KLEINFELDER
Bright People. Right Solutions.

August 10, 2015

Ms. Laura Jennings.
WV Department of Environmental Protection
Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

RE: Antero Midstream LLC – Nichols Compressor Station
West Virginia Department of Environmental Protection, Division of Air Quality,
45CSR13 Air Permit Modification R13-3201

Dear Ms. Jennings,

On behalf of Antero Midstream LLC, please find attached the 45CSR13 Air Permit Modification for permit number R13-3201 for the Nichols Compressor Station (Facility ID 017-00114) located in Doddridge County, West Virginia. A summary of the modifications in this application include:

1. Updated compressor engine emissions to reflect actual operating conditions of the NSCR catalysts and include an annual fuel limit,
2. Updated tank working and breathing emissions and truck loading emissions to include more accurate Hazardous Air Pollutant (HAP) and Greenhouse Gas (GHG) potential to emit,
3. Updated fugitive dust emissions to include haul road traffic, and
4. Updated annual operating hours of the generator units to 8,760 hours with maximum hourly fuel usage.

Additionally, Antero is requesting to modify the permit language to remove permit condition 5.1.3 regarding any fuel restriction for the generator engines. Now that the generator emissions are calculated for a full operating year at maximum hourly fuel usage, no fuel restriction is required.

Enclosed are one hard copy of the original permit application including the permit application form and the required attachments, plus two (2) electronic copies. Per 45CSR22, a $1,000 application fee is also enclosed, which covers the base 45CSR13 application fee.

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.

1801 California Street, Suite 1100 ❖ Denver, CO 80202 ❖ 303.237.6601 ❖ fax 303.237.6602

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 msteyskal@kleinfelder.com .

Sincerely,
Kleinfelder

Michele Steyskal
Air Quality Specialist

Enclosure: Nichols Compressor Station R13-3201 Air Permit Modification

1801 California Street, Suite 1100 ❖ Denver, CO 80202 ❖ 303.237.6601 ❖ fax 303.237.6602

Antero Midstream LLC

Nichols Compressor Station

NSR Permit Application R13-3201 Modification
West Virginia Department of Environmental Protection
Division of Air Quality
45CSR13

Doddridge County, West Virginia

August 2015

Prepared by:

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

DEN15O24216

Table of Contents

WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF AIR QUALITY

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

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

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

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

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

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

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

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

Section I. General

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

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

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

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

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

5B. Facility's present physical address:
2189 Long Run Road
Greenwood, WV 26415

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

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

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

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

- If **YES,** please explain: **Antero Midstream LLC owns the land for the 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 1 7 – 0 0 1 1 4

11B. List all current 45CSR13 and 45CSR30 (Title V) permit numbers associated with this process (for existing facilities only):
R13-3201

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

12A.

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

Take US-50 towards Greenwood, WV. Head northwest on CR-50/30 (Sunnyside Road) for 0.3 miles. Make the first right and head east on CR-36 (Duckworth Road) for 1.0 miles. Turn left and head north on CR-26 (Long Run Road) for 1.1 miles. Turn left onto access road and reach facility in 0.3 miles.

12.B. New site address (if applicable):	12C. Nearest city or town:	12D. County:
2189 Long Run Road **Greenwood, WV 26415**	**Pennsboro**	**Doddridge**
12.E. UTM Northing (KM): **4349.253**	12F. UTM Easting (KM): **511.253**	12G. UTM Zone: **17**

13. Briefly describe the proposed change(s) at the facility:
The reduction efficiencies for the engine catalysts have been updated based on typical operating conditions. A catalytic heater for generator fuel has been added. The generator hours and fuel usage have been updated to maximum potential.

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

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

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

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

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

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

Section II. Additional attachments and supporting documents.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

☒ General Emission Unit, specify: **Engines, Dehydrator, Generator, Catalytic Heater**

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

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

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

☒ Other Collectors, specify : **Catalysts, VRUs**

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

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

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

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

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

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

☐ **YES** ☒ **NO**

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

Section III. Certification of Information

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

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

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

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

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

Certification of Truth, Accuracy, and Completeness

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

Compliance Certification

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

SIGNATURE _____ DATE: 8/5/15

(Please use blue ink) *(Please use blue ink)*

35B. Printed name of signee: Luz C. Slauter		35C. Title: Midstream Environmental & Regulatory Manager
35D. E-mail: lslauter@anteroresources.com	36E. Phone: (303)357-6834	36F. FAX: (303)357-7315
36A. Printed name of contact person (if different from above):		36B. Title:
36C. E-mail:	36D. Phone:	36E. FAX:

PLEASE CHECK ALL APPLICABLE ATTACHMENTS INCLUDED WITH THIS PERMIT APPLICATION:

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

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

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

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

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

Discussion of Nearby Facilities

Nichols Compressor Station – Closest Antero Facilities

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

2. SIC Code: The Nichols Compressor Station will operate under SIC code 4922 (natural gas transmission). The closest facility owned by Antero Midstream LLC with this SIC code is a compressor station 2.7 miles northeast of the facility. All Antero Resources Corporation production facilities operate under the SIC code of 1311 (crude petroleum of natural gas).

3. Continuous or Adjacent: The land between the Nichols Compressor Station and its nearest facility operating under SIC code 4922 is not owned or managed by Antero Midstream LLC. Therefore, the facilities are not considered to be adjacent or continuous.

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

Attachment A.
Business Certificate

State of West Virginia

Certificate

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

ANTERO MIDSTREAM LLC

Control Number: 9A5E1

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

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

Therefore, I hereby issue this

CERTIFICATE OF AUTHORITY OF A FOREIGN LIMITED LIABILITY COMPANY

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

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

Natalie E Tennant

Secretary of State

FILED

APR 29 2014

IN THE OFFICE OF
WV SECRETARY OF STATE

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

1152

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

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

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

Control # 4A5E1

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

WV APPLICATION FOR CERTIFICATE OF AUTHORITY OF LIMITED LIABILITY COMPANY

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

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

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

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

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

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

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

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

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

RECEIVED

APR 29 2014

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

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

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

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

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

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

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

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

Midstream oil and gas operating company

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

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

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

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

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

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

Delaware

The First State

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

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

Jeffrey W. Bullock, Secretary of State

5466900 8300

AUTHENTICATION: 1328067

140532521

DATE: 04-29-14

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

Attachment B.
Area Map

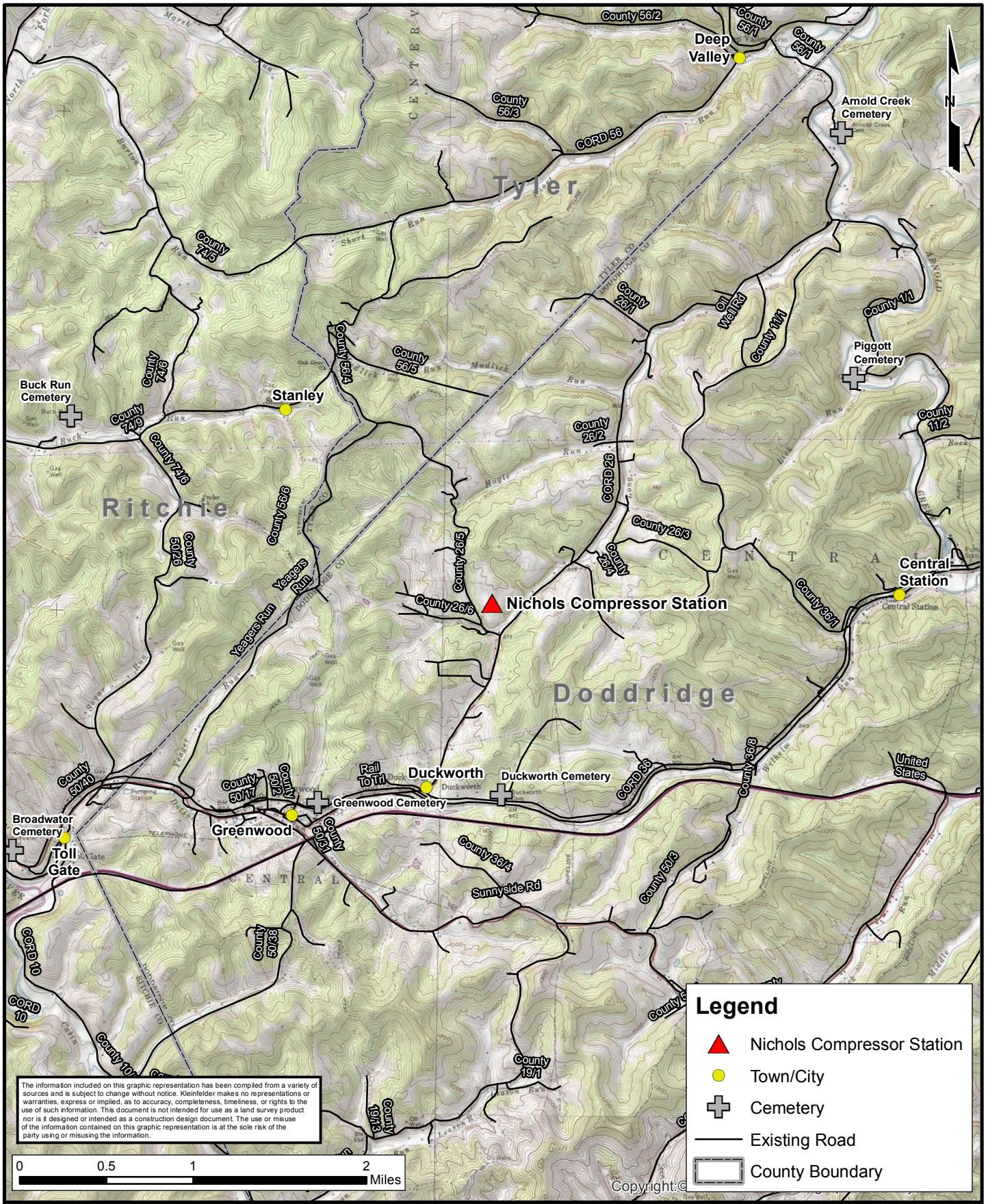
KLEINFELDER
Bright People. Right Solutions.
www.kleinfelder.com

PROJECT NO.	20152866
DRAWN:	10/23/2014
DRAWN BY:	J. Weber
CHECKED BY:	K.Meszaros
FILE NAME:	NicholsCS_Receptor.mxd

Antero Midstream LLC

Nichols Compressor Station
Doddridge County, West Virginia

FIGURE



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PROJECT NO.	20152866
DRAWN:	10/23/2014
DRAWN BY:	J. Weber
CHECKED BY:	K.Meszaros
FILE NAME:	NicholsCS_Topo.mxd

Antero Midstream LLC

Nichols Compressor Station
Doddridge County, West Virginia

FIGURE

Attachment C.
Installation and Startup Schedule

Nichols Compressor Station – Installation and Startup Schedule

The Nichols Compressor Station is located in Doddridge County, WV, approximately 7.6 miles east of Pennsboro, WV. Ground clearing and other site preparation activities began in October 2014. Construction and operation of the catalytic heater will begin upon the modified permit's issuance. All other construction and operations began upon the initial permit approval (R13-3201). Modifications of existing equipment are strictly for changing operating conditions.

Attachment D.
Regulatory Discussion

Nichols Compressor Station – Regulatory Discussion

Federal Regulations

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

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

Applicability: Subpart Kb applies to volatile organic liquid storage tanks with a capacity greater than or equal to 75 m^3 (§60.110b(a)). Since all storage tanks at the Nichols Compressor Station are 64 m^3, Subpart Kb does not apply.

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

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

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

Applicability: Subpart KKK applies to facilities built or modified before August 23, 2011, so Subpart KKK does not apply as the Nichols Compressor Station was constructed after that date.

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

Applicability: Subpart LLL applies to facilities built or modified before August 23, 2011, so Subpart LLL will not apply as the Nichols Compressor Station was constructed after that date.

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

Applicability: Subpart JJJJ applies to rich burn engines that were ordered after June 12, 2006 and manufactured on or after July 1, 2007 for engines with maximum power greater than or equal to 500 hp (§60.4230(a)(4)(i)). Thus, Subpart JJJJ applies to the Nichols Compressor Station as the compressor engines were ordered and manufactured in 2014.

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

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

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

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

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

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

Applicability: Subpart V applies to components such as compressors, valves, and pumps that are intended to operate in volatile hazardous air pollutant (VHAP) service (§61.240(a)). VHAP service means that a component contains or contacts a fluid that is at least 10 percent by weight a VHAP. Subpart V does not apply to the Nichols Compressor Station because none of the components have fluid (natural gas, water, or condensate) that is over 10 percent by weight of any VHAP.

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

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

Applicability: Subpart HH applies to oil and natural gas production facilities that are a major or area source of HAP emissions, and that process, upgrade, or store hydrocarbon liquids or natural gas prior to the transmission and storage source category (§63.760(a)). Subpart HH does apply to the Nichols Compressor Station, and because it is an area source of HAP emissions, the two (2) TEG dehydrators will be applicable sources under Subpart HH (§63.760(b)(2)). However, actual benzene emissions from

the dehydrators at the Nichols Compressor Station are less than 1 ton per year, so both dehydrators are exempt from all requirements except recordkeeping (§63.764(e)(1)(ii)).

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

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

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

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

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

Applicability: Subpart ZZZZ applies to stationary RICE at a major or area source of HAP emissions (§63.6585). Subpart ZZZZ applies to the Nichols Compressor Station as the compressor engines are new RICE. The engines will meet Subpart ZZZZ by meeting 40 CFR Part 60, Subpart JJJJ as the Nichols Compressor Station is an area source of HAP emissions (§63.6590(c)(1)).

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

Applicability: Subpart DDDDD applies to process heaters at a major source of HAP emissions (§63.7485). Subpart DDDDD does not apply to the Nichols 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 Nichols 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*

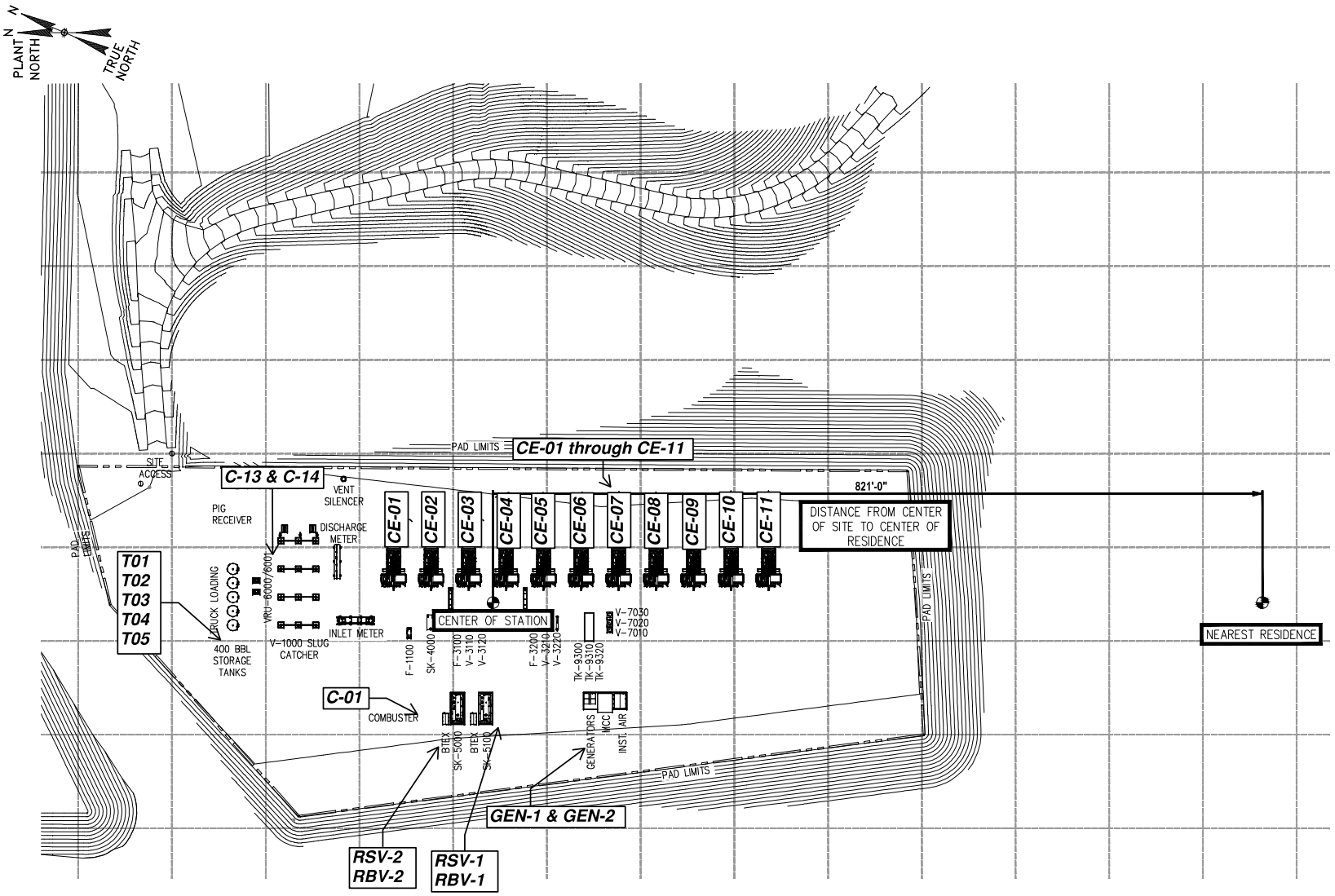
XII. *45CSR33 – Acid Rain Provisions and Permits*

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



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REVISIONS					
NO.	DESCRIPTION	BY / DATE			
1	ISSUED FOR PERMITTING – NICHOLS PROPERTY	SM	JW	PS	
		BY	CHK. DATE	APPR. DATE	

