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June 27, 2016
Kleinfelder Project No.: 20163883.001A

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

SUBJECT: Antero Midstream LLC – Lafferty Compressor Station
West Virginia Department of Environmental Protection, Division of Air Quality, 45CSR13 Air Permit Modification, R13-3285

To Whom it May Concern:

On behalf of Antero Midstream LLC, please find attached the 45CSR13 Air Permit Modification for permit number R13-3285 for the Lafferty Compressor Station (Facility ID 085-00055) located in Ritchie County, West Virginia. A summary of the modifications in this application include:

1. Replacing the thirteen (13) Waukesha compressor engines with eight (8) Caterpillar G3608 2,500 horsepower compressor engines with oxidation catalysts,
2. New installation of a fuel conditioning heater (0.5 million BTU/hr capacity)
3. Increasing the dehydrator throughput to 110 MMscfd per dehydrator, and
4. Modifying the dehydrator flash tank control efficiency based on new standardized guidance from WVDEP.
5. Increasing the number of pigging events to 52 per year.

Enclosed are one hard copy and two CDs containing the entire permit application including the application form and required attachments. Per 45CSR22, a $4,500 application fee is also enclosed which covers the base 45CSR13 $1,000 application fee, an additional $1,000 for NSPS requirements, 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 .

Sincerely,
KLEINFELDER

Kaitlin Meszaros
Air Quality Professional

Enclosure: Lafferty Compressor Station R13-3285 Air Permit Modification

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

Antero Midstream LLC

Lafferty Compressor Station

NSR Permit Modification Application
West Virginia Department of Environmental Protection
Division of Air Quality
45CSR13 – R13-3285

Ritchie County, West Virginia

June 2016

Prepared by:

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

DEN16O41666

Table of Contents

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):*
Lafferty 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:
County Road 10/4
Pennsboro, WV 26415

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 proposed 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 8 5 – 0 0 0 5 5

11B. List all current 45CSR13 and 45CSR30 (Title V) permit numbers associated with this process (for existing facilities only):
R13-3285

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 Pennsboro, WV, head south on WV-74 S/Pullman Drive for about 1.8 miles and turn left on Lynn Camp Road. Continue for 1.4 miles and then continue on Co Rd 10 for 0.1 miles. Make a slight left onto Co Rd 10/4 and after 3.1 miles, the facility entrance will be on the left.

12.B. New site address (if applicable):	12C. Nearest city or town:	12D. County:
County Road 10/4 Pennsboro, WV 26415	Pennsboro	Ritchie
12.E. UTM Northing (KM): 4341.658	12F. UTM Easting (KM): 508.091	12G. UTM Zone: 17

13. Briefly describe the proposed change(s) at the facility:
The thirteen (13) rich-burn compressor engines will be replaced with eight (8) lean-burn compressor engines with oxidation catalyst. The dehydrator throughput has been increased to 110 MMSCFD per dehydrator. A fuel conditioning heater will be added and pigging events will be increased to 52 per year.

14A. Provide the date of anticipated installation or change: April 2016 – 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: November 2016

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: Engines, Dehydrator, Fuel Conditioning Heater

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 : Oxidation catalysts

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 _____ DATE: _____

(Please use blue ink) *(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

Lafferty Compressor Station – Closest Antero Facilities

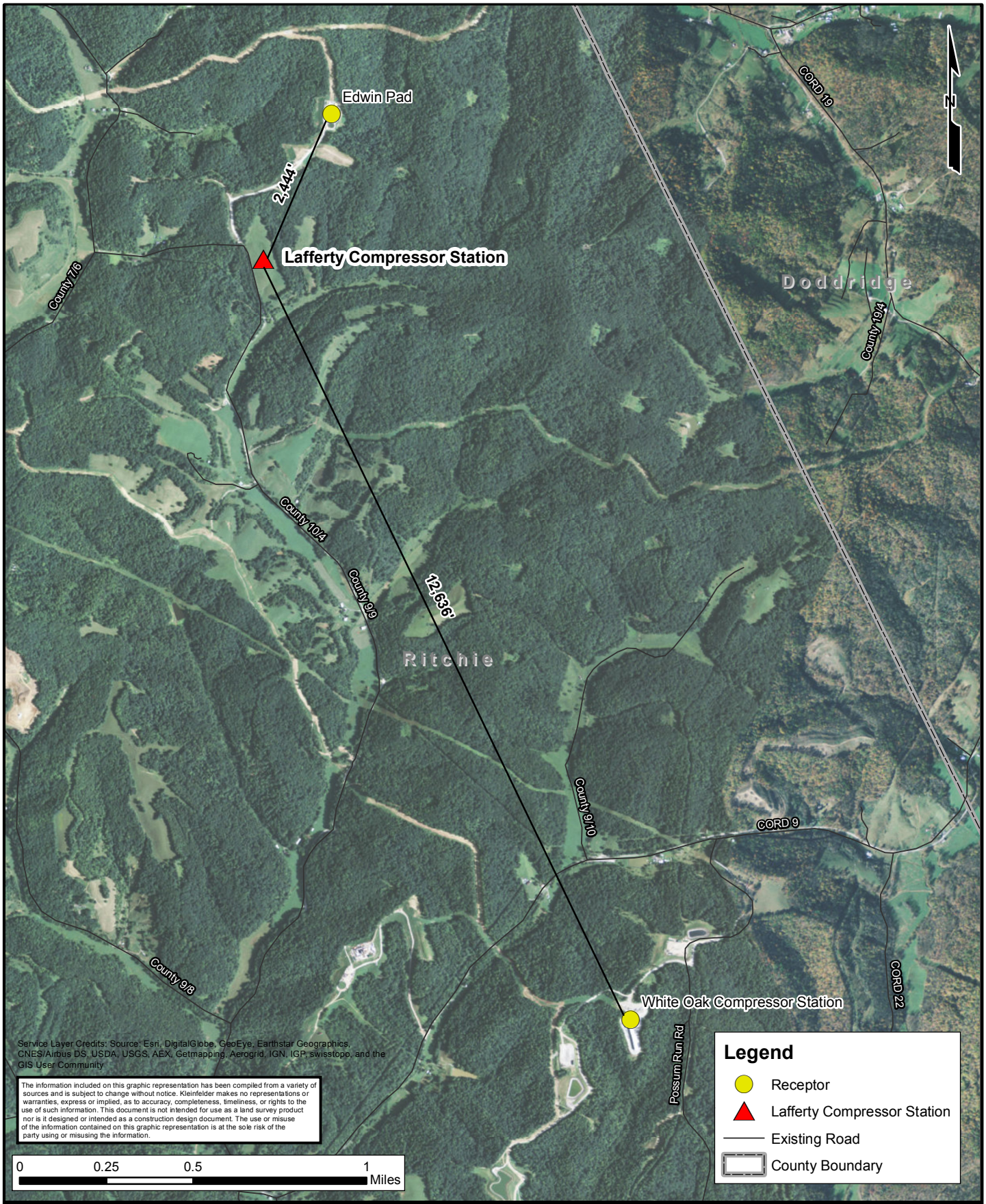
1. Common Control: Only those facilities that are owned and managed by Antero were included in the aggregation discussion. This includes Antero Resources Corporation production facilities in addition to the Antero Midstream LLC midstream facilities.

2. SIC Code: The Lafferty 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 White Oak Compressor station which is 2.4 miles southeast 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 Edwin Pad 2,444 feet to the northeast.

3. Contiguous or Adjacent: The land between the Lafferty 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. Secondly, although most of the Lafferty Compressor Station land parcel border is not adjacent to any parcels operated by Antero, the north border of the Lafferty Compressor Station land parcel is adjacent to the land parcel for the Edwin Pad facility operating under 1311. The actual pad locations for the Lafferty Compressor Station and the Edwin Pad are 2,444 feet apart and thus not contiguous.

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

Although a portion of their land parcel borders are adjacent, the Lafferty Compressor Station and Edwin 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.



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PROJECT NO.	20161767.001A
DRAWN:	9/30/2015
DRAWN BY:	B. McDavid
CHECKED BY:	M. Steyskal
FILE NAME:	Lafferty_ClosestReceptor.mxd

Antero Midstream LLC

Lafferty Compressor Station
Ritchie 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

140532521

AUTHENTICATION: 1328067

DATE: 04-29-14

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

Attachment B.
Area Map

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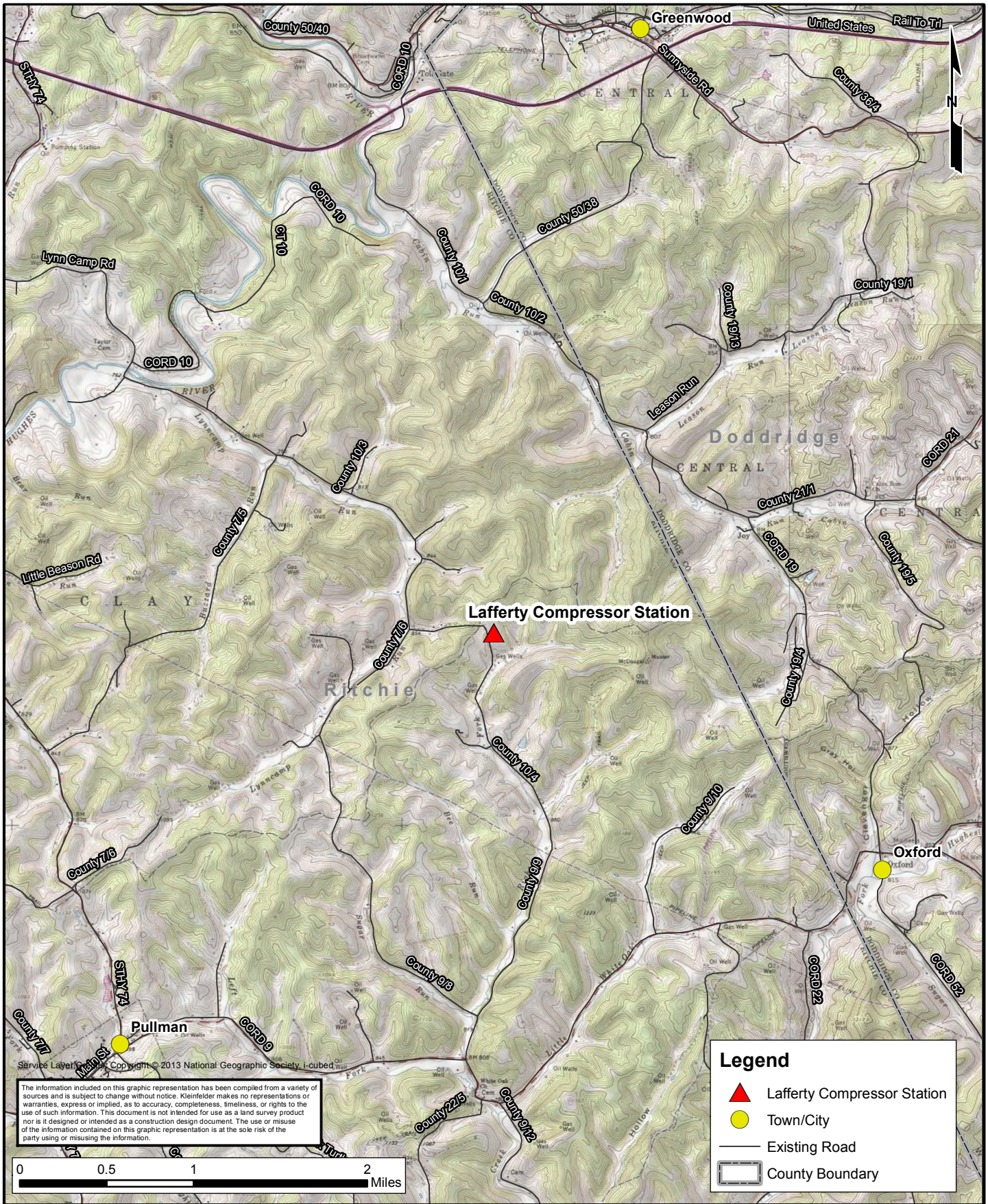
PROJECT NO.	20161767.001A
DRAWN:	9/30/2015
DRAWN BY:	B. McDavid
CHECKED BY:	M. Steyskal
FILE NAME:	Lafferty_Receptor_Aerial.mxd

Antero Midstream LLC

Lafferty Compressor Station
Ritchie County, West Virginia

FIGURE



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www.kleinfelder.com

PROJECT NO.	20161767.001A
DRAWN:	9/30/2015
DRAWN BY:	B. McDavid
CHECKED BY:	M. Steyskal
FILE NAME:	LaffertyCompressor_Topo.mxd

Antero Midstream LLC

Lafferty Compressor Station
Ritchie County, West Virginia

FIGURE

Attachment C.
Installation and Startup Schedule

Lafferty Compressor Station – Installation and Startup Schedule

The Lafferty Compressor Station will be a new facility located in Ritchie County, WV, approximately 5.3 miles southeast of Pennsboro, WV. Ground clearing and other site preparation activities occurred around January 2016. The modifications requested in this application will be implemented during the initial installation of the facility, otherwise equipment will be installed per permit R13-3285. Facility operations are scheduled to begin on or around November 2016.

Attachment D.
Regulatory Discussion

Lafferty 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)). Storage vessels with a design capacity less than 1,589.874 m3 do not apply to this subpart if they are used store condensate prior to custody transfer. The condensate and produced water storage tanks at the Lafferty Compressor Station will be 64 m^3. The settler tank is 79 m^3, but stores condensate prior to custody transfer. Therefore, Subpart Kb does not apply to the Lafferty 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 generator at the Lafferty Compressor Station will 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 Lafferty Compressor Station has not been constructed yet.

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 Lafferty Compressor Station has not been constructed yet.

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

Applicability: Subpart JJJJ applies to lean 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 Lafferty Compressor Station as the compressor engines will be installed in 2016 and are new engines 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 generator at the Lafferty Compressor Station will have a heat input rating less than 10 million Btu per hour, Subpart KKKK does not apply.

VII. *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, Subpart OOOOa applies to storage vessel affected facilities with individual tank emissions greater than 6 tons per year (§60.5365a(e)). Finally, the collection of fugitive emissions components at a compressor station is an affected facility under this Subpart ((§60.5365a(j)). Thus, Subpart OOOOa applies to the Lafferty Compressor Station as it is a compressor station that will be constructed after September 18, 2015 and has reciprocating compressors and a settler tank that has controlled VOC potential to emit greater than six (6) tons per year. The pneumatic controllers installed at Lafferty Compressor Station are air-actuated and therefore exempt from the requirements of this subpart.

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 Lafferty Compressor Station because none of the components will 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 Lafferty Compressor Station, and because it is an area source of HAP emissions, the two (2) TEG dehydrators will be applicable sources under Subpart HH (§63.760(b)(2)). However, actual benzene emissions from the dehydrators at the Lafferty Compressor Station will be 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 Lafferty Compressor Station as it is not a major source of HAP emissions. Further, the Lafferty Compressor Station would be 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 Lafferty 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 Lafferty 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 Lafferty 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 Lafferty 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 Lafferty 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 Lafferty 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*

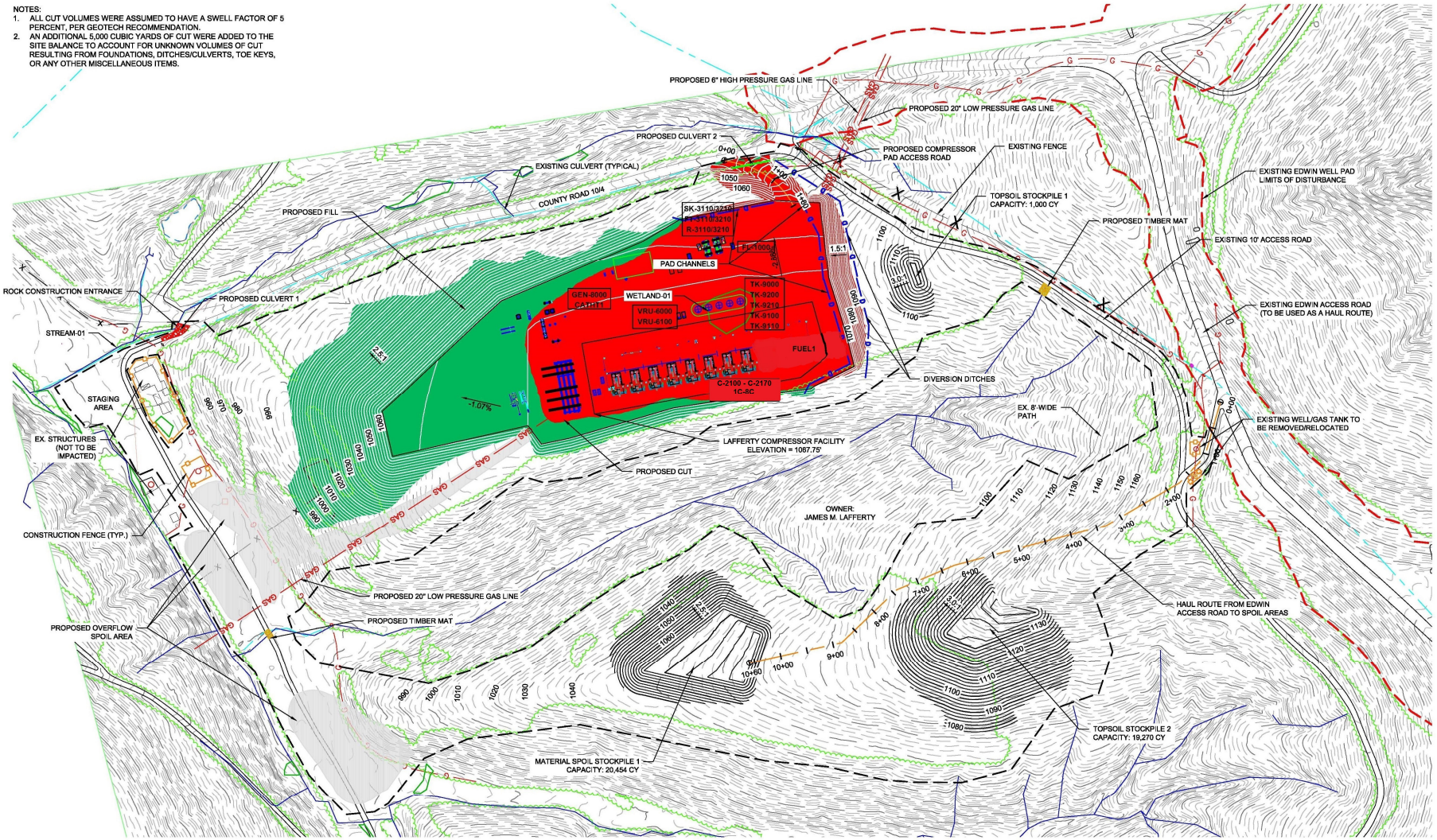
XIII. *45CSR34 – Emission Standards for Hazardous Air Pollutants for Source Categories Pursuant to 40 CFR, Part 63*

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

XV. *45CSR42 – Greenhouse Gas Emissions Inventory*

Attachment E.
Plot Plan

NOTES:
1. ALL CUT VOLUMES WERE ASSUMED TO HAVE A SWELL FACTOR OF 5 PERCENT, PER GEOTECH RECOMMENDATION.
2. AN ADDITIONAL 5,000 CUBIC YARDS OF CUT WERE ADDED TO THE SITE BALANCE TO ACCOUNT FOR UNKNOWN VOLUMES OF CUT RESULTING FROM FOUNDATIONS, DITCHES/CULVERTS, TOE KEYS, OR ANY OTHER MISCELLANEOUS ITEMS.



