.3	0.9	0.0106699	0.00825455	0.0102487	0.995489	0.374935	
Kinematic Viscosity	cSt	0.7	1.0	0.5	4.2	0.6	0.6	1.0	0.5	0.9	12.3690	2.78708	424.748	0.998214	0.645263		
Thermal Conductivity	Btu/(ft²*°F)	0.0	0.3	0.1	0.0	0.1	0.0	0.3	0.1	0.3	0.0169869	0.0103118	0.0122172	0.346404	0.0681251		
Surface Tension	lb/ft		0.005	0.001	0.001	0.001	0.005	0.001	0.005	0.001	0.005			0.00503923		0.00132191	
Net I.G. Heating Value	Btu/ft³	662.2	1117.6	0.5	4250.4	2454.3	5048.8	1119.2	0.0	4240.6	0.0	1097.44	2402.04	45.9302	0.468656	333.489	4714.04
Net Liquid Heating Value	Btu/lb	12491.3	20711.9	-1048.8	19090.9	19648.1	18988.8	20740.2	-1059.8	19095.0	-1058.9	19756.1	19693.1	-35.4188	-1049.38	4653.99	

Isobutane	0.507393	0.507338	0.602589	0.602589	6.69438	6.69438	0.507998				0.211056	0.211056	6.57975	0.000292942	0.507338	0.597854	2.26182	
n-Butane	1.01927	1.01915	1.19964	1.19964	15.2159	15.2159	1.02060				0.875284	0.875284	14.8100	0.00182832	1.01915	1.18947	4.60930	
Isopentane	0.271164	0.271135	0.299382	0.299382	4.44796	4.44796	0.271499				0.142025	0.142025	4.05859	7.43426E-05	0.271135	0.296448	1.14230	
n-Pentane	0.210840	0.210817	0.302076	0.302076	4.62397	4.62397	0.211099				0.139260	0.139260	4.16705	5.31609E-05	0.210817	0.298951	1.15228	
2-Methylpentane	0	0	0.0612824	0.0612824	0.972712	0.972712	0				0.0127631	0.0127631	0.864514	9.30079E-07	0	0.0605666	0.227205	
3-Methylpentane	0	0	0.0379554	0.0379554	0.603941	0.603941	0				0.0211353	0.0211353	0.535082	3.73414E-06	0	0.0375063	0.140443	
n-Hexane	0.224743	0.224719	0.101710	0.101710	1.61131	1.61131	0.224999				0.0166137	0.0166137	0.0970976	4.68869E-08	0.224719	0.100462	0.371400	
Methylcyclopentane	0	0	0.0117753	0.0117753	0.189424	0.189424	0				0.0194648	0.0194648	0.153893	7.39565E-06	0	0.0116322	0.0437103	
Benzene	0	0	0.00153307	0.00153307	0.0244865	0.0244865	0				0.0174152	0.0174152	0.00121734	2.03369E-05	0	0.00151455	0.00571286	
2-Methylhexane	0	0	0.0224956	0.0224956	0.342732	0.342732	0				0.00391632	0.00391632	0.0191349	4.67391E-09	0	0.0221846	0.0777325	
3-Methylhexane	0	0	0.0182529	0.0182529	0.278046	0.278046	0				0.00331891	0.00331891	0.233749	5.93655E-08	0	0.0180017	0.0631012	
Heptane	0	0	0.0318889	0.0318889	0.475526	0.475526	0				0.00595528	0.00595528	0.368090	7.82109E-08	0	0.0314455	0.108265	
Methylcyclohexane	0	0	0.0170190	0.0170190	0.260547	0.260547	0				0.0174708	0.0174708	0.203976	1.41757E-06	0	0.0167853	0.0591528	
Toluene	0	0	0.00331674	0.00331674	0.0506034	0.0506034	0				0.0034986	0.0034986	0.00534418	1.88166E-05	0	0.00327048	0.0115339	
Octane	0	0	0.0221875	0.0221875	0.310146	0.310146	0				0.00230497	0.00230497	0.224480	5.89777E-09	0	0.0218405	0.0700966	
Ethylbenzene	0	0	0.00118177	0.00118177	0.0169190	0.0169190	0				0.0110144	0.0110144	0.00338307	3.47946E-06	0	0.00116330	0.00382927	
m-Xylene	0	0	0.00112037	0.00112037	0.0159078	0.0159078	0				0.0102617	0.0102617	0.00404959	3.61894E-06	0	0.00110244	0.00359299	
o-Xylene	0	0	0.00132875	0.00132875	0.0188411	0.0188411	0				0.0126366	0.0126366	0.00419412	4.65941E-06	0	0.00130735	0.00425491	
Nonane	0	0	0.00409457	0.00409457	0.0548132	0.0548132	0				0.000619697	0.000619697	0.0361012	7.46493E-10	0	0.00402338	0.0121379	
C10+	0	0	0.00136399	0.00136399	0.0162324	0.0162324	0				0.000172686	0.000172686	0.00921587	3.03978E-11	0	0.00133690	0.00362526	
Molar Flow		lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h
Water	3.19777	3.52676	0	0	0.0150444	0	0				0	0.0204063	2.45014E-07	0.00544539	0	0.000727855	0	
H2S	0	0	0	0	0	0	0				0	0	0	0	0	0	0	0
Nitrogen	9.28818	9.28801	0	0	0.000557478	0	9.28939				0.00159183	6.37555E-07	2.42250E-07	0	0.00231263	0	0	
Carbon Dioxide	4.36623	4.36426	0	0	0.0101718	0	4.38947				0.00756790	0.000376142	7.75796E-05	0	0.000594276	0	0	
Methane	1847.57	1847.51	0	0	0.852734	0	1848.04				0.487705	0.00673227	0.000206209	0	0.373493	0	0	
Ethane	338.032	338.023	0	0	3.81921	0	338.128				0.110007	0.192097	4.29152E-05	0	0.0797326	0	0	
Propane	99.8649	99.8643	0	0	4.82877	0	99.8969				0.0357556	0.203163	3.39929E-06	0	0.0247508	0	0	
Isobutane	11.9487	11.9487	0	0	0.999974	0	11.9499				0.00142150	0.0391519	1.69200E-08	0	0.00295974	0	0	
n-Butane	24.0029	24.0026	0	0	2.27288	0	24.0080				0.00589516	0.00881246	1.05602E-07	0	0.00588859	0	0	
Isopentane	6.38569	6.38570	0	0	0.664414	0	6.38661				0.000956557	0.0241501	4.29393E-09	0	0.00146760	0	0	
n-Pentane	4.96512	4.96510	0	0	0.690706	0	4.96579				0.000937936	0.0247954	3.07050E-09	0	0.00147999	0	0	
2-Methylpentane	0	0	0	0	0.145299	0	0				8.59615E-05	0.00514416	5.37201E-11	0	0.000299842	0	0	
3-Methylpentane	0	0	0	0	0.0902138	0	0				0.000142349	0.00318393	2.15679E-10	0	0.000185679	0	0	
n-Hexane	5.29251	5.29251	0	0	0.240690	0	5.29277				0.000111896	0.000577766	2.70813E-12	0	0.000497350	0	0	
Methylcyclopentane	0	0	0	0	0.0282953	0	0				0.000131098	0.000915720	4.27163E-10	0	5.75867E-05	0	0	
Benzene	0	0	0	0	0.00365768	0	0				0.000117294	7.24358E-06	1.17463E-09	0	7.49807E-06	0	0	
2-Methylhexane	0	0	0	0	0.0511956	0	0				2.63770E-05	0.000113859	2.69959E-13	0	0.000109827	0	0	
3-Methylhexane	0	0	0	0	0.0415332	0	0				2.23534E-05	0.00139089	3.42888E-12	0	8.91193E-05	0	0	
Heptane	0	0	0	0	0.0710318	0	0				4.01097E-05	0.00219027	4.51736E-12	0	0.000155675	0	0	
Methylcyclohexane	0	0	0	0	0.0389192	0	0				0.000117669	0.00121373	8.18769E-11	0	8.30977E-05	0	0	
Toluene	0	0	0	0	0.00755889	0	0				0.000225618	3.17998E-05	1.08682E-09	0	1.61909E-05	0	0	
Octane	0	0	0	0	0.0463281	0	0				1.55243E-05	0.00133574	3.40647E-13	0	0.000108124	0	0	
Ethylbenzene	0	0	0	0	0.00252728	0	0				7.41834E-05	2.01304E-05	2.00969E-10	0	5.75905E-06	0	0	
m-Xylene	0	0	0	0	0.00237623	0	0				6.91143E-05	2.43642E-05	2.09025E-10	0	5.45774E-06	0	0	
o-Xylene	0	0	0	0	0.00281439	0	0				8.51096E-05	2.49565E-05	2.69121E-10	0	6.47220E-06	0	0	
Nonane	0	0	0	0	0.00818772	0	0				4.17375E-06	0.000214815	4.31164E-14	0	1.99182E-05	0	0	
C10+	0	0	0	0	0.00242471	0	0				1.16307E-06	5.48377E-05	1.75574E-15	0	6.61847E-06	0	0	
Mass Fraction		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water	0.119813	0.132127	0.127351	0.127351	0.0385896	0.0385896	0				2.60116	2.60116	1.61557E-05	92.3056	0.132127	0.125302	0.126309	
H2S	0	0	0	0	0	0	0				0	0	0	0	0	0	0	0
Nitrogen	0.541145	0.541084	0.612308	0.612308	0.00222355	0.00222355	0.541713				0.315517	0.315517	6.53699E-05	0.00638541	0.541084	0.619075	0.0775241	
Carbon Dioxide	0.399641	0.399423	0.250448	0.250448	0.0637379	0.0637379	0.402137				2.35658	2.35658	0.0605889	3.21257	0.399423	0.229923	0.229668	
Methane	61.6438	61.6358	57.0818	57.0818	1.94777	1.94777	61.7162				55.3591	55.3591	0.395300	3.11269	61.6358	57.2566	21.0365	
Ethane	21.1395	21.1370	22.9684	22.9684	16.3511	16.3511	21.1649				23.4045	23.4045	21.1415	1.21420	21.1370	22.9101	32.2995	
Propane	9.15851	9.15760	10.4814	10.4814	30.3170	30.3170	9.16987				11.1558	11.1558	32.7895	0.141040	9.15760	10.4293	24.0199	
Isobutane	1.44437	1.44423	1.65448	1.65448	8.27531	8.27531	1.44585				0.584585	0.584585	8.32892	0.000925336	1.44423	1.64387	4.31984	
n-Butane	2.90149	2.90120	3.29376	3.29376	18.8093	18.8093	2.90478				2.42437	2.42437	18.7471	0.00577525	2.90120	3.27058	8.80331	
Isopentane	0.958194	0.958106	1.02036	1.02036	6.82530	6.82530	0.959213				0.488315	0.488315	6.37737	0.000291502	0.958106	1.01183	2.70819	
n-Pentane	0.745032	0.744961	1.02954	1.02954	7.09538	7.09538	0.745819				0.478809	0.478809	6.54779	0.000208448	0.744961	1.02037	2.73183	
2-Methylpentane	0	0	0.249469	0.249469	1.78279	1.78279	0				0.0524140	0.0524140	1.62253	4.35590E-06	0	0.246915	0.643384	
3-Methylpentane	0	0	0.154510	0.154510	1.10690	1.10690	0				0.0867959	0.0867959	1.00425	1.74883E-05	0	0.152904	0.397696	
n-Hexane	0.948554	0.948465	0.414043	0.414043	2.95321	2.95321	0.949472				0.0682271	0.0682271	0.182234	2.19589E-07	0.948465	0.409559	1.05170	
Methylcyclopentane	0	0	0.0468138	0.0468138	0.339056	0.339056	0				0.0780656	0.0780656	0.282072	3.38263E-05	0	0.0463124	0.120880	