Antero Resources

NICHOLS COMPRESSOR STATION

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

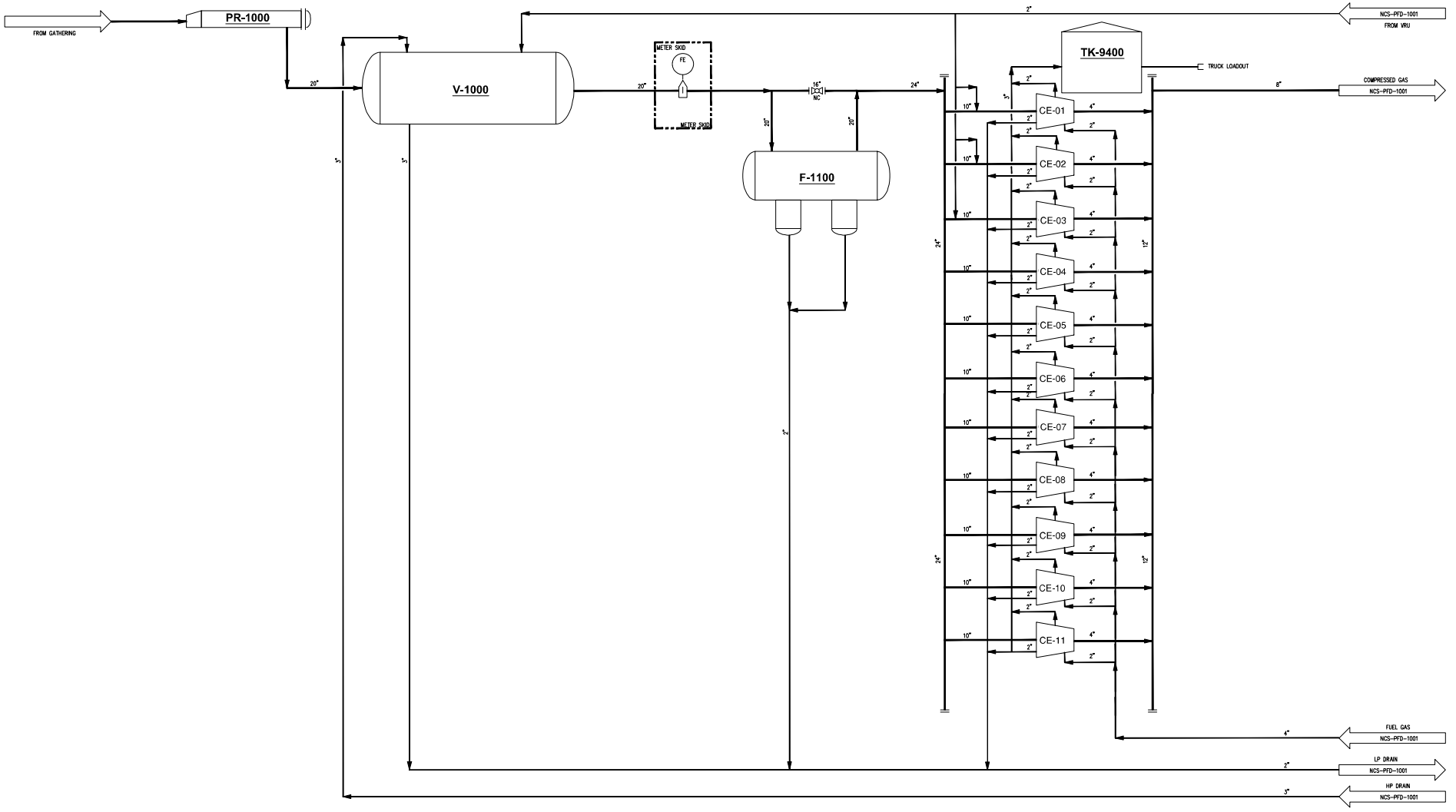
SITE PLAN

GENERAL LOCATIONS
PERMITTING

DRAWN BY: S. MINJAREZ	CHECKED: J. WARMAN	APPROVED: P. STOCKEBRAND
CREATION DATE: 06/30/14	CHECK DATE:	APPR. DATE:
Proj. No.: 4083.0164.00	DWG. No.: NIC-PP-2055	SHEET No.: 1 OF 1
SCALE: 1"=50'		

PLOT TIME/DATE: June 30, 2014
LAST SAVED: 06/30/14 BY: Rumaldo Minjarez
FILE LOCATION:N:\PROJECTS\ANTERO APPALACHIAN RESOURCES\4083.0164.00 - NICHOLS CS\2000-SITE PLAN - GA'S\NIC-PP-2055.DWG

Attachment F.
Process Flow Diagram



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A	ISSUED FOR REVIEW	AC	05/06/14	JW	05/06/14	PS	05/06/14
NO.	DESCRIPTION	BY	DATE	CHK.	DATE	APPR.	DATE

Antero

NICHOLS COMPRESSOR STATION

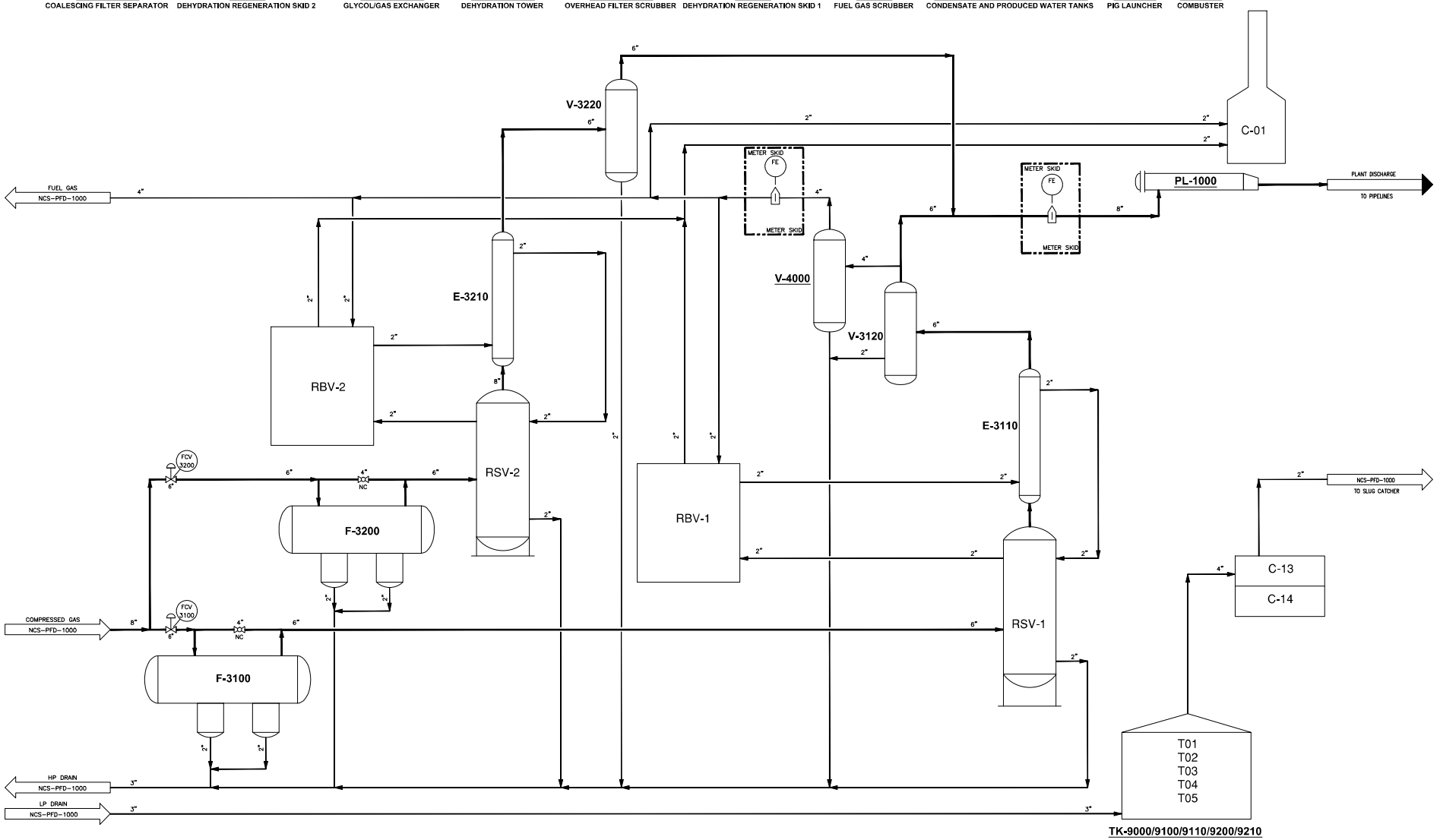
KAHUNA VENTURES LLC
WESTMINSTER, CO 80021
303-451-7574
BY: KAHUNA DESIGN LLC.

PROCESS FLOW DIAGRAM

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

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

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



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REVISIONS					
NO.	DESCRIPTION	BY	DATE	CHK.	DATE	APPR.	DATE
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A	ISSUED FOR REVIEW	AC	05/06/14	JM	05/06/14	PS	05/06-14

Antero

NICHOLS COMPRESSOR STATION

KAHUNA VENTURES LLC
WESTMINSTER, CO 80021
303-451-7574
BY: KAHUNA DESIGN LLC.

PROCESS FLOW DIAGRAM

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

PLOT TIME/DATE: June 19, 2014

LAST SAVED: 06/18/14 BY: Mara Cooley

FILE LOCATION:N:\PROJECTS\ANTERO APPALACHIAN RESOURCES\4083.0164.00 - NICHOLS CS\1000-PFD-PID\NCS-PFD-1001.DWG

Attachment G.
Process Description

Nichols Compressor Station – Process Description

The Nichols Compressor Station is located in Doddridge County, West Virginia. Gas from surrounding pipelines enters the facility through one (1) receiver and associated slug catcher. From there, the gas is metered and routed through a scrubber and filter separator. Any produced liquids from the scrubber or separator are sent to the 400 barrel settling tank (T03). Gas from the filter separator is sent to one (1) of eleven (11) 1680 hp Waukesha compressor engines (CE-01 through CE-11). The eleven (11) compressor engines are controlled with NSCR catalysts and air-fuel ratio controllers (C-02 through C-12). Produced fluids are routed to the settling tank and gas going to one of the two (2) TEG dehydrators.

Each TEG dehydrator (RSV-1 and RSV-2) contains a flash gas tank and 1.5 MMBtu/hr reboiler. Each dehydrator has a design rate of 60 MMscf/day. Within the dehydrator unit, vent gas from the flash gas tank is routed to the reboiler (RBV-1 and RBV-2) and used as fuel. Emissions from each reboiler are routed to the atmosphere. The dehydrator still vents (RSV-1 and RSV-2) are controlled by a combustor with at least 98% control efficiency (C-01). Produced fluids from the dehydrator are routed to the settling tank. The dry gas from the dehydration process is either routed to a fuel gas scrubber, metered, and routed to the compressors as fuel gas or metered and sent to plant discharge.

All produced fluids enter one (1) 400 barrel settling tank (T03) where the fluids settle out as either condensate or produced water. The produced water goes to two (2) 400 barrel produced water tanks (T01 and T02) and the condensate goes to two (2) 400 barrel condensate tanks (T04 and T05). Flashing only occurs at the settling tank as the fluids stabilize in the settling tank before going to the other storage tanks. All five (5) tanks are connected to a vapor recovery unit (C-13) where tank vapors are collected and recycled back into the gas system right before the initial filter scrubber. There is a second vapor recovery unit (C-14) that is used as a back-up control for the storage tanks. The produced fluids are trucked out via tanker trucks as needed (EPLOR). The production is 151 barrels per day of condensate and 45 barrels per day of produced water.

Two (2) natural gas microturbine generators, each rated at 200 kWe supply power to the facility (GEN1 – GEN2). A small 24,000 Btu/hr catalytic heater (CATHT-1) is used to heat the fuel to power the generators. Fugitive emissions from component leaks, traffic on unpaved roads, and emissions from venting or blowdown events also occur.

There will also be nine (9) small storage tanks onsite. A list of the tanks and their capacity is in the table below.

Tag Number	Description	Gallons
TK-9440	Compressor Skid Settling Tank	1,000
TK-9410	Bulk TEG Storage Tank	1,000
TK-9430	Bulk Lube Oil Storage Tank	1,000
TK-9330	Waste Oil Storage Tank	1,000
TK-9420	Bulk Coolant Storage Tank	1,000
TK-9300	Compressor Skid Oily Water Tank	1,000
TK-9310	Sump Collection Tank	1,000
TK-9320	Jacket Water Storage Tank	1,000
TK-9400	Compressor Waste Oil Tank	4,200

Attachment H.
Material Safety Data Sheets

SAFETY DATA SHEET

Material Name: Produced Water **US GHS**

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

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

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

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

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

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

* * * Section 2 – HAZARDS IDENTIFICATION * * *

GHS Classification:

Eye Irritant – Category 2A.

GHS LABEL ELEMENTS
Symbol(s)

Signal Word

Warning

Hazard Statements

Causes serious eye irritation

Precautionary Statements

Prevention

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

Response

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

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

If EYE irritation persists, get medical advice / attention.

Storage
Store in a secure area.

Disposal
Dispose of contents/containers in accordance with regulations.

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

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

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

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

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

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

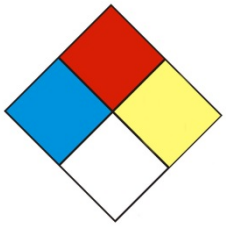
First Aid: Ingestion (Swallowing)
First aid is not required, normally. If spontaneous vomiting occurs, lean the victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. If symptoms develop, seek medical attention.

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

Most important symptoms and effects

None known or anticipated.

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



NFPA 704 Hazard Class

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

General Fire Hazards

No fire hazards are expected.

General Fire Hazards

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

Extinguishing Media

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

Unsuitable Extinguishing Media

None

Fire Fighting Equipment / Instructions

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

Hazardous Combustion Products

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

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

Recovery and Neutralization

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

Materials and Methods for Clean-Up

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

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

Emergency Measures

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

Personal Precautions and Protective Equipment

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

Environmental Precautions

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

Prevention of Secondary Hazards

None

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

Handling Procedures

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

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

Storage Procedures

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

Incompatibilities

Keep away from excessive heat to prevent rupture of container.

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

Component Exposure Limits

Water (7732-18-5)

ACGIH: Not listed

Sodium Chloride (7647-14-5)

ACGIH: Not listed

Engineering Measures

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

Personal Protective Equipment: Respiratory

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

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

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

Personal Protective Equipment: Skin and Hands

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

Personal Protective Equipment: Eyes

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

Hygiene Measures

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

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

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

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

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

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

Conditions to Avoid

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

Hazardous Decomposition Products

Not anticipated under normal conditions of use.

Hazardous Polymerization

Not known to occur.

* * * Section 11 – TOXICOLOGICAL INFORMATION * * *

Acute Toxicity

A: General Product Information

Unlikely to be harmful.

B. Component Analysis – D50/LC50

Water (7732-18-5)

Oral LD50 Rat 90 g/kg

Sodium Chloride (7647-14-5)

Oral LD50 Rat 3 g/kg

Potential Health Effects: Skin Corrosion Property / Stimulativeness

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

Potential Health Effects: Eye Critical Damage / Stimulativeness

Contact with eyes may cause moderate irritation.

Potential Health Effects: Ingestion

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

Potential Health Effects: Inhalation

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

Generative Cell Mutagenicity

Not expected to cause genetic effects.

Carcinogenicity

General Product Information

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

Reproductive Toxicity

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

Specified Target Organ General Toxicity: Single Exposure

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

Specified Target Organ General Toxicity: Repeated Exposure

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

Aspiration Respiratory Organs Hazard

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

* * * Section 12 – ECOLOGICAL INFORMATION * * *

Ecotoxicity

A: General Product Information

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

Persistence / Degradability

No information available

Bioaccumulation

No information available

Mobility in Soil

No information available

* * * Section 13 – DISPOSAL CONSIDERATIONS * * *

Waste Disposal Instructions

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

Disposal of Contaminated Containers or Packaging

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

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

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

* * * Section 14 – TRANSPORTATION INFORMATION * * *

DOT Information

Shipping Description: Not Regulated

UN #: Not Regulated

* * * Section 15 – REGULATORY INFORMATION * * *

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

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

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

State Regulations

Component Analysis

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

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

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

U.S. Export control classification Number: EAR99.

* * * Section 16 – OTHER INFORMATION * * *

NFPA® Hazard Rating

Health	1
Fire	0
Reactivity	0

HMIS® Hazard Rating

Health	1	Slight
Fire	0	Minimal
Physical	0	Minimal

Key/Legend

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

Literature References

None

Other Information

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

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

Date of Preparation: January 28, 2014

Date of Last Revision: March 4, 2014

End of Sheet

SAFETY DATA SHEET

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

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

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

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

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

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

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

* * * Section 2 – HAZARDS IDENTIFICATION * * *

GHS Classification:

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

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

Danger

Hazard Statements

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

Precautionary Statements

Prevention

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

Response

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

Storage

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

Disposal

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

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

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

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

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

First Aid: Eyes

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

First Aid: Skin

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

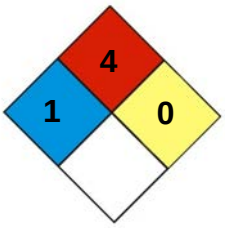
First Aid: Ingestion (swallowing)

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

First Aid: Inhalation (breathing)

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

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



NFPA 704 Hazard Class

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

General Fire Hazards

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

Hazardous Combustion Products

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

Extinguishing Media

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

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

Unsuitable Extinguishing Media

None

Fire Fighting Equipment / Instructions

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

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

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

Recovery and Neutralization

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

Materials and Methods for Clean-Up

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

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

Emergency Measures

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

Personal Precautions and Protective Equipment

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

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

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

Environmental Precautions

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

Prevention of Secondary Hazards

None

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

Handling Procedures

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

Storage Procedures

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

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

Incompatibilities

Keep away from strong oxidizers, ignition sources and heat.

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

Component Exposure Limits

Octanes (111-65-9)

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

Heptanes (142-82-5)

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

n-Hexane (110-54-3)

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

n-Pentane (109-66-0)

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

n-Butane (106-97-8)

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

Propane (74-98-6)

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

Ethane (74-84-0)

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

Benzene (71-43-2)

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

Toluene (108-88-3)

ACGIH: 20 ppm TWA (listed under Toluene)

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

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

Engineering Measures

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

Personal Protective Equipment: Respiratory

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

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

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

Personal Protective Equipment: Hands

Gloves constructed of nitrile or neoprene are recommended.

Personal Protective Equipment: Eyes

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

Personal Protective Equipment: Skin and Body

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

Hygiene Measures

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

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

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

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

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

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

Keep away from ignition sources and high temperatures.

Hazardous Decomposition Products

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

* * * Section 11 – TOXICOLOGICAL INFORMATION * * *

Acute Toxicity

A: General Product Information

Harmful if swallowed.

