



July 19, 2016

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

**RE: Antero Midstream LLC – Bluestone Compressor Station
West Virginia Department of Environmental Protection, Division of Air Quality,
45CSR13 Air Permit Modification R13-3280**

To Whom it May Concern,

On behalf of Antero Midstream LLC (Antero), please find attached the permit modification application for permit number R13-3280 for Facility Number 033-00172 located in Harrison County, West Virginia. This application requests the originally permitted Caterpillar G3516LE compressor engine (CE-2) under G35-A004A replace the currently permitted Caterpillar G3516B compressor engine (CE-4). Additionally, it is requested that Permit Condition 5.4.1 be removed.

Enclosed is a hard-copy of the entire permit application plus two (2) electronic CDs of the permit application form and the required attachments. Per 45CSR13, a \$3,500 application fee is also enclosed, which covers the \$1,000 45CSR13 application fee and an additional \$2,500 for MACT 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

A handwritten signature in black ink that reads "Kaitlin Meszaros". The signature is written in a cursive, flowing style.

Kaitlin Meszaros
Air Quality Professional

Enclosure: Bluestone Compressor Station R13-3280 Air Permit Modification

Antero Midstream LLC

Bluestone Compressor Station

**NSR Permit Modification Application
West Virginia Department of Environmental Protection
Division of Air Quality
45CSR13 – R13-3280**

Harrison County, West Virginia

July 2016

Prepared by:



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

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DEN16O42431

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WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF AIR QUALITY

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

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

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

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

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

- ADMINISTRATIVE AMENDMENT MINOR MODIFICATION
 SIGNIFICANT MODIFICATION

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

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

Section I. General

1. Name of applicant (as registered with the WV Secretary of State's Office): Antero Midstream LLC		2. Federal Employer ID No. (FEIN): 46-5517375	
3. Name of facility (if different from above): Bluestone Compressor Station		4. The applicant is the: <input type="checkbox"/> OWNER <input type="checkbox"/> OPERATOR <input checked="" type="checkbox"/> BOTH	
5A. Applicant's mailing address: 1615 Wynkoop Street Denver, CO 80202		5B. Facility's present physical address: US-50 Salem, WV 26426	
6. West Virginia Business Registration. Is the applicant a resident of the State of West Virginia? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO – If YES , provide a copy of the Certificate of Incorporation/Organization/Limited Partnership (one page) including any name change amendments or other Business Registration Certificate as Attachment A . – If NO , provide a copy of the Certificate of Authority/Authority of 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 <i>proposed site</i> ? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO – If YES , please explain: Antero Midstream LLC owns the land for the site – If NO , you are not eligible for a permit for this source.			
9. Type of plant or facility (stationary source) to be constructed, modified, relocated, administratively updated or temporarily permitted (e.g., coal preparation plant, primary crusher, etc.): Natural Gas Compressor Station		10. North American Industry Classification System (NAICS) code for the facility: 486210	
11A. DAQ Plant ID No. (for existing facilities only): 0 3 3 – 0 0 1 7 2		11B. List all current 45CSR13 and 45CSR30 (Title V) permit numbers associated with this process (for existing facilities only): R13-3280	

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

<p>12A.</p> <ul style="list-style-type: none"> For Modifications, Administrative Updates or Temporary permits at an existing facility, please provide directions to the <i>present location</i> of the facility from the nearest state road; For Construction or Relocation permits, please provide directions to the <i>proposed new site location</i> from the nearest state road. Include a MAP as Attachment B. <p>From Bridgeport, WV head west on US-50W. In 20 miles, turn right onto 50/28. Take the first right to stay on 50/28. The entrance to the facility will be 0.2 miles ahead on the right.</p>		
<p>12.B. New site address (if applicable):</p> <p>US-50 Salem, WV 26426</p>	<p>12C. Nearest city or town:</p> <p>Salem</p>	<p>12D. County:</p> <p>Harrison</p>
<p>12.E. UTM Northing (KM): 4350.034</p>	<p>12F. UTM Easting (KM): 534.947</p>	<p>12G. UTM Zone: 17</p>
<p>13. Briefly describe the proposed change(s) at the facility: The originally permitted CE-2 (Caterpillar G3516LE 1,085 hp compressor engine) from G35-A004A is operated instead of the compressor engine authorized under the existing permit, CE-4</p>		
<p>14A. Provide the date of anticipated installation or change:</p> <ul style="list-style-type: none"> If this is an After-The-Fact permit application, provide the date upon which the proposed change did happen: / / 	<p>14B. Date of anticipated Start-Up if a permit is granted:</p>	
<p>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).</p>		
<p>15. Provide maximum projected Operating Schedule of activity/activities outlined in this application:</p> <p>Hours Per Day 24 Days Per Week 7 Weeks Per Year 52</p>		
<p>16. Is demolition or physical renovation at an existing facility involved? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO</p>		
<p>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.</p>		
<p>18. Regulatory Discussion. List all Federal and State air pollution control regulations that you believe are applicable to the proposed process (<i>if known</i>). 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 (<i>if known</i>). Provide this information as Attachment D.</p>		
<p>Section II. Additional attachments and supporting documents.</p>		
<p>19. Include a check payable to WVDEP – Division of Air Quality with the appropriate application fee (per 45CSR22 and 45CSR13).</p>		
<p>20. Include a Table of Contents as the first page of your application package.</p>		
<p>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) .</p> <ul style="list-style-type: none"> Indicate the location of the nearest occupied structure (e.g. church, school, business, residence). 		
<p>22. Provide a Detailed Process Flow Diagram(s) showing each proposed or modified emissions unit, emission point and control device as Attachment F.</p>		
<p>23. Provide a Process Description as Attachment G.</p> <ul style="list-style-type: none"> Also describe and quantify to the extent possible all changes made to the facility since the last permit review (if applicable). 		
<p>All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.</p>		

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:

<input type="checkbox"/> Bulk Liquid Transfer Operations	<input type="checkbox"/> Haul Road Emissions	<input type="checkbox"/> Quarry
<input type="checkbox"/> Chemical Processes	<input type="checkbox"/> Hot Mix Asphalt Plant	<input type="checkbox"/> Solid Materials Sizing, Handling and Storage Facilities
<input type="checkbox"/> Concrete Batch Plant	<input type="checkbox"/> Incinerator	<input type="checkbox"/> Storage Tanks
<input type="checkbox"/> Grey Iron and Steel Foundry	<input type="checkbox"/> Indirect Heat Exchanger	
<input checked="" type="checkbox"/> General Emission Unit, specify: Engine		

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

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

<input type="checkbox"/> Absorption Systems	<input type="checkbox"/> Baghouse	<input type="checkbox"/> Flare
<input type="checkbox"/> Adsorption Systems	<input type="checkbox"/> Condenser	<input type="checkbox"/> Mechanical Collector
<input type="checkbox"/> Afterburner	<input type="checkbox"/> Electrostatic Precipitator	<input type="checkbox"/> Wet Collecting System
<input type="checkbox"/> Other Collectors, specify :		

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

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

31. **Monitoring, Recordkeeping, Reporting and Testing Plans.** Attach proposed monitoring, recordkeeping, reporting and testing plans in order to demonstrate compliance with the proposed emissions limits and operating parameters in this permit application. Provide this information as **Attachment O**.
 ➤ Please be aware that all permits must be practically enforceable whether or not the applicant chooses to propose such measures. Additionally, the DAQ may not be able to accept all measures proposed by the applicant. If none of these plans are proposed by the applicant, DAQ will develop such plans and include them in the permit.

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

33. **Business Confidentiality Claims.** Does this application include confidential information (per 45CSR31)?
 YES NO
 ➤ If **YES**, identify each segment of information on each page that is submitted as confidential and provide justification for each segment claimed confidential, including the criteria under 45CSR§31-4.1, and in accordance with the DAQ's "**Precautionary Notice – Claims of Confidentiality**" guidance found in the **General Instructions** as **Attachment Q**.

Section III. Certification of Information

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

<input checked="" type="checkbox"/> Authority of Corporation or Other Business Entity	<input type="checkbox"/> Authority of Partnership
<input type="checkbox"/> Authority of Governmental Agency	<input type="checkbox"/> 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  (Please use blue ink)

DATE: 6/22/16 (Please use blue ink)

35B. Printed name of signee: Ward McNeilly

35C. Title: Vice President, Reserves Planning and Midstream

35D. E-mail: wmcneilly@anteroresources.com

35E. Phone: (303) 357-6822

35F. 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:

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

Bluestone Compressor Station – Closest Antero Midstream LLC 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 Bluestone Compressor Station operates under SIC code 4922 (pipeline transportation of natural gas). The closest facility owned by Antero Midstream LLC with this SIC code is a compressor station 4.5 miles southwest of Bluestone Compressor Station. All Antero Resources Corporation facilities operate under the SIC code of 1311 (crude oil and natural gas). The closest facility with this SIC code is approximately 2 miles to the southwest.

3. Contiguous or Adjacent: The land between the Bluestone Compressor Station and its nearest compressor station operating under the same SIC code is not owned or managed by Antero Midstream LLC. Therefore, the facilities are not considered to be adjacent or contiguous.

Based on this three-pronged evaluation, there are no other existing facilities that should aggregate emissions with Bluestone Compressor Station.

Remote Engine Classification

Bluestone Compressor Station – Remote Engine Classification

The Caterpillar G3516LE 1,265 horsepower engine at Bluestone Compressor Station is an existing area source. For 40 CFR Part 63 Subpart ZZZZ (Subpart ZZZZ), the engine is classified as a remote engine because it is located in a Department of Transportation (DOT) Class 1 area. The definition of a remote engine for Subpart ZZZZ is based on the DOT Class 1 definition. The attached map and report documents the DOT classification. The map shows that there are less than ten (10) residences and no four story buildings within the orange boundary (220 yards) that buffers the 1 mile long and ¼ mile wide pipeline that defines the DOT Class 1 area around the compressor station. There are six (6) residences in the DOT Class 1 area.