LEGEND

- PROPERTY LINE
- EXISTING MINOR CONTOUR (2')
- EXISTING MAJOR CONTOUR (10')
- EXISTING STRUCTURE
- EXISTING GAS LINE
- PROPOSED MINOR CONTOUR (2')
- PROPOSED MAJOR CONTOUR (10')
- PROPOSED ROAD CENTERLINE
- PROPOSED CUT
- PROPOSED FILL
- PROPOSED LIMITS OF DISTURBANCE
- PROPOSED GAS LINE
- PROPOSED CONSTRUCTION FENCE

GRADES (XH:1V)	CUT	FILL
COMPRESSOR PAD	1.5	2.5
ACCESS ROADS	2	2.5
SPOIL PILES	2	2.5
TOPSOIL PILES	3	3

LIMITS OF DISTURBANCE	29.50 AC
TREE CLEARING LIMITS	7.50 AC

IMPACTS	
STREAM-01	20 LF
WETLAND-01	5176 SF

Lafferty CF QUANTITIES						
DESCRIPTION	*CUT (CY)	FILL (CY)	TOPSOIL (CY)	BASE (CY)	SPOIL (CY)	BORROW (CY)
Compressor Pad	98540	81902	13936	11127	13829	N/A
Access Road	1588	2	364	153	1374	N/A
Material Spoil	0	20454	3071	0	N/A	20454
Topsoil	0	20270	2899	0	N/A	N/A
Foundations, Ditches, ETC.	5250	0	0	0	5250	N/A
TOTALS	105378	122628	20270	11280	20454	20454
		TOTAL FILL (CY)				0

*ASSUMED 5% SWELL FACTOR

KLEINFELDER
Bright People. Right Solutions.
230 Executive Drive, Suite 122
Cranberry Township, PA 16066
Phone: 724-772-7072
www.kleinfelder.com

Signed By: #### # ####

REVISIONS

REV	DESCRIPTION	DSN DWN	CHK APP	DATE

PRELIMINARY PLANS
NOT FOR CONSTRUCTION

SCALE VERIFICATION
1 INCH
ADJUST SCALE ACCORDINGLY IF DISTANCE PLOTS DIFFERENTLY

0 100 200 300
SCALE: 1" = 100' SCALE IN FEET
ORIGINAL DRAWING SIZE IS 22 x 34

OVERALL SITE PLAN

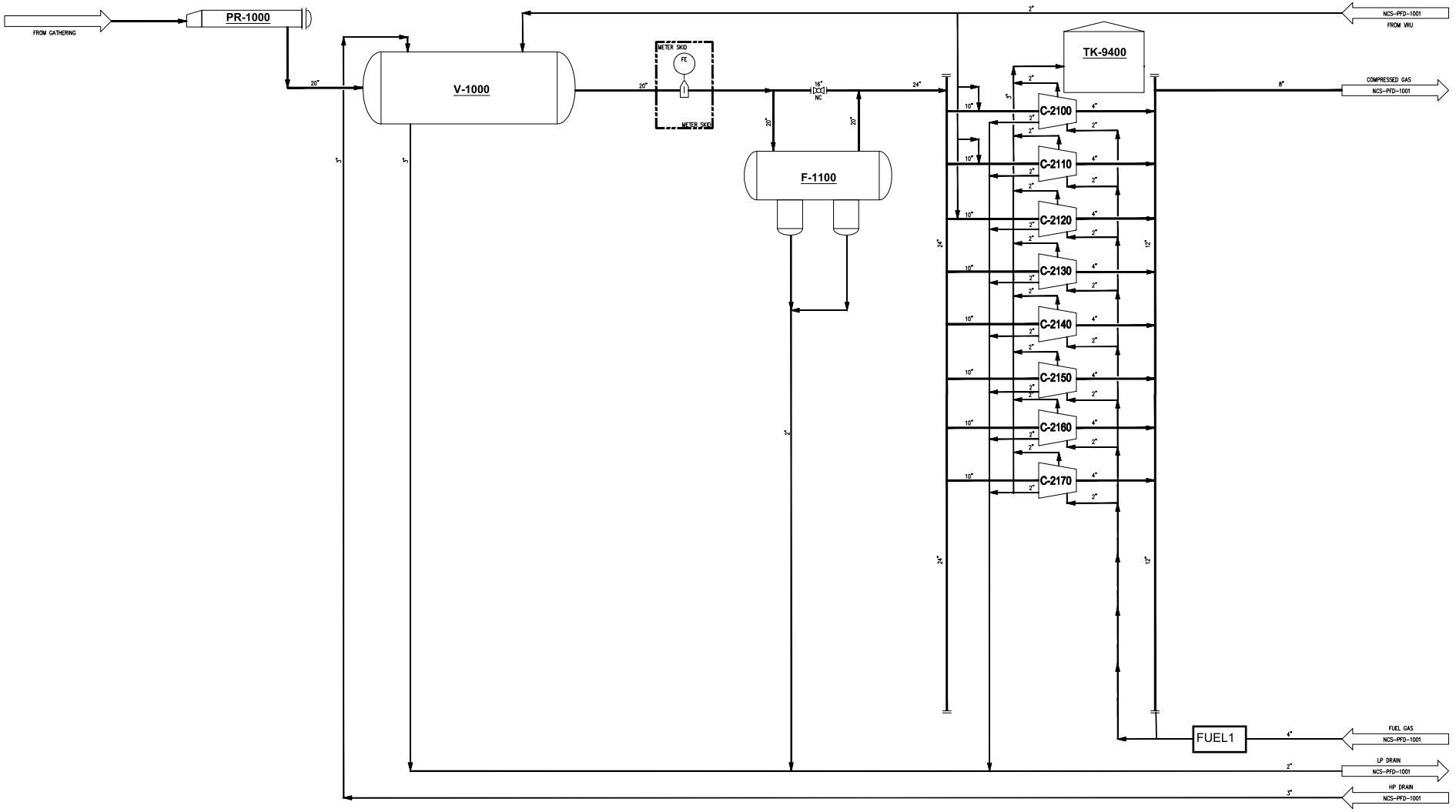
LAFFERTY CF
RITCHIE COUNTY
WEST VIRGINIA

Antero Resources

PROJECT NO.	20160328
ISSUE DATE	08/27/2015
CURRENT REVISION	-
DESIGNED BY	AJD
DRAWN BY	AJD
CHECKED BY	-
APPROVED BY	TWW

SHEET 1 of 2

Attachment F.
Process Flow Diagram



NOTES:

REFERENCE DRAWINGS	
DWG. NO.	TITLE

REVISIONS							
NO.	DESCRIPTION	BY	DATE	CHK.	DATE	APPR.	DATE
B	ISSUED FOR AIR PERMIT	AC	06/19/14	LW	06/19/14	PS	06/19/14
A	ISSUED FOR REVIEW	AC	05/08/14	JW	05/08/14	PS	05/08/14

Antero Resources

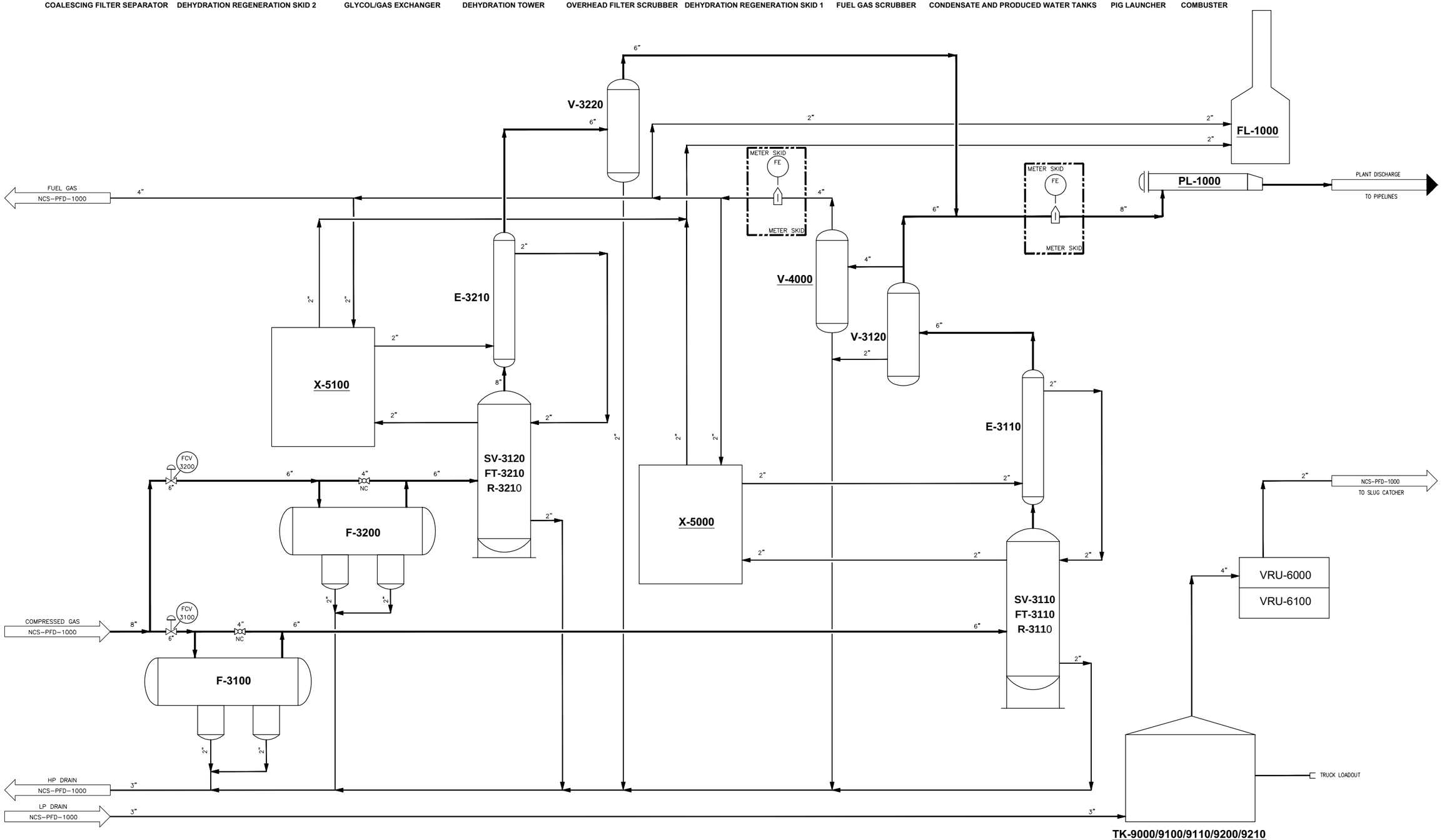
KANUNA VENTURES LLC
WESTMINSTER, COLORADO
303-451-7574
BY: KANUNA DESIGN LLC.

PROCESS FLOW DIAGRAM

DRAWN BY: A. COOLEY	CHECKED: J. WARMAN	APPROVED: P. STOCKEBRAND
CREATION DATE: 05/05/14	CHECK DATE: 05/05/14	APPR. DATE: 05/05/14
Proj. No.: 4083.0164.00	DWG. No.: TCS-PFD-1000	SHEET No.: 1 OF 2
SCALE: NONE		B

PLOT TIME/DATE: June 19, 2014
LAST SAVED: 06/19/14 BY: Alex Cooley
FILE LOCATION: K:\PROJECTS\ANTERO APPALACHIAN RESOURCES\4083.0164.00 - NICHOLS CS\1000-PFD-PID\NCS-PFD-1000.DWG

F-3100/3200 COALESCING FILTER SEPARATOR | **X-5100** DEHYDRATION REGENERATION SKID 2 | **E-3110/3210** GLYCOL/GAS EXCHANGER | **V-3110/3210** DEHYDRATION TOWER | **V-3120/3220** OVERHEAD FILTER SCRUBBER | **X-5000** DEHYDRATION REGENERATION SKID 1 | **V-4000** FUEL GAS SCRUBBER | **TK-9000/9100/9110/9200/9210** CONDENSATE AND PRODUCED WATER TANKS | **PL-1000** PIG LAUNCHER | **FL-1000** COMBUSTER



NOTES:

REFERENCE DRAWINGS	
DWG. NO.	TITLE

REVISIONS						
NO.	DESCRIPTION	BY	DATE	CHK.	DATE	APPR.	DATE
B	ISSUED FOR AIR PERMIT	AC	06/19/14	LW	06/19/14	PS	06/19/14
A	ISSUED FOR REVIEW	AC	05/06/14	JW	05/06/14	PS	05/06-14

Antero Resources

KAHUNA VENTURES LLC
WESTMINSTER, CO 80021
303-451-7374
BY: KAHUNA DESIGN LLC.

PROCESS FLOW DIAGRAM

DRAWN BY: A. COOLEY	CHECKED: J. WARMAN	APPROVED: P. STOCKEBRAND
CREATION DATE: 05/05/14	CHECK DATE: 05/05/14	APPR. DATE: 05/06/14
Proj. No.: 4083.0164.00	DWG. No.: TCS-PFD-1001	SHEET No. 2 OF 2
SCALE: NONE		B

PLOT TIME/DATE: June 19, 2014
LAST SAVED: 06/18/14 BY: Abra Cooley
FILE LOCATION:N:\PROJECTS\ANTERO APPALACHIAN RESOURCES\4083.0164.00 - NICHOLS CS\1000-PFD-PID\NCS-PFD-1001.DWG

Attachment G.
Process Description

Lafferty Compressor Station – Process Description

The Lafferty Compressor Station will be located in Ritchie County, West Virginia. Gas from surrounding pipelines will enter the facility through one (1) receiver and associated slug catcher. From there, the gas is metered and routed through a filter separator. Any produced liquids from the scrubber or separator are sent to the 500 barrel settling tank (TK-9000). Gas from the filter separator is sent to one (1) of eight (8) 2,500 hp compressor engines (C-2100 – C-2170). The eight (8) compressor engines are controlled by oxidation catalysts (1C – 8C). Fuel gas for the compressor engines will be treater 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 high pressure gas is sent to one of the two (2) TEG dehydrators.

Each TEG dehydrator contains a flash gas tank (FT-3110 & FT-3210) and 1.5 MMBtu/hr reboiler (R-3110 & R-3210). Each dehydrator has a design rate of 110 MMscf/day. Within the dehydrator unit, vent gas from the flash gas tank (FT-3110 & FT-3210) is routed to the reboiler (R-3110 & R-3210) 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 vapor recovery units (VRU-6000 and VRU-6100) via the storage tanks (TK-9000 through TK-9210) and thus controlled by 98%. Combustion emissions from each reboiler are routed to the atmosphere. The dehydrator still vents (SV-3110 & SV-3210) are controlled by a flare with at least 98% control efficiency (FL-1000). 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 the high pressure facility discharge pipeline.

All produced fluids enter one (1) 500 barrel settling tank (TK-9000) where the fluids settle out as either condensate or produced water. The produced water goes to two (2) 400 barrel produced water tanks (TK-9100 – TK-9110) and the condensate goes to two (2) 400 barrel condensate tanks (TK-9200 – TK-9210). 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 primary vapor recovery unit (VRU-6000) where tank vapors are collected and recycled back into the gas system right before the initial filter scrubber. A second vapor recovery unit (VRU-6100) is used as back-up to the primary vapor recovery unit. The produced fluids are trucked out via tanker trucks as needed (LDOUT1). The loading emissions are uncontrolled. The anticipated production is 150 barrels per day of condensate and 45 barrels per day of produced water.

One (1) 600 kWe microturbine generator will be used at the facility. The Capstone C600 unit is comprised of three (3) 200 kWe units that can be operated individually. Likely, all three units will not be operating 8,760 hours per year; however, emissions were calculated as such for maximum flexibility. The fuel line for the generators will be heated by a small catalytic heater (CATHT1) with a burner rating of 24 Btu/hr.

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

There will also be small storage tanks located at the facility. Their ID number, description, and exact size are listed in the table below.

Tag Number	Description	Gallons
TK-9300 & TK-9320	Compressor Skid Oily Water Tanks	1,000 each
TK-9310 & TK-9330	Used Oil Tank	500 each
TK-9410	TEG Make-Up Tank	1,000
TK-9420	Compressor Coolant Tank	2,000
TK-9430	Engine Lube Oil Tank	2,000
TK-9440	Compressor Lube Oil Tank	2,000
TK-9400	Compressor Waste Oil Tank	4,200

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.

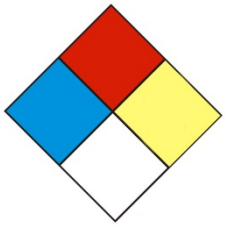
First Aid: Ingestion (Swallowing)
First aid is not required, normally. If spontaneous vomiting occurs, lean the victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. If symptoms develop, seek medical attention.

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.

