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Bright People. Right Solutions.

October 21, 2016

Assistant Director for Permitting
WV Department of Environmental Protection
Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

SUBJECT: Antero Midstream LLC – Monroe Compressor Station
West Virginia Department of Environmental Protection, Division of Air Quality, 45CSR13 Air Permit Modification R13-3184C

To Whom it May Concern:

On behalf of Antero Midstream LLC, please find attached the 45CSR13 Air Permit Modification for permit number R13-3184C for the Monroe Compressor Station (Facility ID 095-00037) located in Tyler County, West Virginia. A summary of the modifications in this application include:

1. Increasing the dehydrator throughput to 110 MMscfd per dehydrator,
2. Adding a fuel conditioning heater (0.5 MMBtu/hr capacity),
3. Increasing the size of the settling tank to 500 barrels,
3. Removing the operational hours limitation on the generators, and
4. Modifying compressor blowdown and pigging events based on expected operations and fugitive component counts.

With these emission-related modifications, Antero also requests that conditions 5.4.1 and 8.2.1 of R13-3184C be removed from the permit. Condition 5.4.1 requires the fuel used by the compressor engines and generator be monitored and recorded. This requirement is no longer necessary since the compressor engines and generator no longer have an operational restriction (i.e., fuel use or hours). Condition 8.2.1 requires the throughput to the vapor recovery units be monitored. The throughput to the vapor recovery units is directly dependent on the facility liquids production already being monitored for the storage tanks and loading, therefore compliance for the VRUs is demonstrated through monitoring the liquids throughput.

Enclosed are one hardcopy and two CDs containing the entire permit application including the application form and required attachments. Per 45CSR22, a $3,500 application fee is also enclosed, which covers the base 45CSR13 $1,000 application fee and an additional $2,500 for Hazardous Air Pollutant requirements.

A copy of the Air Quality Permit Notice for the advertisement is included as Attachment P. As the Notice is being submitted simultaneously with the application, the official affidavit of publication will be submitted to the Division of Air Quality separately once it is completed.

Please call if you have any questions or if I can be of further assistance. I can be reached at (719) 632-3593 or by email at kmeszaros@kleinfelder.com .

KLEINFELDER 1801 California Street, Suite 1100, Denver, CO 80202 p | 303.237.6601 f | 303.237.6602

Sincerely,
KLEINFELDER

Kaitlin Meszaros
Air Quality Professional

Enclosure: Monroe Compressor Station R13-3184C Air Permit Modification

KLEINFELDER 1801 California Street, Suite 1100, Denver, CO 80202 p | 303.237.6601 f | 303.237.6602

Antero Midstream LLC

Monroe Compressor Station

NSR Permit Application R13-3184C Modification
West Virginia Department of Environmental Protection
Division of Air Quality
45CSR13

Tyler County, West Virginia

October 2016

Prepared by:

1801 California Street, Suite 1100
Denver, CO 80202
(303) 237-6601
Fax (303) 237-6602
www.kleinfelder.com

DEN16O46146

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WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF AIR QUALITY

601 57th Street, SE
Charleston, WV 25304
(304) 926-0475
www.dep.wv.gov/daq

APPLICATION FOR NSR PERMIT AND TITLE V PERMIT REVISION (OPTIONAL)

PLEASE CHECK ALL THAT APPLY TO **NSR (45CSR13)** (IF KNOWN):

☐ **CONSTRUCTION** ☒ **MODIFICATION** ☐ **RELOCATION**
☐ **CLASS I ADMINISTRATIVE UPDATE** ☐ **TEMPORARY**
☐ **CLASS II ADMINISTRATIVE UPDATE** ☐ **AFTER-THE-FACT**

PLEASE CHECK TYPE OF **45CSR30 (TITLE V)** REVISION (IF ANY):

☐ **ADMINISTRATIVE AMENDMENT** ☐ **MINOR MODIFICATION**
☐ **SIGNIFICANT MODIFICATION**

IF ANY BOX ABOVE IS CHECKED, INCLUDE TITLE V REVISION INFORMATION AS **ATTACHMENT S** TO THIS APPLICATION

FOR TITLE V FACILITIES ONLY: Please refer to "Title V Revision Guidance" in order to determine your Title V Revision options (Appendix A, "Title V Permit Revision Flowchart") and ability to operate with the changes requested in this Permit Application.

Section I. General

1. Name of applicant *(as registered with the WV Secretary of State's Office):*
Antero Midstream LLC

2. Federal Employer ID No. ***(FEIN):***
46-5517375

3. Name of facility *(if different from above):*
Monroe Compressor Station

4. The applicant is the:
☐ **OWNER** ☐ **OPERATOR** ☒ **BOTH**

5A. Applicant's mailing address:
1615 Wynkoop Street
Denver, CO 80202

5B. Facility's present physical address:
Conaway Run Road
Alma, WV 26320

6. **West Virginia Business Registration.** Is the applicant a resident of the State of West Virginia? ☐ **YES** ☒ **NO**

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

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

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

- If **YES,** please explain: Antero Midstream LLC owns the land for the site
- If **NO,** you are not eligible for a permit for this source.

9. Type of plant or facility (stationary source) to be **constructed, modified, relocated, administratively updated** or **temporarily permitted** (e.g., coal preparation plant, primary crusher, etc.): Natural Gas Compressor Station

10. North American Industry Classification System **(NAICS)** code for the facility:
221210

11A. DAQ Plant ID No. (for existing facilities only):
0 9 5 – 0 0 0 3 7

11B. List all current 45CSR13 and 45CSR30 (Title V) permit numbers associated with this process (for existing facilities only):
R13-3184C

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

12A.

- For **Modifications, Administrative Updates** or **Temporary permits** 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 B**.

From Alma, WV, on WV-18 turn west onto Conaway Run Road (Co Rd 48). After 1.6 miles, turn right onto facility entrance.

12.B. New site address (if applicable):	12C. Nearest city or town:	12D. County:
Conaway Run Road Alma, WV 26320	Alma	Tyler
12.E. UTM Northing (KM): 4363.467	12F. UTM Easting (KM): 511.720	12G. UTM Zone: 17

13. Briefly describe the proposed change(s) at the facility:
The dehydrator throughput has been increased to 110 MMscfd per dehydrator, the size of the settling tank is 500 bbl, the hour limit on the generators has been removed, a fuel conditioning heater has been added, and the fugitive and venting emissions have been updated based on expected operations.

14A. Provide the date of anticipated installation or change: Upon Permit Issuance – If this is an **After-The-Fact** permit application, provide the date upon which the proposed change did happen: / /	14B. Date of anticipated Start-Up if a permit is granted: January 2017

14C. Provide a **Schedule** of the planned **Installation** of/**Change** to and **Start-Up** of each of the units proposed in this permit application as **Attachment C** (if more than one unit is involved).

15. Provide maximum projected **Operating Schedule** of activity/activities outlined in this application:
Hours Per Day 24 Days Per Week 7 Weeks Per Year 52

16. Is demolition or physical renovation at an existing facility involved? ☐ **YES** ☒ **NO**

17**. Risk Management Plans.** If this facility is subject to 112(r) of the 1990 CAAA, or will become subject due to proposed changes (for applicability help see www.epa.gov/ceppo), submit your **Risk Management Plan (RMP)** to U. S. EPA Region III.

18**. Regulatory Discussion.** List all Federal and State air pollution control regulations that you believe are applicable to the proposed process *(if known).* A list of possible applicable requirements is also included in Attachment S of this application (Title V Permit Revision Information). Discuss applicability and proposed demonstration(s) of compliance *(if known).* Provide this information as **Attachment D.**

Section II. Additional attachments and supporting documents.

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

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

21. Provide a **Plot Plan,** e.g. scaled map(s) and/or sketch(es) showing the location of the property on which the stationary source(s) is or is to be located as **Attachment E** (Refer to ***Plot Plan Guidance***) **.**

– Indicate the location of the nearest occupied structure (e.g. church, school, business, residence).

22. Provide a **Detailed Process Flow Diagram(s)** showing each proposed or modified emissions unit, emission point and control device as **Attachment F.**

23. Provide a **Process Description** as **Attachment G.**

– Also describe and quantify to the extent possible all changes made to the facility since the last permit review (if applicable).

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

24. Provide **Material Safety Data Sheets (MSDS)** for all materials processed, used or produced as **Attachment H.**

– For chemical processes, provide a MSDS for each compound emitted to the air.

25. Fill out the **Emission Units Table** and provide it as **Attachment I.**

26. Fill out the **Emission Points Data Summary Sheet (Table 1 and Table 2)** and provide it as **Attachment J.**

27. Fill out the **Fugitive Emissions Data Summary Sheet** and provide it as **Attachment K.**

28. Check all applicable **Emissions Unit Data Sheets** listed below:

☐ Bulk Liquid Transfer Operations	☐ Haul Road Emissions	☐ Quarry
☒ Chemical Processes	☐ Hot Mix Asphalt Plant	☐ Solid Materials Sizing, Handling and Storage Facilities
☐ Concrete Batch Plant	☐ Incinerator	☒ Storage Tanks
☐ Grey Iron and Steel Foundry	☐ Indirect Heat Exchanger	

☒ General Emission Unit, specify: Dehydrator, Fuel Conditioning Heater, Generator

Fill out and provide the **Emissions Unit Data Sheet(s)** as **Attachment L.**

29. Check all applicable **Air Pollution Control Device Sheets** listed below:

☐ Absorption Systems	☐ Baghouse	☐ Flare
☐ Adsorption Systems	☐ Condenser	☐ Mechanical Collector
☐ Afterburner	☐ Electrostatic Precipitator	☐ Wet Collecting System

☐ Other Collectors, specify :

Fill out and provide the **Air Pollution Control Device Sheet(s)** as **Attachment M.**

30. Provide all **Supporting Emissions Calculations** as **Attachment N,** or attach the calculations directly to the forms listed in Items 28 through 31.

31. **Monitoring, Recordkeeping, Reporting and Testing Plans.** Attach proposed monitoring, recordkeeping, reporting and testing plans in order to demonstrate compliance with the proposed emissions limits and operating parameters in this permit application. Provide this information as **Attachment O.**

➢ Please be aware that all permits must be practically enforceable whether or not the applicant chooses to propose such measures. Additionally, the DAQ may not be able to accept all measures proposed by the applicant. If none of these plans are proposed by the applicant, DAQ will develop such plans and include them in the permit.

32. **Public Notice.** At the time that the application is submitted, place a **Class I Legal Advertisement** in a newspaper of general circulation in the area where the source is or will be located (See 45CSR§13-8.3 through 45CSR§13-8.5 and ***Example Legal Advertisement*** for details). Please submit the **Affidavit of Publication** as **Attachment P** immediately upon receipt.

33. **Business Confidentiality Claims.** Does this application include confidential information (per 45CSR31)?

☐ **YES** ☒ **NO**

➢ If **YES,** identify each segment of information on each page that is submitted as confidential and provide justification for each segment claimed confidential, including the criteria under 45CSR§31-4.1, and in accordance with the DAQ's ***"Precautionary Notice – Claims of Confidentiality"*** guidance found in the ***General Instructions*** as **Attachment Q.**

Section III. Certification of Information

34. **Authority/Delegation of Authority.** Only required when someone other than the responsible official signs the application. Check applicable **Authority Form** below:

☒ Authority of Corporation or Other Business Entity	☐ Authority of Partnership
☐ Authority of Governmental Agency	☐ Authority of Limited Partnership

Submit completed and signed **Authority Form** as **Attachment R.**

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

35A. **Certification of Information.** To certify this permit application, a Responsible Official (per 45CSR§13-2.22 and 45CSR§30-2.28) or Authorized Representative shall check the appropriate box and sign below.

Certification of Truth, Accuracy, and Completeness

I, the undersigned ☒ **Responsible Official** / ☐ **Authorized Representative,** hereby certify that all information contained in this application and any supporting documents appended hereto, is true, accurate, and complete based on information and belief after reasonable inquiry I further agree to assume responsibility for the construction, modification and/or relocation and operation of the stationary source described herein in accordance with this application and any amendments thereto, as well as the Department of Environmental Protection, Division of Air Quality permit issued in accordance with this application, along with all applicable rules and regulations of the West Virginia Division of Air Quality and W.Va. Code § 22-5-1 et seq. (State Air Pollution Control Act). If the business or agency changes its Responsible Official or Authorized Representative, the Director of the Division of Air Quality will be notified in writing within 30 days of the official change.

Compliance Certification

Except for requirements identified in the Title V Application for which compliance is not achieved, I, the undersigned hereby certify that, based on information and belief formed after reasonable inquiry, all air contaminant sources identified in this application are in compliance with all applicable requirements.

SIGNATURE Ward McNeilly *(Please use blue ink)* DATE: 10/14/16 *(Please use blue ink)*

35B. Printed name of signee: Ward McNeilly		35C. Title: Vice President, Reserves Planning and Midstream
35D. E-mail: wmcneilly@anteroresources.com	36E. Phone: (303)357-6822	36F. FAX: (303)357-7315
36A. Printed name of contact person (if different from above): Barry Schatz		36B. Title: Senior Environmental and Regulatory Manager
36C. E-mail: bschatz@anteroresources.com	36D. Phone: (303) 357-7276	36E. FAX: (303)357-7315

PLEASE CHECK ALL APPLICABLE ATTACHMENTS INCLUDED WITH THIS PERMIT APPLICATION:

- ☒ **Attachment A: Business Certificate**
- ☒ **Attachment B: Map(s)**
- ☒ **Attachment C: Installation and Start Up Schedule**
- ☒ **Attachment D: Regulatory Discussion**
- ☒ **Attachment E: Plot Plan**
- ☒ **Attachment F: Detailed Process Flow Diagram(s)**
- ☒ **Attachment G: Process Description**
- ☒ **Attachment H: Material Safety Data Sheets (MSDS)**
- ☒ **Attachment I: Emission Units Table**
- ☒ **Attachment J: Emission Points Data Summary Sheet**
- ☒ **Attachment K: Fugitive Emissions Data Summary Sheet**
- ☒ **Attachment L: Emissions Unit Data Sheet(s)**
- ☐ **Attachment M: Air Pollution Control Device Sheet(s)**
- ☒ **Attachment N: Supporting Emissions Calculations**
- ☒ **Attachment O: Monitoring/Recordkeeping/Reporting/Testing Plans**
- ☒ **Attachment P: Public Notice**
- ☐ **Attachment Q: Business Confidential Claims**
- ☒ **Attachment R: Authority Forms**
- ☐ **Attachment S: Title V Permit Revision Information**
- ☒ **Application Fee**

Please mail an original and three (3) copies of the complete permit application with the signature(s) to the DAQ, Permitting Section, at the address listed on the first page of this application. Please DO NOT fax permit applications.

FOR AGENCY USE ONLY – IF THIS IS A TITLE V SOURCE:

- ☐ ***Forward 1 copy of the application to the Title V Permitting Group and:***
- ☐ ***For Title V Administrative Amendments:***
  - ☐ ***NSR permit writer should notify Title V permit writer of draft permit,***
- ☐ ***For Title V Minor Modifications:***
  - ☐ ***Title V permit writer should send appropriate notification to EPA and affected states within 5 days of receipt,***
  - ☐ ***NSR permit writer should notify Title V permit writer of draft permit.***
- ☐ ***For Title V Significant Modifications processed in parallel with NSR Permit revision:***
  - ☐ ***NSR permit writer should notify a Title V permit writer of draft permit,***
  - ☐ ***Public notice should reference both 45CSR13 and Title V permits,***
  - ☐ ***EPA has 45 day review period of a draft permit.***

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

Discussion of Nearby Facilities

Monroe Compressor Station – Closest Antero Midstream Facilities

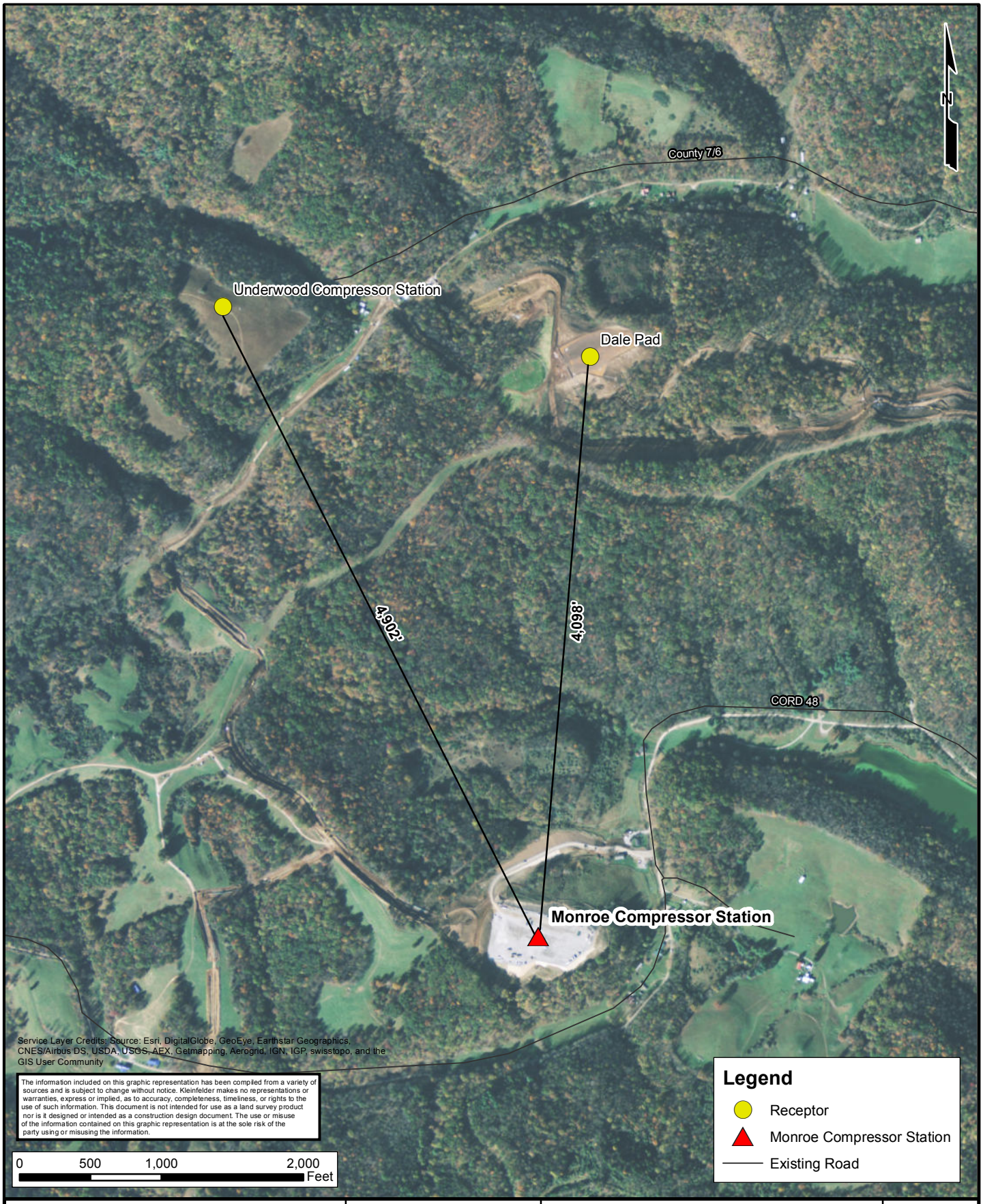
1. Common Control: Only those facilities that are owned and managed by Antero were included in the aggregation discussion. This includes Antero Resources Corporation production facilities in addition to the Antero Midstream LLC midstream facilities.

2. SIC Code: The Monroe Compressor Station will operate under SIC code 4923 (natural gas distribution). The closest facility owned by Antero Midstream LLC with this SIC code is the Underwood Compressor station which is 0.93 miles northwest of the Facility. All Antero Resources Corporation production facilities operate under the SIC code of 1311 (crude petroleum and natural gas extraction). The closest facility operated by Antero Resources Corporation with the SIC code of 1311 is the Dale Pad 0.78 miles to the north.

3. Contiguous or Adjacent: The land between the Monroe Compressor Station and its nearest facility operating under SIC code 4923 is not owned or managed by Antero Midstream LLC or Antero Resources Corporation. Therefore, the two facilities are not contiguous or adjacent.

Based on this three-pronged evaluation, although the Monroe Compressor Station and Underwood Compressor Station do belong to the same major industrial group, they should not be aggregated because they are not contiguous or adjacent.

The Monroe Compressor Station and Dale Pad should not be aggregated because they do not belong to the same major industrial group and do not directly rely on each other nor are they contiguous or adjacent.



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PROJECT NO.	20163815.001A
DRAWN:	1/20/2016
DRAWN BY:	B. McDavid
CHECKED BY:	M. Steyskal
FILE NAME:	Monroe_ClosestReceptor.mxd

Antero Midstream LLC

Monroe Compressor Station
Tyler County, West Virginia

FIGURE

Attachment A.
Business Certificate

State of West Virginia

Certificate

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

ANTERO MIDSTREAM LLC

Control Number: 9A5E1

a limited liability company, organized under the laws of the State of Delaware

has filed its "Application for Certificate of Authority" in my office according to the provisions of West Virginia Code §31B-10-1002. I hereby declare the organization to be registered as a foreign limited liability company from its effective date of April 29, 2014, until a certificate of cancellation is filed with our office.

Therefore, I hereby issue this

CERTIFICATE OF AUTHORITY OF A FOREIGN LIMITED LIABILITY COMPANY

to the limited liability company authorizing it to transact business in West Virginia

Given under my hand and the Great Seal of the State of West Virginia on this day of April 29, 2014

Natalie E Tennant

Secretary of State

FILED

APR 29 2014

IN THE OFFICE OF
WV SECRETARY OF STATE

Submitted by:
CT Corporation Rep-Terry Stamper
Terry.Stamper@wolterskluwer.com
304-776-1152

1152

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

Penney Barker, Manager
Corporations Division
Tel: (304)558-8000
Fax: (304)558-8381
Website: www.wvsos.com
E-mail: business@wvsos.com

Office Hours: Monday – Friday
8:30 a.m. – 5:00 p.m. ET

Control # A45E1

FILE ONE ORIGINAL.
(Two if you want a filed stamped copy returned to you)
FEE: $150

WV APPLICATION FOR CERTIFICATE OF AUTHORITY OF LIMITED LIABILITY COMPANY

1. The **name** of the company as registered in its **home state** is: Antero Midstream LLC

   and the **state or country of organization** is: Delaware

☒ **CHECK HERE to indicate you have obtained and submitted with this application a CERTIFICATE OF EXISTENCE (GOOD STANDING), dated during the current tax year, from your home state of original incorporation as required to process your application. The certificate may be obtained by contacting the Secretary of State's Office in the home state of original incorporation.**

2. The **name** to be used in **West Virginia** will be: [The **name must contain one of the required terms** such as limited liability company" or abbreviations such as "LLC" or "PLLC". See instructions for complete list of acceptable terms and requirements for use of trade name.]
   ☒ **Home State name as listed above,** if available in WV (If name is not available, check DBA Name box below and follow special instructions in **Section 2.** attached.)
   ☐ **DBA name** _____ (See special instructions in **Section 2.** Regarding the **Letter of Resolution** attached to this application.)

3. The company will be a: [See instructions for limitations on professions which may form P.L.L.C. in WV. All members must have WV professional license. In most cases, a **Letter of Authorization/Approval from the appropriate State Licensing Board** is required to process the application.]
   ☒ regular **L.L.C.**
   ☐ **Professional L.L.C.** for the profession of _____

4. The street address of the **principal office** is:
   No. & Street: 1625 17th Street, Suite 300
   City/State/Zip: Denver, Colorado 80202

   and the mailing address (if different) is:
   Street/Box: _____
   City/State/Zip: _____

5. The **address** of the **designated office** of the company in WV, if any, will be:
   No. & Street: 5400 D Big Tyler Road
   City/State/Zip: Charleston, West Virginia 25313

6. **Agent of Process:** Properly designated person to whom notice of legal process may be sent, if any:
   Name: C T Corporation System
   Address: 5400 D Big Tyler Road
   City/State/Zip: Charleston, West Virginia 25313

RECEIVED

APR 29 2014

214913 3/2/2014 8:35:00

7. **E-mail address** where business correspondence may be received: jgiannaula@anteroresources.com

8. **Website address of the business,** if any: N/A

9. The company is:
   - [X] an **at-will** company, for an indefinite period
   - [ ] a **term** company, for the term of _____ years, which will expire on _____.

10. The company is:
   - [X] **member**-managed. [List the names and addresses of all members.]
   - [ ] **manager**-managed. [List the names and addresses of all managers.]

List the **Name(s) and Address(es) of the Member(s)/Manager(s)** of the company (attach additional pages if necessary).

Name	Street Address	City, State, Zip
Antero Resources Corporation	1625 17th Street, Suite 300	Denver, Colorado 80202

11. All or specified members of a limited liability company are liable in their capacity as members for all or specified debts, obligations or liabilities of the company.
   - [X] **No**--All debts, obligations and liabilities are those of the company.
   - [ ] **Yes**--Those persons who are liable in their capacity as members for all debts, obligations or liability of the company have consented in writing to the adoption of the provision or to be bound by the provision.

12. The **purpose** for which this limited liability company is formed are as follows:
(Describe the type(s) of business activity which will be conducted, for example, "real estate," "construction of residential and commercial buildings," "commercial printing," "professional practice of architecture.")

Midstream oil and gas operating company

13. Is the business a **Scrap Metal Dealer**?
   - [ ] **Yes** [If "Yes," you must complete the **Scrap Metal Dealer Registration Form** (Form SMD-1) and proceed to question 14.].
   - [X] **No** [Proceed to question 14.]

14. The number of pages attached and included in this application is: 3

15. The requested **effective date** is: [Requested date *may not be earlier than filing nor later than 90 days after filing in our office.*]
☒ the date & time of filing in the Secretary of State's Office
☐ the following date _____ and time _____

16. **Contact and Signature Information*** (See below ***Important Legal Notice Regarding Signature***):

a.	Alvyn A. Schopp	(313) 357-7310
	Contact Name	Phone Number
b.	Alvyn A. Schopp	Chief Administrative Officer and Regional Vice President
	Print or type name of signer	Title / Capacity of Signer
c.	_____	April 28, 2014
	Signature	**Date**

****Important Legal Notice Regarding Signature:* Per West Virginia Code §31B-2-209, Liability for false statement in filed record.** If a record authorized or required to be filed under this chapter contains a false statement, one who suffers loss by reliance on the statement may recover damages for the loss from a person who signed the record or caused another to sign it on the person's behalf and knew the statement to be false at the time the record was signed.

Delaware

The First State

I, JEFFREY W. BULLOCK, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY "ANTERO MIDSTREAM LLC" IS DULY FORMED UNDER THE LAWS OF THE STATE OF DELAWARE AND IS IN GOOD STANDING AND HAS A LEGAL EXISTENCE SO FAR AS THE RECORDS OF THIS OFFICE SHOW, AS OF THE TWENTY-NINTH DAY OF APRIL, A.D. 2014.

AND I DO HEREBY FURTHER CERTIFY THAT THE ANNUAL TAXES HAVE NOT BEEN ASSESSED TO DATE.

Jeffrey W. Bullock, Secretary of State

5466900 8300

AUTHENTICATION: 1328067

140532521

DATE: 04-29-14

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

Attachment B.
Area Map

Source: Esri, DigitalGlobe, CNES/Airbus DS, USDA, swisstopo, and the GIS User Community

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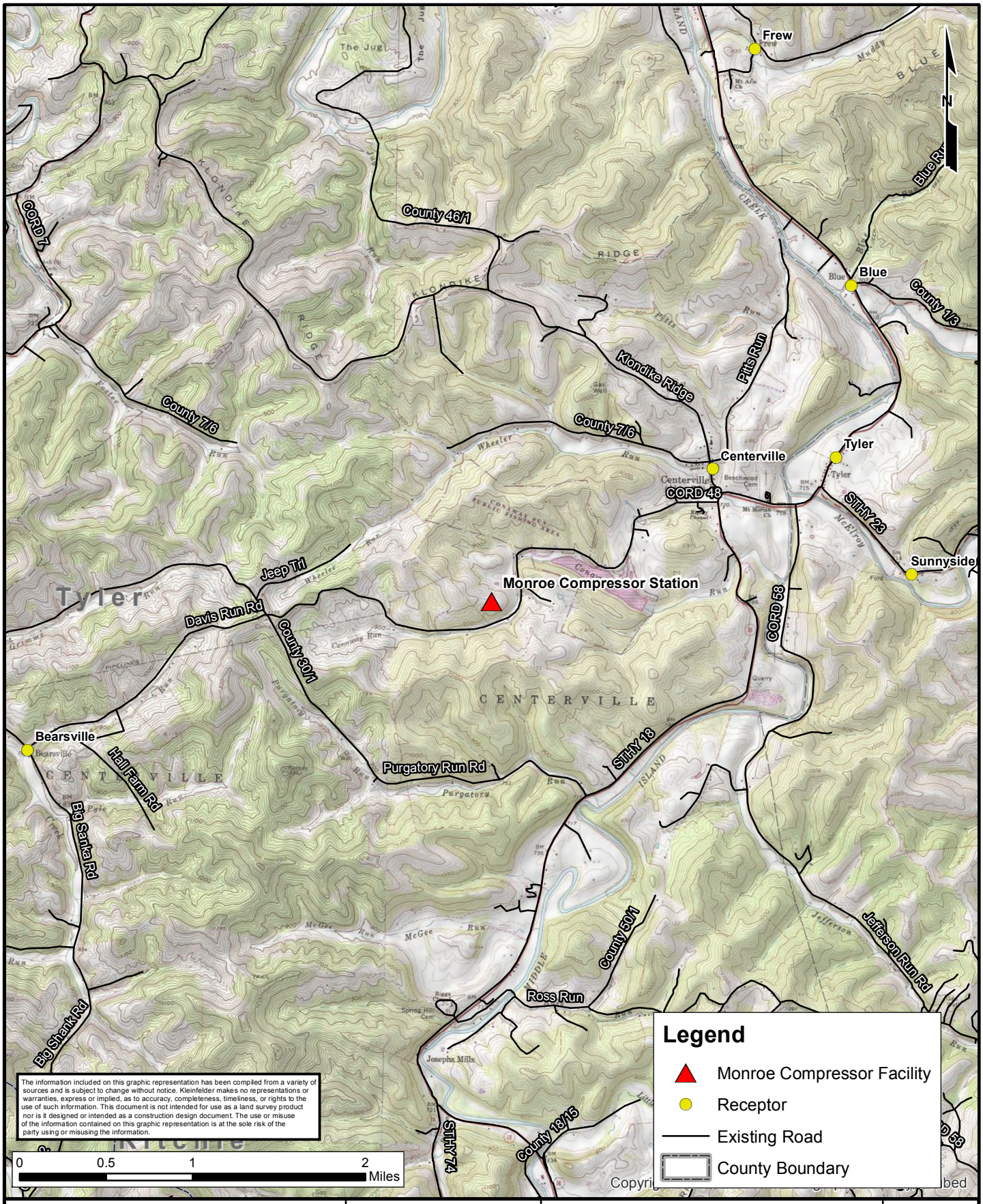
PROJECT NO.	139193/1
DRAWN:	10/21/2014
DRAWN BY:	A.Leonard
CHECKED BY:	K.Meszaros
FILE NAME:	MonroeCompressor_Receptor.mxd

Antero Midstream LLC

Monroe Compressor Station
Tyler County, West Virginia

FIGURE



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PROJECT NO.	139193/1
DRAWN:	10/21/2014
DRAWN BY:	A.Leonard
CHECKED BY:	K.Meszaros
FILE NAME:	MonroeCompressor_Topo_v3.mxd

Antero Midstream LLC

Monroe Compressor Station
Tyler County, West Virginia

FIGURE

Attachment C.
Installation and Startup Schedule

Monroe Compressor Station – Installation and Startup Schedule

The Monroe Compressor Station is an existing facility located in Tyler County, WV, approximately 2.0 miles west of Alma, WV. Equipment is currently installed and operating per permit R13-3184C. The proposed equipment is scheduled to be installed and operational around January 2017.

Attachment D.
Regulatory Discussion

Monroe Compressor Station – Regulatory Discussion

Federal Regulations

40 CFR Part 60 – Standards of Performance for New Stationary Sources

I. *Subpart Kb - Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984.*

Applicability: Subpart Kb applies to volatile organic liquid storage tanks with a capacity greater than or equal to 75 m^3 (§60.110b(a)). However, Subpart Kb does not apply to storage vessels with a design capacity less than or equal to 1,589.874 m^3 that are used for petroleum or condensate storage prior to custody transfer. The storage tanks at Monroe Compressor Station will be less than 1,589.874 m^3 and will be used for storage prior to custody transfer. Therefore, Subpart Kb does not apply to the Monroe Compressor Station.

II. *Subpart GG - Standards of Performance for Stationary Gas Turbines*

Applicability: Subpart GG applies to all stationary gas turbines with a heat input at peak load equal to or greater than 10 million BTU per hour based on the lower heating value of the fuel (§60.330(a)). Since the microturbine generators at the Monroe Compressor Station have a heat input rating less than 10 million Btu per hour, Subpart GG does not apply.

III. *Subpart KKK - Standards of Performance for Equipment Leaks of VOC from Onshore Natural Gas Processing Plants for Which Construction, Reconstruction, or Modification Commenced After January 20, 1984, and on or Before August 23, 2011.*

Applicability: Subpart KKK applies to facilities built or modified before August 23, 2011, so Subpart KKK will not apply as the Monroe Compressor Station was constructed in 2014.

IV. *Subpart LLL - Standards of Performance for SO_2 Emissions from Onshore Natural Gas Processing for Which Construction, Reconstruction, or Modification Commenced After January 20, 1984, and on or Before August 23, 2011.*

Applicability: Subpart LLL applies to facilities built or modified before August 23, 2011, so Subpart LLL will not apply as the Monroe Compressor Station was constructed in 2014.

V. *Subpart JJJJ - Standards of Performance for Stationary Spark Ignition Internal Combustion Engines*

Applicability: Subpart JJJJ applies to rich burn engines that were ordered after June 12, 2006 and manufactured on or after July 1, 2007 for engines with maximum power

greater than or equal to 500 hp (§60.4230(a)(4)(i)). Thus, Subpart JJJJ applies to the Monroe Compressor Station as the compressor engines were ordered after June 12, 2006 and manufactured after July 1, 2007.

VI. *Subpart KKKK - Standards of Performance for Stationary Combustion Turbines*

Applicability: Subpart KKKK applies to all stationary combustion turbines with a heat input at peak load equal to or greater than 10 million BTU per hour based on the higher heating value of the fuel (§60.4305(a)). Since the microturbine generators at the Monroe Compressor Station have a heat input rating less than 10 million Btu per hour, Subpart KKKK does not apply.

VII. *Subpart OOOO - Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution*

Applicability: Subpart OOOO applies to reciprocating compressor facilities that were constructed, modified, or reconstructed after August 23, 2011 (§60.5365(c)) and before September 18, 2015. Additionally, Subpart OOOO applies to storage vessel affected facilities with individual tank emissions greater than 6 tons per year (§60.5365(e)). Thus, Subpart OOOO applies to the Monroe Compressor Station as it was constructed after August 23, 2011 and has a settling tank with uncontrolled VOC potential to emit greater than six (6) tons per year. The pneumatic controllers installed at Monroe Compressor Station are air-actuated and therefore exempt from the requirements of this subpart.

VIII. *Subpart OOOOa – Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification, or Reconstruction Commenced after September 18, 2015*

Applicability: Subpart OOOOa applies to reciprocating compressor facilities that were constructed, modified, or reconstructed after September 18, 2015 (§60.5365a(c)). Additionally, the collection of fugitive emissions components at a compressor station is an affected facility under this Subpart (§60.5365a(j)). A modification for a compressor station under §60.5365a(j) occurs when a compressor engine is added or replaced to increase overall horsepower. Thus, Subpart OOOOa does apply to the reciprocating compressors and fugitive leak components Monroe Compressor Station since the modifications after September 18, 2015 added compression to the facility.

40 CFR Part 61 – National Emission Standards for Hazardous Air Pollutants

I. *Subpart V – National Emission Standard for Equipment Leaks (Fugitive Emission Sources)*

Applicability: Subpart V applies to components such as compressors, valves, and pumps that are intended to operate in volatile hazardous air pollutant (VHAP) service (§61.240(a)). VHAP service means that a component contains or contacts a fluid that is at least 10 percent by weight a VHAP. Subpart V does not apply to the Monroe

Compressor Station because none of the components have fluid (natural gas, water, or condensate) that is over 10 percent by weight of any VHAP.

40 CFR Part 63 – National Emission Standards for Hazardous Air Pollutants for Source Categories

I. *Subpart HH – National Emission Standards for Hazardous Air Pollutants from Oil and Natural Gas Production Facilities*

Applicability: Subpart HH applies to oil and natural gas production facilities that are a major or area source of HAP emissions, and that process, upgrade, or store hydrocarbon liquids or natural gas prior to the transmission and storage source category (§63.760(a)). Subpart HH does apply to the Monroe Compressor Station, and because it is an area source of HAP emissions, the two (2) TEG dehydrators are applicable sources under Subpart HH (§63.760(b)(2)). However, actual benzene emissions from the dehydrators at the Monroe Compressor Station are less than 1 ton per year, so both dehydrators are exempt from all requirements except recordkeeping (§63.764(e)(1)(ii)).

II. *Subpart HHH – National Emission Standards for Hazardous Air Pollutants from Natural Gas Transmission and Storage Facilities*

Applicability: Subpart HHH applies to natural gas transmission and storage facilities that are a major source of HAP emissions (§63.1270(a)). Subpart HHH does not apply to the Monroe Compressor Station as it is not a major source of HAP emissions. Further, the Monroe Compressor Station is prior to the gas transmission and storage phase.

III. *Subpart EEEE – National Emission Standards for Hazardous Air Pollutants: Organic Liquids Distribution (Non-Gasoline)*

Applicability: Subpart EEEE applies to organic liquids distribution operations that are located at major source of HAP emissions (§63.2334(a)). Subpart EEEE does not apply to the Monroe Compressor Station as it is not a major source of HAP emissions.