B. Component Analysis – LD50/LC50

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

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

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

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

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

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

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

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

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

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

Potential Health Effects: Skin Corrosion Property / Stimulativeness

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

Potential Health Effects: Eye Critical Damage / Stimulativeness

Contact with eyes may cause moderate irritation.

Potential Health Effects: Ingestion (swallowing)

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

Potential Health Effects: Inhalation (breathing)

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

Respiratory Organs Sensitization / Skin Sensitization

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

Generative Cell Mutagenicity

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

Carcinogenicity

A: General Product Information

May cause cancer.

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

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

B: Component Carcinogenicity

Benzene (71-43-2)

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

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

Reproductive Toxicity

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

Specified Target Organ General Toxicity: Single Exposure

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

Specified Target Organ General Toxicity: Repeated Exposure

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

Aspiration Respiratory Organs Hazard

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

* * * Section 12 – ECOLOGICAL INFORMATION * * *

Ecotoxicity

A: General Product Information

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

B: Component Analysis – Ecotoxicity – Aquatic Toxicity

Benzene (71-43-2)

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

Natural Gas condensates (68919-39-1)

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

Persistence / Degradability

No information available

Bioaccumulation

No information available

Mobility in Soil

No information available

* * * Section 13 – DISPOSAL CONSIDERATIONS * * *

Waste Disposal Instructions

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

Disposal of Contaminated Containers or Packaging

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

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

* * * Section 14 – TRANSPORTATION INFORMATION * * *

DOT Information

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

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

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

Placard:

* * * Section 15 – REGULATORY INFORMATION * * *

Regulatory Information

Component Analysis

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

Benzene (71-43-2)

SARA 313: 0.1% de minimis concentration

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

SARA Section 311/312 – Hazard Classes

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

SARA SECTION 313 – SUPPLIER NOTIFICATION

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

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

Canadian Regulatory Information

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

European Union Regulatory Information

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

State Regulations

Component Analysis – State

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

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

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

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

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

Component Analysis – WHMIS IDL

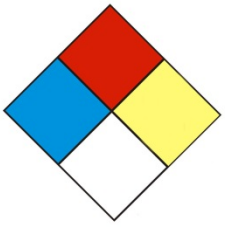
The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List:

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

* * * Section 16 – OTHER INFORMATION * * *

NFPA® Hazard Rating

Health	1
Fire	4
Reactivity	0



HMIS® Hazard Rating

Health	1	Slight
Fire	4	Severe
Physical	0	Minimal
		* Chronic

Key/Legend

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

Literature References

None

Other Information

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

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

Date of Preparation: January 29, 2014

Date of Last Revision: March 4, 2014

End of Sheet

SAFETY DATA SHEET

Material Name: Wet Field Natural Gas

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

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

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

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

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

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

* * * Section 2 – HAZARDS IDENTIFICATION * * *

GHS Classification:

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

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

Danger

Hazard Statements

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

Precautionary Statements

Prevention

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

Response

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

Storage

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

Disposal

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

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

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

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

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

First Aid: Eyes

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

First Aid: Skin

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

Material Name: Wet Field Natural Gas

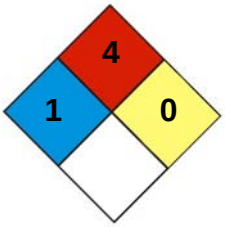
First Aid: Ingestion

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

First Aid: Inhalation

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

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



NFPA 704 Hazard Class

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

General Fire Hazards

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

Hazardous Combustion Products

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

Extinguishing Media

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

Unsuitable Extinguishing Media

None.

Fire Fighting Equipment / Instructions

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

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

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

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

Recovery and Neutralization

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

Materials and Methods for Clean-Up

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

Emergency Measures

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

Personal Precautions and Protective Equipment

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

Environmental Precautions

Do not flush gas vapors toward sewer or drainage systems.

Prevention of Secondary Hazards

None.

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

Handling Procedures

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

Storage Procedures

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

Incompatibilities

Keep away from strong oxidizers, ignition sources and heat.

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

Component Exposure Limits

Methane (74-82-8)

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

Ethane (74-84-0)

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

Propane (74-98-6)

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

Butane (106-97-8)

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

Pentanes (109-66-0)

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

Hexanes (110-54-3)

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

Material Name: Wet Field Natural Gas

Nitrogen (7727-37-9)

Simple Asphyxiant

Carbon Dioxide (124-38-9)

ACGIH: 5000 ppm TWA (listed under Carbon Dioxide)

Oxygen (7782-44-7)

N/A – Necessary for life

Engineering Measures

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

Personal Protective Equipment: Respiratory

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

Personal Protective Equipment: Hands

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

Personal Protective Equipment: Eyes

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

Personal Protective Equipment: Skin and Body

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

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

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

Material Name: Wet Field Natural Gas

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

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

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

Keep away from strong oxidizers, ignition sources and heat.

Hazardous Decomposition Products

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

* * * Section 11 – TOXICOLOGICAL INFORMATION * * *

Acute Toxicity

A: General Product Information

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

B. Component Analysis – LD50/LC50

Methane (74-82-8)

Inhalation LC50 Mouse 326 g/m3 2h

Ethane (74-84-0)

Inhalation LC50 Rat 658 mg/l 4h

Propane (74-98-6)

Inhalation LC50 Rat 658 mg/l 4h

Material Name: Wet Field Natural Gas

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

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

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

Nitrogen (7727-37-9)
Simple Asphyxiant

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

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

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

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

Carcinogenicity

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

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

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

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

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

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

* * * Section 12 – ECOLOGICAL INFORMATION * * *

Ecotoxicity

A: General Product Information

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

B: Component Analysis – Ecotoxicity – Aquatic Toxicity

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

Persistance / Degradability

No information available.

Bioaccumulation

No information available.

Mobility in Soil

No information available.

* * * Section 13 – DISPOSAL CONSIDERATIONS * * *

Waste Disposal Instructions

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

Disposal of Contaminated Containers or Packaging

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

* * * Section 14 – TRANSPORTATION INFORMATION * * *

DOT Information

Shipping Name: Natural Gas, Compressed

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

Placard:

* * * Section 15 – REGULATORY INFORMATION * * *

Regulatory Information

Component Analysis

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

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

SARA Section 311/312 – Hazard Classes

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

SARA Section 313 – Supplier Notification

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

State Regulations

Component Analysis – State

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

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

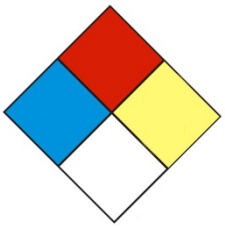
SAFETY DATA SHEET

Material Name: Wet Field Natural Gas

* * * Section 16 – OTHER INFORMATION * * *

NFPA® Hazard Rating

Health	1
Fire	4
Reactivity	0



HMIS® Hazard Rating

Health	1	Moderate
Fire	4	Severe
Physical	0	Minimal
		* Chronic

Key/Legend

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

Literature References

None

Other Information

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

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

Date of Preparation: February 7, 2014

Date of Last Revision: March 4,, 2014

End of Sheet

SAFETY DATA SHEET

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

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

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

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

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

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

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

* * * Section 2 – HAZARDS IDENTIFICATION * * *

GHS Classification:

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

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

Danger

Hazard Statements

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

Precautionary Statements

Prevention

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

Response

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

Storage

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

Disposal

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

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

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

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

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

First Aid: Eyes

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

First Aid: Skin

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

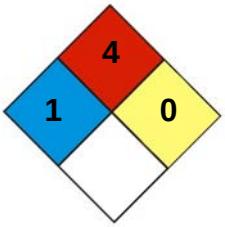
First Aid: Ingestion

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

First Aid: Inhalation

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

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



NFPA 704 Hazard Class

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

General Fire Hazards

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

Hazardous Combustion Products

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

Extinguishing Media

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

Unsuitable Extinguishing Media

None.

Fire Fighting Equipment / Instructions

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

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

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

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

Recovery and Neutralization

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

Materials and Methods for Clean-Up

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

Emergency Measures

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

Personal Precautions and Protective Equipment

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

Environmental Precautions

Do not flush gas vapors toward sewer or drainage systems.

Prevention of Secondary Hazards

None.

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

Handling Procedures

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

Storage Procedures

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

Incompatibilities

Keep away from strong oxidizers, ignition sources and heat.

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

Component Exposure Limits

Methane (74-82-8)

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

Ethane (74-84-0)

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

Propane (74-98-6)

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

Butane (106-97-8)

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

Pentanes (109-66-0)

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

Hexanes (110-54-3)

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

Nitrogen (7727-37-9)

Simple Asphyxiant

Carbon Dioxide (124-38-9)

ACGIH: 5000 ppm TWA (listed under Carbon Dioxide)

Oxygen (7782-44-7)

N/A – Necessary for life

Engineering Measures

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

Personal Protective Equipment: Respiratory

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

Personal Protective Equipment: Hands

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

Personal Protective Equipment: Eyes

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

Personal Protective Equipment: Skin and Body

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

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

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

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

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

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

Keep away from strong oxidizers, ignition sources and heat.

Hazardous Decomposition Products

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

* * * Section 11 – TOXICOLOGICAL INFORMATION * * *

Acute Toxicity

A: General Product Information

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

B. Component Analysis – LD50/LC50

Methane (74-82-8)

Inhalation LC50 Mouse 326 g/m3 2h

Ethane (74-84-0)

Inhalation LC50 Rat 658 mg/l 4h

Propane (74-98-6)

Inhalation LC50 Rat 658 mg/l 4h

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

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

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

Nitrogen (7727-37-9)
Simple Asphyxiant

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

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

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

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

Carcinogenicity

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

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

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

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

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

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

* * * Section 12 – ECOLOGICAL INFORMATION * * *

Ecotoxicity

A: General Product Information

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

B: Component Analysis – Ecotoxicity – Aquatic Toxicity

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

Persistance / Degradability

No information available.

Bioaccumulation

No information available.

Mobility in Soil

No information available.

* * * Section 13 – DISPOSAL CONSIDERATIONS * * *

Waste Disposal Instructions

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

Disposal of Contaminated Containers or Packaging

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

* * * Section 14 – TRANSPORTATION INFORMATION * * *

DOT Information

Shipping Name: Natural Gas, Compressed

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

Placard:

* * * Section 15 – REGULATORY INFORMATION * * *

Regulatory Information

Component Analysis

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

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

SARA Section 311/312 – Hazard Classes

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

SARA Section 313 – Supplier Notification

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

State Regulations

Component Analysis – State

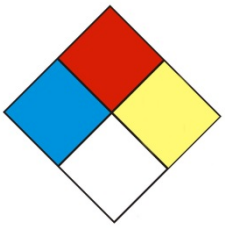
The following components appear on one or more of the following state hazardous substances lists:

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

* * * Section 16 – OTHER INFORMATION * * *

NFPA® Hazard Rating

Health	1
Fire	4
Reactivity	0



HMIS® Hazard Rating

Health	1	Moderate
Fire	4	Severe
Physical	0	Minimal
		* Chronic

Key/Legend

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

Literature References

None

Other Information

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

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

Date of Preparation: January 30, 2014

Date of Last Revision: March 4, 2014

End of Sheet

Material Safety Data Sheet
(TRIETHYLENE GLYCOL (TEG))

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

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

EMERGENCY NUMBER: 800-255-3924

SECTION 1 – IDENTIFICATION OF CHEMICAL PRODUCT

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

SECTION 2 – COMPOSITION / INFORMATION ON INGREDIENTS

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

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

SECTION 3 – HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

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

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

OSHA REGULATED:..... No

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

POTENTIAL HEALTH EFFECTS

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

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

SECTION 4 – FIRST AID MEASURES

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

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

SECTION 5 - FIRE FIGHTING MEASURES

FLASHPOINT:..... 350°F

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

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

LOWER FLAME LIMIT:..... < 0.9

HIGHER FLAME LIMIT:..... > 9

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

FIRE FIGHTING

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

SECTION 6 – ACCIDENTAL RELEASE MEASURES

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

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

RCRA STATUS: ..... None

SECTION 7 – HANDLING AND STORAGE

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

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

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

SECTION 8 – EXPOSURE CONTROL / PERSONAL PROTECTION

GENERAL CONSIDERATIONS:

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

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

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

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

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

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

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

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

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

SECTION 10 – STABILITY AND REACTIVITY

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

Material Safety Data Sheet
(TRIETHYLENE GLYCOL (TEG))

SECTION 11 – TOXICOLOGICAL INFORMATION

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

SECTION 12 – ECOLOGICAL INFORMATION

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

SECTION 13 DISPOSAL CONSIDERATIONS

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

SECTION 14- TRANSPORTATION INFORMATION

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

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

SECTION 15 - REGULATORY INFORMATION

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

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

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

SECTION 16 - ADDITIONAL INFORMATION

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

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

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

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

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Attachment I.
Emission Units Table

Attachment I

Emission Units Table

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

Emission Unit ID[1]	Emission Point ID[2]	Emission Unit Description	Year Installed/ Modified	Design Capacity	Type[3] and Date of Change	Control Device[4]
C-01	1E	Flare Combustion Device 1	2015	4.8 MMBtu/hr	NA	NA
CE-01	15E	Compressor Engine #1	2015	1680 hp	Modification	NSCR (C-02)
CE-02	16E	Compressor Engine #2	2015	1680 hp	Modification	NSCR (C-03)
CE-03	17E	Compressor Engine #3	2015	1680 hp	Modification	NSCR (C-04)
CE-04	18E	Compressor Engine #4	2015	1680 hp	Modification	NSCR (C-05)
CE-05	19E	Compressor Engine #5	2015	1680 hp	Modification	NSCR (C-06)
CE-06	20E	Compressor Engine #6	2015	1680 hp	Modification	NSCR (C-07)
CE-07	21E	Compressor Engine #7	2015	1680 hp	Modification	NSCR (C-08)
CE-08	22E	Compressor Engine #8	2015	1680 hp	Modification	NSCR (C-09)
CE-09	23E	Compressor Engine #9	2015	1680 hp	Modification	NSCR (C-10)
CE-10	24E	Compressor Engine #10	2015	1680 hp	Modification	NSCR(C-11)
CE-11	25E	Compressor Engine #11	2015	1680 hp	Modification	NSCR(C-12)
GEN-1	26E	Microturbine Generator #1	2015	200 kWe	NA	None
GEN-2	27E	Microtrubine Generator #2	2015	200 kWe	NA	None
RSV-1	29E	Dehydrator Still Vent #1	2015	60 MMscfd	NA	Combustor (C-01)
RBV-1	28E	Dehydrator Reboiler #1	2015	1.5 mmbtu/hr	NA	None
RSV-2	31E	Dehydrator Still Vent #2	2015	60 MMscfd	NA	Combustor (C-01)
RBV-2	30E	Dehydrator Reboiler #2	2015	1.5 mmbtu/hr	NA	None
T03	34E	Settling Tank 1	2015	400 barrel	NA	VRUs (C-13 and C-14)
T04	35E	Condensate Tank 1	2015	400 barrel	NA	VRUs (C-13 and C-14)
T05	36E	Condensate Tank 2	2015	400 barrel	NA	VRUs (C-13 and C-14)
T01	32E	Produced Water Tank 1	2015	400 barrel	NA	VRUs (C-13 and C-14)
T02	33E	Produced Water Tank 2	2015	400 barrel	NA	VRUs (C-13 and C-14)

C-01	2E	NSCR Catalyst for Compressor #1	2015	-----	Modification	None
C-02	3E	NSCR Catalyst for Compressor #2	2015	-----	Modification	None
C-03	4E	NSCR Catalyst for Compressor #3	2015	-----	Modification	None
C-04	5E	NSCR Catalyst for Compressor #4	2015	-----	Modification	None
C-05	6E	NSCR Catalyst for Compressor #5	2015	-----	Modification	None
C-06	7E	NSCR Catalyst for Compressor #6	2015	----	Modification	None
C-07	8E	NSCR Catalyst for Compressor #7	2015	----	Modification	None
C-08	9E	NSCR Catalyst for Compressor #8	2015	----	Modification	None
C-09	10E	NSCR Catalyst for Compressor #9	2015	----	Modification	None
C-10	11E	NSCR Catalyst for Compressor #10	2015	----	Modification	None
C-11	12E	NSCR Catalyst for Compressor #11	2015	----	Modification	None
C-13	13E	Vapor Recovery Unit 1	2015	46 MSCFD	NA	None
C-14	14E	Vapor Recovery Unit 2	2015	46 MSCFD	NA	None
EPLOR	37E	Truck Loadout	2015	71,395 bbl/yr	NA	None
CATHT1	47E	Catalytic Heater	2015	24,000 btu/hr	New	None

[1] For Emission Units (or Sources) use the following numbering system:1S, 2S, 3S,... or other appropriate designation.
[2] For Emission Points use the following numbering system:1E, 2E, 3E, ... or other appropriate designation.
[3] New, modification, removal
[4] For Control Devices use the following numbering system: 1C, 2C, 3C,... or other appropriate designation.