BLUESTONE COMPRESSOR STATION DOT CLASS 1 REMOTE ENGINE DETERMINATION

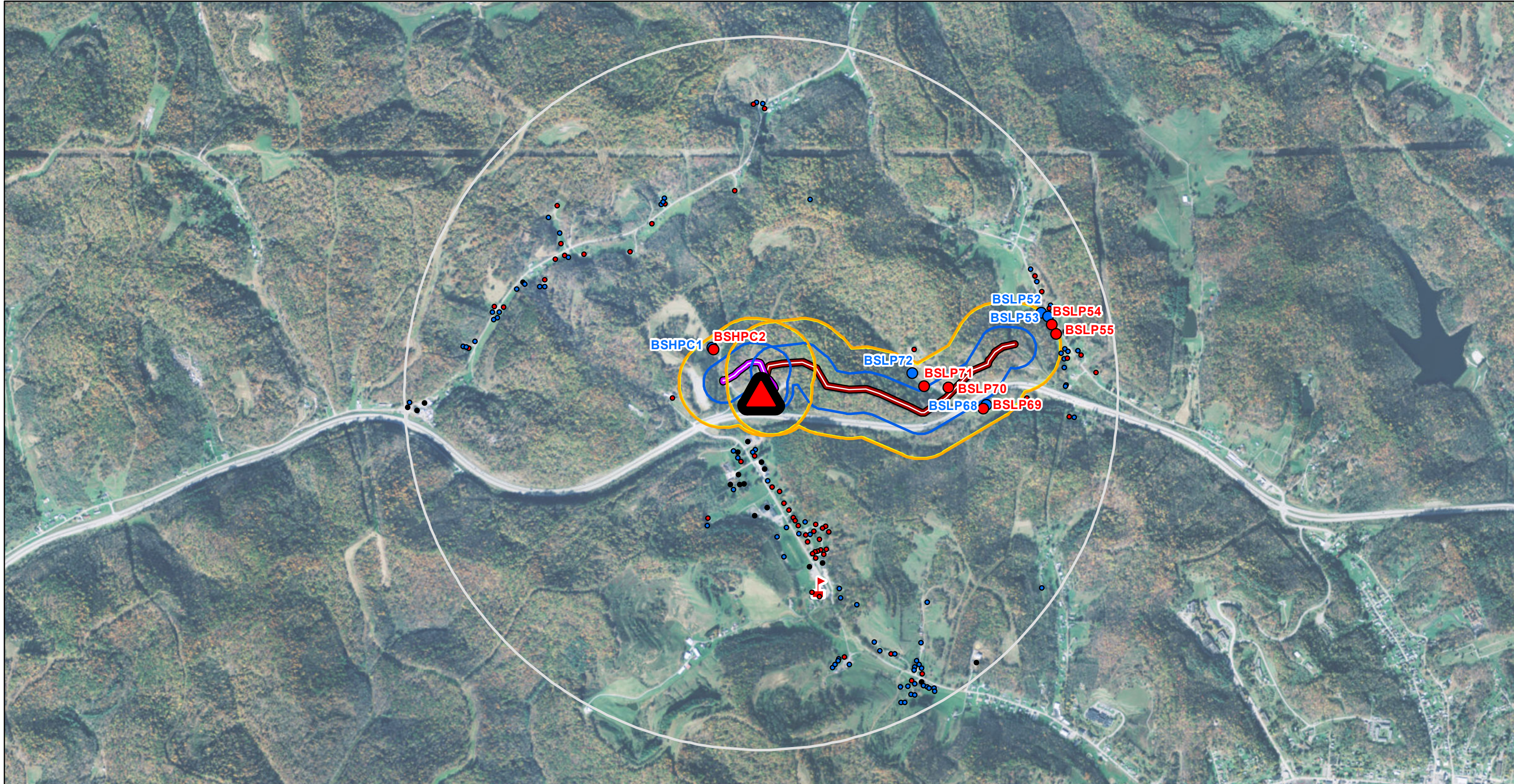
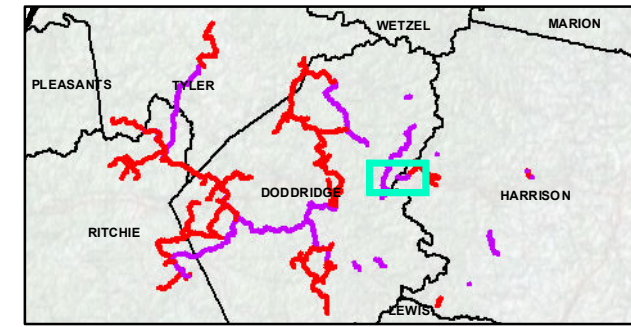
1 inch = 1,385 feet
0 750 1,500 3,000 Feet

- RESIDENCE - INSIDE DOT CLASS 1 AREA
- NON-RESIDENCE - INSIDE DOT CLASS 1 AREA

- RESIDENCE
- NON-RESIDENCE
- OFFICE
- SCHOOL
- BLUESTONE COMPRESSOR STATION

- 300 FEET (100 YARDS)
- 660 FEET (220 YARDS)
- 670 FEET (223.33 YARDS)
- 1 MILE
- BLUESTONE COMPRESSOR HP TO COLUMBIA - DOT CLASS 1
- BLUESTONE LP GATHERING MAIN - DOT CLASS 1

MAIN MAP EXTENT

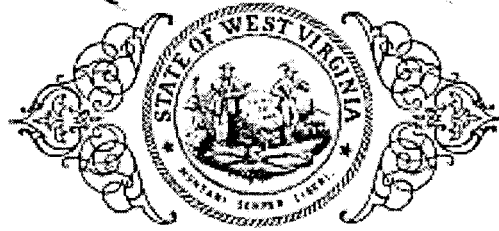


Line Name	Bluestone Compressor station
State	West Virginia
County	Doddridge/Harrison
Imagery Source	GoogleEarth 11/13/2013 GoogleEarth 12/30/2003

Structure Name	Structure Description	Pipeline	Longitude	Latitude	Structure Field Verification Date
BSLP52	Non-Residence	Bluestone LP Gathering Main	-80.580624	39.302074	
BSLP53	Non-Residence	Bluestone LP Gathering Main	-80.58027	39.301905	
BSLP54	Residence	Bluestone LP Gathering Main	-80.58005	39.301588	
BSLP55	Residence	Bluestone LP Gathering Main	-80.579853	39.3012	
BSLP68	Non-Residence	Bluestone LP Gathering Main	-80.583495	39.298326	
BSLP69	Residence	Bluestone LP Gathering Main	-80.583677	39.298178	
BSLP70	Residence	Bluestone LP Gathering Main	-80.585599	39.299082	
BSLP71	Residence	Bluestone LP Gathering Main	-80.586755	39.299102	
BSLP72	Non-Residence	Bluestone LP Gathering Main	-80.587379	39.299628	
BSHPC1	Non-Residence	Bluestone Compressor HP to Columbia	-80.59782	39.30071	
BSHPC2	Residence	Bluestone Compressor HP to Columbia	-80.59776	39.300628	

**Attachment A.
Business Certificate**

State of West Virginia



Certificate

LAB

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

ANTERO MIDSTREAM LLC

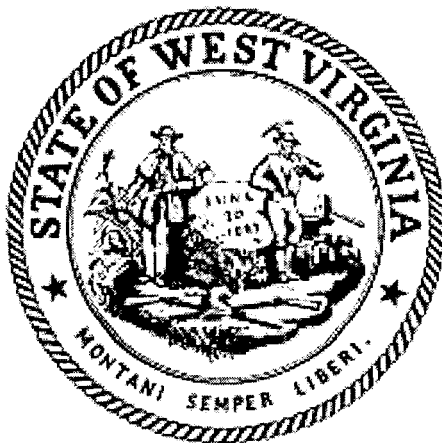
Control Number: 9A5E1

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

WV APPLICATION FOR
CERTIFICATE OF AUTHORITY OF
LIMITED LIABILITY COMPANY

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

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

Control # WABE1

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: 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

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: an at-will company, for an indefinite period
 a term company, for the term of _____ years,
 which will expire on _____.

10. The company is: 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. 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.

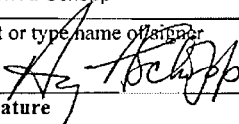
12. The purpose for which this limited liability company is formed are as follows:
 (Describe the type(s) of business activity which will be conducted, for example, "real estate," "construction of residential and commercial buildings," "commercial printing," "professional practice of architecture.")
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.]
 No [Proceed to question 14.]

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

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

PAGE 1

The First State

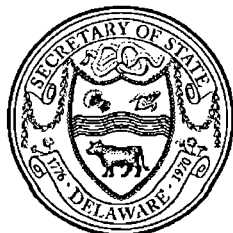
I, JEFFREY W. BULLOCK, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY "ANTERO MIDSTREAM LLC" IS DULY FORMED UNDER THE LAWS OF THE STATE OF DELAWARE AND IS IN GOOD STANDING AND HAS A LEGAL EXISTENCE SO FAR AS THE RECORDS OF THIS OFFICE SHOW, AS OF THE TWENTY-NINTH DAY OF APRIL, A.D. 2014.


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

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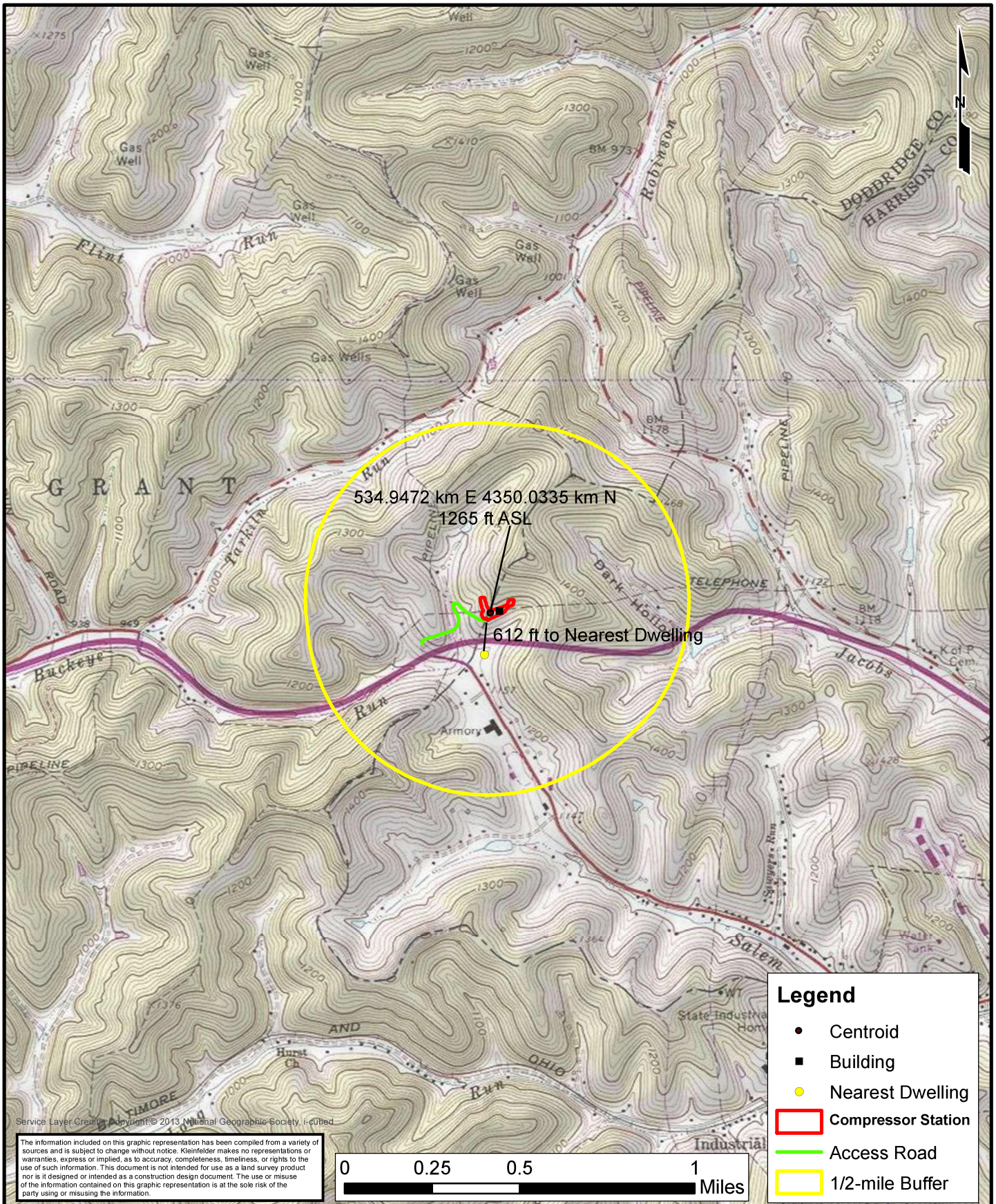
You may verify this certificate online
at corp.delaware.gov/authver.shtml




Jeffrey W. Bullock, Secretary of State
AUTHENTICATION: 1328067

DATE: 04-29-14

**Attachment B.
Area Map**



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PROJECT NO.	20161518
DRAWN:	7/21/2015
DRAWN BY:	B. McDavid
CHECKED BY:	K. Meszaros
FILE NAME:	Bluestone_ProjectLocation.mxd

Antero Midstream LLC	FIGURE
	1
Bluestone Compressor Station Harrison County, West Virginia Project Area Map	

**Attachment C.
Installation and Startup Schedule**

Bluestone Compressor Station – Installation and Startup Schedule

The Bluestone Compressor Station is an existing facility located in Harrison County, WV, approximately 2.2 miles northwest of Salem, WV. The facility began operations in 2008 under General Permit G35-A004A. The permit was transferred to Antero Midstream LLC in October of 2015 and permitted under the active permit, R13-3280. The engine that is being included in this application (CE-02) was installed in 2008 and has not been modified since.