Benzene	0	0	0.00565689	0.00565689	0.0406795	0.0406795	0				0.0648264	0.0648264	0.00207092	8.63330E-05	0	0.00559677	0.0146636
2-Methylhexane	0	0	0.106481	0.106481	0.730403	0.730403	0				0.0187009	0.0187009	0.0417579	2.54526E-08	0	0.105162	0.255946
3-Methylhexane	0	0	0.0863985	0.0863985	0.592551	0.592551	0				0.0158482	0.0158482	0.510110	3.23285E-07	0	0.0853335	0.207770
Heptane	0	0	0.150944	0.150944	1.01340	1.01340	0				0.0284371	0.0284371	0.803281	4.25911E-07	0	0.149602	0.356478
Methylcyclohexane	0	0	0.0789374	0.0789374	0.544086	0.544086	0				0.0817468	0.0817468	0.436180	7.56431E-06	0	0.0779669	0.190851
Toluene	0	0	0.0144361	0.0144361	0.0991637	0.0991637	0				0.147087	0.147087	0.0102741	9.42231E-05	0	0.0142555	0.0349209
Octane	0	0	0.119724	0.119724	0.753481	0.753481	0				0.0125472	0.0125472	0.558458	3.66132E-08	0	0.118023	0.263112
Ethylbenzene	0	0	0.00592670	0.00592670	0.0382022	0.0382022	0				0.0557248	0.0557248	0.00782220	2.00756E-05	0	0.00584257	0.0133588
m-Xylene	0	0	0.00561877	0.00561877	0.0359189	0.0359189	0				0.0519171	0.0519171	0.00946735	2.08804E-05	0	0.00553689	0.0125345
o-Xylene	0	0	0.00666380	0.00666380	0.0425422	0.0425422	0				0.0639323	0.0639323	0.00969748	2.68836E-05	0	0.00656606	0.0148437
Nonane	0	0	0.0248074	0.0248074	0.149517	0.149517	0				0.00378758	0.00378758	0.100840	5.20326E-09	0	0.0244116	0.0511547
C10+	0	0	0.00978095	0.00978095	0.0524066	0.0524066	0				0.00124922	0.00124922	0.0304681	2.50778E-10	0	0.00960065	0.0180834

Mass Flow		lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	
Water		57.6087	63.5355	0	0	0.271029	0	0			0	0.367626	4.41399E-06	0.0981002	0	0	0.0131125	0	
H2S		0	0	0	0	0	0	0			0	0	0	0	0	0	0	0	0
Nitrogen		260.194	260.189	0	0	0.0156169	0	260.228			0.0445925	1.78601E-05	6.78626E-06	0.0647846	0	0	0.0647846	0	
Carbon Dioxide		192.156	192.069	0	0	0.447655	0	193.178			0.333059	0.0165538	0.00341424	0.0261538	0	0	0.0261538	0	
Methane		29639.6	29638.6	0	0	13.6800	0	29647.2			7.82399	0.108002	0.00330809	5.99175	0	0	5.99175	0	
Ethane		10164.3	10164.0	0	0	114.840	0	10167.2			3.30780	5.77618	0.00129042	2.39748	0	0	2.39748	0	
Propane		4403.60	4403.58	0	0	212.928	0	4405.01			1.57667	8.95859	0.000149894	1.09140	0	0	1.09140	0	
Isobutane		694.484	694.482	0	0	58.1207	0	694.554			0.0826204	2.27559	9.83425E-07	0.172027	0	0	0.172027	0	
n-Butane		1395.10	1395.09	0	0	132.105	0	1395.40			0.342640	5.12199	6.13779E-06	0.342258	0	0	0.342258	0	
Isopentane		460.720	460.720	0	0	47.9367	0	460.786			0.0690144	1.74240	3.98020E-07	0.105886	0	0	0.105886	0	
n-Pentane		358.227	358.226	0	0	49.8336	0	358.276			0.0676709	1.78896	2.21533E-07	0.106779	0	0	0.106779	0	
2-Methylpentane		0	0	0	0	12.5212	0	0			0.00740776	0.443300	4.62935E-09	0.0258390	0	0	0.0258390	0	
3-Methylpentane		0	0	0	0	7.77421	0	0			0.0122670	0.274376	1.85862E-08	0.0106010	0	0	0.0106010	0	
n-Hexane		456.084	456.084	0	0	20.7415	0	456.106			0.00964265	0.0497892	2.33374E-10	0.0428593	0	0	0.0428593	0	
Methylcyclopentane		0	0	0	0	2.38132	0	0			0.0110331	0.0770665	3.59498E-08	0.00484647	0	0	0.00484647	0	
Benzene		0	0	0	0	0.285708	0	0			0.00916203	0.000565809	9.17527E-08	0.000585688	0	0	0.000585688	0	
2-Methylhexane		0	0	0	0	5.12990	0	0			0.00264303	0.0114089	2.70504E-11	0.0110049	0	0	0.0110049	0	
3-Methylhexane		0	0	0	0	4.16171	0	0			0.00223985	0.139370	3.43580E-10	0.00892993	0	0	0.00892993	0	
Heptane		0	0	0	0	7.11753	0	0			0.00401907	0.219469	4.52648E-10	0.0155989	0	0	0.0155989	0	
Methylcyclohexane		0	0	0	0	3.82133	0	0			0.0115534	0.119171	8.03917E-09	0.00815904	0	0	0.00815904	0	
Toluene		0	0	0	0	0.696464	0	0			0.0207881	0.00292998	1.00138E-07	0.00149180	0	0	0.00149180	0	
Octane		0	0	0	0	5.29199	0	0			0.00177332	0.152579	3.89116E-11	0.0123508	0	0	0.0123508	0	
Ethylbenzene		0	0	0	0	0.268309	0	0			0.00787568	0.00213715	2.13359E-08	0.000611410	0	0	0.000611410	0	
m-Xylene		0	0	0	0	0.252272	0	0			0.00733752	0.00258663	2.21912E-08	0.000579421	0	0	0.000579421	0	
o-Xylene		0	0	0	0	0.298790	0	0			0.00903566	0.00264951	2.85712E-08	0.000687121	0	0	0.000687121	0	
Nonane		0	0	0	0	1.05012	0	0			0.000535305	0.0275511	5.52990E-12	0.00255461	0	0	0.00255461	0	
C10+		0	0	0	0	0.368071	0	0			0.000176554	0.00832436	2.66521E-13	0.00100468	0	0	0.00100468	0	