Attachment J.
Emission Point Data Summary Sheet

Attachment J
EMISSION POINTS DATA SUMMARY SHEET

Table 1: Emissions Data

Emission Point ID No. *(Must match Emission Units Table & Plot Plan)*	Emission Point Type[1]	Emission Unit Vented Through This Point *(Must match Emission Units Table & Plot Plan)*		Air Pollution Control Device *(Must match Emission Units Table & Plot Plan)*		Vent Time for Emission Unit *(chemical processes only)*		All Regulated Pollutants - Chemical Name/CAS[3] *(Speciate VOCs & HAPS)*	Maximum Potential Uncontrolled Emissions [4]		Maximum Potential Controlled Emissions [5]		Emission Form or Phase *(At exit conditions, Solid, Liquid or Gas/Vapor)*	Est. Method Used [6]	Emission Concentration [7] (ppmv or mg/m[4])
		ID No.	Source	ID No.	Device Type	Short Term[2]	Max (hr/yr)		lb/hr	ton/yr	lb/hr	ton/yr			
1E/29E/ 31E	Upward Vertical Stack	C-01	Flare combustion device 1	---	---	C	8760	NOx CO VOC PM10 SO2 Total HAPs CO2e	--- --- --- --- --- --- ---	--- --- --- --- --- --- ---	0.33 1.78 1.91 0.0001 1E-5 0.34 608	1.44 7.79 8.36 0.0006 5E-5 1.51 2663	Gas/Vapor	EE	
15E/2E	Upward Vertical Stack	CE-01	Compressor engine 1	C-02	NSCR catalyst	C	8760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.37 47.41 1.48 0.27 0.01 0.35 0.19 2085	198.22 186.56 5.83 1.06 0.03 1.38 0.73 8206	2.01 1.90 0.74 0.27 0.01 0.13 0.04 1993	7.93 7.46 2.92 1.06 0.03 0.51 0.17 7841	Gas/Vapor	EE	
16E/3E	Upward Vertical Stack	CE-02	Compressor engine 2	C-03	NSCR catalyst	C	8760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.37 47.41 1.48 0.27 0.01 0.35 0.19 2085	198.22 186.56 5.83 1.06 0.03 1.38 0.73 8206	2.01 1.90 0.74 0.27 0.01 0.13 0.04 1993	7.93 7.46 2.92 1.06 0.03 0.51 0.17 7841	Gas/Vapor	EE	

17E/4E	Upward Vertical Stack	CE-03	Com-pressor engine 3	C-04	NSCR catalyst	C	8760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.37 47.41 1.48 0.27 0.01 0.35 0.19 2085	198.22 186.56 5.83 1.06 0.03 1.38 0.73 8206	2.01 1.90 0.74 0.27 0.01 0.13 0.04 1993	7.93 7.46 2.92 1.06 0.03 0.51 0.17 7841	Gas/Vapor	EE	
18E/5E	Upward Vertical Stack	CE-04	Com-pressor engine 4	C-05	NSCR catalyst	C	8760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.37 47.41 1.48 0.27 0.01 0.35 0.19 2085	198.22 186.56 5.83 1.06 0.03 1.38 0.73 8206	2.01 1.90 0.74 0.27 0.01 0.13 0.04 1993	7.93 7.46 2.92 1.06 0.03 0.51 0.17 7841	Gas/Vapor	EE	
19E/6E	Upward Vertical Stack	CE-05	Com-pressor engine 5	C-06	NSCR catalyst	C	8760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.37 47.41 1.48 0.27 0.01 0.35 0.19 2085	198.22 186.56 5.83 1.06 0.03 1.38 0.73 8206	2.01 1.90 0.74 0.27 0.01 0.13 0.04 1993	7.93 7.46 2.92 1.06 0.03 0.51 0.17 7841	Gas/Vapor	EE	
20E/7E	Upward Vertical Stack	CE-06	Com-pressor engine 6	C-07	NSCR catalyst	C	8760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.37 47.41 1.48 0.27 0.01 0.35 0.19 2085	198.22 186.56 5.83 1.06 0.03 1.38 0.73 8206	2.01 1.90 0.74 0.27 0.01 0.13 0.04 1993	7.93 7.46 2.92 1.06 0.03 0.51 0.17 7841	Gas/Vapor	EE	

21E/8E	Upward Vertical Stack	CE-07	Com-pressor engine 7	C-08	NSCR catalyst	C	8760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.37 47.41 1.48 0.27 0.01 0.35 0.19 2085	198.22 186.56 5.83 1.06 0.03 1.38 0.73 8206	2.01 1.90 0.74 0.27 0.01 0.13 0.04 1993	7.93 7.46 2.92 1.06 0.03 0.51 0.17 7841	Gas/Vapor	EE	
22E/9E	Upward Vertical Stack	CE-08	Com-pressor engine 8	C-09	NSCR catalyst	C	8760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.37 47.41 1.48 0.27 0.01 0.35 0.19 2085	198.22 186.56 5.83 1.06 0.03 1.38 0.73 8206	2.01 1.90 0.74 0.27 0.01 0.13 0.04 1993	7.93 7.46 2.92 1.06 0.03 0.51 0.17 7841	Gas/Vapor	EE	
23E/10E	Upward Vertical Stack	CE-09	Com-pressor engine 9	C-10	NSCR catalyst	C	8760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.37 47.41 1.48 0.27 0.01 0.35 0.19 2085	198.22 186.56 5.83 1.06 0.03 1.38 0.73 8206	2.01 1.90 0.74 0.27 0.01 0.13 0.04 1993	7.93 7.46 2.92 1.06 0.03 0.51 0.17 7841	Gas/Vapor	EE	
24E/11E	Upward Vertical Stack	CE-10	Com-pressor engine 10	C-11	NSCR catalyst	C	8760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.37 47.41 1.48 0.27 0.01 0.35 0.19 2085	198.22 186.56 5.83 1.06 0.03 1.38 0.73 8206	2.01 1.90 0.74 0.27 0.01 0.13 0.04 1993	7.93 7.46 2.92 1.06 0.03 0.51 0.17 7841	Gas/Vapor	EE	

25E/12E	Upward Vertical Stack	CE-11	Com-pressor engine 11	C-12	NSCR catalyst	C	8760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.37 47.41 1.48 0.27 0.01 0.35 0.19 2085	198.22 186.56 5.83 1.06 0.03 1.38 0.73 8206	2.01 1.90 0.74 0.27 0.01 0.13 0.04 1993	7.93 7.46 2.92 1.06 0.03 0.51 0.17 7841	Gas/Vapor	EE	
26E	Upward Vertical Stack	GEN-1	Microturbine Generator 1	----	----	C	8760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	0.10 0.26 0.02 0.02 0.008 0.003 0.002 266	0.42 1.16 0.11 0.07 0.04 0.01 0.008 1166	0.10 0.26 0.02 0.02 0.008 0.003 0.002 266	0.42 1.16 0.11 0.07 0.04 0.01 0.008 1166	Gas/Vapor	EE	
27E	Upward Vertical Stack	GEN-2	Microturbine Generator 2	----	----	C	8760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	0.10 0.26 0.02 0.02 0.008 0.003 0.002 266	0.42 1.16 0.11 0.07 0.04 0.01 0.008 1166	0.10 0.26 0.02 0.02 0.008 0.003 0.002 266	0.42 1.16 0.11 0.07 0.04 0.01 0.008 1166	Gas/Vapor	EE	
28E	Upward Vertical Stack	RBV-1	Dehydrator Reboiler 1	---	----	C	8760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	0.15 0.12 0.01 0.01 0.001 0.003 0.0001 176	0.64 0.54 0.04 0.05 0.004 0.01 0.0005 771	0.15 0.12 1.12 0.01 0.001 0.05 0.0001 204	0.64 0.54 4.92 0.05 0.004 0.22 0.0005 893	Gas/Vapor	EE	

30E	Upward Vertical Stack	RBV-2	Dehydrator Reboiler 2	---	----	C	8760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	0.15 0.12 0.01 0.01 0.001 0.003 0.0001 176	0.64 0.54 0.04 0.05 0.004 0.01 0.0005 771	0.15 0.12 1.12 0.01 0.001 0.05 0.0001 204	0.64 0.54 4.92 0.05 0.004 0.22 0.0005 893	Gas/Vapor	EE	
32E/13E &14E	Upward Vertical Stack	T01	Produced Water Tank 1	C-13, C-14	VRU-Closed Loop System	C	8760	VOC Total HAPs CO2e	0.09 0.007 0.23	0.38 0.03 1.02	0.002 1.4E-4 0.005	0.008 5.9E-4 0.02	Gas/Vapor	EE	
33E/13E &14E	Upward Vertical Stack	T02	Produced Water Tank 2	C-13, C-14	VRU-Closed Loop System	C	8760	VOC Total HAPs CO2e	0.09 0.007 0.23	0.38 0.03 1.02	0.002 1.4E-4 0.005	0.008 5.9E-4 0.02	Gas/Vapor	EE	
34E/13E &14E	Upward Vertical Stack	T03	Settler Tank	C-13, C-14	VRU-Closed Loop System	C	8760	VOC Total HAPs CO2e	91.49 7.30 252	400.72 31.96 1104	1.83 0.15 5.23	8.01 0.64 22.9	Gas/Vapor	EE	
35E/13E &14E	Upward Vertical Stack	T04	Condensate Tank 1	C-13, C-14	VRU-Closed Loop System	C	8760	VOC Total HAPs CO2e	1.28 0.10 3.47	5.60 0.44 15.20	0.03 0.002 0.07	0.11 0.009 0.30	Gas/Vapor	EE	
36E/13E &14E	Upward Vertical Stack	T05	Condensate Tank 2	C-13, C-14	VRU-Closed Loop System	C	8760	VOC Total HAPs CO2e	1.28 0.10 3.47	5.60 0.44 15.20	0.03 0.002 0.07	0.11 0.009 0.30	Gas/Vapor	EE	
47E	Upward Vertical Stack	CATHT 1	Catalytic Heater	---	---	C	8760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	0.002 0.002 0.0001 0.0002 1E-5 4E-5 2E-6 2.82	0.01 0.009 0.0006 0.0008 6E-5 0.0002 8E-6 12.3	0.002 0.002 0.0001 0.0002 1E-5 4E-5 2E-6 2.82	0.01 0.009 0.0006 0.0008 6E-5 0.0002 8E-6 12.3	Gas/Vapor	EE	

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

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

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

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

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

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

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

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

Attachment J
EMISSION POINTS DATA SUMMARY SHEET

Table 2: Release Parameter Data

Emission Point ID No. *(Must match Emission Units Table)*	Inner Diameter (ft.)	Exit Gas			Emission Point Elevation (ft)		UTM Coordinates (km)	
		Temp. (°F)	Volumetric Flow [1] (acfm) *at operating conditions*	Velocity (fps)	Ground Level *(Height above mean sea level)*	Stack Height [2] *(Release height of emissions above ground level)*	Northing	Easting
15E/C-02	1.1	1225	8886	156	1100	25	4349.145	511.240
16E/C-03	1.1	1225	8886	156	1100	25	4349.151	511.242
17E/C-04	1.1	1225	8886	156	1100	25	4349.166	511.248
18E/C-05	1.1	1225	8886	156	1100	25	4349.181	511.253
19E/C-06	1.1	1225	8886	156	1100	25	4349.196	511.259
20E/C-07	1.1	1225	8886	156	1100	25	4349.211	511.264
21E/C-08	1.1	1225	8886	156	1100	25	4349.226	511.270
22E/C-09	1.1	1225	8886	156	1100	25	4349.241	511.275
23E/C-10	1.1	1225	8886	156	1100	25	4349.256	511.281
24E/C-11	1.1	1225	8886	156	1100	25	4349.261	511.283
25E/C-12	1.1	1225	8886	156	1100	25	4349.276	511.288
26E	1.0	535	1.3 kg/s mass flow	67	1100	8	4349.225	511.208
27E	1.0	535	1.3 kg/s mass flow	67	1100	8	4349.146	511.424
29E/C-01 (1E)	4	1400	7540	10	1100	15	4349.297	511.220
28E	1.5	1000	965	9.1	1100	30	4349.281	511.214
31E/C-01 (1E)	4	1400	7540	10	1100	15	4349.297	511.220
30E	1.5	1000	965	9.10	1100	30	4349.272	511.211
32E-36E/C-13-C-14	Emissions captured in closed loop system with VRU				1100	NA	4349.368	511.286
47E	TBD	1300	TBD	TBD	1100	TBD	4349.217	511.201

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

Attachment K.
Fugitive Emissions Data Summary Sheet

Attachment K

FUGITIVE EMISSIONS DATA SUMMARY SHEET

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

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

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

FUGITIVE EMISSIONS SUMMARY	All Regulated Pollutants - Chemical Name/CAS [1]	Maximum Potential Uncontrolled Emissions [2]		Maximum Potential Controlled Emissions [3]		Est. Method Used [4]
		lb/hr	ton/yr	lb/hr	ton/yr	
Haul Road/Road Dust Emissions Paved Haul Roads						
Unpaved Haul Roads	PM-10 PM-2.5	0.30 0.03	1.30 0.13	0.30 0.03	1.30 0.13	EE
Storage Pile Emissions						
Loading/Unloading Operations	VOCs Total HAPs CO2e	57.54 4.53 156.2	7.87 0.62 21.36	57.54 4.53 156.2	7.87 0.62 21.36	EE
Wastewater Treatment Evaporation & Operations						
Equipment Leaks	VOCs Total HAPs CO2e	2.41 0.11 32.3	10.57 0.48 142	2.41 0.11 32.3	10.57 0.48 142	EE
General Clean-up VOC Emissions						
Other – Venting Episodes	VOCs Total HAPs CO2e	Does not apply	8.88 0.40 642	Does not apply	8.88 0.40 642	EE

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

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

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

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

Attachment L.
Emission Unit Data Sheets

Compressor Engines

NATURAL GAS COMPRESSOR/GENERATOR ENGINE DATA SHEET

Source Identification Number[1]		15E		16E		17E	
Engine Manufacturer and Model		Waukesha, 7044 GSI		Waukesha, 7044 GSI		Waukesha, 7044 GSI	
Manufacturer's Rated bhp/rpm		1680 bhp/1200 rpm		1680 bhp/1200 rpm		1680 bhp/1200 rpm	
Source Status[2]		MS		MS		MS	
Date Installed/Modified/Removed[3]		January 2015		January 2015		January 2015	
Engine Manufactured/Reconstruction Date[4]		2014		2014		2014	
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No)[5]		No		No		No	
Engine, Fuel and Combustion Data	Engine Type[6]	RB4S		RB4S		RB4S	
	APCD Type[7]	NSCR		NSCR		NSCR	
	Fuel Type[8]	PQ		PQ		PQ	
	H_2S (gr/100 scf)	0		0		0	
	Operating bhp/rpm	1680 bhp/1200 rpm		1680 bhp/1200 rpm		1680 bhp/1200 rpm	
	BSFC (Btu/bhp-hr)	8,295		8,295		8,295	
	Fuel throughput (ft^3/hr)	12,360		12,360		12,360	
	Fuel throughput ($MMft^3$/yr)	97.45		97.45		97.45	
	Operation (hrs/yr)	8,760		8,760		8,760	
Reference[9]	Potential Emissions[10]	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
OT	NO_X	2.01	7.93	2.01	7.93	2.01	7.93
OT	CO	1.90	7.46	1.90	7.46	1.90	7.46
MD	VOC	0.74	2.92	0.74	2.92	0.74	2.92
AP	SO_2	0.008	0.03	0.008	0.03	0.008	0.03
AP	PM_{10}	0.27	1.06	0.27	1.06	0.27	1.06
MD	Formaldehyde	0.04	0.17	0.04	0.17	0.04	0.17

Source Identification Number[1]		18E		19E		20E	
Engine Manufacturer and Model		Waukesha, 7044 GSI		Waukesha, 7044 GSI		Waukesha, 7044 GSI	
Manufacturer's Rated bhp/rpm		1680 bhp/1200 rpm		1680 bhp/1200 rpm		1680 bhp/1200 rpm	
Source Status[2]		MS		MS		MS	
Date Installed/Modified/Removed[3]		January 2015		January 2015		January 2015	
Engine Manufactured/Reconstruction Date[4]		2014		2014		2014	
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No)[5]		No		No		No	
Engine, Fuel and Combustion Data	Engine Type[6]	RB4S		RB4S		RB4S	
	APCD Type[7]	NSCR		NSCR		NSCR	
	Fuel Type[8]	PQ		PQ		PQ	
	H_2S (gr/100 scf)	0		0		0	
	Operating bhp/rpm	1680 bhp/1200 rpm		1680 bhp/1200 rpm		1680 bhp/1200 rpm	
	BSFC (Btu/bhp-hr)	8,295		8,295		8,295	
	Fuel throughput (ft^3/hr)	12,360		12,360		12,360	
	Fuel throughput ($MMft^3$/yr)	97.45		97.45		97.45	
	Operation (hrs/yr)	8,760		8,760		8,760	
Reference[9]	Potential Emissions[10]	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
OT	NO_X	2.01	7.93	2.01	7.93	2.01	7.93
OT	CO	1.90	7.46	1.90	7.46	1.90	7.46
MD	VOC	0.74	2.92	0.74	2.92	0.74	2.92
AP	SO_2	0.008	0.03	0.008	0.03	0.008	0.03
AP	PM_{10}	0.27	1.06	0.27	1.06	0.27	1.06
MD	Formaldehyde	0.04	0.17	0.04	0.17	0.04	0.17

Source Identification Number[1]		21E		22E		23E	
Engine Manufacturer and Model		Waukesha, 7044 GSI		Waukesha, 7044 GSI		Waukesha, 7044 GSI	
Manufacturer's Rated bhp/rpm		1680 bhp/1200 rpm		1680 bhp/1200 rpm		1680 bhp/1200 rpm	
Source Status[2]		MS		MS		MS	
Date Installed/Modified/Removed[3]		January 2015		January 2015		January 2015	
Engine Manufactured/Reconstruction Date[4]		2014		2014		2014	
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No)[5]		No		No		No	
Engine, Fuel and Combustion Data	Engine Type[6]	RB4S		RB4S		RB4S	
	APCD Type[7]	NSCR		NSCR		NSCR	
	Fuel Type[8]	PQ		PQ		PQ	
	H_2S (gr/100 scf)	0		0		0	
	Operating bhp/rpm	1680 bhp/1200 rpm		1680 bhp/1200 rpm		1680 bhp/1200 rpm	
	BSFC (Btu/bhp-hr)	8,295		8,295		8,295	
	Fuel throughput (ft^3/hr)	12,360		12,360		12,360	
	Fuel throughput ($MMft^3$/yr)	97.45		97.45		97.45	
	Operation (hrs/yr)	8,760		8,760		8,760	
Reference[9]	Potential Emissions[10]	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
OT	NO_X	2.01	7.93	2.01	7.93	2.01	7.93
OT	CO	1.90	7.46	1.90	7.46	1.90	7.46
MD	VOC	0.74	2.92	0.74	2.92	0.74	2.92
AP	SO_2	0.008	0.03	0.008	0.03	0.008	0.03
AP	PM_{10}	0.27	1.06	0.27	1.06	0.27	1.06
MD	Formaldehyde	0.04	0.17	0.04	0.17	0.04	0.17

Source Identification Number[1]		24E		25E			
Engine Manufacturer and Model		Waukesha, 7044 GSI		Waukesha, 7044 GSI			
Manufacturer's Rated bhp/rpm		1680 bhp/1200 rpm		1680 bhp/1200 rpm			
Source Status[2]		MS		MS			
Date Installed/Modified/Removed[3]		January 2015		January 2015			
Engine Manufactured/Reconstruction Date[4]		2014		2014			
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No)[5]		No		No			
Engine, Fuel and Combustion Data	Engine Type[6]	RB4S		RB4S			
	APCD Type[7]	NSCR		NSCR			
	Fuel Type[8]	PQ		PQ			
	H_2S (gr/100 scf)	0		0			
	Operating bhp/rpm	1680 bhp/1200 rpm		1680 bhp/1200 rpm			
	BSFC (Btu/bhp-hr)	8,295		8,295			
	Fuel throughput (ft^3/hr)	12,360		12,360			
	Fuel throughput ($MMft^3$/yr)	97.45		97.45			
	Operation (hrs/yr)	8,760		8,760			
Reference[9]	Potential Emissions[10]	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
OT	NO_X	2.01	7.93	2.01	7.93		
OT	CO	1.90	7.46	1.90	7.46		
MD	VOC	0.74	2.92	0.74	2.92		
AP	SO_2	0.008	0.03	0.008	0.03		
AP	PM_{10}	0.27	1.06	0.27	1.06		
MD	Formaldehyde	0.04	0.17	0.04	0.17		

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	RB4S	Rich Burn Four Stroke
LB4S	Lean Burn Four Stroke		

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

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

8. Enter the Fuel Type using the following codes:

PQ	Pipeline Quality Natural Gas	RG	Raw Natural Gas

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

MD	Manufacturer's Data	AP	AP-42
GR	GRI-HAPCalc™	OT	Other Based on typical operating conditions

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*.