**Attachment D.
Regulatory Discussion**

Bluestone 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 m³ (§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 produced water storage tanks at the Bluestone Compressor Station are 33 m³ and 8 m³. Therefore, Subpart Kb does not apply to the Bluestone Compressor Station.

- II. *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 does not apply as the Bluestone Compressor Station was modified after August 23, 2011.

- III. *Subpart LLL - Standards of Performance for SO₂ 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 does not apply as the Bluestone Compressor Station was modified after August 23, 2011.

- IV. *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)). Subpart JJJJ does not apply to Bluestone Compressor Station since the compressor engine was manufactured before July 1, 2007.

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

Applicability: Subpart OOOO applies to gas well facilities and reciprocating compressor facilities that were constructed, modified, or reconstructed after August 23, 2011 (§60.5365(c)). Additionally, Subpart OOOO applies to storage vessel affected facilities with individual tank emissions greater than 6 tons per year (§60.5365(e)). Therefore, Subpart OOOO does not apply

to the Bluestone Compressor Station as the gas well was drilled in May of 2008, the compressor engine was not modified after August 23, 2011, and each of the storage tanks' potential to emit is less than six (6) tons per year of VOCs. The pneumatic controllers installed at Bluestone Compressor Station are air-actuated and therefore exempt from the requirements of this Subpart.

- VI. *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 does not apply since Bluestone Compressor Station was modified before September 18, 2015.

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 Bluestone 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 Bluestone Compressor Station, and because it is an area source of HAP emissions, the TEG dehydrator will be applicable sources under Subpart HH (§63.760(b)(2)). However, actual benzene emissions from the dehydrator at the Bluestone Compressor Station is less than 1 ton per year, so the dehydrator is 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 Bluestone Compressor Station as it is not a major source of HAP emissions. Further, the Bluestone Compressor Station is prior to the gas transmission and storage phase.

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

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

IV. *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 Bluestone Compressor Station as the compressor engine is an existing RICE. The compressor engine at the Bluestone Compressor Station meets the definition of remote stationary RICE as discussed in the aggregation section of the application. Therefore, the compressor engine will meet the maintenance, operating and recordkeeping requirements of Subpart ZZZZ for remote engines greater than 500 horsepower at an area source of HAP emissions.

V. *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 Bluestone Compressor Station as it is not a major source of HAP emissions.

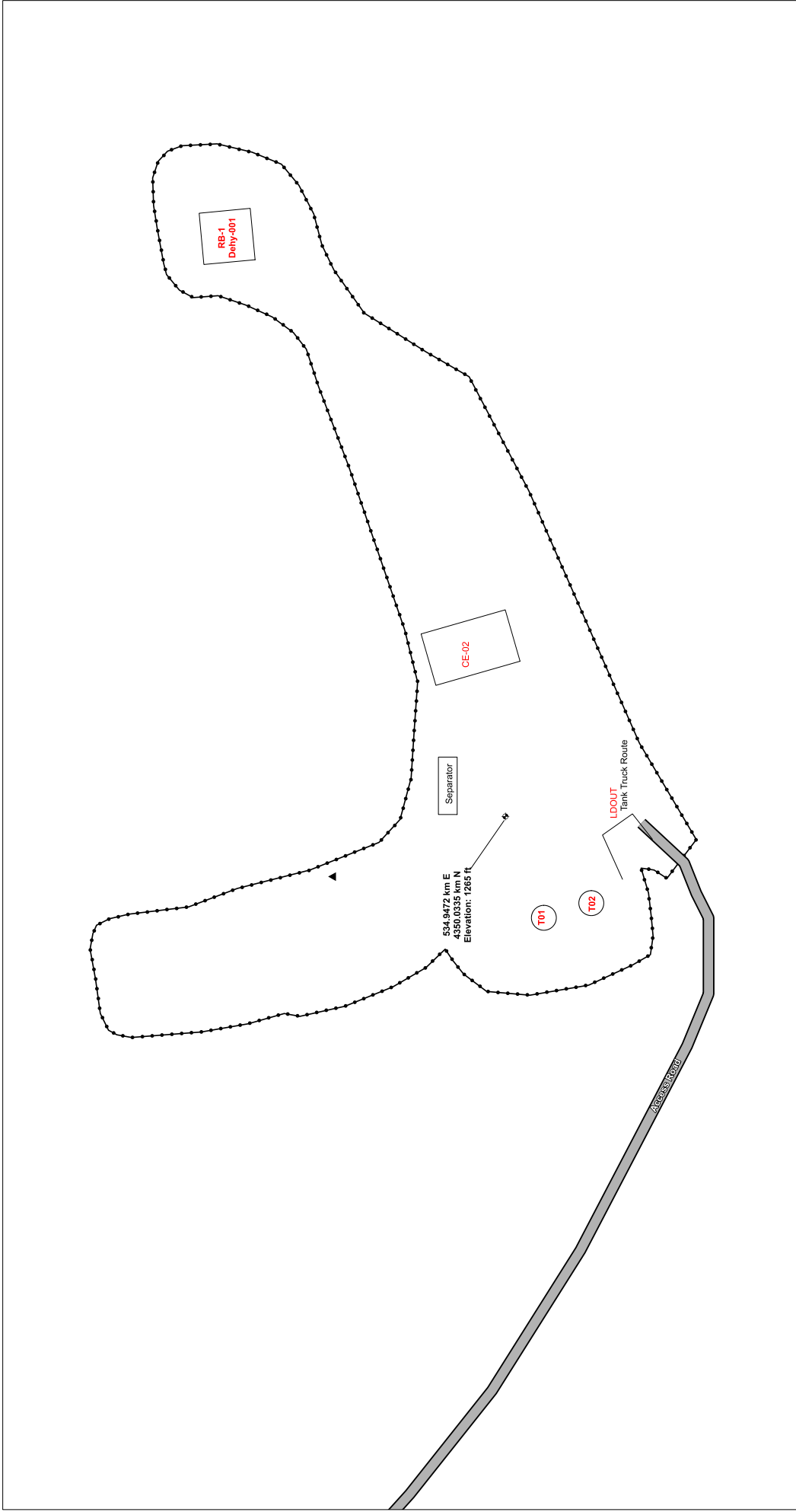
West Virginia State Regulations

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

The following Title 45 Legislative Rules will be applicable to the Bluestone 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**



0 25 50 100 Feet

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- Legend**
- ▲ Wellhead
 - ▬ Access Road
 - ▭ Well Pad/Property Boundary/Fence

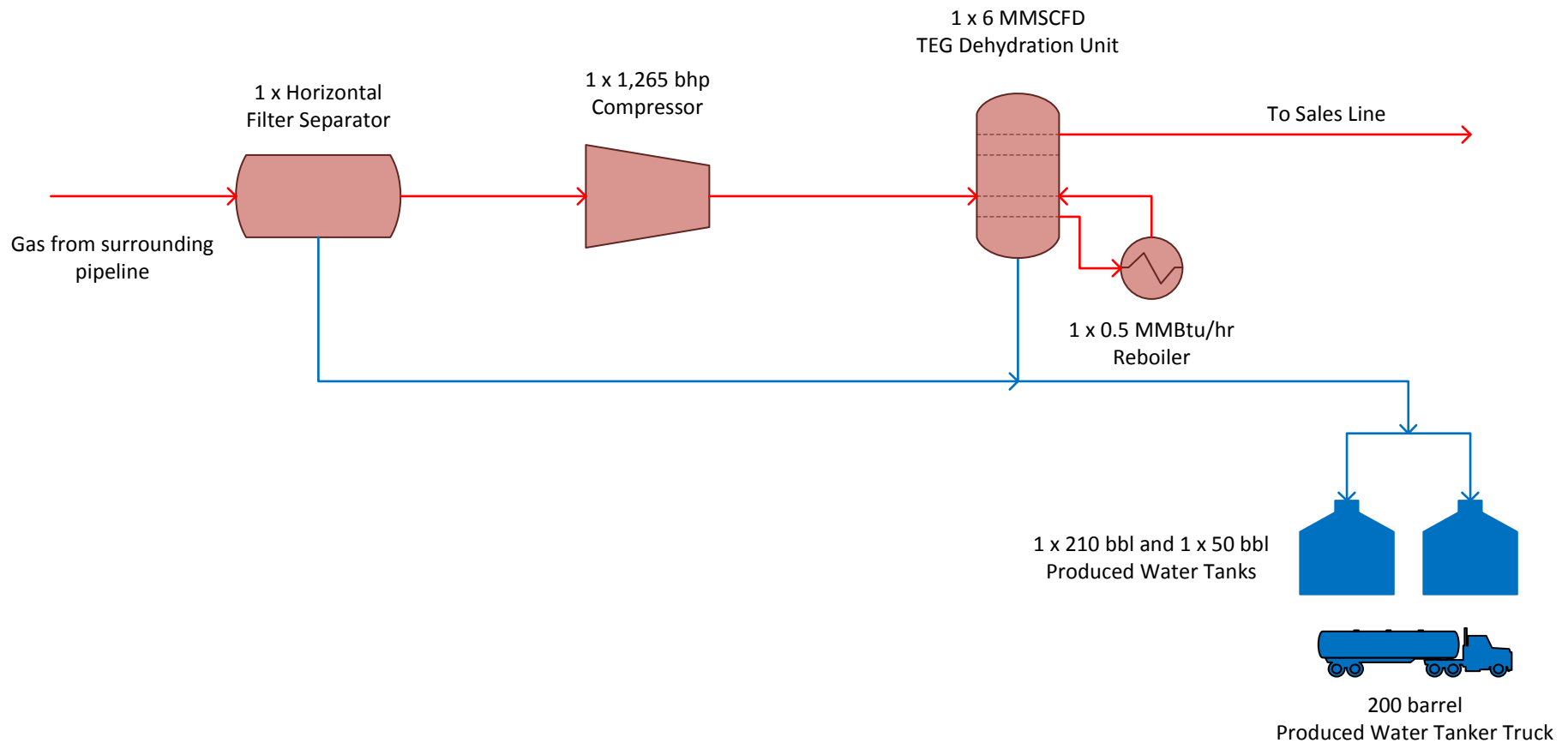


PROJECT NO. 20161518
 DRAWN: 7/21/2015
 DRAWN BY: B. McDavid
 CHECKED BY: K. Meszaros
 FILE NAME: BluestoneCompressorStation.mxd

Antero Midstream LLC
 Bluestone Compressor Station
 Harrison County, Virginia
 Plot Plan

FIGURE
1

**Attachment F.
Process Flow Diagram**



Process Flow Diagram
Antero Midstream LLC
Bluestone Compressor Station
Harrison County, West Virginia

**Attachment G.
Process Description**

Attachment G

Bluestone Compressor Station – Process Description

The Bluestone Compressor Station is located in Harrison County, West Virginia. The facility consists of one (1) 1,265 brake horsepower (bhp) Caterpillar G3516LE compressor engine, one (1) 210 barrel (bbl) produced water tank, one (1) 50 bbl produced water tank, one (1) 25 million standard cubic feet per day (MMSCFD) capacity triethylene glycol (TEG) dehydration unit with a 0.5 MMBtu/hr reboiler, and one (1) horizontal filter separator.