IV. *Subpart YYYY – National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines*

Applicability: Subpart YYYY applies to stationary combustion turbines located at major sources of HAP emissions (§63.6085(a)). Since the Monroe Compressor Station is not a major source of HAP emissions, Subpart YYYY does not apply.

V. *Subpart ZZZZ - National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines*

Applicability: Subpart ZZZZ applies to stationary RICE at a major or area source of HAP emissions (§63.6585). Subpart ZZZZ applies to the Monroe Compressor Station as the

compressor engines are new RICE. The engines will meet Subpart ZZZZ by meeting 40 CFR Part 60, Subpart JJJJ as the Monroe Compressor Station is an area source of HAP emissions (§63.6590(c)(1)).

VI. *Subpart DDDDD – National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters*

Applicability: Subpart DDDDD applies to process heaters at a major source of HAP emissions (§63.7485). Subpart DDDDD does not apply to the Monroe Compressor Station as it is not a major source of HAP emissions.

West Virginia State Regulations

Title 45 Legislative Rule – Division of Environmental Protection, Office of Air Quality

The following Title 45 Legislative Rules will be applicable to the Monroe Compressor Station:

I. *45CSR2 – To Prevent and Control Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers*

II. *45CSR2A – Testing, Monitoring, Recordkeeping and Reporting Requirements Under 45CSR2*

III. *45CSR4 – To Prevent and Control the Discharge of Air Pollutants into the Open Air Which Causes or Contributes to an Objectionable Odor or Odors*

IV. *45CSR6 – Control of Air Pollution from Combustion of Refuse*

V. *45CSR8 – Ambient Air Quality Standards*

VI. *45CSR11 – Prevention of Air Pollution Emergency Episodes*

VII. *45CSR13 – Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, and Procedures for Evaluation*

VIII. *45CSR16 – Standards of Performance for New Stationary Sources Pursuant to 40 CFR, Part 60*

IX. *45CSR20 – Good Engineering Practice as Applicable to Stack Heights*

X. *45CSR22 – Air Quality Management Fee Program*

XI. *45CSR27 – To Prevent and Control the Emissions of Toxic Air Pollutants*

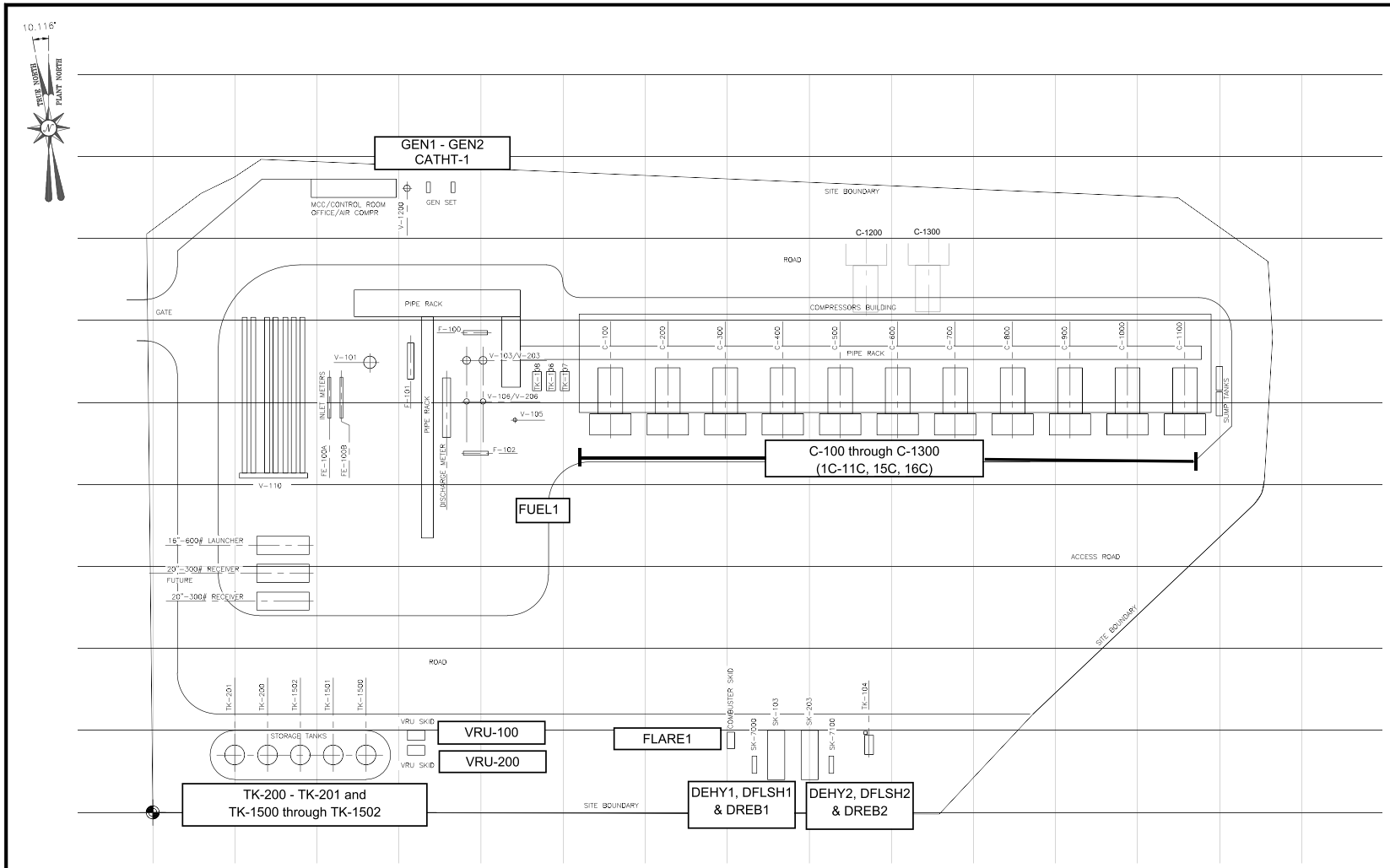
XII. *45CSR33 – Acid Rain Provisions and Permits*

XIII. *45CSR34 – Emission Standards for Hazardous Air Pollutants for Source Categories Pursuant to 40 CFR, Part 63*

XIV. *45CSR38 – Provisions for Determination of Compliance with Air Quality Management Rules*

XV. *45CSR42 – Greenhouse Gas Emissions Inventory*

Attachment E.
Plot Plan



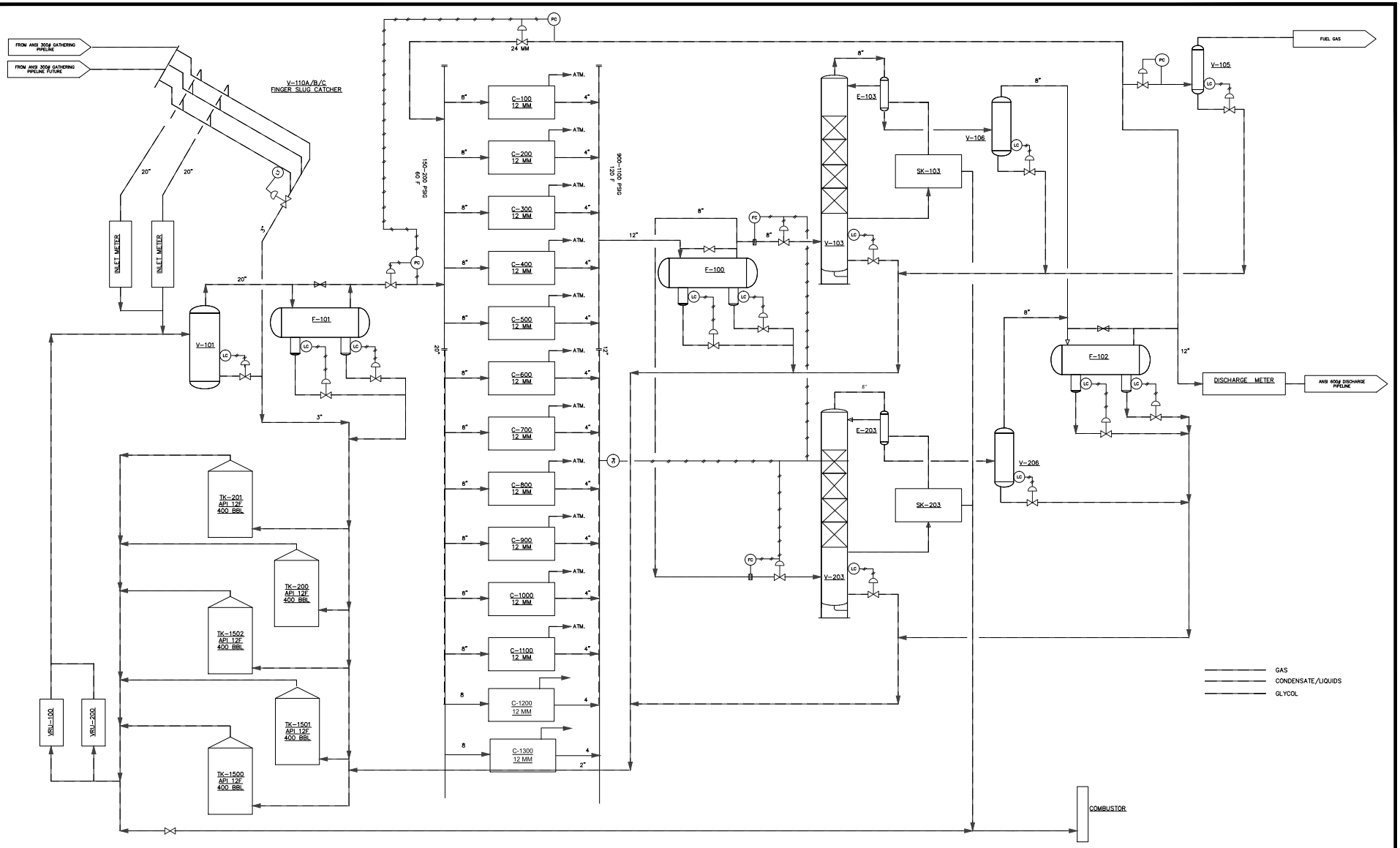
EQUIPMENT	DESCRIPTION
C-100	COMPRESSOR SKID JGK/4
C-200	COMPRESSOR SKID JGK/4
C-300	COMPRESSOR SKID JGK/4
C-400	COMPRESSOR SKID JGK/4
C-500	COMPRESSOR SKID JGK/4
C-600	COMPRESSOR SKID JGK/4
C-700	COMPRESSOR SKID JGK/4
C-800	COMPRESSOR SKID JGK/4
C-900	COMPRESSOR SKID JGK/4
C-1000	COMPRESSOR SKID JGK/4
C-1100	COMPRESSOR SKID JGK/4
F-100	INLET COALESCING FILTER SEPARATOR
F-101	DISCHARGE COALESCING FILTER SEPARATOR
F-102	DISCHARGE COALESCING FILTER SEPARATOR
FE-100A	INLET METER
FE-100B	DISCHARGE METER
L-1	PIG LAUNCHER
PR-100	PIG RECEIVER
PR-200	PIG RECEIVER FUTURE
SK-103	DEHY SKID
SK-203	DEHY SKID
SK-7000	BTEX SKID
SK-7100	BTEX SKID
TK-104	TEG MAKE UP TANK
TK-106	COOLANT STORAGE TANK
TK-107	ENGINE LUBE OIL TANK
TK-108	COMPRESSOR LUBE OIL TANK
TK-200	CONDENSATE TANK
TK-201	CONDENSATE TANK
TK-1500	PRODUCED WATER TANK
TK-1501	PRODUCED WATER TANK
TK-1502	WATER/ORGANIC SETTLING TANK
V-101	INLET SCRUBBER
V-103	DEHY TOWER
V-105	FUEL GAS SCRUBBER
V-106	DISCHARGE VERTICAL SCRUBBER
V-110	INLET SLUG CATCHER
V-203	DEHY TOWER
V-206	DISCHARGE VERTICAL SCRUBBER
V-1200	STARTING AIR VOLUME BOTTLE

REFERENCE DRAWINGS	No	REVISIONS	BY	CHKD	PM	DATE
	A	ISSUED FOR PERMIT	TAD	EB		1/30/14

ANTERO RESOURCES APPALACHIAN CORP
WEST VIRGINIA
MONROE COMPRESSOR STATION
PLOT PLAN

PROJ. NUMBER	DRAWING NUMBER	SCALE	REVISION
13MONROECS	MON-PP-4100	1"=30'-0"	A

Attachment F.
Process Flow Diagram



REFERENCE DRAWINGS	No	REVISIONS	BY	CHKD	PM	DATE
	B	ISSUED FOR PERMIT	TAD			1/30/14
	A	ISSUED FOR REVIEW	TAD			1/28/14

ALTIERO RESOURCES APPALACHIAN CORP

MONROE COMPRESSOR STATION
PROCESS FLOW DIAGRAM

PROJ. NUMBER	DRAWING NUMBER	SCALE	REVISION
13MONROECS	MON-PFD-4100	N.T.S.	B

Attachment G.
Process Description

Monroe Compressor Station – Process Description

The Monroe Compressor Station is located in Tyler County, West Virginia. Gas from surrounding pipelines enters the facility through one receiver and associated slug catcher. From there, the gas is metered and routed through a scrubber and filter separator. Any produced liquids from the scrubber or separator are sent to the 500 barrel settling tank (TK-1502). Gas from the filter separator is sent to one (1) of thirteen (13) 1,680 hp Waukesha compressor engines (C-100 – C-1300). The thirteen (13) compressor engines are controlled with NSCR catalysts and air-fuel ratio controllers (1C – 11C, 15C, 16C). Fuel gas for the compressor engines will be treated prior to the engines by a fuel conditioning skid with a 0.5 MMBtu/hr heater (FUEL1) to allow more complete combustion. Produced fluids are routed to the settling tank and gas going to one of the two (2) TEG dehydrators.

Each TEG dehydrator (DEHY1 – DEHY2) contains a flash gas tank and 1.5 MMBtu/hr reboiler. Each dehydrator has a design rate of 110 MMscf/day. Within the dehydrator unit, vent gas from the flash gas tank (DFLSH1 – DFLSH2) is routed to the reboiler (DREB1 – DREB2) and used as fuel. In the case where the flash tank gas cannot be used by the reboiler due to excess gas or the reboiler being offline, the gas will be sent to the VRUs (VRU-100 and VRU-200) via the storage tanks (TK-1500 – TK-1502, TK-200 – TK-201) and thus controlled by 98%. Emissions from each reboiler are routed to the atmosphere. The dehydrator still vents (DEHY1 – DEHY2) are controlled by a flare with at least 98% control efficiency (FLARE1). Produced fluids from the dehydrator are routed to the settling tank. The dry gas from the dehydration process is either routed to a fuel gas scrubber, metered, and routed to the compressors as fuel gas or metered and sent to plant discharge.

All produced fluids enter one (1) 500 barrel settling tank (TK-1502) where the fluids settle out as either condensate or produced water. The produced water goes to two (2) 400 barrel produced water tanks (TK-1500 – TK-1501) and the condensate goes to two (2) 400 barrel condensate tanks (TK-200 – TK-201). Flashing only occurs at the settling tank as the fluids stabilize in the settling tank before going to the other storage tanks. All five (5) tanks are connected to a vapor recovery unit (VRU-100) where tank vapors are collected and recycled back into the gas system right before the initial filter scrubber. A second vapor recovery unit (VRU-200) is also connected to the tank as a backup unit. The produced fluids are trucked out via tanker trucks as needed (LDOUT1). The anticipated production is 150 barrels per day of condensate and 45 barrels per day of produced water.

Two (2) natural gas microturbine generators, each rated at 600 kWe, supply power to the facility (GEN1 – GEN2). Each 600 kWe generator is actually comprised of three smaller units, each rated at 200 kWe. All generators (six 200 kWe) are wired together and operation between individual 200 kWe engines will rotate based on functionality of engines. No more than 600 kWe will be operational at any given time, except when units are being switched. Each individual engine will continuously record hours of operation and will be used interchangeably. A small 24,000 Btu/hr catalytic heater (CATHT-1) is used to heat fuel to power the generators.

There are also small storage tanks (1,000 to 2,000 gallons) located at the facility. Their ID number, description, and exact size are listed in the table below.

Fugitive emissions from component leaks and emissions from venting or blowdown events also occur.

Tag Number	Description	Gallons
TK-300	Compressor Skid Oily Water Tank	1,000
TK-301	Used Oil Tank	1,000
TK-104	TEG Make-Up Tank	1,000
TK-106	Compressor Coolant Tank	2,000
TK-107	Engine Lube Oil Tank	2,000
TK-108	Compressor Lube Oil Tank	2,000

Attachment H.
Material Safety Data Sheets

SAFETY DATA SHEET

Material Name: Produced Water **US GHS**

SYNONYMS: **Produced Brine Water, Brine, Brine Water, Formation Water**

* * * Section 1 – PRODUCT AND COMPANY IDENTIFICATION * * *

PRODUCT NAME: **Produced Water**
PRODUCT CODES: **Mixture**

EMERGENCY PHONE: **(800) 878-1373**
AFTER HOURS: **(800) 878-1373**

PRODUCER: **Antero Resources**
ADDRESS: **1615 Wynkoop Street**
Denver, Colorado 80202

CHEMTREC PHONE: **(800) 424-9300**

* * * Section 2 – HAZARDS IDENTIFICATION * * *

GHS Classification:

Eye Irritant – Category 2A.

GHS LABEL ELEMENTS
Symbol(s)

Signal Word

Warning

Hazard Statements

Causes serious eye irritation

Precautionary Statements

Prevention

Wear protective gloves/protective clothing/eye protection/face protection.

Response

If on SKIN (or hair): Rinse skin with water / shower. Remove / Take off all contaminated clothing immediately.

If in EYES: Rinse cautiously with water for at least fifteen (15) minutes. Remove Contact Lenses, if present and easy to do. Continue rinsing.

If EYE irritation persists, get medical advice / attention.

Storage
Store in a secure area.

Disposal
Dispose of contents/containers in accordance with regulations.

* * * Section 3 – COMPOSITION / INFORMATION ON INGREDIENTS * * *

CAS #	Component	Percent
7732-18-5	Water	80
7647-14-5	Sodium Chloride	20

Because brine water is a natural product, composition can vary greatly.

* * * Section 4 – FIRST AID MEASURES * * *

First Aid: Eyes
Flush eyes with clean running water for at least fifteen (15) minutes. If irritation or redness develops from exposure, following flushing, seek medical attention.

First Aid: Skin
First aid is not required, normally. However, it is a good practice to wash any chemical from the skin.

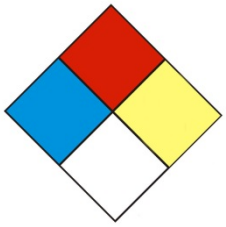
First Aid: Ingestion (Swallowing)
First aid is not required, normally. If spontaneous vomiting occurs, lean the victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. If symptoms develop, seek medical attention.

First Aid: Inhalation (Breathing)
Remove person to fresh air. If person is not breathing, provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

Most important symptoms and effects

None known or anticipated.

* * * Section 5 – FIRE FIGHTING MEASURES * * *



NFPA 704 Hazard Class

Health: 1 Flammability: 0 Instability: 0 (0=Minimal, 1=Slight, 2=Moderate, 3=Serious, 4=Severe)

General Fire Hazards

No fire hazards are expected.

General Fire Hazards

No unusual fire or explosion hazards are expected. If container is not properly cooled, it can rupture in the heat of a fire.

Extinguishing Media

The material is non-flammable. Use extinguishing agent suitable for the type of surrounding fire.

Unsuitable Extinguishing Media

None

Fire Fighting Equipment / Instructions

Small fires in the beginning stage may typically be extinguished using handheld portable fire extinguishers and other firefighting equipment. Isolate area around container involved in fire and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from the immediate hazard area if it can be done safely. Cool equipment exposed to fire with water, if it can be done safely.

Hazardous Combustion Products

None Anticipated. See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

* * * Section 6 – ACCIDENTAL RELEASE MEASURES * * *

Recovery and Neutralization

Contain and stop the source of the spill, if safe to do so.

Materials and Methods for Clean-Up

Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios of this material. However, local conditions and regulations may influence or limit the choice of appropriate actions to be taken. See Section 13 for information on appropriate disposal.

Emergency Measures

The material is not considered hazardous. Nevertheless, evacuate nonessential personnel and secure the area. Stay upwind and uphill, if possible.

Personal Precautions and Protective Equipment

Stay upwind and away from the spill/release. Avoid direct contact with the material. For large spillages, notify persons downstream of the spill/release. Isolate the immediate hazard area and keep unauthorized personnel out. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

Environmental Precautions

Protect bodies of water by diking or absorbents, if possible. Do not flush down sewer or drainage systems. Use water sparingly to minimize environmental contamination and reduce disposal requirements. If a spill occurs on water, notify appropriate authorities and advise shipping of any hazard.

Prevention of Secondary Hazards

None

* * * Section 7 – HANDLING AND STORAGE * * *

Handling Procedures

Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8).

Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29 CFR 1910.146. Do not wear contaminated clothing or shoes.

Storage Procedures

Keep container(s) tightly closed and properly labeled. Use and store this material in cool, dry, well ventilated areas. Store only in approved containers. Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage.

Incompatibilities

Keep away from excessive heat to prevent rupture of container.

* * * Section 8 – EXPOSURE CONTROLS / PERSONAL PROTECTION * * *

Component Exposure Limits

Water (7732-18-5)

ACGIH: Not listed

Sodium Chloride (7647-14-5)

ACGIH: Not listed

Engineering Measures

If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Personal Protective Equipment: Respiratory

Emergencies or conditions that could result in significant airborne exposures may require the use of NIOSH approved respiratory protection. An industrial hygienist or other appropriate health and safety professional should be consulted for specific guidance under these situations.

A respiratory protection program that meets or is equivalent to OSHA 29 CFR

1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use.

Personal Protective Equipment: Skin and Hands

The use of skin protection is not normally required; however, good industrial hygiene practice suggests the use of gloves or other appropriate skin protection whenever working with chemicals.

Personal Protective Equipment: Eyes

Safety glasses or goggles that meet or exceed ANSI Z-87.1 are recommended where there is a possibility of splashing or spraying.

Hygiene Measures

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Promptly remove contaminated clothing and launder before reuse.

* * * Section 9 – PHYSICAL AND CHEMICAL PROPERTIES * * *

Appearance:	Clear to Brown	**Odor:**	Salty
Physical State:	Liquid	**pH:**	ND
Vapor Pressure:	< 0.36 psia @ 70°F / 21.1°C	**Vapor Density:**	> 1
Boiling Point:	212°F / 100°C	**Melting Point:**	2.4°F / -16.5°C
Solubility (H2O):	Complete	**Specific Gravity:**	1.1 @ 68°F / 20°C
Evaporation Rate:	Variable	**VOC:**	ND
Octanol / H2O Coeff.:	ND	**Flash Point:**	ND
Flash Point Method:	ND		
Lower Flammability Limit: (LFL):	ND	**Upper Flammability Limit: (UFL):**	ND
Auto Ignition:	ND	**Burning Rate:**	ND

* * * Section 10 – CHEMICAL STABILITY & REACTIVITY INFORMATION * * *

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will react with alkali and alkaline metals to form flammable hydrogen gas.

Conditions to Avoid

Avoid contact with alkali metals (lithium, sodium, potassium), alkaline metals (beryllium, magnesium, calcium, strontium, and barium), and metallic hydrides like lithium aluminum hydride.

Hazardous Decomposition Products

Not anticipated under normal conditions of use.

Hazardous Polymerization

Not known to occur.

* * * Section 11 – TOXICOLOGICAL INFORMATION * * *

Acute Toxicity

A: General Product Information

Unlikely to be harmful.

B. Component Analysis – D50/LC50

Water (7732-18-5)

Oral LD50 Rat 90 g/kg

Sodium Chloride (7647-14-5)

Oral LD50 Rat 3 g/kg

Potential Health Effects: Skin Corrosion Property / Stimulativeness

May cause skin irritation with prolonged or repeated contact. Not expected to be a skin sensitizer.

Potential Health Effects: Eye Critical Damage / Stimulativeness

Contact with eyes may cause moderate irritation.

Potential Health Effects: Ingestion

Ingestion may result in nausea, vomiting, diarrhea, abdominal cramps, and dehydration (thirst).

Potential Health Effects: Inhalation

No information available on the mixture. However, none of the components have been classified for respiratory sensitization (or are below the concentration threshold for classification).

Generative Cell Mutagenicity

Not expected to cause genetic effects.

Carcinogenicity

General Product Information

Not expected to cause cancer. This substance is not listed as a carcinogen by IARC, NTP or OSHA.

Reproductive Toxicity

This product is not reported to have any reproductive toxicity effects.

Specified Target Organ General Toxicity: Single Exposure

This product is not reported to have any specific target organ general toxicity single exposure effects.

Specified Target Organ General Toxicity: Repeated Exposure

This product is not reported to have any specific target organ general toxicity multiple exposure effects.

Aspiration Respiratory Organs Hazard

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

* * * Section 12 – ECOLOGICAL INFORMATION * * *

Ecotoxicity

A: General Product Information

Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable under Federal and State regulations.

Persistence / Degradability

No information available

Bioaccumulation

No information available

Mobility in Soil

No information available

* * * Section 13 – DISPOSAL CONSIDERATIONS * * *

Waste Disposal Instructions

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment Recommendations.

Disposal of Contaminated Containers or Packaging

Recover or recycle if possible. It is the responsibility of the generator to determine the toxicity and physical properties of the material generated so as to properly classify the waste and ensure disposal methods comply with applicable regulations.

This material, if discarded as produced, is not a RCRA "listed" hazardous waste, and is not believed to exhibit characteristics of hazardous waste. Consult state and local regulations regarding the proper disposal of this material. Do not dispose of brine water by draining onto the ground. This will result in soil and groundwater contamination. Waste arising from spillage or tank cleaning should be disposed of in accordance with applicable regulations.

Container contents should be completely used and containers should be emptied prior to discard. Container rinsate should not be considered a RCRA hazardous waste but must be disposed of with care and in full compliance with federal, state and local regulations. Larger empty containers, such as drums, should be returned to the distributor or to a qualified drum reconditioner. To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

* * * Section 14 – TRANSPORTATION INFORMATION * * *

DOT Information

Shipping Description: Not Regulated

UN #: Not Regulated

* * * Section 15 – REGULATORY INFORMATION * * *

CERCLA/SARA – Section 302 Extremely Hazardous Substances and TPQs (in pounds):
This material does not contain any chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372,

CERCLA/SARA – Section 313 and 40 CFR 372):
This material does not contain any chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372.

EPA (CERCLA) Reportable Quantity (in pounds):
This material does not contain any chemicals with CERCLA Reportable Quantities.

State Regulations

Component Analysis

The following components appear on one or more of the following state hazardous substances list.

California Proposition 65:
This material does not contain any chemicals that are known to the State of California to cause cancer, birth defects or other reproductive harm at concentrations that trigger the warning requirements of California Proposition 65.

National Chemical Inventories:
All components are either listed on the US TSCA Inventory, or are not regulated under TSCA.

U.S. Export control classification Number: EAR99.

* * * Section 16 – OTHER INFORMATION * * *

NFPA® Hazard Rating

Health	1
Fire	0
Reactivity	0

HMIS® Hazard Rating

Health	1	Slight
Fire	0	Minimal
Physical	0	Minimal

Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act: ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; NJTSR = New Jersey Trade Secret Registry.

Literature References

None

Other Information

The information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

Date of Preparation: January 28, 2014

Date of Last Revision: March 4, 2014

End of Sheet

SAFETY DATA SHEET

Material Name: Natural Gas Condensate **US GHS**

SYNONYMS: **Drips; Condensate; Field Condensate; Gas Well Condensate; High Pressure Inlet Liquids; Lease Condensate; Natural Gas Liquids; Pipeline Liquids**

* * * Section 1 – PRODUCT AND COMPANY IDENTIFICATION * * *

PRODUCT NAME: **Natural Gas Condensate**
PRODUCT CODES: **64741-47-5**

EMERGENCY PHONE: **(800) 878-1373**
AFTER HOURS: **(800) 878-1373**

PRODUCER: **Antero Resources**
ADDRESS: **1615 Wynkoop Street**
Denver, Colorado 80202

CHEMTREC PHONE: **(800) 424-9300**

* * * Section 2 – HAZARDS IDENTIFICATION * * *

GHS Classification:

Flammable Liquids – Category 2.
Acute Toxicity Inhalation – Category 3
Germ Cell Mutagenicity – Category 1B
Carcinogenicity – Category 1A
Specific Target Organ Systemic Toxicity (STOT) – Single Exposure Category 3
Specific Target Organ Systemic Toxicity (STOT) – Repeat Exposure Category 1
Aspiration Toxicity – Category 1
Toxic to the Aquatic Environment Acute – Category 3

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

Danger

Hazard Statements

Highly flammable liquid and vapor.
Toxic if inhaled.
May cause genetic defects.
May cause cancer.
May cause respiratory irritation.
May cause drowsiness or dizziness.
May cause damage to organs (liver, kidneys, blood, nervous system, and skin) through prolonged or repeated exposure.
May be fatal if swallowed and enters airways.
Harmful to aquatic life.

Precautionary Statements

Prevention

Keep away from heat/sparks/open flames/hot surfaces. No smoking.
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ventilating/lighting equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Wear protective gloves/protective clothing/eye protection/face protection.
Do not breathe gas/mist/vapors/spray.
Do not handle until all safety precautions have been read and understood.
Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Avoid release to the environment.

Response

If on SKIN (or hair): Wash with plenty of soap and water. Remove / Take off all contaminated clothing immediately. Rinse skin with water/shower.
If INHALED: Remove victim to fresh air and keep comfortable for breathing. Call a poison center/doctor if the victim feels unwell.
If SWALLOWED: Immediately call a poison center or doctor / physician. Do not Induce vomiting.
If exposed or concerned: Get medical advice/attention.
In case of fire: Use water spray, fog or fire-fighting foam.

Storage

Store in a well-ventilated place. Keep cool.
Store in a secure area.

Disposal

Dispose of contents/containers in accordance with local/regional/national/international regulations.

* * * Section 3 – COMPOSITION / INFORMATION ON INGREDIENTS * * *

CAS #	Component	Percent
111-65-9	Octanes	25 - 95
142-82-5	Heptanes	25 - 95
110-54-3	Hexanes as n-Hexane	25 - 95
109-66-0	Pentanes as n-Pentane	5 - 70
106-97-8	N-butane	0 - 45
74-98-6	Propane	0 - 15
78-84-0	Ethane	0 - 5
71-43-2	Benzene	< 1
108-88-3	Toluene	< 1
1330-20-7	m-,o-,p-Xylene	< 1

Because natural gas condensate is a natural product, composition can vary greatly.

* * * Section 4 – FIRST AID MEASURES * * *

First Aid: Eyes

Flush eyes with clean running water for at least fifteen (15) minutes. Following flushing, seek medical attention.

First Aid: Skin

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops. Wash contaminated clothing before reuse.

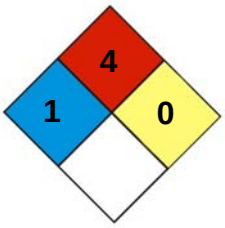
First Aid: Ingestion (swallowing)

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean the victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

First Aid: Inhalation (breathing)

Remove person to fresh air. If person is not breathing, provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

* * * Section 5 – FIRE FIGHTING MEASURES * * *



NFPA 704 Hazard Class

Health: 1 **Flammability:** 4 **Instability:** 0 (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

General Fire Hazards

See Section 9 for Flammability Properties.
Extremely flammable. Vapors may be ignited rapidly when exposed to heat, spark, open flame, or other source of ignition (e.g., static electricity, pilot lights, mechanical / electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe). Flammable vapors can burn in the open or explode in confined spaces. Vapors are heavier than air, and may travel distances to an ignition source and flash back. Runoff to sewer systems may cause fire or explosion.

Hazardous Combustion Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

Extinguishing Media

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, firefighting foam, water spray, carbon dioxide (CO_2), or other gaseous extinguishing agents. Use caution when applying CO2 in confined spaces.

LARGE FIRES: Water spray, fog or fire-fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

Unsuitable Extinguishing Media

None

Fire Fighting Equipment / Instructions

Small fires in the beginning stage may typically be extinguished using handheld portable fire extinguishers and other firefighting equipment. Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied firefighting foam.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full face piece and full protective clothing.

* * * Section 6 – ACCIDENTAL RELEASE MEASURES * * *

Recovery and Neutralization

Contain and stop the source of the spill, if safe to do so.

Materials and Methods for Clean-Up

Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken.

Emergency Measures

Evacuate nonessential personnel and secure all ignition sources. No road flares, smoking or flames in hazard area. Consider wind direction. Stay upwind and uphill, if possible. Vapor cloud may be white, but color will dissipate as cloud disperses. Fire and explosion hazard is still present.

Personal Precautions and Protective Equipment

Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8). Extremely flammable. Spillages of liquid product will create a fire hazard and may form an explosive atmosphere. Keep all sources of

ignition and hot metal surfaces away from spill/release if safe to do so.

The use of explosion-proof electrical equipment is recommended. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons downwind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions

Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of firefighting foam may be useful in certain situations to reduce vapors. If spill occurs on water notify appropriate authorities and advise shipping of any hazard. Spills into or upon navigable waters, the contiguous zone, or adjoining shorelines that cause a sheen or discoloration on the surface of the water, may require notification of the National Response Center (phone number 800-424-8802).

Prevention of Secondary Hazards

None

* * * Section 7 – HANDLING AND STORAGE * * *

Handling Procedures

Keep away from flame, sparks and excessive temperatures. Bond and ground containers. Use non-sparking tools. Use only outdoors or in well ventilated areas. Wear protective gloves / clothing and eye / face protection. Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8).

Storage Procedures

Store only in approved containers. Bond and ground containers. Keep away from flame, sparks, excessive temperatures and open flames. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks."

Incompatibilities

Keep away from strong oxidizers, ignition sources and heat.

* * * Section 8 – EXPOSURE CONTROLS / PERSONAL PROTECTION * * *

Component Exposure Limits

Octanes (111-65-9)

ACGIH: 300 ppm TWA (listed under Octane, all isomers)

Heptanes (142-82-5)

ACGIH: 400 ppm TWA (listed under n-Heptane)

n-Hexane (110-54-3)

ACGIH: 20 ppm TWA (listed under n-Hexane)

n-Pentane (109-66-0)

ACGIH: 600 ppm TWA (listed under Pentane, all isomers)

n-Butane (106-97-8)

ACGIH: 600 ppm TWA (listed under n-Butane)

Propane (74-98-6)

ACGIH: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases C1-C4)

Ethane (74-84-0)

ACGIH: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases C1-C4)

Benzene (71-43-2)

ACGIH: 0.5 ppm (TWA); NIOSH: 0.1 ppm (TWA); OSHA 1 ppm (TWA)

Toluene (108-88-3)

ACGIH: 20 ppm TWA (listed under Toluene)

m-, o-, p-Xylene (1330-20-7)

ACGIH: 100 ppm TWA (listed under Xylene o, m & p isomers)

Engineering Measures

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces. Use explosion-proof equipment and lighting in classified / controlled areas.

Personal Protective Equipment: Respiratory

Use a NIOSH-approved positive-pressure, supplied air respirator with escape bottle or self-contained breathing apparatus (SCBA) for gas concentrations above occupational exposure limits, for potential for uncontrolled release, if exposure levels are not known, or in an oxygen-deficient atmosphere (oxygen content less than 19.5 percent). A respiratory program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant the use of a respirator.

If benzene concentrations equal or exceed applicable exposure limits, OSHA requirements for personal protective equipment, exposure monitoring, and training may apply (29 CFR 1910.1028 – Benzene).

CAUTION: Flammability limits (i.e., explosion hazard should be considered when assessing the need to expose personnel to concentrations requiring respiratory protection.

Personal Protective Equipment: Hands

Gloves constructed of nitrile or neoprene are recommended.

Personal Protective Equipment: Eyes

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying. Eye protection that meets or exceeds ANSI Z.87.1 is recommended. Depending on conditions of use, a face shield may be necessary.

Personal Protective Equipment: Skin and Body

Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

Hygiene Measures

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use gasoline or solvents (naphtha, kerosene, etc.) for washing this product from

exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

* * * Section 9 – PHYSICAL AND CHEMICAL PROPERTIES * * *

Appearance:	Colorless to straw yellow	**Odor:**	Aromatic, Gasoline;
Physical State:	Liquid	**pH:**	ND
Vapor Pressure:	110 – 200 psia (Reid VP) @ 100°F/37.8°C	**Vapor Density (air = 1):**	> 1
Boiling Point:	Approx. 85 - 437°F (39 – 200°C)	**Melting Point:**	ND
Solubility (H2O):	Insoluble to slightly soluble	**Specific Gravity:**	AP 0.62-0.76 (varies)
Evaporation Rate:	High	**VOC:**	ND
Octanol / H2O Coeff.:	ND	**Flash Point:**	-40°F -40°C
Flash Point Method:	Tag Closed Cup (TCC)		
Lower Flammability Limit: (LFL):	ND (NFPA Gasoline 1.4)	**Upper Flammability Limit: (UFL):**	ND (NFPA Gasoline 7.6)
Auto Ignition:	AP 480°F (250°C)	**Burning Rate:**	ND

* * * Section 10 – CHEMICAL STABILITY & REACTIVITY INFORMATION * * *

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

Keep away from ignition sources and high temperatures.

Hazardous Decomposition Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

* * * Section 11 – TOXICOLOGICAL INFORMATION * * *

Acute Toxicity

A: General Product Information

Harmful if swallowed.