Antero - Nichols Compressor Station - Doddridge County, WV

VHP - L7044GSI

Gas Compressor Consultants, Inc. Kyle Jark (303) 325-2074 kjark@gccinc.us

Gas Compression - Continuous

ENGINE SPEED (rpm):	1200		
DISPLACEMENT (in3):	7040	COOLING SYSTEM:	JW, IC + OC
COMPRESSION RATIO:	8:1	INTERCOOLER WATER INLET (°F):	130
IGNITION SYSTEM:	ESM	JACKET WATER OUTLET (°F):	180
EXHAUST MANIFOLD:	Water Cooled	JACKET WATER CAPACITY (gal):	100
COMBUSTION:	Rich Burn, Turbocharged	AUXILIARY WATER CAPACITY (gal):	11
ENGINE DRY WEIGHT (lbs):	21000	LUBE OIL CAPACITY (gal):	190
AIR/FUEL RATIO SETTING:	0.38% CO	MAX. EXHAUST BACKPRESSURE (in. H2O):	18
ENGINE SOUND LEVEL (dBA)	104	MAX. AIR INLET RESTRICTION (in. H2O):	15
		EXHAUST SOUND LEVEL (dBA)	111

SITE CONDITIONS:

FUEL:		ALTITUDE (ft):	908
FUEL PRESSURE RANGE (psig):	30 - 60	MAXIMUM INLET AIR TEMPERATURE (°F):	100
FUEL HHV (BTU/ft3):	1,247.2	FUEL WKI:	62.6
FUEL LHV (BTU/ft3):	1,127.4		

SITE SPECIFIC TECHNICAL DATA

POWER RATING	UNITS	MAX RATING AT 100 °F AIR TEMP	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE OF 100 °F		
			100%	90%	50%
CONTINUOUS ENGINE POWER	BHP	1680	1680	1512	843
OVERLOAD	% 2/24 hr	10	10	-	-
MECHANICAL EFFICIENCY (LHV)	%	30.7	30.7	30.0	28.6
CONTINUOUS POWER AT FLYWHEEL	BHP	1680	1680	1512	843
based on no auxiliary engine driven equipment					
FUEL CONSUMPTION					
FUEL CONSUMPTION (LHV)	BTU/BHP-hr	8295	8295	8488	8915
FUEL CONSUMPTION (HHV)	BTU/BHP-hr	9176	9176	9390	9862
FUEL FLOW *based on fuel analysis LHV*	SCFM	206	206	190	111
HEAT REJECTION					
JACKET WATER (JW)	BTU/hr x 1000	4171	4171	3911	2526
LUBE OIL (OC)	BTU/hr x 1000	572	572	557	435
INTERCOOLER (IC)	BTU/hr x 1000	269	269	238	92
EXHAUST	BTU/hr x 1000	4211	4211	3836	1922
RADIATION	BTU/hr x 1000	707	707	694	538
EMISSIONS					
NOx (NO + NO2)	g/bhp-hr	13.6	13.6	14.1	16.5
CO	g/bhp-hr	12.8	12.8	12.9	11.4
THC	g/bhp-hr	2.3	2.3	2.3	1.8
NMHC	g/bhp-hr	0.89	0.89	0.89	0.69
NM, NEHC	g/bhp-hr	0.40	0.40	0.40	0.31
CH4	g/bhp-hr	1.43	1.43	1.41	1.10
CO2	g/bhp-hr	527	527	539	566
CO2e	g/bhp-hr	557	557	569	590
CH2O	g/bhp-hr	0.05	0.05	0.05	0.05
AIR INTAKE / EXHAUST GAS					
INDUCTION AIR FLOW	SCFM	2552	2552	2350	1376
EXHAUST GAS MASS FLOW	lb/hr	11867	11866	10929	6397
EXHAUST GAS FLOW *at exhaust temp, 14.5 psia*	ACFM	8887	8886	8131	4353
EXHAUST TEMPERATURE	°F	1225	1225	1214	1071

HEAT EXHANGER SIZING		
TOTAL JACKET WATER CIRCUIT (JW)	BTU/hr x 1000	4730
TOTAL AUXILIARY WATER CIRCUIT (IC + OC)	BTU/hr x 1000	954

COOLING SYSTEM WITH ENGINE MOUNTED WATER PUMPS		
JACKET WATER PUMP MIN. DESIGN FLOW	GPM	450
JACKET WATER PUMP MAX. EXTERNAL RESTRICTION	psig	16
AUX WATER PUMP MIN. DESIGN FLOW	GPM	79
AUX WATER PUMP MAX. EXTERNAL RESTRICTION	psig	44

All data provided per the condtions listed in the notes section on page three.
Data Generated by EngCalc Program Version 3.3 Dresser Inc.
6/9/2014 3:27 PM

Antero - Nichols Compressor Station - Doddridge County, WV

VHP - L7044GSI

Gas Compressor Consultants, Inc. Kyle Jark (303) 325-2074 kjark@gccinc.us

Gas Compression - Continuous

FUEL COMPOSITION

HYDROCARBONS:		Mole or Volume %
Methane	CH4	77.891
Ethane	C2H6	14.319
Propane	C3H8	4.156
Iso-Butane	I-C4H10	0.5719
Normal Butane	N-C4H10	1.0496
Iso-Pentane	I-C5H12	0.309
Normal Pentane	N-C5H12	0.308
Hexane	C6H14	0.25
Heptane	C7H16	0.09
Ethene	C2H4	0
Propene	C3H6	0
	SUM HYDROCARBONS	98.944
NON-HYDROCARBONS:		
Nitrogen	N2	0.795
Oxygen	O2	0
Helium	He	0
Carbon Dioxide	CO2	0.205
Carbon Monoxide	CO	0
Hydrogen	H2	0
Water Vapor	H2O	0
	TOTAL FUEL	99.944

FUEL:	
FUEL PRESSURE RANGE (psig):	30 - 60
FUEL WKI:	62.6
FUEL SLHV (BTU/ft3):	1107.82
FUEL SLHV (MJ/Nm3):	43.56
FUEL LHV (BTU/ft3):	1127.44
FUEL LHV (MJ/Nm3):	44.34
FUEL HHV (BTU/ft3):	1247.17
FUEL HHV (MJ/Nm3):	49.04
FUEL DENSITY (SG):	0.71

Standard Conditions per ASTM D3588-91 [60°F and 14.696psia] and ISO 6976:1996-02-01[25, V(0;101.325)].
Based on the fuel composition, supply pressure and temperature, liquid hydrocarbons may be present in the fuel. No liquid hydrocarbons are allowed in the fuel. The fuel must not contain any liquid water.
Waukesha recommends both of the following:
1) Dew point of the fuel gas to be at least 20°F (11°C) below the measured temperature of the gas at the inlet of the engine fuel regulator.
2) A fuel filter separator to be used on all fuels except commercial quality natural gas.
Refer to the 'Fuel and Lubrication' section of 'Technical Data' or contact the Waukesha Application Engineering Department for additional information on fuels, or LHV and WKI* calculations.
* Trademark of General Electric Company

FUEL CONTAMINANTS

Total Sulfur Compounds	0	% volume
Total Halogen as Cloride	0	% volume
Total Ammonia	0	% volume
Siloxanes		
Tetramethyl silane	0	% volume
Trimethyl silanol	0	% volume
Hexamethyldisiloxane (L2)	0	% volume
Hexamethylcyclotrisiloxane (D3)	0	% volume
Octamethyltrisiloxane (L3)	0	% volume
Octamethylcyclotetrasiloxane (D4)	0	% volume
Decamethyltetrasiloxane (L4)	0	% volume
Decamethylcyclopentasiloxane (D5)	0	% volume
Dodecamethylpentasiloxane (L5)	0	% volume
Dodecamethylcyclohexasiloxane (D6)	0	% volume
Others	0	% volume

Total Sulfur Compounds	0 µg/BTU
Total Halogen as Cloride	0 µg/BTU
Total Ammonia	0 µg/BTU
Total Siloxanes (as Si)	0 µg/BTU

Calculated fuel contaminant analysis will depend on the entered fuel composition and selected engine model.

No water or hydrocarbon condensates are allowed in the engine. Requires liquids removal.

NOTES

1. All data is based on engines with standard configurations unless noted otherwise.

2. Power rating is adjusted for fuel, site altitude, and site air inlet temperature, in accordance with ISO 3046/1 with tolerance of ± 3%.

3. Fuel consumption is presented in accordance with ISO 3046/1 with a tolerance of -0 / +5% at maximum rating. Fuel flow calculation based on fuel LHV and fuel consumption with a tolerance of -0/+5 %. For sizing piping and fuel equipment, it is recommended to include the 5% tolerance.

4. Heat rejection tolerances are ± 30% for radiation, and ± 8% for jacket water, lube oil, intercooler, and exhaust energy.

5. Emission levels are given at engine exhaust outlet flange prior to any after treatment. Values are based on a new engine operating at indicated site conditions, and adjusted to the specified timing and air/fuel ratio at rated load. Emissions are at an absolute humidity of 75 grains H2O/lb (10.71 g H2O/kg) of dry air. Emission levels may vary subject to instrumentation, measurement, ambient conditions, fuel quality, and engine variation. Engine may require adjustment on-site to meet emission values, which may affect engine performance and heat output. NOx, CO, THC, and NMHC emission levels are listed as a not to exceed limit, all other emission levels are estimated. CO2 emissions based on EPA Federal Register/Vol. 74, No. 209/Friday, October 30, 2009 Rules and Regulations 56398, 56399 (3) Tier 3 Calculation Methodology, Equation C-5.

6. Air flow is based on undried air with a tolerance of ± 7%.

7. Exhaust temperature given at engine exhaust outlet flange with a tolerance of ± 75°F (42°C).

8. Exhaust gas mass flow value is based on a "wet basis" with a tolerance of ± 7%.

9. Inlet air restrictions based on full rated engine load. Exhaust backpressure based on 158 PSI BMEP and 1200 RPM. Refer to the engine specification section of Waukesha's standard technical data for more information.

10. Cooling circuit capacity, lube oil capacity, and engine dry weight values are typical.

11. Fuel must conform to Waukesha's "Gaseous Fuel Specification" S7884-7 or most current version. Fuel may require treatment to meet current fuel specification.

12. Heat exchanger sizing values given as the maximum heat rejection of the circuit, with applied tolerances and an additional 5% reserve factor.

13. Fuel volume flow calculation in english units is based on 100% relative humidity of the fuel gas at standard conditions of 60°F and 14.696 psia (29.92 inches of mercury; 101.325 kPa).

14. Fuel volume flow calculation in metric units is based on 100% relative humidity of the fuel gas at a combustion temperature of 25°C and metering conditions of 0°C and 101.325 kPa (14.696 psia; 29.92 inches of mercury). This is expressed as [25, V(0;101.325)].

15. Engine sound data taken with the microphone at 1 m (3.3 ft) from the side of the engine at the approximate front-to-back centerline. Microphone height was at intake manifold level. Engine sound pressure data may be different at front, back and opposite side locations. Exhaust sound data taken with microphone 1 meter (3.3 ft) away and 1 meter (3.3 ft) to the side of the exhaust outlet.

16. Due to variation between test conditions and final site conditions, such as exhaust configuration and background sound level, sound pressure levels under site conditions may be different than those tabulated above.

17. Cooling system design flow is based on minimum allowable cooling system flow. Cooling system maximum external restriction is defined as the allowable restriction at the minimum cooling system flow. Refer to technical data sheets S-5136-34 and S-6543-36 (or latest version) for more information.

18. Continuous Power Rating: The highest load and speed that can be applied 24 hours per day, seven days per week, 365 days per year except for normal maintenance at indicated ambient reference conditions and fuel. It is permissible to operate the engine at the indicated overload power, for two hours in every 24 hour period.

REQUIRED OPTION CODES

Microturbine Generators

NATURAL GAS COMPRESSOR/GENERATOR ENGINE DATA SHEET

Source Identification Number[1]		26E		27E			
Engine Manufacturer and Model		Capstone C200 Standard		Capstone C200 Standard			
Manufacturer's Rated bhp/rpm		200 kWe		200 kWe			
Source Status[2]		ES		ES			
Date Installed/Modified/Removed[3]		January 2015		January 2015			
Engine Manufactured/Reconstruction Date[4]		2014		2014			
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No)[5]		N/A		N/A			
Engine, Fuel and Combustion Data	Engine Type[6]	N/A		N/A			
	APCD Type[7]	N/A		N/A			
	Fuel Type[8]	PQ		PQ			
	H_2S (gr/100 scf)	0		0			
	Operating kWe	200		200			
	BSFC (Btu/kWe)	10,300		10,300			
	Fuel throughput (ft^3/hr)	2,425		2,425			
	Fuel throughput ($MMft^3$/yr)	21.23		21.23			
	Operation (hrs/yr)	8,760		8,760			
Reference[9]	Potential Emissions[10]	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
MD	NO_X	0.10	0.42	0.10	0.42		
MD	CO	0.26	1.16	0.26	1.16		
MD	VOC	0.02	0.11	0.02	0.11		
AP	SO_2	0.01	0.04	0.01	0.04		
AP	PM_{10}	0.02	0.07	0.02	0.07		
AP	Formaldehyde	0.002	0.008	0.002	0.008		

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

2. Enter the Source Status using the following codes:

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

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

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

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

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

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

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

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

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

8. Enter the Fuel Type using the following codes:

PQ	Pipeline Quality Natural Gas	RG	Raw Natural Gas

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

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

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

C200 MicroTurbine
High-pressure Natural Gas

World's largest air-bearing microturbine produces 200kW of clean, green, and reliable power.

- Ultra-low emissions
- One moving part – minimal maintenance and downtime
- Patented air bearing – no lubricating oil or coolant
- 5 and 9 year Factory Protection Plans available
- Remote monitoring and diagnostic capabilities
- Integrated utility synchronization and protection
- Small, modular design allows for easy, low-cost installation
- Proven technology with tens of millions of run hours and counting
- Internal fuel gas compressor available for low fuel pressure natural gas applications

C200 MicroTurbine

Electrical Performance[1]

Electrical Power Output	200kW
Voltage	400–480 VAC
Electrical Service	3-Phase, 4 wire
Frequency	50/60 Hz, grid connect operation
	10–60 Hz, stand alone operation
Maximum Output Current	290A RMS @ 400V, grid connect operation
	240A RMS @ 480V, grid connect operation
	310A RMS, stand alone operation[2]
Electrical Efficiency LHV	33%

Fuel/Engine Characteristics[1]

Natural Gas HHV	30.7–47.5 MJ/m^3 (825–1,275 BTU/scf)
Inlet Pressure[3]	517–552 kPa gauge (75–80 psig)
Fuel Flow HHV	2,400 MJ/hr (2,280,000 BTU/hr)
Net Heat Rate LHV	10.9 MJ/kWh (10,300 BTU/kWh)

Exhaust Characteristics[1]

NOx Emissions @ 15% O_2[4]	< 9 ppmvd (18 mg/m^3)
NOx / Electrical Output[4]	0.14 g/bhp-hr (0.4 lb/MWhe)
Exhaust Gas Flow	1.3 kg/s (2.9 lbm/s)
Exhaust Gas Temperature	280°C (535°F)
Exhaust Energy	1,420 MJ/hr (1,350,000 BTU/hr)

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

Dimensions & Weight[5]

Width x Depth x Height[6]	1.7 x 3.8 x 2.5 m (67 x 150 x 98 in)
Weight – Grid Connect Model	2776 kg (6,120 lb)
Weight – Dual Mode Model	3413 kg (7,525 lb)

Minimum Clearance Requirements[7]

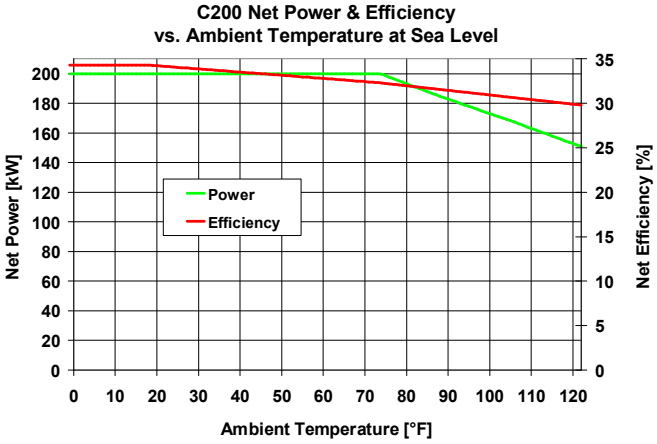
Vertical Clearance	0.6 m (24 in)
Horizontal Clearance	
Left & Right	1.1 m (42 in)
Front	1.1 m (42 in)
Rear	1.8 m (70 in)