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	3	LP Separator Oil
Phase: Vapor	Status	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Property	Units																
Temperature	*F	61.9	70.0	70.0	70.0	75.9	75.9	67.0			75.9	75.94	75.9425	75.9425	70	69.4766	70
Pressure	psig	200	246	246	246	0	0	300			0	0	7.81169	-14.2256	246	246	40
Mole Fraction Vapor	%	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
Mole Fraction Heavy Liquid	%	0	0	0	0	0	0	0			0	0	0	0	0	0	0
Molecular Weight	lb/lbmol	20.4	20.4	21.2	21.2	47.0	47.0	20.4			21.0	20.9842	45.9159	18.4003	20.4175	21.1383	30.4321
Mass Density	lb/ft^3	0.8	1.0	1.0	1.0	0.1	0.1	1.2			0.1	0.0538524	0.184894	0.00150632	1.00150	1.04378	0.302250
Molar Flow	lbmol/h	2354.9	2355.2	0.0	0.0	14.9	0.0	2352.4			0.0	0.673515	0.595036	0.00577587	0.0	0.495062	0
Mass Flow	lb/h	48082.1	48086.6	0.0	0.0	702.3	0.0	48037.9			0.0	14.1332	27.3216	0.106278	0.0	10.4647	0
Vapor Volumetric Flow	MCFH	57.9	48.0	0.0	0.0	5.7	0.0	38.9			0.0	0.262443	0.147769	0.0705547	0.0	0.0100259	0
Liquid Volumetric Flow	Mbb/d	247.6	205.2	0.0	0.0	24.5	0.0	166.2			0.0	1.12183	0.631650	0.301592	0.0	0.0428563	0
Sid Vapor Volumetric Flow	MMSCFD	21.4	21.5	0.0	0.0	0.1	0.0	21.4			0.0	0.00613412	0.00541936	5.26045E-05	0.0	0.00450884	0
Sid Liquid Volumetric Flow	Mbb/d	9.8	9.8	0.0	0.0	0.1	0.0	9.8			0.0	0.00277025	0.00376390	8.03626E-06	0.0	0.00208642	0
Compressibility		0.944	0.935	0.930	0.930	0.981	0.981	0.920			0.996	0.996260	0.972423	0.999551	0.935005	0.929729	0.968838
Specific Gravity		0.705	0.705	0.731	0.731	1.623	1.623	0.705			0.725	0.724527	1.58535	0.635312	0.704960	0.729847	1.05074
API Gravity																	
Enthalpy	MMBtu/h	-80.9	-80.9	0.0	0.0	0.7	0.0	80.7			0.0	-0.0252012	-0.0278347	-0.000587643	0	-0.0171059	0
Mass Enthalpy	Btu/lb	-1683.1	-1681.5	-1632.9	-1632.9	-1013.8	-1013.8	-1680.1			-1783.1	-1783.13	-1018.78	-529.32	-1681.54	-1634.63	-1278.19
Mass Cp	Btu/(lb*F)	0.5	0.5	0.5	0.5	0.4	0.4	0.5			0.5	0.473175	0.407027	0.443106	0.515502	0.511117	0.437207
Ideal Gas Cp/Cv Ratio		1.256	1.254	1.247	1.247	1.117	1.117	1.255			1.251	1.25114	1.12051	1.32215	1.25426	1.24717	1.17983

Dynamic Viscosity	cP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0106699	0.00825455	0.0102487	0.0108663	0.0107863	0.00946867
Kinematic Viscosity	cSt	0.8	0.7	0.6	0.6	4.2	4.2	0.6	12.4	12.3690	2.78708	424.748	0.677340	0.645129	1.95570	1.95570
Thermal Conductivity	Btu/(h*ft^2*F)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0169869	0.0103118	0.0122172	0.0180583	0.0177657	0.0137610	0.0137610
Surface Tension	lb/ft															
Net I.G. Heating Value	Btu/ft^3	1117.7	1117.6	1155.6	1155.6	2454.3	2454.3	1119.2	1097.4	1097.44	2402.04	45.9302	1117.55	1154.06	1623.84	1623.84
Net Liquid Heating Value	Btu/lb	20714.5	20711.9	20649.4	20649.4	19648.1	19648.1	20740.2	19756.1	19756.1	19693.1	-35.4188	20711.9	20651.6	20123.4	20123.4
Gross I.G. Heating Value	Btu/ft^3	1232.9	1232.8	1273.6	1273.6	2665.3	2665.3	1234.5	1211.2	1211.22	2609.35	98.1971	1232.78	1271.88	1775.30	1775.30
Gross Liquid Heating Value	Btu/lb	22856.4	22853.6	22763.3	22763.3	21350.5	21350.5	22883.3	21813.8	21813.8	21406.4	1042.5	22853.6	22766.6	22012.0	22012.0

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	3	LP Separator Oil
Phase: Light Liquid	Status	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Mole Fraction	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water	99.9610	99.9563	99.9565	0.0442994	0.00183204	0.00183204	100	0	99.9968	99.9968	1.05100E-06	100.0000	99.9563	0.0436776	0.0144583	0.0144583
H2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	7.47439E-05	8.57798E-05	0.000101011	0.0130439	5.57074E-06	5.57074E-06	0	0.0150002	2.76921E-06	2.76921E-06	2.56477E-07	1.57255E-09	8.57798E-05	0.0131728	0.000481399	0.000481399
Carbon Dioxide	0.00143386	0.00155593	0.00101166	0.00320226	0.00108732	0.00108732	0	0.0260003	0.000544813	0.000544813	0.00152322	2.09538E-05	0.00155593	0.0320287	0.00964347	0.00964347
Methane	0.0291078	0.0331139	0.0318423	6.62722	0.0280756	0.0280756	0	6.88607	0.00174309	0.00174309	0.00878080	2.75877E-06	0.0331139	6.64954	0.753420	0.753420
Ethane	0.00589430	0.00644927	0.00724725	8.27768	0.807239	0.807239	0	8.32208	0.000458109	0.000458109	1.56858	6.72876E-07	0.00644927	8.28089	3.96888	3.96888
Propane	0.00197519	0.00201011	0.00237116	8.76738	3.73861	3.73861	0	8.76109	0.000164489	0.000164489	6.04211	5.91633E-08	0.00201011	8.76635	7.38894	7.38894
Isobutane	7.45842E-05	7.64505E-05	9.00050E-05	2.53828	1.98586	1.98586	0	2.53203	2.27503E-06	2.27503E-06	2.94324	1.02884E-10	7.64505E-05	2.53768	2.58708	2.58708
n-Butane	0.000316640	0.000329779	0.000384602	7.18458	6.53005	6.53005	0	7.16507	2.07768E-05	2.07768E-05	9.59940	1.41503E-09	0.000329779	7.18269	7.63913	7.63913
Isopentane	5.66406E-05	5.61906E-05	6.13455E-05	4.27460	4.88302	4.88302	0	4.26104	2.31028E-06	2.31028E-06	6.71979	3.96266E-11	5.61906E-05	4.27331	4.82747	4.82747
n-Pentane	4.16580E-05	4.24922E-05	6.01288E-05	5.71946	6.80395	6.80395	0	5.70106	2.24282E-06	2.24282E-06	9.21967	2.80545E-11	4.24922E-05	5.71770	6.52559	6.52559
2-Methylpentane	0	0	5.40314E-06	2.74824	3.51825	3.51825	0	2.73903	9.78619E-08	9.78619E-08	4.69914	2.34509E-13	0	2.74736	3.19321	3.19321
3-Methylpentane	0	0	9.22493E-06	1.89332	2.43673	2.43673	0	1.88702	4.39680E-07	4.39680E-07	3.23872	2.55461E-12	0	1.89271	2.20271	2.20271
n-Hexane	1.56249E-05	1.57443E-05	7.00716E-06	6.24539	8.11227	8.11227	0	6.22406	1.01293E-07	1.01293E-07	0.732978	9.41143E-15	1.57443E-05	6.24337	7.28217	7.28217
Methylcyclopentane	0	0	9.30619E-06	0.752457	0.978282	0.978282	0	0.750008	1.21567E-06	1.21567E-06	1.18240	1.51707E-11	0	0.752214	0.877554	0.877554
Benzene	0	0	6.14555E-05	0.0966084	0.125557	0.125557	0	0.0970010	5.42390E-05	5.42390E-05	0.00908922	2.07650E-09	0	0.0965784	0.112652	0.112652
2-Methylhexane	0	0	1.65330E-06	3.02941	4.01993	4.01993	0	3.01903	2.53946E-08	2.53946E-08	0.330616	1.00169E-15	0	3.02842	3.55040	3.55040
3-Methylhexane	0	0	1.40208E-06	2.57887	3.42470	3.42470	0	2.57003	2.24946E-08	2.24946E-08	4.23573	1.32957E-14	0	2.57802	3.02291	3.02291
Heptane	0	0	2.51603E-06	5.54409	7.38592	7.38592	0	5.52506	4.05882E-08	4.05882E-08	8.37842	1.76361E-14	0	5.54228	6.50355	6.50355
Methylcyclohexane	0	0	7.98386E-06	3.01531	4.01670	4.01670	0	3.00503	7.21965E-07	7.21965E-07	4.62658	1.93256E-12	0	3.01432	3.53709	3.53709
Toluene	0	0	0.000100115	0.709275	0.946873	0.946873	0	0.708007	8.62265E-05	8.62265E-05	0.146796	1.59579E-09	0	0.709047	0.832430	0.832430
Octane	0	0	9.68400E-07	11.3533	15.2529	15.2529	0	11.3141	1.03651E-08	1.03651E-08	16.1899	8.81608E-16	0	11.3496	13.3449	13.3449
Ethylbenzene	0	0	3.02110E-05	0.711731	0.963958	0.963958	0	0.715007	2.56433E-05	2.56433E-05	0.280655	2.68313E-10	0	0.716896	0.843032	0.843032
m-Xylene	0	0	2.89886E-05	0.804449	1.08192	1.08192	0	0.802008	2.47333E-05	2.47333E-05	0.405154	2.89101E-10	0	0.804185	0.945804	0.945804
o-Xylene	0	0	4.64115E-05	1.06515	1.43297	1.43297	0	1.06201	4.11759E-05	4.11759E-05	0.463292	5.03109E-10	0	1.06480	1.25240	1.25240
Nonane	0	0	2.62022E-07	6.15034	8.28460	8.28460	0	6.12906	4.43095E-09	4.43095E-09	8.06731	1.78391E-16	0	6.14831	7.23376	7.23376
C10+	0	0	7.29105E-08	9.81808	13.2387	13.2387	0	9.78410	1.12948E-09	1.12948E-09	10.9101	6.68706E-18	0	9.81885	11.5504	11.5504
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	1619.98	0	1619.58	0.0609705	0	0.0186954	1623.17	0	1619.56	0	0	0	1619.65	0.0601346	0.0169139	0.0169139
H2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	0.00121131	0	0.00163668	0.0179527	0	5.68477E-06	0.0207169	4.48506E-08	0	0	0	0	0.00138994	0.0181361	0.000563163	0.000563163
Carbon Dioxide	0.0232372	0	0.0163918	0.040736	0.00110958	0.00110958	0	0.0359092	0.00882388	0.00882388	0	0.0252115	0.0440965	0.0112814	0.0112814	
Methane	0.471723	0	0.515937	9.12124	0.0286503	0.0286503	0	9.51042	0.0282314	0.0282314	0	0.536562	9.15497	0.881384	0.881384	
Ethane	0.0955234	0	0.117426	11.3928	0.823763	0.823763	0	11.4937	0.00741960	0.00741960	0	0.104501	11.4010	4.64297	4.64297	
Propane	0.0320100	0	0.0384197	12.0668	3.81514	3.81514	0	12.1068	0.00266409	0.00266409	0	0.0325710	12.0694	8.64392	8.64392	
Isobutane	0.00120872	0	0.00145834	3.49351	2.02651	2.02651	0	3.49701	3.68468E-05	3.68468E-05	0	0.00123877	3.49383	3.02648	3.02648	
n-Butane	0.00513148	0	0.00623167	9.88834	6.66372	6.66372	0	9.89575	0.000336504	0.000336504	0	0.00534359	9.88899	8.93659	8.93659	
Isopentane	0.000917921	0	0.000993975	5.88326	4.98298	4.98298	0	5.88497	3.74177E-05	3.74177E-05	0	0.000910487	5.88342	5.64739	5.64739	
n-Pentane	0.000675112	0	0.000974261	7.87186	6.94323	6.94323	0	7.87379	3.63250E-05	3.63250E-05	0	0.000688524	7.87203	7.63393	7.63393	
2-Methylpentane	0	0	8.75465E-05	3.78248	3.59026	3.59026	0	3.78290	1.58499E-06	1.58499E-06	0	0	3.78251	3.73556	3.73556	
3-Methylpentane	0	0	0.000149470	2.60582	2.48661	2.48661	0	2.60582	7.12112E-06	7.12112E-06	0	0	2.60585	2.57683	2.57683	
n-Hexane	0.000253218	0	0.000113536	8.59570	8.27833	8.27833	0	8.59612	1.64055E-06	1.64055E-06	0	0	0.000255113	8.59576	8.51902	8.51902
Methylcyclopentane	0	0	0.000150787	1.03563	0.998307	0.998307	0	1.03584	1.96892E-05	1.96892E-05	0	0	1.03563	1.02660	1.02660	
Benzene	0	0	0.000995756	0.132965	0.128128	0.128128	0	0.133969	0.000878463	0.000878463	0	0	0.132967	0.131785	0.131785	
2-Methylhexane	0	0	2.67883E-05	4.16946	0	4.10222	0	4.16961	4.11295E-07	4.11295E-07	0	0	4.16948	4.15341	4.15341	
3-Methylhexane	0	0	2.27177E-05	3.54937	3.49480	3.49480	0	3.54949	3.64326E-07	3.64326E-07	0	0	3.54938	3.53634	3.53634	
Heptane	0	0	4.07670E-05	7.63050	7.53711	7.53711	0	7.63071	6.57373E-07	6.57373E-07	0	0	7.63051	7.60814	7.60814	
Methylcyclohexane	0	0	0.000129362	4.15006	4.09892	4.09892	0	4.15028	1.16931E-05	1.16931E-05	0	0	4.15007	4.13784	4.13784	
Toluene	0	0	0.0016221													