B. Component Analysis – LD50/LC50

Octanes (111-65-9)
Inhalation LC50 rat = 118,000 mg/m3 / 4H

Heptanes (142-82-5)
Inhalation LC50 rat = 103,000 mg/m3 / 4H

Hexanes as n-Hexane (110-53-3)
Inhalation LC50 rat = 48,000 ppm / 4H

Pentanes as n-Pentane (109-66-0)
Inhalation LC50 rat = 364,000 mg/m3 / 4H

Butanes as n-Butane (106-97-8)
Inhalation LC50 rat 658,000 mg/l / 4H

Propane (74-98-6)
Inhalation LC50 Rat > 800,000 ppm / 0.25H

Ethane (74-84-0)
Inhalation LC50 Rat 658,000 mg/l / 4H

Benzene (71-43-2)
Inhalation LC50 Rat 44,700 mg/m3 /

Toluene (108-88-3)
Inhalation LD50 Rat 12/5 mg/l / 4H

m-, o-, p-Xylene (1330-20-7)
Inhalation LC50 Rat 5000 ppm / 4H

Potential Health Effects: Skin Corrosion Property / Stimulativeness

May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are exposed repeatedly.

Potential Health Effects: Eye Critical Damage / Stimulativeness

Contact with eyes may cause moderate irritation.

Potential Health Effects: Ingestion (swallowing)

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

Potential Health Effects: Inhalation (breathing)

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

Respiratory Organs Sensitization / Skin Sensitization

This product is not reported to have any skin sensitization effects.

Generative Cell Mutagenicity

May cause genetic defects. Some crude oils and crude oil fractions have been positive in mutagenicity studies.

Carcinogenicity

A: General Product Information

May cause cancer.

This product contains benzene, although at very low concentrations. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

Exposure to light hydrocarbons in the same boiling range as this product have been associated in animal studies with effects to the central nervous system, peripheral nervous system, liver, and kidneys. The significance of these animal models to predict similar human response is uncertain. Observing good work practices and personal hygiene procedures (Sections 7 and 8) can minimize potential risks to humans.

B: Component Carcinogenicity

Benzene (71-43-2)

ACGIH:	A1 - Confirmed Human Carcinogen
OSHA:	5 ppm STEL (Cancer hazard, Flammable, See 29 CFR 1910.1028, 15 min); 0.5 ppm Action Level; 1 ppm TWA
NIOSH:	potential occupational carcinogen
NTP:	Known Human Carcinogen (Select Carcinogen)

IARC: Monograph 100F [in preparation]; Supplement 7 [1987]; Monograph 29 [1982] (Group 1 (carcinogenic to humans))

Reproductive Toxicity

This product is not reported to have any reproductive toxicity effects.

Specified Target Organ General Toxicity: Single Exposure

This product is not reported to have any specific target organ general toxicity single exposure effects.

Specified Target Organ General Toxicity: Repeated Exposure

May cause damage to organs (liver, kidneys, blood, nervous system and skin) through prolonged or repeated exposure.

Aspiration Respiratory Organs Hazard

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

* * * Section 12 – ECOLOGICAL INFORMATION * * *

Ecotoxicity

A: General Product Information

Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable under Federal and State regulations.

B: Component Analysis – Ecotoxicity – Aquatic Toxicity

Benzene (71-43-2)

Test and Species	Conditions
96 Hr LC50 Pimephales promelas	10.7-14.7 mg/L [flow-through]
96 Hr LC50 Oncorhynchus mykiss	5.3 mg/L [flow-through]
96 Hr LC50 Lepomis macrochirus	22.49 mg/L [static]
96 Hr LC50 Poecilia reticulata	28.6 mg/L [static]
96 Hr LC50 Pimephales promelas	22330-41160 µg/L [static]
96 Hr LC50 Lepomis macrochirus	70000-142000 µg/L [static]
72 Hr EC50 Pseudokirchneriella subcapitata	29 mg/L
48 Hr EC50 Daphnia magna	8.76 - 15.6 mg/L [static]
48 Hr EC50 Daphnia magna	10 mg/L

Natural Gas condensates (68919-39-1)

Test and Species	Conditions
96 Hr LC50 Alburnus alburnus	119 mg/L [static]
96 Hr LC50 Cyprinodon variegatus	82 mg/L [static]
72 Hr EC50 Pseudokirchneriella subcapitata	56 mg/L
24 Hr EC50 Daphnia magna	170 mg/L

Persistence / Degradability

No information available

Bioaccumulation

No information available

Mobility in Soil

No information available

* * * Section 13 – DISPOSAL CONSIDERATIONS * * *

Waste Disposal Instructions

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment Recommendations.

Disposal of Contaminated Containers or Packaging

Recover or recycle if possible. It is the responsibility of the generator to determine the toxicity and physical properties of the material generated so as to properly classify the waste and ensure disposal methods comply with applicable regulations.
This material, if discarded should be fully characterized for ignitability (D001), reactivity (D003) and benzene (D018) prior to disposal (40 CFR261). Use which results in chemical or physical change or contamination may subject it to regulation as a hazardous waste. Along with properly characterizing all waste materials, consult state and local regulations regarding the proper disposal of this material. Do not dispose of by draining onto the ground. This will result in soil and groundwater contamination. Waste arising from spillage or tank cleaning should be disposed of in accordance with applicable regulations.

Container contents should be completely used and containers should be emptied prior to discard. Container rinsate could be considered a RCRA hazardous waste and must be disposed of with care and in full compliance with federal, state and local regulations. Larger empty containers, such as drums, should be returned to the distributor or to a qualified drum reconditioner. To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

* * * Section 14 – TRANSPORTATION INFORMATION * * *

DOT Information

Shipping Name: Petroleum Products, n.o.s. (condensate)

UN #: 1268 **Hazard Class:** 3

Additional Info.: Dependent on the product's properties, the shipper may also elect to classify as Gasoline UN1203 or Petroleum Crude Oil UN1267 - reference 49 CFR 172.101 for further description (e.g., packing group determination).

Placard:

* * * Section 15 – REGULATORY INFORMATION * * *

Regulatory Information

Component Analysis

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65) and/or CERCLA (40 CFR 302.4).

Benzene (71-43-2)

SARA 313: 0.1% de minimis concentration

CERCLA: 10 lb final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 14, 1989 final rule); 4.54 kg final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 14, 1989 final rule)

SARA Section 311/312 – Hazard Classes

Acute Health	Chronic Health	Fire	Sudden Release of Pressure	Reactive
X	X	X	--	--

SARA SECTION 313 – SUPPLIER NOTIFICATION

This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION PERCENT BY WEIGHT
Benzene (71-43-2)	<0.1 to 2

Canadian Regulatory Information

DSL/NDSL Inventory	This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the SDS contains all the information required by the Regulations.
Workplace Hazardous Materials Information System	B2 - Flammable Liquid D1A – Material Causing Immediate and Serious Toxic Effects - Very Toxic Material D2A: Material Causing Other Toxic Effects Very Toxic D2B - Material Causing Other Toxic Effects - Toxic Material

European Union Regulatory Information

Labeling	Product is dangerous as defined by the European Union Dangerous Substances / Preparations Directives. Contains: Low Boiling Point Naphtha
Symbol	**F+** Extremely Flammable **T** Toxic **N** Dangerous for the Environment
Risk Phrases	R12-45-38-65-67-51/53 Extremely flammable. May cause cancer. Irritating to skin. Harmful: may cause lung damage if swallowed. Vapors may cause drowsiness and dizziness. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Safety Phrases	S16-53-45-2-23-24-29-43-62 Keep away from sources of ignition – No smoking. Avoid exposure – obtain special instructions before use. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Keep out of reach of children. Do not breathe vapor. Avoid contact with skin. Do not empty into drains. In case of fire use foam/dry powder/CO2. If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.

State Regulations

Component Analysis – State

The following components appear on one or more of the following state hazardous substances lists

Component	CAS	CA	MA	MN	NJ	PA	RI
Octanes	111-65-9	Yes	No	Yes	Yes	Yes	Yes
Heptanes	142-82-5	Yes	No	Yes	Yes	Yes	Yes
n-Hexane	110-54-3	Yes	Yes	Yes	Yes	Yes	Yes
n-Pentane	109-66-0	Yes	No	Yes	Yes	Yes	Yes
n-Butane	106-97-8	Yes	No	Yes	Yes	Yes	Yes
Propane	74-98-6	No	No	Yes	Yes	Yes	Yes
Ethane	78-84-0	No	No	Yes	Yes	Yes	No
Benzene	71-43-2	Yes	Yes	Yes	Yes	Yes	Yes
Toluene	108-88-3	Yes	Yes	Yes	Yes	Yes	Yes
m-, o-, p-Xylene	1330-20-7	Yes	Yes	Yes	Yes	Yes	Yes

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):

WARNING! This product contains a chemical known to the state of California to cause cancer.

WARNING! This product contains a chemical known to the state of California to cause Reproductive / developmental effects.

Component Analysis – WHMIS IDL

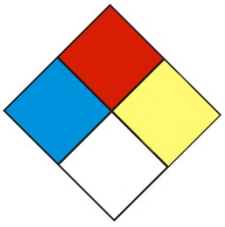
The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List:

Component	CAS #	Minimum Concentration
Benzene	71-43-2	0.1%

* * * Section 16 – OTHER INFORMATION * * *

NFPA® Hazard Rating

Health	1
Fire	4
Reactivity	0



HMIS® Hazard Rating

Health	1	Slight
Fire	4	Severe
Physical	0	Minimal
		* Chronic

Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act: ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; NJTSR = New Jersey Trade Secret Registry.

Literature References

None

Other Information

The information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

Date of Preparation: January 29, 2014

Date of Last Revision: March 4, 2014

End of Sheet

SAFETY DATA SHEET

Material Name: Wet Field Natural Gas

SYNONYMS: **CNG, Natural Gas, Methane.**

* * * Section 1 – PRODUCT AND COMPANY IDENTIFICATION * * *

PRODUCT NAME: **Wet Field Natural Gas**
PRODUCT CODES: **CAS Reg. No. 68410-63-9**

EMERGENCY PHONE: **(800) 878-1373**
AFTER HOURS: **(800) 878-1373**

PRODUCER: **Antero Resources**
ADDRESS: **1615 Wynkoop Street**
Denver, Colorado 80202

CHEMTREC PHONE: **(800) 424-9300**

* * * Section 2 – HAZARDS IDENTIFICATION * * *

GHS Classification:

Flammable Gas – Category 1.
Gases Under Pressure – Gas.
Specific Target Organ Systemic Toxicity (STOT) – Single Exposure Category 2.

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

Danger

Hazard Statements

Extremely flammable gas.
Contains gas under pressure, may explode if heated.
May cause damage to central nervous and respiratory systems.

Precautionary Statements

Prevention

Keep away from heat/sparks/open flames/hot surfaces. No smoking.
Do not breathe fume/gas/mist/vapors/spray.
Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.

Response

Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.
If exposed to gas, or concerned about possible exposure: Call a POISON CENTER or doctor/physician.

Storage

Protect from sunlight. Store in a well-ventilated place.
Store in a secure area.

Disposal

Dispose of contents/containers in accordance with local/regional/national/international regulations.

* * * Section 3 – COMPOSITION / INFORMATION ON INGREDIENTS * * *

CAS #	Component	Percent
74-82-8	Methane	72 - 97
78-84-0	Ethane	2.2 - 14
74-98-6	Propane	0.0 – 8.0
106-97-8	Butanes	0.0 – 3.5
109-66-0	Pentanes	0.0 – 1.4
110-54-3	Hexanes	0.0 – 0.5
7727-37-9	Nitrogen	< 0.4
124-38-9	Carbon Dioxide	< 0.2
7782-44-7	Oxygen	< 0.04

Because natural gas is a natural product, composition can vary greatly.

* * * Section 4 – FIRST AID MEASURES * * *

First Aid: Eyes

In case of freeze burn, cover eyes to protect from light. Flush eyes with running water for at least fifteen (15) minutes. Following flushing, seek medical attention.

First Aid: Skin

Remove contaminated clothing. In case of blistering, frostbite or freeze burns, seek immediate medical attention.

Material Name: Wet Field Natural Gas

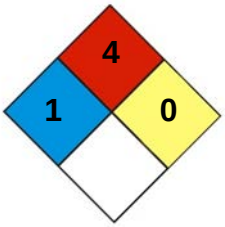
First Aid: Ingestion

Risk of ingestion is extremely low. However, if oral exposure occurs, seek immediate medical assistance.

First Aid: Inhalation

Remove person to fresh air. If person is not breathing, provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

* * * Section 5 – FIRE FIGHTING MEASURES * * *



NFPA 704 Hazard Class

Health: **1** Flammability: **4** Instability: **0** (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

General Fire Hazards

See Section 9 for Flammability Properties.
Forms a flammable mixture with air. If released, the resulting vapors will disperse with the prevailing wind. If a source of ignition is present where the vapor exists at a 5 – 15% concentration in air, the vapor will burn along the flame front toward the source of the fuel.

Hazardous Combustion Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

Extinguishing Media

Any extinguisher suitable for Class B fires, dry chemical, firefighting foam, CO2, and other gaseous agents. However, fire should not be extinguished unless flow of gas can be immediately stopped.

Unsuitable Extinguishing Media

None.

Fire Fighting Equipment / Instructions

Gas fires should not be extinguished unless flow of gas can be immediately stopped. Shut off gas source and allow gas to burn out. If spill or leak has not ignited, determine

if water spray may assist in dispersing gas or vapor to protect personnel attempting to stop leak. Use water to cool equipment, surfaces and piping exposed to fire and excessive heat. For large fire, the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Isolate area, particularly around piping. Let the fire burn unless leak can be stopped. Concentrate fire-fighting efforts on objects / materials ignited by the initial fire. Withdraw immediately in the event of a rising sound from a venting safety device.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH-approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

* * * Section 6 – ACCIDENTAL RELEASE MEASURES * * *

Recovery and Neutralization

Stop the source of the release, if safe to do so.

Materials and Methods for Clean-Up

Consider the use of water spray to disperse gas vapors. Do not use water spray to direct gas vapors toward sewer or drainage systems. Isolate the area until gas has dispersed. Ventilate and gas test area before entering.

Emergency Measures

Evacuate nonessential personnel and secure all ignition sources. No road flares, smoking or flames in hazard area. Consider wind direction. Stay upwind and uphill, if possible. Vapor cloud may be white, but color will dissipate as cloud disperses. Fire and explosion hazard is still present.

Personal Precautions and Protective Equipment

Cooling effect of expanding gas from leak may present frostbite / freeze burn hazard. Wear flame retardant (FR) clothing around un-ignited leak. Wear fire protective clothing around an active fire.

Environmental Precautions

Do not flush gas vapors toward sewer or drainage systems.

Prevention of Secondary Hazards

None.

* * * Section 7 – HANDLING AND STORAGE * * *

Handling Procedures

Keep away from flame, sparks and excessive temperatures. Bond and ground containers. Use only in well ventilated areas.

Storage Procedures

Natural gas will be contained in the pipeline. Keep away from flame, sparks, excessive temperatures and open flames. Empty pipeline segments may contain explosive residues from natural gas liquids. Do not cut, heat, weld or expose containers to sources of ignition sections of pipeline unless the sections have been purged of natural gas residues.

Incompatibilities

Keep away from strong oxidizers, ignition sources and heat.

* * * Section 8 – EXPOSURE CONTROLS / PERSONAL PROTECTION * * *

Component Exposure Limits

Methane (74-82-8)

ACGIH: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases : Alkane C1-4)

Ethane (74-84-0)

ACGIH: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases : Alkane C1-4)

Propane (74-98-6)

ACGIH: 2500 ppm TWA (listed under Aliphatic hydrocarbon gases : Alkane C1-4)

Butane (106-97-8)

ACGIH: 800 ppm TWA (listed under Aliphatic hydrocarbon gases : Alkane C1-4)

Pentanes (109-66-0)

ACGIH: 600 ppm TWA (listed under Pentane, all isomers)

Hexanes (110-54-3)

ACGIH: 50 ppm TWA (listed under n-Hexane)

Material Name: Wet Field Natural Gas

Nitrogen (7727-37-9)

Simple Asphyxiant

Carbon Dioxide (124-38-9)

ACGIH: 5000 ppm TWA (listed under Carbon Dioxide)

Oxygen (7782-44-7)

N/A – Necessary for life

Engineering Measures

Use adequate ventilation to keep gas and vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces. Use explosion-proof equipment and lighting in classified / controlled areas.

Personal Protective Equipment: Respiratory

Use a NIOSH approved positive-pressure, supplied air respirator with escape bottle or self-contained breathing apparatus (SCBA) for gas concentrations above occupational exposure limits, for potential for uncontrolled release, if exposure levels are not known, or in an oxygen-deficient atmosphere. CAUTION: Flammability limits (i.e., explosion hazard should be considered when assessing the need to expose personnel to concentrations requiring respiratory protection.

Personal Protective Equipment: Hands

Use cold-impervious, insulating flame-retardant (FR) gloves where contact with pressurized gas may occur.

Personal Protective Equipment: Eyes

Where there is a possibility of pressurized gas contact, wear splash-proof safety goggles and faceshield.

Personal Protective Equipment: Skin and Body

Where contact with pressurized gas may occur, wear flame-retardant (FR) and a faceshield.

* * * Section 9 – PHYSICAL AND CHEMICAL PROPERTIES * * *

Appearance:	Colorless	**Odor:**	Odorless to slight petroleum odor
Physical State:	Gas	**pH:**	ND
Vapor Pressure:	40 atm @ -187°F (-86°C)	**Vapor Density:**	0.6
Boiling Point:	-259°F (-162°C)	**Melting Point:**	ND
Solubility (H2O):	3.5%	**Specific Gravity:**	0.4 @ -263°F (-164°C)

Material Name: Wet Field Natural Gas

Evaporation Rate:	ND	**VOC:**	ND
Octanol / H2O Coeff.:	ND	**Flash Point:**	Flammable Gas
Flash Point Method:	N/A		
Lower Flammability Limit: (LFL):	3.8 – 6.5	**Upper Flammability Limit: (UFL):**	13-17
Auto Ignition:	900-1170°F (482-632°C)	**Burning Rate:**	ND

* * * Section 10 – CHEMICAL STABILITY & REACTIVITY INFORMATION * * *

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

Keep away from strong oxidizers, ignition sources and heat.

Hazardous Decomposition Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

* * * Section 11 – TOXICOLOGICAL INFORMATION * * *

Acute Toxicity

A: General Product Information

Methane and ethane, the main components of natural gas, are considered practically inert in terms of physiological effects. At high concentrations these materials act as simple asphyxiants and may cause death due to lack of oxygen.

B. Component Analysis – LD50/LC50

Methane (74-82-8)

Inhalation LC50 Mouse 326 g/m3 2h

Ethane (74-84-0)

Inhalation LC50 Rat 658 mg/l 4h

Propane (74-98-6)

Inhalation LC50 Rat 658 mg/l 4h

Material Name: Wet Field Natural Gas

Butanes (106-97-8)
Inhalation LC50 Rat 658 g/m3 4h

Pentanes (109-66-0)
Inhalation LD50 Rat 364 g/m3 4h

Hexanes (110-54-3)
Inhalation LC50 Rat > 20 mg/l 4h

Nitrogen (7727-37-9)
Simple Asphyxiant

Carbon Dioxide (124-38-9)
Inhalation LC50 Human 100,000 ppm 1minute

Oxygen (7782-44-7)
N/A – Necessary for life

Potential Health Effects: Skin Corrosion Property / Stimulativeness
This product is not reported to have any skin sensitization effects.

Generative Cell Mutagenicity
This product is not reported to have any mutagenic effects.

Carcinogenicity

A: General Product Information
This product is not reported to have any carcinogenic effects.

B: Component Carcinogenicity
None of this product's components are listed by ACGIH, IARC, OSHA, NIOSH, or NTP.

Reproductive Toxicity
This product is not reported to have any reproductive toxicity effects.

Specified Target Organ General Toxicity: Single Exposure
This product may cause damage to the heart.

Specified Target Organ General Toxicity: Repeated Exposure
This product is not reported to have any specific target organ repeat effects.

Aspiration Respiratory Organs Hazard
This product is not reported to have any aspiration hazard effects.

* * * Section 12 – ECOLOGICAL INFORMATION * * *

Ecotoxicity

A: General Product Information

Keep gas and vapors out of sewers, drainage areas, and waterways. Report spills and releases, as applicable under Federal and State regulations.

B: Component Analysis – Ecotoxicity – Aquatic Toxicity

No ecotoxicity data are available for this product's components.

Persistance / Degradability

No information available.

Bioaccumulation

No information available.

Mobility in Soil

No information available.

* * * Section 13 – DISPOSAL CONSIDERATIONS * * *

Waste Disposal Instructions

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment Recommendations.

Disposal of Contaminated Containers or Packaging

Dispose of contents / container in accordance with local / regional / national / international regulations.

* * * Section 14 – TRANSPORTATION INFORMATION * * *

DOT Information

Shipping Name: Natural Gas, Compressed

UN #: 1971 **Hazard Class:** 2.1

Placard:

* * * Section 15 – REGULATORY INFORMATION * * *

Regulatory Information

Component Analysis

None of this products components are listed under SARA Section 302 (40 CFR 355 Appendix A.
n-hexane is listed under SARA Section 313 (40 CFR 372.65). However the concentration of this component is approximately 0.01 % in compressed natural gas and is therefore far under the reporting threshold for the chemical.

n-hexane is listed under CERCLA (40 CFR 302.4). However the concentration of this component is approximately 0.01 % in compressed natural gas and is therefore far under the reporting threshold for the chemical.

SARA Section 311/312 – Hazard Classes

Acute Health	Chronic Health	Fire	Sudden Release of Pressure	Reactive
---	---	X	X	---

SARA Section 313 – Supplier Notification

This product contains one chemical (n-Hexane) that is subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-to-know act (EPCRA) of 1986 and of 40 CFR 372. However the concentration of this component is approximately 0.01 % in compressed natural gas and is therefore far under the reporting threshold for the chemical.

State Regulations

Component Analysis – State

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA	RI
Methane	74-82-8	No	No	Yes	Yes	Yes	No
Ethane	78-84-0	No	No	Yes	Yes	Yes	No
Propane	74-98-6	No	No	Yes	Yes	Yes	Yes
Butane	106-97-8	Yes	No	Yes	Yes	Yes	Yes
Pentanes	109-66-0	Yes	No	Yes	Yes	Yes	Yes
Hexanes	110-54-3	Yes	Yes	Yes	Yes	Yes	Yes
Nitrogen	7727-37-9	No	No	No	No	No	No
Carbon Dioxide	124-38-9	Yes	No	Yes	Yes	Yes	Yes
Oxygen	7782-44-7	No	No	No	No	No	No

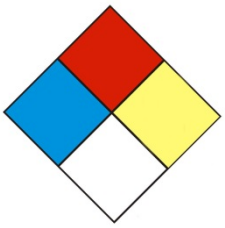
SAFETY DATA SHEET

Material Name: Wet Field Natural Gas

* * * Section 16 – OTHER INFORMATION * * *

NFPA® Hazard Rating

Health	1
Fire	4
Reactivity	0



HMIS® Hazard Rating

Health	1	Moderate
Fire	4	Severe
Physical	0	Minimal
		* Chronic

Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act: ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; NJTSR = New Jersey Trade Secret Registry.

Literature References

None

Other Information

The information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

Date of Preparation: February 7, 2014

Date of Last Revision: March 4,, 2014

End of Sheet

SAFETY DATA SHEET

Material Name: Dry Field Natural Gas **US GHS**

SYNONYMS: **CNG, Natural Gas, Methane.**

* * * Section 1 – PRODUCT AND COMPANY IDENTIFICATION * * *

PRODUCT NAME: **Dry Field Natural Gas**
PRODUCT CODES: **CAS Reg. No. 68410-63-9**

EMERGENCY PHONE: **(800) 878-1373**
AFTER HOURS: **(800) 878-1373**

PRODUCER: **Antero Resources**
ADDRESS: **1615 Wynkoop Street**
Denver, Colorado 80202

CHEMTREC PHONE: **(800) 424-9300**

* * * Section 2 – HAZARDS IDENTIFICATION * * *

GHS Classification:

Flammable Gas – Category 1.
Gases Under Pressure – Gas.
Specific Target Organ Systemic Toxicity (STOT) – Single Exposure Category 2.

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

Danger

Hazard Statements

Extremely flammable gas.
Contains gas under pressure, may explode if heated.
May cause damage to central nervous and respiratory systems.

Precautionary Statements

Prevention

Keep away from heat/sparks/open flames/hot surfaces. No smoking.
Do not breathe fume/gas/mist/vapors/spray.
Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.

Response

Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.
If exposed to gas, or concerned about possible exposure: Call a POISON CENTER or doctor/physician.

Storage

Protect from sunlight. Store in a well-ventilated place.
Store in a secure area.

Disposal

Dispose of contents/containers in accordance with local/regional/national/international regulations.

* * * Section 3 – COMPOSITION / INFORMATION ON INGREDIENTS * * *

CAS #	Component	Percent
74-82-8	Methane	95.01
78-84-0	Ethane	3.99
74-98-6	Propane	0.32
106-97-8	Butanes	0.07
109-66-0	Pentanes	0.02
110-54-3	Hexanes	0.01
7727-37-9	Nitrogen	0.35
124-38-9	Carbon Dioxide	0.19
7782-44-7	Oxygen	0.03

Because natural gas is a natural product, composition can vary greatly.

* * * Section 4 – FIRST AID MEASURES * * *

First Aid: Eyes

In case of freeze burn, cover eyes to protect from light. Flush eyes with running water for at least fifteen (15) minutes. Following flushing, seek medical attention.

First Aid: Skin

Remove contaminated clothing. In case of blistering, frostbite or freeze burns, seek immediate medical attention.

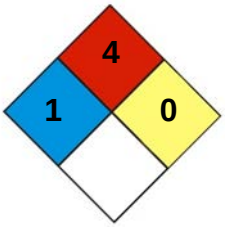
First Aid: Ingestion

Risk of ingestion is extremely low. However, if oral exposure occurs, seek immediate medical assistance.

First Aid: Inhalation

Remove person to fresh air. If person is not breathing, provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

* * * Section 5 – FIRE FIGHTING MEASURES * * *



NFPA 704 Hazard Class

Health: **1** Flammability: **4** Instability: **0** (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

General Fire Hazards

See Section 9 for Flammability Properties.
Forms a flammable mixture with air. If released, the resulting vapors will disperse with the prevailing wind. If a source of ignition is present where the vapor exists at a 5 – 15% concentration in air, the vapor will burn along the flame front toward the source of the fuel.

Hazardous Combustion Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

Extinguishing Media

Any extinguisher suitable for Class B fires, dry chemical, fire fighting foam, CO2, and other gaseous agents. However, fire should not be extinguished unless flow of gas can be immediately stopped.

Unsuitable Extinguishing Media

None.

Fire Fighting Equipment / Instructions

Gas fires should not be extinguished unless flow of gas can be immediately stopped. Shut off gas source and allow gas to burn out. If spill or leak has not ignited, determine

if water spray may assist in dispersing gas or vapor to protect personnel attempting to stop leak. Use water to cool equipment, surfaces and piping exposed to fire and excessive heat. For large fire, the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Isolate area, particularly around piping. Let the fire burn unless leak can be stopped. Concentrate fire-fighting efforts on objects / materials ignited by the initial fire. Withdraw immediately in the event of a rising sound from a venting safety device.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH-approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

* * * Section 6 – ACCIDENTAL RELEASE MEASURES * * *

Recovery and Neutralization

Stop the source of the release, if safe to do so.

Materials and Methods for Clean-Up

Consider the use of water spray to disperse gas vapors. Do not use water spray to direct gas vapors toward sewer or drainage systems. Isolate the area until gas has dispersed. Ventilate and gas test area before entering.

Emergency Measures

Evacuate nonessential personnel and secure all ignition sources. No road flares, smoking or flames in hazard area. Consider wind direction. Stay upwind and uphill, if possible. Vapor cloud may be white, but color will dissipate as cloud disperses. Fire and explosion hazard is still present.

Personal Precautions and Protective Equipment

Cooling effect of expanding gas from leak may present frostbite / freeze burn hazard. Wear flame retardant (FR) clothing around un-ignited leak. Wear fire protective clothing around an active fire.

Environmental Precautions

Do not flush gas vapors toward sewer or drainage systems.

Prevention of Secondary Hazards

None.

* * * Section 7 – HANDLING AND STORAGE * * *

Handling Procedures

Keep away from flame, sparks and excessive temperatures. Bond and ground containers. Use only in well ventilated areas.

Storage Procedures

Natural gas will be contained in the pipeline. Keep away from flame, sparks, excessive temperatures and open flames. Empty pipeline segments may contain explosive residues from natural gas liquids. Do not cut, heat, weld or expose containers to sources of ignition sections of pipeline unless the sections have been purged of natural gas residues.

Incompatibilities

Keep away from strong oxidizers, ignition sources and heat.

* * * Section 8 – EXPOSURE CONTROLS / PERSONAL PROTECTION * * *

Component Exposure Limits

Methane (74-82-8)

ACGIH: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases : Alkane C1-4)

Ethane (74-84-0)

ACGIH: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases : Alkane C1-4)

Propane (74-98-6)

ACGIH: 2500 ppm TWA (listed under Aliphatic hydrocarbon gases : Alkane C1-4)

Butane (106-97-8)

ACGIH: 800 ppm TWA (listed under Aliphatic hydrocarbon gases : Alkane C1-4)

Pentanes (109-66-0)

ACGIH: 600 ppm TWA (listed under Pentane, all isomers)

Hexanes (110-54-3)

ACGIH: 50 ppm TWA (listed under n-Hexane)

Nitrogen (7727-37-9)

Simple Asphyxiant

Carbon Dioxide (124-38-9)

ACGIH: 5000 ppm TWA (listed under Carbon Dioxide)

Oxygen (7782-44-7)

N/A – Necessary for life

Engineering Measures

Use adequate ventilation to keep gas and vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces. Use explosion-proof equipment and lighting in classified / controlled areas.

Personal Protective Equipment: Respiratory

Use a NIOSH approved positive-pressure, supplied air respirator with escape bottle or self-contained breathing apparatus (SCBA) for gas concentrations above occupational exposure limits, for potential for uncontrolled release, if exposure levels are not known, or in an oxygen-deficient atmosphere. CAUTION: Flammability limits (i.e., explosion hazard should be considered when assessing the need to expose personnel to concentrations requiring respiratory protection.

Personal Protective Equipment: Hands

Use cold-impervious, insulating flame-retardant (FR) gloves where contact with pressurized gas may occur.

Personal Protective Equipment: Eyes

Where there is a possibility of pressurized gas contact, wear splash-proof safety goggles and faceshield.

Personal Protective Equipment: Skin and Body

Where contact with pressurized gas may occur, wear flame-retardant (FR) and a faceshield.

* * * Section 9 – PHYSICAL AND CHEMICAL PROPERTIES * * *

Appearance:	Colorless	**Odor:**	Odorless to slight petroleum odor
Physical State:	Gas	**pH:**	ND
Vapor Pressure:	40 atm @ -187°F (-86°C)	**Vapor Density:**	0.6
Boiling Point:	-259°F (-162°C)	**Melting Point:**	ND
Solubility (H2O):	3.5%	**Specific Gravity:**	0.4 @ -263°F (-164°C)

Evaporation Rate:	ND	**VOC:**	ND
Octanol / H2O Coeff.:	ND	**Flash Point:**	Flammable Gas
Flash Point Method:	N/A		
Lower Flammability Limit: (LFL):	3.8 – 6.5	**Upper Flammability Limit: (UFL):**	13-17
Auto Ignition:	900-1170°F (482-632°C)	**Burning Rate:**	ND

* * * Section 10 – CHEMICAL STABILITY & REACTIVITY INFORMATION * * *

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

Keep away from strong oxidizers, ignition sources and heat.

Hazardous Decomposition Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

* * * Section 11 – TOXICOLOGICAL INFORMATION * * *

Acute Toxicity

A: General Product Information

Methane and ethane, the main components of natural gas, are considered practically inert in terms of physiological effects. At high concentrations these materials act as simple asphyxiants and may cause death due to lack of oxygen.

B. Component Analysis – LD50/LC50

Methane (74-82-8)

Inhalation LC50 Mouse 326 g/m3 2h

Ethane (74-84-0)

Inhalation LC50 Rat 658 mg/l 4h

Propane (74-98-6)

Inhalation LC50 Rat 658 mg/l 4h

Butanes (106-97-8)
Inhalation LC50 Rat 658 g/m3 4h

Pentanes (109-66-0)
Inhalation LD50 Rat 364 g/m3 4h

Hexanes (110-54-3)
Inhalation LC50 Rat > 20 mg/l 4h

Nitrogen (7727-37-9)
Simple Asphyxiant

Carbon Dioxide (124-38-9)
Inhalation LC50 Human 100,000 ppm 1minute

Oxygen (7782-44-7)
N/A – Necessary for life

Potential Health Effects: Skin Corrosion Property / Stimulativeness
This product is not reported to have any skin sensitization effects.

Generative Cell Mutagenicity
This product is not reported to have any mutagenic effects.

Carcinogenicity

A: General Product Information
This product is not reported to have any carcinogenic effects.

B: Component Carcinogenicity
None of this product's components are listed by ACGIH, IARC, OSHA, NIOSH, or NTP.

Reproductive Toxicity
This product is not reported to have any reproductive toxicity effects.

Specified Target Organ General Toxicity: Single Exposure
This product may cause damage to the heart.

Specified Target Organ General Toxicity: Repeated Exposure
This product is not reported to have any specific target organ repeat effects.

Aspiration Respiratory Organs Hazard
This product is not reported to have any aspiration hazard effects.

* * * Section 12 – ECOLOGICAL INFORMATION * * *

Ecotoxicity

A: General Product Information

Keep gas and vapors out of sewers, drainage areas, and waterways. Report spills and releases, as applicable under Federal and State regulations.

B: Component Analysis – Ecotoxicity – Aquatic Toxicity

No ecotoxicity data are available for this product's components.

Persistance / Degradability

No information available.

Bioaccumulation

No information available.

Mobility in Soil

No information available.

* * * Section 13 – DISPOSAL CONSIDERATIONS * * *

Waste Disposal Instructions

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment Recommendations.

Disposal of Contaminated Containers or Packaging

Dispose of contents / container in accordance with local / regional / national / international regulations.

* * * Section 14 – TRANSPORTATION INFORMATION * * *

DOT Information

Shipping Name: Natural Gas, Compressed

UN #: 1971 **Hazard Class:** 2.1

Placard:

* * * Section 15 – REGULATORY INFORMATION * * *

Regulatory Information

Component Analysis

None of this products components are listed under SARA Section 302 (40 CFR 355 Appendix A.
n-hexane is listed under SARA Section 313 (40 CFR 372.65). However the concentration of this component is approximately 0.01 % in compressed natural gas and is therefore far under the reporting threshold for the chemical.

n-hexane is listed under CERCLA (40 CFR 302.4). However the concentration of this component is approximately 0.01 % in compressed natural gas and is therefore far under the reporting threshold for the chemical.

SARA Section 311/312 – Hazard Classes

Acute Health	Chronic Health	Fire	Sudden Release of Pressure	Reactive
---	---	X	X	---

SARA Section 313 – Supplier Notification

This product contains one chemical (n-Hexane) that is subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-to-know act (EPCRA) of 1986 and of 40 CFR 372. However the concentration of this component is approximately 0.01 % in compressed natural gas and is therefore far under the reporting threshold for the chemical.

State Regulations

Component Analysis – State

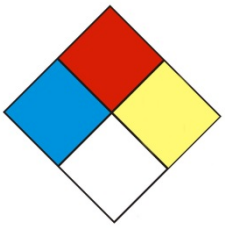
The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA	RI
Methane	74-82-8	No	No	Yes	Yes	Yes	No
Ethane	78-84-0	No	No	Yes	Yes	Yes	No
Propane	74-98-6	No	No	Yes	Yes	Yes	Yes
Butane	106-97-8	Yes	No	Yes	Yes	Yes	Yes
Pentanes	109-66-0	Yes	No	Yes	Yes	Yes	Yes
Hexanes	110-54-3	Yes	Yes	Yes	Yes	Yes	Yes
Nitrogen	7727-37-9	No	No	No	No	No	No
Carbon Dioxide	124-38-9	Yes	No	Yes	Yes	Yes	Yes
Oxygen	7782-44-7	No	No	No	No	No	No

* * * Section 16 – OTHER INFORMATION * * *

NFPA® Hazard Rating

Health	1
Fire	4
Reactivity	0



HMIS® Hazard Rating

Health	1	Moderate
Fire	4	Severe
Physical	0	Minimal
		* Chronic

Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act: ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; NJTSR = New Jersey Trade Secret Registry.

Literature References

None

Other Information

The information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

Date of Preparation: January 30, 2014

Date of Last Revision: March 4, 2014

End of Sheet

Material Safety Data Sheet
(TRIETHYLENE GLYCOL (TEG))

JMN Specialties, Inc.
1100 Victory Drive
Westwego, LA 70094
(504) 341-3749
ISO 9001 Registered

HMIS HEALTH:.....2
HMIS FLAMMABILITY: 1
HMIS REACTIVITY:.....0
PERSONAL PROTECTION: C

EMERGENCY NUMBER: 800-255-3924

SECTION 1 – IDENTIFICATION OF CHEMICAL PRODUCT

PRODUCT NAME:..... TRIETHYLENE GLYCOL (TEG)
EFFECTIVE DATE:..... October 1, 2007
CHEMICAL FAMILY:..... Glycol
FORMULA: $C_6H_{14}O_4$
CAS NUMBER:..... 112-27-6

SECTION 2 – COMPOSITION / INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENT	PERCENT	CAS NUMBER	PEL
TRIETHYLENE GLYCOL	> 99	112-27-6	None Established by ACGIH or OSHA.

The criteria for listing components in the composition section are as follows: Carcinogens are listed when present at 0.1% or greater; components which are otherwise hazardous according to OSHA are listed when present at 1.0% or greater. Non-hazardous components may be listed at 3.0% or greater if not proprietary in nature. This is not intended to be complete compositional disclosure. Refer to section 14 for applicable states right to know and other regulatory information.

SECTION 3 – HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

APPEARANCE / ODOR:..... Clear Liquid / Mild Odor

SHORT TERM EXPOSURE: **Inhalation:** No adverse health effects expected from inhalation. **Ingestion:** No adverse effects expected. **Skin Contact:** Prolonged exposure may cause skin irritation. **Eye Contact:** Splashing in eye causes irritation with transitory disturbances of corneal epithelium. However, these effects diminish and no permanent injury is expected. Vapors are non-irritating. **Chronic Exposure:** Possible skin irritation. **Aggravation of Pre-existing Conditions:** No information found.