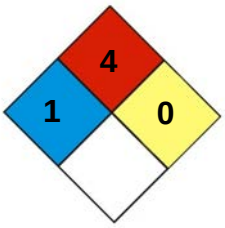
First Aid: Ingestion (swallowing)

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

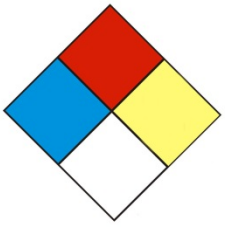
The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List:

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

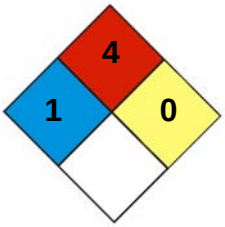
First Aid: Ingestion

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

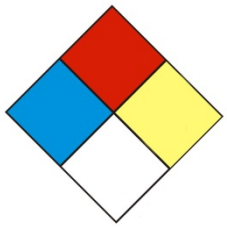
SAFETY DATA SHEET

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.

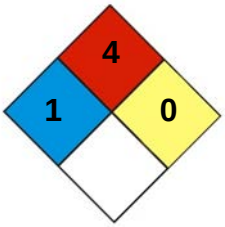
First Aid: Ingestion

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

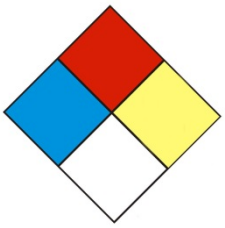
The following components appear on one or more of the following state hazardous substances lists:

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

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-2100	1E	Compressor Engine #1	2016	2,500 hp	Modified	Ox Cat (1C)
C-2110	2E	Compressor Engine #2	2016	2,500 hp	Modified	Ox Cat (2C)
C-2120	3E	Compressor Engine #3	2016	2,500 hp	Modified	Ox Cat (3C)
C-2130	4E	Compressor Engine #4	2016	2,500 hp	Modified	Ox Cat (4C)
C-2140	5E	Compressor Engine #5	2016	2,500 hp	Modified	Ox Cat (5C)
C-2150	6E	Compressor Engine #6	2016	2,500 hp	Modified	Ox Cat (6C)
C-2160	7E	Compressor Engine #7	2016	2,500 hp	Modified	Ox Cat (7C)
C-2170	8E	Compressor Engine #8	2016	2,500 hp	Modified	Ox Cat (8C)
C-2180	9E	Compressor Engine #9	2016	1,680 hp	Removal	NSCR (9C)
C-2190	10E	Compressor Engine #10	2016	1,680 hp	Removal	NSCR(10C)
C-2200	11E	Compressor Engine #11	2016	1,680 hp	Removal	NSCR(11C)
C-2210	12E	Compressor Engine #12	2016	1,680 hp	Removal	NSCR(12C)
C-2220	13E	Compressor Engine #13	2016	1,680 hp	Removal	NSCR(13C)
G-8000	14E	Microturbine Generator #1	2016	600 kWe	NA	None
SV-3110	15E	Dehydrator Still Vent #1	2016	110 MMscfd	Modified	FL-1000 (14C)
FT-3110	16E	Dehydrator Flash Tank #1	2016	110 MMscfd	Modified	R-3110 (17E)
R-3110	17E	Dehydrator Reboiler #1	2016	1.5 mmbtu/hr	Modified	None
SV-3210	18E	Dehydrator Still Vent #2	2016	110 MMscfd	Modified	FL-1000 (14C)
FT-3210	19E	Dehydrator Flash Tank #2	2016	110 MMscfd	Modified	R-3210 (20E)
R-3210	20E	Dehydrator Reboiler #2	2016	1.5 mmbtu/hr	Modified	None
TK-9000	21E	Settling Tank 1	2016	500 barrel	NA	VRU-6000 & VRU-6100 (15C & 16C)
TK-9200	22E	Condensate Tank 1	2016	400 barrel	NA	VRU-6000 & VRU-6100 (15C & 16C)
TK-9210	23E	Condensate Tank 2	2016	400 barrel	NA	VRU-6000 & VRU-6100 ((15C & 16C)

TK-9100	24E	Produced Water Tank 1	2016	400 barrel	NA	VRU-6000 & VRU-6100 (15C & 16C)
TK-9110	25E	Produced Water Tank 2	2016	400 barrel	NA	VRU-6000 & VRU-6100 (15C & 16C)
CATHT1	26E	Catalytic Heater for Generator Fuel	2016	0.024 MMBtu/hr	NA	None
FUEL1	28E	Fuel Conditioning Heater	2016	0.5 MMBtu/hr	New	None
-----	-----	Oxidation Catalyst for Compressor #1	2016	-----	Modified	1C
-----	-----	Oxidation Catalyst for Compressor #2	2016	-----	Modified	2C
-----	-----	Oxidation Catalyst for Compressor #3	2016	-----	Modified	3C
-----	-----	Oxidation Catalyst for Compressor #4	2016	-----	Modified	4C
-----	-----	Oxidation Catalyst for Compressor #5	2016	-----	Modified	5C
----	----	Oxidation Catalyst for Compressor #6	2016	----	Modified	6C
----	----	Oxidation Catalyst for Compressor #7	2016	----	Modified	7C
----	----	Oxidation Catalyst for Compressor #8	2016	----	Modified	8C
----	----	NSCR Catalyst for Compressor #9	2016	----	Removal	9C
----	----	NSCR Catalyst for Compressor #10	2016	----	Removal	10C
----	----	NSCR Catalyst for Compressor #11	2016	----	Removal	11C
----	----	NSCR Catalyst for Compressor #12	2016	----	Removal	12C
----	----	NSCR Catalyst for Compressor #13	2016	----	Removal	13C
FL-1000	27E	Flare Combustion Device 1	2016	9.2 MMBtu/hr	NA	14C
VRU-6000	-----	Vapor Recovery Unit 1	2016	TBD	NA	15C
VRU-6100	----	Vapor Recovery Unit 2	2016	TBD	NA	16C

[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-2100	Compressor engine 1	1C	Oxidation catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	1.65 14.44 2.26 0.17 0.01 1.21 0.88 2811	7.24 63.25 9.90 0.75 0.04 5.32 3.86 12324	1.65 0.88 1.49 0.17 0.01 0.39 0.17 2811	7.24 3.86 6.52 0.75 0.04 1.69 0.72 12324	Gas/Vapor	EE	
2E	Upward Vertical Stack	C-2110	Compressor engine 2	2C	Oxidation catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	1.65 14.44 2.26 0.17 0.01 1.21 0.88 2811	7.24 63.25 9.90 0.75 0.04 5.32 3.86 12324	1.65 0.88 1.49 0.17 0.01 0.39 0.17 2811	7.24 3.86 6.52 0.75 0.04 1.69 0.72 12324	Gas/Vapor	EE	
3E	Upward Vertical Stack	C-2120	Compressor engine 3	3C	Oxidation catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	1.65 14.44 2.26 0.17 0.01 1.21 0.88 2811	7.24 63.25 9.90 0.75 0.04 5.32 3.86 12324	1.65 0.88 1.49 0.17 0.01 0.39 0.17 2811	7.24 3.86 6.52 0.75 0.04 1.69 0.72 12324	Gas/Vapor	EE	

4E	Upward Vertical Stack	C-2130	Com-pressor engine 4	4C	Oxidation catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	1.65 14.44 2.26 0.17 0.01 1.21 0.88 2811	7.24 63.25 9.90 0.75 0.04 5.32 3.86 12324	1.65 0.88 1.49 0.17 0.01 0.39 0.17 2811	7.24 3.86 6.52 0.75 0.04 1.69 0.72 12324	Gas/Vapor	EE	
5E	Upward Vertical Stack	C-2140	Com-pressor engine 5	5C	Oxidation catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	1.65 14.44 2.26 0.17 0.01 1.21 0.88 2811	7.24 63.25 9.90 0.75 0.04 5.32 3.86 12324	1.65 0.88 1.49 0.17 0.01 0.39 0.17 2811	7.24 3.86 6.52 0.75 0.04 1.69 0.72 12324	Gas/Vapor	EE	
6E	Upward Vertical Stack	C-2150	Com-pressor engine 6	6C	Oxidation catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	1.65 14.44 2.26 0.17 0.01 1.21 0.88 2811	7.24 63.25 9.90 0.75 0.04 5.32 3.86 12324	1.65 0.88 1.49 0.17 0.01 0.39 0.17 2811	7.24 3.86 6.52 0.75 0.04 1.69 0.72 12324	Gas/Vapor	EE	
7E	Upward Vertical Stack	C-2160	Com-pressor engine 7	7C	Oxidation catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	1.65 14.44 2.26 0.17 0.01 1.21 0.88 2811	7.24 63.25 9.90 0.75 0.04 5.32 3.86 12324	1.65 0.88 1.49 0.17 0.01 0.39 0.17 2811	7.24 3.86 6.52 0.75 0.04 1.69 0.72 12324	Gas/Vapor	EE	

8E	Upward Vertical Stack	C-2170	Com-pressor engine 8	8C	Oxidation catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	1.65 14.44 2.26 0.17 0.01 1.21 0.88 2811	7.24 63.25 9.90 0.75 0.04 5.32 3.86 12324	1.65 0.88 1.49 0.17 0.01 0.39 0.17 2811	7.24 3.86 6.52 0.75 0.04 1.69 0.72 12324	Gas/Vapor	EE	
14E	Upward Vertical Stack	G8000	Microtu rbine Genera tor	----	----	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	0.24 0.66 0.06 0.04 0.02 0.006 0.004 799	1.05 2.89 0.26 0.18 0.09 0.03 0.02 3499	0.24 0.66 0.06 0.04 0.02 0.006 0.004 799	1.05 2.89 0.26 0.18 0.09 0.03 0.02 3499	Gas/Vapor	EE	
15E	Upward Vertical Stack	SV-3110	Dehydr ator Still Vent 1	14C	Flare-98% Control	C	8,760	VOC Total HAPs Benzene Toluene Ethylbenzene Xylenes n-Hexane CO2e	11.13 3.03 0.65 1.43 0.002 0.38 0.57 461	48.73 13.27 2.86 6.26 0.007 1.65 2.49 2021	See 27E emissi ons		Gas/Vapor	EE	
16E	Used for fuel in 17E	FT-3110	Dehydr ator Flash Gas 1	Used for Fuel in 17E	98% Control	C	8,760	VOC Total HAPs Benzene Toluene Ethylbenzene Xylenes n-Hexane CO2e	47.79 1.53 0.05 0.07 5E-5 0.006 1.41 2866	209.3 6.72 0.23 0.29 0.0002 0.03 6.18 12554	See 17E emissi ons		Gas/Vapor	EE	

17E	Upward Vertical Stack	R-3110	Dehydrator Reboiler 1	---	----	C	8,760	NOx CO VOC PM10 SO2 Total HAPs CO2e	0.18 0.15 0.01 0.01 0.001 0.003 176.1	0.81 0.68 0.04 0.06 0.005 0.02 771	0.18 0.15 0.97 0.01 0.001 0.03 235	0.81 0.68 4.23 0.06 0.005 0.15 1029	Gas/Vapor	EE	
18E	Upward Vertical Stack	SV-3210	Dehydrator Still Vent 2	14C	Flare-98% Control	C	8,760	VOC Total HAPs Benzene Toluene Ethylbenzene Xylenes n-Hexane CO2e	11.13 3.03 0.65 1.43 0.002 0.38 0.57 461	48.73 13.27 2.86 6.26 0.007 1.65 2.49 2021	See 27E emissions		Gas/Vapor	EE	
19E	Used for fuel in 20E	FT-3210	Dehydrator Flash Gas 2	Used for Fuel in 20E	98% Control	C	8,760	VOC Total HAPs Benzene Toluene Ethylbenzene Xylenes n-Hexane CO2e	47.79 1.53 0.05 0.07 5E-5 0.006 1.41 2866	209.3 6.72 0.23 0.29 0.0002 0.03 6.18 12554	See 17E emissions		Gas/Vapor	EE	
20E	Upward Vertical Stack	R-3210	Dehydrator Reboiler 2	---	----	C	8,760	NOx CO VOC PM10 SO2 Total HAPs CO2e	0.18 0.15 0.01 0.01 0.001 0.003 176.1	0.81 0.68 0.04 0.06 0.005 0.02 771	0.18 0.15 0.97 0.01 0.001 0.03 235	0.81 0.68 4.23 0.06 0.005 0.15 1029	Gas/Vapor	EE	
21E	Upward Vertical Stack	TK-9000	Settler Tank	13C	VRU-98% capture	C	8,760	VOC Total HAPs CO2e	101.0 3.51 434	442.5 15.39 1901	2.02 0.070 8.9	8.85 0.31 39	Gas/Vapor	EE	

22E	Upward Vertical Stack	TK-9200	Condensate Tank 1	13C	VRU-98% capture	C	8,760	VOC Total HAPs CO2e	1.10 3.1e-3 0.67	4.80 1.37e-2 2.95	0.022 6.28e-5 0.016	0.10 2.75e-4 0.068	Gas/Vapor	EE	
23E	Upward Vertical Stack	TK-9210	Condensate Tank 2	13C	VRU-98% capture	C	8,760	VOC Total HAPs CO2e	1.10 3.1e-3 0.67	4.80 1.37e-2 2.95	0.022 6.28e-5 0.016	0.10 2.75e-4 0.068	Gas/Vapor	EE	
24E	Upward Vertical Stack	TK-9100	Produced Water Tank 1	13C	VRU-98% capture	C	8,760	VOC Total HAPs CO2e	7.6e-5 6.1e-8 3.0e-3	3.3e-4 2.7e-7 0.013	1.5e-6 1.2e-9 9.9e-5	6.6e-6 5.3e-9 4.3e-4	Gas/Vapor	EE	
25E	Upward Vertical Stack	TK-9110	Produced Water Tank 2	13C	VRU-98% capture	C	8,760	VOC Total HAPs CO2e	7.6e-5 6.1e-8 3.0e-3	3.3e-4 2.7e-7 0.013	1.5e-6 1.2e-9 9.9e-5	6.6e-6 5.3e-9 4.3e-4	Gas/Vapor	EE	
26E	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 6 E-5 2 E-6 2.82	0.013 0.011 7.1 E-4 0.001 7.7 E-5 2.4 E-4 1 E-5 12	0.0029 0.0025 1.6 E-4 2.2 E-4 1.8 E-5 6 E-5 2 E-6 2.82	0.013 0.011 7.1 E-4 0.001 7.7 E-5 2.4 E-4 1 E-5 12	Gas/Vapor	EE	
27E	Upward Vertical Stack	FL-1000	Flare combustion device 1	---	---	C	8,760	NOx CO VOC PM10 Total HAPs CO2e	--- --- --- --- --- ---	--- --- --- --- --- ---	0.63 2.86 0.45 1.3e-4 0.12 1102	2.74 12.51 1.95 5.5e-4 0.53 4826	Gas/Vapor	EE	

28E	Upward Vertical Stack	FUEL1	Fuel Conditioning Heater	---	---	C	8,760	NOx CO VOC PM10 SO2 Total HAPs CO2e	0.061 0.051 0.0034 0.0047 3.7E-4 0.0012 58.69	0.27 0.23 0.015 0.020 0.0016 0.0051 257.1	0.061 0.051 0.0034 0.0047 3.7E-4 0.0012 58.69	0.27 0.23 0.015 0.020 0.0016 0.0051 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).

Attachment J
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) *at operating conditions*	Velocity (fps)	Ground Level *(Height above mean sea level)*	Stack Height [2]	Northing	Easting
1E/1C	1.1	818	16086	282	1068	TBD	4,341.7528	508.0764
2E/2C	1.1	818	16086	282	1068	TBD	4,341.7422	508.0779
3E/3C	1.1	818	16086	282	1068	TBD	4,341.7315	508.0795
4E/4C	1.1	818	16086	282	1068	TBD	4,341.7208	508.0810
5E/5C	1.1	818	16086	282	1068	TBD	4,341.7102	508.0825
6E/6C	1.1	818	16086	282	1068	TBD	4,341.6995	508.0840
7E/7C	1.1	818	16086	282	1068	TBD	4,341.6888	508.0855
8E/8C	1.1	818	16086	282	1068	TBD	4,341.6782	508.0871
14E	0.5	535	4.0 kg/s mass flow	'---	1068	~11	4,341.6041	508.0477
17E	0.75	350	530	20	1068	~18	4,341.6768	508.0249
20E	0.75	350	530	20	1068	~18	4,341.6708	508.0258
26E	0.5	225	47	4	1068	~10	4,341.6041	508.0477
27E	3	1030	2545	6	1068	20	4,341.6608	508.0267
28E	0.5	350	530	20	1068	~18	4,341.7559	508.0713
Note: Points 13E and 16E are grouped into 25E. Points 14E and 17E are grouped into 15E and 18E respectively. Points 19E-23E are sent to the VRUs in a closed loop.								

[1] Give at operating conditions. Include inerts. [2] Release height of emissions above ground level.