Gas from surrounding pipelines and onsite well enters the facility through one (1) filter separator for the initial separation of production liquids and sales gas. There are no regular emissions associated with the separator other than fugitive component leaks discussed below. Gas from the filter separator is sent to the 1,265 bhp Caterpillar compressor engine (CE-02). Produced water from the filter separator and compressor engine is sent to the 210 bbl produced water tank (T01) and 50 bbl produced water tank (T02). Gas from the compressor engine is sent to the TEG dehydrator (DEHY-001).

The TEG dehydrator (DEHY-001) contains a flash gas tank and 0.5 MMBtu/hr reboiler (RB-1). The dehydrator has a design rate of 25 MMSCFD, but will only process a maximum of 6 MMSCFD. Within the dehydration unit, vent gas from the flash gas tank is routed to the reboiler and used as fuel with an assumed 95% efficiency for combusting the gas. Emissions from the reboiler are routed to the atmosphere. The still vent is equipped with a condenser. Produced water from the dehydrator is routed to the two (2) produced water tanks. The dry gas from the dehydration process is sent to plant discharge.

Produced water is trucked out via tank trucks as needed (LDOUT). The facility produced water production is 210 barrels per day. Fugitive emissions also occur from component leaks and from haul road dust from onsite truck traffic. The compressor engine will undergo venting episodes from regular maintenance including compressor blowdowns.

The N Ritter 1 is a dry gas well owned by Antero Resources Corporation on the same pad as the Bluestone Compressor Station. The well is not covered under R13-3280 since there are no emissions associated with this well as it does not have any associated production equipment and its production is piped to commingle with other compressor station inlet flows.

Sources of emissions from the compressor station include:

- Compressor Engine: NO_x, CO, VOC, SO_x, PM₁₀, PM_{2.5}, HAPs, CO_{2e}
- Produced Water Storage Tanks: VOC, HAPs, CO_{2e}
- Dehydration Unit: VOC, HAPs, CO_{2e}
- Reboiler: NO_x, CO, VOC, SO_x, PM₁₀, PM_{2.5}, HAPs, CO_{2e}
- Truck Loading: VOC, HAPs, CO_{2e}
- Fugitive Component Leaks: VOC, HAPs, CO_{2e}
- Venting Episodes: VOC, HAPs, CO_{2e}
- Fugitive Dust: PM₁₀, PM_{2.5}

Attachment H.
Material Safety Data Sheets



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

PRODUCT CODES: CAS Reg. No. 68410-63-9 **AFTER HOURS:** (800) 878-1373

PRODUCER: Antero Resources

ADDRESS: 1615 Wynkoop Street **CHEMTREC PHONE:** (800) 424-9300
Denver, Colorado 80202

***** 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.

SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

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.

SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

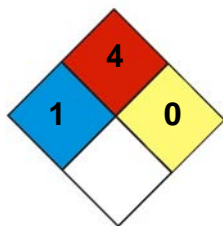
First Aid: Ingestion

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

SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

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.

SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

*** 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)

SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

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)

SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

Evaporation Rate: ND	VOC: ND
Octanol / H₂O Coeff.: ND	Flash Point: Flammable Gas
Flash Point Method: N/A	
Lower Flammability Limit: 3.8 – 6.5	Upper Flammability Limit: 13-17
(LFL):	(UFL):
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

SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

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.

SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

*** 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.

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

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:



SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

***** 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

<u>Acute Health</u>	<u>Chronic Health</u>	<u>Fire</u>	<u>Sudden Release of Pressure</u>	<u>Reactive</u>
---	---	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

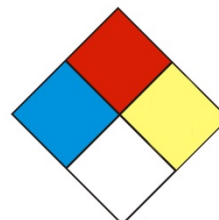
Material Name: Dry Field Natural Gas

US GHS

***** 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



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	EMERGENCY PHONE:	(800) 878-1373
PRODUCT CODES:	Mixture	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.

SAFETY DATA SHEET

Material Name: Produced Water

US GHS

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.

SAFETY DATA SHEET

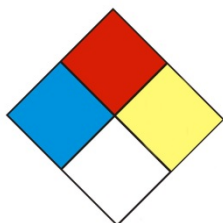
Material Name: Produced Water

US GHS

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

SAFETY DATA SHEET

Material Name: Produced Water

US GHS

*** 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

SAFETY DATA SHEET

Material Name: Produced Water

US GHS

*** 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

SAFETY DATA SHEET

Material Name: Produced Water

US GHS

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	Upper Flammability Limit:	ND
Lower Flammability Limit: (LFL):	ND	(UFL):	
Auto Ignition:	ND	Burning Rate:	ND

SAFETY DATA SHEET

Material Name: Produced Water

US GHS

*** 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.

SAFETY DATA SHEET

Material Name: Produced Water

US GHS

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.

SAFETY DATA SHEET

Material Name: Produced Water

US GHS

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

SAFETY DATA SHEET

Material Name: Produced Water

US GHS

*** 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

SAFETY DATA SHEET

Material Name: Produced Water

US GHS

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

**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: C₆H₁₄O₄
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

Material Safety Data Sheet (TRIETHYLENE GLYCOL (TEG))

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 (CO₂).
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

**Material Safety Data Sheet
(TRIETHYLENE GLYCOL (TEG))**

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

Material Safety Data Sheet (TRIETHYLENE GLYCOL (TEG))

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 agents and materials reactive with hydroxyl compounds. Avoid burning or heating in air. This may produce irritating aldehydes, acids, and ketones.

CONDITIONS TO AVOID:..... Excessive heat. Will ignite in air at 700°F

**Material Safety Data Sheet
(TRIETHYLENE GLYCOL (TEG))**

SECTION 11 – TOXICOLOGICAL INFORMATION

EYE EFFECTS:

The eye irritation hazard is based on data from information supplied by raw material(s) supplier(s).

SKIN EFFECTS:

The skin irritation hazard is based on data from information supplied by raw material(s) supplier(s).

ACUTE ORAL EFFECTS:

The acute oral toxicity is based on data from information supplied by raw material(s) supplier(s).

ACUTE INHALATION EFFECTS:

The acute respiratory toxicity is based on data from information supplied by raw material(s) supplier(s).

SECTION 12 – ECOLOGICAL INFORMATION

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

SECTION 13 DISPOSAL CONSIDERATIONS

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

SECTION 14- TRANSPORTATION INFORMATION

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

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

SECTION 15 - REGULATORY INFORMATION

SARA 311 CATEGORIES:

EPA ACUTE:..... Yes (Eyes)

**Material Safety Data Sheet
(TRIETHYLENE GLYCOL (TEG))**

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.**

THIS IS THE LAST PAGE OF THIS MSDS

**Attachment I.
Emission Units Table**

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
CE-02	1E	Caterpillar G3516LE Compressor Engine	2008	1,265 bhp	Modification	NA
CE-4	1E	Caterpillar G3516B Compressor Engine	2010	1,380 bhp	Removal	1C
T01	2E	Produced Water Storage Tank #1	2015	210 bbl	NA	None
T02	3E	Produced Water Storage Tank #2	2015	50 bbl	NA	None
DEHY-001	4E	TEG Dehydration Unit	2015	25 MMSCFD	NA	RB-1 (2C)
RB-1	5E/2C	Reboiler	2015	0.5 MMBtu/hr	NA	None
LDOUT	6E	Produced Water Truck Loadout	2015	210 bbl/day	NA	None

¹ For Emission Units (or Sources) use the following numbering system: 1S, 2S, 3S,... or other appropriate designation.

² For Emission Points use the following numbering system: 1E, 2E, 3E, ... or other appropriate designation.

³ New, modification, removal

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

Attachment J.
Emission Point Data Summary Sheet

**Attachment J
EMISSION POINTS DATA SUMMARY SHEET**

Table 1: Emissions Data															
Emission Point ID No. <i>(Must match Emission Units Table & Plot Plan)</i>	Emission Point Type ¹	Emission Unit Vented Through This Point <i>(Must match Emission Units Table & Plot Plan)</i>		Air Pollution Control Device <i>(Must match Emission Units Table & Plot Plan)</i>		Vent Time for Emission Unit <i>(chemical processes only)</i>		All Regulated Pollutants - Chemical Name/CAS ³ <i>(Speciate VOCs & HAPS)</i>	Maximum Potential Uncontrolled Emissions ⁴		Maximum Potential Controlled Emissions ⁵		Emission Form or Phase <i>(At exit conditions, Solid, Liquid or Gas/Vapor)</i>	Est. Method Used ⁶	Emission Concentration ⁷ <i>(ppmv or mg/m⁴)</i>
		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	CE-02	Compressor engine	----	----	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	5.58 5.19 0.73 0.094 0.0055 0.68 0.50 1315	24.43 22.72 3.18 0.41 0.024 2.96 2.17 5758	5.58 5.19 0.73 0.094 0.0055 0.68 0.50 1315	24.43 22.72 3.18 0.41 0.024 2.96 2.17 5758	Gas/Vapor	EE	
2E	Upward Vertical Stack	T01	Produced Water Tank 1	----	----	C	8,760	VOC Total HAPs CO2e	0.44 0.018 95.5	1.91 0.080 418.3	0.44 0.018 95.5	1.91 0.080 418.3	Gas/Vapor	EE	
3E	Upward Vertical Stack	T02	Produced Water Tank 2	----	----	C	8,760	VOC Total HAPs CO2e	0.11 0.0052 23.2	0.47 0.023 101.6	0.11 0.0052 23.2	0.47 0.023 101.6	Gas/Vapor	EE	
4E	Upward Vertical Stack	DEHY-001	TEG Dehydration Unit	4C	NSCR catalyst	C	8,760	VOC Total HAPs Benzene Toluene Ethylbenzene Xylenes n-Hexane CO2e	2.71 1.93 0.073 0.46 0.097 1.27 0.037 36.7	11.87 8.46 0.32 1.99 0.43 5.57 0.16 161	1.95 1.73 0.062 0.40 0.087 1.17 0.011 3.02	8.54 7.57 0.27 1.73 0.38 5.14 0.047 13.2	Gas/Vapor	EE	

5E	Upward Vertical Stack	RB-1	Reboiler	---	----	C	8,760	NOx	0.061	0.27	0.061	0.27	Gas/Vapor	EE
								CO	0.051	0.23	0.051	0.23		
								VOC	0.0034	0.015	0.0034	0.015		
								PM10	0.0047	0.020	0.0047	0.020		
								SO2	3.7E-4	0.0016	3.7E-4	0.0016		
								Total HAPs	0.0012	0.0051	0.0012	0.0051		
								Formaldehyde	4.6E-5	2.0E-4	4.6E-5	2.0E-4		
								CO2e	58.7	257	58.7	257		

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, CS₂, VOCs, H₂S, Inorganics, Lead, Organics, O₃, NO, NO₂, SO₂, SO₃, all applicable Greenhouse Gases (including CO₂ and methane), etc. **DO NOT LIST** H₂, H₂O, N₂, O₂, and Noble Gases.
- 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/m³) at standard conditions (68 °F and 29.92 inches Hg) (see 45CSR7). If the pollutant is SO₂, use units of ppmv (See 45CSR10).