OSHA REGULATED:..... No

LISTED CARCINOGEN: ..... **NTP:** No **IARC MONOGRAPHS:** No

POTENTIAL HEALTH EFFECTS

INHALATION: ..... Unlikely
INGESTION:..... Irritant
SKIN (DERMAL): ..... Slight Irritant After Prolonged Contact

OVER EXPOSURE EFFECTS: **Inhalation:** No adverse health effects expected from inhalation. **Ingestion:** No adverse effects expected. **Skin Contact:** Prolonged exposure may cause skin irritation. **Eye Contact:** Splashing in eye causes irritation with transitory disturbances of corneal epithelium. However, these effects diminish and no permanent injury is expected. Vapors are non-irritating. **Chronic Exposure:** Possible skin irritation. **Aggravation of Pre-existing Conditions:** No information found.

SECTION 4 – FIRST AID MEASURES

FIRST AID: **SKIN CONTACT:** Remove contaminated clothing and shoes immediately. Wash affected area with soap or mild detergent and large amounts of water until no evidence of chemical remains (at least 15-20 minutes). Get medical attention immediately. **EYE CONTACT:** Flush eyes immediately with large amounts of water or normal saline solution, occasionally lifting upper and lower lids until no evidence of chemical remains (at least 15-20 minutes). Get medical attention immediately. **INGESTION:** Give large amounts of fresh water or milk immediately. Do not give anything by mouth if person is unconscious or otherwise unable to swallow. If vomiting occurs, keep head below hips to prevent aspiration. Treat symptomatically and supportively. Seek medical attention immediately. **INHALATION:** Remove from exposure area to fresh air immediately. If breathing has stopped, perform artificial resuscitation. Keep person warm and at rest. Treat symptomatically and supportively. Seek medical attention immediately. Qualified medical personnel should consider administering oxygen.

NOTE TO PHYSICIAN: ..... Ethylene Glycol (EG) and diethylene glycol (DEG) intoxication may initially produce behavioral changes, drowsiness, vomiting, diarrhea, thirst, and convulsions. EG and DEG are nephrotoxic. End stages of poisoning may include renal damage or failure with acidosis. Supportive measures, supplemented with hemodialysis if indicated, may limit the progression and severity of toxic effects. Primary toxic effects of EG when swallowed are kidney damage and metabolic acidosis. This product may contain trace amounts of Ethylene Glycol (EG) or Diethylene Glycol (DEG).

SECTION 5 - FIRE FIGHTING MEASURES

FLASHPOINT:..... 350°F

EXTINGUISHING MEDIA: Water fog or spray, Foam, Dry Powder, Carbon Dioxide (CO_2).

DECOMPOSITION PRODUCTS:..... From fire; Smoke, Carbon dioxide, & Carbon Monoxide

LOWER FLAME LIMIT:..... < 0.9

HIGHER FLAME LIMIT:..... > 9

UNUSUAL FIRE AND EXPLOSION HAZARDS:..... Toxic levels of carbon monoxide, carbon dioxide, irritation aldehydes and ketones may be formed on burning. Heating in air may produce irritating aldehydes, acids, and ketones.

FIRE FIGHTING

EQUIPMENT: ..... Fire fighters and others exposed to products of combustion should wear self-contained breathing apparatus. Equipment should be thoroughly decontaminated after use.

SECTION 6 – ACCIDENTAL RELEASE MEASURES

CHEMTEL EMERGENCY NUMBER (24 Hour): **1-800-255-3924**

SPILL: ..... Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer!

RCRA STATUS: ..... None

SECTION 7 – HANDLING AND STORAGE

HANDLE IN ACCORDANCE WITH GOOD INDUSTRIAL HYGIENE AND SAFETY PRACTICES. THESE PRACTICES INCLUDE AVOIDING UNNECESSARY EXPOSURE AND PROMPT REMOVAL OF MATERIAL FROM EYES, SKIN, AND CLOTHING.

HANDLING AND STORAGE: .. No special storage requirements. Do not store above 120°F.

PRECAUTIONARY MEASURES: ..... Provide fresh air ventilation during and after application. Close container after each use. Avoid prolonged or repeated contact with skin. Avoid contact with skin, eyes, and clothing. After handling this product, wash hands before eating, drinking, or smoking. If needed, take first aid action shown in Section 4.

SECTION 8 – EXPOSURE CONTROL / PERSONAL PROTECTION

GENERAL CONSIDERATIONS:

Consider the potential hazards of this material (see section 3), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment.

EYE PROTECTION: ..... Chemical safety goggles meeting the specifications of OSHA 29CFR 1910.133 / ANSI Standard Z87.1 should be worn whenever there is the possibility of splashing or other contact with the eyes. Wear safety glasses meeting the specifications of OSHA 29CFR 1910.133 / ANSI Standard Z87.1 where no contact with the eye is anticipated.

RESPIRATORY PROTECTION: ..... Not normally needed. Use NIOSH approved vapor respirator if exposure is unknown or exceeds permissible limits. A respiratory protection program that meets OSHA's 29 CFR 1910.134 or ANSI Z88.2 requirements must be followed whenever workplace conditions warrant respirator use.

Use NIOSH / MSHA approved respiratory protection equipment when airborne exposure limits are exceeded (see below). Consult the respirator manufacturer to determine appropriate type of

equipment for a given application. Observe respirator use limitations specified by NIOSH / MSHA or the manufacturer. Respiratory protection programs must comply with 29 CFR 1910.134.
WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
PROTECTIVE GLOVES:..... Wear impervious gloves
VENTILATION: A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
MECHANICAL EXHAUST: ..... Desired in closed places
LOCAL EXHAUST: ..... Recommended

VENTILATION NOTES: Provide natural or mechanical ventilation to control exposure levels below Airborne exposure limits (see below). The use of local mechanical exhaust ventilation is preferred at sources of air contamination such as open process equipment. Consult NFPA Standard 91 for design of exhaust systems.

THRESHOLD LIMIT VALUE: . None Established
PROTECTIVE EQUIPMENT:... HMIS PERSONAL PROTECTION: C: Safety Glasses, Gloves, Apron
The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE / ODOR: ..... Clear Liquid / Mild Odor
BOILING POINT: ..... > 500°F
FREEZING POINT: ..... < 32°F
VAPOR PRESSURE:..... > 1
VAPOR DENSITY (AIR=1): 5.1
SPECIFIC GRAVITY: 1.1
pH: 8.2
SOLUBILITY IN WATER: ..... Complete

SECTION 10 – STABILITY AND REACTIVITY

STABILITY:..... Stable
HAZARDOUS
POLYMERIZATION:..... Will Not Occur
POLYMERIZATION AVOID:... None
INCOMPATIBILITY:..... Explosive decomposition may occur if combined with strong acids or strong bases and subjected to elevated temperatures. Therefore, avoid strong acids and strong bases at elevated temperatures. Avoid contamination with strong oxidizing agentsand materials reactive with hydroxyl compounds. Avoid burning or heating in air. This may produce irritating aldehydes, acids, and ketones.
CONDITIONS TO AVOID:..... Excessive heat. Will ignite in air at 700°F

Material Safety Data Sheet
(TRIETHYLENE GLYCOL (TEG))

SECTION 11 – TOXICOLOGICAL INFORMATION

EYE EFFECTS:
The eye irritation hazard is based on data from information supplied by raw material(s) supplier(s).
SKIN EFFECTS:
The skin irritation hazard is based on data from information supplied by raw material(s) supplier(s).
ACUTE ORAL EFFECTS:
The acute oral toxicity is based on data from information supplied by raw material(s) supplier(s).
ACUTE INHALATION EFFECTS:
The acute respiratory toxicity is based on data from information supplied by raw material(s) supplier(s).

SECTION 12 – ECOLOGICAL INFORMATION

Data from laboratory studies and from scientific literature is noted below if available.

SECTION 13 DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: ..... Treatment, storage, transportation and disposal must be in accordance with Federal, State/Provincial and Local Regulations. Regulations may vary in different locations. Characterization and compliance with applicable laws are the responsibility solely of the generator. Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

SECTION 14- TRANSPORTATION INFORMATION

The data provided in this section is for information only. The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate regulations to properly classify your shipment for transportation.

PROPER SHIPPING NAME:..... DOT NON-REGULATED - TRIETHYLENE GLYCOL (TEG)
REPORTABLE QUANTITY:..... None
HAZARD CLASS AND LABEL: NON-REGULATED
UN NUMBER: ..... None
NA NUMBER: ..... None
PACKAGING SIZE:..... Pail, Drum & Bulk

SECTION 15 - REGULATORY INFORMATION

SARA 311 CATEGORIES:
EPA ACUTE:..... Yes (Eyes)

EPA CHRONIC: ..... No
EPA IGNITABILITY: ..... No
EPA REACTIVITY: ..... No
EPA SUDDEN RELEASE
OF PRESSURE: ..... No

CERCLA RQ VALUE: ..... None
SARA TPQ: ..... None
SARA RQ: ..... None
EPA HAZARD WASTE #: ..... None
CLEAN AIR: ..... NA
CLEAN WATER: ..... NA
SARA SECTION 313: ..... No
NFPA HEALTH: 2
NFPA FLAMMABILITY: 1
NFPA REACTIVITY: 0
DEA Chemical Trafficking Act:.. No
TSCA STATUS: ..... All ingredients in this product are on the TSCA Inventory List.

SECTION 16 - ADDITIONAL INFORMATION

FOOT NOTES: NA - NOT APPLICABLE ND - NO DATA AVAILABLE > = GREATER THAN < = LESS THAN

Prepared according to the OSHA Hazard Communication Standard (29 CFR 1910.1200) and the ANSI MSDS Standard (Z400.1) by the Company Health and Risk Assessment Unit, PO Box 1519, Gretna, LA 70054-1519.

REVISION STATEMENT: Changes have been made throughout this Material Safety Data Sheet. Please read the entire document.

DISCLAIMER:
Although the information and recommendations set forth herein (hereinafter "Information") are presented in good faith and believed to be correct as of the date hereof, the Company makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that the persons receiving this MSDS will make their own determination as to its suitability for their intended purposes prior to use. Since the product is within the exclusive control of the user, it is the user's obligation to determine the conditions of safe use of this product. Such conditions should comply with all Federal Regulations concerning the Product. It must be recognized that the physical and chemical properties of any product may not be fully understood and that new, possibly hazardous products may arise from reactions between chemicals. The information given in this data sheet is based on our present knowledge and shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship. NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH INFORMATION REFERS.

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Attachment I.
Emission Units Table

Attachment I

Emission Units Table

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

Emission Unit ID[1]	Emission Point ID[2]	Emission Unit Description	Year Installed/ Modified	Design Capacity	Type[3] and Date of Change	Control Device[4]
C-100	1E	Compressor Engine #1	2016	1,680 hp	NA	NSCR (1C)
C-200	2E	Compressor Engine #2	2016	1,680 hp	NA	NSCR (2C)
C-300	3E	Compressor Engine #3	2016	1,680 hp	NA	NSCR (3C)
C-400	4E	Compressor Engine #4	2016	1,680 hp	NA	NSCR (4C)
C-500	5E	Compressor Engine #5	2016	1,680 hp	NA	NSCR (5C)
C-600	6E	Compressor Engine #6	2016	1,680 hp	NA	NSCR (6C)
C-700	7E	Compressor Engine #7	2016	1,680 hp	NA	NSCR (7C)
C-800	8E	Compressor Engine #8	2016	1,680 hp	NA	NSCR (8C)
C-900	9E	Compressor Engine #9	2016	1,680 hp	NA	NSCR (9C)
C-1000	10E	Compressor Engine #10	2016	1,680 hp	NA	NSCR(10C)
C-1100	11E	Compressor Engine #11	2016	1,680 hp	NA	NSCR(11C)
GEN1	12E	Microturbine Generator #1	2017	600 kWe	Modified	None
GEN2	13E	Microtrubine Generator #2	2017	600 kWe	Modified	None
DEHY1	14E	Dehydrator Still Vent #1	2017	110 MMscfd	Modified	FLARE1 (12C)
DFLSH1	15E	Dehydrator Flash Tank #1	2017	110 MMscfd	Modified	98% control
DREB1	16E	Dehydrator Reboiler #1	2017	1.5 mmbtu/hr	Modified	None
DEHY2	17E	Dehydrator Still Vent #2	2017	110 MMscfd	Modified	FLARE1 (12C)
DFLSH2	18E	Dehydrator Flash Tank #2	2017	110 MMscfd	Modified	98% contol
DREB2	19E	Dehydrator Reboiler #2	2017	1.5 mmbtu/hr	Modified	None
TK-1502	20E	Settling Tank 1	2014	500 barrel	NA	VRU-100 & 200 (13C & 14C)
TK-200	21E	Condensate Tank 1	2014	400 barrel	NA	VRU-100 & 200 (13C & 14C)
TK-201	22E	Condensate Tank 2	2014	400 barrel	NA	VRU-100 & 200 (13C & 14C)
TK-1500	23E	Produced Water Tank 1	2014	400 barrel	NA	VRU-100 & 200 (13C & 14C)

TK-1501	24E	Produced Water Tank 2	2014	400 barrel	NA	VRU-100 & 200 (13C & 14C)
CATHT1	27E	Catalytic Heater for Generator Fuel	2014	0.024 MMBtu/hr	NA	None
-----	-----	NSCR Catalyst for Compressor #1	2016	-----	NA	1C
-----	-----	NSCR Catalyst for Compressor #2	2016	-----	NA	2C
-----	-----	NSCR Catalyst for Compressor #3	2016	-----	NA	3C
-----	-----	NSCR Catalyst for Compressor #4	2016	-----	NA	4C
-----	-----	NSCR Catalyst for Compressor #5	2016	-----	NA	5C
----	----	NSCR Catalyst for Compressor #6	2016	----	NA	6C
----	----	NSCR Catalyst for Compressor #7	2016	----	NA	7C
----	----	NSCR Catalyst for Compressor #8	2016	----	NA	8C
----	----	NSCR Catalyst for Compressor #9	2016	----	NA	9C
----	----	NSCR Catalyst for Compressor #10	2016	----	NA	10C
----	----	NSCR Catalyst for Compressor #11	2016	----	NA	11C
FLARE1	26E	Flare Combustion Device 1	2014	4.8 MMBtu/hr	NA	12C
VRU-100	-----	Vapor Recovery Unit 1	2014	----	NA	13C
VRU-200	----	Vapor Recovery Unit 2	2014	----	NA	14C
C-1200	28E	Compressor Engine #12	2016	1,680 hp	NA	NSCR (15C)
C-1300	29E	Compressor Engine #13	2016	1,680 hp	NA	NSCR (16C)
----	----	NSCR Catalyst for Compressor #12	2016	-----	NA	15C
----	----	NSCR Catalyst for Compressor #13	2016	-----	NA	16C
LDOUT1	30E	Truck Loadout	2014	195 bbl/day	NA	None
FUEL1	31E	Fuel Conditioning Heater	2017	0.5 MMBtu/hr	New	None

[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 J.
Emission Point Data Summary Sheet

Attachment J
EMISSION POINTS DATA SUMMARY SHEET

Table 1: Emissions Data															
Emission Point ID No. *(Must match Emission Units Table & Plot Plan)*	Emission Point Type[1]	Emission Unit Vented Through This Point *(Must match Emission Units Table & Plot Plan)*		Air Pollution Control Device *(Must match Emission Units Table & Plot Plan)*		Vent Time for Emission Unit *(chemical processes only)*		All Regulated Pollutants - Chemical Name/CAS[3] *(Speciate VOCs & HAPS)*	Maximum Potential Uncontrolled Emissions [4]		Maximum Potential Controlled Emissions [5]		Emission Form or Phase *(At exit conditions, Solid, Liquid or Gas/Vapor)*	Est. Method Used [6]	Emission Concentration [7] (ppmv or mg/m[4])
		ID No.	Source	ID No.	Device Type	Short Term[2]	Max (hr/yr)		lb/hr	ton/yr	lb/hr	ton/yr			
1E	Upward Vertical Stack	C-100	Com-pressor engine 1	1C	NSCR catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.74 47.04 1.70 0.27 0.0082 0.35 0.19 2080	222.24 206.02 7.46 1.18 0.036 1.54 0.81 9109	1.27 1.18 0.27 0.27 0.0082 0.18 0.019 1993	5.56 5.15 1.19 1.18 0.036 0.81 0.081 8731	Gas/Vapor	EE	
2E	Upward Vertical Stack	C-200	Com-pressor engine 2	2C	NSCR catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.74 47.04 1.70 0.27 0.0082 0.35 0.19 2080	222.24 206.02 7.46 1.18 0.036 1.54 0.81 9109	1.27 1.18 0.27 0.27 0.0082 0.18 0.019 1993	5.56 5.15 1.19 1.18 0.036 0.81 0.081 8731	Gas/Vapor	EE	
3E	Upward Vertical Stack	C-300	Com-pressor engine 3	3C	NSCR catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.74 47.04 1.70 0.27 0.0082 0.35 0.19 2080	222.24 206.02 7.46 1.18 0.036 1.54 0.81 9109	1.27 1.18 0.27 0.27 0.0082 0.18 0.019 1993	5.56 5.15 1.19 1.18 0.036 0.81 0.081 8731	Gas/Vapor	EE	

4E	Upward Vertical Stack	C-400	Com-pressor engine 4	4C	NSCR catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.74 47.04 1.70 0.27 0.0082 0.35 0.19 2080	222.24 206.02 7.46 1.18 0.036 1.54 0.81 9109	1.27 1.18 0.27 0.27 0.0082 0.18 0.019 1993	5.56 5.15 1.19 1.18 0.036 0.81 0.081 8731	Gas/Vapor	EE	
5E	Upward Vertical Stack	C-500	Com-pressor engine 5	5C	NSCR catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.74 47.04 1.70 0.27 0.0082 0.35 0.19 2080	222.24 206.02 7.46 1.18 0.036 1.54 0.81 9109	1.27 1.18 0.27 0.27 0.0082 0.18 0.019 1993	5.56 5.15 1.19 1.18 0.036 0.81 0.081 8731	Gas/Vapor	EE	
6E	Upward Vertical Stack	C-600	Com-pressor engine 6	6C	NSCR catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.74 47.04 1.70 0.27 0.0082 0.35 0.19 2080	222.24 206.02 7.46 1.18 0.036 1.54 0.81 9109	1.27 1.18 0.27 0.27 0.0082 0.18 0.019 1993	5.56 5.15 1.19 1.18 0.036 0.81 0.081 8731	Gas/Vapor	EE	
7E	Upward Vertical Stack	C-700	Com-pressor engine 7	7C	NSCR catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.74 47.04 1.70 0.27 0.0082 0.35 0.19 2080	222.24 206.02 7.46 1.18 0.036 1.54 0.81 9109	1.27 1.18 0.27 0.27 0.0082 0.18 0.019 1993	5.56 5.15 1.19 1.18 0.036 0.81 0.081 8731	Gas/Vapor	EE	

8E	Upward Vertical Stack	C-800	Com-pressor engine 8	8C	NSCR catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.74 47.04 1.70 0.27 0.0082 0.35 0.19 2080	222.24 206.02 7.46 1.18 0.036 1.54 0.81 9109	1.27 1.18 0.27 0.27 0.0082 0.18 0.019 1993	5.56 5.15 1.19 1.18 0.036 0.81 0.081 8731	Gas/Vapor	EE	
9E	Upward Vertical Stack	C-900	Com-pressor engine 9	9C	NSCR catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.74 47.04 1.70 0.27 0.0082 0.35 0.19 2080	222.24 206.02 7.46 1.18 0.036 1.54 0.81 9109	1.27 1.18 0.27 0.27 0.0082 0.18 0.019 1993	5.56 5.15 1.19 1.18 0.036 0.81 0.081 8731	Gas/Vapor	EE	
10E	Upward Vertical Stack	C-1000	Com-pressor engine 10	10C	NSCR catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.74 47.04 1.70 0.27 0.0082 0.35 0.19 2080	222.24 206.02 7.46 1.18 0.036 1.54 0.81 9109	1.27 1.18 0.27 0.27 0.0082 0.18 0.019 1993	5.56 5.15 1.19 1.18 0.036 0.81 0.081 8731	Gas/Vapor	EE	
11E	Upward Vertical Stack	C-1100	Com-pressor engine 11	11C	NSCR catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.74 47.04 1.70 0.27 0.0082 0.35 0.19 2080	222.24 206.02 7.46 1.18 0.036 1.54 0.81 9109	1.27 1.18 0.27 0.27 0.0082 0.18 0.019 1993	5.56 5.15 1.19 1.18 0.036 0.81 0.081 8731	Gas/Vapor	EE	

12E	Upward Vertical Stack	GEN1 & GEN2	Microturbine Generator 1	----	----	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	0.24 0.66 0.060 0.041 0.021 0.0063 0.0044 799	1.05 2.89 0.26 0.18 0.092 0.028 0.019 3499	0.24 0.66 0.060 0.041 0.021 0.0063 0.0044 799	1.05 2.89 0.26 0.18 0.092 0.028 0.019 3499	Gas/Vapor	EE	
13E	Upward Vertical Stack	GEN2	Microturbin Generator 2	----	----	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	0.24 0.66 0.060 0.041 0.021 0.0063 0.0044 799	1.05 2.89 0.26 0.18 0.092 0.028 0.019 3499	0.24 0.66 0.060 0.041 0.021 0.0063 0.0044 799	1.05 2.89 0.26 0.18 0.092 0.028 0.019 3499	Gas/Vapor	EE	
14E	Upward Vertical Stack	DEHY1	Dehydrator Still Vent 1	12C	Flare-98% Control	C	8,760	VOC Total HAPs Benzene Toluene Ethylbenzene n-Hexane CO2e	14.99 2.76 0.61 1.62 0.077 0.45 446	65.64 12.08 2.69 7.09 0.34 1.96 1952	0.30 0.055 0.012 0.032 0.0015 0.0089 9.2	1.31 0.24 0.054 0.14 0.0067 0.039 40.1	Gas/Vapor	EE	
15E	Used for fuel in 16E	DFLSH1	Dehydrator Flash Gas 1	Used for Fuel in 16E	98% Control Backup	C	8,760	VOC Total HAPs Benzene Toluene Ethylbenzene n-Hexane CO2e	59.33 1.25 0.051 0.076 0.0018 1.12 2828	259.87 5.49 0.22 0.33 0.0080 4.93 12385	1.19 0.025 0.0010 0.0015 3.6E-5 0.023 58.7	5.20 0.11 0.0044 0.0067 2.0E-4 0.099 257	Gas/Vapor	EE	

16E	Upward Vertical Stack	DREB1	Dehydrator Reboiler 1	---	----	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	0.18 0.15 0.010 0.014 0.0011 0.0035 1.4E-4 176.1	0.81 0.68 0.044 0.061 0.0048 0.015 6.0E-4 771	0.18 0.15 0.010 0.014 0.0011 0.0035 1.4E-4 176.1	0.81 0.68 0.044 0.061 0.0048 0.015 6.0E-4 771	Gas/Vapor	EE	
17E	Upward Vertical Stack	DEHY2	Dehydrator Still Vent 2	12C	Flare-98% Control	C	8,760	VOC Total HAPs Benzene Toluene Ethylbenzene n-Hexane CO2e	14.99 2.76 0.61 1.62 0.077 0.45 446	65.64 12.08 2.69 7.09 0.34 1.96 1952	0.30 0.055 0.012 0.032 0.0015 0.0089 9.2	1.31 0.24 0.054 0.14 0.0067 0.039 40.1	Gas/Vapor	EE	
18E	Used for fuel in 19E	DFLSH2	Dehydrator Flash Gas 2	Used for Fuel in 19E	98% Control Backup	C	8,760	VOC Total HAPs Benzene Toluene Ethylbenzene n-Hexane CO2e	59.33 1.25 0.051 0.076 0.0018 1.12 2828	259.87 5.49 0.22 0.33 0.0080 4.93 12385	1.19 0.025 0.0010 0.0015 3.6E-5 0.023 58.7	5.20 0.11 0.0044 0.0067 2.0E-4 0.099 257	Gas/Vapor	EE	
19E	Upward Vertical Stack	DREB2	Dehydrator Reboiler 2	---	----	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	0.18 0.15 0.010 0.014 0.0011 0.0035 1.4E-4 176.1	0.81 0.68 0.044 0.061 0.0048 0.015 6.0E-4 771	0.18 0.15 0.010 0.014 0.0011 0.0035 1.4E-4 176.1	0.81 0.68 0.044 0.061 0.0048 0.015 6.0E-4 771	Gas/Vapor	EE	
20E	Upward Vertical Stack	TK-1502	Settler Tank	13C	VRU-98% control	C	8,760	VOC Total HAPs CO2e	129.2 4.01 325.8	566.0 17.55 1427	2.58 0.080 6.68	11.32 0.35 29	Gas/Vapor	EE	

21E	Upward Vertical Stack	TK-200	Condensate Tank 1	13C	VRU-98% control	C	8,760	VOC Total HAPs CO2e	1.83 0.057 0.41	8.03 0.25 1.77	0.037 0.0012 0.010	0.16 0.0050 0.043	Gas/Vapor	EE	
22E	Upward Vertical Stack	TK-201	Condensate Tank 2	13C	VRU-98% control	C	8,760	VOC Total HAPs CO2e	1.83 0.057 0.41	8.03 0.25 1.77	0.037 0.0012 0.010	0.16 0.0050 0.043	Gas/Vapor	EE	
23E	Upward Vertical Stack	TK-1500	Produced Water Tank 1	13C	VRU-98% control	C	8,760	VOC Total HAPs CO2e	8.8E-5 2.6E-7 0.0020	3.9E-4 1.2E-6 0.0089	1.8E-6 5.2E-9 7.4E-5	7.7E-6 2.3E-8 3.2E-4	Gas/Vapor	EE	
24E	Upward Vertical Stack	TK-1501	Produced Water Tank 2	13C	VRU-98% control	C	8,760	VOC Total HAPs CO2e	8.8E-5 2.6E-7 0.0020	3.9E-4 1.2E-6 0.0089	1.8E-6 5.2E-9 7.4E-5	7.7E-6 2.3E-8 3.2E-4	Gas/Vapor	EE	
26E	Upward Vertical Stack	FLARE 1	Flare combustion device 1	---	---	C	8,760	NOx CO VOC PM10 Total HAPs CO2e	--- --- --- --- --- ---	--- --- --- --- --- ---	0.33 1.78 1.1E-4 1.5E-4 3.8E-5 566	1.44 7.79 4.8E-4 6.7E-4 1.7E-4 2478	Gas/Vapor	EE	
27E	Upward Vertical Stack	CATHT 1	Catalytic Heater for Generator Fuel	---	---	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	0.0029 0.0025 1.6 E-4 2.2 E-4 1.8 E-5 5.5 E-5 2.2 E-6 2.83	0.013 0.011 7.1 E-4 9.8E-4 7.7 E-5 2.4 E-4 9.7 E-6 12.4	0.0029 0.0025 1.6 E-4 2.2 E-4 1.8 E-5 5.5 E-5 2.2 E-6 2.83	0.013 0.011 7.1 E-4 9.8E-4 7.7 E-5 2.4 E-4 9.7 E-6 12.4	Gas/Vapor	EE	
28E	Upward Vertical Stack	C-1200	Compressor engine 12	15C	NSCR catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.74 47.04 1.70 0.27 0.0082 0.35 0.19 2080	222.24 206.02 7.46 1.18 0.036 1.54 0.81 9109	1.27 1.18 0.27 0.27 0.0082 0.18 0.019 1993	5.56 5.15 1.19 1.18 0.036 0.81 0.081 8731	Gas/Vapor	EE	

29E	Upward Vertical Stack	C-1300	Com-pressor engine 13	16C	NSCR catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.74 47.04 1.70 0.27 0.0082 0.35 0.19 2080	222.24 206.02 7.46 1.18 0.036 1.54 0.81 9109	1.27 1.18 0.27 0.27 0.0082 0.18 0.019 1993	5.56 5.15 1.19 1.18 0.036 0.81 0.081 8731	Gas/Vapor	EE	
31E	Upward Vertical Stack	FUEL1	Fuel Conditi oning Heater	----	----	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	0.049 0.041 0.0027 0.0037 2.9E-4 9.2E-4 3.7E-5 58.7	0.21 0.18 0.012 0.016 0.0013 0.0040 1.6E-4 257.1	0.049 0.041 0.0027 0.0037 2.9E-4 9.2E-4 3.7E-5 58.7	0.21 0.18 0.012 0.016 0.0013 0.0040 1.6E-4 257.1	Gas/Vapor	EE	

The EMISSION POINTS DATA SUMMARY SHEET provides a summation of emissions by emission unit. Note that uncaptured process emission unit emissions are not typically considered to be fugitive and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET. Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions). Please complete the FUGITIVE EMISSIONS DATA SUMMARY SHEET for fugitive emission activities.

[1] Please add descriptors such as upward vertical stack, downward vertical stack, horizontal stack, relief vent, rain cap, etc.

[2] Indicate by "C" if venting is continuous. Otherwise, specify the average short-term venting rate with units, for intermittent venting (ie., 15 min/hr). Indicate as many rates as needed to clarify frequency of venting (e.g., 5 min/day, 2 days/wk).

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

[4] Give maximum potential emission 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).

[5] Give maximum potential emission 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).

[6] 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).

[7] Provide for all pollutant emissions. Typically, the units of parts per million by volume (ppmv) are used. If the emission is a mineral acid (sulfuric, nitric, hydrochloric or phosphoric) use units of milligram per dry cubic meter (mg/m^3) at standard conditions (68 °F and 29.92 inches Hg) (see 45CSR7). If the pollutant is SO_2, use units of ppmv (See 45CSR10).

EMISSION POINTS DATA SUMMARY SHEET

Table 2: Release Parameter Data

Emission Point ID No.	Inner Diameter (ft.)	Exit Gas			Emission Point Elevation (ft)		UTM Coordinates (km)	
		Temp. (°F)	Volumetric Flow [1] (acfm)	Velocity (fps)	Ground Level	Stack Height [2]	Northing	Easting
1E/1C	1.1	1224	8858	112	956	25	4363.536	511.678
2E/2C	1.1	1224	8858	112	956	25	4363.529	511.688
3E/3C	1.1	1224	8858	112	956	25	4363.522	511.697
4E/4C	1.1	1224	8858	112	956	25	4363.515	511.707
5E/5C	1.1	1224	8858	112	956	25	4363.508	511.716
6E/6C	1.1	1224	8858	112	956	25	4363.500	511.726
7E/7C	1.1	1224	8858	112	956	25	4363.493	511.735
8E/8C	1.1	1224	8858	112	956	25	4363.486	511.745
9E/9C	1.1	1224	8858	112	956	25	4363.581	511.754
10E/10C	1.1	1224	8858	112	956	25	4363.574	511.764
11E/11C	1.1	1224	8858	112	956	25	4363.464	511.773
12E	NA	535	3.99 kg/s mass flow	NA	956	10	4363.564	511.639
13E	NA	535	3.99 kg/s mass flow	NA	956	10	4363.581	511.626
14E/12C/26E	5	1400	64.0	0.05	956	15	4363.442	511.659
15E	Combusted in 16E		N/A	N/A	956	N/A	4363.442	511.659
16E	0.75	350	530	20	956	~18	4363.442	511.659
17E/12C/26E	5	1400	64.0	0.05	956	15	4363.426	511.684
18E	Combusted in 19E		N/A	N/A	956	N/A	4363.426	511.684
19E	0.75	350	530	20	956	~18	4363.426	511.684
20E-25E/13C-14C	Emissions captured in closed loop system with VRU			N/A	956	N/A	4363.466	511.568
27E	0.75	350	530	20	956	~18	4363.569	511.646
28E/15C	1.1	1224	8858	112	956	25	4363.489	511.753
29E/16C	1.1	1224	8858	112	956	25	4363.487	511.765
31E	0.75	350	530	20	956	~18	4363.462	511.692

Attachment K.
Fugitive Emissions Data Summary Sheet

Attachment K

FUGITIVE EMISSIONS DATA SUMMARY SHEET

The FUGITIVE EMISSIONS SUMMARY SHEET provides a summation of fugitive emissions. Fugitive emissions are those emissions which could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening. Note that uncaptured process emissions are not typically considered to be fugitive, and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET.

Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions).

APPLICATION FORMS CHECKLIST - FUGITIVE EMISSIONS
1.) Will there be haul road activities? ☒ Yes ☐ No ☒ If YES, then complete the HAUL ROAD EMISSIONS UNIT DATA SHEET.
2.) Will there be Storage Piles? ☐ Yes ☒ No ☐ If YES, complete Table 1 of the NONMETALLIC MINERALS PROCESSING EMISSIONS UNIT DATA SHEET.
3.) Will there be Liquid Loading/Unloading Operations? ☒ Yes ☐ No ☒ If YES, complete the BULK LIQUID TRANSFER OPERATIONS EMISSIONS UNIT DATA SHEET.
4.) Will there be emissions of air pollutants from Wastewater Treatment Evaporation? ☐ Yes ☒ No ☐ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.
5.) Will there be Equipment Leaks (e.g. leaks from pumps, compressors, in-line process valves, pressure relief devices, open-ended valves, sampling connections, flanges, agitators, cooling towers, etc.)? ☒ Yes ☐ No ☒ If YES, complete the LEAK SOURCE DATA SHEET section of the CHEMICAL PROCESSES EMISSIONS UNIT DATA SHEET.
6.) Will there be General Clean-up VOC Operations? ☐ Yes ☒ No ☐ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.
7.) Will there be any other activities that generate fugitive emissions? ☒ Yes ☐ No ☒ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET or the most appropriate form.
If you answered "NO" to all of the items above, it is not necessary to complete the following table, "Fugitive Emissions Summary."

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						
Unpaved Haul Roads	PM-10 PM-2.5	0.14 0.014	0.61 0.061	0.14 0.014	0.61 0.061	EE
Storage Pile Emissions						
Loading/Unloading Operations	VOCs Total HAPs CO2e	72.94 2.02 295.4	15.24 0.42 61.74	72.94 2.02 295.4	15.24 0.42 61.74	EE
Wastewater Treatment Evaporation & Operations						
Equipment Leaks	VOCs Total HAPs CO2e	2.35 0.052 40.41	10.31 0.23 177.0	2.37 0.052 40.41	10.31 0.23 177.0	EE
General Clean-up VOC Emissions						
Other – Venting Episodes	VOCs Total HAPs CO2e	Does not apply	22.11 0.38 1,627	Does not apply	22.11 0.38 1,627	EE

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

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

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

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

Attachment L.
Emission Unit Data Sheets

Dehydrators

NATURAL GAS GLYCOL DEHYDRATION UNIT DATA SHEET

General Glycol Dehydration Unit Data		Manufacturer and Model		Valerus, 110 MMscfd	
		Max Dry Gas Flow Rate (MMscf/day)		110	
		Design Heat Input (MMBtu/hr)		1.5	
		Design Type (DEG or TEG)		TEG	
		Source Status[2]		MS	
		Date Installed/Modified/Removed[3]		January 2017	
		Regenerator Still Vent APCD[4]		FL	
		Fuel HV (Btu/scf)		1,250	
		H_2S Content (gr/100 scf)		0	
		Operation (hrs/yr)		8,760	
Source ID #[1]	Vent	Reference[5]	Potential Emissions[6]	lbs/hr	tons/yr
16E	Reboiler Vent	AP	NO_X	0.18	0.81
		AP	CO	0.15	0.68
		AP	VOC	0.010	0.044
		AP	SO_2	0.0011	0.0048
		AP	PM_{10}	0.014	0.061
14E	Glycol Regenerator Still Vent	GRI-GLYCalc™	VOC	0.30	1.31
		GRI-GLYCalc™	Benzene	0.012	0.054
		GRI-GLYCalc™	Ethylbenzene	0.0015	0.0067
		GRI-GLYCalc™	Toluene	0.032	0.14
		GRI-GLYCalc™	Xylenes	0.00	0.00
		GRI-GLYCalc™	n-Hexane	0.0089	0.039
15E	Flash Gas Tank Vent	GRI-GLYCalc™	VOC	1.19	5.20
		GRI-GLYCalc™	Benzene	0.0010	0.0044
		GRI-GLYCalc™	Ethylbenzene	0.000036	0.00020
		GRI-GLYCalc™	Toluene	0.0015	0.0067
		GRI-GLYCalc™	Xylenes	0.00	0.00
		GRI-GLYCalc™	n-Hexane	0.023	0.099

General Glycol Dehydration Unit Data		Manufacturer and Model		Valerus, 110 MMscfd	
		Max Dry Gas Flow Rate (mmscf/day)		110	
		Design Heat Input (mmBtu/hr)		1.5	
		Design Type (DEG or TEG)		TEG	
		Source Status[2]		MS	
		Date Installed/Modified/Removed[3]		January 2017	
		Regenerator Still Vent APCD[4]		FL	
		Fuel HV (Btu/scf)		1,250	
		H_2S Content (gr/100 scf)		0	
		Operation (hrs/yr)		8,760	
Source ID #[1]	Vent	Reference[5]	Potential Emissions[6]	lbs/hr	tons/yr
19E	Reboiler Vent	AP	NO_X	0.18	0.81
		AP	CO	0.15	0.68
		AP	VOC	0.010	0.044
		AP	SO_2	0.0011	0.0048
		AP	PM_{10}	0.014	0.061
17E	Glycol Regenerator Still Vent	GRI-GLYCalc™	VOC	0.30	1.31
		GRI-GLYCalc™	Benzene	0.012	0.054
		GRI-GLYCalc™	Ethylbenzene	0.0015	0.0067
		GRI-GLYCalc™	Toluene	0.032	0.14
		GRI-GLYCalc™	Xylenes	0.00	0.00
		GRI-GLYCalc™	n-Hexane	0.0089	0.039
18E	Flash Gas Tank Vent	GRI-GLYCalc™	VOC	1.19	5.20
		GRI-GLYCalc™	Benzene	0.0010	0.0044
		GRI-GLYCalc™	Ethylbenzene	0.000036	0.00020
		GRI-GLYCalc™	Toluene	0.0015	0.0067
		GRI-GLYCalc™	Xylenes	0.00	0.00
		GRI-GLYCalc™	n-Hexane	0.023	0.099

1. Enter the appropriate Source Identification Numbers for the glycol dehydration unit Reboiler Vent and glycol Regenerator Still Vent. The glycol dehydration unit Reboiler Vent and glycol Regenerator Still Vent should be designated RBV-1 and RSV-1, respectively. If the compressor station incorporates multiple glycol dehydration units, a *Glycol Dehydration Unit Data Sheet* shall be completed for each, using Source Identification #s RBV-2 and RSV-2, RBV-3 and RSV-3, etc.