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	0.032 0.0032	0.14 0.014	0.032 0.0032	0.14 0.014	EE
Storage Pile Emissions						
Loading/Unloading Operations	VOCs Total HAPs CO2e	44.98 0.13 52.0	6.77 0.019 5.28	44.98 0.13 52.0	6.77 0.019 5.28	EE
Wastewater Treatment Evaporation & Operations						
Equipment Leaks	VOCs Total HAPs CO2e	0.81 0.023 22.5	3.57 0.10 98.6	0.81 0.023 22.5	3.57 0.10 98.6	EE
General Clean-up VOC Emissions						
Other – Venting Episodes	VOCs Total HAPs CO2e	Does not apply	7.51 0.19 714	Does not apply	7.51 0.19 714	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

Compressor Engines

NATURAL GAS COMPRESSOR/GENERATOR ENGINE DATA SHEET

Source Identification Number[1]		1E		2E		3E	
Engine Manufacturer and Model		Caterpillar G3608		Caterpillar G3608		Caterpillar G3608	
Manufacturer's Rated bhp/rpm		2500 bhp/1000 rpm		2500 bhp/1000 rpm		2500 bhp/1000 rpm	
Source Status[2]		MS		MS		MS	
Date Installed/Modified/Removed[3]		November 2016		November 2016		November 2016	
Engine Manufactured/Reconstruction Date[4]		After 7/1/2007		After 7/1/2007		After 7/1/2007	
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No)[5]		No		No		No	
Engine, Fuel and Combustion Data	Engine Type[6]	LB4S		LB4S		LB4S	
	APCD Type[7]	SCR		SCR		SCR	
	Fuel Type[8]	PQ		PQ		PQ	
	H_2S (gr/100 scf)	0		0		0	
	Operating bhp/rpm	2500 bhp/1000 rpm		2500 bhp/1000 rpm		2500 bhp/1000 rpm	
	BSFC (Btu/bhp-hr)	6,850		6,850		6,850	
	Fuel throughput (ft^3/hr)	16,500		16,500		16,500	
	Fuel throughput ($MMft^3$/yr)	114.54		114.54		114.54	
	Operation (hrs/yr)	8,760		8,760		8,760	
Reference[9]	Potential Emissions[10]	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
MD	NO_X	1.65	7.24	1.65	7.24	1.65	7.24
MD	CO	0.88	3.86	0.88	3.86	0.88	3.86
MD	VOC	1.49	6.52	1.49	6.52	1.49	6.52
AP	SO_2	0.010	0.044	0.010	0.044	0.010	0.044
AP	PM_{10}	0.17	0.75	0.17	0.75	0.17	0.75
MD	Formaldehyde	0.17	0.72	0.17	0.72	0.17	0.72

Source Identification Number[1]		4E		5E		6E	
Engine Manufacturer and Model		Caterpillar G3608		Caterpillar G3608		Caterpillar G3608	
Manufacturer's Rated bhp/rpm		2500 bhp/1000 rpm		2500 bhp/1000 rpm		2500 bhp/1000 rpm	
Source Status[2]		MS		MS		MS	
Date Installed/Modified/Removed[3]		November 2016		November 2016		November 2016	
Engine Manufactured/Reconstruction Date[4]		After 7/1/2007		After 7/1/2007		After 7/1/2007	
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No)[5]		No		No		No	
Engine, Fuel and Combustion Data	Engine Type[6]	LB4S		LB4S		LB4S	
	APCD Type[7]	SCR		SCR		SCR	
	Fuel Type[8]	PQ		PQ		PQ	
	H_2S (gr/100 scf)	0		0		0	
	Operating bhp/rpm	2500 bhp/1000 rpm		2500 bhp/1000 rpm		2500 bhp/1000 rpm	
	BSFC (Btu/bhp-hr)	6,850		6,850		6,850	
	Fuel throughput (ft^3/hr)	16,500		16,500		16,500	
	Fuel throughput ($MMft^3$/yr)	114.54		114.54		114.54	
	Operation (hrs/yr)	8,760		8,760		8,760	
Reference[9]	Potential Emissions[10]	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
MD	NO_X	1.65	7.24	1.65	7.24	1.65	7.24
MD	CO	0.88	3.86	0.88	3.86	0.88	3.86
MD	VOC	1.49	6.52	1.49	6.52	1.49	6.52
AP	SO_2	0.010	0.044	0.010	0.044	0.010	0.044
AP	PM_{10}	0.17	0.75	0.17	0.75	0.17	0.75
MD	Formaldehyde	0.17	0.72	0.17	0.72	0.17	0.72

Source Identification Number[1]		7E		8E			
Engine Manufacturer and Model		Caterpillar G3608		Caterpillar G3608			
Manufacturer's Rated bhp/rpm		2500 bhp/1000 rpm		2500 bhp/1000 rpm			
Source Status[2]		MS		MS			
Date Installed/Modified/Removed[3]		November 2016		November 2016			
Engine Manufactured/Reconstruction Date[4]		After 7/1/2007		After 7/1/2007			
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No)[5]		No		No			
Engine, Fuel and Combustion Data	Engine Type[6]	LB4S		LB4S			
	APCD Type[7]	SCR		SCR			
	Fuel Type[8]	PQ		PQ			
	H_2S (gr/100 scf)	0		0			
	Operating bhp/rpm	2500 bhp/1000 rpm		2500 bhp/1000 rpm			
	BSFC (Btu/bhp-hr)	6,850		6,850			
	Fuel throughput (ft^3/hr)	16,500		16,500			
	Fuel throughput ($MMft^3$/yr)	114.54		114.54			
	Operation (hrs/yr)	8,760		8,760			
Reference[9]	Potential Emissions[10]	lbs/hr	tons/yr	lbs/hr	tons/yr		
MD	NO_X	1.65	7.24	1.65	7.24		
MD	CO	0.88	3.86	0.88	3.86		
MD	VOC	1.49	6.52	1.49	6.52		
AP	SO_2	0.010	0.044	0.010	0.044		
AP	PM_{10}	0.17	0.75	0.17	0.75		
MD	Formaldehyde	0.17	0.72	0.17	0.72		

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*.

G3608

GAS COMPRESSION APPLICATION

GAS ENGINE SITE SPECIFIC TECHNICAL DATA
8666

CATERPILLAR®

ENGINE SPEED (rpm):	1000	RATING STRATEGY:	STANDARD
COMPRESSION RATIO:	7.6	RATING LEVEL:	CONTINUOUS
AFTERCOOLER TYPE:	SCAC	FUEL SYSTEM:	GAV
AFTERCOOLER - STAGE 2 INLET (°F):	130		WITH AIR FUEL RATIO CONTROL
AFTERCOOLER - STAGE 1 INLET (°F):	174	**SITE CONDITIONS:**	
JACKET WATER OUTLET (°F):	190	FUEL:	Gas Analysis
ASPIRATION:	TA	FUEL PRESSURE RANGE(psig):	58.0-70.3
COOLING SYSTEM:	JW+1AC, OC+2AC	FUEL METHANE NUMBER:	65.1
CONTROL SYSTEM:	ADEM4	FUEL LHV (Btu/scf):	1039
EXHAUST MANIFOLD:	DRY	ALTITUDE(ft):	1140
COMBUSTION:	LOW EMISSION	MAXIMUM INLET AIR TEMPERATURE(°F):	100
NOx EMISSION LEVEL (g/bhp-hr NOx):	0.3	STANDARD RATED POWER:	2500 bhp@1000rpm
SET POINT TIMING:	17		

			MAXIMUM RATING	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE		
RATING	**NOTES**	**LOAD**	**100%**	**100%**	**75%**	**50%**
ENGINE POWER (WITHOUT FAN)	(1)	bhp	2500	2500	1875	1250
INLET AIR TEMPERATURE		°F	100	100	100	100
ENGINE DATA						
FUEL CONSUMPTION (LHV)	(2)	Btu/bhp-hr	6850	6850	7077	7575
FUEL CONSUMPTION (HHV)	(2)	Btu/bhp-hr	7570	7570	7821	8372
AIR FLOW (@inlet air temp, 14.7 psia) (WET)	(3)(4)	ft3/min	6562	6562	4973	3381
AIR FLOW (WET)	(3)(4)	lb/hr	27899	27899	21142	14374
FUEL FLOW (60ºF, 14.7 psia)		scfm	275	275	213	152
INLET MANIFOLD PRESSURE	(5)	in Hg(abs)	102.9	102.9	77.8	54.3
EXHAUST TEMPERATURE - ENGINE OUTLET	(6)	°F	827	827	870	935
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia) (WET)	(7)(4)	ft3/min	16056	16056	12589	8996
EXHAUST GAS MASS FLOW (WET)	(7)(4)	lb/hr	28710	28710	21771	14823
EMISSIONS DATA - ENGINE OUT						
NOx (as NO2)	(8)(9)	g/bhp-hr	0.30	0.30	0.30	0.30
CO	(8)(9)	g/bhp-hr	2.62	2.62	2.62	2.62
THC (mol. wt. of 15.84)	(8)(9)	g/bhp-hr	4.49	4.49	4.76	4.84
NMHC (mol. wt. of 15.84)	(8)(9)	g/bhp-hr	1.26	1.26	1.33	1.35
NMNEHC (VOCs) (mol. wt. of 15.84)	(8)(9)(10)	g/bhp-hr	0.41	0.41	0.43	0.44
HCHO (Formaldehyde)	(8)(9)	g/bhp-hr	0.16	0.16	0.17	0.20
CO2	(8)(9)	g/bhp-hr	429	429	445	474
EXHAUST OXYGEN	(8)(11)	% DRY	11.6	11.6	11.3	10.9
HEAT REJECTION						
HEAT REJ. TO JACKET WATER (JW)	(12)	Btu/min	27608	27608	23006	18921
HEAT REJ. TO ATMOSPHERE	(12)	Btu/min	9197	9197	9684	9447
HEAT REJ. TO LUBE OIL (OC)	(12)	Btu/min	12834	12834	12204	11129
HEAT REJ. TO A/C - STAGE 1 (1AC)	(12)(13)	Btu/min	25471	25471	13030	3866
HEAT REJ. TO A/C - STAGE 2 (2AC)	(12)(13)	Btu/min	8738	8738	5571	2865

COOLING SYSTEM SIZING CRITERIA			
TOTAL JACKET WATER CIRCUIT (JW+1AC)	(13)(14)	Btu/min	57113
TOTAL STAGE 2 AFTERCOOLER CIRCUIT (OC+2AC)	(13)(14)	Btu/min	24576
A cooling system safety factor of 0% has been added to the cooling system sizing criteria.			

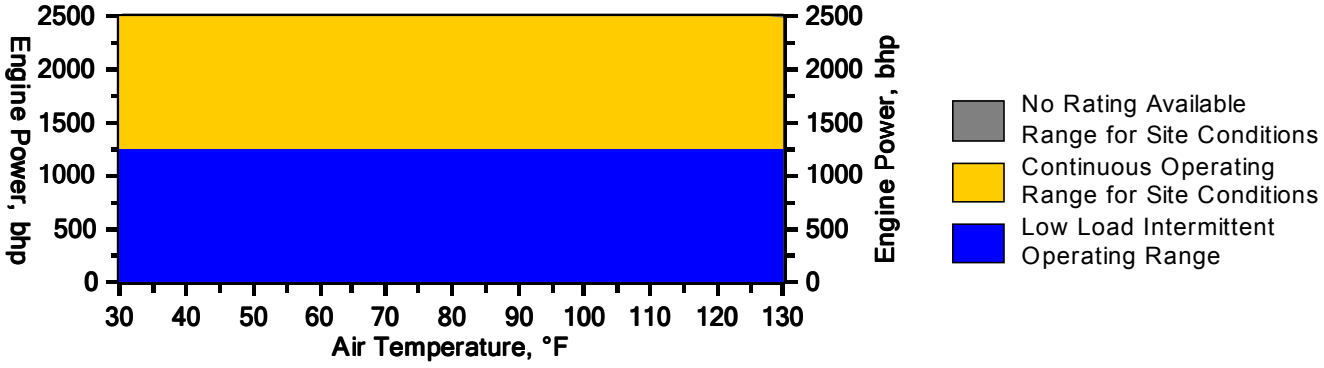
CONDITIONS AND DEFINITIONS

Engine rating obtained and presented in accordance with ISO 3046/1, adjusted for fuel, site altitude and site inlet air temperature. 100% rating at maximum inlet air temperature is the maximum engine capability for the specified fuel at site altitude and maximum site inlet air temperature. Maximum rating is the maximum capability at the specified aftercooler inlet temperature for the specified fuel at site altitude and reduced inlet air temperature. Lowest load point is the lowest continuous duty operating load allowed. No overload permitted at rating shown.

For notes information consult page three.

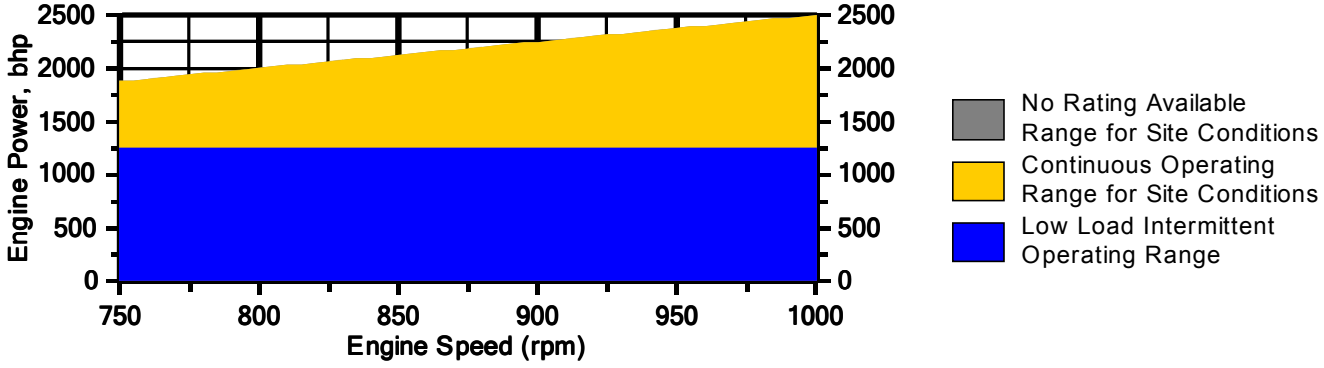
Engine Power vs. Inlet Air Temperature

Data represents temperature sweep at 1140 ft and 1000 rpm



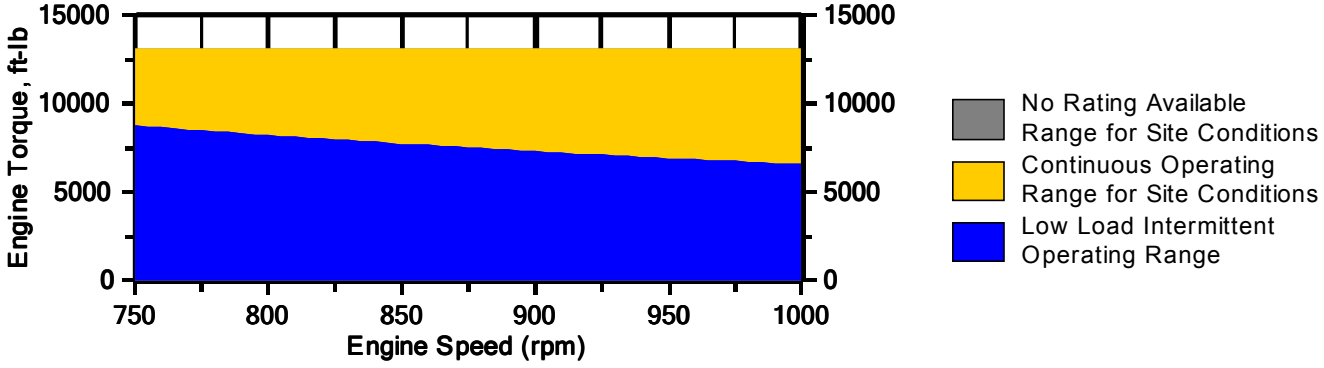
Engine Power vs. Engine Speed

Data represents speed sweep at 1140 ft and 100 ºF



Engine Torque vs. Engine Speed

Data represents speed sweep at 1140 ft and 100 ºF



Note: At site conditions of 1140 ft and 100°F inlet air temp., constant torque can be maintained down to 750 rpm. The minimum speed for loading at these conditions is 750 rpm.

NOTES

1. Engine rating is with two engine driven water pumps. Tolerance is ± 3% of full load.

2. Fuel consumption tolerance is ± 2.5% of full load data.

3. Air flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of ± 5 %.

4. Inlet and Exhaust Restrictions must not exceed A&I limits based on full load flow rates from the standard technical data sheet.

5. Inlet manifold pressure is a nominal value with a tolerance of ± 5 %.

6. Exhaust temperature is a nominal value with a tolerance of (+)63°F, (-)54°F.

7. Exhaust flow value is on a "wet" basis. Flow is a nominal value with a tolerance of ± 6 %.

8. Emissions data is at engine exhaust flange prior to any after treatment.

9. Values listed are higher than nominal levels to allow for instrumentation, measurement, and engine-to-engine variations. They indicate the maximum values expected under steady state conditions. Fuel methane number cannot vary more than ± 3. THC, NMHC, and NMNEHC do not include aldehydes. An oxidation catalyst may be required to meet Federal, State or local CO or HC requirements.

10. VOCs - Volatile organic compounds as defined in US EPA 40 CFR 60, subpart JJJJ

11. Exhaust Oxygen level is the result of adjusting the engine to operate at the specified NOx level. Tolerance is ± 0.5.

12. Heat rejection values are nominal. Tolerances, based on treated water, are ± 10% for jacket water circuit, ± 50% for radiation, ± 20% for lube oil circuit, and ± 5% for aftercooler circuit.

13. Aftercooler heat rejection includes an aftercooler heat rejection factor for the site elevation and inlet air temperature specified. Aftercooler heat rejection values at part load are for reference only. Do not use part load data for heat exchanger sizing.

14. Cooling system sizing criteria are maximum circuit heat rejection for the site, with applied tolerances.

Constituent	Abbrev	Mole %	Norm
Water Vapor	H2O	0.0000	0.0000
Methane	CH4	84.8500	85.0712
Ethane	C2H6	11.1700	11.1991
Propane	C3H8	1.8400	1.8448
Isobutane	iso-C4H1O	0.0300	0.0301
Norbutane	nor-C4H1O	0.5700	0.5715
Isopentane	iso-C5H12	0.1500	0.1504
Norpentane	nor-C5H12	0.1500	0.1504
Hexane	C6H14	0.1000	0.1003
Heptane	C7H16	0.0500	0.0501
Nitrogen	N2	0.7000	0.7018
Carbon Dioxide	CO2	0.1000	0.1003
Hydrogen Sulfide	H2S	0.0000	0.0000
Carbon Monoxide	CO	0.0000	0.0000
Hydrogen	H2	0.0000	0.0000
Oxygen	O2	0.0000	0.0000
Helium	HE	0.0000	0.0000
Neopentane	neo-C5H12	0.0000	0.0000
Octane	C8H18	0.0200	0.0201
Nonane	C9H20	0.0100	0.0100
Ethylene	C2H4	0.0000	0.0000
Propylene	C3H6	0.0000	0.0000
TOTAL (Volume %)		99.7400	100.0001

Fuel Makeup:	Gas Analysis
Unit of Measure:	English

Calculated Fuel Properties

Caterpillar Methane Number:	65.1
Lower Heating Value (Btu/scf):	1039
Higher Heating Value (Btu/scf):	1148
WOBBE Index (Btu/scf):	1289
THC: Free Inert Ratio:	123.67
Total % Inerts (% N2, CO2, He):	0.8%
RPC (%) (To 905 Btu/scf Fuel):	100%
Compressibility Factor:	0.997
Stoich A/F Ratio (Vol/Vol):	10.80
Stoich A/F Ratio (Mass/Mass):	16.64
Specific Gravity (Relative to Air):	0.649
Specific Heat Constant (K):	1.295

CONDITIONS AND DEFINITIONS

Caterpillar Methane Number represents the knock resistance of a gaseous fuel. It should be used with the Caterpillar Fuel Usage Guide for the engine and rating to determine the rating for the fuel specified. A Fuel Usage Guide for each rating is included on page 2 of its standard technical data sheet.