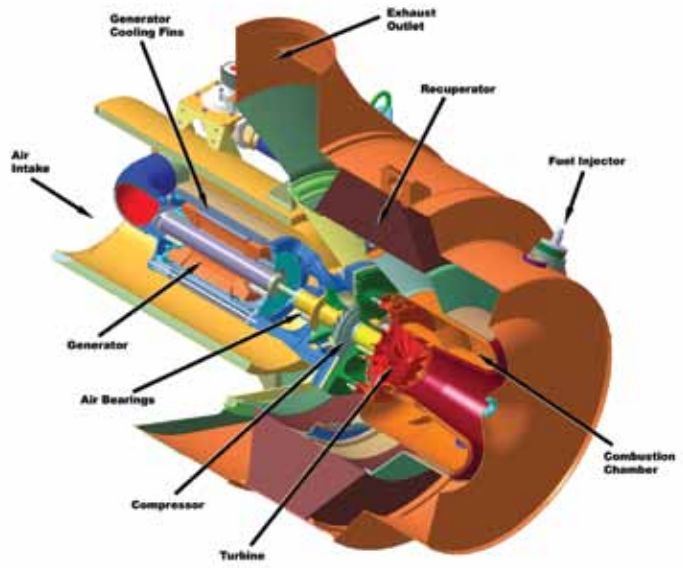
Sound Levels

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

Certifications

- UL 2200 and UL 1741 natural gas operation[8]
- Complies with IEEE 1547 and meets statewide utility interconnection requirements for California Rule 21 and the New York State Public Service Commission
- CE certified





(1) Nominal full power performance at ISO conditions: 59°F, 14.696 psia, 60% RH
(2) With linear load
(3) Inlet pressure for standard natural gas at 39.4 MJ/Nm³ (1,000 BTU/scf) (HHV)
(4) Emissions for standard natural gas at 39.4 MJ/Nm³ (1,000 BTU/scf) (HHV)
(5) Approximate dimensions and weight
(6) Height dimensions are to the roof line. Exhaust outlet extends at least 8 inches above the roof line
(7) Clearance requirements may increase due to local code considerations
(8) All natural gas models are planned to be UL Listed

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

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Technical Reference

Capstone MicroTurbine™ Systems Emissions

Summary

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

Maximum Exhaust Emissions at ISO Conditions

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

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

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

Notes:

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

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

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

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

Notes: - same as for Table 1

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

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

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

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

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

Table 3. Emission for Different Capstone Microturbine Models in [ppmvd] at 15% O_2

Model	Fuel	NOx	CO	VOC
C30 NG	Natural Gas (1)	9	40	9
CR30 MBTU	Landfill Gas (2)	9	500	40
CR30 MBTU	Digester Gas (3)	9	250	40
C30 Liquid	Diesel #2 (4)	35	9	9
C65 NG Standard	Natural Gas (1)	9	40	7
C65 NG Low NOx	Natural Gas (1)	4	40	7
C65 NG CARB	Natural Gas (1)	4	8	3
CR65 Landfill	Landfill Gas (2)	9	130	7
CR65 Digester	Digester Gas (3)	9	130	7
C200 NG	Natural Gas (1)	9	40	7
C200 NG CARB	Natural Gas (1)	4	8	3
CR200 Digester	Digester Gas (3)	9	130	7

Notes: same as Table 1

Table 4. Emission for Different Capstone Microturbine Models in [mg/m3] at 15% O_2

Model	Fuel	NOx	CO	VOC (5)
C30 NG	Natural Gas (1)	18	50	6
CR30 MBTU	Landfill Gas (2)	18	620	30
CR30 MBTU	Digester Gas (3)	18	310	30
C30 Liquid	Diesel #2 (4)	72	11	6
C65 NG Standard	Natural Gas (1)	19	50	5
C65 NG Low NOx	Natural Gas (1)	8	50	5
C65 NG CARB	Natural Gas (1)	8	9	2
CR65 Landfill	Landfill Gas (2)	18	160	5
CR65 Digester	Digester Gas (3)	18	160	5
C200 NG	Natural Gas (1)	18	50	5
C200 NG CARB	Natural Gas (1)	8	9	2
CR200 Digester	Digester Gas (3)	18	160	5

Notes: same as Table 1

The emissions stated in Tables 1, 2, 3 and 4 are guaranteed by Capstone for new microturbines during the standard warranty period. They are also the expected emissions for a properly maintained microturbine according to manufacturer's published maintenance schedule for the useful life of the equipment.

Emissions at Full Power but Not at ISO Conditions

The maximum emissions in Tables 1, 2, 3 and 4 are at full power under ISO conditions. These levels are also the expected values at full power operation over the published allowable ambient temperature and elevation ranges.

Emissions at Part Power

Capstone microturbines are designed to maintain combustion stability and low emissions over a wide operating range. Capstone microturbines utilize multiple fuel injectors, which are switched on or off depending on the power output of the turbine. All injectors are typically on when maximum power is demanded, regardless of the ambient temperature or elevation. As the load requirements of the microturbine are decreased, injectors will be switched off to maintain stability and low emissions. However, the emissions relative to the lower power output may increase. This effect differs for each microturbine model.

Emissions Calculations for Permitting

Air Permitting agencies are normally concerned with the maximum amount of a given pollutant being emitted per unit of time (for example pounds per day of NOx). The simplest way to make this calculation is to use the maximum microturbine full electrical power output (expressed in MW) multiplied by the emissions rate in pounds per MWhe times the number of hours per day. For example, the C65 CARB microturbine operating on natural gas would have a NOx emissions rate of:

NOx = .17 X (65/1000) X 24 = .27 pounds per day

This would be representative of operating the equipment full time, 24 hours per day, at full power output of 65 kWe.

As a general rule, if local permitting is required, use the published agency levels as the stated emissions for the permit and make sure that this permitted level is above the calculated values in this technical reference.

Consideration of Useful Thermal Output

Capstone microturbines are often deployed where their clean exhaust can be used to provide heating or cooling, either directly or using hot water or other heat transfer fluids. In this case, the local permitting or standards agencies will usually consider the emissions from traditional heating sources as being displaced by the useful thermal output of the microturbine exhaust energy. This increases the useful output of the microturbine, and decreases the relative emissions of the combined heat and power system. For example, the CARB version C65 ICHP system with integral heat recovery can achieve a total system efficiency of 70% or more, depending on inlet water temperatures and other installation-specific characteristics. The electric efficiency of the CARB version C65 microturbine is 28% at ISO conditions. This means that the total NOx output based emissions, including the captured thermal value, is the electric-only emissions times the ratio of electric efficiency divided by total system efficiency:

NOx = .17 X 28/70 = .068 pounds per MWh (based on total system output)

This is typically much less than the emissions that would result from providing electric power using traditional central power plants, plus the emissions from a local hot water heater or boiler. In fact microturbine emissions are so low compared with traditional hot water heaters that installing a Capstone microturbine with heat recovery can actually decrease the local emissions of NOx and other criteria pollutants, without even considering the elimination of emissions from a remote power plant.

Greenhouse Gas Emissions

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

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

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

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

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

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

Notes:

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

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

Useful Conversions

The conversions shown in Table 6 can be used to obtain other units of emissions outputs. These are approximate conversions.

Table 6. Useful Unit Conversions

From	Multiply By	To Get
lb/MWh	0.338	g/bhp-hr
g/bhp-hr	2.96	lb/MWh
lb	0.454	kg
kg	2.20	lb
kg	1,000	g
hp (electric)	.746	kW
kW	1.34	hp (electric)
MW	1,000	kW
kW	0.001	MW

Definitions

- ISO conditions are defined as: 15 °C (59 °F), 60% relative humidity, and sea level pressure of 101.3 kPa (14.696 psia).
- HHV: Higher Heating Value
- LHV: Lower Heating Value
- kW_{th}: Kilowatt (thermal)
- kW_e : Kilowatt (electric)
- MWh: Megawatt-hour
- hp-hr: horsepower-hour (sometimes referred to as “electric horsepower-hour”)
- Scf: Standard cubic foot (standard references ISO temperature and pressure)
- m3: Normal cubic meter (normal references 0 °C and one atmosphere pressure)

Capstone Contact Information

If questions arise regarding this technical reference, please contact Capstone Turbine Corporation for assistance and information:

Capstone Applications

Toll Free Telephone: (866) 4-CAPSTONE or (866) 422-7786

Fax: (818) 734-5385

E-mail: applications@capstoneturbine.com

Catalytic Heater

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

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

Identification Number (as assigned on *Equipment List Form*): 47E

1. Name or type and model of proposed affected source: Bruest HotCat Heater. Model 8000 24,000 Btu/hr
2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.
3. Name(s) and maximum amount of proposed process material(s) charged per hour: Natural Gas as fuel - 30 scf/hr
4. Name(s) and maximum amount of proposed material(s) produced per hour: Heater is used to increase temperature of fuel gas to generators. Heater will be used to raise the temperature of the fuel gas by approximately 30 F (average from 45F to 75F).
5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants: Combustion process

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

6. Combustion Data (if applicable):

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

Natural Gas as fuel - 30 scf/hr

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

Same as fuel gas analysis - see attached sheet

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

@ °F and psia.

(d) Percent excess air:

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

24,000 Btu/hr heater. Natural gas

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

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

7. Projected operating schedule:

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

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

@ 75 °F and 164 psia

a.	NO_X	0.0024	lb/hr	grains/ACF
b.	SO_2	0.000014	lb/hr	grains/ACF
c.	CO	0.0020	lb/hr	grains/ACF
d.	PM_{10}	0.00018	lb/hr	grains/ACF
e.	Hydrocarbons		lb/hr	grains/ACF
f.	VOCs	0.00013	b/hr	grains/ACF
g.	Pb		lb/hr	grains/ACF
h.	Specify other(s)			
	Total HAP (including formaldehyde	0.000044	lb/hr	grains/ACF
	CO2e	2.82	lb/hr	grains/ACF
			lb/hr	grains/ACF
			lb/hr	grains/ACF

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

(2) Complete the Emission Points Data Sheet.

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

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

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

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

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

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

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

Infrared Radiant Heaters

The Safest, Most Efficient Alternative Wherever Flameless Heat is Required

Catalytic heating is the product of intensive research efforts to quantify the effectiveness of catalysts in promoting the reaction of combustive gases with oxygen or air to produce heat. There is no flame to create a hazard, and catalytic heat can operate efficiently on low-cost natural gas, butane or propane.

The use of catalytic heaters has been approved and accepted for dozens of industrial and petrochemical applications.

How the Catalytic Principle Works

The normal ignition temperature of natural gas (80%) in air (20%) at atmosphere pressure is given as 1260˚F. In the presence of the catalyst, the reaction occurs with sufficient velocity to begin a chain reaction at 225˚F. Thus, if natural gas is brought into contact with the catalyst at 225˚F in the presence of oxygen, it is oxidized to carbon dioxide and water vapor. Sufficient heat is, therefore, evolved to raise the temperature of the bed of the heater and oxidation will continue as long as gas and oxygen are supplied.

No flame is produced under these conditions, since the gases are well below ignition temperature (1260˚F). However, approximately the same amount of heat is produced as if the gas had been burned in the normal manner.

The thermal efficiency of a catalytic heater is substantially higher than a conventional heater. In the catalytic heating principle, a considerably larger proportion of the heat produced is radiant heat of wavelengths of 2–16 microns, and much less heat is required to heat the evolved gases.

Practically no heat is utilized to heat the large volume of nitrogen associated with the oxygen as in a conventional heater because most of the heat content of the carbon dioxide and water is recovered as radiant heat.

In a catalytic heater, the temperature attained in the catalyst bed is determined by two factors: the flow of the gas to the catalyst bed, and the rate at which oxygen diffuses through the bed to replace what was consumed in the reaction.

If the rate of gas flow is too high, not enough oxygen can enter to completely burn the gas. If the rate is too low, the gas is burned deeper in the bed and the surface cools. Therefore, the temperature of a catalytic heater is self-limiting and the system will operate stably for long periods of time without intervention as long as gas and air are supplied.

The Catalytic Principle

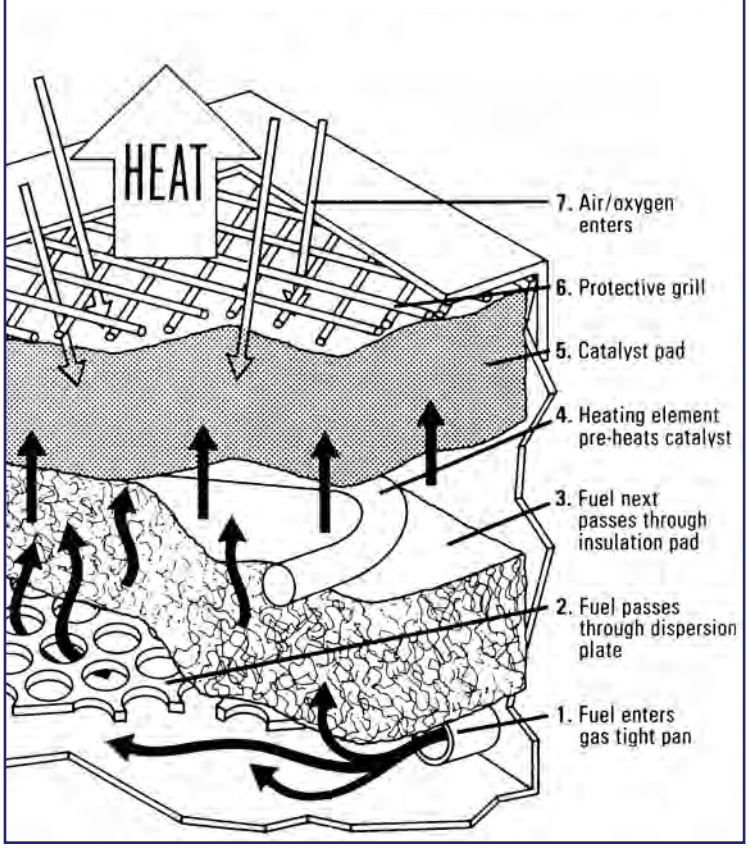
Catalytic heat is radiant heat. Radiant heat, like light, is electromagnetic wave energy that travels in straight lines at 186,000 miles per second, casts shadows, may be transmitted, absorbed or reflected by matter, and may be focused or dispersed by lenses or prisms of the proper material.

A source of radiant energy – such as a catalytic heater – floods the area around it with heat energy in the same way that light floods the area around it. The intensity of the heat energy varies with the square of the distance (as does light) and travels any distance without loss as long as it does not contact matter which absorbs it.

The absorption of radiant energy by various materials is a property specific to each material. Certain wavelengths will be absorbed to a considerable extent, others less, and some very little or not at all. Thus, each molecular substance has an infrared absorption spectrum which is a fingerprint of that substance. The absorption data for many substances can be found in an atlas of infrared absorption spectra.

Since the absorption of radiant heat is highly selective, there are many excellent application opportunities. By selecting proper substances to act as a filter between the source and object to be heated, all but the desired wavelengths can be filtered out.

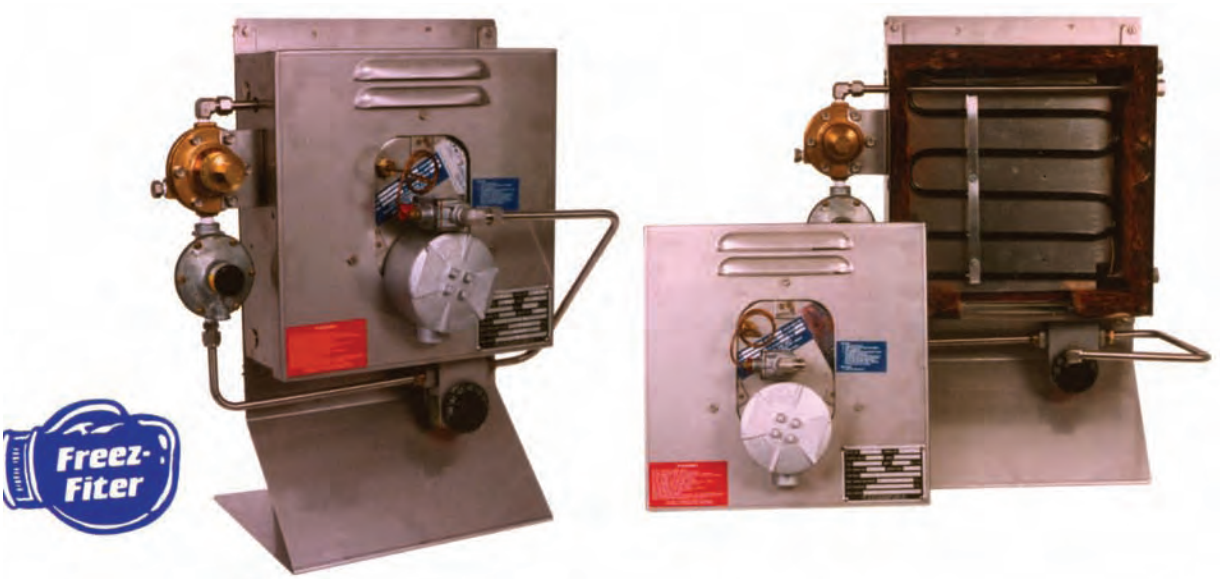
SIMPLIFIED CATALYTIC HEATER DIAGRAM



Sample Applications for Bruest Catalytic Heaters

- **Compressor Gas Preheat**
- **Regulators and Control Valves**
- **Gas Wellhead Heaters**
- **Peak Shaving Vaporizer Valves**
- **Enclosures of all Types**
- **Oil Production Well Injection, Offshore Platform Approved**
- **Personnel, Fixed or Portable**
- **Space Heaters, Compressor Stations**
- **Pipeline Heaters**

Bruest Catalytic Heaters are approved for use by
THE CANADIAN STANDARDS ASSOCIATION and FACTORY MUTUAL SYSTEM
for hazardous locations Class 1, Group D, Division 2.