Attachment J EMISSION POINTS DATA SUMMARY SHEET

Emission Point ID No.	Inner Diameter (ft.)	Exit Gas			Emission Point Elevation (ft)		UTM Coordinates (km)	
		Temp. (°F)	Volumetric Flow ¹ (acfm) <i>at operating conditions</i>	Velocity (fps)	Ground Level <i>(Height above mean sea level)</i>	Stack Height ²	Northing	Easting
1E	1.1	873	7,663	134	1,265	~10	4350.028	534.939
2E	0.1	65	0.42	3.7	1,265	15	4350.022	534.893
3E	0.1	65	1.75	0.9	1,265	6	4350.013	534.897
4E	1.5	250	2.9	0.03	1,265	~4	4350.066	535.007
5E	2.0	375	3,770	20	1,265	~10	4350.066	535.014

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? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If YES, then complete the HAUL ROAD EMISSIONS UNIT DATA SHEET.	
2.) Will there be Storage Piles? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If YES, complete Table 1 of the NONMETALLIC MINERALS PROCESSING EMISSIONS UNIT DATA SHEET.	
3.) Will there be Liquid Loading/Unloading Operations? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If YES, complete the BULK LIQUID TRANSFER OPERATIONS EMISSIONS UNIT DATA SHEET.	
4.) Will there be emissions of air pollutants from Wastewater Treatment Evaporation? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> 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.)? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> 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? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.	
7.) Will there be any other activities that generate fugitive emissions? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> 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	PM-10 PM-2.5	---	---	---	---	EE
Unpaved Haul Roads	PM-10 PM-2.5	0.071 0.0071	0.31 0.031	0.071 0.0071	0.31 0.031	EE
Storage Pile Emissions						
Loading/Unloading Operations	VOCs Total HAPs CO2e	0.71 0.03 154.8	0.14 0.006 29.7	0.71 0.03 154.8	0.14 0.006 29.7	EE
Wastewater Treatment Evaporation & Operations						
Equipment Leaks	VOCs Total HAPs CO2e	Does not apply	0.58 0.030 27.6	Does not apply	0.58 0.030 27.6	EE
General Clean-up VOC Emissions						
Other – Venting Episodes	VOCs Total HAPs CO2e	Does not apply	0.29 0.016 61.7	Does not apply	0.29 0.016 61.7	EE

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

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

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

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

**Attachment L.
Emissions Unit Data Sheets**

Compressor Engine

NATURAL GAS COMPRESSOR/GENERATOR ENGINE DATA SHEET

Source Identification Number ¹		CE-02					
Engine Manufacturer and Model		Caterpillar G3516LE					
Manufacturer's Rated bhp/rpm		1,265 bhp/ 1,400 rpm					
Source Status ²		MS					
Date Installed/Modified/Removed ³		2008					
Engine Manufactured/Reconstruction Date ⁴		Pre-July 2007					
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No) ⁵		No					
Engine, Fuel and Combustion Data	Engine Type ⁶	LB4S					
	APCD Type ⁷	NA					
	Fuel Type ⁸	PQ					
	H ₂ S (gr/100 scf)	0					
	Operating bhp/rpm	1,265 bhp/ 1,400 rpm					
	BSFC (Btu/bhp-hr)	7,405					
	Fuel throughput (ft ³ /hr)	8,229					
	Fuel throughput (MMft ³ /yr)	72.09					
	Operation (hrs/yr)	8,760					
Reference ⁹	Potential Emissions ¹⁰	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
MD	NO _x	5.58	24.43				
MD	CO	5.19	22.72				
MD	VOC	0.73	3.18				
AP	SO ₂	0.0055	0.024				
AP	PM ₁₀	0.094	0.41				
AP	Formaldehyde	0.50	2.17				

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
LB4S Lean Burn Four Stroke

RB4S Rich Burn Four Stroke

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

A/F Air/Fuel Ratio
HEIS High Energy Ignition System
PSC Prestratified Charge
NSCR Rich Burn & Non-Selective Catalytic Reduction

IR Ignition Retard
SIPC Screw-in Precombustion Chambers
LEC Low Emission Combustion
SCR Lean Burn & Selective Catalytic Reduction

8. Enter the Fuel Type using the following codes:

PQ Pipeline Quality Natural Gas

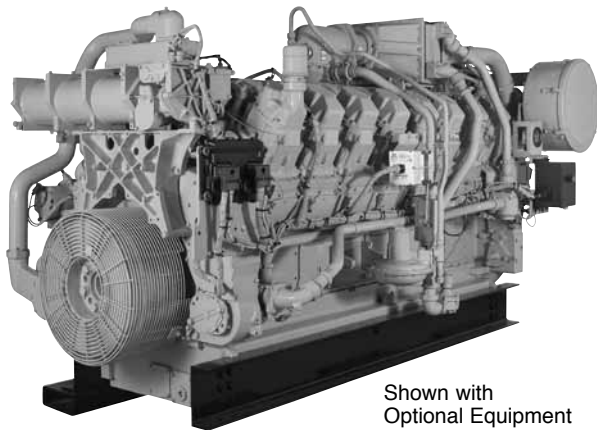
RG Raw Natural Gas

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
GR GRI-HAPCalc™

AP AP-42
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*.



Shown with
Optional Equipment

CAT® ENGINE SPECIFICATIONS

V-16, 4-Stroke-Cycle

Bore	170 mm (6.7 in.)
Stroke	190 mm (7.5 in.)
Displacement	69 L (4210 cu. in.)
Aspiration	Turbocharged-Aftercooled
Digital Engine Management	
Governor and Protection	Electronic (ADEM™ A3)
Combustion	Low Emission (Lean Burn)
Engine Weight, net dry (approx)	8015 kg (17,670 lb)
Power Density	8 kg/kW (13.2 lb/bhp)
Power per Displacement	19.3 bhp/L
Total Cooling System Capacity	217.7 L (57.5 gal)
Jacket Water	200.6 L (53 gal)
Aftercooler Circuit	17 L (4.5 gal)
Lube Oil System (refill)	424 L (112 gal)
Oil Change Interval	1000 hours
Rotation (from flywheel end)	Counterclockwise
Flywheel and Flywheel Housing	SAE No. 00
Flywheel Teeth	183

FEATURES

Engine Design

- Proven reliability and durability
- Ability to burn a wide spectrum of gaseous fuels
- Robust diesel strength design prolongs life and lowers owning and operating costs
- Broad operating speed range

Emissions

Meets U.S. EPA Spark Ignited Stationary NSPS Emissions for 2007/8

Lean Burn Engine Technology

Lean-burn engines operate with large amounts of excess air. The excess air absorbs heat during combustion reducing the combustion temperature and pressure, greatly reducing levels of NOx. Lean-burn design also provides longer component life and excellent fuel consumption.

Advanced Digital Engine Management

ADEM A3 control system providing integrated ignition, speed governing, protection, and controls, including detonation-sensitive variable ignition timing. ADEM A3 has improved: user interface, display system, shutdown controls, and system diagnostics.

Ease of Operation

Side covers on block allow for inspection of internal components

Full Range of Attachments

Large variety of factory-installed engine attachments reduces packaging time

Testing

Every engine is full-load tested to ensure proper engine performance.

Gas Engine Rating Pro

GERP is a PC-based program designed to provide site performance capabilities for Cat® natural gas engines for the gas compression industry. GERP provides engine data for your site's altitude, ambient temperature, fuel, engine coolant heat rejection, performance data, installation drawings, spec sheets, and pump curves.

Product Support Offered Through Global Cat Dealer Network

More than 2,200 dealer outlets

Cat factory-trained dealer technicians service every aspect of your petroleum engine

Cat parts and labor warranty

Preventive maintenance agreements available for repair-before-failure options

S•O•SSM program matches your oil and coolant samples against Caterpillar set standards to determine:

- Internal engine component condition
- Presence of unwanted fluids
- Presence of combustion by-products
- Site-specific oil change interval

Over 80 Years of Engine Manufacturing Experience

Over 60 years of natural gas engine production

Ownership of these manufacturing processes enables Caterpillar to produce high quality, dependable products.

- Cast engine blocks, heads, cylinder liners, and flywheel housings
- Machine critical components
- Assemble complete engine

Web Site

For all your petroleum power requirements, visit www.catoilandgas.cat.com.

TECHNICAL DATA
G3516 LE Gas Petroleum Engine

Fuel System		2 g NOx NTE Rating DM8618-01	2 g NOx NTE Rating DM8620-01
Engine Power			
@ 100% Load	bkW (bhp)	999 (1340)	858 (1150)
@ 75% Load	bkW (bhp)	749 (1004)	643 (862)
Engine Speed		1400	1200
Max Altitude @ Rated Torque and 38°C (100°F)	rpm m (ft)	304.8 (1000)	1219.2 (4000)
Speed Turndown @ Max Altitude, Rated Torque, and 38°C (100°F)	%	25	9.2
SCAC Temperature		54 (130)	54 (130)
Emissions*			
NOx	g/bkW-hr (g/bhp-hr)	2.68 (2)	2.68 (2)
CO	g/bkW-hr (g/bhp-hr)	2.49 (1.86)	2.35 (1.75)
CO ₂	g/bkW-hr (g/bhp-hr)	632 (471)	624 (466)
VOC**	g/bkW-hr (g/bhp-hr)	0.35 (0.26)	0.4 (0.3)
Fuel Consumption***			
@ 100% Load	MJ/bkW-hr (Btu/bhp-hr)	10.48 (7405)	10.36 (7324)
@ 75% Load	MJ/bkW-hr (Btu/bhp-hr)	10.79 (7628)	10.76 (7605)
Heat Balance			
Heat Rejection to Jacket Water			
@ 100% Load	bkW (Btu/mn)	741 (42,123)	639 (36,343)
@ 75% Load	bkW (Btu/mn)	616.7 (35,075)	554 (31,480)
Heat Rejection to Aftercooler			
@ 100% Load	bkW (Btu/mn)	167.8 (9546)	131.9 (7509)
@ 75% Load	bkW (Btu/mn)	108.6 (6179)	72.2 (4108)
Heat Rejection to Exhaust			
@ 100% Load	bkW (Btu/mn)	837.8 (47,643)	694.6 (39,536)
LHV to 25° C (77° F)			
@ 75% Load	bkW (Btu/mn)	630.4 (35,848)	524.1 (29,806)
LHV to 25° C (77° F)			
Exhaust System			
Exhaust Gas Flow Rate			
@ 100% Load	m ³ /min (cfm)	217.0 (7663)	182.9 (6460)
@ 75% Load	m ³ /min (cfm)	163.8 (5785)	138.9 (4905)
Exhaust Stack Temperature			
@ 100% Load	°C (°F)	467.22 (873)	452.2 (846)
@ 75% Load	°C (°F)	467.22 (873)	450.5 (843)
Intake System			
Air Inlet Flow Rate			
@ 100% Load	m ³ /min (scfm)	80.6 (2847)	69.5 (2453)
@ 75% Load	m ³ /min (scfm)	60.8 (2147)	52.8 (1864)
Gas Pressure		241.5-275.8 (35-40)	241.5-275.8 (35-40)