o-Xylene	0	0	0.000752001	1.46599	0	1.46230	0	1.46675	0.000666891	0	0	0	0	1.46600	1.46512
Nonane	0	0	4.24552E-06	8.46488	0	8.45419	0	8.46491	7.17644E-08	0	0	0	0	8.46488	8.46238
C10+	0	0	1.18136E-06	13.5129	0	13.5097	0	13.5129	1.82932E-08	0	0	0	0	13.5129	13.5122
Mass Fraction	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water	99.9491	99.9491	99.9475	0.00953572	0.000330585	0.000330585	100	0	99.9946	99.9946	1.99994E-07	99.9999	99.9491	0.00940418	0.00279796
H2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	0.000116217	0.000133376	0.000157057	0.00436604	1.56310E-06	1.56310E-06	0	0.00503353	4.30598E-06	4.30598E-06	7.58906E-08	2.44529E-09	0.000133376	0.00441027	0.000144862
Carbon Dioxide	0.00350253	0.00380070	0.00247115	0.0168390	0.000479305	0.000479305	0	0.0137068	0.00133089	0.00133089	0.000708081	5.11881E-05	0.00380070	0.0168464	0.00455893
Methane	0.0259185	0.0294855	0.0283527	1.27033	0.00451136	0.00451136	0	1.32329	0.00155217	0.00155217	0.00148792	2.45666E-06	0.0294855	1.27492	0.129835
Ethane	0.00983740	0.0107636	0.0120952	2.97402	0.243125	0.243125	0	2.99752	0.00074606	0.00074606	0.498194	1.12309E-06	0.0107636	2.97589	1.28195
Propane	0.00483428	0.00491976	0.00580332	4.61935	1.65125	1.65125	0	4.62769	0.000402607	0.000402607	2.81422	1.44813E-07	0.00491976	4.61993	3.49994
Isobutane	0.000240612	0.000246632	0.000290355	1.76277	1.15611	1.15611	0	1.76287	7.33972E-06	7.33972E-06	1.80693	3.31932E-10	0.000246632	1.76278	1.61523
n-Butane	0.00102149	0.00106388	0.00124072	4.98951	3.80160	3.80160	0	4.98854	6.70301E-05	6.70301E-05	5.89331	4.56525E-09	0.00106388	4.98942	4.76946
Isopentane	0.000226822	0.000225020	0.000245658	3.68502	3.52878	3.52878	0	3.68261	9.25216E-06	9.25216E-06	5.12104	1.58699E-10	0.000225020	3.68480	3.74138
n-Pentane	0.000166823	0.000170163	0.000240786	4.93059	4.91697	4.91697	0	4.92715	8.98199E-06	8.98199E-06	7.02615	1.12354E-10	0.000170163	4.93028	5.05746
2-Methylpentane	0	0	2.58434E-05	2.82978	3.03681	3.03681	0	2.82742	4.68108E-07	4.68108E-07	4.27735	1.12177E-12	0	2.82956	2.95593
3-Methylpentane	0	0	4.41231E-05	1.94949	2.10329	2.10329	0	1.94792	2.10314E-06	2.10314E-06	2.94802	1.22199E-11	0	1.94934	2.03903
n-Hexane	7.47359E-05	7.53068E-05	3.35154E-05	6.43069	7.00218	7.00218	0	6.42493	4.84518E-07	4.84518E-07	0.667187	4.50192E-14	7.53068E-05	6.43018	6.74105
Methylcyclopentane	0	0	4.34705E-05	0.75668	0.824660	0.824660	0	0.756101	5.67895E-06	5.67895E-06	1.05109	7.08709E-11	0	0.756598	0.793342
Benzene	0	0	0.000266439	0.0901669	0.0982352	0.0982352	0	0.0907620	0.000235168	0.000235168	0.00749923	9.00343E-09	0	0.0901608	0.0945234
2-Methylhexane	0	0	9.19492E-06	3.62701	4.03462	4.03462	0	3.62372	1.41243E-07	1.41243E-07	0.349924	5.57143E-15	0	3.62671	3.82152
3-Methylhexane	0	0	7.79772E-06	3.08759	3.43721	3.43721	0	3.08478	1.25113E-07	1.25113E-07	4.48310	7.39513E-14	0	3.08734	3.25376
Heptane	0	0	1.39931E-05	6.63776	7.41290	7.41290	0	6.63168	2.25749E-07	2.25749E-07	8.86771	9.80930E-14	0	6.63721	7.00019
Methylcyclohexane	0	0	4.35094E-05	3.53750	3.95027	3.95027	0	3.53435	3.93474E-06	3.93474E-06	4.79826	1.05328E-11	0	3.53721	3.73060
Toluene	0	0	0.000511989	0.780855	0.873856	0.873856	0	0.781429	0.000440992	0.000440992	0.142866	8.16158E-09	0	0.780794	0.823895
Octane	0	0	6.14023E-06	15.4957	17.4515	17.4515	0	15.4813	6.57198E-08	6.57198E-08	19.5341	5.58996E-15	0	15.4944	16.3747
Ethylbenzene	0	0	0.000178019	0.909693	1.02505	1.02505	0	0.909291	0.000511114	0.000511114	0.314722	1.58118E-09	0	0.909617	0.961411
m-Xylene	0	0	0.000170816	1.02046	1.15049	1.15049	0	1.01993	0.000145752	0.000145752	0.454334	1.70369E-09	0	1.02037	1.07861
o-Xylene	0	0	0.000273481	1.35116	1.52379	1.52379	0	1.35058	0.000242646	0.000242646	0.519528	2.96485E-09	0	1.35105	1.42826
Nonane	0	0	1.86523E-06	9.42516	10.6428	10.6428	0	9.41629	3.15443E-08	3.15443E-08	10.9289	1.27001E-15	0	9.42435	9.96603
C10+	0	0	6.14302E-07	17.8079	20.1292	20.1292	0	17.7911	9.51697E-09	9.51697E-09	17.4934	5.63463E-17	0	17.8064	18.8344