FREEZ-FITER PILOT-REGULATOR HEATER PREVENTS FREEZE-UPS

- Heats gas supply to controllers, pilots and instrument regulators
- Heat source - Bruest flameless catalytic heater
- Fuel: natural gas, L.P. (propane) or butane gas
- Low fuel consumption
- FM models suitable for use in Class 1, Division 2, Group D locations
- CSA models suitable for use in Class 1, Division 1 and 2, Group D locations
- Single coil standard - dual coil model available (use with 2 regulators)
- Low pressure fuel gas regulator comes with unit (maximum 50 PSI inlet pressure)
- Preheat fuel gas tube

FREEZ-FILTER SPECIFICATIONS

MODEL NO.	EXCHANGER COIL	HEATER	CASE DIMENSION
1800	3/8" OD - Type 304 Stainless Steel • Operating Pressure • 2500 PSI-Max. Test Pressure - 5000 PSI • Exchanger Coil Pipe Fittings - 1/4" NPT	Bruest-SR-8 Catalytic Heater• Start-up Voltage - 12 Volt or 120 Volt • Stainless Steel Case • 2500 BTU Input • Fuel - Natural Gas at 3 1/2" W.C. • LP Gas at 11" W.C.	Size 12" x 12" x 4" with 1" Fiberglass Insulation • Stainless Steel Case
4000	Same as Above	Bruest-SR-12 Catalytic Heater • Start-up Voltage 12 Volt or 120 Volt • Stainless Steel Case • 5000 BTU Input • Fuel-Natural Gas at 3 1/2" W.C. • LP Gas at 11" W.C.	Size 16" x 16" x 4" with 1" Fiberglass insulation • Stainless Steel Case

ACCESSORY OPTIONS

- High pressure fuel gas regulator; 6000 PSI max; 10-75 PSI outlet; Fisher 1301F
- Thermostat: 100° - 200°F range (Invensys)
- Explosion-proof junction box is standard on CSA models and optional on FM models
- 16 ft. - 12V electrical pigtail with battery clips for a standard or explosion-proof junction box
- 25 ft. - 12V electrical pigtail with battery clips for a standard or explosion-proof junction box
- Nupro relief valve (set @ 45 PSI) 1/4˝ npt

Dehydrators

NATURAL GAS GLYCOL DEHYDRATION UNIT DATA SHEET

General Glycol Dehydration Unit Data		Manufacturer and Model		Valerus, 60 MMscfd	
		Max Dry Gas Flow Rate (mmscf/day)		60	
		Design Heat Input (mmBtu/hr)		1.5	
		Design Type (DEG or TEG)		TEG	
		Source Status[2]		ES	
		Date Installed/Modified/Removed[3]		January 2015	
		Regenerator Still Vent APCD[4]		FL	
		Fuel HV (Btu/scf)		1,126	
		H_2S Content (gr/100 scf)		0	
		Operation (hrs/yr)		8,760	
Source ID #[1]	Vent	Reference[5]	Potential Emissions[6]	lbs/hr	tons/yr
28E	Reboiler Vent	AP & ProMax3.2	NO_X	0.15	0.64
		AP & ProMax3.2	CO	0.12	0.54
		AP & ProMax3.2	VOC	1.12	4.92
		AP & ProMax3.2	SO_2	0.0009	0.004
		AP & ProMax3.2	PM_{10}	0.01	0.05
		AP & ProMax3.2	Benzene	0.001	0.004
		AP & ProMax3.2	Ethylbenzene	0.0000006	0.000003
		AP & ProMax3.2	Toluene	0.001	0.005
		AP & ProMax3.2	Xylenes	0.0001	0.0004
		AP & ProMax3.2	n-Hexane	0.05	0.20
29E	Glycol Regenerator Still Vent	ProMax 3.2	VOC	0.95	4.18
		ProMax 3.2	Benzene	0.03	0.11
		ProMax 3.2	Ethylbenzene	0.00004	0.0002
		ProMax 3.2	Toluene	0.06	0.26
		ProMax 3.2	Xylenes	0.009	0.04
		ProMax 3.2	n-Hexane	0.08	0.34

General Glycol Dehydration Unit Data		Manufacturer and Model		Valerus, 60 MMscfd	
		Max Dry Gas Flow Rate (mmscf/day)		60	
		Design Heat Input (mmBtu/hr)		1.5	
		Design Type (DEG or TEG)		TEG	
		Source Status[2]		ES	
		Date Installed/Modified/Removed[3]		January 2015	
		Regenerator Still Vent APCD[4]		FL	
		Fuel HV (Btu/scf)		1,126	
		H_2S Content (gr/100 scf)		0	
		Operation (hrs/yr)		8,760	
Source ID #[1]	Vent	Reference[5]	Potential Emissions[6]	lbs/hr	tons/yr
30E	Reboiler Vent	AP & ProMax3.2	NO_X	0.15	0.64
		AP & ProMax3.2	CO	0.12	0.54
		AP & ProMax3.2	VOC	1.12	4.92
		AP & ProMax3.2	SO_2	0.0009	0.004
		AP & ProMax3.2	PM_{10}	0.01	0.05
		AP & ProMax3.2	Benzene	0.001	0.004
		AP & ProMax3.2	Ethylbenzene	0.0000006	0.000003
		AP & ProMax3.2	Toluene	0.001	0.005
		AP & ProMax3.2	Xylenes	0.0001	0.0004
		AP & ProMax3.2	n-Hexane	0.05	0.20
31E	Glycol Regenerator Still Vent	ProMax 3.2	VOC	0.95	4.18
		ProMax 3.2	Benzene	0.03	0.11
		ProMax 3.2	Ethylbenzene	0.00004	0.0002
		ProMax 3.2	Toluene	0.06	0.26
		ProMax 3.2	Xylenes	0.009	0.04
		ProMax 3.2	n-Hexane	0.08	0.34

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

2. Enter the Source Status using the following codes:

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

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

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

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

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

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

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

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

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

West Virginia Department of Environmental Protection

Division of Air Quality

40 CFR Part 63; Subpart HH & HHH Registration Form

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

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

Section A: Facility Description		
Affected facility actual annual average natural gas throughput (scf/day):	**120,000,000 per Dehy)**	**(60,000,000**
Affected facility actual annual average hydrocarbon liquid throughput: (bbl/day):	**196**	
The affected facility processes, upgrades, or stores hydrocarbon liquids prior to custody transfer.	(Yes)	No
The affected facility processes, upgrades, or stores natural gas prior to the point at which natural gas (NG) enters the NG transmission and storage source category or is delivered to the end user.	(Yes)	No
The affected facility is: ☒ prior to a NG processing plant ☐ a NG processing plant ☐ prior to the point of custody transfer and there is no NG processing plant		
The affected facility transports or stores natural gas prior to entering the pipeline to a local distribution company or to a final end user (if there is no local distribution company).	(Yes)	No
The affected facility exclusively processes, stores, or transfers black oil.	Yes	(No)
Initial producing gas-to-oil ratio (GOR): _____scf/bbl API gravity: _____degrees		

Section B: Dehydration Unit (if applicable) [1]			
Description:	**Nichols Compressor Station Dehydrators (RSV-1 and RSV-2)**		
Date of Installation:	**January 2015**	Annual Operating Hours: **8,760**	Burner rating (MMbtu/hr): **1.5**
Exhaust Stack Height (ft):	**15**	Stack Diameter (ft): **4**	Stack Temp. (°F): **1,400**
Glycol Type:	☒ TEG ☐ EG ☐ Other:		
Glycol Pump Type:	☐ Electric ☒ Gas	If gas, what is the volume ratio? **_0.032**___ACFM/gpm	
Condenser installed?	☒ Yes ☐ No	Exit Temp. 145___ °F	Condenser Pressure _0__psig
Incinerator/flare installed?	☒ Yes ☐ No	Destruction Eff. __98___%	
Other controls installed?	☐ Yes ☒ No	Describe:	
Wet Gas[2]: (Upstream of Contact Tower)	Gas Temp.: **_120_** °F	Gas Pressure **_810** psig	
	Saturated Gas? ☒ Yes ☐ No	If no, water content _____ lb/MMSCF	
Dry Gas: (Downstream of Contact Tower)	Gas Flowrate(MMSCFD) Actual _____	Design ___**60**____	
	Water Content ___**5.0**____ lb/MMSCF		
Lean Glycol:	Circulation rate (gpm) Actual[3] _____	Maximum[4] ___**7.5**____	
	Pump make/model: **Kimray 45015PV**		
Glycol Flash Tank (if applicable):	Temp.: __**130**__ °F	Pressure __**60**___ psig	Vented? Yes ☐ No ☒
	If no, describe vapor control: **Flash tank vent gas used in reboiler as fuel**		
Stripping Gas (if applicable):	Source of gas: **dry gas, if used**	Rate **_40**__ scfm	

Please attach the following required dehydration unit information:

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

Section C: Facility NESHAPS Subpart HH/HHH status

Affected facility status: (choose only one)

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

Storage Tanks
(Tanks 4.0.9d Runs Included in Attachment N)

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

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

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

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name Production Storage Tanks	2. Tank Name Produced Water Tank 1
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) T01	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 32E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☐ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) Existing source - no modifications requested	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode).	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): None	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. 400 barrel	
9A. Tank Internal Diameter (ft) 12	9B. Tank Internal Height (or Length) (ft) 20
10A. Maximum Liquid Height (ft) 19	10B. Average Liquid Height (ft) 10
11A. Maximum Vapor Space Height (ft) 1	11B. Average Vapor Space Height (ft) 10
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 380 barrel	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
342,625.5	939

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 21.31

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

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

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

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

18. Type of tank (check all that apply):
- ☒ Fixed Roof X vertical ___ horizontal ___ flat roof __ cone roof X dome roof ___ other (describe)
- ☐ External Floating Roof ___ pontoon roof ___ double deck roof
- ☐ Domed External (or Covered) Floating Roof
- ☐ Internal Floating Roof ___ vertical column support ___ self-supporting
- ☐ Variable Vapor Space ___ lifter roof ___ diaphragm
- ☐ Pressurized ___ spherical ___ cylindrical
- ☐ Underground
- ☐ Other (describe)

III. TANK CONSTRUCTION & OPERATION INFORMATION (optional if providing TANKS Summary Sheets)

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

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

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

22A. Is the tank heated? ☐ YES ☐ NO

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

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

23. Operating Pressure Range (psig): to

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

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

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

25. Complete the following section for **Floating Roof Tanks** ☐ Does Not Apply

25A. Year Internal Floaters Installed:

25B. Primary Seal Type: (check one)
☐ Metallic (Mechanical) Shoe Seal ☐ Liquid Mounted Resilient Seal
☐ Vapor Mounted Resilient Seal ☐ Other (describe):

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

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

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

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

26. Complete the following section for Internal Floating Roof Tanks ☐ Does Not Apply	
26A. Deck Type: ☐ Bolted ☐ Welded	
26B. For Bolted decks, provide deck construction:	
26C. Deck seam: ☐ Continuous sheet construction 5 feet wide ☐ Continuous sheet construction 6 feet wide ☐ Continuous sheet construction 7 feet wide ☐ Continuous sheet construction 5 × 7.5 feet wide ☐ Continuous sheet construction 5 × 12 feet wide ☐ Other (describe)	
26D. Deck seam length (ft)	26E. Area of deck (ft^2)
For column supported tanks: 26F. Number of columns:	26G. Diameter of each column:

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

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

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

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

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

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

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

VI. EMISSIONS AND CONTROL DEVICE DATA (required)

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

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

[1] Complete appropriate Air Pollution Control Device Sheet.

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

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
VOC	0.0009	0.0009	lb/hr	15.07	EPA - TANKS 4.0.9
Emissions are controlled values					

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

☒ Remember to attach emissions calculations, including TANKS Summary Sheets if applicable.

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

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

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

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name Production Storage Tanks	2. Tank Name Produced Water Tank 2
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) T02	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 33E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☐ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) Existing source - no modifications requested	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode).	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): None	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. 400 barrel	
9A. Tank Internal Diameter (ft) 12	9B. Tank Internal Height (or Length) (ft) 20
10A. Maximum Liquid Height (ft) 19	10B. Average Liquid Height (ft) 10
11A. Maximum Vapor Space Height (ft) 1	11B. Average Vapor Space Height (ft) 10
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 380 barrel	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
342,625.5	939

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 21.31

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

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

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

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

18. Type of tank (check all that apply):
- ☒ Fixed Roof X vertical ___ horizontal ___ flat roof __ cone roof X dome roof ___ other (describe)
- ☐ External Floating Roof ___ pontoon roof ___ double deck roof
- ☐ Domed External (or Covered) Floating Roof
- ☐ Internal Floating Roof ___ vertical column support ___ self-supporting
- ☐ Variable Vapor Space ___ lifter roof ___ diaphragm
- ☐ Pressurized ___ spherical ___ cylindrical
- ☐ Underground
- ☐ Other (describe)

III. TANK CONSTRUCTION & OPERATION INFORMATION (optional if providing TANKS Summary Sheets)

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

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

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

22A. Is the tank heated? ☐ YES ☐ NO

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

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

23. Operating Pressure Range (psig): to

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

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

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

25. Complete the following section for **Floating Roof Tanks** ☐ Does Not Apply

25A. Year Internal Floaters Installed:

25B. Primary Seal Type: (check one)
☐ Metallic (Mechanical) Shoe Seal ☐ Liquid Mounted Resilient Seal
☐ Vapor Mounted Resilient Seal ☐ Other (describe):

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

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

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

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

26. Complete the following section for Internal Floating Roof Tanks ☐ Does Not Apply	
26A. Deck Type: ☐ Bolted ☐ Welded	
26B. For Bolted decks, provide deck construction:	
26C. Deck seam: ☐ Continuous sheet construction 5 feet wide ☐ Continuous sheet construction 6 feet wide ☐ Continuous sheet construction 7 feet wide ☐ Continuous sheet construction 5 × 7.5 feet wide ☐ Continuous sheet construction 5 × 12 feet wide ☐ Other (describe)	
26D. Deck seam length (ft)	26E. Area of deck (ft^2)
For column supported tanks: 26F. Number of columns:	26G. Diameter of each column:

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

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

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

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

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

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

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

VI. EMISSIONS AND CONTROL DEVICE DATA (required)

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

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

[1] Complete appropriate Air Pollution Control Device Sheet.

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

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
VOC	0.0009	0.0009	lb/hr	15.07	EPA - TANKS 4.0.9
Emissions are controlled values					

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

☒ Remember to attach emissions calculations, including TANKS Summary Sheets if applicable.

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

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

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

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name Production Storage Tanks	2. Tank Name Settling Tank
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) T03	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 34E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☐ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) Existing source – no modifications requested	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode).	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): None	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. 400 barrel	
9A. Tank Internal Diameter (ft) 12	9B. Tank Internal Height (or Length) (ft) 20
10A. Maximum Liquid Height (ft) 19	10B. Average Liquid Height (ft) 10
11A. Maximum Vapor Space Height (ft) 1	11B. Average Vapor Space Height (ft) 10
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 380 barrel	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
2,998,548	8,215

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 186.54

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

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

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

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

18. Type of tank (check all that apply):
- ☒ Fixed Roof X vertical ___ horizontal ___ flat roof __ cone roof X dome roof ___ other (describe)
- ☐ External Floating Roof ___ pontoon roof ___ double deck roof
- ☐ Domed External (or Covered) Floating Roof
- ☐ Internal Floating Roof ___ vertical column support ___ self-supporting
- ☐ Variable Vapor Space ___ lifter roof ___ diaphragm
- ☐ Pressurized ___ spherical ___ cylindrical
- ☐ Underground
- ☐ Other (describe)

III. TANK CONSTRUCTION & OPERATION INFORMATION (optional if providing TANKS Summary Sheets)

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

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

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

22A. Is the tank heated? ☐ YES ☐ NO

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

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

23. Operating Pressure Range (psig): to

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

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

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

25. Complete the following section for **Floating Roof Tanks** ☐ Does Not Apply

25A. Year Internal Floaters Installed:

25B. Primary Seal Type: (check one)
☐ Metallic (Mechanical) Shoe Seal ☐ Liquid Mounted Resilient Seal
☐ Vapor Mounted Resilient Seal ☐ Other (describe):

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

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

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

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

26. Complete the following section for Internal Floating Roof Tanks ☐ Does Not Apply	
26A. Deck Type: ☐ Bolted ☐ Welded	
26B. For Bolted decks, provide deck construction:	
26C. Deck seam: ☐ Continuous sheet construction 5 feet wide ☐ Continuous sheet construction 6 feet wide ☐ Continuous sheet construction 7 feet wide ☐ Continuous sheet construction 5 × 7.5 feet wide ☐ Continuous sheet construction 5 × 12 feet wide ☐ Other (describe)	
26D. Deck seam length (ft)	26E. Area of deck (ft^2)
For column supported tanks: 26F. Number of columns:	26G. Diameter of each column:

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

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

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

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

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

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

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

VI. EMISSIONS AND CONTROL DEVICE DATA (required)

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

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

[1] Complete appropriate Air Pollution Control Device Sheet.

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

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
VOC	0.009	0.025	lb/hr	16,029	O-flashing emissions by ProMax 3.2, EPA – working and breathing by EPA Tanks 4.0.9d
Emissions are controlled values				*Annual Loss includes flash emissions	

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

☒ Remember to attach emissions calculations, including TANKS Summary Sheets if applicable.

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

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

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

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name Production Storage Tanks	2. Tank Name Condensate Tank 1
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) T04	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 35E
5. Date of Commencement of Construction (for existing tanks) January 2015	
6. Type of change ☐ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) Existing source - no modification requested.	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode).	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): None	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. 400 barrel	
9A. Tank Internal Diameter (ft) 12	9B. Tank Internal Height (or Length) (ft) 20
10A. Maximum Liquid Height (ft) 19	10B. Average Liquid Height (ft) 10
11A. Maximum Vapor Space Height (ft) 1	11B. Average Vapor Space Height (ft) 10
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 380 barrel	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
1,156,648.5	3,169

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 71.96

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

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

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

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

18. Type of tank (check all that apply):
- ☒ Fixed Roof — X vertical ___ horizontal ___ flat roof __ cone roof X dome roof ___ other (describe)
- ☐ External Floating Roof ___ pontoon roof ___ double deck roof
- ☐ Domed External (or Covered) Floating Roof
- ☐ Internal Floating Roof ___ vertical column support ___ self-supporting
- ☐ Variable Vapor Space ___ lifter roof ___ diaphragm
- ☐ Pressurized ___ spherical ___ cylindrical
- ☐ Underground
- ☐ Other (describe)

III. TANK CONSTRUCTION & OPERATION INFORMATION (optional if providing TANKS Summary Sheets)

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

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

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

22A. Is the tank heated? ☐ YES ☐ NO

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

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

23. Operating Pressure Range (psig): to

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

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

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

25. Complete the following section for **Floating Roof Tanks** ☐ Does Not Apply

25A. Year Internal Floaters Installed:

25B. Primary Seal Type (check one): ☐ Metallic (Mechanical) Shoe Seal ☐ Liquid Mounted Resilient Seal ☐ Vapor Mounted Resilient Seal ☐ Other (describe):

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

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

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

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

26. Complete the following section for Internal Floating Roof Tanks ☐ Does Not Apply	
26A. Deck Type: ☐ Bolted ☐ Welded	
26B. For Bolted decks, provide deck construction:	
26C. Deck seam: ☐ Continuous sheet construction 5 feet wide ☐ Continuous sheet construction 6 feet wide ☐ Continuous sheet construction 7 feet wide ☐ Continuous sheet construction 5 × 7.5 feet wide ☐ Continuous sheet construction 5 × 12 feet wide ☐ Other (describe)	
26D. Deck seam length (ft)	26E. Area of deck (ft^2)
For column supported tanks: 26F. Number of columns:	26G. Diameter of each column:

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

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

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

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

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

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

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

VI. EMISSIONS AND CONTROL DEVICE DATA (required)

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

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

[1] Complete appropriate Air Pollution Control Device Sheet.