2. Enter the Source Status using the following codes:

NS	Construction of New Source	ES	Existing Source
MS	Modification of Existing Source	RS	Removal of Source

3. Enter the date (or anticipated date) of the glycol dehydration unit's installation (construction of source), modification or removal.

4. Enter the Air Pollution Control Device (APCD) type designation using the following codes:

NA	None	CD	Condenser
FL	Flare	CC	Condenser/Combustion Combination
TO	Thermal Oxidizer		

5. Enter the Potential Emissions Data Reference designation using the following codes:

MD	Manufacturer's Data	AP	AP-42	
GR	GRI-GLYCalc™	OT	Other _____	(please list)

6. Enter the Reboiler Vent and glycol Regenerator Still Vent Potential to Emit (PTE) for the listed regulated pollutants in lbs per hour and tons per year. The glycol Regenerator Still Vent potential emissions may be determined using the most recent version of the thermodynamic software model GRI-GLYCalc™ (Radian International LLC & Gas Research Institute). Attach all referenced Potential Emissions Data (or calculations) and the GRI-GLYCalc *Aggregate Calculations Report* to this *Glycol Dehydration Unit Data Sheet(s)*. This PTE data shall be incorporated in the *Emissions Summary Sheet*.

Include a copy of the GRI-GLYCalc™ analysis. This includes a printout of the aggregate calculations report, which shall include emissions reports, equipment reports, and stream reports.

***An explanation of input parameters and examples, when using GRI-GLYCalc™ is available on our website.**

West Virginia Department of Environmental Protection

Division of Air Quality

40 CFR Part 63; Subpart HH & HHH Registration Form

DIVISION OF AIR QUALITY : (304) 926-0475
WEB PAGE: http:\\www.wvdep.org

Complete this form for any oil and natural gas production or natural gas transmission and storage facility that uses an affected unit under HH/HHH, whether subject or not.

Section A: Facility Description		
Affected facility actual annual average natural gas throughput (scf/day):	220,000,000 (110,000,000 per dehy)	
Affected facility actual annual average hydrocarbon liquid throughput: (bbl/day):	195	
The affected facility processes, upgrades, or stores hydrocarbon liquids prior to custody transfer.	(Yes)	No
The affected facility processes, upgrades, or stores natural gas prior to the point at which natural gas (NG) enters the NG transmission and storage source category or is delivered to the end user.	(Yes)	No
The affected facility is: ☒ prior to a NG processing plant ☐ a NG processing plant ☐ prior to the point of custody transfer and there is no NG processing plant		
The affected facility transports or stores natural gas prior to entering the pipeline to a local distribution company or to a final end user (if there is no local distribution company).	(Yes)	No
The affected facility exclusively processes, stores, or transfers black oil.	Yes	(No)
Initial producing gas-to-oil ratio (GOR): _____scf/bbl API gravity: _____degrees		

Section B: Dehydration Unit (if applicable) [1]			
Description:	Monroe Compressor Station Dehydrators (DEHY1 and DEHY2)		
Date of Installation:	Modified 2016	Annual Operating Hours: 8,760	Burner rating (MMbtu/hr): 1.5
Exhaust Stack Height (ft):	TBD	Stack Diameter (ft): TBD	Stack Temp. (°F): 212
Glycol Type:	☒ TEG ☐ EG ☐ Other:		
Glycol Pump Type:	☐ Electric ☒ Gas	If gas, what is the volume ratio? __0.032__ACFM/gpm	
Condenser installed?	☒ Yes ☐ No	Exit Temp. 200___ °F	Condenser Pressure _0__psig
Incinerator/flare installed?	☒ Yes ☐ No	Destruction Eff. __98___%	
Other controls installed?	☐ Yes ☒ No	Describe:	
Wet Gas[2]: (Upstream of Contact Tower)	Gas Temp.: _120_°F Gas Pressure _1,200 psig Saturated Gas? ☒ Yes ☐ No	If no, water content _____ lb/MMSCF	
Dry Gas: (Downstream of Contact Tower)	Gas Flowrate(MMSCFD) Actual _____ Design ___110____ Water Content ___5.0____ lb/MMSCF		
Lean Glycol:	Circulation rate (gpm) Actual[3] _____ Maximum[4] ___15____ Pump make/model: Kimray 45015PV		
Glycol Flash Tank (if applicable):	Temp.: __80__°F Pressure __5___ psig Vented? Yes ☐ No ☒ If no, describe vapor control: Vent gas used in reboiler as fuel or sent to VRU system		
Stripping Gas (if applicable):	Source of gas: Dry gas, if used	Rate _9__ scfm	

Please attach the following required dehydration unit information:

1. System map indicating the chain of custody information. See Page 43 of this document for an example of a gas flow schematic. It is not intended that the applicant provide this level of detail for all sources. The level of detail that is necessary is to establish where the custody transfer points are located. This can be accomplished by submitting a process flow diagram indicating custody transfer points and the natural gas flow. However, the DAQ reserves the right to request more detailed information in order to make the necessary decisions.
2. Extended gas analysis from the Wet Gas Stream including mole percents of C_1-C_8, benzene, ethylbenzene, toluene, xylene and n-Hexane, using Gas Processors Association (GPA) 2286 (or similar). A sample should be taken from the inlet gas line, downstream from any inlet separator, and using a manifold to remove entrained liquids from the sample and a probe to collect the sample from the center of the gas line. GPA standard 2166 reference method or a modified version of EPA Method TO-14, (or similar) should be used.
3. GRI-GLYCalc Ver. 3.0 aggregate report based on maximum Lean Glycol circulation rate and maximum throughput.
4. Detailed calculations of gas or hydrocarbon flow rate.

Section C: Facility NESHAPS Subpart HH/HHH status

Affected facility status: (choose only one)

- ☒ Subject to Subpart HH - applies, but is exempt through < 1 tpy benzene exemption
- ☐ Subject to Subpart HHH
- ☒ Not Subject because:
  - ☒ < 10/25 TPY
  - ☐ Affected facility exclusively handles black oil
  - ☐ The facility wide actual annual average NG throughput is < 650 thousand scf/day and facility wide actual annual average hydrocarbon liquid is < 250 bpd
  - ☐ No affected source is present

Fuel Conditioning Heater

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): 31E

1. Name or type and model of proposed affected source:

   Fuel Conditioning Heater - 500,000 Btu/hr

2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.

3. Name(s) and maximum amount of proposed process material(s) charged per hour:

   Natural Gas as fuel - 490 scf/hr

4. Name(s) and maximum amount of proposed material(s) produced per hour:

   Heater is used to increase temperature of fuel before use by the compressor engines to allow more complete combustion.

5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants:

   Combustion process

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable):

(a) Type and amount in appropriate units of fuel(s) to be burned:

Natural gas as fuel - 490 scf/hr

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

Same as onsite gas analysis - see Attachment N

(c) Theoretical combustion air requirement (ACF/unit of fuel):

@ °F and psia.

(d) Percent excess air:

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

500,000 Btu/hr. Natural gas.

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

(g) Proposed maximum design heat input: $\times 10^6$ BTU/hr.

7. Projected operating schedule:

Hours/Day	24	Days/Week	7	Weeks/Year	52

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used:

@ °F and psia

a.	NO_X	0.049	lb/hr	grains/ACF
b.	SO_2	0.00029	lb/hr	grains/ACF
c.	CO	0.041	lb/hr	grains/ACF
d.	PM_{10}	0.0037	lb/hr	grains/ACF
e.	Hydrocarbons		lb/hr	grains/ACF
f.	VOCs	0.0027	lb/hr	grains/ACF
g.	Pb		lb/hr	grains/ACF
h.	Specify other(s)			
	Total HAP (including HCHO)	0.00092	lb/hr	grains/ACF
	CO2e	58.7	lb/hr	grains/ACF
			lb/hr	grains/ACF
			lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
see Attachment O	see Attachment O
REPORTING	TESTING
see Attachment O	see Attachment O

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

Generators

NATURAL GAS COMPRESSOR/GENERATOR ENGINE DATA SHEET

Source Identification Number[1]		12E		13E			
Engine Manufacturer and Model		Capstone C600 Standard		Capstone C600 Standard			
Manufacturer's Rated bhp/rpm		600 kWe		600 kWe			
Source Status[2]		MS		MS			
Date Installed/Modified/Removed[3]		January 2017		January 2017			
Engine Manufactured/Reconstruction Date[4]		2013		2013			
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No)[5]		N/A		N/A			
Engine, Fuel and Combustion Data	Engine Type[6]	N/A		N/A			
	APCD Type[7]	N/A		N/A			
	Fuel Type[8]	PQ		PQ			
	H_2S (gr/100 scf)	0		0			
	Operating kWe	200		200			
	BSFC (Btu/kWe)	10,300		10,300			
	Fuel throughput (ft^3/hr)	4,946		4,946			
	Fuel throughput ($MMft^3$/yr)	43.33		43.33			
	Operation (hrs/yr)	8,760		8,760			
Reference[9]	Potential Emissions[10]	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
MD	NO_X	0.24	1.05	0.24	1.05		
MD	CO	0.66	2.89	0.66	2.89		
MD	VOC	0.060	0.26	0.060	0.26		
AP	SO_2	0.021	0.092	0.021	0.092		
AP	PM_{10}	0.041	0.18	0.041	0.18		
AP	Formaldehyde	0.0044	0.019	0.0044	0.019		

1. Enter the appropriate Source Identification Number for each natural gas-fueled reciprocating internal combustion compressor/generator engine located at the compressor station. Multiple compressor engines should be designated CE-1, CE-2, CE-3 etc. Generator engines should be designated GE-1, GE-2, GE-3 etc. If more than three (3) engines exist, please use additional sheets.

2. Enter the Source Status using the following codes:

NS	Construction of New Source (installation)	ES	Existing Source
MS	Modification of Existing Source	RS	Removal of Source

3. Enter the date (or anticipated date) of the engine's installation (construction of source), modification or removal.

4. Enter the date that the engine was manufactured, modified or reconstructed.

5. Is the engine a certified stationary spark ignition internal combustion engine according to 40CFR60 Subpart JJJJ. If so, the engine and control device must be operated and maintained in accordance with the manufacturer's emission-related written instructions. You must keep records of conducted maintenance to demonstrate compliance, but no performance testing is required. If the certified engine is not operated and maintained in accordance with the manufacturer's emission-related written instructions, the engine will be considered a non-certified engine and you must demonstrate compliance according to 40CFR§60.4243a(2)(i) through (iii), as appropriate.

   Provide a manufacturer's data sheet for all engines being registered.

6. Enter the Engine Type designation(s) using the following codes:

LB2S	Lean Burn Two Stroke	RB4S	Rich Burn Four Stroke
LB4S	Lean Burn Four Stroke		

7. Enter the Air Pollution Control Device (APCD) type designation(s) using the following codes:

A/F	Air/Fuel Ratio	IR	Ignition Retard
HEIS	High Energy Ignition System	SIPC	Screw-in Precombustion Chambers
PSC	Prestratified Charge	LEC	Low Emission Combustion
NSCR	Rich Burn & Non-Selective Catalytic Reduction	SCR	Lean Burn & Selective Catalytic Reduction

8. Enter the Fuel Type using the following codes:

PQ	Pipeline Quality Natural Gas	RG	Raw Natural Gas

9. Enter the Potential Emissions Data Reference designation using the following codes. Attach all referenced data to this *Compressor/Generator Data Sheet(s)*.

MD	Manufacturer's Data	AP	AP-42	
GR	GRI-HAPCalc™	OT	Other _____	(please list)

10. Enter each engine's Potential to Emit (PTE) for the listed regulated pollutants in pounds per hour and tons per year. PTE shall be calculated at manufacturer's rated brake horsepower and may reflect reduction efficiencies of listed Air Pollution Control Devices. Emergency generator engines may use 500 hours of operation when calculating PTE. PTE data from this data sheet shall be incorporated in the *Emissions Summary Sheet*.

C600 600kW Power Package
High-pressure Natural Gas

World's largest air-bearing microturbine produces 600kW of clean, green and reliable power.

- High electrical efficiency over a very wide operating range
- Low maintenance air bearings require no lube oil or coolant
- Ultra-low emissions
- High availability – part load redundancy
- Proven technology with tens of millions of operating hours
- Integrated utility synchronization and protection with a modular design
- 5 and 9 year Factory Protection Plans available
- Remote monitoring and diagnostic capabilities
- Upgradable to 800kW or 1MW with field installed Capstone 200kW power modules
- Internal fuel gas compressor available for low fuel pressure Natural Gas applications

C600 600kW Power Package

Electrical Performance[1]

Electrical Power Output	600kW
Voltage	400–480 VAC
Electrical Service	3-Phase, 4 wire
Frequency	50/60 Hz, grid connect operation
	10–60 Hz, stand alone operation
Maximum Output Current	870A RMS @ 400V, grid connect operation
	720A RMS @ 480V, grid connect operation
	930A RMS, stand alone operation[2]
Electrical Efficiency LHV	33%

Fuel/Engine Characteristics[1]

Natural Gas HHV	30.7–47.5 MJ/m^3 (825–1,275 BTU/scf)
Inlet Pressure[3]	517–552 kPa gauge (75–80 psig)
Fuel Flow HHV	7,200 MJ/hr (6,840,000 BTU/hr)
Net Heat Rate LHV	10.9 MJ/kWh (10,300 BTU/kWh)

Exhaust Characteristics[1]	Standard	CARB Version
NOx Emissions @ 15% O_2[4]	< 9 ppmvd (18 mg/m^3)	< 4 ppmvd (8 mg/m^3)
NOx / Electrical Output[4]	0.14 g/bhp-hr (0.4 lb/MWhe)	0.05 g/bhp-hr (0.14 lb/MWhe)
Exhaust Gas Flow	4.0 kg/s (8.8 lbm/s)	4.0 kg/s (8.8 lbm/s)
Exhaust Gas Temperature	280°C (535°F)	280°C (535°F)
Exhaust Energy	4,260 MJ/hr (4,050,000 BTU/hr)	4,260 MJ/hr (4,050,000 BTU/hr)

Reliable power when and where you need it. Clean and simple.

Dimensions & Weight[5]

Width x Depth x Height	2.4 x 9.1 x 2.9 m (96 x 360 x 114 in)
Weight - Grid Connect Model	12565 kg (27,700 lbs)
Weight - Dual Mode Model	15014 kg (33,100 lbs)

Minimum Clearance Requirements[6]

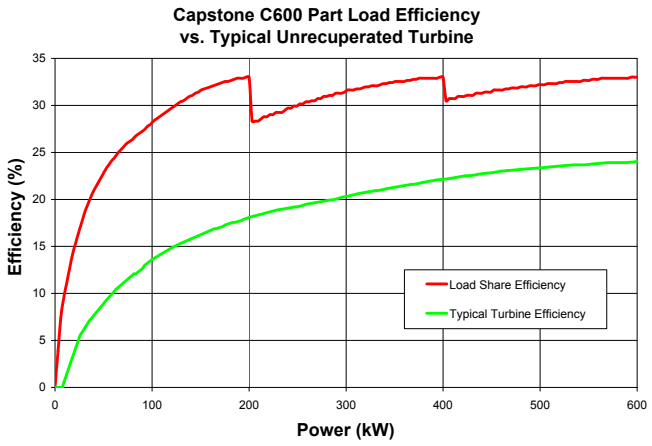
Vertical Clearance	0.6 m (24 in)
Horizontal Clearance	
Left & Right	1.5 m (60 in)
Front	1.5 m (60 in)
Rear	1.8 m (72 in)

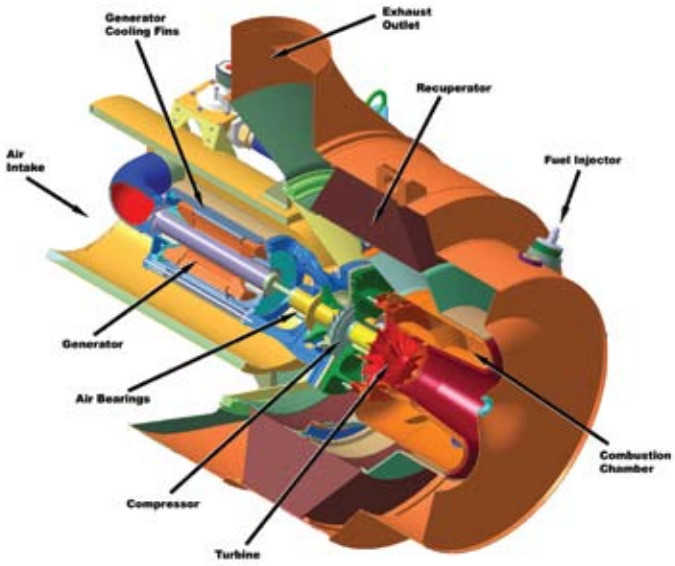
Sound Levels

Acoustic Emissions at Full Load Power	
Nominal at 10 m (33 ft)	65 dBA

Planned Certifications

- UL 2200 and UL 1741 for natural gas operation under existing UL files[7]
- Will comply with IEEE 1547 and will meet statewide utility interconnection requirements for California Rule 21 and the New York State Public Service Commission
- Models will be available with optional equipment for CE marking





C200 Engine

(1) Nominal full power performance at ISO conditions: 59°F, 14.696 psia, 60% RH
(2) With linear load
(3) Inlet pressure for standard natural gas at 39.4 MJ/Nm³ (1,000 BTU/scf) (HHV)
(4) Emissions for standard natural gas at 39.4 MJ/Nm³ (1,000 BTU/scf) (HHV)
(5) Approximate dimensions and weights
(6) Clearance requirements may increase due to local code considerations
(7) All models are planned to be UL Listed or available with optional equipment for CE marking

Specifications are not warranted and are subject to change without notice.

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Capstone Turbine Corporation • 21211 Nordhoff Street • Chatsworth • CA 91311 • USA
Phone: (818) 734-5300 • Fax: (818) 734-5320 • Web: www.microturbine.com

Technical Reference

Capstone MicroTurbine™ Systems Emissions

Summary

Capstone MicroTurbine™ systems are inherently clean and can meet some of the strictest emissions standards in the world. This technical reference is to provide customers with information that may be requested by local air permitting organizations or to compare air quality impacts of different technologies for a specific project. The preferred units of measure are "output based"; meaning that the quantity of a particular exhaust emission is reported relative to the useable output of the microturbine – typically in pounds per megawatt hour for electrical generating equipment. This technical reference also provides volumetric measurements in parts per million and milligrams per normal cubic meter. A conversion between several common units is also provided.

Maximum Exhaust Emissions at ISO Conditions

Table 1 below summarizes the exhaust emissions at full power and ISO conditions for different Capstone microturbine models. Note that the fuel can have a significant impact on certain emissions. For example landfill and digester gas can be made up of a wide variety of fuel elements and impurities, and typically contains some percentage of carbon dioxide (CO_2). This CO_2 dilutes the fuel, makes complete combustion more difficult, and results in higher carbon monoxide emissions (CO) than for pipeline-quality natural gas.

Table 1. Emission for Different Capstone Microturbine Models in [lb/MWhe]

Model	Fuel	NOx	CO	VOC (5)
C30 NG	Natural Gas (1)	0.64	1.8	0.23
CR30 MBTU	Landfill Gas (2)	0.64	22.0	1.00
CR30 MBTU	Digester Gas (3)	0.64	11.0	1.00
C30 Liquid	Diesel #2 (4)	2.60	0.41	0.23
C65 NG Standard	Natural Gas (1)	0.46	1.25	0.10
C65 NG Low NOx	Natural Gas (1)	0.17	1.30	0.10
C65 NG CARB	Natural Gas (1)	0.17	0.24	0.05
CR65 Landfill	Landfill Gas (2)	0.46	4.0	0.10
CR65 Digester	Digester Gas (3)	0.46	4.0	0.10
C200 NG	Natural Gas (1)	0.40	1.10	0.10
C200 NG CARB	Natural Gas (1)	0.14	0.20	0.04
CR200 Digester	Digester Gas (3)	0.40	3.6	0.10

Notes:

(1) Emissions for standard natural gas at 1,000 BTU/scf (HHV) or 39.4 MJ/m3 (HHV)
(2) Emissions for surrogate gas containing 42% natural gas, 39% CO2, and 19% Nitrogen
(3) Emissions for surrogate gas containing 63% natural gas and 37% CO2
(4) Emissions for Diesel #2 according to ASTM D975-07b
(5) Expressed as Methane

Table 2 provides the same output-based information shown in Table 1, but expressed in grams per horsepower hour (g/hp-hr).

Table 2. Emission for Different Capstone Microturbine Models in [g/hp-hr]

Model	Fuel	NOx	CO	VOC [5]
C30 NG	Natural Gas [1]	0.22	0.60	0.078
CR30 MBTU	Landfill Gas [2]	0.22	7.4	0.340
CR30 MBTU	Digester Gas [3]	0.22	3.7	0.340
C30 Liquid	Diesel #2 [4]	0.90	0.14	0.078
C65 NG Standard	Natural Gas [1]	0.16	0.42	0.034
C65 NG Low NOx	Natural Gas [1]	0.06	0.44	0.034
C65 NG CARB	Natural Gas [1]	0.06	0.08	0.017
CR65 Landfill	Landfill Gas [2]	0.16	1.4	0.034
CR65 Digester	Digester Gas [3]	0.16	1.4	0.034
C200 NG	Natural Gas [1]	0.14	0.37	0.034
C200 NG CARB	Natural Gas [1]	0.05	0.07	0.014
CR200 Digester	Digester Gas [3]	0.14	1.3	0.034

Notes: - same as for Table 1

Emissions may also be reported on a volumetric basis, with the most common unit of measurement being parts per million. This is typically a measurement that is corrected to specific oxygen content in the exhaust and without considering moisture content. The abbreviation for this unit of measurement is “ppmvd” (parts per million by volume, dry) and is corrected to 15% oxygen for electrical generating equipment such as microturbines. The relationship between an output based measurement like pounds per MWh and a volumetric measurement like ppmvd depends on the characteristics of the generating equipment and the molecular weight of the criteria pollutant being measured. Table 3 expresses the emissions in ppmvd at 15% oxygen for the Capstone microturbine models shown in Table 1. Note that raw measurements expressed in ppmv will typically be lower than the corrected values shown in Table 3 because the microturbine exhaust has greater than 15% oxygen.

Another volumetric unit of measurement expresses the mass of a specific criteria pollutant per standard unit of volume. Table 4 expresses the emissions in milligrams per normal cubic meter at 15% oxygen. Normal conditions for this purpose are expresses as one atmosphere of pressure and zero degrees Celsius. Note that both the ppmvd and mg/m3 measurements are for specific oxygen content. A conversion can be made to adjust either unit of measurement to other reference oxygen contents, if required. Use the equation below to convert from one reference oxygen content to another:

$$\text{Emissions at New } O_2 = \frac{(20.9 - \text{New } O_2 \text{ Percent})}{(20.9 - \text{Current } O_2 \text{ Percent})} \text{ X Emissions at Current } O_2$$

For example, to express 9 ppmvd of NOx at 15% oxygen to ppmvd at 3% oxygen:

$$\text{Emissions at 3\% } O_2 = \frac{(20.9 - 3.0)}{(20.9 - 15.0)} \text{ X } 9 = 27 \text{ ppmvd}$$

Greenhouse Gas Emissions

Many gasses are considered "greenhouse gasses", and agencies have ranked them based on their global warming potential (GWP) in the atmosphere compared with carbon dioxide (CO_2), as well as their ability to maintain this effect over time. For example, methane is a greenhouse gas with a GWP of 21. Criteria pollutants like NOx and organic compounds like methane are monitored by local air permitting authorities, and are subject to strong emissions controls. Even though some of these criteria pollutants can be more troublesome for global warming than CO_2, they are released in small quantities – especially from Capstone microturbines. So the major contributor of concern is carbon dioxide, or CO_2. Emission of CO_2 depends on two things:

1. Carbon content in the fuel
2. Efficiency of converting fuel to useful energy

It is for these reasons that many local authorities are focused on using clean fuels (for example natural gas compared with diesel fuel), achieving high efficiency using combined heat and power systems, and displacing emissions from traditional power plants using renewable fuels like waste landfill and digester gasses.

Table 5 shows the typical CO_2 emissions due to combustion for different Capstone microturbine models at full power and ISO conditions. The values do not include CO_2 that may already exist in the fuel itself, which is typical for renewable fuels like landfill and digester gas. These values are expressed on an output basis, as is done for criteria pollutants in Table 1. The table shows the pounds per megawatt hour based on electric power output only, as well as considering total useful output in a CHP system with total 70% efficiency (LHV). As for criteria pollutants, the relative quantity of CO_2 released is substantially less when useful thermal output is also considered in the measurement.

Table 5. CO_2 Emission for Capstone Microturbine Models in [lb/MWh]

Model	Fuel	CO_2	
		Electric Only	70% Total CHP
C30 NG	Natural Gas (1)	1,690	625
CR30 MBTU	Landfill Gas (1)	1,690	625
CR30 MBTU	Digester Gas (1)	1,690	625
C30 Liquid	Diesel #2 (2)	2,400	855
C65 NG Standard	Natural Gas (1)	1,520	625
C65 NG Low NOx	Natural Gas (1)	1,570	625
C65 NG CARB	Natural Gas (1)	1,570	625
CR65 Landfill	Landfill Gas (1)	1,520	625
CR65 Digester	Digester Gas (1)	1,520	625
C200 NG	Natural Gas (1)	1,330	625
C200 NG CARB	Natural Gas (1)	1,330	625
CR200 Digester	Digester Gas (1)	1,330	625

Notes:

(1) Emissions due to combustion, assuming natural gas with CO_2 content of 117 lb/MMBTU (HHV)

(2) Emissions due to combustion, assuming diesel fuel with CO_2 content of 160 lb/MMBTU (HHV)

Settling Tank

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

Provide the following information for each new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT **www.epa.gov/tnn/tanks.html**), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (**http://www.epa.gov/tnn/chief/**).

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name Production Storage Tanks	2. Tank Name Settling Tank
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-1502	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 20E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☐ New Construction ☐ New Stored Material ☒ Other Tank Modification	
7. Description of Tank Modification (if applicable) Update size of settling tank to 500 barrels.	
7A. Does the tank have more than one mode of operation? ☐ Yes ☒ No (e.g. Is there more than one product stored in the tank?)	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode).	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): None	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. 400 barrel	
9A. Tank Internal Diameter (ft) 12	9B. Tank Internal Height (or Length) (ft) 25
10A. Maximum Liquid Height (ft) 24	10B. Average Liquid Height (ft) 12.5
11A. Maximum Vapor Space Height (ft) 1	11B. Average Vapor Space Height (ft) 12.5
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 475 barrels	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
2,989,350	8,190

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 149.8

15. Maximum tank fill rate (gal/min): TBD

16. Tank fill method: ☐ Submerged ☒ Splash ☐ Bottom Loading

17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☒ Does Not Apply

17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

18. Type of tank (check all that apply):
- ☒ Fixed Roof — X vertical ___ horizontal ___ flat roof X 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 & OPERATION INFORMATION (optional if providing TANKS Summary Sheets)

19. Tank Shell Construction:
☐ Riveted ☐ Gunite lined ☐ Epoxy-coated rivets ☐ Other (describe)

20A. Shell Color	20B. Roof Color	20C. Year Last Painted

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

22A. Is the tank heated? ☐ YES ☐ NO

22B. If YES, provide the operating temperature (°F)

22C. If YES, please describe how heat is provided to tank.

23. Operating Pressure Range (psig): to

24. Complete the following section for **Vertical Fixed Roof Tanks** ☐ Does Not Apply

24A. For dome roof, provide roof radius (ft)

24B. For cone roof, provide slope (ft/ft)

25. Complete the following section 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
☐ Vapor Mounted Resilient Seal ☐ Other (describe):

25C. Is the Floating Roof equipped with a Secondary Seal? ☐ YES ☐ NO

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

25E. Is the Floating Roof equipped with a weather shield? ☐ YES ☐ NO

25F. Describe deck fittings; indicate the number of each type of fitting:		
ACCESS HATCH		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
AUTOMATIC GAUGE FLOAT WELL		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
COLUMN WELL		
BUILT-UP COLUMN – SLIDING COVER, GASKETED:	BUILT-UP COLUMN – SLIDING COVER, UNGASKETED:	PIPE COLUMN – FLEXIBLE FABRIC SLEEVE SEAL:
LADDER WELL		
PIP COLUMN – SLIDING COVER, GASKETED:	PIPE COLUMN – SLIDING COVER, UNGASKETED:	
GAUGE-HATCH/SAMPLE PORT		
SLIDING COVER, GASKETED:	SLIDING COVER, UNGASKETED:	
ROOF LEG OR HANGER WELL		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	SAMPLE WELL-SLIT FABRIC SEAL (10% OPEN AREA)
VACUUM BREAKER		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
RIM VENT		
WEIGHTED MECHANICAL ACTUATION GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
DECK DRAIN (3-INCH DIAMETER)		
OPEN:	90% CLOSED:	
STUB DRAIN		
1-INCH DIAMETER:		
OTHER (DESCRIBE, ATTACH ADDITIONAL PAGES IF NECESSARY)		

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 5 feet wide ☐ Continuous sheet construction 6 feet wide ☐ Continuous sheet construction 7 feet wide ☐ Continuous sheet construction 5 × 7.5 feet wide ☐ Continuous sheet construction 5 × 12 feet wide ☐ Other (describe)	
26D. Deck seam length (ft)	26E. Area of deck (ft^2)
For column supported tanks: 26F. Number of columns:	26G. Diameter of each column:

IV. SITE INFORMANTION (optional if providing TANKS Summary Sheets)

27. Provide the city and state on which the data in this section are based.
28. Daily Average Ambient Temperature (°F)
29. Annual Average Maximum Temperature (°F)
30. Annual Average Minimum Temperature (°F)
31. Average Wind Speed (miles/hr)
32. Annual Average Solar Insulation Factor (BTU/(ft^2·day))
33. Atmospheric Pressure (psia)

V. LIQUID INFORMATION (optional if providing TANKS Summary Sheets)

34. Average daily temperature range of bulk liquid:	
34A. Minimum (°F)	34B. Maximum (°F)
35. Average operating pressure range of tank:	
35A. Minimum (psig)	35B. Maximum (psig)
36A. Minimum Liquid Surface Temperature (°F)	36B. Corresponding Vapor Pressure (psia)
37A. Average Liquid Surface Temperature (°F)	37B. Corresponding Vapor Pressure (psia)
38A. Maximum Liquid Surface Temperature (°F)	38B. Corresponding Vapor Pressure (psia)

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

39A. Material Name or Composition			
39B. CAS Number			
39C. Liquid Density (lb/gal)			
39D. Liquid Molecular Weight (lb/lb-mole)			
39E. Vapor Molecular Weight (lb/lb-mole)			

Maximum Vapor Pressure 39F. True (psia) 39G. Reid (psia)			
Months Storage per Year 39H. From 39I. To			

VI. EMISSIONS AND CONTROL DEVICE DATA (required)

40. Emission Control Devices (check as many as apply): ☐ Does Not Apply

- ☐ Carbon Adsorption[1]
- ☐ Condenser[1]
- ☐ Conservation Vent (psig)
  - Vacuum Setting — Pressure Setting
- ☐ Emergency Relief Valve (psig)
- ☐ Inert Gas Blanket of
- ☐ Insulation of Tank with
- ☐ Liquid Absorption (scrubber)[1]
- ☐ Refrigeration of Tank
- ☐ Rupture Disc (psig)
- ☐ Vent to Incinerator[1]
- ☒ Other[1] (describe): Vapor Recovery Unit and vapors recycled back into system

[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 & CAS No.	Breathing Loss (lb/hr)	Working Loss Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
VOC	0.026	0.033	lb/hr	22,639	O-flashing, working, and breathing emissions by ProMax 3.2
Emissions are controlled values				*Annual Loss includes flash emissions	

[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 if applicable.

Fugitives

Attachment L
EMISSIONS UNIT DATA SHEET
CHEMICAL PROCESS

For chemical processes please fill out this sheet and all supplementary forms (see below) that apply. Please check all supplementary forms that have been completed.

☐ *Emergency Vent Summary Sheet*
☒ *Leak Sources Data Sheet*
☐ *Toxicology Data Sheet*
☐ *Reactor Data Sheet*
☐ *Distillation Column Data Sheet*

1. Chemical process area name and equipment ID number (as shown in *Equipment List Form*)
   Piping for Entire Facility. Piping not contained in equipment form.

2. Standard Industrial Classification Codes (SICs) for process(es)
   4923

3. List raw materials and ☐ attach MSDSs
   Wet Natural Gas

4. List Products and Maximum Production and ☐ attach MSDSs

Description and CAS Number	Maximum Hourly (lb/hr)	Maximum Annual (ton/year)
Dry Natural Gas	9.17 MMscf/hour	80,300 MMscf/year
Condensate	6.25 barrels/hour	54,750 barrels/year
Produced Water	1.88 barrels/hour	16,425 barrels/year

5. Complete the *Emergency Vent Summary Sheet* for all emergency relief devices.

6. Complete the *Leak Source Data Sheet* and describe below or attach to application the leak detection or maintenance program to minimize fugitive emissions. Include detection instruments, calibration gases or methods, planned inspection frequency, and record-keeping, and similar pertinent information. If subject to a rule requirement (e.g. 40CFR60, Subpart VV), please list those here.

   Leak Detection Plan will be developed. Subject to NSPS OOOOa.

7. Clearly describe below or attach to application Accident Procedures to be followed in the event of an accidental spill or release.
   Will reference developed and approved Spill Prevention, Control and Countermeasure (SPCC) plan.

8A. Complete the *Toxicology Data Sheet* or attach to application a toxicology report (an up-to-date material safety data sheets (MSDS) may be used) outlining the currently known acute and chronic health effects of each compound or chemical entity emitted to the air. If these compounds have already been listed in Item 3, then a duplicate MSDS sheet is not required. Include data such as the OSHA time weighted average (TWA) or mutagenicity, teratogenicity, irritation, and other known or suspected effects should be addressed. Indicate where these are unknown, and provide references.

8B. Describe any health effects testing or epidemiological studies on these compounds that are being or may be conducted by the company or required under TSCA, RCRA or other federal regulations. Discuss the persistence in the environment of any emission (e.g. pesticides, etc.).

9. **Waste Products** - Waste products status: (If source is subject to RCRA or 45CSR25, please contact the Hazardous Waste Section of WVDEP, OAQ at (304) 926-3647.)

9A. Types and amounts of wastes to be disposed:

9B. Method of disposal and location of waste disposal facilities:
Carrier: Phone:

9C. Check here if approved USEPA/State Hazardous Waste Landfill will be used ☐

10. Maximum and Projected Typical Operating Schedule for process or project as a whole (circle appropriate units).

circle units:	(hrs/day) (hr/batch)	(days), (batches/day), (batches/week)	(days/yr), (weeks/year)
10A. Maximum	24	7	52
10B. Typical	24	7	52

11. Complete a *Reactor Data Sheet* for each reactor in this chemical process.

12. Complete a *Distillation Column Data Sheet* for each distillation column in this chemical process.

13. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
See Attachment O	**See Attachment O**
REPORTING	TESTING
See Attachment O	**See Attachment O**

MONITORING. Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment operation or air pollution control device.

RECORDKEEPING. Please describe the proposed recordkeeping that will accompany the monitoring.

REPORTING. Please describe the proposed frequency of reporting of the recordkeeping.

TESTING. Please describe any proposed emissions testing for this process equipment or air pollution control device.

14. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

INFORMATION REQUIRED FOR CHEMICAL PROCESSES

The notes listed below for chemical processes are intended to help the applicant submit a complete application to the OAQ; these notes are not intended to be all inclusive. The requirements for a complete application for a permit issued under 45CSR13 are designed to provided enough information for a permit reviewer to begin a technical review. Additional information beyond that identified may be required to complete the technical review of any individual application.

Process Description

Please keep these points in mind when completing your process description as part of this permit application.

1. Provide a general process overview. This brief, but complete, process description should include chemical or registered trademark names of chemical products, intermediates, and/or raw materials to be produced or consumed, and the ultimate use(s) of the product(s). A list of the various chemical compounds is helpful.
2. Describe <u>each</u> <u>process</u> <u>step</u>. Include the process chemistry and stoichiometrically balanced reaction equation or material mass balance on all components.
3. Describe the methods and equipment used to receive, store, handle, and charge raw materials.
4. Describe the methods and equipment used to handle, store, or package final products and intermediates.
5. Provide process flow diagrams or equipment layout drawings which clearly show the process flow relationships among all pieces of process and control equipment. Identify all air emission discharge points. Discuss instrumentation and controls for the process.
6. Discuss the possibilities of process upsets, the duration and frequency of upsets, and consequences (including air emissions) of these upsets. Include a description of rupture discs, pressure relief valves, and secondary containment systems.
7. Discuss any fugitive emissions and the methods used to minimize them.
8. Include the following plans for the process if available:
   a. preventative maintenance and malfunction abatement plan (recommended for all control equipment).
   b. continuous emissions (in-stack) monitoring plan
   c. ambient monitoring plan
   d. emergency response plan

Regulatory Discussion

The following state and federal air pollution control regulations may be applicable to your chemical process. You should review these regulations carefully to determine if they apply to your process. Please summarize the results of your review in your permit application along with any other regulations you believe are applicable.