*at 100% load and speed, all values are listed as not to exceed

**Volatile organic compounds as defined in U.S. EPA 40 CFR 60, subpart JJJJ

***ISO 3046/1

**Attachment N.
Emission Calculations**

EMISSIONS SUMMARY TOTAL

Company:	Antero Midstream LLC
Facility Name:	Bluestone Compressor Station
Facility Location:	Harrison County, West Virginia

UNCONTROLLED POTENTIAL EMISSION SUMMARY

Source	NOx		CO		VOC		SO ₂		PM-10		PM-2.5		HAPs		CO ₂ e tpy
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	
Engines															
Compressor Engine	5.58	24.43	5.19	22.72	0.73	3.18	0.0055	0.024	0.094	0.41	0.094	0.41	0.68	2.96	5,758
Storage Tanks															
Produced Water Tanks	---	---	---	---	0.54	2.38	---	---	---	---	---	---	0.023	0.10	520
Dehydrators															
TEG Dehydrator	---	---	---	---	2.71	11.87	---	---	---	---	---	---	1.93	8.46	161
Heaters															
Reboiler	0.061	0.27	0.051	0.23	0.0034	0.015	0.00037	0.0016	0.0047	0.020	0.0047	0.020	0.0012	0.0051	257
Hydrocarbon Loading															
Truck Loadout	---	---	---	---	0.71	0.14	---	---	---	---	---	---	0.030	0.0057	30
Fugitive Emissions															
Component Leak Emissions	---	---	---	---	0.13	0.58	---	---	---	---	---	---	0.0069	0.030	28
Venting Emissions	---	---	---	---	---	0.29	---	---	---	---	---	---	---	0.015	62
Haul Road Dust Emissions	---	---	---	---	---	---	---	---	0.071	0.31	0.0071	0.031	---	---	---
Total Facility PTE =	5.64	24.70	5.24	22.95	4.82	18.44	0.01	0.03	0.17	0.74	0.11	0.46	2.67	11.58	6,815

CONTROLLED POTENTIAL EMISSION SUMMARY

Source	NOx		CO		VOC		SO ₂		PM-10		PM-2.5		HAPs		CO ₂ e tpy
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	
Engines															
Compressor Engine	5.58	24.43	5.19	22.72	0.73	3.18	0.0055	0.024	0.094	0.41	0.094	0.41	0.68	2.96	5,758
Storage Tanks															
Produced Water Tanks	---	---	---	---	0.54	2.38	---	---	---	---	---	---	0.023	0.10	520
Dehydrators															
TEG Dehydrator	---	---	---	---	1.91	8.36	---	---	---	---	---	---	1.72	7.52	5
Heaters															
Reboiler	0.061	0.27	0.051	0.23	0.043	0.19	0.00037	0.0016	0.0047	0.020	0.0047	0.020	0.012	0.052	265
Hydrocarbon Loading															
Truck Loadout	---	---	---	---	0.71	0.14	---	---	---	---	---	---	0.030	0.0057	30
Fugitive Emissions															
Component Leak Emissions	---	---	---	---	0.13	0.58	---	---	---	---	---	---	0.0069	0.030	28
Venting Emissions	---	---	---	---	---	0.29	---	---	---	---	---	---	---	0.015	62
Haul Road Dust Emissions	---	---	---	---	---	---	---	---	0.071	0.31	0.0071	0.031	---	---	---
Total Facility PTE =	5.64	24.70	5.24	22.95	4.06	15.10	0.01	0.03	0.17	0.74	0.11	0.46	2.47	10.69	6,667

Compressor Engine Emission Calculations

Company:	Antero Midstream LLC
Facility Name:	Bluestone Compressor Station
Facility Location:	Harrison County, West Virginia
Source Description:	Compressor Engine

Source Information-Per Engine

Emission Unit ID:	CE-2	
Engine Make/Model	Caterpillar G3516LE	
Service	Compression	
Controls - Y or N / Type	N	
Site Horsepower Rating	1,265	hp
Fuel Consumption (BSFC) ¹	7,405	Btu/(hp-hr)
Heat Rating ²	9.37	MMBtu/hr
Fuel Consumption ²	72.09	MMscf/yr
Fuel Consumption ²	8,229	scf/hr
Fuel Heating Value	1,138	Btu/scf
Operating Hours	8,760	hrs/yr

Notes:

1. Values from Caterpillar specification sheet
2. Calculated values.

Potential Emissions

Pollutant	Emission Factor		Estimated Emissions ²			Source of Emissions Factors
	(lb/MMBtu)	(g/hp-hr)	(lb/hr)	(lb/yr)	(tpy)	
NOx ⁴	---	2.00	5.58	---	24.43	Manufacturer specifications
CO ⁴	---	1.86	5.19	---	22.72	Manufacturer specifications
VOC	---	0.26	0.73	---	3.18	Manufacturer specifications
SO ₂	5.88E-04	---	0.0055	---	0.024	AP-42, Chapter 3.2, Table 3.2-2
PM ₁₀	9.99E-03	---	0.094	---	0.41	AP-42, Chapter 3.2, Table 3.2-2
PM _{2.5}	9.99E-03	---	0.094	---	0.41	AP-42, Chapter 3.2, Table 3.2-2
1,3-Butadiene	2.67E-04	---	2.50E-03	21.91	1.10E-02	AP-42, Chapter 3.2, Table 3.2-2
2,2,4-Trimethylpentane	2.50E-04	---	2.34E-03	20.51	1.03E-02	AP-42, Chapter 3.2, Table 3.2-2
Acenaphthene	1.25E-06	---	1.17E-05	0.10	5.13E-05	AP-42, Chapter 3.2, Table 3.2-2
Acenaphthylene	5.53E-06	---	5.18E-05	0.45	2.27E-04	AP-42, Chapter 3.2, Table 3.2-2
Acetaldehyde	8.36E-03	---	7.83E-02	686.0	3.43E-01	AP-42, Chapter 3.2, Table 3.2-2
Acrolein	5.14E-03	---	4.81E-02	421.8	2.11E-01	AP-42, Chapter 3.2, Table 3.2-2
Benzene	4.40E-04	---	4.12E-03	36.11	1.81E-02	AP-42, Chapter 3.2, Table 3.2-2
Benzo(b)fluoranthene	1.66E-07	---	1.55E-06	0.014	6.81E-06	AP-42, Chapter 3.2, Table 3.2-2
Benzo(e)pyrene	4.15E-07	---	3.89E-06	0.034	1.70E-05	AP-42, Chapter 3.2, Table 3.2-2
Benzo(g,h,i)perylene	4.14E-07	---	3.88E-06	0.034	1.70E-05	AP-42, Chapter 3.2, Table 3.2-2
Biphenyl	2.12E-04	---	1.99E-03	17.40	8.70E-03	AP-42, Chapter 3.2, Table 3.2-2
Chrysene	6.93E-07	---	6.49E-06	0.057	2.84E-05	AP-42, Chapter 3.2, Table 3.2-2
Ethylbenzene	3.97E-05	---	3.72E-04	3.26	1.63E-03	AP-42, Chapter 3.2, Table 3.2-2
Fluoranthene	1.11E-06	---	1.04E-05	0.091	4.55E-05	AP-42, Chapter 3.2, Table 3.2-2
Fluorene	5.67E-06	---	5.31E-05	0.47	2.33E-04	AP-42, Chapter 3.2, Table 3.2-2
Formaldehyde	5.28E-02	---	4.95E-01	4,333	2.17E+00	AP-42, Chapter 3.2, Table 3.2-2
Methanol	2.50E-03	---	2.34E-02	205.1	1.03E-01	AP-42, Chapter 3.2, Table 3.2-2
Methylene Chloride	2.00E-05	---	1.87E-04	1.64	8.21E-04	AP-42, Chapter 3.2, Table 3.2-2
n-Hexane	1.11E-03	---	1.04E-02	91.08	4.55E-02	AP-42, Chapter 3.2, Table 3.2-2
Naphthalene	7.44E-05	---	6.97E-04	6.11	3.05E-03	AP-42, Chapter 3.2, Table 3.2-2
PAH	2.69E-05	---	2.52E-04	2.21	1.10E-03	AP-42, Chapter 3.2, Table 3.2-2
Phenanthrene	1.04E-05	---	9.74E-05	0.85	4.27E-04	AP-42, Chapter 3.2, Table 3.2-2
Phenol	2.40E-05	---	2.25E-04	1.97	9.85E-04	AP-42, Chapter 3.2, Table 3.2-2
Pyrene	1.36E-06	---	1.27E-05	0.11	5.58E-05	AP-42, Chapter 3.2, Table 3.2-2
Tetrachloroethane	2.48E-06	---	2.32E-05	0.20	1.02E-04	AP-42, Chapter 3.2, Table 3.2-2
Toluene	4.08E-04	---	3.82E-03	33.48	1.67E-02	AP-42, Chapter 3.2, Table 3.2-2
Vinyl Chloride	1.49E-05	---	1.40E-04	1.22	6.11E-04	AP-42, Chapter 3.2, Table 3.2-2
Xylenes	1.84E-04	---	1.72E-03	15.10	7.55E-03	AP-42, Chapter 3.2, Table 3.2-2
Other HAPs ³	2.62E-04	---	2.45E-03	21.47	1.07E-02	AP-42, Chapter 3.2, Table 3.2-2
Total HAPS			0.68	5,921	2.96	

Pollutant	Emission Factor		Estimated Emissions ²			Source of Emissions Factors
	(kg/MMBtu)	(g/hp-hr)	(lb/hr)	(lb/yr)	(tpy)	
CO ₂	---	471	1,314	---	5,753	Manufacturer specifications
CH ₄	0.001	---	0.021	---	0.091	40 CFR Part 98, Subpart C, Table C-2
N ₂ O	0.0001	---	0.0021	---	0.0091	40 CFR Part 98, Subpart C, Table C-2
CO ₂ e	---	---	1,315	---	5,758	40 CFR Part 98, Subpart A, Table A-1, effective January 2014

Notes:

3. Other HAPs include those HAPs listed in AP-42 below the detection thresholds.

Example Calculations

lb/hr = (g/kp-hr) * (hp) * (1 lb/453.6 g) or (lb/MMBtu) * (MMBtu/hr)
 tpy = (lb/hr) * (1 ton/2000 lb) * (hrs/yr) or (MMscf/yr) * (Btu/scf) * (lb/MMBtu) * (1 ton/2000 lb)