RPC always applies to naturally aspirated (NA) engines, and turbocharged (TA or LE) engines only when they are derated for altitude and ambient site conditions.

Project specific technical data sheets generated by the Caterpillar Gas Engine Rating Pro program take the Caterpillar Methane Number and RPC into account when generating a site rating.

Fuel properties for Btu/scf calculations are at 60F and 14.696 psia.

Caterpillar shall have no liability in law or equity, for damages, consequently or otherwise, arising from use of program and related material or any part thereof.

FUEL LIQUIDS

Field gases, well head gases, and associated gases typically contain liquid water and heavy hydrocarbons entrained in the gas. To prevent detonation and severe damage to the engine, hydrocarbon liquids must not be allowed to enter the engine fuel system. To remove liquids, a liquid separator and coalescing filter are recommended, with an automatic drain and collection tank to prevent contamination of the ground in accordance with local codes and standards.

To avoid water condensation in the engine or fuel lines, limit the relative humidity of water in the fuel to 80% at the minimum fuel operating temperature.

Dehydrators

NATURAL GAS GLYCOL DEHYDRATION UNIT DATA SHEET

General Glycol Dehydration Unit Data		Manufacturer and Model		Exterran	
		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]		November 2016	
		Regenerator Still Vent APCD[4]		FL	
		Fuel HV (Btu/scf)		1,122	
		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
17E	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
15E	Glycol Regenerator Still Vent	GRI-GLYCalc™	VOC	0.22	0.97
		GRI-GLYCalc™	Benzene	0.013	0.057
		GRI-GLYCalc™	Ethylbenzene	0.000023	0.00010
		GRI-GLYCalc™	Toluene	0.029	0.13
		GRI-GLYCalc™	Xylenes	0.0075	0.033
		GRI-GLYCalc™	n-Hexane	0.011	0.050
16E	Flash Gas Tank Vent	GRI-GLYCalc™	VOC	0.96	4.19
		GRI-GLYCalc™	Benzene	0.0010	0.0046
		GRI-GLYCalc™	Ethylbenzene	9.1E-7	4.0E-6
		GRI-GLYCalc™	Toluene	0.0013	0.0057
		GRI-GLYCalc™	Xylenes	0.00010	0.00050
		GRI-GLYCalc™	n-Hexane	0.028	0.12

General Glycol Dehydration Unit Data		Manufacturer and Model		Exterran	
		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]		November 2016	
		Regenerator Still Vent APCD[4]		FL	
		Fuel HV (Btu/scf)		1,122	
		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
20E	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
18E	Glycol Regenerator Still Vent	GRI-GLYCalc™	VOC	0.22	0.97
		GRI-GLYCalc™	Benzene	0.013	0.057
		GRI-GLYCalc™	Ethylbenzene	0.000023	0.00010
		GRI-GLYCalc™	Toluene	0.029	0.13
		GRI-GLYCalc™	Xylenes	0.0075	0.033
		GRI-GLYCalc™	n-Hexane	0.011	0.050
19E	Flash Gas Tank Vent	GRI-GLYCalc™	VOC	0.96	4.19
		GRI-GLYCalc™	Benzene	0.0010	0.0046
		GRI-GLYCalc™	Ethylbenzene	9.1E-7	4.0E-6
		GRI-GLYCalc™	Toluene	0.0013	0.0057
		GRI-GLYCalc™	Xylenes	0.00010	0.00050
		GRI-GLYCalc™	n-Hexane	0.028	0.12

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	
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:	Lafferty Compressor Station Dehydrators (SV-3110 & SV-3210; FT-3110 & FT-3210; R-3110 & R-3210)		
Date of Installation:	November 2016	Annual Operating Hours: 8,760	Burner rating (MMbtu/hr): 1.5
Exhaust Stack Height (ft):	TBD	Stack Diameter (ft): TBD	Stack Temp. (°F): TBD
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 each ____ Water Content ___5.0____ lb/MMSCF		
Lean Glycol:	Circulation rate (gpm) Actual[3] __TBD_____ 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		
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*):

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 - 613 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 - 613 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	0.061	lb/hr	grains/ACF
b.	SO_2	0.00037	lb/hr	grains/ACF
c.	CO	0.051	lb/hr	grains/ACF
d.	PM_{10}	0.0047	lb/hr	grains/ACF
e.	Hydrocarbons		lb/hr	grains/ACF
f.	VOCs	0.0034	lb/hr	grains/ACF
g.	Pb		lb/hr	grains/ACF
h.	Specify other(s)			
	Total HAP (including HCHO)	0.000046	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

Pigging Venting

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 - 0.044 tons VOC per event, 4.17 tons CO2e per event
- compressor startup - 0.005 tons VOC per event, 0.44 tons CO2e per event
- plant shutdown - 0.44 tons VOC per event, 41.72 tons CO2e per event
- pigging venting - 0.004 tons VOC per event, 0.42 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	variable based on event	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 M.
Air Pollution Control Device Sheets

Oxidation Catalysts

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): 1C – 8C

Equipment Information

1. Manufacturer: EMIT Technologies Model No. RT-3615-H	2. Control Device Name: 1C – 8C – Catalysts for C-2100 through C-2170 Type: Oxidation Catalyst
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected: N/A – no capture of pollutants	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: 16,086 ACFM	10. Capacity:
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any. N/A	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal. Replace Catalyst elements when necessary	

Gas Stream Characteristics

14. Are halogenated organics present?	☐ Yes	☒ No
Are particulates present?	☒ Yes	☐ No
Are metals present?	☐ Yes	☒ No

15. Inlet Emission stream parameters:	**Maximum**	**Typical**
Pressure (mmHg):	Not specified	
Heat Content (BTU/scf):	1,400	1,039
Oxygen Content (%):	Not specified	
Moisture Content (%):	Not specified	
Relative Humidity (%):	Not specified	

16. Type of pollutant(s) controlled: ☐ SO_x ☐ Odor
☐ Particulate (type): ☒ Other CO, VOC, HCHO

17. Inlet gas velocity: 282 ft/sec

18. Pollutant specific gravity:

19. Gas flow into the collector:
16,086 ACF @ 818°F and PSIA

20. Gas stream temperature:
Inlet: 818 °F
Outlet: 818 °F

21. Gas flow rate:
Design Maximum: 16,086 ACFM
Average Expected: TBD ACFM

22. Particulate Grain Loading in grains/scf: N/A
Inlet:
Outlet:

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	IN Pollutant		Emission Capture Efficiency %	OUT Pollutant		Control Efficiency %
	lb/hr	grains/acf		lb/hr	grains/acf	
A CO	14.44		--	0.88		94
B VOC	2.26		--	1.49		34
C HCHO	0.88		--	0.17		81

24. Dimensions of stack: Height TBD ft. Diameter 1.10 ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table: Particulate Size Range (microns)	Particle Size Distribution at Inlet to Collector: Weight % for Size Range	Fraction Efficiency of Collector: Weight % for Size Range
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification): None

28. Describe the collection material disposal system: Catalyst elements can be cleaned and/or replaced; materials are not disposed on site.

29. Have you included ***Other Collectores Control Device*** in the Emissions Points Data Summary Sheet? yes

30. **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: **see Attachment O**	RECORDKEEPING: **see Attachment O**
REPORTING: **see Attachment O**	TESTING: **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 or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

31. Manufacturer's Guaranteed Control Efficiency for each air pollutant.
CO: 94%, VOC: 34%, HCHO: 81%. Due to variable load conditions these reduction efficiencies are typical based on expected operating conditions.

32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.
Inlet temperature range is 750 F – 1250 F. Engine must be operated between 50 – 100 % load. A/F ratio controller must be set properly with fuel heating value of around 1400 Btu/scf. Engine lube oil shall contain less than 0.5 wt% sulfated ash. Catalyst must not be exposed to the following: antimony, arsenic, chromium, copper, iron, lead, lithium, magnesium, mercury, nickel, phosphorous, potassium, silicon, sodium, sulfur, tin, zinc.

Attachment N.
Supporting Emissions Calculations

Emission Calculations

Emissions Summary Total

Company:	**Antero Midstream LLC**
Facility Name:	**Lafferty Compressor Station**
Facility Location:	**Ritchie 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	1.65	7.24	14.44	63.25	2.26	9.90	0.010	0.044	0.17	0.75	1.21	5.32	0.88	3.86	12,324
Compressor Engine 2	1.65	7.24	14.44	63.25	2.26	9.90	0.010	0.044	0.17	0.75	1.21	5.32	0.88	3.86	12,324
Compressor Engine 3	1.65	7.24	14.44	63.25	2.26	9.90	0.010	0.044	0.17	0.75	1.21	5.32	0.88	3.86	12,324
Compressor Engine 4	1.65	7.24	14.44	63.25	2.26	9.90	0.010	0.044	0.17	0.75	1.21	5.32	0.88	3.86	12,324
Compressor Engine 5	1.65	7.24	14.44	63.25	2.26	9.90	0.010	0.044	0.17	0.75	1.21	5.32	0.88	3.86	12,324
Compressor Engine 6	1.65	7.24	14.44	63.25	2.26	9.90	0.010	0.044	0.17	0.75	1.21	5.32	0.88	3.86	12,324
Compressor Engine 7	1.65	7.24	14.44	63.25	2.26	9.90	0.010	0.044	0.17	0.75	1.21	5.32	0.88	3.86	12,324
Compressor Engine 8	1.65	7.24	14.44	63.25	2.26	9.90	0.010	0.044	0.17	0.75	1.21	5.32	0.88	3.86	12,324
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
Catalytic Heater for Generator Fuel	0.0029	0.013	0.0025	0.011	0.00016	0.00071	0.000018	0.000077	0.00022	0.0010	0.000055	0.00024	0.0000022	0.000010	12
Dehydrators															
TEG Dehydrator Still Vent 1	---	---	---	---	11.13	48.73	---	---	---	---	3.03	13.27	---	---	2,021
TEG Dehydrator Still Vent 2	---	---	---	---	11.13	48.73	---	---	---	---	3.03	13.27	---	---	2,021
TEG Dehydrator Flash Tank 1	---	---	---	---	47.79	209.30	---	---	---	---	1.53	6.72	---	---	12,554
TEG Dehydrator Flash Tank 2	---	---	---	---	47.79	209.30	---	---	---	---	1.53	6.72	---	---	12,554
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	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Heaters															
Fuel Conditioning Heater	0.061	0.27	0.051	0.23	0.0034	0.015	0.00037	0.0016	0.0047	0.020	0.0012	0.0051	0.000046	0.00020	257
Hydrocarbon Loading															
Truck Loadout	---	---	---	---	44.98	6.77	---	---	---	---	0.13	0.019	---	---	5.3
Fugitive Emissions															
Component Leak Emissions	---	---	---	---	0.81	3.57	---	---	---	---	0.023	0.10	---	---	99
Venting Emissions	---	---	---	---	---	7.51	---	---	---	---	---	0.19	---	---	714
Haul Road Dust Emissions	---	---	---	---	---	---	---	---	0.032	0.14	---	---	---	---	---
Storage Tanks															
Produced Water Tanks	---	---	---	---	0.00015	0.00066	---	---	---	---	1.21E-07	5.30E-07	---	---	0.026
Settler Tank	---	---	---	---	101.02	442.47	---	---	---	---	3.51	15.39	---	---	1,901
Condensate Tanks	---	---	---	---	2.19	9.60	---	---	---	---	0.0063	0.027	---	---	5.9
Total Facility PTE =	**13.90**	**60.88**	**116.54**	**510.46**	**284.99**	**1,065.5**	**0.10**	**0.46**	**1.47**	**6.46**	**22.49**	**98.32**	**7.06**	**30.92**	**135,777**

Emissions Summary Total

Company:	**Antero Midstream LLC**
Facility Name:	**Lafferty Compressor Station**
Facility Location:	**Ritchie 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	1.65	7.24	0.88	3.86	1.49	6.52	0.010	0.044	0.17	0.75	0.39	1.69	0.165	0.72	12,324
Compressor Engine 2	1.65	7.24	0.88	3.86	1.49	6.52	0.010	0.044	0.17	0.75	0.39	1.69	0.165	0.72	12,324
Compressor Engine 3	1.65	7.24	0.88	3.86	1.49	6.52	0.010	0.044	0.17	0.75	0.39	1.69	0.165	0.72	12,324
Compressor Engine 4	1.65	7.24	0.88	3.86	1.49	6.52	0.010	0.044	0.17	0.75	0.39	1.69	0.165	0.72	12,324
Compressor Engine 5	1.65	7.24	0.88	3.86	1.49	6.52	0.010	0.044	0.17	0.75	0.39	1.69	0.165	0.72	12,324
Compressor Engine 6	1.65	7.24	0.88	3.86	1.49	6.52	0.010	0.044	0.17	0.75	0.39	1.69	0.165	0.72	12,324
Compressor Engine 7	1.65	7.24	0.88	3.86	1.49	6.52	0.010	0.044	0.17	0.75	0.39	1.69	0.165	0.72	12,324
Compressor Engine 8	1.65	7.24	0.88	3.86	1.49	6.52	0.010	0.044	0.17	0.75	0.39	1.69	0.165	0.72	12,324
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
Catalytic Heater for Generator Fuel	0.0029	0.013	0.0025	0.011	0.00016	0.00071	0.000018	0.000077	0.00022	0.0010	0.000055	0.00024	0.0000022	0.000010	12
Dehydrators															
TEG Dehydrator Still Vent 1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
TEG Dehydrator Still Vent 2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
TEG Dehydrator Flash Tank 1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
TEG Dehydrator Flash Tank 2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Reboiler 1	0.18	0.81	0.15	0.68	0.97	4.23	0.0011	0.0048	0.014	0.061	0.034	0.15	0.00014	0.00060	1,029
Reboiler 2	0.18	0.81	0.15	0.68	0.97	4.23	0.0011	0.0048	0.014	0.061	0.034	0.15	0.00014	0.00060	1,029
Combustors															
Flare and Pilot	0.63	2.75	2.86	12.51	0.45	1.95	0.000010	0.000043	0.00012	0.00055	0.12	0.53	---	---	4,826
Heaters															
Fuel Conditioning Heater	0.061	0.27	0.051	0.23	0.0034	0.015	0.00037	0.0016	0.0047	0.020	0.0012	0.0051	0.000046	0.00020	257
Hydrocarbon Loading															
Truck Loadout	---	---	---	---	44.98	6.77	---	---	---	---	0.13	0.019	---	---	5.3
Fugitive Emissions															
Component Leak Emissions	---	---	---	---	0.81	3.57	---	---	---	---	0.023	0.10	---	---	99
Venting Emissions	---	---	---	---	---	7.51	---	---	---	---	---	0.19	---	---	714
Haul Road Dust Emissions	---	---	---	---	---	---	---	---	0.032	0.14	---	---	---	---	---
Storage Tanks															
Produced Water Tanks	---	---	---	---	0.000003	0.00001	---	---	---	---	2.42E-09	1.06E-08	---	---	0.00087
Settler Tank	---	---	---	---	2.02	8.85	---	---	---	---	0.070	0.31	---	---	39
Condensate Tanks	---	---	---	---	0.044	0.19	---	---	---	---	0.00013	0.00055	---	---	0.14
Total Facility PTE =	**14.53**	**63.63**	**10.93**	**47.89**	**62.20**	**89.72**	**0.10**	**0.46**	**1.47**	**6.46**	**3.54**	**15.00**	**1.33**	**5.81**	**110,101**

1. Controlled dehydrator still vent emissions are in the flare and pilot category.
2. Controlled dehydrator flash tank emissions are in the reboiler category.

HAP Emissions Summary Total

Company:	**Antero Midstream LLC**
Facility Name:	**Lafferty Compressor Station**
Facility Location:	**Ritchie 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	0.0050	0.022	0.0046	0.020	0.00045	0.0020	0.0021	0.009	---	---
Compressor Engine 2	0.0050	0.022	0.0046	0.020	0.00045	0.0020	0.0021	0.009	---	---
Compressor Engine 3	0.0050	0.022	0.0046	0.020	0.00045	0.0020	0.0021	0.009	---	---
Compressor Engine 4	0.0050	0.022	0.0046	0.020	0.00045	0.0020	0.0021	0.009	---	---
Compressor Engine 5	0.0050	0.022	0.0046	0.020	0.00045	0.0020	0.0021	0.009	---	---
Compressor Engine 6	0.0050	0.022	0.0046	0.020	0.00045	0.0020	0.0021	0.009	---	---
Compressor Engine 7	0.0050	0.022	0.0046	0.020	0.00045	0.0020	0.0021	0.009	---	---
Compressor Engine 8	0.0050	0.022	0.0046	0.020	0.00045	0.0020	0.0021	0.009	---	---
Turbines										
Microturbine Generator 1	7.42E-05	3.25E-04	8.03E-04	3.52E-03	1.98E-04	8.66E-04	3.96E-04	1.73E-03	---	---
Catalytic Heater for Generator Fuel	---	---	---	---	---	---	---	---	---	---
Dehydrators										
TEG Dehydrator Still Vent 1	---	---	---	---	---	---	---	---	---	---
TEG Dehydrator Still Vent 2	---	---	---	---	---	---	---	---	---	---
TEG Dehydrator Flash Tank 1	---	---	---	---	---	---	---	---	---	---
TEG Dehydrator Flash Tank 2	---	---	---	---	---	---	---	---	---	---
Reboiler 1	0.0010	0.0046	0.0013	0.0057	0.00000091	0.0000040	0.00010	0.00050	0.028	0.12
Reboiler 2	0.0010	0.0046	0.0013	0.0057	0.00000091	0.0000040	0.00010	0.00050	0.028	0.12
Combustion										
Flare and Pilot	0.026	0.11	0.057	0.25	0.000046	0.00020	0.015	0.066	0.023	0.10
Heaters										
Fuel Conditioning Heater	---	---	---	---	---	---	---	---	---	---
Hydrocarbon Loading										
Truck Loadout	0.0049	0.00071	0.0086	0.0013	0.0046	0.00070	0.013	0.0020	0.10	0.015
Fugitive Emissions										
Component Leak Emissions	0.00054	0.0024	0.00065	0.0028	0.000073	0.00032	0.00025	0.0011	0.021	0.093
Venting Emissions	---	0.0027	---	0.0045	---	0.0000041	---	0.00076	---	0.19
Haul Road Dust Emissions	---	---	---	---	---	---	---	---	---	---
Storage Tanks										
Produced Water Tanks	1.47E-09	6.45E-09	5.89E-10	2.58E-09	9.74E-11	4.26E-10	2.26E-10	9.91E-10	3.44E-11	1.51E-10
Settler Tank	3.42E-03	1.50E-02	2.87E-03	1.25E-02	7.95E-04	3.48E-03	2.08E-03	9.12E-03	6.11E-02	2.68E-01
Condensate Tanks	4.49E-06	1.97E-05	8.36E-06	3.66E-05	4.51E-06	1.98E-05	1.27E-05	5.58E-05	9.54E-05	4.18E-04
Total Facility PTE =	**0.08**	**0.32**	**0.11**	**0.45**	**0.01**	**0.02**	**0.05**	**0.15**	**0.26**	**0.91**

1. Controlled dehydrator still vent emissions are in the flare and pilot category.
2. Controlled dehydrator flash tank emissions are in the reboiler category.