- Title 45 Legislative Rule Division of Environmental Protection, Office of Air Quality contains West Virginia's air pollution control regulations, including the following promulgated rules which may require emissions reductions or control technologies for your chemical process:
  a. 45CSR27 - Best Available Technology (BAT) for Toxic Air Pollutants (TAPs)
  b. 45CSR21 - VOC emissions controls for ozone maintenance in Kanawha, Cabell, Putnam, Wayne, and Wood counties.
  c. 45CSR13 (Table 45-13A) - plantwide emission thresholds for permitting for certain pollutants.
- Federal Guidelines for case-by-case MACT determinations under section 112(g) of the 1990 CAAA for individual and total HAPs greater than 10 and 25 tons per year, respectively.
- There are also subparts of the federal Standards of Performance for New Stationary Sources (NSPS), 40CFR60 60, and the National Emission Standards for Hazardous Air Pollutants (NESHAP) at 40CFR61 and 40CFR63, which apply to various chemical and nonchemical processes. These subparts are too numerous to list here, but these areas of the federal regulations should be consulted carefully to determine applicability to your process.

Emissions Summary and Calculations

Please keep these points in mind when submitting your emissions calculations as part of this permit application.

1. For each pollutant, provide the basis for the emissions estimate and for all emission reduction(s) or control efficiency(ies) claimed.
2. For all <u>batch</u> processes provide the following
   a. Emissions of each pollutant in pound(s) per batch, from each process step
   b. Annual emissions based on number of batches requested per year
   c. The total time for each process step and the duration of the emissions during the process step
   d. Total batch time, total emissions per batch (or per day), and annual emissions based on the number of batches requested per year.

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	750	TBD	1st attempt – 5 days	12,973.5 – EE
	Light Liquid VOC	160	TBD	1st attempt – 5 days	5,719.5 – EE
	Heavy Liquid VOC				
	Non-VOC				
Safety Relief Valves[11]	Gas VOC				
	Non VOC				
Open-ended Lines[12]	VOC				
	Non-VOC				
Sampling Connections[13]	VOC				
	Non-VOC				
Compressors	VOC	39	TBD	1st attempt – 5 days	1,319– EE
	Non-VOC				
Flanges	Gas VOC	850	TBD	1st attempt – 5 days	1,274 – EE
	Light Liquid VOC	400	TBD	1st attempt – 5 days	629 – EE
Other	VOC				
	Non-VOC				

[1 - 13] See notes on the following page.

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): Fugitive so no number assigned

1. Name or type and model of proposed affected source:

Fugitive emissions from venting episodes such as plant shutdowns and compressor start ups/shut downs.

2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.

3. Name(s) and maximum amount of proposed process material(s) charged per hour:

4. Name(s) and maximum amount of proposed material(s) produced per hour:

- compressor blowdown - 0.012 tons VOC per event, 0.87 tons CO2e per event
- compressor startup - 0.0057 tons VOC per event, 0.42 tons CO2e per event
- plant shutdown - 0.55 tons VOC per event, 40.30 tons CO2e per event
- low pressure pigging venting - 0.0028 tons VOC per event, 0.21 tons CO2e per event
- high pressure pigging venting - 0.015 tons VOC per event, 1.13 tons CO2e per event

5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants:

none

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable):

(a) Type and amount in appropriate units of fuel(s) to be burned:

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

(c) Theoretical combustion air requirement (ACF/unit of fuel):

@ °F and psia.

(d) Percent excess air:

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

(g) Proposed maximum design heat input: × 10^6 BTU/hr.

7. Projected operating schedule:

Hours/Day	not a regular schedule	Days/Week	not a regular schedule	Weeks/Year	not a regular schedule

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used:

@ venting events are uncontrolled °F and psia

a.	NO_X	lb/hr	grains/ACF
b.	SO_2	lb/hr	grains/ACF
c.	CO	lb/hr	grains/ACF
d.	PM_{10}	lb/hr	grains/ACF
e.	Hydrocarbons	lb/hr	grains/ACF
f.	VOCs	lb/hr	grains/ACF
g.	Pb	lb/hr	grains/ACF
h.	Specify other(s)		
		lb/hr	grains/ACF
		lb/hr	grains/ACF
		lb/hr	grains/ACF
		lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
See Attachment O	See Attachment O
REPORTING	**TESTING**
See Attachment O	See Attachment O

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

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

Attachment N.
Supporting Emissions Calculations

Emission Calculations

Emissions Summary Total

Company:	**Antero Midstream LLC**
Facility Name:	**Monroe Compressor Station**
Facility Location:	**Tyler County, West Virginia**

UNCONTROLLED POTENTIAL EMISSION SUMMARY

Source	NOx		CO		VOC		SO_2		PM-10		HAPs		Formaldehyde		CO_2e
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	tpy
Engines															
Compressor Engine 1	50.74	222.24	47.04	206.02	1.70	7.46	0.0082	0.036	0.27	1.18	0.35	1.54	0.19	0.81	9,109
Compressor Engine 2	50.74	222.24	47.04	206.02	1.70	7.46	0.0082	0.036	0.27	1.18	0.35	1.54	0.19	0.81	9,109
Compressor Engine 3	50.74	222.24	47.04	206.02	1.70	7.46	0.0082	0.036	0.27	1.18	0.35	1.54	0.19	0.81	9,109
Compressor Engine 4	50.74	222.24	47.04	206.02	1.70	7.46	0.0082	0.036	0.27	1.18	0.35	1.54	0.19	0.81	9,109
Compressor Engine 5	50.74	222.24	47.04	206.02	1.70	7.46	0.0082	0.036	0.27	1.18	0.35	1.54	0.19	0.81	9,109
Compressor Engine 6	50.74	222.24	47.04	206.02	1.70	7.46	0.0082	0.036	0.27	1.18	0.35	1.54	0.19	0.81	9,109
Compressor Engine 7	50.74	222.24	47.04	206.02	1.70	7.46	0.0082	0.036	0.27	1.18	0.35	1.54	0.19	0.81	9,109
Compressor Engine 8	50.74	222.24	47.04	206.02	1.70	7.46	0.0082	0.036	0.27	1.18	0.35	1.54	0.19	0.81	9,109
Compressor Engine 9	50.74	222.24	47.04	206.02	1.70	7.46	0.0082	0.036	0.27	1.18	0.35	1.54	0.19	0.81	9,109
Compressor Engine 10	50.74	222.24	47.04	206.02	1.70	7.46	0.0082	0.036	0.27	1.18	0.35	1.54	0.19	0.81	9,109
Compressor Engine 11	50.74	222.24	47.04	206.02	1.70	7.46	0.0082	0.036	0.27	1.18	0.35	1.54	0.19	0.81	9,109
Compressor Engine 12	50.74	222.24	47.04	206.02	1.70	7.46	0.0082	0.036	0.27	1.18	0.35	1.54	0.19	0.81	9,109
Compressor Engine 13	50.74	222.24	47.04	206.02	1.70	7.46	0.0082	0.036	0.27	1.18	0.35	1.54	0.19	0.81	9,109
Fuel Conditioning Heater	0.049	0.21	0.041	0.18	0.0027	0.012	0.00029	0.0013	0.0037	0.016	0.00092	0.0040	0.000037	0.00016	257
Turbines															
Microturbine Generator 1	0.24	1.05	0.66	2.89	0.060	0.26	0.021	0.092	0.041	0.18	0.0063	0.028	0.0044	0.019	3,499
Microturbine Generator 2	0.24	1.05	0.66	2.89	0.060	0.26	0.021	0.092	0.041	0.18	0.0063	0.028	0.0044	0.019	3,499
Catalytic Heater for Generator Fuel	0.0029	0.013	0.0025	0.0108	0.00016	0.00071	0.000018	0.000077	0.00022	0.00098	0.000055	0.00024	0.0000022	0.0000097	12
Dehydrator															
TEG Dehydrator 1	---	---	---	---	74.32	325.51	---	---	---	---	4.01	17.57	---	---	14,337
TEG Dehydrator 2	---	---	---	---	74.32	325.51	---	---	---	---	4.01	17.57	---	---	14,337
Reboiler 1	0.18	0.81	0.15	0.68	0.010	0.044	0.0011	0.0048	0.014	0.061	0.0035	0.015	0.00014	0.00060	771
Reboiler 2	0.18	0.81	0.15	0.68	0.010	0.044	0.0011	0.0048	0.014	0.061	0.0035	0.015	0.00014	0.00060	771
Combustors															
Flare and Pilot	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Hydrocarbon Loading															
Truck Loadout	---	---	---	---	78.45	8.19	---	---	---	---	2.43	0.25	---	---	21
Fugitive Emissions															
Component Leak Emissions	---	---	---	---	2.50	10.96	---	---	---	---	0.053	0.23	---	---	181
Venting Emissions	---	---	---	---	---	22.11	---	---	---	---	---	0.38	---	---	1,627
Haul Road Dust Emissions	---	---	---	---	---	---	---	---	0.051	0.22	---	---	---	---	---
Storage Tanks															
Produced Water Tanks	---	---	---	---	0.00018	0.00077	---	---	---	---	5.23E-07	2.29E-06	---	---	0.02
Settler Tank	---	---	---	---	129.22	565.96	---	---	---	---	4.01	17.55	---	---	1,427
Condensate Tanks	---	---	---	---	3.67	16.06	---	---	---	---	0.11	0.50	---	---	4
Total Facility PTE =	**660.53**	**2,893.12**	**613.15**	**2,685.61**	**384.76**	**1,371.92**	**0.15**	**0.66**	**3.67**	**16.08**	**19.20**	**74.18**	**2.42**	**10.58**	**159,159**

Emissions Summary Total

Company:	**Antero Midstream LLC**
Facility Name:	**Monroe Compressor Station**
Facility Location:	**Tyler County, West Virginia**

CONTROLLED POTENTIAL EMISSION SUMMARY

Source	NOx		CO		VOC		SO_2		PM-10		HAPs		Formaldehyde		CO_2e
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	tpy
Engines															
Compressor Engine 1	1.27	5.56	1.18	5.15	0.27	1.19	0.0082	0.036	0.27	1.18	0.18	0.81	0.019	0.081	8,731
Compressor Engine 2	1.27	5.56	1.18	5.15	0.27	1.19	0.0082	0.036	0.27	1.18	0.18	0.81	0.019	0.081	8,731
Compressor Engine 3	1.27	5.56	1.18	5.15	0.27	1.19	0.0082	0.036	0.27	1.18	0.18	0.81	0.019	0.081	8,731
Compressor Engine 4	1.27	5.56	1.18	5.15	0.27	1.19	0.0082	0.036	0.27	1.18	0.18	0.81	0.019	0.081	8,731
Compressor Engine 5	1.27	5.56	1.18	5.15	0.27	1.19	0.0082	0.036	0.27	1.18	0.18	0.81	0.019	0.081	8,731
Compressor Engine 6	1.27	5.56	1.18	5.15	0.27	1.19	0.0082	0.036	0.27	1.18	0.18	0.81	0.019	0.081	8,731
Compressor Engine 7	1.27	5.56	1.18	5.15	0.27	1.19	0.0082	0.036	0.27	1.18	0.18	0.81	0.019	0.081	8,731
Compressor Engine 8	1.27	5.56	1.18	5.15	0.27	1.19	0.0082	0.036	0.27	1.18	0.18	0.81	0.019	0.081	8,731
Compressor Engine 9	1.27	5.56	1.18	5.15	0.27	1.19	0.0082	0.036	0.27	1.18	0.18	0.81	0.019	0.081	8,731
Compressor Engine 10	1.27	5.56	1.18	5.15	0.27	1.19	0.0082	0.036	0.27	1.18	0.18	0.81	0.019	0.081	8,731
Compressor Engine 11	1.27	5.56	1.18	5.15	0.27	1.19	0.0082	0.036	0.27	1.18	0.18	0.81	0.019	0.081	8,731
Compressor Engine 12	1.27	5.56	1.18	5.15	0.27	1.19	0.0082	0.036	0.27	1.18	0.18	0.81	0.019	0.081	8,731
Compressor Engine 13	1.27	5.56	1.18	5.15	0.27	1.19	0.0082	0.036	0.27	1.18	0.18	0.81	0.019	0.081	8,731
Fuel Conditioning Heater	0.049	0.21	0.041	0.18	0.0027	0.012	0.00029	0.0013	0.0037	0.016	0.00092	0.0040	0.000037	0.00016	257
Turbines															
Microturbine Generator 1	0.24	1.05	0.66	2.89	0.060	0.26	0.021	0.092	0.041	0.18	0.0063	0.028	0.0044	0.019	3,499
Microturbine Generator 2	0.24	1.05	0.66	2.89	0.060	0.26	0.021	0.092	0.041	0.18	0.0063	0.028	0.0044	0.019	3,499
Catalytic Heater for Generator Fuel	0.0029	0.013	0.0025	0.011	0.00016	0.00071	0.000018	0.000077	0.00022	0.00098	0.000055	0.00024	0.0000022	0.0000097	12
Dehydrator															
TEG Dehydrator 1	---	---	---	---	1.49	6.51	---	---	---	---	0.080	0.35	---	---	297
TEG Dehydrator 2	---	---	---	---	1.49	6.51	---	---	---	---	0.080	0.35	---	---	297
Reboiler 1	0.18	0.81	0.15	0.68	0.010	0.044	0.0011	0.0048	0.014	0.061	0.0035	0.015	0.00014	0.00060	771
Reboiler 2	0.18	0.81	0.15	0.68	0.010	0.044	0.0011	0.0048	0.014	0.061	0.0035	0.015	0.00014	0.00060	771
Combustors															
Flare and Pilot	0.33	1.44	1.78	7.79	0.00011	0.00048	0.000012	0.000053	0.00015	0.00067	0.000038	0.00017	---	---	2,478
Hydrocarbon Loading															
Truck Loadout	---	---	---	---	78.45	8.19	---	---	---	---	2.43	0.25	---	---	21
Fugitive Emissions															
Component Leak Emissions	---	---	---	---	2.50	10.96	---	---	---	---	0.053	0.23	---	---	181
Venting Emissions	---	---	---	---	---	22.11	---	---	---	---	---	0.38	---	---	1,627
Haul Road Dust Emissions	---	---	---	---	---	---	---	---	0.051	0.22	---	---	---	---	---
Storage Tanks															
Produced Water Tanks	---	---	---	---	3.53E-06	1.54E-05	---	---	---	---	1.05E-08	4.58E-08	---	---	0.0006
Settler Tank	---	---	---	---	2.58	11.32	---	---	---	---	0.080	0.35	---	---	29
Condensate Tanks	---	---	---	---	0.073	0.32	---	---	---	---	0.0023	0.010	---	---	0.09
Total Facility PTE =	**17.72**	**77.61**	**18.74**	**82.07**	**90.27**	**82.06**	**0.15**	**0.66**	**3.67**	**16.08**	**5.09**	**12.55**	**0.25**	**1.09**	**127,248**

HAP Emissions Summary Total

Company:	**Antero Midstream LLC**
Facility Name:	**Monroe Compressor Station**
Facility Location:	**Tyler County, West Virginia**

CONTROLLED POTENTIAL EMISSION SUMMARY

Source	Benzene		Toluene		Ethylbenzene		Xylenes		n-Hexane	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Engines										
Compressor Engine 1	0.022	0.096	0.0078	0.034	0.00034	0.0015	0.0027	0.012	---	---
Compressor Engine 2	0.022	0.096	0.0078	0.034	0.00034	0.0015	0.0027	0.012	---	---
Compressor Engine 3	0.022	0.096	0.0078	0.034	0.00034	0.0015	0.0027	0.012	---	---
Compressor Engine 4	0.022	0.096	0.0078	0.034	0.00034	0.0015	0.0027	0.012	---	---
Compressor Engine 5	0.022	0.096	0.0078	0.034	0.00034	0.0015	0.0027	0.012	---	---
Compressor Engine 6	0.022	0.096	0.0078	0.034	0.00034	0.0015	0.0027	0.012	---	---
Compressor Engine 7	0.022	0.096	0.0078	0.034	0.00034	0.0015	0.0027	0.012	---	---
Compressor Engine 8	0.022	0.096	0.0078	0.034	0.00034	0.0015	0.0027	0.012	---	---
Compressor Engine 9	0.022	0.096	0.0078	0.034	0.00034	0.0015	0.0027	0.012	---	---
Compressor Engine 10	0.022	0.096	0.0078	0.034	0.00034	0.0015	0.0027	0.012	---	---
Compressor Engine 11	0.022	0.096	0.0078	0.034	0.00034	0.0015	0.0027	0.012	---	---
Compressor Engine 12	0.022	0.096	0.0078	0.034	0.00034	0.0015	0.0027	0.012	---	---
Compressor Engine 13	0.022	0.096	0.0078	0.034	0.00034	0.0015	0.0027	0.012	---	---
Fuel Conditioning Heater	---	---	---	---	---	---	---	---	---	---
Turbines										
Microturbine Generator 1	0.000074	0.00032	0.00080	0.0035	0.00020	0.00087	0.00040	0.0017	---	---
Microturbine Generator 2	0.000074	0.00032	0.00080	0.0035	0.00020	0.00087	0.00040	0.0017	---	---
Catalytic Heater for Generator Fuel	---	---	---	---	---	---	---	---	---	---
Dehydrator										
TEG Dehydrator 1	0.013	0.058	0.034	0.15	0.0015	0.0069	0.000	0.000	0.031	0.14
TEG Dehydrator 2	0.013	0.058	0.034	0.15	0.0015	0.0069	0.000	0.000	0.031	0.14
Reboiler 1	---	---	---	---	---	---	---	---	---	---
Reboiler 2	---	---	---	---	---	---	---	---	---	---
Combustors										
Flare and Pilot	---	---	---	---	---	---	---	---	---	---
Hydrocarbon Loading										
Truck Loadout	0.038	0.0039	0.077	0.0080	0.027	0.0029	0.066	0.0069	2.22	0.23
Fugitive Emissions										
Component Leak Emissions	0.00085	0.0037	0.0018	0.0078	0.00030	0.0013	0.00061	0.0027	0.050	0.22
Venting Emissions	---	0.0062	---	0.013	---	0.00056	---	0.000	---	0.36
Haul Road Dust Emissions	---	---	---	---	---	---	---	---	---	---
Storage Tanks										
Produced Water Tanks	6.00E-09	2.63E-08	2.92E-09	1.28E-08	3.38E-10	1.48E-09	6.78E-10	2.97E-09	5.37E-10	2.35E-09
Settler Tank	1.24E-03	5.41E-03	2.52E-03	1.10E-02	9.00E-04	3.94E-03	2.17E-03	9.49E-03	7.33E-02	3.21E-01
Condensate Tanks	2.29E-05	1.00E-04	5.19E-05	2.27E-04	1.97E-05	8.61E-05	4.80E-05	2.10E-04	2.15E-03	9.41E-03
Total Facility PTE =	**0.35**	**1.39**	**0.25**	**0.79**	**0.037**	**0.044**	**0.10**	**0.18**	**2.41**	**1.42**

Compressor Engine Emission Calculations

Company:	**Antero Midstream LLC**
Facility Name:	**Monroe Compressor Station**
Facility Location:	**Tyler County, West Virginia**
Source Description:	**Compressor Engines**

Source Information-Per Engine

Emission Unit ID:	C-100 through C-1300	
Engine Make/Model	Waukesha 7044 GSI	
Service	Compression	
Controls - Y or N / Type	Y	NSCR/AFRC
Site Horsepower Rating[1]	1,680	hp
Fuel Consumption (BSFC)[1]	8,272	Btu/(hp-hr)
Heat Rating[2]	13.90	MMBtu/hr
Fuel Consumption[2,3]	106.17	MMscf/yr
Fuel Consumption[1]	12,120	scf/hr
Fuel Heating Value	1,250	Btu/scf
Operating Hours	8,760	hrs/yr

Notes:

1. Values from Waukesha specification sheet
2. Calculated values
3. Annual fuel consumption is 100% of maximum fuel consumption at 100% load.

Potential Emissions per Engine

	Uncontrolled					***Controlled***					
Pollutant	**Emission Factor**		**Estimated Emissions[2]**			**Emission Factor**		**Estimated Emissions[2]**			**Source of Emissions Factors**
	(lb/MMBtu)	**(g/bhp-hr)**	**(lb/hr)**	**(lb/yr)**	**(tpy)**	**(lb/MMBtu)**	**(g/bhp-hr)**	**(lb/hr)**	**(lb/yr)**	**(tpy)**	
NOx[1,4]	---	13.7	50.74	---	222.2	---	0.34	1.27	---	5.56	Manufacturer's Specs - uncontrolled, Catalyst Specs - controlled
CO[1,4]	---	12.7	47.04	---	206.0	---	0.32	1.18	---	5.15	Manufacturer's Specs - uncontrolled, Catalyst Specs - controlled
VOC[1,4]	---	0.46	1.70	---	7.46	---	0.074	0.27	---	1.19	Manufacturer's Specs - uncontrolled, Catalyst Specs - controlled
SO_2	5.88E-04	---	0.0082	---	0.036	5.88E-04	---	0.0082	---	0.036	AP-42, Chapter 3.2, Table 3.2-3
$PM_{2.5}/PM_{10}$	1.94E-02	---	0.27	---	1.18	1.94E-02	---	0.27	---	1.18	AP-42, Chapter 3.2, Table 3.2-3
Total PM	1.94E-02	---	0.27	---	1.18	1.94E-02	---	0.27	---	1.18	AP-42, Chapter 3.2, Table 3.2-3
1,1,2,2-Tetrachloroethane	2.53E-05	---	0.00035	3.08	0.0015	2.53E-05	---	0.00035	3.08	0.0015	AP-42, Chapter 3.2, Table 3.2-3
1,3-Butadiene	6.63E-04	---	0.0092	80.71	0.040	6.63E-04	---	0.0092	80.71	0.040	AP-42, Chapter 3.2, Table 3.2-3
Acetaldehyde	2.79E-03	---	0.039	339.6	0.17	2.79E-03	---	0.039	339.6	0.17	AP-42, Chapter 3.2, Table 3.2-3
Acrolein	2.63E-03	---	0.037	320.2	0.16	2.63E-03	---	0.037	320.2	0.16	AP-42, Chapter 3.2, Table 3.2-3
Benzene	1.58E-03	---	0.022	192.3	0.096	1.58E-03	---	0.022	192.3	0.096	AP-42, Chapter 3.2, Table 3.2-3
Ethylbenzene	2.48E-05	---	0.00034	3.02	0.0015	2.48E-05	---	0.00034	3.02	0.0015	AP-42, Chapter 3.2, Table 3.2-3
Formaldehyde[1,4]	---	0.05	0.19	1,622	0.81	---	0.01	0.019	162.2	0.081	Manufacturer's Specs - uncontrolled, Catalyst Specs - controlled
Methanol	3.06E-03	---	0.043	372.5	0.19	3.06E-03	---	0.043	372.5	0.19	AP-42, Chapter 3.2, Table 3.2-3
Methylene Chloride	4.12E-05	---	0.00057	5.02	0.0025	4.12E-05	---	0.00057	5.02	0.0025	AP-42, Chapter 3.2, Table 3.2-3
PAH	1.41E-04	---	0.0020	17.16	0.0086	1.41E-04	---	0.0020	17.16	0.0086	AP-42, Chapter 3.2, Table 3.2-3
Toluene	5.58E-04	---	0.0078	67.93	0.034	5.58E-04	---	0.0078	67.93	0.034	AP-42, Chapter 3.2, Table 3.2-3
Xylenes	1.95E-04	---	0.0027	23.74	0.012	1.95E-04	---	0.0027	23.74	0.012	AP-42, Chapter 3.2, Table 3.2-3
Other HAPs[2]	2.10E-04	---	0.0029	25.54	0.013	2.10E-04	---	0.0029	25.54	0.013	AP-42, Chapter 3.2, Table 3.2-3
Total HAPS			0.35	3,073	1.54			0.18	1,613	0.81	
Pollutant	**Emission Factor**		**Estimated Emissions[2]**			**Emission Factor**		**Estimated Emissions[2]**			**Source of Emissions Factors**
	(kg/MMBtu)	**(g/bhp-hr)**	**(lb/hr)**	**(lb/yr)**	**(tpy)**	**(kg/MMBtu)**	**(g/bhp-hr)**	**(lb/hr)**	**(lb/yr)**	**(tpy)**	
CO_2[1]	---	528	1,956	---	8,566	---	528	1,956	---	8,566	Manufacturer's Specs
CH_4[1,4]	---	1.33	4.93	---	21.58	---	0.40	1.48	---	6.47	Manufacturer's Specs - uncontrolled, Catalyst Specs - controlled
N_2O	0.0001	---	0.0031	---	0.013	0.0001	---	0.0031	---	0.013	40 CFR Part 98, Subpart C, Table C-2
CO_2e[2]	---	---	2,080	---	9,109	---	---	1,993	---	8,731	40 CFR Part 98, Subpart A, Table A-1, effective January 2014

Notes:

4. Due to variable load conditions, the catalyst efficiency may vary. The catalyst efficiencies used in the emissions are typical based on expected operating conditions. The catalyst specification sheet shows typical destruction efficiencies that were used in the calculations. The emission factors shown on the catalyst specification sheet are not site specific, so those will vary; however the efficiencies will be the same.

Example Calculations

lb/hr = (g/hp-hr) * (hp) * (1 lb/453.6 g) or (lb/MMBtu) * (MMBtu/hr)

tpy = (lb/hr) * (8,760 hrs/yr) / (2,000 lb/ton)

Natural Gas Fueled Fuel Conditioning Heater Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Monroe Compressor Station**
Location:	**Tyler County, West Virginia**
Source Description:	**Fuel Conditioning Heater**

Source Information

Emission Unit ID:	FUEL1	
Source Description:	Fuel Conditioning Heater	
Hours of Operation	8,760	hr/yr
Design Heat Rate	0.50	MMBtu/hr
Fuel Heat Value	1,020	Btu/scf
Fuel Use	4.29	MMscf/yr

Emission Calculations per Heater

Pollutant	Emission Factor (lb/MMscf)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
NO_X	100	0.049	0.21	AP-42 Ch. 1.4 Table 1.4-1
CO	84	0.041	0.18	AP-42 Ch. 1.4 Table 1.4-1
VOC	5.5	0.0027	0.012	AP-42 Ch. 1.4 Table 1.4-2
PM_{10}	7.6	0.0037	0.016	AP-42 Ch. 1.4 Table 1.4-2
SO_2	0.6	0.00029	0.0013	AP-42 Ch. 1.4 Table 1.4-2
Formaldehyde	0.075	0.000037	0.00016	AP-42 Ch. 1.4 Table 1.4-3
Total HAPs (including HCHO)[1]	1.9	0.00092	0.0040	AP-42 Ch. 1.4 Table 1.4-3
Pollutant	**Emission Factor (kg/MMBtu)**	**Emissions (lb/hr)**	**Emissions (tpy)**	**Emission Factor Source**
Carbon Dioxide	53.06	58.63	256.8	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.0011	0.0048	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.00011	0.00048	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	58.69	257.1	40 CFR Part 98, Subpart A, Table A-1

1. Only those HAP pollutants above detection thresholds were included.

Sample Calculations:

$$\text{Fuel Consumption (MMscf/yr)} = \frac{\text{Heater Size (MMBtu/hr)} * \text{Hours of Operation (hrs/yr)}}{\text{Fuel Heat Value (Btu/scf)} * \text{Heater Efficiency}}$$

$$\text{Emissions (tons/yr)} = \frac{\text{Emission Factor (lbs/MMscf)} * \text{Fuel Consumption (MMscf/yr)}}{\text{2,000 (lbs/ton)}}$$

Microturbine Generator Emission Calculations

Company:	**Antero Midstream LLC**
Facility Name:	**Monroe Compressor Station**
Facility Location:	**Tyler County, West Virginia**
Source Description:	**Microturbine Generators**

Source Information

Emission Unit ID:	GEN1 & GEN2	
Make/Model	Capstone C600 Standard	
Microturbine Rating[2]	600	kWe
Number of Microturbines[2]	2	units
Net Heat Rate	10,300	Btu/kWhe
Heat Input [1]	6.18	MMBtu/hr
Operating Hours[2]	8,760	hrs/yr

Notes:

1) Calculated

2) There will be two (2) generators onsite each rated at 600 kWe. Only 600 kWe will be operational at any time while the other 600 kWe unit will be on standby for the full year. Individual units may switch between primary and standby status depending on their need for maintenance. Emissions were calculated based on both units (1,200 kWe total) operating at full load for 8,760 hours per year, so as to be conservative.

Potential Emissions per Generator

	Uncontrolled					***Controlled***					
Pollutant	**Emission Factor**		**Estimated Emissions[1]**			**Emission Factor**		**Estimated Emissions[1]**			**Source of Emissions Factors**
	(lb/MMBtu)	**(lb/MWhe)**	**(lb/hr)**	**(lb/yr)**	**(tpy)**	**(lb/MMBtu)**	**(lb/MWhe)**	**(lb/hr)**	**(lb/yr)**	**(tpy)**	
NOx	---	0.40	0.24	---	1.05	---	0.40	0.24	---	1.05	Manufacturer Specifications
CO	---	1.10	0.66	---	2.89	---	1.10	0.66	---	2.89	Manufacturer Specifications
VOC	---	0.10	0.060	---	0.26	---	0.10	0.060	---	0.26	Manufacturer Specifications
SO_2	3.40E-03	---	0.021	---	0.092	3.40E-03	---	0.021	---	0.092	AP-42, Chapter 3.1, Table 3.1-2a
$PM_{2.5}/PM_{10}$	6.60E-03	---	0.041	---	0.18	6.60E-03	---	0.041	---	0.18	AP-42, Chapter 3.1, Table 3.1-2a
1,3-Butadiene	4.30E-07	---	2.66E-06	0.023	1.16E-05	4.30E-07	---	2.66E-06	0.023	1.16E-05	AP-42, Chapter 3.1, Table 3.1-3
Acetaldehyde	4.00E-05	---	2.47E-04	2.17	1.08E-03	4.00E-05	---	2.47E-04	2.17	1.08E-03	AP-42, Chapter 3.1, Table 3.1-3
Acrolein	6.40E-06	---	3.96E-05	0.35	1.73E-04	6.40E-06	---	3.96E-05	0.35	1.73E-04	AP-42, Chapter 3.1, Table 3.1-3
Benzene	1.20E-05	---	7.42E-05	0.65	3.25E-04	1.20E-05	---	7.42E-05	0.65	3.25E-04	AP-42, Chapter 3.1, Table 3.1-3
Ethylbenzene	3.20E-05	---	1.98E-04	1.73	8.66E-04	3.20E-05	---	1.98E-04	1.73	8.66E-04	AP-42, Chapter 3.1, Table 3.1-3
Formaldehyde	7.10E-04	---	4.39E-03	38.44	1.92E-02	7.10E-04	---	4.39E-03	38.44	1.92E-02	AP-42, Chapter 3.1, Table 3.1-3
Naphthalene	1.30E-06	---	8.03E-06	0.070	3.52E-05	1.30E-06	---	8.03E-06	0.070	3.52E-05	AP-42, Chapter 3.1, Table 3.1-3
PAH	2.20E-06	---	1.36E-05	0.12	5.96E-05	2.20E-06	---	1.36E-05	0.12	5.96E-05	AP-42, Chapter 3.1, Table 3.1-3
Propylene Oxide	2.90E-05	---	1.79E-04	1.57	7.85E-04	2.90E-05	---	1.79E-04	1.57	7.85E-04	AP-42, Chapter 3.1, Table 3.1-3
Toluene	1.30E-04	---	8.03E-04	7.04	3.52E-03	1.30E-04	---	8.03E-04	7.04	3.52E-03	AP-42, Chapter 3.1, Table 3.1-3
Xylenes	6.40E-05	---	3.96E-04	3.46	1.73E-03	6.40E-05	---	3.96E-04	3.46	1.73E-03	AP-42, Chapter 3.1, Table 3.1-3
Total HAPS			0.0063	55.62	0.028			0.0063	55.62	0.028	
Pollutant	**Emission Factor**		**Estimated Emissions[1]**			**Emission Factor**		**Estimated Emissions[1]**			**Source of Emissions Factors**
	(kg/MMBtu)	**(lb/MWhe)**	**(lb/hr)**		**(tpy)**	**(kg/MMBtu)**	**(lb/MWhe)**	**(lb/hr)**		**(tpy)**	
CO_2	---	1,330	798.0	---	3,495	---	1,330	798.0	---	3,495	Manufacturer Specifications
CH_4	0.001	---	0.014	---	0.060	0.001	---	0.014	---	0.060	40 CFR Part 98, Subpart C, Table C-2
N_2O	0.0001	---	0.0014	---	0.0060	0.0001	---	0.0014	---	0.0060	40 CFR Part 98, Subpart C, Table C-2
CO_2e	---	---	798.7	---	3,499	---	---	798.7	---	3,499	40 CFR Part 98, Subpart A, Table A-1, effective January 2014

Example Calculations

lb/hr = (lb/Mwhe) * kWe * (1 MWe/1000 kWe) or (lb/MMBtu) * (MMBtu/hr) or (kg/MMBtu) * (MMBtu/hr) * (2.21 lb/kg)

tpy = (lb/hr) * (hr/yr) * (ton/2000 lb)

Natural Gas Fueled Catalytic Heater Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Monroe Compressor Station**
Location:	**Tyler County, West Virginia**
Source Description:	**Catalytic Heater for Generator Fuel**

Source Information

Emission Unit ID:	CATHT1	
Source Description:	Generator Fuel Heater	
Hours of Operation	8,760	hr/yr
Design Heat Rate	0.024	MMBtu/hr
Heater Efficiency	80%	
Fuel Heat Value	1,020	Btu/scf
Fuel Use	0.26	MMscf/yr

Emission Calculations per Heater

Pollutant	Emission Factor (lb/MMscf)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
NO_X	100	0.0029	0.013	AP-42 Ch. 1.4 Table 1.4-1
CO	84	0.0025	0.011	AP-42 Ch. 1.4 Table 1.4-1
VOC	5.5	0.00016	0.00071	AP-42 Ch. 1.4 Table 1.4-2
PM_{10}	7.6	0.00022	0.00098	AP-42 Ch. 1.4 Table 1.4-2
SO_2	0.6	0.000018	0.000077	AP-42 Ch. 1.4 Table 1.4-2
Formaldehyde	0.075	0.0000022	0.0000097	AP-42 Ch. 1.4 Table 1.4-3
Total HAPs (including HCHO)[1]	1.9	0.000055	0.00024	AP-42 Ch. 1.4 Table 1.4-3
Pollutant	**Emission Factor (kg/MMBtu)**	**Emissions (lb/hr)**	**Emissions (tpy)**	**Emission Factor Source**
Carbon Dioxide	53.06	2.81	12.3	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.000053	0.00023	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.0000053	0.000023	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	2.83	12.4	40 CFR Part 98, Subpart A, Table A-1

1. Only those HAP pollutants above detection thresholds were included.

Sample Calculations:

$$\text{Fuel Consumption (MMscf/yr)} = \frac{\text{Heater Size (MMBtu/hr)} * \text{Hours of Operation (hrs/yr)}}{\text{Fuel Heat Value (Btu/scf)} * \text{Heater Efficiency}}$$

$$\text{Emissions (tons/yr)} = \frac{\text{Emission Factor (lbs/MMscf)} * \text{Fuel Consumption (MMscf/yr)}}{\text{2,000 (lbs/ton)}}$$

Dehydrator Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Monroe Compressor Station**
Facility Location:	**Tyler County, West Virginia**
Source Description:	**Dehydrator Units**

Potential Emissions per Dehydrator

Pollutant	Emission Unit ID: DEHY1/DEHY2 Dehydrator Still Vent		Emission Unit ID: DFLSH1/DFLSH2 Flash Tank Gas	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Uncontrolled Emissions [1]				
VOC	14.99	65.64	59.33	259.87
Total HAPs	2.76	12.08	1.25	5.49
Benzene	0.61	2.69	0.051	0.22
Toluene	1.62	7.09	0.076	0.33
Ethylbenzene	0.077	0.34	0.0018	0.0080
Xylenes	0.000	0.000	0.000	0.000
n-Hexane	0.45	1.96	1.12	4.93
Methane	17.82	78.04	113.0	495.0
Carbon Dioxide	0.25	1.10	2.18	9.55
CO_2e	445.7	1,952	2,828	12,385
Controlled Emissions [2,3]				
VOC	0.30	1.31	1.19	5.20
Total HAPs	0.055	0.24	0.025	0.11
Benzene	0.012	0.054	0.0010	0.0044
Toluene	0.032	0.14	0.0015	0.0067
Ethylbenzene	0.0015	0.0067	0.000036	0.00020
Xylenes	0.000	0.000	0.000	0.000
n-Hexane	0.0089	0.039	0.023	0.099
Methane	0.36	1.56	2.26	9.90
Carbon Dioxide	0.25	1.10	2.18	9.55
CO_2e	9.16	40.12	58.69	257.1

Pollutant	Dehydrator Emission Totals	
	(lb/hr)	(tpy)
Uncontrolled Emissions [1]		
VOC	74.32	325.5
Total HAPs	4.01	17.57
Benzene	0.67	2.91
Toluene	1.70	7.43
Ethylbenzene	0.079	0.34
Xylenes	0.00	0.00
n-Hexane	1.57	6.88
Methane	130.8	573.1
Carbon Dioxide	2.43	10.65
CO_2e	3,273	14,337
Controlled Emissions [2,3]		
VOC	1.49	6.51
Total HAPs	0.080	0.35
Benzene	0.013	0.058
Toluene	0.034	0.15
Ethylbenzene	0.0015	0.0069
Xylenes	0.000	0.000
n-Hexane	0.031	0.14
Methane	2.62	11.46
Carbon Dioxide	2.43	10.65
CO_2e	67.85	297.2

[1] Output from GRI-GLYCalc 4.0 for both the still vent and flash tank gas emissions

[2] Controlled emissions assume that the glycol still vent is equipped with a condenser and is controlled by a combustor with 98% control efficiency.

[3] Flash tank gas is used in the reboiler as the primary fuel source. However, in the case that gas cannot be used in the reboiler, the gas is sent to the primary/backup VRU system via the storage tanks for 98% control.