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
Water	29184.3	0	29177.3	1.09840	0	0.0336803	29241.9	0	29176.9	0	0	0	29178.4	1.08334	0.304709
H2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	0.0339328	0	0.0458489	0.502916	0	0.000159250	0.580350	0.00125642	0.00125642	0	0	0	0.0389369	0.508054	0.0157761
Carbon Dioxide	1.02266	0	0.721394	1.93966	0	0.0488320	1.58035	0.388335	0.388335	0	0	0	1.10955	1.94067	0.496487
Methane	7.56760	0	8.27689	146.327	0	0.459622	152.571	0.452900	0.452900	0	0	0	8.60778	146.868	14.1396
Ethane	2.87230	0	3.53090	342.571	0	24.7698	345.605	0.223100	0.223100	0	0	0	3.14224	342.816	139.610
Propane	1.41150	0	1.69414	532.093	0	168.231	533.558	0.117475	0.117475	0	0	0	1.43624	532.206	381.159
Isobutane	0.0702533	0	0.0847620	203.050	0	117.785	203.254	0.00214162	0.00214162	0	0	0	0.0720000	203.669	175.906
n-Butane	0.298253	0	0.362198	574.732	0	387.310	575.163	0.0195584	0.0195584	0	0	0	0.310581	574.770	519.414
Isopentane	0.0662269	0	0.0717141	424.470	0	359.516	424.593	0.00269964	0.00269964	0	0	0	0.0656906	424.482	407.452
n-Pentane	0.0487085	0	0.0702917	567.945	0	500.945	568.084	0.00262081	0.00262081	0	0	0	0.0496762	567.957	550.779
2-Methylpentane	0	0	0.000754435	325.956	0	309.392	325.993	0.000136587	0.000136587	0	0	0	0	325.959	321.914
3-Methylpentane	0	0	0.0128807	224.558	0	214.285	224.589	0.000613665	0.000613665	0	0	0	0	224.560	222.059
n-Hexane	0.0218212	0	0.00978403	740.738	0	713.388	740.773	0.000141375	0.000141375	0	0	0	0.0219845	740.743	734.129
Methylcyclopentane	0	0	0.0126902	87.1579	0	84.0170	87.1760	0.00165703	0.00165703	0	0	0	0	87.1585	86.3983
Benzene	0	0	0.0777804	10.3861	0	10.0083	10.4646	0.0686183	0.0686183	0	0	0	0	10.3863	10.2940
2-Methylhexane	0	0	0.00268424	417.788	0	411.050	417.803	4.12126E-05	4.12126E-05	0	0	0	0	417.790	416.180
3-Methylhexane	0	0	0.00227636	355.653	0	350.186	355.666	3.65061E-05	3.65061E-05	0	0	0	0	355.654	354.348
Heptane	0	0	0.00408494	764.590	0	755.233	764.612	6.58700E-05	6.58700E-05	0	0	0	0	764.592	762.350
Methylcyclohexane	0	0	0.0127015	407.478	0	402.457	407.499	0.0114810	0.0114810	0	0	0	0	407.479	406.278
Toluene	0	0	0.149463	89.9451	0	89.0292	90.0962	0.128675	0.128675	0	0	0	0	89.9458	89.7257
Octane	0	0	0.00179249	1784.92	0	1777.98	1784.94	1.91760E-05	1.91760E-05	0	0	0	0	1784.92	1783.27
Ethylbenzene	0	0	0.0519684	104.786	0	104.433	104.838	0.0440927	0.0440927	0	0	0	0	104.786	104.702
m-Xylene	0	0	0.0498656	117.544	0	117.213	117.595	0.0425281	0.0425281	0	0	0	0	117.545	117.466
o-Xylene	0	0	0.0798362	155.637	0	155.245	155.718	0.0708005	0.0708005	0	0	0	0	155.638	155.544
Nonane	0	0	0.000544509	1085.66	0	1084.29	1085.67	9.20415E-06	9.20415E-06	0	0	0	0	1085.66	1085.34
C10+	0	0	0.000179331	2051.26	0	2050.78	2051.26	2.77691E-06	2.77691E-06	0	0	0	0	2051.26	2051.15

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	3	LP Separator Oil
Phase: Light Liquid	Status	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Property	Units															
Temperature	°F	61.9	70.0	70.0	70.0	75.9	75.9	67.0	67.0	75.9	75.94	75.9425	75.9425	70	69.4766	70

Pressure	psig	200	246	246	246	0	0	200	300	0	0	7.81169	-14.2256	246	246	40
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	83.7	99.8	99.8	18.0	83.5	18.0	18.0157	94.6731	18.0153	18.0166	83.6718	93.0929
Mass Density	lb/ft^3	62.3	62.3	62.3	41.9	43.4	43.4	62.3	42.0	62.2	62.2171	42.6224	62.2179	62.2575	41.9263	42.9269
Molar Flow	lbmol/h	1620.6	0.0	1620.3	137.6	0.0	102.0	1623.2	138.1	1619.6	0	0	0	1620.35	137.678	116.985
Mass Flow	lb/h	29197.7	0.0	29192.6	11518.8	0.0	10188.1	29241.9	11529.7	29178.5	0	0	0	29193.2	11519.8	10890.4
Vapor Volumetric Flow	MCFH	0.5	0.0	0.5	0.3	0.0	0.2	0.5	0.3	0.5	0	0	0	0.468911	0.274762	0.253697
Liquid Volumetric Flow	Mbb/d	2.0	0.0	2.0	1.2	0.0	1.0	2.0	1.2	2.0	0	0	0	2.00440	1.17449	1.08445
Std Vapor Volumetric Flow	MMSCFD	14.8	0.0	14.8	1.3	0.0	0.9	14.8	1.3	14.8	0	0	0	14.7576	1.25392	1.06545
Std Liquid Volumetric Flow	Mbb/d	2.0	0.0	2.0	1.2	0.0	1.0	2.0	1.2	2.0	0	0	0	2.00280	1.20038	1.09450
Compressibility		0.011	0.013	0.013	0.092	0.006	0.006	0.011	0.111	0.001	0.000740331	0.00869769	2.36931E-05	0.0132723	0.0916192	0.0208676
Specific Gravity		0.999	0.998	0.998	0.672	0.696	0.696	0.999	0.674	0.998	0.997564	0.683390	0.997577	0.998213	0.672230	0.688272
API Gravity		10.1	10.1	10.1	77.4	69.5	69.5	10.0	77.4	10.0	10.0154	73.1446	10.0135	10.0540	77.3956	72.5750
Enthalpy	MMBtu/h	-199.5	0.0	-199.2	-10.8	0.0	-9.1	-199.7	-10.9	-199.1	0	0	0	-199.254	-10.8351	-9.93978
Mass Enthalpy	Btu/lb	-6833.7	-6825.3	-6825.2	-940.2	891.9	891.9	-6830.9	-941.8	-6822.4	-6822.37	-933.264	-6822.66	-6825.34	-940.567	-912.709
Mass Cp	Btu/(lb*F)	1.0	1.0	1.0	0.5	0.5	0.5	1.0	0.5	1.0	0.982733	0.504333	0.982746	0.983024	0.508530	0.499725
Ideal Gas CpCv Ratio		1.326	1.326	1.326	1.066	1.055	1.055	1.326	1.067	1.326	1.32555	1.05752	1.32556	1.32580	1.06621	1.05950
Dynamic Viscosity	cP	1.1	1.0	1.0	0.3	0.4	0.4	1.0	0.3	0.9	0.924436	0.371346	0.924434	0.995489	0.312960	0.374935
Kinematic Viscosity	cSt	1.1	1.0	1.0	0.5	0.6	0.6	1.0	0.5	0.9	0.927569	0.543902	0.927556	0.998214	0.465994	0.545263
Thermal Conductivity	Btu/(h*ft^2*F)	0.3	0.3	0.3	0.1	0.1	0.1	0.3	0.1	0.3	0.349781	0.0677401	0.349835	0.346404	0.0670702	0.0681251
Surface Tension	lb/ft	0.005	0.005	0.005	0.001	0.001	0.001	0.005	0.001	0.005	0.00499710	0.00132226	0.00499737	0.00503923	0.00113775	0.00132191
Net I.G. Heating Value	Btu/ft^3	0.4	0.5	0.5	4250.4	5044.8	5044.8	0.0	4240.6	0.0	0.0382332	4802.91	3.75961E-05	0.468656	4249.43	4714.04
Net Liquid Heating Value	Btu/lb	-1050.4	-1049.4	-1048.8	19090.9	18988.8	18988.8	-1059.8	19095.0	-1058.9	-1058.90	19075.7	-1059.76	-1049.38	19091.1	19031.3
Gross I.G. Heating Value	Btu/ft^3	50.8	50.8	50.8	4580.5	5428.5	5428.5	50.3	4570.0	50.3	50.3500	5174.60	50.3100	50.8051	4579.43	5075.63
Gross Liquid Heating Value	Btu/lb	9.8	10.9	11.4	20585.4	20444.7	20444.7	0.0	20590.2	0.9	0.870576	20564.1	0.000834296	10.8621	20585.6	20503.1