Compressor Engine Emission Calculations

Company:	**Antero Midstream LLC**
Facility Name:	**Lafferty Compressor Station**
Facility Location:	**Ritchie County, West Virginia**
Source Description:	**Compressor Engines**

Source Information-Per Engine

Emission Unit ID:	C-2100 to C-2170	
Engine Make/Model	Caterpillar G3608	
Service	Compression	
Controls - Y or N / Type	Y	Ox. Cat.
Site Horsepower Rating[1]	2,500	hp
Fuel Consumption (BSFC)[1]	6,850	Btu/(hp-hr)
Heat Rating[2]	17.13	MMBtu/hr
Fuel Consumption[2,3]	144.54	MMscf/yr
Fuel Consumption[1]	16,500	scf/hr
Fuel Heating Value	1,039	Btu/scf
Operating Hours	8,760	hrs/yr

Notes:

1. Values from Caterpillar 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)[4]**	**(tpy)[4]**	**(lb/MMBtu)**	**(g/bhp-hr)**	**(lb/hr)**	**(lb/yr)[4]**	**(tpy)[4]**	
NO_x[1]	---	0.30	1.65		7.24	---	0.30	1.65	---	7.24	Manufacturer's Specs - uncontrolled and controlled
CO[1]	---	2.62	14.44	---	63.25	---	0.16	0.88	---	3.86	Manufacturer's Specs - uncontrolled, see note 6 - controlled
VOC[1]	---	0.41	2.26	---	9.90	---	0.27	1.49	---	6.52	Manufacturer's Specs - uncontrolled, see note 6 - controlled
SO_2	5.88E-04	---	0.010	---	0.044	5.88E-04	---	0.010	---	0.044	AP-42, Chapter 3.2, Table 3.2-2
$PM_{2.5}/PM_{10}$	9.99E-03	---	0.17	---	0.75	9.99E-03	---	0.17	---	0.75	AP-42, Chapter 3.2, Table 3.2-2
Total PM	9.99E-03	---	0.17	---	0.75	9.99E-03	---	0.17	---	0.75	AP-42, Chapter 3.2, Table 3.2-2
1,3-Butadiene	2.67E-04	---	0.0046	40.05	0.020	1.76E-04	---	0.0030	26.38	0.013	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
2-Methylnaphthalene	3.32E-05	---	0.00057	4.98	0.0025	3.32E-05	---	0.00057	4.98	0.0025	AP-42, Chapter 3.2, Table 3.2-2
2,2,4-Trimethylpentane	2.50E-04	---	0.0043	37.50	0.019	1.65E-04	---	0.0028	24.70	0.012	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
Acenaphthene	1.25E-06	---	0.000021	0.19	0.000094	1.25E-06	---	0.000021	0.19	0.00009	AP-42, Chapter 3.2, Table 3.2-2
Acenaphthylene	5.53E-06	---	0.000095	0.83	0.00041	5.53E-06	---	0.00009	0.83	0.00041	AP-42, Chapter 3.2, Table 3.2-2
Acetaldehyde	8.36E-03	---	0.14	1,254	0.63	5.51E-03	---	0.094	825.9	0.41	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
Acrolein	5.14E-03	---	0.088	771.1	0.39	3.38E-03	---	0.058	507.8	0.25	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
Benzene	4.40E-04	---	0.0075	66.01	0.033	2.90E-04	---	0.0050	43.47	0.022	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
Benzo(b)fluoranthene	1.66E-07	---	0.0000028	0.025	0.000012	1.66E-07	---	0.0000028	0.025	0.000012	AP-42, Chapter 3.2, Table 3.2-2
Benzo(e)pyrene	4.15E-07	---	0.0000071	0.062	0.000031	4.15E-07	---	0.0000071	0.062	0.000031	AP-42, Chapter 3.2, Table 3.2-2
Benzo(g,h,i)perylene	4.14E-07	---	0.0000071	0.062	0.000031	4.14E-07	---	0.0000071	0.062	0.000031	AP-42, Chapter 3.2, Table 3.2-2
Biphenyl	2.12E-04	---	0.0036	31.80	0.016	1.40E-04	---	0.0024	20.94	0.010	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
Chrysene	6.93E-07	---	0.000012	0.10	0.000052	6.93E-07	---	0.000012	0.10	0.000052	AP-42, Chapter 3.2, Table 3.2-2
Ethylbenzene	3.97E-05	---	0.00068	5.96	0.0030	2.61E-05	---	0.00045	3.92	0.0020	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
Fluoranthene	1.11E-06	---	0.000019	0.17	0.000083	1.11E-06	---	0.000019	0.17	0.000083	AP-42, Chapter 3.2, Table 3.2-2
Fluorene	5.67E-06	---	0.00010	0.85	0.00043	5.67E-06	---	0.00010	0.85	0.00043	AP-42, Chapter 3.2, Table 3.2-2
Formaldehyde[1]	---	0.16	0.88	7,725	3.86	---	0.030	0.17	1,448.4	0.72	Manufacturer's Specs - uncontrolled, see note 6 - controlled
Methanol	2.50E-03	---	0.043	375.0	0.19	1.65E-03	---	0.028	247.0	0.12	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
Methylene Chloride	2.00E-05	---	0.00034	3.00	0.0015	1.32E-05	---	0.00023	1.98	0.0010	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
n-Hexane	1.11E-03	---	0.019	166.5	0.083	7.31E-04	---	0.013	109.7	0.055	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
Naphthalene	7.44E-05	---	0.0013	11.16	0.0056	4.90E-05	---	0.00084	7.35	0.0037	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
PAH	2.69E-05	---	0.00046	4.04	0.0020	2.69E-05	---	0.00046	4.04	0.0020	AP-42, Chapter 3.2, Table 3.2-2
Phenanthrene	1.04E-05	---	0.00018	1.56	0.00078	1.04E-05	---	0.00018	1.56	0.00078	AP-42, Chapter 3.2, Table 3.2-2
Phenol	2.40E-05	---	0.00041	3.60	0.0018	1.58E-05	---	0.00027	2.37	0.0012	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
Pyrene	1.36E-06	---	0.000023	0.20	0.00010	1.36E-06	---	0.000023	0.20	0.00010	AP-42, Chapter 3.2, Table 3.2-2
Tetrachloroethane	2.48E-06	---	0.000042	0.37	0.00019	1.63E-06	---	0.000028	0.25	0.00012	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
Toluene	4.08E-04	---	0.0070	61.21	0.031	2.69E-04	---	0.0046	40.31	0.020	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
Vinyl Chloride	1.49E-05	---	0.00026	2.24	0.0011	9.81E-06	---	0.00017	1.47	0.00074	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
Xylenes	1.84E-04	---	0.0032	27.60	0.014	1.21E-04	---	0.0021	18.18	0.0091	AP-42, Chapter 3.2, Table 3.2-2 - uncontrolled, see note 5 - controlled
Other HAPs[2]	2.62E-04	---	0.0045	39.26	0.020	2.62E-04	---	0.0045	39.26	0.020	AP-42, Chapter 3.2, Table 3.2-2
Total HAPS			1.21	10,634	5.32			0.39	3,382	1.69	
Pollutant	**Emission Factor**		**Estimated Emissions[2]**			**Emission Factor**		**Estimated Emissions[2]**			**Source of Emissions Factors**
	(kg/MMBtu)	**(g/bhp-hr)**	**(lb/hr)**	**(lb/yr)[4]**	**(tpy)[4]**	**(kg/MMBtu)**	**(g/bhp-hr)**	**(lb/hr)**	**(lb/yr)[4]**	**(tpy)[4]**	
CO_2[1]	---	429	2,364	---	10,368	---	429	2,364	---	10,368	Manufacturer's Specs
CH_4[1]	---	3.23	17.80	---	78.06	---	3.23	17.80	---	78.06	Manufacturer's Specs; THC minus NMHC emission factor
N_2O	0.0001	---	0.0038	---	0.017	0.0001	---	0.0038	---	0.017	40 CFR Part 98, Subpart C, Table C-2
CO_2e[2]	---	---	2,811	---	12,324	---	---	2,811	---	12,324	40 CFR Part 98, Subpart A, Table A-1, effective January 2014

Notes:

4. Annual Emissions are based on engines operating with 100% fuel of total fuel usage
5. Those HAPs that are also VOCs are assumed to be controlled by the same efficiency by the oxidation catalyst.
6. Due to variable load conditions, the catalyst reduction efficiencies used are typical based on expected operating conditions.

Example Calculations

lb/hr = (g/hp-hr) * (hp) * (1 lb/453.6 g) or (lb/MMBtu) * (MMBtu/hr)

tpy = (lb/hr) * (1 ton/2000 lb) *(hr/yr)

Microturbine Generator Emission Calculations

Company:	**Antero Midstream LLC**
Facility Name:	**Lafferty Compressor Station**
Facility Location:	**Ritchie County, West Virginia**
Source Description:	**Microturbine Generators**

Source Information

Emission Unit ID:	G-8000	
Make/Model	Capstone C600 Standard	
Microturbine Rating[2]	600	kWe
Number of Microturbines[2]	1	unit
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) The Capstone C600 package is made up of three (3) 200 kWe units that can operate individually. While all three units may not be operating all at once, potential emissions are calculated as though all three are operating at 8,760 hours per year.

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	0.06	---	0.26	---	0.10	0.06	---	0.26	Manufacturer Specifications
SO_2	3.40E-03	---	0.02	---	0.09	3.40E-03	---	0.02	---	0.09	AP-42, Chapter 3.1, Table 3.1-2a
$PM_{2.5}/PM_{10}$	6.60E-03	---	0.04	---	0.18	6.60E-03	---	0.04	---	0.18	AP-42, Chapter 3.1, Table 3.1-2a
1,3-Butadiene	4.30E-07	---	2.66E-06	0.02	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	0.07	3.52E-05	1.30E-06	---	8.03E-06	0.07	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			0.006	55.62	0.03			0.006	55.62	0.03	
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	---	3,495	---	1,330	798	---	3,495	Manufacturer Specifications
CH_4	0.001	---	0.01	---	0.06	0.001	---	0.01	---	0.06	40 CFR Part 98, Subpart C, Table C-2
N_2O	0.0001	---	0.001	---	0.006	0.0001	---	0.001	---	0.006	40 CFR Part 98, Subpart C, Table C-2
CO_2e	---	---	799	---	3,499	---	---	799	---	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:	**Lafferty Compressor Station**
Location:	**Ritchie 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	0.0010	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	0.000002	0.000010	AP-42 Ch. 1.4 Table 1.4-3
Total HAPs (including HCHO)[1]	1.9	0.00006	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	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.0001	0.00023	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.00001	0.000023	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	2.82	12	40 CFR Part 98, Subpart A, Table A-1

1. Only those HAP pollutants above detection thresholds were included.

Example 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:	**Lafferty Compressor Station**
Facility Location:	**Ritchie County, West Virginia**
Source Description:	**Dehydrator Units**

Potential Emissions per Dehydrator

Pollutant	Emission Unit ID: SV-3110/SV-3210 Dehydrator Still Vent		Emission Unit ID: FT-3110/FT-3210 Flash Tank Gas	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Uncontrolled Emissions [1]				
VOC	11.13	48.73	47.79	209.3
Total HAPs	3.03	13.27	1.53	6.72
Benzene	0.65	2.86	0.052	0.23
Toluene	1.43	6.26	0.065	0.29
Ethylbenzene	0.0017	0.0074	0.000046	0.00020
Xylenes	0.38	1.65	0.0056	0.025
n-Hexane	0.57	2.49	1.41	6.18
Methane	18.45	80.80	114.6	501.9
Carbon Dioxide	0.19	0.84	1.63	7.14
CO_2e	461.4	2,021	2,866	12,554
Controlled Emissions [2,3]	**FL-1000**		**R-3110/R-3210**	
VOC	0.22	0.97	0.96	4.19
Total HAPs	0.061	0.27	0.031	0.13
Benzene	0.013	0.057	0.0010	0.0046
Toluene	0.029	0.13	0.0013	0.0057
Ethylbenzene	0.000023	0.00010	0.00000091	0.0000040
Xylenes	0.0075	0.033	0.00010	0.00050
n-Hexane	0.011	0.050	0.028	0.12
Methane	0.37	1.62	2.29	10.04
Carbon Dioxide	0.19	0.84	1.63	7.14
CO_2e	9.41	41.24	58.92	258.1

[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 at least 98% control efficiency. Controlled emissions are shown with FL-1000 in summary tables.

[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. Controlled emissions are shown with R-3110 and R-3210 in the summary tables.

Natural Gas Fueled Dehydrator Reboiler Combustion Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Lafferty Compressor Station**
Location:	**Ritchie County, West Virginia**
Source Description:	**Dehydrator Reboilers**

Source Information

Emission Unit ID:	R-3110 & R-3210	
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	175.89	770	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	----	176.08	771	40 CFR Part 98, Subpart A, Table A-1

Example 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 Combustion Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Lafferty Compressor Station**
Facility Location:	**Ritchie County, West Virginia**
Source Description:	**Flare for Dehydrator Still Vent Gas**
Emission Unit ID:	**FL-1000**

Combusted Gas Emissions

Flare Heat Input :	9.21	MMBtu/hr
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	0.63	2.74
Carbon Monoxide (CO)	0.31	2.86	12.51

[1] Emission Factors from Table 13.5-1 and 13.5-2 of AP-42 Section 13.5 (April 2015)

Pilot Emissions

Pilot Heating Value:	1,020	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	1.25E-04	5.46E-04
Nitrogen Oxides (NOx)	100	1.64E-03	7.18E-03
Sulfur Dioxide (SO_2)[2]	0.6	9.84E-06	4.31E-05
Carbon Monoxide (CO)[2]	84	1.38E-03	6.03E-03
Volatile Organic Compounds (VOC)[2]	5.5	9.02E-05	3.95E-04
Total HAPs[2,3]	1.88	3.08E-05	1.35E-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	Emission Rate (lbs/hr)	Emission Rate (tons/year)
Particulate Matter ($PM/PM_{10}/PM_{2.5}$)	1.25E-04	5.46E-04
Nitrogen Oxides (NOx)	0.63	2.75
Sulfur Dioxide (SO_2)	9.84E-06	4.31E-05
Carbon Monoxide (CO)	2.86	12.51
Volatile Organic Compounds (VOC)	9.02E-05	3.95E-04
Total HAPs	3.08E-05	1.35E-04

Greenhouse Gas Emissions

Pollutant	Emission Factor (kg/MMBtu)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
Carbon Dioxide	53.06	1,082	4,739	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.020	0.089	40 CFR Part 98, Subpart C, Table C-2
Nitrogen Dioxide	0.0001	0.0020	0.0089	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	1,083	4,744	40 CFR Part 98, Subpart A, Table A-1

Natural Gas Fueled Fuel Conditioning Heater Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Lafferty Compressor Station**
Location:	**Ritchie County, West Virginia**
Source Description:	**Fuel Conditioning Heater**

Source Information

Emission Unit ID:	CATHT1	
Source Description:	Generator Fuel Heater	
Hours of Operation	8,760	hr/yr
Design Heat Rate	0.50	MMBtu/hr
Heater Efficiency	80%	
Fuel Heat Value	1,020	Btu/scf
Fuel Use	5.37	MMscf/yr

Emission Calculations per Heater

Pollutant	Emission Factor (lb/MMscf)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
NO_X	100	0.061	0.27	AP-42 Ch. 1.4 Table 1.4-1
CO	84	0.051	0.23	AP-42 Ch. 1.4 Table 1.4-1
VOC	5.5	0.0034	0.015	AP-42 Ch. 1.4 Table 1.4-2
PM_{10}	7.6	0.0047	0.020	AP-42 Ch. 1.4 Table 1.4-2
SO_2	0.6	0.00037	0.0016	AP-42 Ch. 1.4 Table 1.4-2
Formaldehyde	0.075	0.000046	0.00020	AP-42 Ch. 1.4 Table 1.4-3
Total HAPs (including HCHO)[1]	1.9	0.0012	0.0051	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.