Natural Gas Fueled Dehydrator Reboiler Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Monroe Compressor Station**
Location:	**Tyler County, West Virginia**
Source Description:	**Dehydrator Reboilers**

Source Information

Emission Unit ID:	DREB1 & DREB2	
Source Description:	Dehydrator Reboiler	
Hours of Operation	8,760	hr/yr
Design Heat Rate	1.5	MMBtu/hr
Heater Efficiency	0.8	
Fuel Heat Value	1,020	Btu/scf
Fuel Use	16.1	MMscf/yr

Emission Calculations per Reboiler

Pollutant	Emission Factor (lb/MMscf)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
NO_X	100	0.18	0.81	AP-42 Ch. 1.4 Table 1.4-1
CO	84	0.15	0.68	AP-42 Ch. 1.4 Table 1.4-1
VOC	5.5	0.010	0.044	AP-42 Ch. 1.4 Table 1.4-2
PM_{10}	7.6	0.014	0.061	AP-42 Ch. 1.4 Table 1.4-2
SO_2	0.6	0.0011	0.0048	AP-42 Ch. 1.4 Table 1.4-2
Formaldehyde	0.075	0.00014	0.00060	AP-42 Ch. 1.4 Table 1.4-3
Total HAPs (including HCHO)	1.9	0.0035	0.015	AP-42 Ch. 1.4 Table 1.4-3
Pollutant	**Emission Factor (kg/MMBtu)**	**Emissions (lb/hr)**	**Emissions (tpy)**	**Emission Factor Source**
Carbon Dioxide	53.06	175.9	770.4	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.0033	0.015	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.00033	0.0015	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	176.1	771.2	40 CFR Part 98, Subpart A, Table A-1

Sample Calculations:

$$\text{Fuel Consumption (MMscf/yr)} = \frac{\text{Heater Size (MMBtu/hr)} * \text{Hours of Operation (hrs/yr)}}{\text{Fuel Heat Value (Btu/scf)} * \text{Heater Efficiency}}$$

$$\text{Emissions (tons/yr)} = \frac{\text{Emission Factor (lbs/MMscf)} * \text{Fuel Consumption (MMscf/yr)}}{\text{2,000 (lbs/ton)}}$$

Flare Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Monroe Compressor Station**
Facility Location:	**Tyler County, West Virginia**
Source Description:	**Flare for Dehydrator Still Vent Gas**
Emission Unit ID:	**FLARE1**

Combusted Gas Emissions

Flare Heat Input :	4.80	MMBtu/hr
Vent Gas to Flare Rate:	3,841	scf/hr
Gas Heating Value:	1,250	Btu/scf
Hours of Operation:	8,760	hr/yr

Pollutant	Emission Factor[1] (lb/MMBtu)	Emissions (lbs/hr)	Emissions (tons/yr)
Particulate Matter ($PM/PM_{10}/PM_{2.5}$)	N/A - Smokeless Design		
Nitrogen Oxides (NO_x)	0.068	0.33	1.43
Carbon Monoxide (CO)	0.37	1.78	7.78

[1] Emission Factors from Table 13.5-1 of AP-42 Section 13.5 (Sept 1991)

Pilot Emissions

Pilot Heating Value:	1,250	Btu/scf
Hours of Operation:	8,760	hr/yr
Total Pilot Natural Gas Usage:	1.64E-05	MMscf/hr

Pollutant	Emission Factor (lb/MMscf)	Emissions (lbs/hr)	Emissions (tons/yr)
Particulate Matter ($PM/PM_{10}/PM_{2.5}$)[2]	7.6	1.53E-04	6.69E-04
Nitrogen Oxides (NOx)	100	2.01E-03	8.80E-03
Sulfur Dioxide (SO_2)[2]	0.6	1.21E-05	5.28E-05
Carbon Monoxide (CO)[2]	84	1.69E-03	7.39E-03
Volatile Organic Compounds (VOC)[2]	5.5	1.10E-04	4.84E-04
Total HAPs[2,3]	1.88	3.78E-05	1.65E-04

[2] Emission Factors from AP-42 Tables 1.4-1, 1.4-2, 1.4-3, and 1.4-4 (7/98).

[3] Sum of Emissions Factors published for pollutants classified as "HAPS" under AP-42 Table 1.4-3.

Total Flare Emissions

Pollutant	Total Potential Emission Rate (tons/year)
Particulate Matter ($PM/PM_{10}/PM_{2.5}$)	6.69E-04
Nitrogen Oxides (NOx)	1.44
Sulfur Dioxide (SO_2)	5.28E-05
Carbon Monoxide (CO)	7.79
Volatile Organic Compounds (VOC)	4.84E-04
Total HAPs	1.65E-04

Greenhouse Gas Emissions

Pollutant	Emission Factor (kg/MMBtu)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
Carbon Dioxide	53.06	565.3	2,476	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.011	0.047	40 CFR Part 98, Subpart C, Table C-2
Nitrogen Dioxide	0.0001	0.0011	0.0047	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	565.8	2,478	40 CFR Part 98, Subpart A, Table A-1

Storage Tank Flashing Emissions Calculated by ProMax Simulation

Company:	**Antero Midstream LLC**
Facility Name:	**Monroe Compressor Station**
Facility Location:	**Tyler County, West Virginia**
Source Description:	**Settling Tank**
Emission Unit ID:	**TK-1502**

Settling Tank Flashing Emissions

Component	Uncontrolled Flashing Emissions [1] (lb/hr)	Uncontrolled Flashing Emissions (tons/yr)	Controlled Flashing Emissions [2,3] (lb/hr)	Controlled Flashing Emissions [2,3] (tons/yr)
Methane	13.00	56.95	0.26	1.14
Ethane	31.90	139.71	0.64	2.79
Propane	45.56	199.57	0.91	3.99
i-Butane	12.01	52.60	0.24	1.05
n-Butane	30.60	134.02	0.61	2.68
i-Pentane	11.42	50.01	0.23	1.00
n-Pentane	13.12	57.48	0.26	1.15
2-Methylpentane	5.62	24.62	0.11	0.49
n-Heptane	3.28	14.36	0.066	0.29
n-Octane	1.11	4.85	0.022	0.097
n-Nonane	0.19	0.81	0.0037	0.016
Decanes+	0.016	0.071	0.00032	0.0014
Benzene	0.061	0.27	0.0012	0.0053
Toluene	0.12	0.54	0.0025	0.011
Ethylbenzene	0.044	0.19	0.00089	0.0039
Xylenes	0.11	0.47	0.0021	0.0094
n-Hexane	3.60	15.76	0.072	0.32
Water	1.59	6.95	1.59	6.95
Nitrogen	0.063	0.27	0.063	0.27
Carbon Dioxide	0.17	0.74	0.17	0.74
VOC Subtotal	126.85	555.62	2.54	11.11
HAP Subtotal	3.93	17.23	0.079	0.34
CO_2e Subtotal	325.24	1,424.5	6.67	29.22
Total	173.57	760.25	5.25	23.01

Notes:

1. Flashing emissions calculated by ProMax 4.0. Flash gas is "Uncontrolled Flash Gas" of the associated ProMax simulation. Flashing only occurs in the settling tank as all pressurized fluids flow into the settling tank and then separate out at atmospheric conditions to the condensate and produced water tanks.

2. Tanks are controlled by a VRU with assumed 98% capture efficiency; but will likely be higher as vapors are recycled back into the system.

3. VRU-100 is the primary VRU to collect storage tank vapors and VRU-200 is the backup VRU in times when the primary VRU is undergoing maintenance or shutdown.

Storage Tank Working and Breathing Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Monroe Compressor Station**
Facility Location:	**Tyler County, West Virginia**
Source Description:	**Condensate, Settling, and Produced Water Tanks**
Emission Unit ID:	**TK-200, TK-201, TK-1500, TK-1501, TK-1501**

TANK DESCRIPTION	Uncontrolled VOC Emissions[1] (tons/yr)	Uncontrolled Benzene Emissions[1] (tons/yr)	Uncontrolled Toluene Emissions[1] (tons/yr)	Uncontrolled Ethylbenzene Emissions[1] (tons/yr)	Uncontrolled Xylene Emissions[1] (tons/yr)	Uncontrolled n-Hexane Emissions[1] (tons/yr)	Uncontrolled CH_4 Emissions[1] (tons/yr)	Uncontrolled CO_2e Emissions (tons/yr)
400 bbl Hydrocarbon Storage Tank (TK-200)	8.03	2.50E-03	5.68E-03	2.15E-03	5.26E-03	2.35E-01	0.071	1.77
400 bbl Hydrocarbon Storage Tank (TK-201)	8.03	2.50E-03	5.68E-03	2.15E-03	5.26E-03	2.35E-01	0.071	1.77
500 bbl Settling Tank (TK-1502)	10.34	3.23E-03	7.32E-03	2.77E-03	6.77E-03	3.03E-01	0.091	2.29
400 bbl Produced Water Storage Tank[2] (TK-1500)	0.00039	6.57E-07	3.20E-07	3.70E-08	7.43E-08	5.88E-08	0.00035	0.0089
400 bbl Produced Water Storage Tank[2] (TK-1501)	0.00039	6.57E-07	3.20E-07	3.70E-08	7.43E-08	5.88E-08	0.00035	0.0089
TOTAL	**26.40**	**0.0082**	**0.019**	**0.0071**	**0.017**	**0.77**	**0.23**	**5.85**

TANK DESCRIPTION	Controlled VOC Emissions[1,2] (tons/yr)	Controlled Benzene Emissions[1,2] (tons/yr)	Controlled Toluene Emissions[1,2] (tons/yr)	Controlled Ethylbenzene Emissions[1,2] (tons/yr)	Controlled Xylene Emissions[1,2] (tons/yr)	Controlled n-Hexane Emissions[1,2] (tons/yr)	Controlled CH_4 Emissions[1,2] (tons/yr)	Controlled CO_2e Emissions[1,2] (tons/yr)
400 bbl Hydrocarbon Storage Tank (TK-200)	0.16	5.01E-05	1.14E-04	4.31E-05	1.05E-04	4.71E-03	0.0014	0.043
400 bbl Hydrocarbon Storage Tank (TK-201)	0.16	5.01E-05	1.14E-04	4.31E-05	1.05E-04	4.71E-03	0.0014	0.043
500 bbl Settling Tank (TK-1502)	0.21	6.46E-05	1.46E-04	5.55E-05	1.35E-04	6.06E-03	0.0018	0.053
400 bbl Produced Water Storage Tank[2] (TK-1500)	0.0000077	1.31E-08	6.39E-09	7.40E-10	1.49E-09	1.18E-09	0.0000070	0.00032
400 bbl Produced Water Storage Tank[2] (TK-1501)	0.0000077	1.31E-08	6.39E-09	7.40E-10	1.49E-09	1.18E-09	0.0000070	0.00032
TOTAL	**0.53**	**1.65E-04**	**3.74E-04**	**1.42E-04**	**3.46E-04**	**1.55E-02**	**0.0047**	**0.14**

Notes:

1. ProMax 3.2 used to calculate standing, working, and breathing (S,W,B) emissions
2. Tanks are controlled by a VRU with assumed 98% capture efficiency; but will likely be higher as vapors are recycled back into the system.
3. VRU-100 is the primary VRU to collect storage tank vapors and VRU-200 is the backup VRU in times when the primary VRU is undergoing maintenance or shutdown.

Truck Loading Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Monroe Compressor Station**
Facility Location:	**Tyler County, West Virginia**
Source Description:	**Production Liquids Truck Loadout**
Emission Unit ID:	**LDOUT1**

AP - 42, Chapter 5.2 $L_L = 12.46 \times S \times P \times M / T$

L_L = Loading Loss Emission Factor (lbs VOC/1000 gal loaded)
- S = Saturation Factor
- P = True Vapor Pressure of the Loaded Liquid (psia)
- M = Vapor Molecular Weight of the Loaded Liquid (lbs/lbmol)
- T = Temperature of Loaded Liquid (ºR)

VOC Emissions (tpy) = $\dfrac{L_L \text{ (lbs VOC/1000 gal)} * 42 \text{ gal/bbl} * 365 \text{ days/year} * \text{production (bbl/day)}}{1000 \text{ gal} * 2000 \text{ lbs/ton}}$

								Uncontrolled						
Source	**S[1]**	**P (psia)[2]**	**M[3]**	**T (ºF)[4]**	**T (ºR)**	**L_L (lb/1000 gal)**	**Production (bbl/day)**	**VOC (tpy)**	**Benzene (tpy)**	**Toluene (tpy)**	**E-Benzene (tpy)**	**Xylene (tpy)**	**n-Hexane (tpy)**	**CO_2e[5] (tpy)**
Condensate	0.6	12.1	41.1	65	524.75	7.09	150	8.15	0.0039	0.0080	0.0029	0.0069	0.23	20.89
Produced Water	0.6	0.35	18.5	65	524.75	0.093	45	0.032	1.54E-05	3.14E-05	1.12E-05	2.69E-05	9.08E-04	0.082

Notes:
1. Saturation factor from AP-42, Table 5.2-1 (Submerged loading (bottom loading): dedicated normal service)
2. True vapor pressure retrieved from tank-specific ProMax 4.0 simulation for both liquids.
3. Molecular weight of the liquid vapor is retrieved from tank-specific ProMax simulation for both liquids.
4. Temperature is the annual average temperature of Charleston, WV retrieved from ProMax working & breathing report.
6. CO_2e emissions estimated assuming 7.5% of the vent gas by weight is methane and 73% by weight are VOCs (per ProMax simulation).
7. HAP emissions estimated assuming 2.3% by weight of the vent gas are HAPs and 73% by weight are VOCs (per ProMax simulation).

Assume 1 truck loaded per hour, 260 bbl truck, for short term emissions

								Uncontrolled						
Source	**S[1]**	**P (psia)[2]**	**M[3]**	**T (ºF)[4]**	**T (ºR)**	**L_L (lb/1000 gal)**	**Loading (bbl/hr)**	**VOC (lb/hr)**	**Benzene (lb/hr)**	**Toluene (lb/hr)**	**E-Benzene (lb/hr)**	**Xylene (lb/hr)**	**n-Hexane (lb/hr)**	**CO_2e[5] (lb/hr)**
Condensate	0.6	12.1	41.1	65	524.75	7.09	260	77.44	0.037	0.076	0.027	0.065	2.20	198.4
Produced Water	0.6	0.35	18.5	65	524.75	0.093	260	1.01	4.87E-04	9.94E-04	3.54E-04	8.53E-04	2.87E-02	2.60

Component Fugitive Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Monroe Compressor Station**
Facility Location:	**Tyler County, West Virginia**
Source Description:	**Fugitive Emissions - Component Leaks**

VOC Fugitive Emissions

Equipment Type and Service	Number of Units [1]	Hours of Operation (hours/yr)	THC Emission Factor[2] (kg/hr-unit)	VOC Weight Fraction[3]	THC Emissions (tpy)	VOC Emissions (tpy)
Flanges - Gas Service	850	8,760	3.90E-04	0.20	3.21	0.64
Valves - Gas Service	750	8,760	4.50E-03	0.20	32.67	6.49
Compressor Seals Gas Service	39	8,760	8.80E-03	0.20	3.32	0.66
Flanges - Liquid Service	400	8,760	1.10E-04	0.74	0.43	0.31
Valves - Liquid Service	160	8,760	2.50E-03	0.74	3.87	2.86
Total Emissions (tons/yr)					**43.50**	**10.96**

HAPs Fugitive Emissions

Equipment Type and Service	Benzene Weight Fraction[3]	Benzene Emissions (tpy)	Toluene Weight Fraction[2]	Toluene Emissions (tpy)	Ethylbenzene Weight Fraction[2]	Ethylbenzene Emissions (tpy)	Xylene Weight Fraction[2]	Xylene Emissions (tpy)	n-Hexane Weight Fraction[2]	n-Hexane Emissions (tpy)
Flanges - Gas Service	5.60E-05	0.00018	1.19E-04	0.00038	5.07E-06	0.000016	0.00E+00	0.000	3.26E-03	0.010
Valves - Gas Service	5.60E-05	0.0018	1.19E-04	0.0039	5.07E-06	0.00017	0.00E+00	0.000	3.26E-03	0.11
Compressor Seals Gas Service	5.60E-05	0.00019	1.19E-04	0.00039	5.07E-06	0.000017	0.00E+00	0.000	3.26E-03	0.011
Flanges - Liquid Service	3.55E-04	0.00015	7.24E-04	0.00031	2.58E-04	0.00011	6.22E-04	0.00026	2.09E-02	0.0089
Valves - Liquid Service	3.55E-04	0.0014	7.24E-04	0.0028	2.58E-04	0.0010	6.22E-04	0.0024	2.09E-02	0.081
Total Emissions (tons/yr)		**0.0037**		**0.0078**		**0.0013**		**0.0027**		**0.22**

1) Component counts from engineering lists.

2) API average emission factors are for oil and gas production operations - Table 2.4, EPA Protocol for Equipment Leak Emission Estimates - 1995. A LDAR program will be implemented per NSPS OOOOa, so it is likely emissions will be lower.

3) Gas weight fractions from a site-specific gas analysis and liquid weight fractions from a site-specific ProMax model run.

GHG Fugitive Emissions

Equipment Type	Number of Units [1]	Hours of Operation (hours/yr)	Emission Factor[2] (scf/hr-unit)	CH_4 Concentration[3]	CO_2 Concentration[3]	CH_4 Emissions (tpy)	CO_2 Emissions (tpy)	CO_2e Emissions (tpy)
Flanges	1,250	8,760	0.003	0.98	0.011	0.68	0.021	16.97
Valves	910	8,760	0.027	0.98	0.011	4.44	0.137	111.17
Compressor Seals	39	8,760	0.300	0.98	0.011	2.11	0.065	52.94
Total Emissions (tons/yr)						**7.23**	**0.22**	**181.08**

1) Component counts from engineering lists.

2) Emission factors from 40 CFR Part 98 Subpart W, Table W1-A.

3) CH_4 and CO_2 concentrations as defined in 40 CFR Part 98.233(r).

Fugitive Emissions From Venting Episodes

Company:	**Antero Midstream LLC**
Facility Name:	**Monroe Compressor Station**
Facility Location:	**Tyler County, West Virginia**
Source Description:	**Fugitive Emissions-Venting Episodes**

VOC Venting Emissions						
Type of Event[1]	**Number Of Events (event/yr)**	**Amount Vented per Event (scf/event)**	**Molecular Weight of Vented Gas (lb/lb-mol)**	**Total Emissions (ton/yr)**	**VOC Weight Fraction[4]**	**VOC Emissions (ton/yr)**
Compressor Blowdown[2]	936	2,162	21.13	56.35	0.20	11.08
Compressor Startup	936	1,050	21.13	27.36	0.20	5.38
Plant Shutdown	2	100,000	21.13	5.57	0.20	1.10
Low Pressure Pig Venting[3]	198	516	21.13	2.84	0.20	0.56
High Pressure Pig Venting[3]	260	2,801	21.13	20.28	0.20	3.99
Total Emissions (tons/yr)						**22.11**

HAPs Venting Emissions										
Type of Event[1]	**Benzene Weight Fraction[4]**	**Benzene Emissions (tpy)**	**Toluene Weight Fraction[4]**	**Toluene Emissions (tpy)**	**Ethylbenzene Weight Fraction[4]**	**Ethylbenzene Emissions (tpy)**	**Xylene Weight Fraction[4]**	**Xylene Emissions (tpy)**	**n-Hexane Weight Fraction[4]**	**n-Hexane Emissions (tpy)**
Compressor Blowdown[2]	5.54E-05	0.0031	1.18E-04	0.0066	5.02E-06	0.00028	0.00E+00	0.000	3.23E-03	0.18
Compressor Startup	5.54E-05	0.0015	1.18E-04	0.0032	5.02E-06	0.00014	0.00E+00	0.000	3.23E-03	0.088
Plant Shutdown	5.54E-05	0.00031	1.18E-04	0.00066	5.02E-06	0.000028	0.00E+00	0.000	3.23E-03	0.018
Low Pressure Pig Venting[3]	5.54E-05	0.00016	1.18E-04	0.00033	5.02E-06	0.000014	0.00E+00	0.000	3.23E-03	0.0092
High Pressure Pig Venting[3]	5.54E-05	0.0011	1.18E-04	0.0024	5.02E-06	0.00010	0.00E+00	0.000	3.23E-03	0.065
Total Emissions (tons/yr)		**0.0062**		**0.013**		**0.00056**		**0.000**		**0.36**

GHG Venting Emissions								
Type of Event[1]	**Number Of Events (event/yr)**	**Amount Vented per Event (scf/event)**	**Molecular Weight of Vented Gas (lb/lb-mol)**	**CH_4 Weight Fraction[4]**	**CO_2 Weight Fraction[4]**	**CH_4 Emissions (ton/yr)**	**CO_2 Emissions (ton/yr)**	**CO_2e Emissions (tpy)**
Compressor Blowdown[2]	936	2,162	21.13	0.58	0.0037	32.62	0.21	815.70
Compressor Startup	936	1,050	21.13	0.58	0.0037	15.84	0.10	396.11
Plant Shutdown	2	100,000	21.13	0.58	0.0037	3.22	0.020	80.61
Low Pressure Pig Venting[3]	198	516	21.13	0.58	0.0037	1.64	0.010	41.09
High Pressure Pig Venting[3]	260	2,801	21.13	0.58	0.0037	11.74	0.074	293.52
Total Emissions (tons/yr)						**65.06**	**0.41**	**1,627.0**

1) Estimated number of events and venting per event from engineering. Compressor blowdowns are calculated to be 120.4 lb/event.

2) Total number of compressor blowdowns based on 18 blowdowns per week.

3) Total number of pigging events based on expected operations.

4) Weight fractions are from a site-specific gas analysis.

Fugitive Dust Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Monroe Compressor Station**
Facility Location:	**Tyler County, West Virginia**
Source Description:	**Fugitive Dust Emissions**

Gravel Access Road	Loaded Truck Weight[1]	Trips per year[2]	Trips per day[2]	Distance per round trip (truck in and out)[3]		VMT per year[4]
	tons			feet	miles	miles
Condensate Tank Truck	40.00	365	1.0	2,746	0.52	190
Produced Water Tank Truck	40.00	365	1.0	2,746	0.52	190

Equation Parameter	PM-10/PM2.5	PM-Total
E, annual size-specific emission factor for PM_{10} & $PM_{2.5}$ (upaved industrial roads) extrapolated for natural mitigation[6]	**see table below**	**see table below**
k, Particle size multiplier for particle size range (PM_{10}), (lb/VMT) (Source: AP-42 Table 13.2.2-2)	**1.5**	**4.9**
k, Particle size multiplier for particle size range ($PM_{2.5}$), (lb/VMT) (Source: AP-42 Table 13.2.2-2)	**0.15**	
s, surface material silt content, (%) (Source: AP-42 Table 13.2.2-1)	**4.8**	**4.8**
W, mean weight (tons) of the vehicles traveling the road	**40.00**	**40.00**
a, constant for PM_{10} and $PM_{2.5}$ on industrial roads (Source: AP-42 Table 13.2.2-2)	**0.9**	**0.7**
b, constant for PM_{10} and $PM_{2.5}$ on industrial roads (Source: AP-42 Table 13.2.2-2)	**0.45**	**0.45**
P, number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period, based on AP-42 Figure 13.2.2-1.	**160**	**160**

$$E=\left[k\left(\frac{s}{12}\right)^{a}\times\left(\frac{W}{3}\right)^{b}\right]\times(365-P/365)$$

Source of Equation: AP-42 Section 13.2.2

PM_{10} Emissions

Emission Factor (lb/VMT)	Vehicle miles traveled (VMT/yr)[4]	Annual Uncontrolled PM_{10} Emissions (tpy)
1.18	379.60	0.22

$PM_{2.5}$ Emissions (tons/yr)

Emission Factor (lb/VMT)	Vehicle miles traveled (VMT/yr)[4]	Annual Uncontrolled $PM_{2.5}$ Emissions (tpy)
0.12	379.60	0.022

PM- Total Emissions (tons/yr)

Emission Factor (lb/VMT)	Vehicle miles traveled (VMT/yr)[4]	Annual Uncontrolled PM-Total Emissions (tpy)
4.65	379.60	0.88

Table Notes:

1. Loaded truck weight is based on typical weight limit for highway vehicles.
2. Based on production, it's assumed a maximum of one condensate truck (260 bbl truck) and one produced water truck (260 bbl truck) will be onsite per day.
3. Distance per round trip is based on the site layout. The one way distance is measured as 0.26 miles for the gravel access road.
4. VMT/yr = Trips/yr x Roundtrip Distance
5. Hourly emissions determined from tons per year calculation using 2,000 lb/ton and 8,760 hours per year.

Facility Gas Analysis

	MOL %	MW	Component Weight lb/lb-mol	Wt. Fraction
Methane	76.27	16.04	12.23	0.58
Ethane	15.11	30.07	4.54	0.21
Propane	5.15	44.10	2.27	0.11
i-Butane	0.63	58.12	0.36	0.017
n-Butane	1.30	58.12	0.76	0.036
i-Pentane	0.32	72.15	0.23	0.011
n-Pentane	0.32	72.15	0.23	0.011
Hexanes	0.13	106.72	0.14	0.0065
Heptanes	0.074	100.20	0.074	0.0035
Octanes	0.017	114.23	0.019	0.00092
Nonanes	0.0035	128.26	0.0045	0.00021
Decanes	0.00010	142.29	0.00014	0.0000067
n-Hexane	0.079	86.18	0.068	0.0032
Benzene	0.0015	78.11	0.0012	0.000055
Toluene	0.0027	92.14	0.0025	0.00012
Ethylbenzene	0.00010	106.17	0.00011	0.0000050
Xylenes	0.000	106.16	0.000	0.000
Nitrogen	0.43	28.01	0.12	0.0057
Carbon Dioxide	0.18	44.01	0.077	0.0037
Oxygen	0.0062	32.01	0.0020	0.000094
Totals	100.0		21.13	1.00

Heating Value (Btu/scf)	1,249.6
Molecular weight	21.13
VOC weight fraction	0.20
Methane weight fraction	0.58
THC weight fraction	0.99
VOC of THC wt fraction	0.20
Methane of THC wt fraction	0.58
Benzene of THC wt fraction	0.000056
Toluene of THC wt fraction	0.00012
E-benzene of THC wt fraction	0.0000051
Xylene of THC wt fraction	0.000
n-Hexane of THC wt fraction	0.0033

1. Gas analysis is site-specific.

Facility Tank Vent Gas Analysis

	MOL %	MW	Component Weight lb/lb-mol	Wt. Fraction
Methane	19.18	16.04	3.08	0.075
Ethane	25.10	30.07	7.55	0.18
Propane	24.45	44.10	10.78	0.26
i-Butane	4.89	58.12	2.84	0.069
n-Butane	12.46	58.12	7.24	0.18
i-Pentane	3.74	72.15	2.70	0.066
n-Pentane	4.30	72.15	3.11	0.076
Hexanes	1.54	86.18	1.33	0.032
Heptanes	0.77	100.20	0.78	0.019
Octanes	0.23	114.23	0.26	0.0064
Nonanes	0.034	128.26	0.044	0.0011
Decanes+	0.0022	172.85	0.0038	0.000093
n-Hexane	0.99	86.18	0.85	0.021
Benzene	0.018	78.11	0.014	0.00035
Toluene	0.032	92.14	0.029	0.00072
Ethylbenzene	0.0099	106.17	0.010	0.00026
Xylenes	0.024	106.17	0.025	0.00062
Nitrogen	0.05	28.01	0.015	0.00036
Carbon Dioxide	0.091	44.01	0.040	0.0010
Water	2.08	18.02	0.38	0.0091
Totals	100.00		41.07	1.00

Molecular weight	34.36
VOC weight fraction	0.73
Methane weight fraction	0.075
THC weight fraction	0.99
VOC of THC wt fraction	0.74
Methane of THC wt fraction	0.076
Benzene of THC wt fraction	0.00036
Toluene of THC wt fraction	0.00072
E-benzene of THC wt fraction	0.00026
Xylene of THC wt fraction	0.00062
n-Hexane of THC wt fraction	0.021

1. Tank vent gas analysis retrieved from "Uncontrolled Flash Gas" stream from ProMax 4.0 simulation.

GlyCalc 4.0

GRI-GLYCalc VERSION 4.0 - SUMMARY OF INPUT VALUES

Case Name: Monroe Compressor Station
File Name: W:\20171806 - Antero WV CS Permit Mods\Monroe CS\Attachment N\GlyCalc\Gly Calc Monroe CS.ddf
Date: September 09, 2016

DESCRIPTION:

Description: Kimray 45015PV pump
One (1) 110 MMSCFD dehydration unit

Annual Hours of Operation: 8760.0 hours/yr

WET GAS:

Temperature: 120.00 deg. F
Pressure: 1200.00 psig
Wet Gas Water Content: Saturated

Component	Conc. (vol %)
Carbon Dioxide	0.1760
Nitrogen	0.4348
Methane	76.2652
Ethane	15.1069
Propane	5.1485
Isobutane	0.6256
n-Butane	1.3010
Isopentane	0.3193
n-Pentane	0.3157
n-Hexane	0.0792
Other Hexanes	0.1288
Heptanes	0.0741
Benzene	0.0015
Toluene	0.0027
Ethylbenzene	0.0001
C8+ Heavies	0.0206

DRY GAS:

Flow Rate: 110.0 MMSCF/day
Water Content: 5.0 lbs. H2O/MMSCF

LEAN GLYCOL:

Glycol Type: TEG
Water Content: 1.5 wt% H2O
Flow Rate: 15.0 gpm

Dehy Inputs_Monroe

PUMP:

Glycol Pump Type: Gas Injection
Gas Injection Pump Volume Ratio: 0.032 acfm gas/gpm glycol

FLASH TANK:

Flash Control: Combustion device
Flash Control Efficiency: 98.00 %
Temperature: 80.0 deg. F
Pressure: 5.0 psig

STRIPPING GAS:

Source of Gas: Dry Gas
Gas Flow Rate: 9.000 scfm

REGENERATOR OVERHEADS CONTROL DEVICE:

Control Device: Condenser
Temperature: 200.0 deg. F
Pressure: 14.7 psia

Control Device: Combustion Device
Destruction Efficiency: 98.0 %
Excess Oxygen: 0.0 %
Ambient Air Temperature: 0.0 deg. F

GRI-GLYCalc VERSION 4.0 - AGGREGATE CALCULATIONS REPORT

Case Name: Monroe Compressor Station
File Name: W:\20171806 - Antero WV CS Permit Mods\Monroe CS\Attachment N\GlyCalc\Gly Calc Monroe CS.ddf
Date: September 09, 2016

DESCRIPTION:

Description: Kimray 45015PV pump
One (1) 110 MMSCFD dehydration unit

Annual Hours of Operation: 8760.0 hours/yr

EMISSIONS REPORTS:

CONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	0.3563	8.552	1.5608
Ethane	0.1453	3.487	0.6364
Propane	0.0888	2.130	0.3888
Isobutane	0.0173	0.415	0.0757
n-Butane	0.0438	1.051	0.1919
Isopentane	0.0141	0.337	0.0616
n-Pentane	0.0172	0.414	0.0755
n-Hexane	0.0089	0.215	0.0392
Other Hexanes	0.0107	0.257	0.0469
Heptanes	0.0201	0.483	0.0881
Benzene	0.0123	0.295	0.0538
Toluene	0.0324	0.777	0.1418
Ethylbenzene	0.0015	0.037	0.0067
C8+ Heavies	0.0326	0.781	0.1426
Total Emissions	0.8013	19.232	3.5098
Total Hydrocarbon Emissions	0.8013	19.232	3.5098
Total VOC Emissions	0.2997	7.192	1.3125
Total HAP Emissions	0.0551	1.323	0.2414
Total BTEX Emissions	0.0462	1.108	0.2023

UNCONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	17.8179	427.630	78.0425
Ethane	7.2654	174.370	31.8225
Propane	4.4387	106.529	19.4415
Isobutane	0.8646	20.749	3.7868
n-Butane	2.1907	52.576	9.5951
Isopentane	0.7031	16.874	3.0796

n-Pentane	0.8623	20.695	3.7768
n-Hexane	0.4470	10.729	1.9580
Other Hexanes	0.5349	12.838	2.3430
Heptanes	1.0058	24.140	4.4055
Benzene	0.6146	14.751	2.6921
Toluene	1.6196	38.871	7.0939
Ethylbenzene	0.0769	1.844	0.3366
C8+ Heavies	1.6276	39.063	7.1290
Total Emissions	40.0691	961.659	175.5028
Total Hydrocarbon Emissions	40.0691	961.659	175.5028
Total VOC Emissions	14.9858	359.659	65.6377
Total HAP Emissions	2.7581	66.195	12.0805
Total BTEX Emissions	2.3111	55.466	10.1225

FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	2.2604	54.249	9.9004
Ethane	1.1071	26.570	4.8490
Propane	0.6161	14.787	2.6986
Isobutane	0.1039	2.495	0.4553
n-Butane	0.2398	5.754	1.0502
Isopentane	0.0657	1.577	0.2877
n-Pentane	0.0714	1.713	0.3126
n-Hexane	0.0225	0.540	0.0985
Other Hexanes	0.0341	0.819	0.1494
Heptanes	0.0249	0.597	0.1090
Benzene	0.0010	0.024	0.0044
Toluene	0.0015	0.037	0.0067
Ethylbenzene	<0.0001	0.001	0.0002
C8+ Heavies	0.0056	0.136	0.0247
Total Emissions	4.5541	109.297	19.9468
Total Hydrocarbon Emissions	4.5541	109.297	19.9468
Total VOC Emissions	1.1866	28.479	5.1974
Total HAP Emissions	0.0251	0.602	0.1098
Total BTEX Emissions	0.0026	0.062	0.0113

FLASH TANK OFF GAS

Component	lbs/hr	lbs/day	tons/yr
Methane	113.0180	2712.432	495.0189
Ethane	55.3542	1328.501	242.4513
Propane	30.8061	739.347	134.9308
Isobutane	5.1971	124.730	22.7633
n-Butane	11.9880	287.713	52.5076
Isopentane	3.2846	78.831	14.3867
n-Pentane	3.5686	85.646	15.6304
n-Hexane	1.1248	26.995	4.9265
Other Hexanes	1.7060	40.944	7.4723

Heptanes	1.2445	29.867	5.4507
Benzene	0.0506	1.216	0.2218
Toluene	0.0762	1.829	0.3337
Ethylbenzene	0.0018	0.044	0.0080
C8+ Heavies	0.2824	6.778	1.2370
Total Emissions	227.7030	5464.872	997.3392
Total Hydrocarbon Emissions	227.7030	5464.872	997.3392
Total VOC Emissions	59.3308	1423.940	259.8690
Total HAP Emissions	1.2535	30.083	5.4901
Total BTEX Emissions	0.1287	3.088	0.5636

COMBINED REGENERATOR VENT/FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	2.6167	62.801	11.4612
Ethane	1.2524	30.057	5.4855
Propane	0.7049	16.917	3.0874
Isobutane	0.1212	2.910	0.5310
n-Butane	0.2836	6.806	1.2421
Isopentane	0.0798	1.914	0.3493
n-Pentane	0.0886	2.127	0.3881
n-Hexane	0.0314	0.754	0.1377
Other Hexanes	0.0448	1.076	0.1963
Heptanes	0.0450	1.080	0.1971
Benzene	0.0133	0.319	0.0582
Toluene	0.0339	0.813	0.1484
Ethylbenzene	0.0016	0.038	0.0069
C8+ Heavies	0.0382	0.917	0.1673
Total Emissions	5.3554	128.529	23.4566
Total Hydrocarbon Emissions	5.3554	128.529	23.4566
Total VOC Emissions	1.4863	35.671	6.5099
Total HAP Emissions	0.0802	1.925	0.3512
Total BTEX Emissions	0.0488	1.170	0.2135

COMBINED REGENERATOR VENT/FLASH GAS EMISSION CONTROL REPORT:

Component	Uncontrolled tons/yr	Controlled tons/yr	% Reduction
Methane	573.0614	11.4612	98.00
Ethane	274.2738	5.4855	98.00
Propane	154.3724	3.0874	98.00
Isobutane	26.5500	0.5310	98.00
n-Butane	62.1028	1.2421	98.00
Isopentane	17.4663	0.3493	98.00
n-Pentane	19.4072	0.3881	98.00
n-Hexane	6.8845	0.1377	98.00
Other Hexanes	9.8152	0.1963	98.00

Heptanes	9.8562	0.1971	98.00
Benzene	2.9139	0.0582	98.00
Toluene	7.4276	0.1484	98.00
Ethylbenzene	0.3447	0.0069	98.00
C8+ Heavies	8.3659	0.1673	98.00
Total Emissions	1172.8420	23.4566	98.00
Total Hydrocarbon Emissions	1172.8420	23.4566	98.00
Total VOC Emissions	325.5067	6.5099	98.00
Total HAP Emissions	17.5706	0.3512	98.00
Total BTEX Emissions	10.6861	0.2135	98.00

EQUIPMENT REPORTS:

CONDENSER AND COMBUSTION DEVICE

Condenser Outlet Temperature:	200.00 deg. F
Condenser Pressure:	14.70 psia
Condenser Duty:	2.22e-001 MM BTU/hr
Produced Water:	19.44 bbls/day
Ambient Temperature:	0.00 deg. F
Excess Oxygen:	0.00 %
Combustion Efficiency:	98.00 %
Supplemental Fuel Requirement:	2.22e-001 MM BTU/hr

Component	Emitted	Destroyed
Methane	2.00%	98.00%
Ethane	2.00%	98.00%
Propane	2.00%	98.00%
Isobutane	2.00%	98.00%
n-Butane	2.00%	98.00%
Isopentane	2.00%	98.00%
n-Pentane	2.00%	98.00%
n-Hexane	2.00%	98.00%
Other Hexanes	2.00%	98.00%
Heptanes	2.00%	98.00%
Benzene	2.00%	98.00%
Toluene	2.00%	98.00%
Ethylbenzene	2.00%	98.00%
C8+ Heavies	2.00%	98.00%