Produced Water Storage Tank Flashing Emissions

Company:	Antero Midstream LLC
Facility Name:	Bluestone Compressor Station
Facility Location:	Harrison County, West Virginia
Source Description:	Produced Water Tanks
Emission Unit ID:	T01 and T02

Number of Produced Water Storage Tanks: **2** tanks
 Produced Water Throughput: **210** bbl/day

Component	Produced Water Flashing Emissions			
	Uncontrolled Flashing Emissions ¹ (lb/hr)		Uncontrolled Flashing Emissions (tons/yr)	
	T01	T02	T01	T02
Methane	3.82	0.93	16.73	4.06
Ethane	0.71	0.17	3.10	0.76
Propane	0.20	0.049	0.89	0.22
i-Butane	0.043	0.010	0.19	0.045
n-Butane	0.055	0.013	0.24	0.059
i-Pentane	0.027	0.0066	0.12	0.029
n-Pentane	0.019	0.0047	0.085	0.021
Hexanes	0.0064	0.0015	0.028	0.0067
Heptanes	0.027	0.0066	0.12	0.029
Octanes	0.028	0.0068	0.12	0.030
Nonanes	0.0063	0.0015	0.028	0.0067
Decanes+	0.0023	0.00056	0.010	0.0025
Benzene	0.00019	0.00010	0.00085	0.00046
Toluene	0.0010	0.00052	0.0046	0.0023
Ethylbenzene	0.00021	0.00010	0.0009	0.00044
Xylenes	0.0012	0.00069	0.0055	0.0030
n-Hexane	0.016	0.0037	0.068	0.016
Water	0.10	0.025	0.45	0.11
Nitrogen	0.013	0.0031	0.057	0.014
Carbon Dioxide	0.012	0.0035	0.052	0.015
VOC Subtotal	0.54		2.38	
HAP Subtotal²	0.02		0.10	
CO₂e Subtotal³	118.69		519.87	
Total	6.33		27.73	

Notes:

1. Flashing emissions calculated by ProMax 3.2. Flash gas is stream Uncontrolled Flash Gas of the associated ProMax simulation.
2. HAP emissions include those of benzene, toluene, ethylbenzene, xylenes and n-hexane.
3. CO₂e emissions calculated using global warming potentials published in 40 CFR Part 98 Subpart A Table A-1.
4. No control devices are utilized for the produced water tanks.

Storage Tank Working and Breathing Emissions

Company:	Antero Midstream LLC
Facility Name:	Bluestone Compressor Station
Facility Location:	Harrison County, West Virginia
Source Description:	Produced Water Tanks
Emission Unit ID:	T01 and T02

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 Xylenes Emissions ¹ (tons/yr)	Uncontrolled n-Hexane Emissions ¹ (tons/yr)	Uncontrolled HAP Emissions ² (tons/yr)	Uncontrolled CH ₄ Emissions ¹ (tons/yr)	Uncontrolled CO ₂ e Emissions ³ (tons/yr)
210 bbl Produced Water Storage Tank (T01)	3.48E-05	3.60E-09	9.30E-09	1.10E-09	7.60E-09	6.20E-10	2.22E-08	2.60E-03	0.065
50 bbl Produced Water Storage Tank (T02)	5.77E-06	1.30E-09	3.00E-09	3.50E-10	2.70E-09	1.00E-10	7.45E-09	4.20E-04	0.011
TOTAL	4.06E-05	4.90E-09	1.23E-08	1.45E-09	1.03E-08	7.20E-10	2.97E-08	3.02E-03	0.08

Notes:

1. Uncontrolled emissions retrieved from Tank Losses simulation tool in ProMax for individual tanks.
2. HAP emissions are the sum of benzene, toluene, ethylbenzene, xylenes, and n-hexane emissions.
3. CO₂e emissions estimated using global warming potentials retrieved from 40 CFR Part 98 Subpart A Table A-1.
4. No control devices are utilized for the produced water tanks.

Dehydrator Emissions

Company:	Antero Midstream LLC
Facility Name:	Bluestone Compressor Station
Facility Location:	Harrison County, West Virginia
Source Description:	Dehydrator Unit

Total Gas Throughput: **6.0** MMSCFD
 Number of Dehydrators: **1** dehydrator

Potential Emissions

Pollutant	Emission Unit ID: DEHY-001			
	Dehydrator Still Vent		Flash Tank Gas	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Uncontrolled Emissions ¹				
VOC	1.91	8.36	0.80	3.51
Total HAPs	1.72	7.52	0.21	0.94
Benzene	0.062	0.27	0.012	0.050
Toluene	0.39	1.72	0.062	0.27
Ethylbenzene	0.087	0.38	0.010	0.045
Xylenes	1.17	5.11	0.10	0.45
n-Hexane	0.0093	0.041	0.028	0.12
Methane	0.049	0.21	1.42	6.22
Carbon Dioxide	0.0045	0.020	0.023	0.10
CO ₂ e	1.22	5.36	35.5	155
Controlled Emissions ²				
VOC	1.91	8.36	0.040	0.18
Total HAPs	1.72	7.52	0.011	0.047
Benzene	0.062	0.27	0.00060	0.0025
Toluene	0.39	1.72	0.0031	0.014
Ethylbenzene	0.087	0.38	0.00050	0.0022
Xylenes	1.17	5.11	0.0052	0.023
n-Hexane	0.0093	0.041	0.0014	0.0060
Methane	0.049	0.21	0.071	0.31
Carbon Dioxide	0.0045	0.020	0.023	0.10
CO ₂ e	1.22	5.36	1.80	7.87

¹Output from GRI-GLYCalc 4.0 for both the still vent (regenerator) and flash tank gas emissions.

²Flash tank gas is used in the reboiler as the primary fuel source. Assumed 95% combustion of flash tank gas. The still vent will not be controlled.

Natural Gas Fueled Reboiler Emissions

Company:	Antero Midstream LLC
Facility Name:	Bluestone Compressor Station
Location:	Harrison County, West Virginia
Source Description:	Reboiler

Source Information

Emission Unit ID:	RB-01	
Source Description:	Reboiler	
Number of Heaters	1	heater
Hours of Operation	8,760	hr/yr
Design Heat Rate	0.5	MMBtu/hr per Heater
Heater Efficiency	0.8	
Fuel Heat Value ¹	1,138	Btu/scf
Fuel Use	4.8	MMscf/yr per Heater

¹ Site-specific gas heating value.

Emission Calculations

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
PM _{2.5}	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
2-Methylnaphthalene	2.40E-05	1.47E-08	6.44E-08	AP-42 Ch. 1.4 Table 1.4-3
Benzene	2.10E-03	1.29E-06	5.64E-06	AP-42 Ch. 1.4 Table 1.4-3
Dichlorobenzene	1.20E-03	7.35E-07	3.22E-06	AP-42 Ch. 1.4 Table 1.4-3
Fluoranthene	3.00E-06	1.84E-09	8.05E-09	AP-42 Ch. 1.4 Table 1.4-3
Fluorene	2.80E-06	1.72E-09	7.51E-09	AP-42 Ch. 1.4 Table 1.4-3
Formaldehyde	7.50E-02	4.60E-05	2.01E-04	AP-42 Ch. 1.4 Table 1.4-3
n-Hexane	1.80E+00	1.10E-03	4.83E-03	AP-42 Ch. 1.4 Table 1.4-3
Napthalene	6.10E-04	3.74E-07	1.64E-06	AP-42 Ch. 1.4 Table 1.4-3
Phenanathrene	1.70E-05	1.04E-08	4.56E-08	AP-42 Ch. 1.4 Table 1.4-3
Pyrene	5.00E-06	3.06E-09	1.34E-08	AP-42 Ch. 1.4 Table 1.4-3
Toluene	3.40E-03	2.08E-06	9.13E-06	AP-42 Ch. 1.4 Table 1.4-3
Total HAPs	1.88	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	58.6	257	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 ₂ e	----	58.7	257	40 CFR Part 98, Subpart A, Table A-1

1. Only those HAPs that are above detection thresholds are speciated. Total HAPs includes all HAPs above and below detection.

Sample Calculations:

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

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

Truck Loading Emissions

Company:	Antero Midstream LLC
Facility Name:	Bluestone Compressor Station
Facility Location:	Harrison County, West Virginia
Source Description:	Produced Water Truck Loadout
Emission Unit ID:	LDOUT

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 (°R)

VOC Emissions (tpy) = $\frac{L_L \text{ (lbs VOC/1000 gal)} \times 42 \text{ gal/bbl} \times 365 \text{ days/year} \times \text{production (bbl/day)}}{1000 \text{ gal} \times 2000 \text{ lbs/ton}}$

Source	S ¹	P (psia) ²	M ³	T (°F) ⁴	T (°R)	L _L (lb/1000 gal)	Loading bbl/day	Uncontrolled							
								VOC (tpy)	Benzene ⁵ (tpy)	Toluene ⁵ (tpy)	E-benzene ⁵ (tpy)	Xylenes ⁵ (tpy)	n-Hexane ⁵ (tpy)	HAPs ⁵ (tpy)	CO ₂ e ⁶ (tpy)
Produced Water	0.6	0.3	18	65	524.77	0.08	210	0.14	6.52E-05	3.48E-04	6.97E-05	4.24E-04	4.83E-03	0.006	29.7

- Notes:
- Saturation factor from AP-42, Table 5.2-1 (Submerged loading (bottom loading): dedicated normal service)
 - True vapor pressure is estimated from ProMax working and breathing report calculated using the Tank Losses simulation tool.
 - Molecular weight of vapor is estimated from ProMax 3.2 report "Uncontrolled Flash Gas" stream.
 - Temperature based on ProMax working and breathing report (the annual average temperature of Charleston, West Virginia).
 - HAP emissions estimated assuming 0.4% by weight of the vent gas are HAPs and 8.5% by weight are VOCs (per ProMax simulation). Speciated HAPs use their individual weight fraction to calculate emissions.
 - CO₂e emissions estimated assuming 75% of the vent gas by weight is methane and 8.5% by weight are VOCs (per ProMax simulation).