Example Calculations:

$$\text{Fuel Consumption (MMscf/yr)} = \frac{\text{Heater Size (MMBtu/hr)} * \text{Hours of Operation (hrs/yr)}}{\text{Fuel Heat Value (Btu/scf)} * \text{Heater Efficiency}}$$

$$\text{Emissions (tons/yr)} = \frac{\text{Emission Factor (lbs/MMscf)} * \text{Fuel Consumption (MMscf/yr)}}{\text{2,000 (lbs/ton)}}$$

Settling Tank Flashing Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Lafferty Compressor Station**
Facility Location:	**Ritchie County, West Virginia**
Source Description:	**Settling Tank**
Emission Unit ID:	**TK-9000**

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	17.31	75.82	0.35	1.52
Ethane	32.46	142.17	0.65	2.84
Propane	38.26	167.58	0.77	3.35
i-Butane	9.71	42.52	0.19	0.85
n-Butane	22.95	100.53	0.46	2.01
i-Pentane	8.04	35.20	0.16	0.70
n-Pentane	8.23	36.06	0.16	0.72
i-Hexanes	4.60	20.13	0.092	0.40
Heptanes	2.86	12.53	0.057	0.25
Octanes	1.18	5.18	0.024	0.10
Nonanes	0.18	0.79	0.0036	0.016
Decanes+	0.01	0.04	0.00017	0.00073
n-Hexane	3.05	13.37	0.061	0.27
Benzene	0.17	0.75	0.0034	0.015
Toluene	0.14	0.63	0.0029	0.013
Ethylbenzene	0.04	0.17	0.00079	0.0035
Xylenes	0.10	0.45	0.0021	0.0091
Nitrogen	0.11	0.46	0.11	0.46
Carbon Dioxide	0.20	0.88	0.20	0.88
Water	1.52	6.65	1.52	6.65
VOC Subtotal	99.53	435.92	1.99	8.72
HAP Subtotal	3.51	15.37	0.070	0.31
CO_2e Subtotal	432.99	1896.50	8.86	38.79
Total	151.12	661.91	4.81	21.07

Notes:

1. Flashing emissions calculated by ProMax 3.2. 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-6000 is the primary VRU to collect storage tank vapors and VRU-6100 is the backup VRU in times when the primary VRU is undergoing maintenance or shutdown. In the unlikely event that both VRU-6000 and VRU-6100 are under maintenance or are shutdown, a bypass system is in place to route tank vapors to the facility inlet.

Storage Tank Working and Breathing Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Lafferty Compressor Station**
Facility Location:	**Ritchie County, West Virginia**
Source Description:	**Condensate, Settling, and Produced Water Tanks**
Emission Unit ID:	**TK-9000, TK-9100, TK-9110, TK-9200, TK-9210**

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-9200)	4.80	4.92E-04	9.16E-04	4.94E-04	1.40E-03	1.05E-02	0.12	2.95
400 bbl Hydrocarbon Storage Tank (TK-9210)	4.80	4.92E-04	9.16E-04	4.94E-04	1.40E-03	1.05E-02	0.12	2.95
500 bbl Settling Tank (TK-9000)	6.55	6.72E-04	1.25E-03	6.74E-04	1.90E-03	1.43E-02	0.16	4.03
400 bbl Produced Water Storage Tank[2] (TK-9100)	0.00033	1.61E-07	6.45E-08	1.07E-08	2.48E-08	3.77E-09	0.00051	0.013
400 bbl Produced Water Storage Tank[2] (TK-9110)	0.00033	1.61E-07	6.45E-08	1.07E-08	2.48E-08	3.77E-09	0.00051	0.013
TOTAL	**16.15**	**0.00166**	**0.0031**	**0.0017**	**0.0047**	**0.035**	**0.40**	**9.97**

TANK DESCRIPTION	Controlled VOC Emissions[1,3] (tons/yr)	Controlled Benzene Emissions[1,3] (tons/yr)	Controlled Toluene Emissions[1,3] (tons/yr)	Controlled Ethylbenzene Emissions[1,3] (tons/yr)	Controlled Xylene Emissions[1,3] (tons/yr)	Controlled n-Hexane Emissions[1,3] (tons/yr)	Controlled CH_4 Emissions[1,3] (tons/yr)	Controlled CO_2e Emissions (tons/yr)
400 bbl Hydrocarbon Storage Tank (TK-9200)	0.10	9.84E-06	1.83E-05	9.88E-06	2.79E-05	2.09E-04	0.0024	0.068
400 bbl Hydrocarbon Storage Tank (TK-9210)	0.10	9.84E-06	1.83E-05	9.88E-06	2.79E-05	2.09E-04	0.0024	0.068
500 bbl Settling Tank (TK-9000)	0.13	1.34E-05	2.50E-05	1.35E-05	3.81E-05	2.85E-04	0.0032	0.093
400 bbl Produced Water Storage Tank[2] (TK-9100)	6.64E-06	3.23E-09	1.29E-09	2.13E-10	4.95E-10	7.53E-11	1.03E-05	0.00043
400 bbl Produced Water Storage Tank[2] (TK-9110)	6.64E-06	3.23E-09	1.29E-09	2.13E-10	4.95E-10	7.53E-11	1.03E-05	0.00043
TOTAL	**0.32**	**3.31E-05**	**6.16E-05**	**3.32E-05**	**9.39E-05**	**7.03E-04**	**0.0079**	**0.23**

Notes:

1. ProMax 3.2 used to calculate standing, working, and breathing (S,W,B) emissions
2. Produced water assumed to have no more than 10% hydrocarbon liquid
3. Tanks are controlled by a VRU with assumed 98% capture efficiency; but will likely be higher as vapors are recycled back into the system.
4. VRU-6000 is the primary VRU to collect storage tank vapors and VRU-6100 is the backup VRU in times when the primary VRU is undergoing maintenance or shutdown. In the unlikely event that both VRU-6000 and VRU-6100 are under maintenance or are shutdown, a bypass system is in place to route tank vapors to the facility inlet.

Truck Loading Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Lafferty Compressor Station**
Facility Location:	**Ritchie 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) = $\dfrac{L_L \text{ (lbs VOC/1000 gal)} * 42 \text{ gal/bbl} * 365 \text{ days/year} * \text{production (bbl/day)}}{1000 \text{ gal} * 2000 \text{ lbs/ton}}$

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)	CH_4 (tpy)	CO_2e (tpy)
Condensate	0.6	11.0	37.4	65	524.75	5.87	150	6.74	0.00069	0.0013	0.00069	0.0020	0.015	0.17	4.15
Produced Water	0.6	0.32	18.5	65	524.75	0.08	45	0.03	1.40E-05	5.59E-06	9.23E-07	2.15E-06	3.26E-07	0.044	1.13

Notes:
1. Saturation factor from AP-42, Table 5.2-1 (Submerged loading (bottom loading): dedicated normal service)
2. True vapor pressure and molecular weight are estimated from tank-specific ProMax 3.2 simulations for both liquids.
3. Temperature based on the annual average temperature of Charleston, WV retrieved from ProMax working and breathing report.
4. HAP and CO2e emissions calculated with weight percentages of the working and breathing vent gas from the ProMax 3.2 simulation

Assume 1 truck loaded per hour, 180 bbl truck, for short term emissions

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)	CH_4 (lb/hr)	CO_2e (lb/hr)
Condensate	0.6	11.0	37.4	65	524.75	5.87	180	44.35	0.0045	0.0085	0.0046	0.013	0.10	1.09	27.3
Produced Water	0.6	0.32	18.5	65	524.75	0.08	180	0.63	3.06E-04	1.22E-04	2.02E-05	4.70E-05	7.15E-06	0.97	24.7

Component Fugitive Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Lafferty Compressor Station**
Facility Location:	**Ritchie 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	836	8,760	3.90E-04	0.16	3.16	0.52
Valves - Gas Service	250	8,760	4.50E-03	0.16	10.89	1.79
Compressor Seals Gas Service	33	8,760	8.80E-03	0.16	2.81	0.46
Flanges - Liquid Service	175	8,760	1.10E-04	0.66	0.19	0.12
Valves - Liquid Service	42	8,760	2.50E-03	0.66	1.02	0.67
Total Emissions (tons/yr)					**18.06**	**3.57**

HAPs Fugitive Emissions										
Equipment Type and Service	**Benzene Weight Fraction[3]**	**Benzene Emissions (tpy)**	**Toluene Weight Fraction[3]**	**Toluene Emissions (tpy)**	**Ethylbenzene Weight Fraction[3]**	**Ethylbenzene Emissions (tpy)**	**Xylene Weight Fraction[3]**	**Xylene Emissions (tpy)**	**n-Hexane Weight Fraction[3]**	**n-Hexane Emissions (tpy)**
Flanges - Gas Service	5.81E-05	0.00018	9.94E-05	0.00031	9.03E-08	0.00000029	1.66E-05	0.000052	4.08E-03	0.013
Valves - Gas Service	5.81E-05	0.00063	9.94E-05	0.0011	9.03E-08	0.0000010	1.66E-05	0.00018	4.08E-03	0.044
Compressor Seals Gas Service	5.81E-05	0.00016	9.94E-05	0.00028	9.03E-08	0.00000025	1.66E-05	0.000047	4.08E-03	0.011
Flanges - Liquid Service	1.15E-03	0.000213	9.58E-04	0.00018	2.65E-04	0.000049	6.94E-04	0.00013	2.04E-02	0.0038
Valves - Liquid Service	1.15E-03	0.00116	9.58E-04	0.00097	2.65E-04	0.00027	6.94E-04	0.00071	2.04E-02	0.021
Total Emissions (tons/yr)		**0.0024**		**0.0028**		**0.00032**		**0.0011**		**0.093**

1) Component counts from similar facilities.

2) API average emission factors are for oil and gas production operations - Table 2.4, EPA Protocol for Equipment Leak Emission Estimates - 1995.

3) Gas and liquid weight fractions from representative analyses..

GHG Fugitive Emissions								
Equipment Type and Service	**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	1,011	8,760	0.003	0.98	0.011	0.55	0.017	13.72
Valves - Gas Service	250	8,760	0.027	0.98	0.011	1.22	0.038	30.54
Valves - Liquid Service	42	8,760	0.050	0.98	0.011	0.38	0.012	9.50
Compressor Seals	33	8,760	0.300	0.98	0.011	1.79	0.055	44.79
Total Emissions (tons/yr)						**3.94**	**0.12**	**98.56**

1) Component counts from similar facilities.

2) Emission factors from 40 CFR Part 98 Subpart W, Table W1-A; Gas service where available, else light crude service

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:	**Lafferty Compressor Station**
Facility Location:	**Ritchie 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]	132	10,000	20.41	35.49	0.16	5.80
Compressor Startup[3]	132	1,050	20.41	3.73	0.16	0.61
Plant Shutdown	2	100,000	20.41	5.38	0.16	0.88
Pigging Venting	52	1,000	20.41	1.40	0.16	0.23
Total Emissions (tons/yr)						**7.51**

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]	5.77E-05	0.0020	9.85E-05	0.0035	8.96E-08	0.0000032	1.65E-05	0.00058	4.05E-03	0.14
Compressor Startup[3]	5.77E-05	0.00021	9.85E-05	0.00037	8.96E-08	0.00000033	1.65E-05	0.000061	4.05E-03	0.015
Plant Shutdown	5.77E-05	0.00031	9.85E-05	0.00053	8.96E-08	0.00000048	1.65E-05	0.000089	4.05E-03	0.022
Pigging Venting	5.77E-05	0.000081	9.85E-05	0.00014	8.96E-08	0.00000013	1.65E-05	0.000023	4.05E-03	0.0057
Total Emissions (tons/yr)		**0.0027**		**0.0045**		**0.0000041**		**0.00076**		**0.19**

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]	132	10,000	20.41	0.62	0.0029	22.02	0.10	550.73
Compressor Startup[3]	132	1,050	20.41	0.62	0.0029	2.31	0.011	57.83
Plant Shutdown	2	100,000	20.41	0.62	0.0029	3.34	0.015	83.44
Pigging Venting	52	1,000	20.41	0.62	0.0029	0.87	0.0040	21.70
Total Emissions (tons/yr)						**28.54**	**0.13**	**713.69**

1) Estimated number of events and venting per event from engineering based on other facilities.

2) Total number of compressor blowdowns based on 12 blowdowns per compressor.

3) Total number of compressor startups based on 12 starts per compressor.

4) Weight Fraction is from a gas analysis that will be typical for the facility.

Fugitive Dust Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Lafferty Compressor Station**
Facility Location:	**Ritchie 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	1,000	0.19	69
Produced Water Tank Truck	40.00	365	1.0	1,000	0.19	69
Passenger Vehicles	3.00	1,095	3.0	1,000	0.19	207

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	**17.8**	**17.8**
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)	Annual Uncontrolled PM_{10} Emissions (tpy)
0.82	346	0.14

$PM_{2.5}$ Emissions

Emission Factor (lb/VMT)	Vehicle miles traveled (VMT/yr)	Annual Uncontrolled $PM_{2.5}$ Emissions (tpy)
0.082	346	0.014

PM- Total Emissions

Emission Factor (lb/VMT)	Vehicle miles traveled (VMT/yr)	Annual Uncontrolled PM-Total Emissions (tpy)
3.23	346	0.56

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 (180 bbl truck) and one produced water truck (180 bbl truck) will be onsite per day.
3. Distance per round trip is based on the proposed site layout. The one way distance is measured as 2,200 feet for the gravel access road and 150 feet on the dirt pad one way.

Facility Gas Analysis

	MOL %	MW	Component Weight lb/lb-mol	Wt. Fraction
Methane	78.95	16.04	12.66	0.62
Ethane	14.10	30.07	4.24	0.21
Propane	4.12	44.10	1.82	0.089
i-Butane	0.52	58.12	0.30	0.015
n-Butane	1.00	58.12	0.58	0.029
i-Pentane	0.24	72.15	0.18	0.0086
n-Pentane	0.23	72.15	0.16	0.0080
Hexanes+	0.21	100.00	0.21	0.010
n-Hexane	0.096	86.18	0.083	0.0041
Benzene	0.0015	78.11	0.0012	0.000058
Toluene	0.0022	92.14	0.0020	0.00010
Ethylbenzene	0.0000017	106.17	0.0000018	0.00000009
Xylenes	0.00032	106.16	0.00034	0.000016
Nitrogen	0.40	28.01	0.11	0.0055
Carbon Dioxide	0.13	44.01	0.058	0.0029
Totals	100.0		20.41	1.00

Molecular weight	20.41
VOC weight fraction	0.16
Methane weight fraction	0.62
THC weight fraction	0.99
VOC of THC wt fraction	0.16
CH4 of THC wt fraction	0.63
Benzene of THC wt fraction	0.000058
Toluene of THC wt fraction	0.00010
E-benzene of THC wt fraction	0.00000009
Xylene of THC wt fraction	0.000017
n-Hexane of THC wt fraction	0.0041

Myrtle Unit 2H analysis with BTEX relative fractions from similar wells

Facility Tank Vent Gas Analysis

	MOL %	MW	Component Weight lb/lb-mol	Wt. Fraction
Methane	26.708	16.04	4.28	0.115
Ethane	26.716	30.07	8.03	0.21
Propane	21.475	44.10	9.47	0.25
i-Butane	4.133	58.12	2.40	0.064
n-Butane	9.773	58.12	5.68	0.15
i-Pentane	2.757	72.15	1.99	0.053
n-Pentane	2.824	72.15	2.04	0.054
Other Hexanes	1.320	86.18	1.14	0.030
Heptanes	0.707	100.20	0.71	0.019
Octanes	0.256	114.23	0.29	0.0078
Nonanes	0.035	128.26	0.044	0.0012
Decanes+	0.001	142.28	0.0016	0.000043
n-Hexane	0.877	86.18	0.76	0.020
Benzene	0.054	78.11	0.042	0.00113
Toluene	0.038	92.14	0.035	0.00095
Ethylbenzene	0.009	106.17	0.010	0.00026
Xylenes	0.024	106.16	0.026	0.00069
Nitrogen	0.093	28.01	0.026	0.00070
Carbon Dioxide	0.113	44.01	0.050	0.0013
Water	2.086	18.02	0.38	0.0101
Totals	100.00		37.40	1.00

Molecular weight	37.40
VOC weight fraction	0.66
Methane weight fraction	0.115
THC weight fraction	0.99
VOC of THC wt fraction	0.67
CH4 of THC wt fraction	0.116
Benzene of THC wt fraction	0.0011
Toluene of THC wt fraction	0.00096
E-benzene of THC wt fraction	0.00027
Xylene of THC wt fraction	0.00069
n-Hexane of THC wt fraction	0.020

Tank vent gas is the Settling Tank flash gas stream from the ProMax 3.2 simulation

Facility Pressurized Liquid Analysis

	MOL % Prunty 1H	MOL % Seaborne 1H	MOL % Average	MOL % Water
Methane	4.766	7.703	6.235	0.6235
Ethane	5.726	7.916	6.821	0.6821
Propane	6.545	7.595	7.070	0.7070
i-Butane	2.067	2.047	2.057	0.2057
n-Butane	6.083	6.037	6.060	0.6060
i-Pentane	3.770	3.263	3.517	0.3517
n-Pentane	4.872	4.477	4.675	0.4675
Other Hexanes	4.766	5.314	5.040	0.5040
Heptanes	10.970	12.616	11.793	1.1793
Octanes	13.091	14.845	13.968	1.3968
Nonanes	5.657	6.279	5.968	0.5968
Decanes+	24.100	13.338	18.719	1.8719
n-Hexane	4.430	4.853	4.642	0.4642
Benzene	0.283	0.310	0.297	0.0297
Toluene	0.744	0.818	0.781	0.0781
Ethylbenzene	0.510	0.657	0.584	0.0584
Xylenes	1.570	1.883	1.727	0.1727
Nitrogen	0.018	0.026	0.022	0.0022
Carbon Dioxide	0.031	0.022	0.027	0.0027

C10+ specific gravity	0.8007	0.7987	0.7997
C10+ MW	204.60	163.60	184.100
API	59.13	63.19	61.16

Liquid analysis is the average of two representative analyses from the field. The pressurized water analysis assumes 10% hydrocarbons.