ABSORBER

Calculated Absorber Stages:	1.68
Specified Dry Gas Dew Point:	5.00 lbs. H2O/MMSCF
Temperature:	120.0 deg. F
Pressure:	1200.0 psig
Dry Gas Flow Rate:	110.0000 MMSCF/day

Dehy Outputs_Monroe

Glycol Losses with Dry Gas: 9.7047 lb/hr
Wet Gas Water Content: Saturated
Calculated Wet Gas Water Content: 89.63 lbs. H2O/MMSCF
Calculated Lean Glycol Recirc. Ratio: 2.32 gal/lb H2O

Component	Remaining in Dry Gas	Absorbed in Glycol
Water	5.57%	94.43%
Carbon Dioxide	99.81%	0.19%
Nitrogen	99.98%	0.02%
Methane	99.98%	0.02%
Ethane	99.96%	0.04%
Propane	99.94%	0.06%
Isobutane	99.93%	0.07%
n-Butane	99.92%	0.08%
Isopentane	99.93%	0.07%
n-Pentane	99.91%	0.09%
n-Hexane	99.88%	0.12%
Other Hexanes	99.90%	0.10%
Heptanes	99.82%	0.18%
Benzene	95.37%	4.63%
Toluene	94.43%	5.57%
Ethylbenzene	93.93%	6.07%
C8+ Heavies	99.62%	0.38%

FLASH TANK

Flash Control: Combustion device
Flash Control Efficiency: 98.00 %
Flash Temperature: 80.0 deg. F
Flash Pressure: 5.0 psig

Component	Left in Glycol	Removed in Flash Gas
Water	99.88%	0.12%
Carbon Dioxide	6.06%	93.94%
Nitrogen	0.33%	99.67%
Methane	0.36%	99.64%
Ethane	1.43%	98.57%
Propane	3.78%	96.22%
Isobutane	6.27%	93.73%
n-Butane	8.51%	91.49%
Isopentane	10.50%	89.50%
n-Pentane	13.37%	86.63%
n-Hexane	23.99%	76.01%
Other Hexanes	18.61%	81.39%
Heptanes	42.20%	57.80%
Benzene	92.75%	7.25%
Toluene	95.85%	4.15%
Ethylbenzene	97.90%	2.10%
C8+ Heavies	86.42%	13.58%

REGENERATOR

Regenerator Stripping Gas: Dry Product Gas
Stripping Gas Flow Rate: 9.0000 scfm

Component	Remaining in Glycol	Distilled Overhead
Water	24.59%	75.41%
Carbon Dioxide	0.00%	100.00%
Nitrogen	0.00%	100.00%
Methane	0.00%	100.00%
Ethane	0.00%	100.00%
Propane	0.00%	100.00%
Isobutane	0.00%	100.00%
n-Butane	0.00%	100.00%
Isopentane	2.60%	97.40%
n-Pentane	2.25%	97.75%
n-Hexane	1.39%	98.61%
Other Hexanes	3.32%	96.68%
Heptanes	0.89%	99.11%
Benzene	5.33%	94.67%
Toluene	8.17%	91.83%
Ethylbenzene	10.55%	89.45%
C8+ Heavies	12.24%	87.76%

STREAM REPORTS:

WET GAS STREAM

Temperature: 120.00 deg. F
Pressure: 1214.70 psia
Flow Rate: 4.59e+006 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	1.89e-001	4.12e+002
Carbon Dioxide	1.76e-001	9.36e+002
Nitrogen	4.34e-001	1.47e+003
Methane	7.61e+001	1.48e+005
Ethane	1.51e+001	5.49e+004
Propane	5.14e+000	2.74e+004
Isobutane	6.24e-001	4.39e+003
n-Butane	1.30e+000	9.14e+003
Isopentane	3.19e-001	2.78e+003
n-Pentane	3.15e-001	2.75e+003
n-Hexane	7.91e-002	8.25e+002

Other Hexanes	1.29e-001	1.34e+003
Heptanes	7.40e-002	8.97e+002
Benzene	1.50e-003	1.42e+001
Toluene	2.69e-003	3.01e+001
Ethylbenzene	9.98e-005	1.28e+000
C8+ Heavies	2.06e-002	4.24e+002
Total Components	100.00	2.56e+005

DRY GAS STREAM

Temperature: 120.00 deg. F
Pressure: 1214.70 psia
Flow Rate: 4.58e+006 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	1.05e-002	2.29e+001
Carbon Dioxide	1.76e-001	9.34e+002
Nitrogen	4.35e-001	1.47e+003
Methane	7.63e+001	1.48e+005
Ethane	1.51e+001	5.49e+004
Propane	5.15e+000	2.74e+004
Isobutane	6.25e-001	4.39e+003
n-Butane	1.30e+000	9.13e+003
Isopentane	3.19e-001	2.78e+003
n-Pentane	3.15e-001	2.75e+003
n-Hexane	7.91e-002	8.24e+002
Other Hexanes	1.29e-001	1.34e+003
Heptanes	7.40e-002	8.96e+002
Benzene	1.43e-003	1.35e+001
Toluene	2.55e-003	2.84e+001
Ethylbenzene	9.39e-005	1.20e+000
C8+ Heavies	2.05e-002	4.22e+002
Total Components	100.00	2.55e+005

LEAN GLYCOL STREAM

Temperature: 120.00 deg. F
Flow Rate: 1.50e+001 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.85e+001	8.32e+003
Water	1.50e+000	1.27e+002
Carbon Dioxide	2.09e-012	1.76e-010
Nitrogen	3.56e-013	3.01e-011
Methane	1.00e-017	8.46e-016
Ethane	1.31e-007	1.10e-005
Propane	7.54e-009	6.36e-007
Isobutane	1.04e-009	8.76e-008

n-Butane	2.25e-009	1.90e-007
Isopentane	1.19e-004	1.00e-002
n-Pentane	1.47e-004	1.24e-002
n-Hexane	5.85e-005	4.94e-003
Other Hexanes	1.53e-004	1.30e-002
Heptanes	9.58e-005	8.09e-003
Benzene	4.08e-004	3.45e-002
Toluene	1.70e-003	1.44e-001
Ethylbenzene	1.07e-004	9.05e-003
C8+ Heavies	2.61e-003	2.20e-001
Total Components	100.00	8.44e+003

RICH GLYCOL AND PUMP GAS STREAM

Temperature: 120.00 deg. F
Pressure: 1214.70 psia
Flow Rate: 1.63e+001 gpm
NOTE: Stream has more than one phase.

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.16e+001	8.31e+003
Water	5.69e+000	5.16e+002
Carbon Dioxide	2.56e-002	2.32e+000
Nitrogen	1.30e-002	1.18e+000
Methane	1.25e+000	1.13e+002
Ethane	6.19e-001	5.62e+001
Propane	3.53e-001	3.20e+001
Isobutane	6.11e-002	5.54e+000
n-Butane	1.44e-001	1.31e+001
Isopentane	4.05e-002	3.67e+000
n-Pentane	4.54e-002	4.12e+000
n-Hexane	1.63e-002	1.48e+000
Other Hexanes	2.31e-002	2.10e+000
Heptanes	2.37e-002	2.15e+000
Benzene	7.70e-003	6.98e-001
Toluene	2.02e-002	1.84e+000
Ethylbenzene	9.66e-004	8.76e-002
C8+ Heavies	2.29e-002	2.08e+000
Total Components	100.00	9.07e+003

FLASH TANK OFF GAS STREAM

Temperature: 80.00 deg. F
Pressure: 19.70 psia
Flow Rate: 3.85e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	3.40e-001	6.22e-001

	Dehy Outputs_Monroe	
Carbon Dioxide	4.88e-001	2.18e+000
Nitrogen	4.13e-001	1.17e+000
Methane	6.94e+001	1.13e+002
Ethane	1.81e+001	5.54e+001
Propane	6.88e+000	3.08e+001
Isobutane	8.81e-001	5.20e+000
n-Butane	2.03e+000	1.20e+001
Isopentane	4.49e-001	3.28e+000
n-Pentane	4.87e-001	3.57e+000
n-Hexane	1.29e-001	1.12e+000
Other Hexanes	1.95e-001	1.71e+000
Heptanes	1.22e-001	1.24e+000
Benzene	6.39e-003	5.06e-002
Toluene	8.15e-003	7.62e-002
Ethylbenzene	1.71e-004	1.84e-003
C8+ Heavies	1.63e-002	2.82e-001
Total Components	100.00	2.32e+002

FLASH TANK GLYCOL STREAM

Temperature: 80.00 deg. F
Flow Rate: 1.58e+001 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.40e+001	8.31e+003
Water	5.83e+000	5.15e+002
Carbon Dioxide	1.59e-003	1.41e-001
Nitrogen	4.43e-005	3.91e-003
Methane	4.63e-003	4.09e-001
Ethane	9.08e-003	8.02e-001
Propane	1.37e-002	1.21e+000
Isobutane	3.93e-003	3.47e-001
n-Butane	1.26e-002	1.12e+000
Isopentane	4.36e-003	3.85e-001
n-Pentane	6.23e-003	5.51e-001
n-Hexane	4.02e-003	3.55e-001
Other Hexanes	4.41e-003	3.90e-001
Heptanes	1.03e-002	9.08e-001
Benzene	7.33e-003	6.48e-001
Toluene	1.99e-002	1.76e+000
Ethylbenzene	9.70e-004	8.58e-002
C8+ Heavies	2.03e-002	1.80e+000
Total Components	100.00	8.84e+003

FLASH GAS EMISSIONS

Flow Rate: 1.49e+004 scfh
Control Method: Combustion Device
Control Efficiency: 98.00

Component	Conc. (vol%)	Loading (lb/hr)
Water	6.22e+001	4.39e+002
Carbon Dioxide	3.72e+001	6.40e+002
Nitrogen	1.07e-001	1.17e+000
Methane	3.60e-001	2.26e+000
Ethane	9.41e-002	1.11e+000
Propane	3.57e-002	6.16e-001
Isobutane	4.57e-003	1.04e-001
n-Butane	1.05e-002	2.40e-001
Isopentane	2.33e-003	6.57e-002
n-Pentane	2.53e-003	7.14e-002
n-Hexane	6.67e-004	2.25e-002
Other Hexanes	1.01e-003	3.41e-002
Heptanes	6.35e-004	2.49e-002
Benzene	3.31e-005	1.01e-003
Toluene	4.23e-005	1.52e-003
Ethylbenzene	8.84e-007	3.68e-005
C8+ Heavies	8.47e-005	5.65e-003
Total Components	100.00	1.08e+003

REGENERATOR OVERHEADS STREAM

Temperature: 212.00 deg. F
Pressure: 14.70 psia
Flow Rate: 8.79e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	9.31e+001	3.88e+002
Carbon Dioxide	2.46e-002	2.51e-001
Nitrogen	2.73e-002	1.77e-001
Methane	4.80e+000	1.78e+001
Ethane	1.04e+000	7.27e+000
Propane	4.35e-001	4.44e+000
Isobutane	6.42e-002	8.65e-001
n-Butane	1.63e-001	2.19e+000
Isopentane	4.21e-002	7.03e-001
n-Pentane	5.16e-002	8.62e-001
n-Hexane	2.24e-002	4.47e-001
Other Hexanes	2.68e-002	5.35e-001
Heptanes	4.33e-002	1.01e+000
Benzene	3.40e-002	6.15e-001
Toluene	7.59e-002	1.62e+000
Ethylbenzene	3.13e-003	7.69e-002
C8+ Heavies	4.13e-002	1.63e+000
Total Components	100.00	4.29e+002

CONDENSER PRODUCED WATER STREAM

Temperature: 200.00 deg. F
Flow Rate: 5.67e-001 gpm

Component	Conc. (wt%)	Loading (lb/hr)	(ppm)
Water	1.00e+002	2.84e+002	999988.
Carbon Dioxide	3.93e-005	1.11e-004	0.
Nitrogen	1.22e-006	3.46e-006	0.
Methane	1.97e-004	5.58e-004	2.
Ethane	8.45e-005	2.40e-004	1.
Propane	6.97e-005	1.98e-004	1.
Isobutane	6.85e-006	1.94e-005	0.
n-Butane	2.12e-005	6.02e-005	0.
Isopentane	4.34e-006	1.23e-005	0.
n-Pentane	5.49e-006	1.56e-005	0.
n-Hexane	2.07e-006	5.87e-006	0.
Other Hexanes	2.09e-006	5.93e-006	0.
Heptanes	2.36e-006	6.71e-006	0.
Benzene	2.49e-004	7.07e-004	2.
Toluene	4.79e-004	1.36e-003	5.
Ethylbenzene	1.55e-005	4.39e-005	0.
C8+ Heavies	7.59e-008	2.15e-007	0.
Total Components	100.00	2.84e+002	1000000.

CONDENSER RECOVERED OIL STREAM

Temperature: 200.00 deg. F

The calculated flow rate is less than 0.000001 #mol/hr.
The stream flow rate and composition are not reported.

CONDENSER VENT STREAM

Temperature: 200.00 deg. F
Pressure: 14.70 psia
Flow Rate: 2.81e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	7.85e+001	1.05e+002
Carbon Dioxide	7.68e-002	2.51e-001
Nitrogen	8.54e-002	1.77e-001
Methane	1.50e+001	1.78e+001
Ethane	3.26e+000	7.27e+000
Propane	1.36e+000	4.44e+000
Isobutane	2.01e-001	8.65e-001
n-Butane	5.09e-001	2.19e+000
Isopentane	1.31e-001	7.03e-001
n-Pentane	1.61e-001	8.62e-001

Dehy Outputs_Monroe

n-Hexane	7.00e-002	4.47e-001
Other Hexanes	8.37e-002	5.35e-001
Heptanes	1.35e-001	1.01e+000
Benzene	1.06e-001	6.14e-001
Toluene	2.37e-001	1.62e+000
Ethylbenzene	9.76e-003	7.68e-002
C8+ Heavies	1.29e-001	1.63e+000
Total Components	100.00	1.45e+002

COMBUSTION DEVICE OFF GAS STREAM

Temperature: 1000.00 deg. F
Pressure: 14.70 psia
Flow Rate: 1.20e+001 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Methane	7.01e+001	3.56e-001
Ethane	1.52e+001	1.45e-001
Propane	6.35e+000	8.88e-002
Isobutane	9.39e-001	1.73e-002
n-Butane	2.38e+000	4.38e-002
Isopentane	6.15e-001	1.41e-002
n-Pentane	7.54e-001	1.72e-002
n-Hexane	3.27e-001	8.94e-003
Other Hexanes	3.92e-001	1.07e-002
Heptanes	6.33e-001	2.01e-002
Benzene	4.96e-001	1.23e-002
Toluene	1.11e+000	3.24e-002
Ethylbenzene	4.57e-002	1.54e-003
C8+ Heavies	6.03e-001	3.26e-002
Total Components	100.00	8.01e-001

ProMax 3.2

Bryan Research & Engineering, Inc.

ProMax® 4.0

Simulation Report

Project: MonroeCS.pmx

Licensed to Kleinfelder, Inc. and Affiliates

Client Name: Antero Midstream LLC
Location: Monroe CS
Job:

ProMax Filename: W:\20171806 - Antero WV CS Permit Mods\Monroe CS\Attachment N\ProMax\MonroeCS.pmx
ProMax Version: 4.0.16071.0
Simulation Initiated: 10/10/2016 2:35:58 PM

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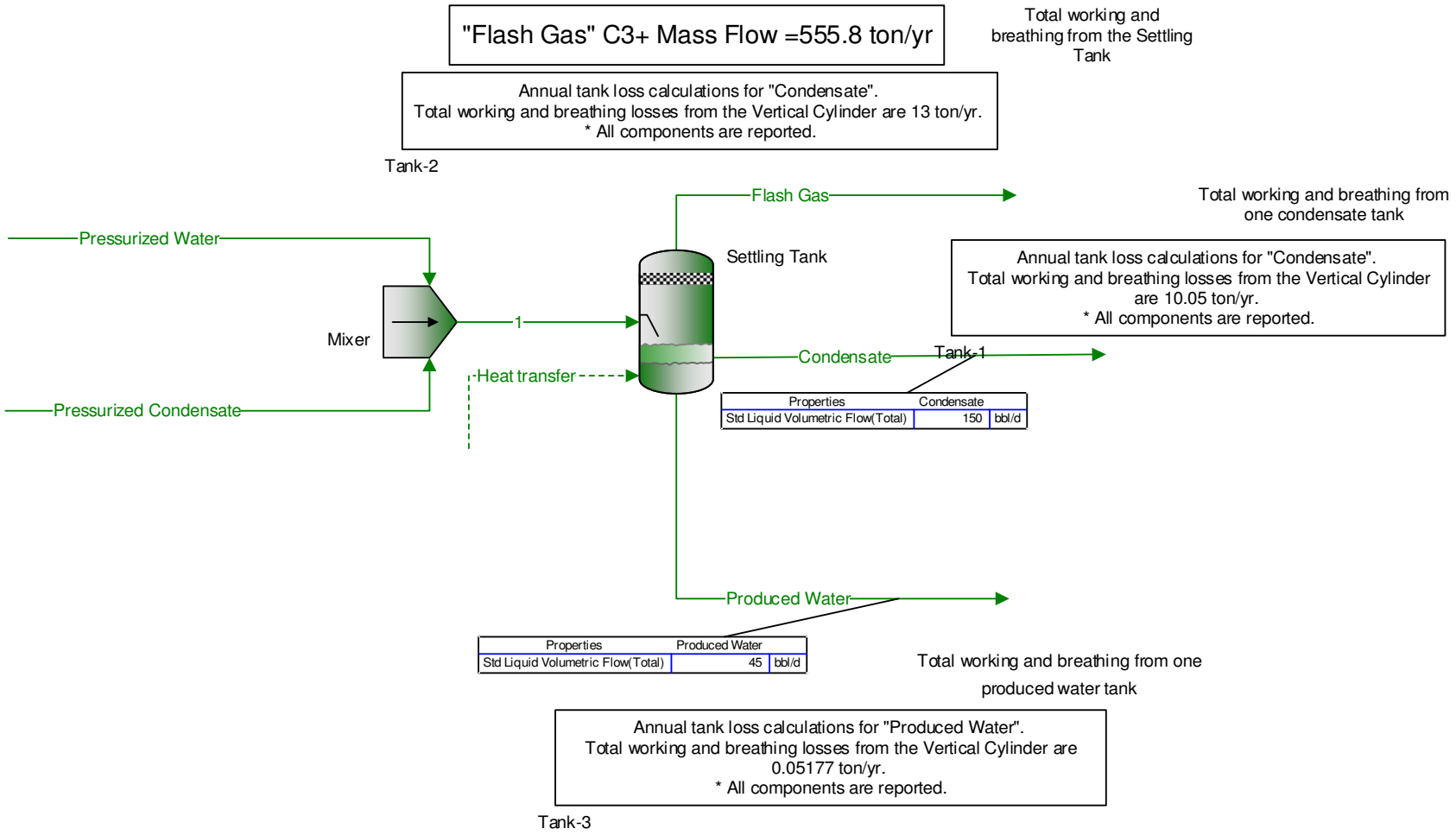
Report Navigator can be activated via the ProMax Navigator Toolbar.
An asterisk (*), throughout the report, denotes a user specified value.
A question mark (?) after a value, throughout the report, denotes an extrapolated or approximate value.


"Flash Gas" C3+ Mass Flow =555.8 ton/yr
Total working and breathing from the Settling Tank
Annual tank loss calculations for "Condensate".
Total working and breathing losses from the Vertical Cylinder are 13 ton/yr.
* All components are reported.
Tank-2
Flash Gas
Total working and breathing from one condensate tank
Pressurized Water
Settling Tank
Annual tank loss calculations for "Condensate".
Total working and breathing losses from the Vertical Cylinder are 10.05 ton/yr.
* All components are reported.
Mixer
1
Condensate
Tank-1
Heat transfer
Pressurized Condensate
Properties Condensate
Std Liquid Volumetric Flow(Total) 150 bbl/d
Produced Water
Properties Produced Water
Std Liquid Volumetric Flow(Total) 45 bbl/d
Total working and breathing from one produced water tank
Annual tank loss calculations for "Produced Water".
Total working and breathing losses from the Vertical Cylinder are 0.05177 ton/yr.
* All components are reported.
Tank-3

Process Streams		Condensate	Flash Gas	Pressurized Condensate	Pressurized Water	Produced Water	1
Composition	**Status:**	Solved	Solved	Solved	Solved	Solved	Solved
Phase: **Total**	**From Block:**	Settling Tank	Settling Tank	--	--	Settling Tank	Mixer
	To Block:	--	--	Mixer	Mixer	--	Settling Tank
Mole Fraction		%	%	%	%	%	%
Methane		0.0990526	19.1772	4.41172*	0.441197*	0.000500012	1.49365
Ethane		0.861062	25.0946	6.34359*	0.634396*	0.00102363	2.14771
Propane		3.18300	24.4818	8.01349*	0.801395*	0.000708761	2.71308
i-Butane		1.71030	4.87298	2.43384*	0.243399*	0.000105047	0.824011
n-Butane		6.41053	12.2616	7.76591*	0.776588*	0.000323033	2.62922
i-Pentane		5.04375	3.82356	4.79369*	0.479397*	7.47029E-05	1.62297
n-Pentane		7.89906	4.39177	7.14654*	0.714696*	3.10036E-05	2.41956
2-Methylpentane		7.16255	1.59903	5.94162*	0.594196*	1.63124E-05	2.01162
n-Heptane		16.3476	0.739044	12.9032*	1.29039*	2.80932E-06	4.36855
n-Octane		15.9556	0.214161	12.4792*	1.24799*	3.30367E-07	4.22500
n-Nonane		7.58563	0.0299408	5.91662*	0.591696*	5.49419E-08	2.00315
n-Hexane		6.47606	0.996766	5.27066*	0.527097*	4.92855E-06	1.78445
Benzene		0.122968	0.0179122	0.0999936*	0.00999994*	7.34589E-05	0.0338542
Toluene		0.811890	0.0320237	0.639959*	0.0639996*	9.77573E-05	0.216667
Ethylbenzene		0.787755	0.00963774	0.615961*	0.0615996*	2.73849E-05	0.208542
p-Xylene		2.15124	0.0256356	1.68189*	0.168199*	4.98577E-05	0.569428
Nitrogen		8.20216E-05	0.0528112	0.0119992*	0.00119999*	6.71399E-07	0.00406250
Carbon Dioxide		0.00140257	0.0920753	0.0219986*	0.00219999*	5.08804E-05	0.00744792
Water		0.0526815	2.08512	0*	89.9995*	99.9969	66.1437
Decanes+		17.3378	0.00225826	13.5081*	1.35089*	1.52659E-07	4.57336
Mass Fraction		%	%	%	%	%	%
Methane		0.0150239	7.48900	0.772688*	0.278946*	0.000445238	0.558200
Ethane		0.244794	18.3682	2.08248*	0.751789*	0.00170845	1.50441
Propane		1.32702	26.2788	3.85782*	1.39270*	0.00173475	2.78694
i-Butane		0.939853	6.89452	1.54440*	0.557540*	0.000338896	1.11570
n-Butane		3.52276	17.3483	4.92788*	1.77889*	0.00104215	3.55992
i-Pentane		3.44056	6.71529	3.77594*	1.36314*	0.000299163	2.72778
n-Pentane		5.38829	7.71323	5.62925*	2.03220*	0.000124160	4.06664
2-Methylpentane		5.83576	3.35435	5.59002*	2.01804*	7.80264E-05	4.03830
n-Heptane		15.4873	1.80266	14.1156*	5.09582*	1.56250E-05	10.1973
n-Octane		17.2320	0.595500	15.5628*	5.61827*	2.09465E-06	11.2427
n-Nonane		9.19841	0.0934773	8.28464*	2.99081*	3.91128E-07	5.98493
n-Hexane		5.27644	2.09095	4.95877*	1.79015*	2.35745E-05	3.58228
Benzene		0.0908147	0.0340591	0.0852736*	0.0307844*	0.000318495	0.0616027
Toluene		0.707269	0.0718257	0.643751*	0.232399*	0.000499955	0.465054
Ethylbenzene		0.790714	0.0249071	0.713936*	0.257736*	0.000161374	0.515757
p-Xylene		2.15932	0.0662509	1.94942*	0.703754*	0.000293802	1.40828
Nitrogen		2.17240E-05	0.0360130	0.00366982*	0.00132483*	1.04397E-06	0.00265112
Carbon Dioxide		0.000583603	0.0986409	0.0105698*	0.00381577*	0.000124291	0.00763576
Water		0.00897317	0.914408	0*	63.8994*	99.9928	27.7587
Decanes+		28.3341	0.00950193	25.4912*	9.20250*	1.46465E-06	18.4152
Mass Flow		lb/h	lb/h	lb/h	lb/h	lb/h	lb/h
Methane		0.231504	13.0003	10.3616*	2.87308*	0.00292286	13.2347
Ethane		3.77203	31.8858	27.9257*	7.74327*	0.0112155	35.6690
Propane		20.4481	45.6179	51.7329*	14.3445*	0.0113881	66.0774
i-Butane		14.4822	11.9683	20.7102*	5.74254*	0.00222475	26.4528
n-Butane		54.2822	30.1153	66.0822*	18.3222*	0.00684142	84.4044
i-Pentane		53.0157	11.6572	50.6348*	14.0400*	0.00196392	64.6748
n-Pentane		83.0283	13.3895	75.4875*	20.9312*	0.000815077	96.4187
2-Methylpentane		89.9234	5.82288	74.9614*	20.7853*	0.000512221	95.7468
n-Heptane		238.644	3.12927	189.288*	52.4858*	0.000102574	241.774
n-Octane		265.528	1.03374	208.695*	57.8670*	1.37508E-05	266.562
n-Nonane		141.738	0.162269	111.096*	30.8048*	2.56765E-06	141.901
n-Hexane		81.3047	3.62972	66.4964*	18.4382*	0.000154760	84.9346
Benzene		1.39936	0.0591238	1.14351*	0.317072*	0.00209083	1.46058
Toluene		10.8983	0.124683	8.63262*	2.39366*	0.00328207	11.0263
Ethylbenzene		12.1841	0.0432368	9.57379*	2.65463*	0.00105938	12.2284
p-Xylene		33.2730	0.115006	26.1414*	7.24851*	0.00192873	33.3899
Nitrogen		0.000334746	0.0625157	0.0492118*	0.0136455*	6.85336E-06	0.0628573
Carbon Dioxide		0.00899274	0.171233	0.141740*	0.0393016*	0.000815933	0.181041
Water		0.138268	1.58734	0*	658.150*	656.425	658.150
Decanes+		436.601	0.0164946	341.833*	94.7838*	9.61499E-06	436.617

Process Streams		Condensate	Flash Gas	Pressurized Condensate	Pressurized Water	Produced Water	1
Properties	Status:	Solved	Solved	Solved	Solved	Solved	Solved
Phase: Total	From Block:	Settling Tank	Settling Tank	--	--	Settling Tank	Mixer
	To Block:	--	--	Mixer	Mixer	--	Settling Tank
Property	**Units**						
Temperature	°F	65.08	65.08*	120*	120*	65.08	119.757
Pressure	psig	0	0*	300*	300*	0	300
Mole Fraction Vapor	%	0	100	0	0	0	0
Mole Fraction Light Liquid	%	100	0	100	9.99274	100	33.8978
Mole Fraction Heavy Liquid	%	0	0	0	90.0073	0	66.1022
Molecular Weight	lb/lbmol	105.768	41.0802	91.5956	25.3737	18.0160	42.9269
Mass Density	lb/ft^3	44.1944	0.108844	41.1450	52.2856	62.3245	45.3601
Molar Flow	lbmol/h	14.5687	4.22568	14.6403	40.5923	36.4382	55.2326
Mass Flow	lb/h	1540.90	173.592	1340.99	1029.98	656.472	2370.97
Vapor Volumetric Flow	ft^3/h	34.8664	1594.87	32.5917	19.6991	10.5331	52.2698
Liquid Volumetric Flow	gpm	4.34698	198.841	4.06338	2.45599	1.31322	6.51676
Std Vapor Volumetric Flow	MMSCFD	0.132686	0.0384859	0.133338	0.369699	0.331865	0.503038
Std Liquid Volumetric Flow	sgpm	4.37509	0.716312	3.98358*	2.42026*	1.31243	6.40384
Compressibility		0.00624551	0.984943	0.112617	0.0245499	0.000754365	0.0478944
Specific Gravity		0.708596	1.41839	0.659703	0.838326	0.999287	0.727286
API Gravity		67.5025		73.1098	33.2397	10.0030	55.9706
Enthalpy	Btu/h	-1.37475E+06	-195539	-1.20281E+06	-4.79451E+06	-4.48537E+06	-5.99732E+06
Mass Enthalpy	Btu/lb	-892.171	-1126.43	-896.958	-4654.96	-6832.54	-2529.48
Mass Cp	Btu/(lb*°F)	0.499039	0.408555	0.545176	0.823702	0.982599	0.666034
Ideal Gas CpCv Ratio		1.05237	1.13534	1.05543	1.21803	1.32607	1.12269
Dynamic Viscosity	cP	0.486241	0.00846087	0.280626	0.438876	1.06070	0.340722
Kinematic Viscosity	cSt	0.686852	4.85279	0.425785	0.524009	1.06246	0.468926
Thermal Conductivity	Btu/(h*ft*°F)	0.0701952	0.0111499	0.0636417	0.228066	0.344705	0.125572
Net Ideal Gas Heating Value	Btu/ft^3	5338.97	2137.24	4642.62	464.287	0.0660795	1571.82
Net Liquid Heating Value	Btu/lb	18998.0	19589.0	19078.1	6210.12	-1058.30	13488.1
Gross Ideal Gas Heating Value	Btu/ft^3	5741.70	2325.95	4998.77	545.183	50.3801	1725.68
Gross Liquid Heating Value	Btu/lb	20442.9	21332.2	20553.6	7419.98	1.49601	14848.2

Working and Breathing Report

Process Stream	**Condensate**	
Tank Geometry	**Vertical Cylinder**	
Shell Length	**25**	ft
Shell Diameter	**12**	ft
Number of Storage Tanks Employed	**1**	
Location	**Charleston, WV**	
Time Frame	**Year**	
Net Throughput	**195**	bbl/day
Report Components	**All**	
Set Bulk Temperature to Stream Temperature?	**TRUE**	
Use Produced Water % Rule?	**FALSE**	
Maximum Fraction Fill of Tank	**90**	%
Average Fraction Fill of Tank	**50**	%
Material Category	**Light Organics**	
Tank Color	**Dark Green**	
Shell Paint Condition	**Good**	
Operating Pressure	**0**	psig
Breather Vent Pressure	**0.03**	psig
Breather Vacuum Pressure	**-0.03**	psig
Roof Type	**Dome**	
Radius of Domed Roof	**6**	ft
Roof Color	**Dark Green**	
Roof Paint Condition	**Good**	

Promax AP-42 Emissions Report
Annual Emissions
Vertical Cylinder

Components	Working Losses (ton/yr)	Breathing Losses (ton/yr)	Total Losses (ton/yr)
Mixture	7.28	5.72	13.00
Methane	0.051	0.040	0.091
Ethane	1.44	1.13	2.57
Propane	2.05	1.61	3.66
i-Butane	0.55	0.43	0.98
n-Butane	1.43	1.12	2.55
i-Pentane	0.52	0.41	0.93
n-Pentane	0.60	0.47	1.08
2-Methylpentane	0.26	0.21	0.47
n-Heptane	0.15	0.11	0.26
n-Octane	0.048	0.038	0.086
n-Nonane	0.0077	0.0061	0.014
n-Hexane	0.17	0.13	0.30
Benzene	0.0018	0.0014	0.0032
Toluene	0.0041	0.0032	0.0073
Ethylbenzene	0.0016	0.0012	0.0028
p-Xylene	0.0038	0.0030	0.0068
Nitrogen	2.31E-05	1.81E-05	4.12E-05
Carbon Dioxide	0.0042	0.0033	0.0074
Water	3.08E-05	2.42E-05	5.51E-05
Decanes+	0.00061	0.00048	0.0011

Attachment O.
Monitoring, Recordkeeping, Reporting, and Testing Plans

Monitoring, Recordkeeping, Reporting, and Testing Plans

The following is a summary of the methods to comply with the requirements of West Virginia Division of Air Quality (WVDAQ) 45CSR13 rules and regulations for the Monroe Compressor Station, including federal and state regulatory requirements.

1. Summary of Key Operational Throughput Limits

a. Maximum wet gas throughput into each Dehy: 110 MMscf/day or 40,150 MMscf/year.

b. Maximum liquids loaded out: 2,989,350 gallons per year.

2. Operational Requirements

a. Compressor engines will operate with the catalytic converter in place at all times and will be fueled by natural gas only.

b. Catalysts installed on all compressor engines will be operated per manufacturer instructions.

c. Reciprocating compressor rod packing will be replaced within 36 months of last packing/startup or within 26,000 operating hours, whichever comes first.

d. Microturbines will be fueled by natural gas only.

e. Each Dehy Reboiler will operate at no more than 1.5 MMBtu/hr and be fueled only by natural gas or off-gases from the Dehydrator flash tanks.

f. No fuel-burning unit of any kind will have opacity greater than 10 percent based on a six minute block average observation.

g. The Dehy Flare capacity will not exceed 4.80 MMBtu/hr, will achieve 98 percent destruction efficiency, will operate at all times that gas is vented to it, will have a flame present at all times, and will have no visible emissions other than for periods not to exceed a total of 5 minutes during any 2 consecutive hours.

h. The flare will be operated per manufacturer instructions.

i. Produced water, Condensate, and Settling storage tanks potential emissions will be routed to the VRU with recovery greater than 98 percent at all times.

j. Storage tanks will be covered and routed to a closed vent system with no detectable emissions.

k. Liquid loadout trucks will use the submerged-fill method.

l. Dehydrator still vents will be controlled by the flare.

m. Dehydrator flash tank vent gas will be used in the reboiler as fuel or routed to the VRU system.

3. Monitoring

a. Non-certified engines will be stack tested within 1 year of startup and every 8,760 hours of operation thereafter.

b. Catalyst inlet temperature will be monitored.

c. Compressor run time or number of months since compressor rod repacking will be monitored or tracked.

d. A rolling 12-month average wet gas throughput for the Dehy will be monitored.

e. Initial Method 22 observation of the Reboiler exhaust and flare will be conducted for a minimum of 2 hours.

f. Monthly Method 22 observations of the Reboiler exhaust and flare will be conducted for a minimum of 10 minutes each.

g. Monthly olfactory, visual, and auditory inspections will be conducted of the tanks closed vent and control system (flare) for leaks or defects that could result in emissions. Leaks will be repaired as soon as practicable, and no later than 5 days for the first attempt.

h. The presence of flare's flame will be continuously monitored.

i. Monthly and rolling twelve-month average amount of liquids loaded out will be monitored.

j. The initial and subsequent leak detection and repair (LDAR) inspections will be conducted per the implemented LDAR monitoring plan. Repair procedures will be followed per the implemented LDAR monitoring plan.

4. Recordkeeping

a. Records will be kept for a minimum of 5 years.

b. Records of inspection, observations, preventive maintenance, malfunctions, and shutdowns of all onsite equipment will be kept.

c. Records of the date, time, duration of each time that a flame is not present at the flare and startup, shutdown, malfunctions of the flare will be kept.

d. Records of engine maintenance and engine run time will be kept.

e. Records of catalyst inlet temperature will be kept.

f. Records of the actual annual average natural gas throughput in the dehy will be kept.

g. Records of LDAR inspections, repaired leaks, and the LDAR monitoring plan will be kept.

5. Notifications and Reports

a. WVDAQ will be notified within 30 calendar days of startup.

b. Upon startup, a Certificate to Operate (CTO) application will be filed and fees to WVDAQ will be paid for the period from startup to the following June 30 and then annually renew the CTO and pay fees. CTO will be maintained on-site.

c. An annual report of compliance with 40 CFR 60 Subpart OOOO for the settling tank will be submitted within 90 days after one year of operation (i.e., within 90 days after 12 months after initial startup).

d. An annual report of compliance with 40 CFR 60 Subpart OOOOa for the compressor engines and leak detection and repair requirements will be submitted within 90 days after one year of modification (i.e., within 90 days after 12 months after initial startup of the added compressor engines).

e. For stack testing, a protocol will be filed at least 30 days prior to test and notify WVDAQ and EPA of the test at least 15 days prior to test. Results will be reported within 60 days of the test.

f. If operations are suspended for 60 days or more, WVDAQ will be notified within 2 weeks after the 60th day.

Attachment P.
Public Notice

AIR QUALITY PERMIT NOTICE
Notice of Application – Monroe Compressor Station

Notice is given that Antero Midstream LLC has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a modification to the existing 45CSR13 Construction Permit R13-3184C for a Natural Gas Compressor Station located north of Conaway Run Road (Co Rd 48) near Alma, in Tyler County, West Virginia. The latitude and longitude coordinates are: 39.4206N, 80.8638W.

The applicant estimates the change in potential to discharge of the following Regulated Air Pollutants will be:

Regulated Pollutant	Change in Emissions (tpy)
Nitrogen Oxides (NOx)	1.21
Carbon Monoxide (CO)	2.91
Volatile Organic Compounds (VOC)	17.19
Sulfur Dioxide (SO_2)	0.09
Particulate Matter less than 10 micrometers (PM_{10})	0.18
Particulate Matter less than 2.5 micrometers ($PM_{2.5}$)	0.18
Total Hazardous Air Pollutants (HAPs)	-0.22
Benzene	-0.23
Toluene	-0.20
Ethylbenzene	0.02
Xylenes	-0.38
Formaldehyde	0.02
n-Hexane	0.79
Carbon Dioxide Equivalent (CO_2e)	4,650

Please note that negative numbers denote a decrease in potential emissions.

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 1250, during normal business hours.
Dated the 21st day of October 2016.

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

Attachment R.
Authority/Delegation of Authority

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: August 5 , 2015

ATTN.: Director

Corporation's / other business entity's Federal Employer I.D. Number 46-5517375

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) Luz Slauter and 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.

W. McNeilly

Ward McNeilly, Vice President - Vice President Reserves Planning & Midstream

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

Antero Midstream LLC

Name of Corporation or business entity