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 WB	Water WB	1	3	LP Separator Oil
Phase: Heavy Liquid	Status	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Mole Fraction	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water				99.9565											99.9563	
H2S				0											0	
Nitrogen				0.000101011											0.000102331	
Carbon Dioxide				0.00101166											0.00101401	
Methane				0.0318423											0.0320015	
Ethane				0.00724725											0.00725208	
Propane				0.00237116											0.00237551	
Isobutane				9.00050E-05											8.99206E-05	
n-Butane				0.000384602											0.000383562	
Isopentane				6.13455E-05											6.12202E-05	
n-Pentane				6.01288E-05											5.98713E-05	
2-Methylpentane				5.40314E-06											5.36980E-06	
3-Methylpentane				9.22493E-06											9.18026E-06	
n-Hexane				7.00716E-06											6.96264E-06	
Methylcyclopentane				9.30619E-06											9.30572E-06	
Benzene				6.14555E-05											6.13570E-05	
2-Methylhexane				1.65330E-06											1.65137E-06	
3-Methylhexane				1.40208E-06											1.40002E-06	
Heptane				2.51603E-06											2.52205E-06	
Methylcyclohexane				7.98386E-06											7.95209E-06	
Toluene				0.000100115											9.97554E-05	
Octane				9.68480E-07											9.61311E-07	
Ethylbenzene				3.02110E-05											3.01370E-05	
m-Xylene				2.89886E-05											2.88799E-05	
o-Xylene				4.64115E-05											4.62119E-05	
Nonane				2.62022E-07											2.60050E-07	
C10+				7.29105E-08											7.23461E-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											1619.59	
H2S				0											0	
Nitrogen				0											0.00165806	
Carbon Dioxide				0											0.0164300	
Methane				0											0.518518	

Ethane					0											0.117505	
Propane					0											0.0384902	
Isobutane					0											0.00145698	
n-Butane					0											0.00621482	
Isopentane					0											0.000991946	
n-Pentane					0											0.000970091	
2-Methylpentane					0											8.70065E-05	
3-Methylpentane					0											0.000148747	
n-Hexane					0											0.000112815	
Methylcyclopentane					0											0.000150780	
Benzene					0											0.000994163	
2-Methylhexane					0											2.67570E-05	
3-Methylhexane					0											2.26845E-05	
Heptane					0											4.08646E-05	
Methylcyclohexane					0											0.000128847	
Toluene					0											0.00161633	
Octane					0											1.55761E-05	
Ethylbenzene					0											0.000488307	
m-Xylene					0											0.000467938	
o-Xylene					0											0.000748768	
Nonane					0											4.21357E-06	
C10+					0											1.17222E-06	
Mass Fraction		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water					99.9475											99.9473	
H2S					0											0	
Nitrogen					0.000157057											0.000159108	
Carbon Dioxide					0.00247115											0.00247691	
Methane					0.0283527											0.0284945	
Ethane					0.0120952											0.0121033	
Propane					0.00580332											0.00581396	
Isobutane					0.000290355											0.000290082	
n-Butane					0.00124072											0.00123736	
Isopentane					0.000245658											0.000245156	
n-Pentane					0.000240786											0.000239755	
2-Methylpentane					2.58434E-05											2.56839E-05	
3-Methylpentane					4.41231E-05											4.39094E-05	
n-Hexane					3.35154E-05											3.33025E-05	
Methylcyclopentane					4.34705E-05											4.34683E-05	
Benzene					0.000266439											0.000266012	
2-Methylhexane					9.19492E-06											9.18416E-06	
3-Methylhexane					7.79772E-06											7.78630E-06	
Heptane					1.39931E-05											1.40265E-05	
Methylcyclohexane					4.35094E-05											4.33362E-05	
Toluene					0.000511989											0.000510149	
Octane					6.14023E-06											6.09478E-06	
Ethylbenzene					0.000178019											0.000177583	
m-Xylene					0.000170816											0.000170175	
o-Xylene					0.000273481											0.000272305	
Nonane					1.86523E-06											1.85119E-06	
C10+					6.14302E-07											6.09547E-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											29177.3	
H2S					0											0	
Nitrogen					0											0.0464480	
Carbon Dioxide					0											0.723076	
Methane					0											8.31830	
Ethane					0											3.53326	
Propane					0											1.69725	
Isobutane					0											0.0846827	
n-Butane					0											0.361219	
Isopentane					0											0.0715677	
n-Pentane					0											0.0699909	
2-Methylpentane					0											0.00749782	
3-Methylpentane					0											0.0128183	

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

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

Sample: Central No. 2H (Jonathan Davis Well Pad)
 Separator Hydrocarbon Liquid
 Sampled @ 300 psig & 70 °F

Date Sampled: 09/20/13

Job Number: 35821.002

CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2186-M

COMPONENT	MOL %	LIQ VOL %	WT %
Nitrogen	0.015	0.004	0.005
Carbon Dioxide	0.026	0.011	0.014
Methane	6.886	2.920	1.331
Ethane	8.322	5.569	3.014
Propane	8.761	6.040	4.653
Isobutane	2.532	2.073	1.772
n-Butane	7.165	5.652	5.015
2,2 Dimethylpropane	0.118	0.113	0.102
Isopentane	4.261	3.899	3.702
n-Pentane	5.583	5.064	4.851
2,2 Dimethylbutane	0.243	0.254	0.252
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.401	0.411	0.416
2 Methylpentane	2.739	2.845	2.843
3 Methylpentane	1.887	1.927	1.958
n-Hexane	4.725	4.862	4.904
Heptanes Plus	<u>46.337</u>	<u>58.355</u>	<u>65.167</u>
Totals:	100.000	100.000	100.000

Characteristics of Heptanes Plus:

Specific Gravity ----- 0.7352 (Water=1)
 °API Gravity ----- 60.96 @ 60°F
 Molecular Weight ----- 116.8
 Vapor Volume ----- 19.98 CF/Gal
 Weight ----- 6.13 Lbs/Gal

Characteristics of Total Sample:

Specific Gravity ----- 0.6584 (Water=1)
 °API Gravity ----- 83.42 @ 60°F
 Molecular Weight ----- 83.0
 Vapor Volume ----- 25.17 CF/Gal
 Weight ----- 5.49 Lbs/Gal

Base Conditions: 14.850 PSI & 60 °F

Certified: FESCO, Ltd. - Alice, Texas

Analyst: XG
 Processor: JCdjv
 Cylinder ID: T-3044

 David Dannhaus 361-661-7015

TANKS DATA INPUT REPORT

COMPONENT	Mol %	LiqVol %	Wt %
Carbon Dioxide	0.026	0.011	0.014
Nitrogen	0.015	0.004	0.005
Methane	6.886	2.920	1.331
Ethane	8.322	5.569	3.014
Propane	8.761	6.040	4.653
Isobutane	2.532	2.073	1.772
n-Butane	7.282	5.765	5.118
Isopentane	4.261	3.899	3.702
n-Pentane	5.583	5.064	4.851
Other C-6's	5.270	5.438	5.470
Heptanes	12.718	14.211	15.025
Octanes	14.320	17.030	18.719
Nonanes	6.129	8.438	9.360
Decanes Plus	9.786	15.535	17.888
Benzene	0.097	0.068	0.091
Toluene	0.708	0.593	0.786
E-Benzene	0.715	0.690	0.914
Xylenes	1.865	1.790	2.384
n-Hexane	4.725	4.862	4.904
2,2,4 Trimethylpentane	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>
Totals:	100.000	100.000	100.000

Characteristics of Total Sample:

Specific Gravity -----	0.6584 (Water=1)
°API Gravity -----	83.42 @ 60°F
Molecular Weight-----	83.0
Vapor Volume -----	25.17 CF/Gal
Weight -----	5.49 Lbs/Gal

Characteristics of Decanes (C10) Plus:

Specific Gravity -----	0.7581 (Water=1)
Molecular Weight-----	151.8

Characteristics of Atmospheric Sample:

°API Gravity -----	68.98 @ 60°F
Reid Vapor Pressure (ASTM D-5191)-----	4.41 psi

QUALITY CONTROL CHECK			
	Sampling Conditions	Test Samples	
Cylinder Number	-----	T-3044*	T-1105
Pressure, PSIG	300	246	238
Temperature, °F	70	70	70