GlyCalc

GRI-GLYCalc VERSION 4.0 - SUMMARY OF INPUT VALUES

Case Name: Lafferty Compressor Station
File Name: W:\20163883_Antero WV Synth Minor Mods\2.0 Technical Information\2.9 Deliverables to Client\Lafferty CS\Application - WVDEP\Attachment N\Dehy Run\Lafferty Dehy.ddf
Date: June 09, 2016

DESCRIPTION:

Description: One (1) 110 MMscf/day TEG dehydration unit
Kimray 45015 PV glycol pump

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	0.1330
Nitrogen	0.4020
Methane	78.9530
Ethane	14.0970
Propane	4.1160
Isobutane	0.5200
n-Butane	1.0030
Isopentane	0.2440
n-Pentane	0.2250
n-Hexane	0.0960
Other Hexanes	0.2070
Benzene	0.0015
Toluene	0.0022
Ethylbenzene	0.0000
Xylenes	0.0003

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

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: Lafferty Compressor Station
File Name: W:\20163883_Antero WV Synth Minor Mods\2.0 Technical Information\2.9 Deliverables to Client\Lafferty CS\Application - WVDEP\Attachment N\Dehy Run\Lafferty Dehy.ddf
Date: June 09, 2016

DESCRIPTION:

Description: One (1) 110 MMscf/day TEG dehydration unit
Kimray 45015 PV glycol pump

Annual Hours of Operation: 8760.0 hours/yr

EMISSIONS REPORTS:

CONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	0.3689	8.855	1.6160
Ethane	0.1358	3.260	0.5949
Propane	0.0715	1.715	0.3130
Isobutane	0.0146	0.350	0.0638
n-Butane	0.0344	0.826	0.1508
Isopentane	0.0110	0.263	0.0481
n-Pentane	0.0126	0.303	0.0554
n-Hexane	0.0114	0.273	0.0498
Other Hexanes	0.0179	0.429	0.0783
Benzene	0.0130	0.313	0.0572
Toluene	0.0286	0.685	0.1251
Ethylbenzene	<0.0001	0.001	0.0001
Xylenes	0.0075	0.181	0.0330
Total Emissions	0.7272	17.454	3.1853
Total Hydrocarbon Emissions	0.7272	17.454	3.1853
Total VOC Emissions	0.2225	5.339	0.9744
Total HAP Emissions	0.0605	1.453	0.2651
Total BTEX Emissions	0.0492	1.180	0.2154

UNCONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	18.4480	442.752	80.8023
Ethane	6.7914	162.994	29.7464
Propane	3.5732	85.756	15.6505
Isobutane	0.7284	17.483	3.1906
n-Butane	1.7216	41.319	7.5407

Isopentane	0.5489	13.175	2.4044
n-Pentane	0.6320	15.169	2.7683
n-Hexane	0.5680	13.632	2.4878
Other Hexanes	0.8935	21.444	3.9135
Benzene	0.6533	15.678	2.8612
Toluene	1.4289	34.294	6.2586
Ethylbenzene	0.0017	0.040	0.0074
Xylenes	0.3768	9.043	1.6503
Total Emissions	36.3657	872.778	159.2820
Total Hydrocarbon Emissions	36.3657	872.778	159.2820
Total VOC Emissions	11.1263	267.032	48.7333
Total HAP Emissions	3.0286	72.687	13.2653
Total BTEX Emissions	2.4606	59.055	10.7775

FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	2.2917	55.002	10.0378
Ethane	1.0222	24.533	4.4772
Propane	0.4920	11.808	2.1550
Isobutane	0.0870	2.088	0.3811
n-Butane	0.1869	4.485	0.8185
Isopentane	0.0509	1.222	0.2229
n-Pentane	0.0518	1.244	0.2270
n-Hexane	0.0282	0.677	0.1235
Other Hexanes	0.0564	1.354	0.2471
Benzene	0.0010	0.025	0.0046
Toluene	0.0013	0.031	0.0057
Ethylbenzene	<0.0001	<0.001	<0.0001
Xylenes	0.0001	0.003	0.0005
Total Emissions	4.2696	102.471	18.7010
Total Hydrocarbon Emissions	4.2696	102.471	18.7010
Total VOC Emissions	0.9557	22.937	4.1860
Total HAP Emissions	0.0307	0.736	0.1343
Total BTEX Emissions	0.0025	0.059	0.0108

FLASH TANK OFF GAS

Component	lbs/hr	lbs/day	tons/yr
Methane	114.5870	2750.088	501.8911
Ethane	51.1101	1226.642	223.8621
Propane	24.6009	590.421	107.7519
Isobutane	4.3502	104.405	19.0539
n-Butane	9.3436	224.246	40.9249
Isopentane	2.5451	61.082	11.1474
n-Pentane	2.5914	62.194	11.3504
n-Hexane	1.4099	33.837	6.1753
Other Hexanes	2.8206	67.695	12.3544
Benzene	0.0524	1.257	0.2293

Toluene	0.0654	1.569	0.2864
Ethylbenzene	<0.0001	0.001	0.0002
Xylenes	0.0056	0.134	0.0245
Total Emissions	213.4821	5123.571	935.0517
Total Hydrocarbon Emissions	213.4821	5123.571	935.0517
Total VOC Emissions	47.7851	1146.841	209.2986
Total HAP Emissions	1.5333	36.798	6.7157
Total BTEX Emissions	0.1234	2.961	0.5404

EQUIPMENT REPORTS:

CONDENSER AND COMBUSTION DEVICE

Condenser Outlet Temperature:	200.00 deg. F
Condenser Pressure:	14.70 psia
Condenser Duty:	2.06e-001 MM BTU/hr
Produced Water:	19.52 bbls/day
Ambient Temperature:	0.00 deg. F
Excess Oxygen:	0.00 %
Combustion Efficiency:	98.00 %
Supplemental Fuel Requirement:	2.06e-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%
Benzene	2.00%	98.00%
Toluene	2.00%	98.00%
Ethylbenzene	2.00%	98.00%
Xylenes	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
Glycol Losses with Dry Gas:	8.4136 lb/hr
Wet Gas Water Content:	Saturated
Calculated Wet Gas Water Content:	89.53 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	99.91%	0.09%
Isopentane	99.92%	0.08%
n-Pentane	99.91%	0.09%
n-Hexane	99.87%	0.13%
Other Hexanes	99.90%	0.10%
Benzene	95.08%	4.92%
Toluene	93.97%	6.03%
Ethylbenzene	93.36%	6.64%
Xylenes	90.75%	9.25%

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	6.22%	93.78%
Nitrogen	0.34%	99.66%
Methane	0.37%	99.63%
Ethane	1.47%	98.53%
Propane	3.87%	96.13%
Isobutane	6.42%	93.58%
n-Butane	8.72%	91.28%
Isopentane	10.75%	89.25%
n-Pentane	13.67%	86.33%
n-Hexane	24.47%	75.53%
Other Hexanes	19.01%	80.99%
Benzene	92.93%	7.07%
Toluene	95.96%	4.04%
Ethylbenzene	97.96%	2.04%
Xylenes	98.72%	1.28%

REGENERATOR

Regenerator Stripping Gas:
Dry Product Gas
Stripping Gas Flow Rate: 9.0000 scfm

Component	Remaining in Glycol	Distilled Overhead
Water	24.62%	75.38%
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	2.63%	97.37%
n-Pentane	2.26%	97.74%
n-Hexane	1.40%	98.60%
Other Hexanes	3.36%	96.64%
Benzene	5.32%	94.68%
Toluene	8.17%	91.83%
Ethylbenzene	10.55%	89.45%
Xylenes	13.05%	86.95%

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	4.11e+002
Carbon Dioxide	1.33e-001	7.07e+002
Nitrogen	4.01e-001	1.36e+003
Methane	7.88e+001	1.53e+005
Ethane	1.41e+001	5.12e+004
Propane	4.11e+000	2.19e+004
Isobutane	5.19e-001	3.65e+003
n-Butane	1.00e+000	7.04e+003
Isopentane	2.44e-001	2.13e+003
n-Pentane	2.25e-001	1.96e+003
n-Hexane	9.58e-002	1.00e+003
Other Hexanes	2.07e-001	2.16e+003
Benzene	1.50e-003	1.42e+001
Toluene	2.20e-003	2.45e+001
Ethylbenzene	2.00e-006	2.57e-002
Xylenes	3.19e-004	4.10e+000

Total Components	100.00	2.47e+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	1.33e-001	7.06e+002
Nitrogen	4.02e-001	1.36e+003
Methane	7.90e+001	1.53e+005
Ethane	1.41e+001	5.12e+004
Propane	4.11e+000	2.19e+004
Isobutane	5.20e-001	3.65e+003
n-Butane	1.00e+000	7.04e+003
Isopentane	2.44e-001	2.13e+003
n-Pentane	2.25e-001	1.96e+003
n-Hexane	9.59e-002	9.98e+002
Other Hexanes	2.07e-001	2.15e+003
Benzene	1.43e-003	1.35e+001
Toluene	2.07e-003	2.30e+001
Ethylbenzene	1.87e-006	2.40e-002
Xylenes	2.90e-004	3.73e+000
Total Components	100.00	2.46e+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	1.57e-012	1.33e-010
Nitrogen	3.22e-013	2.72e-011
Methane	1.02e-017	8.65e-016
Ethane	1.23e-007	1.04e-005
Propane	6.17e-009	5.21e-007
Isobutane	8.95e-010	7.55e-008
n-Butane	1.80e-009	1.52e-007
Isopentane	9.54e-005	8.05e-003
n-Pentane	1.10e-004	9.29e-003
n-Hexane	7.60e-005	6.42e-003
Other Hexanes	2.63e-004	2.23e-002
Benzene	4.34e-004	3.66e-002
Toluene	1.50e-003	1.27e-001

Component	Conc. (wt%)	Loading (lb/hr)
Ethylbenzene	2.35e-006	1.98e-004
Xylenes	6.69e-004	5.65e-002
Total Components	100.00	8.45e+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	9.18e+001	8.31e+003
Water	5.69e+000	5.15e+002
Carbon Dioxide	1.92e-002	1.74e+000
Nitrogen	1.18e-002	1.07e+000
Methane	1.27e+000	1.15e+002
Ethane	5.73e-001	5.19e+001
Propane	2.83e-001	2.56e+001
Isobutane	5.14e-002	4.65e+000
n-Butane	1.13e-001	1.02e+001
Isopentane	3.15e-002	2.85e+000
n-Pentane	3.32e-002	3.00e+000
n-Hexane	2.06e-002	1.87e+000
Other Hexanes	3.85e-002	3.48e+000
Benzene	8.18e-003	7.41e-001
Toluene	1.79e-002	1.62e+000
Ethylbenzene	2.12e-005	1.92e-003
Xylenes	4.84e-003	4.38e-001
Total Components	100.00	9.05e+003

FLASH TANK OFF GAS STREAM

Temperature: 80.00 deg. F
Pressure: 19.70 psia
Flow Rate: 3.74e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	3.40e-001	6.04e-001
Carbon Dioxide	3.76e-001	1.63e+000
Nitrogen	3.84e-001	1.06e+000
Methane	7.24e+001	1.15e+002
Ethane	1.72e+001	5.11e+001
Propane	5.65e+000	2.46e+001
Isobutane	7.59e-001	4.35e+000
n-Butane	1.63e+000	9.34e+000
Isopentane	3.57e-001	2.55e+000
n-Pentane	3.64e-001	2.59e+000

n-Hexane	1.66e-001	1.41e+000
Other Hexanes	3.32e-001	2.82e+000
Benzene	6.79e-003	5.24e-002
Toluene	7.19e-003	6.54e-002
Ethylbenzene	3.73e-006	3.91e-005
Xylenes	5.34e-004	5.59e-003
Total Components	100.00	2.17e+002

FLASH TANK GLYCOL STREAM

Temperature: 80.00 deg. F
Flow Rate: 1.58e+001 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.41e+001	8.31e+003
Water	5.83e+000	5.15e+002
Carbon Dioxide	1.23e-003	1.08e-001
Nitrogen	4.11e-005	3.63e-003
Methane	4.82e-003	4.26e-001
Ethane	8.61e-003	7.60e-001
Propane	1.12e-002	9.91e-001
Isobutane	3.38e-003	2.99e-001
n-Butane	1.01e-002	8.93e-001
Isopentane	3.47e-003	3.07e-001
n-Pentane	4.65e-003	4.10e-001
n-Hexane	5.17e-003	4.57e-001
Other Hexanes	7.49e-003	6.62e-001
Benzene	7.79e-003	6.88e-001
Toluene	1.76e-002	1.55e+000
Ethylbenzene	2.12e-005	1.88e-003
Xylenes	4.90e-003	4.33e-001
Total Components	100.00	8.83e+003

FLASH GAS EMISSIONS

Flow Rate: 1.40e+004 scfh
Control Method: Combustion Device
Control Efficiency: 98.00

Component	Conc. (vol%)	Loading (lb/hr)
Water	6.26e+001	4.17e+002
Carbon Dioxide	3.68e+001	5.98e+002
Nitrogen	1.03e-001	1.06e+000
Methane	3.87e-001	2.29e+000
Ethane	9.20e-002	1.02e+000
Propane	3.02e-002	4.92e-001
Isobutane	4.05e-003	8.70e-002

n-Butane	8.70e-003	1.87e-001
Isopentane	1.91e-003	5.09e-002
n-Pentane	1.94e-003	5.18e-002
n-Hexane	8.86e-004	2.82e-002
Other Hexanes	1.77e-003	5.64e-002
Benzene	3.63e-005	1.05e-003
Toluene	3.84e-005	1.31e-003
Ethylbenzene	1.99e-008	7.82e-007
Xylenes	2.85e-006	1.12e-004
Total Components	100.00	1.02e+003

REGENERATOR OVERHEADS STREAM

Temperature: 212.00 deg. F
Pressure: 14.70 psia
Flow Rate: 8.77e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	9.32e+001	3.88e+002
Carbon Dioxide	1.88e-002	1.91e-001
Nitrogen	2.53e-002	1.64e-001
Methane	4.98e+000	1.84e+001
Ethane	9.77e-001	6.79e+000
Propane	3.51e-001	3.57e+000
Isobutane	5.42e-002	7.28e-001
n-Butane	1.28e-001	1.72e+000
Isopentane	3.29e-002	5.49e-001
n-Pentane	3.79e-002	6.32e-001
n-Hexane	2.85e-002	5.68e-001
Other Hexanes	4.49e-002	8.94e-001
Benzene	3.62e-002	6.53e-001
Toluene	6.71e-002	1.43e+000
Ethylbenzene	6.85e-005	1.68e-003
Xylenes	1.54e-002	3.77e-001
Total Components	100.00	4.25e+002

CONDENSER PRODUCED WATER STREAM

Temperature: 200.00 deg. F
Flow Rate: 5.69e-001 gpm

Component	Conc. (wt%)	Loading (lb/hr)	(ppm)
Water	1.00e+002	2.85e+002	999988.
Carbon Dioxide	3.05e-005	8.69e-005	0.
Nitrogen	1.15e-006	3.27e-006	0.
Methane	2.07e-004	5.91e-004	2.
Ethane	8.03e-005	2.29e-004	1.

Propane	5.70e-005	1.63e-004	1.
Isobutane	5.87e-006	1.67e-005	0.
n-Butane	1.70e-005	4.83e-005	0.
Isopentane	3.45e-006	9.82e-006	0.
n-Pentane	4.09e-006	1.17e-005	0.
n-Hexane	2.67e-006	7.62e-006	0.
Other Hexanes	3.55e-006	1.01e-005	0.
Benzene	2.69e-004	7.68e-004	3.
Toluene	4.30e-004	1.22e-003	4.
Ethylbenzene	3.45e-007	9.82e-007	0.
Xylenes	9.87e-005	2.81e-004	1.
Total Components	100.00	2.85e+002	999999.

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: 2.77e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	7.85e+001	1.03e+002
Carbon Dioxide	5.97e-002	1.91e-001
Nitrogen	8.03e-002	1.64e-001
Methane	1.58e+001	1.84e+001
Ethane	3.10e+000	6.79e+000
Propane	1.11e+000	3.57e+000
Isobutane	1.72e-001	7.28e-001
n-Butane	4.06e-001	1.72e+000
Isopentane	1.04e-001	5.49e-001
n-Pentane	1.20e-001	6.32e-001
n-Hexane	9.04e-002	5.68e-001
Other Hexanes	1.42e-001	8.93e-001
Benzene	1.15e-001	6.52e-001
Toluene	2.13e-001	1.43e+000
Ethylbenzene	2.17e-004	1.68e-003
Xylenes	4.87e-002	3.76e-001
Total Components	100.00	1.40e+002

COMBUSTION DEVICE OFF GAS STREAM

Temperature: 1000.00 deg. F

Lafferty CS_outputs

Pressure: 14.70 psia
Flow Rate: 1.18e+001 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Methane	7.37e+001	3.69e-001
Ethane	1.45e+001	1.36e-001
Propane	5.19e+000	7.15e-002
Isobutane	8.03e-001	1.46e-002
n-Butane	1.90e+000	3.44e-002
Isopentane	4.88e-001	1.10e-002
n-Pentane	5.62e-001	1.26e-002
n-Hexane	4.23e-001	1.14e-002
Other Hexanes	6.65e-001	1.79e-002
Benzene	5.36e-001	1.30e-002
Toluene	9.93e-001	2.86e-002
Ethylbenzene	1.01e-003	3.36e-005
Xylenes	2.27e-001	7.53e-003
Total Components	100.00	7.27e-001

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 Lafferty 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.

c. Maximum fuel use of all compressor engines is 1,156,320,000 scf/year

2. Operational Requirements

a. Compressor engines will operate with the oxidation catalyst 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 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 9.2 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 VRUs 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. Daily, monthly, and 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 first attempt.

h. The presence of flare flame will continuously be monitored.

i. Monthly and rolling twelve-month average amount of liquids loaded out will be monitored.

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.

5. Notifications and Reports

a. WVDAQ will be notified within 30 calendar days of commencement of construction.

b. WVDAQ will be notified within 30 calendar days of startup.

c. 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.

d. An annual report of compliance with 40 CFR 60 Subpart OOOO for the compressors and storage tanks (for settling tank only) will be submitted within 90 days after one year of operation (i.e., within 90 days after 12 months after initial startup).

e. For stack testing, a protocol will be filed at least 30 days prior to test and WVDAQ and EPA will be notified 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 – Lafferty 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 45CSR13 Construction Permit Modification (R13-3285) for a Natural Gas Compressor Station located southwest of Pennsboro and east of County Road 10/4, in Richie County, West Virginia. The latitude and longitude coordinates are: 39.22418N, 80.90627W.

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

Pollutant	Change in Annual Emissions (tpy)
Nitrogen Oxides (NOx)	-13.44
Carbon Monoxide (CO)	-36.30
Volatile Organic Compounds (VOC)	10.51
Particulate Matter less than 10 µm (PM_{10})	-9.40
Particulate Matter less than 2.5 µm ($PM_{2.5}$)	-9.40
Sulfur Dioxide (SO_2)	-0.11
Formaldehyde	3.26
Benzene	-1.03
Toluene	-0.17
Ethylbenzene	-0.004
Xylenes	-0.06
n-Hexane	-0.04
Carbon Dioxide equivalent (CO_2e)	-14,428

Note that negative numbers in the table above denote a decrease in potential emissions.

Startup of operation is planned to begin on or about the 1st day of November 2016, with construction starting prior to that date. 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 this the 24th day of June 2016.

By: Antero Midstream LLC
Barry Schatz
Midstream Environmental Supervisor
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.

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