Assume 1 truck loaded per hour, 200 bbl truck, for short term emissions

Source	S ¹	P (psia) ²	M ³	T (°F) ⁴	T (°R)	L _L (lb/1000 gal)	Loading bbl/hr	Uncontrolled							
								VOC (lb/hr)	Benzene ⁵ (lb/hr)	Toluene ⁵ (lb/hr)	E-benzene ⁵ (lb/hr)	Xylenes ⁵ (lb/hr)	n-Hexane ⁵ (lb/hr)	HAPs ⁵ (lb/hr)	CO ₂ e ⁶ (lb/hr)
Produced Water	0.6	0.3	18	65	524.77	0.08	200	0.71	3.40E-04	1.82E-03	3.64E-04	2.21E-03	2.52E-02	0.03	154.8

Component Fugitive Emissions

Company:	Antero Midstream LLC
Facility Name:	Bluestone Compressor Station
Facility Location:	Harrison 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	75	8,760	3.90E-04	0.088	0.28	0.025
Valves - Gas Service	105	8,760	4.50E-03	0.088	4.57	0.40
Other - Gas Service	5	8,760	8.80E-03	0.088	0.43	0.038
Flanges - Liquid Service	38	8,760	1.10E-04	0.085	0.040	0.0035
Valves - Liquid Service	53	8,760	2.50E-03	0.085	1.28	0.11
Total Emissions (tons/yr)					6.61	0.58

HAP Fugitive Emissions										
Equipment Type and Service	Benzene of VOC Weight Fraction ³	Benzene Emissions (tpy)	Toluene of VOC Weight Fraction ³	Toluene Emissions (tpy)	Ethylbenzene of VOC Weight Fraction ³	Ethylbenzene Emissions (tpy)	Xylenes of VOC Weight Fraction ³	Xylene Emissions (tpy)	n-Hexane of VOC Weight Fraction ³	n-Hexane Emissions (tpy)
Flanges - Gas Service	0.002	4.10E-05	0.007	1.69E-04	0.001	2.72E-05	0.01	2.50E-04	0.03	8.70E-04
Valves - Gas Service	0.002	6.63E-04	0.007	2.73E-03	0.001	4.39E-04	0.01	4.04E-03	0.03	1.40E-02
Other - Gas Service	0.002	6.17E-05	0.007	2.54E-04	0.001	4.09E-05	0.01	3.77E-04	0.03	1.31E-03
Flanges - Liquid Service	0.0005	1.66E-06	0.003	8.87E-06	0.0005	1.78E-06	0.003	1.08E-05	0.04	1.23E-04
Valves - Liquid Service	0.0005	5.27E-05	0.003	2.81E-04	0.0005	5.63E-05	0.003	3.43E-04	0.04	3.90E-03
Total Emissions (tons/yr)		8.20E-04		3.44E-03		5.65E-04		5.02E-03		2.02E-02

1) Component counts estimated from configuration of similar compressor station.

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 site-specific gas analysis and ProMax simulation.

GHG Fugitive Emissions								
Equipment Type	Number of Units ⁴	Hours of Operation (hours/yr)	Emission Factor ⁵ (scf/hr-unit)	CH ₄ Concentration ⁶	CO ₂ Concentration ⁶	CH ₄ Emissions (tpy)	CO ₂ Emissions (tpy)	CO ₂ e Emissions (tpy)
Flanges	113	8,760	0.003	0.98	0.011	0.061	0.0019	1.53
Valves	158	8,760	0.027	0.98	0.011	0.77	0.024	19.30
Other	5	8,760	0.300	0.98	0.011	0.27	0.0084	6.79
Total Emissions (tons/yr)						1.10	0.03	27.62

4) Component counts estimated from configuration of similar compressor station.

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

6) CH₄ and CO₂ concentrations as defined in 40 CFR Part 98.233(r)

Fugitive Emissions From Venting Episodes

Company:	Antero Midstream LLC
Facility Name:	Bluestone Compressor Station
Facility Location:	Harrison County, West Virginia
Source Description:	Fugitive Emissions-Venting Episodes

VOC Venting Emissions						
Type of Event	Number Of Events ¹ (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	12	10,000	18.49	2.92	0.088	0.26
Compressor Startup ³	12	1,050	18.49	0.31	0.088	0.027
Total Emissions (tons/yr)						0.29

HAPs Venting Emissions										
Type of Event	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	0.0001	4.24E-04	0.0006	1.74E-03	0.0001	2.81E-04	0.0009	2.58E-03	0.003	8.98E-03
Compressor Startup ³	0.0001	4.45E-05	0.0006	1.83E-04	0.0001	2.95E-05	0.0009	2.71E-04	0.003	9.43E-04
Total Emissions (tons/yr)		0.0005		0.002		0.0003		0.003		0.01

GHG Venting Emissions								
Type of Event	Number Of Events ¹ (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 ₂ e Emissions (tpy)
Compressor Blowdown ²	12	10,000	18.49	0.76	0.003	2.23	0.0088	55.84
Compressor Startup ³	12	1,050	18.49	0.76	0.003	0.23	0.00093	5.86
Total Emissions (tons/yr)						2.47	0.01	61.70

- 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 per year.
- 3) Total number of compressor startups based on 12 starts per compressor per year.
- 4) Weight Fractions are from a site-specific gas analysis.

Fugitive Dust Emissions

Company:	Antero Midstream LLC
Facility Name:	Bluestone Compressor Station
Facility Location:	Harrison 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	
Produced Water Tank Truck	40.00	730	2.0	2,500	0.47	346
Pick-Up Trucks	3.00	730	2.0	2,500	0.47	346

Equation Parameter	PM-10/PM-2.5	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	21.50	21.50
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

PM₁₀ Emissions

Emission Factor (lb/VMT)	Vehicle miles traveled (VMT/yr) ⁴	Annual Uncontrolled PM ₁₀ Emissions (tpy)
0.90	691	0.31

PM_{2.5} Emissions (tons/yr)

Emission Factor (lb/VMT)	Vehicle miles traveled (VMT/yr) ⁴	Annual Uncontrolled PM _{2.5} Emissions (tpy)
0.090	691	0.031

PM- Total Emissions (tons/yr)

Emission Factor (lb/VMT)	Vehicle miles traveled (VMT/yr) ⁴	Annual Uncontrolled PM-Total Emissions (tpy)
3.52	691	1.22

Notes:

- Loaded truck weight for tanker trucks is based on typical weight limit for highway vehicles. Loaded truck weight for pick-up trucks is based on typical weight for mid-sized pick-up gasoline trucks.
- Based on production, it's assumed a maximum of two produced water trucks (200 bbl truck) will be onsite per day. Also, it is assumed 2 pick up trucks carrying onsite personnel will be onsite per day.
- Distance per round trip is based on the site layout. The one way distance is measured as 1,250 feet for the gravel access road.
- VMT/yr = Trips/yr x Roundtrip Distance
- Hourly emissions determined from tons per year calculation using 2,000 lb/ton and 8,760 hours per year.

Facility Gas Analysis

	MOL %	MW	Component Weight lb/lb-mol	Wt. Fraction
Methane	88.05	16.04	14.12	0.76
Ethane	8.74	30.07	2.63	0.14
Propane	1.71	44.10	0.75	0.041
i-Butane	0.27	58.12	0.15	0.0084
n-Butane	0.35	58.12	0.21	0.011
i-Pentane	0.14	72.15	0.10	0.0055
n-Pentane	0.099	72.15	0.071	0.0039
Hexanes	0.027	106.72	0.029	0.0016
Heptanes	0.10	100.20	0.10	0.0054
Octanes	0.085	114.23	0.10	0.0053
Nonanes	0.018	128.26	0.022	0.0012
Decanes+	0.0064	142.29	0.0091	0.00049
Benzene	0.0034	78.11	0.0027	0.00014
Toluene	0.012	92.14	0.011	0.00060
Ethylbenzene	0.0017	106.17	0.0018	0.00010
Xylenes	0.015	106.16	0.016	0.00088
n-Hexane	0.066	86.18	0.057	0.0031
Nitrogen	0.17	28.01	0.049	0.0026
Carbon Dioxide	0.13	44.01	0.056	0.0030
Total	100.000		18.49	1.00

Heating Value (Btu/scf) 1,138.3
Molecular weight 18.49

VOC weight fraction 0.088
Methane weight fraction 0.76
HAPs weight fraction 0.0048
THC weight fraction 0.99
VOC of THC wt fraction 0.089
CH4 of THC wt fraction 0.77
HAPs of THC wt fraction 0.0048

1. Site-specific gas sample from Bluestone Compressor Station.
2. Speciated BTEX is estimated based on mole fractions from nearby well.

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 Bluestone Compressor Station, including federal and state regulatory requirements.

1. Summary of Key Operational Throughput Limits

- a. Maximum wet gas throughput into Dehydrator: 6 MMscf/day or 2,190 MMscf/year.
- b. Maximum produced water loaded out: 3,219,300 gallons per year.

2. Operational Requirements

- a. Compressor engine will be fueled by natural gas only.
- b. Compressor engine will conduct oil and filter changes, inspect spark plugs, hoses, and belts every 2,160 hours of operation or annually, whichever comes first.
- c. The Dehy Reboiler will operate at no more than 0.5 MMBtu/hr and fueled only by natural gas or off-gases from the Dehydrator flash tank.
- d. No fuel-burning unit of any kind will have opacity greater than 10 percent based on a six minute block average observation.
- e. Liquid loadout trucks will use the submerged-fill method.
- f. Dehydrator flash tank vent gas will be used in the reboiler as fuel.

3. Monitoring

- a. Daily, monthly, and rolling 12-month average wet gas throughput for the Dehy will be monitored.
- b. Initial Method 22 observation of the Reboiler exhaust will be conducted for a minimum of 2 hours.
- c. Monthly Method 22 observations of the Reboiler exhaust will be conducted for a minimum of 10 minutes each.
- d. 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 engine maintenance will be kept.
- d. 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 startup.
- b. Upon startup, a Certificate to Operate (CTO) application will be filed and fees to WVDAQ will be paid for the period from startup to the following June 30 and then annually renew the CTO and pay fees. CTO will be maintained on-site.
- c. 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 – Bluestone Compressor Station

Notice is given that Antero Midstream LLC has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a modification to the existing 45CSR13 Permit R13-3280 for a natural gas compressor station located north of US-50 near Salem, in Harrison County, West Virginia. The latitude and longitude coordinates are: 39.29885N, 80.59530W.

The applicant estimates the change in potential to discharge of the following Regulated Air Pollutants in the table below. Please note that negative changes are a result of decreased potential to emit and positive change are a result of increased potential to emit.

Pollutant	Emission Change (tons per year)
Nitrogen Oxides (NO _x)	17.77
Carbon Monoxide (CO)	19.49
Volatile Organic Compounds (VOC)	-0.03
Particulate Matter less than 10 micrometers (PM ₁₀)	-0.03
Particulate Matter less than 2.5 micrometers (PM _{2.5})	-0.03
Formaldehyde	1.61
Benzene	0.01
Toluene	0.01
Ethylbenzene	0.01
Xylenes	0.00
n-Hexane	0.02
Carbon Dioxide Equivalent (CO _{2e})	-564

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

Any questions regarding this permit application should be directed to the DAQ at (304) 926-0499, extension 1250, during normal business hours.

Dated the 19th day of July 2016.

By: Antero Midstream LLC
Barry Schatz
Senior Environmental and Regulatory Manager
1615 Wynkoop Street
Denver, CO 80202

Attachment R.
Authority/Delegation of Authority

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

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

DATE: August 5, 2015

ATTN.: Director

Corporation's / other business entity's Federal Employer I.D. Number 46-5517375


The undersigned hereby files with the West Virginia Department of Environmental Protection, Division of Air Quality, a permit application and hereby certifies that the said name is a trade name which is used in the conduct of an incorporated business or other business entity.

Further, the corporation or the business entity certifies as follows:

(1) Luz Slauter and Barry Schatz (is/are) the authorized representative(s) and in that capacity may represent the interest of the corporation or the business entity and may obligate and legally bind the corporation or the business entity.

(2) The corporation or the business entity is authorized to do business in the State of West Virginia.

(3) If the corporation or the business entity changes its authorized representative(s), the corporation or the business entity shall notify the Director of the West Virginia Department of Environmental Protection, Division of Air Quality, immediately upon such change.


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