* Sample used for analysis

TOTAL EXTENDED REPORT

COMPONENT	Mol %	LiqVol %	Wt %
Nitrogen	0.015	0.004	0.005
Carbon Dioxide	0.026	0.011	0.014
Methane	6.886	2.920	1.331
Ethane	8.322	5.569	3.014
Propane	8.761	6.040	4.653
Isobutane	2.532	2.073	1.772
n-Butane	7.165	5.652	5.015
2,2 Dimethylpropane	0.118	0.113	0.102
Isopentane	4.261	3.899	3.702
n-Pentane	5.583	5.064	4.851
2,2 Dimethylbutane	0.243	0.254	0.252
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.401	0.411	0.416
2 Methylpentane	2.739	2.845	2.843
3 Methylpentane	1.887	1.927	1.958
n-Hexane	4.725	4.862	4.904
Methylcyclopentane	0.750	0.664	0.760
Benzene	0.097	0.068	0.091
Cyclohexane	0.855	0.728	0.866
2-Methylhexane	3.019	3.512	3.643
3-Methylhexane	2.570	2.952	3.101
2,2,4 Trimethylpentane	0.000	0.000	0.000
Other C-7's	1.170	1.328	1.398
n-Heptane	4.355	5.028	5.256
Methylcyclohexane	3.005	3.023	3.554
Toluene	0.708	0.593	0.786
Other C-8's	8.306	10.150	11.026
n-Octane	3.008	3.857	4.139
E-Benzene	0.715	0.690	0.914
M & P Xylenes	0.802	0.779	1.026
O-Xylene	1.062	1.011	1.358
Other C-9's	4.456	6.081	6.775
n-Nonane	1.673	2.356	2.585
Other C-10's	3.766	5.649	6.408
n-decane	0.826	1.268	1.415
Undecanes(11)	2.552	3.927	4.518
Dodecanes(12)	1.336	2.221	2.591
Tridecanes(13)	0.741	1.321	1.563
Tetradecanes(14)	0.329	0.627	0.752
Pentadecanes(15)	0.124	0.253	0.307
Hexadecanes(16)	0.056	0.123	0.151
Heptadecanes(17)	0.026	0.061	0.075
Octadecanes(18)	0.012	0.028	0.035
Nonadecanes(19)	0.006	0.015	0.019
Eicosanes(20)	0.002	0.005	0.006
Heneicosanes(21)	0.001	0.003	0.004
Docosanes(22)	0.001	0.002	0.002
Tricosanes(23)	0.000	0.001	0.002
Tetracosanes(24)	0.000	0.001	0.001
Pentacosanes(25)	0.000	0.001	0.001
Hexacosanes(26)	0.000	0.001	0.001
Heptacosanes(27)	0.000	0.001	0.001
Octacosanes(28)	0.000	0.001	0.001
Nonacosanes(29)	0.000	0.001	0.002
Triacotanes(30)	0.001	0.002	0.003
Hentriacotanes Plus(31+)	<u>0.005</u>	<u>0.022</u>	<u>0.031</u>
Total	100.000	100.000	100.000



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

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

Date Sampled: 09/20/13

Date Analyzed: 10/02/13

Sample: Central No. 2H (Jonathan Davis Well Pad)

Job Number: J35821

FLASH LIBERATION OF HYDROCARBON LIQUID		
	Separator HC Liquid	Stock Tank
Pressure, psig	300	0
Temperature, °F	70	70
Gas Oil Ratio (1)	-----	365
Gas Specific Gravity (2)	-----	1.408
Separator Volume Factor (3)	1.2406	1.000

STOCK TANK FLUID PROPERTIES	
Shrinkage Recovery Factor (4)	0.8060
Oil API Gravity at 60 °F	68.98
Reid Vapor Pressure, psi (5)	4.41

Quality Control Check			
	Sampling Conditions	Test Samples	
Cylinder No.	-----	T-3044*	T-1105
Pressure, psig	300	246	238
Temperature, °F	70	70	70

(1) - Scf of flashed vapor per barrel of stock tank oil

(2) - Air = 1.000

(3) - Separator volume / Stock tank volume

(4) - Fraction of first stage separator liquid

(5) - Absolute pressure at 100 deg F

Analyst: _____ M. G. _____

* Sample used for flash study

Base Conditions: 14.85 PSI & 60 °F

Certified: FESCO, Ltd. - Alice, Texas

 David Dannhaus 361-661-7015

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

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

Sample: Central No. 2H (Jonathan Davis Well Pad)
 Gas Evolved from Hydrocarbon Liquid Flashed
 From 300 psig & 70 °F to 0 psig & 70 °F

Date Sampled: 09/20/13

Job Number: 35821.001

CHROMATOGRAPH EXTENDED ANALYSIS - SUMMATION REPORT

COMPONENT	MOL%	GPM
Hydrogen Sulfide*	< 0.001	
Nitrogen	0.053	
Carbon Dioxide	0.107	
Methane	23.624	
Ethane	26.392	7.114
Propane	22.728	6.311
Isobutane	4.750	1.567
n-Butane	10.798	3.431
2-2 Dimethylpropane	0.127	0.049
Isopentane	3.304	1.218
n-Pentane	3.382	1.236
Hexanes	2.805	1.165
Heptanes Plus	<u>1.930</u>	<u>0.855</u>
Totals	100.000	22.945

Computed Real Characteristics Of Heptanes Plus:

Specific Gravity ----- 3.556 (Air=1)
 Molecular Weight ----- 101.39
 Gross Heating Value ----- 5420 BTU/CF

Computed Real Characteristics Of Total Sample:

Specific Gravity ----- 1.408 (Air=1)
 Compressibility (Z) ----- 0.9845
 Molecular Weight ----- 40.14
 Gross Heating Value
 Dry Basis ----- 2354 BTU/CF
 Saturated Basis ----- 2314 BTU/CF

*Hydrogen Sulfide tested in laboratory by: Stained 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: ANB
 Cylinder ID: CYL-1

David Dannhaus 361-661-7015

**CHROMATOGRAPH EXTENDED ANALYSIS
TOTAL REPORT**

COMPONENT	MOL %	GPM	WT %
Hydrogen Sulfide*	< 0.001		< 0.001
Nitrogen	0.053		0.037
Carbon Dioxide	0.107		0.117
Methane	23.624		9.441
Ethane	26.392	7.114	19.772
Propane	22.728	6.311	24.970
Isobutane	4.750	1.567	6.879
n-Butane	10.798	3.431	15.637
2,2 Dimethylpropane	0.127	0.049	0.228
Isopentane	3.304	1.218	5.939
n-Pentane	3.382	1.236	6.080
2,2 Dimethylbutane	0.117	0.049	0.251
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.166	0.069	0.356
2 Methylpentane	0.881	0.369	1.892
3 Methylpentane	0.543	0.223	1.166
n-Hexane	1.098	0.455	2.358
Methylcyclopentane	0.079	0.027	0.166
Benzene	0.022	0.006	0.043
Cyclohexane	0.125	0.043	0.262
2-Methylhexane	0.233	0.109	0.582
3-Methylhexane	0.233	0.107	0.582
2,2,4 Trimethylpentane	0.000	0.000	0.000
Other C7's	0.228	0.100	0.564
n-Heptane	0.296	0.138	0.739
Methylcyclohexane	0.195	0.079	0.477
Toluene	0.043	0.015	0.099
Other C8's	0.271	0.127	0.744
n-Octane	0.068	0.035	0.194
Ethylbenzene	0.002	0.001	0.005
M & P Xylenes	0.022	0.009	0.058
O-Xylene	0.003	0.001	0.008
Other C9's	0.076	0.039	0.239
n-Nonane	0.014	0.008	0.045
Other C10's	0.018	0.011	0.063
n-Decane	0.002	0.001	0.007
Undecanes (11)	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>
Totals	100.000	22.945	100.000

Computed Real Characteristics Of Total Sample:

Specific Gravity -----	1.408	(Air=1)
Compressibility (Z) -----	0.9845	
Molecular Weight -----	40.14	
Gross Heating Value		
Dry Basis -----	2354	BTU/CF
Saturated Basis -----	2314	BTU/CF

Antero Resources
Central Unit 2H - Jonathan Davis Pad

Tag Name	Value	Units	Timestamp
Accumulated Gas Flow	449204.7	MCF	10/16/2013 17:05:12
Casing Pressure	2090.66	PSIA	10/16/2013 17:05:11
Current Day Gas Flow	0	MCF	10/16/2013 17:05:12
Differential Pressure	0	inH2O	10/16/2013 17:05:12
Flow Rate	0	MCF Per Day	10/16/2013 17:05:12
Pressure	96.53	PSIA	10/16/2013 17:05:12
Previous Day Energy	116.29	MBTU	10/16/2013 17:05:13
Previous Day Gas Flow	95.17	MCF	10/16/2013 17:05:13
Temperature	62.78	F	10/16/2013 17:05:12
Tubing Pressure	2095.28	PSIA	10/16/2013 17:05:11
Daily AP	0.54	PSIA	10/16/2013 09:00:00
Daily DP	109.39	inH2O	10/16/2013 09:00:00
Daily Energy	116.29	MBTU	10/16/2013 09:00:00
Daily Flow	95.17	MCF	10/16/2013 09:00:00
Daily Tf	79.28	F	10/16/2013 09:00:00
Hourly AP	100.88	PSIA	10/16/2013 10:00:00
Hourly DP	0.02	Inches	10/16/2013 10:00:00
Hourly Energy	0	MBTU	10/16/2013 10:00:00
Hourly Flow Time	0	Seconds	10/16/2013 10:00:00
Hourly Tf	70.9	F	10/16/2013 10:00:00
Hourly Volume	0	MCF	10/16/2013 10:00:00
Audited Accumulated Gas Volume		MCF	
Audited Casing Pressure	2002	PSI	10/14/2013 09:00:00
Audited Gas Volume	542.7	MCF	10/14/2013 09:00:00
Audited Oil Volume	0	Barrels	10/14/2013 09:00:00
Audited Tubing Pressure	2006	PSI	10/14/2013 09:00:00
Audited Water Volume	0	Barrels	10/14/2013 09:00:00
Argon	0	%	10/16/2013 17:05:17
BTU	1221.91	BTU	10/16/2013 17:05:12
C02	0.1866	%	10/16/2013 17:05:17
Carbon Monoxide	0	%	10/16/2013 17:05:17
Decane	0	%	10/16/2013 17:05:17
Ethane	14.3741	%	10/16/2013 17:05:17
Helium	0	%	10/16/2013 17:05:17
Heptane	0	%	10/16/2013 17:05:17
Hexane	0.225	%	10/16/2013 17:05:17
Hydrogen	0	%	10/16/2013 17:05:17
Hydrogen Sulfide	0	%	10/16/2013 17:05:17
Iso-Butane	0.508	%	10/16/2013 17:05:17
Iso-Pentane	0.2715	%	10/16/2013 17:05:17
Methane	78.5619	%	10/16/2013 17:05:17
N2	0.3949	%	10/16/2013 17:05:17
N-Butane	1.0206	%	10/16/2013 17:05:17
Nonane	0	%	10/16/2013 17:05:17
N-Pentane	0.2111	%	10/16/2013 17:05:17
Octane	0	%	10/16/2013 17:05:17
Oxygen	0	%	10/16/2013 17:05:17
Plate Size	3.75	Inches	10/16/2013 17:05:15
Propane	4.2467	%	10/16/2013 17:05:17
SPG	0.7058		10/16/2013 17:05:12
Water	0	%	10/16/2013 17:05:17

Attachment J

Class I Legal Advertisement

Attachment J

**Air Quality Permit Notice
Notice of Application
Rock Run Well Pad
Antero Resources Corporation
Doddridge County, West Virginia**

Notice is given that Antero Resources Corporation has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a G70-A Modification Permit Application for an Oil and Natural Gas facility located at 794 Tunnel Hill Rd, West Union, WV 26456 in Doddridge County, West Virginia.

The latitude and longitude coordinates are: 39.304923 degrees N and -80.814648 degrees W

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

Pollutants	TOTALS (tpy):
VOC	81.1158
NO _x	16.7211
CO _{2e}	25558.9467
CO	37.6067
SO ₂	0.0760
PM _{2.5}	1.1228
PM ₁₀	2.0969
Lead	7.67E-05
Total HAPs	3.8493
Benzene	0.0394
Formaldehyde	0.0305
Xylenes	0.3495

Startup of operation is planned to begin upon issuance of 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 Modification Application Fee

GHD SERVICES INC.

PLEASE DETACH AND RETAIN FOR YOUR RECORDS

INVOICE NUMBER	DATE	VOUCHER NO.	AMOUNT
Account Number: CR90415	9/3/2015	40WVDEPAQ 400968660	426122 1,500.00

TOTAL: 1,500.00

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

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

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

9/4/2015

No. 426122

PAY *****1,500

DOLLARS AND *****00 CENTS \$*****1,500.00

TO THE ORDER OF

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

[Handwritten Signature]
 GHD SERVICES INC.

AUTHORIZED SIGNATURES

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

4 26 1 2 2 1 2 2 1 3 7 0 6 3 2 1 6 1 0 0 0 0 0 1 1 8 9 1 0

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 Type1	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/CAS3 (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, EP-H005, EP-H006, EP-H007, EP-H008, EP-H009, EP-H010	Vertical Stack	H001, H002, H003, H004, H005, H006, H007, H008, H009, H010	Gas Production Unit Heaters	N/A		CO (630080)	1.0312	4.5165	1.0312	4.5165	Gas/Vapor /Solid (for PM)	MB AP-42
						NOx (10102439)	1.2276	5.3768	1.2276	5.3768		
						CO2 Equivalent N2O (10024972), CO2 (124389), CH4 (74828)	1473.1036	6452.1937	1473.1036	6452.1937		
						SO2 (7446095)	7.37E-03	0.0323	7.37E-03	0.0323		
						PM, PM10, PM2.5	0.0933	0.4086	0.0933	0.4086		
						Hexane (110543)	0.0221	0.0968	0.0221	0.0968		
						Formaldehyde (50000)	9.21E-04	0.0040	9.21E-04	4.03E-03		
EP-LH001, EP-LH002, EP-LH003, EP-LH004, EP-LH005, EP-LH006, EP-LH007, EP-LH008, EP-LH009, EP-LH010	Vertical Stack	LH001, LH002, LH003, LH004, LH005, LH006, LH007, LH008, LH009, LH010	Line Heaters	N/A		CO (630080)	1.3749	6.0220	1.3749	6.0220		
						NOx (10102439)	1.6368	7.1691	1.6368	7.1691		
						CO2 Equivalent N2O (10024972), CO2 (124389), CH4 (74828)	1964.1381	8602.9249	1964.1381	8602.9249		
						SO2 (7446095)	9.82E-03	0.0430	9.82E-03	0.0430		
						PM, PM10, PM2.5	0.1244	0.5449	0.1244	0.5449		
						Hexane (110543)	0.0295	0.1290	0.0295	0.1290		
						Total VOCs	0.0900	0.3943	0.0900	0.3943		
F001	N/A	F001	Fugitives	N/A		Benzene (71432)	0.0026	0.0113	0.0026	0.0113	Gas/Vapor	MB
						Toluene (108883)	0.0223	0.0976	0.0223	0.0976		
						Ethyl benzene (100414)	0.0259	0.1136	0.0259	0.1136		
						Hexane (110543)	0.2343	1.0263	0.2343	1.0263		
						o,m,p-xylenes (95476,108383,106423)	0.0676	0.2962	0.0676	0.2962		
						CO2 Equivalent CO2 (124389)), CH4	83.8208	367.1350	83.8208	367.1350		
						VOCs	3.6057	15.7930	3.6057	15.7930		
TAPs (benzene)	2.59E-03	0.0113	0.0026	1.13E-02								
EP-L001, EP-L002	N/A	L001, L002	Loading (Condensate), Loading (Water)	N/A		VOCs	15.6547	11.9054	15.6547	11.9054	Gas/Vapor	MB
						hexane (110543)	0.0364	0.0277	0.0364	0.0277		
						CO2 Equivalent CO2 (124389), CH4	2.9289	2.9449	2.9289	2.9449		

**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 Type1	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/CAS3 (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-HR001	N/A	HR001	Haul Truck	N/A		PM, PM10, PM2.5	3.0733	4.0953	1.5367	2.0476	Solid	MB
EP-EC001, EP-EC002, EP-EC003, EP-EC004,	N/A	TANKCOND001-010, TANKPW001-002, EC001, EC002, EC003, EC004,	Condensate Tank F/W/B, PW Tank F/W/B, Enclosed Combustor	EC001, EC002, EC003, EC004,	Enclosed Combustor	CO (630080)	0.00E+00	0.00E+00	0.5355	2.3453	Gas/Vapor/ Solid (for PM)	MB
						NOx (10102439)	0.00E+00	0.00E+00	0.6375	2.7920		
						CO2 Equivalent N2O (10024972), CO2 (124389), CH4	541.1820	2370.3773	2277.2906	9974.5326		
						PM, PM10, PM2.5	0.00E+00	0.00E+00	0.0484	0.2122		
						Benzene (71432)	0.2954	1.2940	5.91E-03	0.0259		
						Toluene (108883)	0.7202	3.1544	0.0144	0.0631		
						ethyl benzene (100414)	0.2783	1.2190	5.57E-03	0.0244		
						hexane (110543)	20.8010	91.1082	0.4160	1.8222		
						o,m,p-xylenes (95476,108383,106423)	0.5727	2.5083	0.0115	0.0502		
VOCs	596.7608	2613.8125	11.9355	52.2775								
EP-PCV	valve	PCV	Pneumatic CV	N/A		hexane (110543)	0.0056	0.0246	5.62E-03	0.0246	Gas/Vapor	MB
						CO2 Equivalent CO2 (124389)), CH4	9.1343	40.0081	9.1343	40.0081		
						VOCs	0.0958	0.4194	0.0958	0.4194		
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)	27.2163	119.2076	27.2163	119.2076		
						TAPs Formaldehyde (50000)	4.82E-03	0.0211	4.82E-03	0.0211		
						Total VOCs	6.96E-03	0.0305	6.96E-03	0.0305		

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	3.0733	4.0953	1.5367	2.0476	MB
Loading/Unloading Operations	VOCs	15.6547	11.9054	15.6547	11.9054	MB
	toluene (108883)	2.14E-03	1.63E-03	2.14E-03	1.63E-03	
	ethyl benzene (100414)	1.56E-03	1.19E-03	1.56E-03	1.19E-03	
	hexane (110543)	0.0364	0.0277	0.0364	0.0277	
	o,m,p-xylenes (95476,108383,106423)	3.83E-03	2.91E-03	3.83E-03	2.91E-03	
	CO2 Equivalent CO2 (124389), CH4	2.9289	2.9449	2.9289	2.9449	
	benzene (71432)	4.14E-04	3.16E-04	4.14E-04	3.16E-04	
	TAPs (benzene)	4.14E-04	3.16E-04	4.14E-04	3.16E-04	
Equipment Leaks (Components)	Benzene (71432)	Does not apply	0.0113	Does not apply	0.0113	MB
	Toluene (108883)		0.0976		0.0976	
	Ethyl benzene (100414)		0.1136		0.1136	
	Hexane (110543)		1.0263		1.0263	
	o,m,p-xylenes (95476,108383,106423)		0.2962		0.2962	
	CO2 Equivalent CO2 (124389)), CH4		367.1350		367.1350	
	VOCs		15.7930		15.7930	
	TAPs (benzene)		0.0113		0.0113	
Equipment Leaks (PCVs)	hexane (110543)	5.62E-03	0.0246	5.62E-03	0.0246	MB
	CO2 Equivalent CO2 (124389)), CH4	9.1343	40.0081	9.1343	40.0081	
	VOCs	0.0958	0.4194	0.0958	0.4194	

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

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

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

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

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