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

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
VOC	0.009	0.02	lb/hr	224.21	EPA - TANKS 4.0.9
Emissions are controlled value					

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

☒ Remember to attach emissions calculations, including TANKS Summary Sheets if applicable.

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

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

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

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name Production Storage Tanks	2. Tank Name Condensate Tank 2
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) T05	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 36E
5. Date of Commencement of Construction (for existing tanks) January 2015	
6. Type of change ☐ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) Existing source - no modification requested.	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode).	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): None	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. 400 barrel	
9A. Tank Internal Diameter (ft) 12	9B. Tank Internal Height (or Length) (ft) 20
10A. Maximum Liquid Height (ft) 19	10B. Average Liquid Height (ft) 10
11A. Maximum Vapor Space Height (ft) 1	11B. Average Vapor Space Height (ft) 10
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 380 barrel	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
1,156,648.5	3,169

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 71.96

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

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

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

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

18. Type of tank (check all that apply):
- ☒ Fixed Roof — X vertical ___ horizontal ___ flat roof __ cone roof X dome roof ___ other (describe)
- ☐ External Floating Roof ___ pontoon roof ___ double deck roof
- ☐ Domed External (or Covered) Floating Roof
- ☐ Internal Floating Roof ___ vertical column support ___ self-supporting
- ☐ Variable Vapor Space ___ lifter roof ___ diaphragm
- ☐ Pressurized ___ spherical ___ cylindrical
- ☐ Underground
- ☐ Other (describe)

III. TANK CONSTRUCTION & OPERATION INFORMATION (optional if providing TANKS Summary Sheets)

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

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

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

22A. Is the tank heated? ☐ YES ☐ NO

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

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

23. Operating Pressure Range (psig): to

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

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

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

25. Complete the following section for **Floating Roof Tanks** ☐ Does Not Apply

25A. Year Internal Floaters Installed:

25B. Primary Seal Type (check one): ☐ Metallic (Mechanical) Shoe Seal ☐ Liquid Mounted Resilient Seal ☐ Vapor Mounted Resilient Seal ☐ Other (describe):

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

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

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

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

26. Complete the following section for Internal Floating Roof Tanks ☐ Does Not Apply	
26A. Deck Type: ☐ Bolted ☐ Welded	
26B. For Bolted decks, provide deck construction:	
26C. Deck seam: ☐ Continuous sheet construction 5 feet wide ☐ Continuous sheet construction 6 feet wide ☐ Continuous sheet construction 7 feet wide ☐ Continuous sheet construction 5 × 7.5 feet wide ☐ Continuous sheet construction 5 × 12 feet wide ☐ Other (describe)	
26D. Deck seam length (ft)	26E. Area of deck (ft^2)
For column supported tanks: 26F. Number of columns:	26G. Diameter of each column:

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

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

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

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

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

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

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

VI. EMISSIONS AND CONTROL DEVICE DATA (required)

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

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

[1] Complete appropriate Air Pollution Control Device Sheet.

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

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
VOC	0.009	0.02	lb/hr	224.21	EPA - TANKS 4.0.9
Emissions are controlled value					

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

☒ Remember to attach emissions calculations, including TANKS Summary Sheets if applicable.

Bulk Loading and Fugitives

Attachment L
EMISSIONS UNIT DATA SHEET
BULK LIQUID TRANSFER OPERATIONS

Furnish the following information for each new or modified bulk liquid transfer area or loading rack, as shown on the *Equipment List Form* and other parts of this application. This form is to be used for bulk liquid transfer operations such as to and from drums, marine vessels, rail tank cars, and tank trucks.

Identification Number (as assigned on *Equipment List Form*): **37E – Fugitive (EPLOR)**	
1. Loading Area Name: Produced Fluids Loadout	
2. Type of cargo vessels accommodated at this rack or transfer point (check as many as apply): □ Drums □ Marine Vessels □ Rail Tank Cars **X** Tank Trucks	
3. Loading Rack or Transfer Point Data:	
Number of pumps	**None – use truck pumps**
Number of liquids loaded	**Two – Condensate, Produced Water**
Maximum number of marine vessels, tank trucks, tank cars, and/or drums loading at one time	**Four as each tank has a connection, but not likely that there will be four at one time. T03 does not have a loading connection.**
4. Does ballasting of marine vessels occur at this loading area? □ Yes □ No **X** Does not apply	
5. Describe cleaning location, compounds and procedure for cargo vessels using this transfer point: **N/A**	
6. Are cargo vessels pressure tested for leaks at this or any other location? □ Yes **X** No If YES, describe:	

7. Projected Maximum Operating Schedule (for rack or transfer point as a whole):				
Maximum	Jan. - Mar.	Apr. - June	July - Sept.	Oct. - Dec.
hours/day	**10**	**10**	**10**	**10**
days/week	**5**	**5**	**5**	**5**
weeks/quarter	**all**	**all**	**all**	**all**

8. Bulk Liquid Data *(add pages as necessary):*							
Pump ID No.		N/A	N/A				
Liquid Name		**Condensate**	**Produced Water**				
Max. daily throughput (1000 gal/day)		**6.34**	**1.88**				
Max. annual throughput (1000 gal/yr)		**2,313**	**685.3**				
Loading Method [1]		**SUB**	**SUB**				
Max. Fill Rate (gal/min)		**168**	**168**				
Average Fill Time (min/loading)		**50**	**50**				
Max. Bulk Liquid Temperature (°F)		**67**	**67**				
True Vapor Pressure [2]		**7.7**	**0.3**				
Cargo Vessel Condition [3]		**U**	**U**				
Control Equipment or Method [4]		**None**	**None**				
Minimum control efficiency (%)		**NA**	**NA**				
Maximum Emission Rate	Loading (lb/hr)	**56.97**	**0.57**				
	Annual (lb/yr)	**15,700**	**46.8**				
Estimation Method [5]		**EPA**	**EPA**				

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

[2] At maximum bulk liquid temperature

[3] B = Ballasted Vessel, C = Cleaned, U = Uncleaned (dedicated service), O = other (describe)
[4] List as many as apply (complete and submit appropriate *Air Pollution Control Device Sheets*):CA = Carbon Adsorption LOA = Lean Oil AdsorptionCO = Condensation SC = Scrubber (Absorption)CRA = Compressor-Refrigeration-Absorption TO = Thermal Oxidation or Incineration CRC = Compression-Refrigeration-Condensation VB = Dedicated Vapor Balance (closed system) O = other (descibe)
[5] EPA = EPA Emission Factor as stated in AP-42 MB = Material Balance TM = Test Measurement based upon test data submittal O = other (describe)

9. **Proposed Monitoring, Recordkeeping, Reporting, and Testing** Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.	
MONITORING **See Attachment O**	RECORDKEEPING **See Attachment O**
REPORTING **See Attachment O**	TESTING **See Attachment O**

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

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

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

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

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

NA

Attachment L
EMISSIONS UNIT DATA SHEET
CHEMICAL PROCESS

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

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

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

2. Standard Industrial Classification Codes (SICs) for process(es)
   4922

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

4. List Products and Maximum Production and ☐ attach MSDSs

Description and CAS Number	Maximum Hourly (lb/hr)	Maximum Annual (ton/year)
Dry Natural Gas	**5 MMscf/hour**	**43,800 MMscf/year**
Condensate	**6.3 barrels/hour**	**55,079 barrels/year**
Produced Water	**1.9 barrels/hour**	**16,316 barrels/year**

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

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

   Leak Detection Plan. Not subject to any federal regulations.

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

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

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

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

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

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

Carrier: Phone:

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

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

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

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

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

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

Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

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

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

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

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

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

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

INFORMATION REQUIRED FOR CHEMICAL PROCESSES

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

Process Description

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

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

Regulatory Discussion

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

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

Emissions Summary and Calculations

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

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

LEAK SOURCE DATA SHEET

Source Category	Pollutant	Number of Source Components[1]	Number of Components Monitored by Frequency[2]	Average Time to Repair (days)[3]	Estimated Annual Emission Rate (lb/yr)[4]
Pumps[5]	light liquid VOC[6,7]				
	heavy liquid VOC[8]				
	Non-VOC[9]				
Valves[10]	Gas VOC	1,000		1st attempt – 5 days Final repair – 15 days	17,381 – EE
	Light Liquid VOC				
	Heavy Liquid VOC				
	Non-VOC				
Safety Relief Valves[11]	Gas VOC				
	Non VOC				
Open-ended Lines[12]	VOC				
	Non-VOC				
Sampling Connections[13]	VOC				
	Non-VOC				
Compressors	VOC	2,500		1st attempt – 5 days Final repair – 15 days	3,766 – EE
	Non-VOC				
Flanges	VOC				
	Non-VOC				
Other	VOC				
	Non-VOC				

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

Notes for Leak Source Data Sheet

1. For VOC sources include components on streams and equipment that contain greater than 10% w/w VOC, including feed streams, reaction/separation facilities, and product/by-product delivery lines. Do not include certain leakless equipment as defined below by category.

2. By monitoring frequency, give the number of sources routinely monitored for leaks, using a portable detection device that measures concentration in ppm. Do not include monitoring by visual or soap-bubble leak detection methods. "M/Q(M)/Q/SA/A/O" means the time period between inspections as follows:

   Monthly/Quarterly, with Monthly follow-up of repaired leakers/Quarterly/Semi-annual/Annually/Other (specify time period)

   If source category is not monitored, a single zero in the space will suffice. For example, if 50 gas-service valves are monitored quarterly, with monthly follow-up of those repaired, 75 are monitored semi-annually, and 50 are checked bimonthly (alternate months), with non checked at any other frequency, you would put in the category “valves, gas service:” 0/50/0/75/0/50 (bimonthly).

3. Give the average number of days, after a leak is discovered, that an attempt will be made to repair the leak.

4. Note the method used: MB - material balance; EE - engineering estimate; EPA - emission factors established by EPA (cite document used); O - other method, such as in-house emission factor (specify).

5. Do not include in the equipment count sealless pumps (canned motor or diaphragm) or those with enclosed venting to a control device. (Emissions from vented equipment should be included in the estimates given in the Emission Points Data Sheet.)

6. Volatile organic compounds (VOC) means the term as defined in 40 CFR □51.100 (s).

7. A light liquid is defined as a fluid with vapor pressure equal to or greater than 0.04 psi (0.3 Kpa) at 20°C. For mixtures, if 20% w/w or more of the stream is composed of fluids with vapor pressures greater than 0.04 psi (0.3 Kpa) at 20 °C, then the fluid is defined as a light liquid.

8. A heavy liquid is defined as a fluid with a vapor pressure less than 0.04 psi (0.3 Kpa) at 20°C. For mixtures, if less than 20% w/w of the stream is composed of fluids with vapor pressures greater than 0.04 psi (0.3 Kpa) at 20 °C, then the fluid is defined as a heavy liquid.

9. LIST CO, H_2S, mineral acids, NO, NO_2, SO_3, etc. DO NOT LIST CO_2, H_2, H_2O, N_2, O_2, and Noble Gases.

10. Include all process valves whether in-line or on an open-ended line such as sample, drain and purge valves. Do not include safety-relief valves, or leakless valves such as check, diaphragm, and bellows seal valves.

11. Do not include a safety-relief valve if there is a rupture disk in place upstream of the valve, or if the valve vents to a control device.

12 Open-ended lines include purge, drain and vent lines. Do not include sampling connections, or lines sealed by plugs, caps, blinds or second valves.

13. Do not include closed-purge sampling connections.

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

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

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

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

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

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

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

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

- compressor blowdown - 0.028 tons VOC per event, 0.001 tons HAPs per event, 2.04 tons CO2e per event
- plant shutdown - 0.57 tons VOC per event, 0.025 tons HAPs per event, 40.81 tons CO2e per event
-pigging venting - 0.006 tons VOC per event, 0.0003 tons HAPs per event, 0.41 tons CO2e per event

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

none

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

6. Combustion Data (if applicable):

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

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

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

@ °F and psia.

(d) Percent excess air:

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

(g) Proposed maximum design heat input: × 10^6 BTU/hr.

7. Projected operating schedule:

Hours/Day	not a regular schedule	Days/Week	not a regular schedule	Weeks/Year	not a regular schedule

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used:

@ venting events are uncontrolled °F and psia

a.	NO_X	lb/hr	grains/ACF
b.	SO_2	lb/hr	grains/ACF
c.	CO	lb/hr	grains/ACF
d.	PM_{10}	lb/hr	grains/ACF
e.	Hydrocarbons	lb/hr	grains/ACF
f.	VOCs	lb/hr	grains/ACF
g.	Pb	lb/hr	grains/ACF
h.	Specify other(s)		
		lb/hr	grains/ACF
		lb/hr	grains/ACF
		lb/hr	grains/ACF
		lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
See Attachment O	See Attachment O
REPORTING	**TESTING**
See Attachment O	See Attachment O

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

N/A

Attachment L
FUGITIVE EMISSIONS FROM UNPAVED HAULROADS

UNPAVED HAULROADS (including all equipment traffic involved in process, haul trucks, endloaders, etc.)

		PM	PM-10
k =	Particle size multiplier	0.80	0.36
s =	Silt content of road surface material (%)	4.8	4.8
p =	Number of days per year with precipitation >0.01 in.	160	160

Item Number	Description	Number of Wheels	Mean Vehicle Weight (tons)	Mean Vehicle Speed (mph)	Miles per Trip	Maximum Trips per Hour	Maximum Trips per Year	Control Device ID Number	Control Efficiency (%)
1	Condensate Tank Truck	4	40	--	3.00	1	365	NA	NA
2	Produced Water Tank Truck	4	40	--	3.00	1	365	NA	NA
3									
4									
5									
6									
7									
8									

Source: *AP-42 Fifth Edition – 13.2.2 Unpaved Roads*

$E = k \times 5.9 \times (s \div 12) \times (S \div 30) \times (W \div 3)^{0.7} \times (w \div 4)^{0.5} \times ((365 - p) \div 365) =$ lb/Vehicle Mile Traveled (VMT)

Where:

		PM	PM-10
k =	Particle size multiplier	0.80	0.36
s =	Silt content of road surface material (%)	4.8	4.8
S =	Mean vehicle speed (mph)	---	---
W =	Mean vehicle weight (tons)	40	40
w =	Mean number of wheels per vehicle	4	4
p =	Number of days per year with precipitation >0.01 in.	160	160

For lb/hr: [lb ÷ VMT] × [VMT ÷ trip] × [Trips ÷ Hour] = lb/hr

For TPY: [lb ÷ VMT] × [VMT ÷ trip] × [Trips ÷ Hour] × [Ton ÷ 2000 lb] = Tons/year

SUMMARY OF UNPAVED HAULROAD EMISSIONS

Item No.	PM				PM-10			
	Uncontrolled		Controlled		Uncontrolled		Controlled	
	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
1	0.58	2.55	0.58	2.55	0.15	0.65	0.15	0.65
2	0.58	2.55	0.58	2.55	0.15	0.65	0.15	0.65
3								
4								
5								
6								
7								
8								
TOTALS								

Attachment M.
Air Pollution Control Device Sheets

NSCR Catalysts

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): C-02 through C-12

Equipment Information

1. Manufacturer: **EMIT Technologies** Model No. **ELH-4200-1616F-65CEE-361**	2. Control Device Name: **C-02-C-12 – Catalyst for CE-01 to CE-11** Type: **NSCR Catalyst**
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected: N/A – no capture of pollutants	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: **8886** ACFM	10. Capacity:
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any. N/A	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal. Replace Catalyst elements when necessary	

Gas Stream Characteristics

14. Are halogenated organics present?	☐ Yes	☒ No
Are particulates present?	☒ Yes	☐ No
Are metals present?	☐ Yes	☒ No

15. Inlet Emission stream parameters:	**Maximum**	**Typical**
Pressure (mmHg):	Not specified	
Heat Content (BTU/scf):	**1,400**	**1,126**
Oxygen Content (%):	Not specified	
Moisture Content (%):	Not specified	
Relative Humidity (%):	Not specified	

16. Type of pollutant(s) controlled: ☐ SO_x ☐ Odor
☐ Particulate (type): ☒ Other **NOx, CO, VOC, HCHO, CH_4**

17. Inlet gas velocity: **156** ft/sec

18. Pollutant specific gravity:

19. Gas flow into the collector:
8886 ACF @ **1225**°F and PSIA

20. Gas stream temperature:
Inlet: **1225** °F
Outlet: **1225** °F

21. Gas flow rate:
Design Maximum: **8886** ACFM
Average Expected: ACFM

22. Particulate Grain Loading in grains/scf: N/A
Inlet:
Outlet:

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	IN Pollutant		Emission Capture Efficiency %	OUT Pollutant		Control Efficiency %
	lb/hr	grains/acf		lb/hr	grains/acf	
A NOx	50.37		--	2.01		96
B CO	47.41		--	1.90		96
C VOC	1.48		--	0.74		50
D HCHO	0.19		--	0.04		76
E CH4	5.30		--	1.59		70

24. Dimensions of stack: Height **25** ft. Diameter **1.1** ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table: Particulate Size Range (microns)	Particle Size Distribution at Inlet to Collector: Weight % for Size Range	Fraction Efficiency of Collector: Weight % for Size Range
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification): **None**

28. Describe the collection material disposal system: Catalyst elements can be cleaned and/or replaced; materials are not disposed on site.

29. Have you included ***Other Collectores Control Device*** in the Emissions Points Data Summary Sheet? yes

30. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING:	RECORDKEEPING:
See Attachment O	**See Attachment O**
REPORTING:	TESTING:
See Attachment O	**See Attachment O**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

31. Manufacturer's Guaranteed Control Efficiency for each air pollutant.
NOx: 96%, CO: 96%, VOC: 50%, HCHO: 76%, CH4:70%
Due to variable load conditions, the catalyst efficiency may vary. The catalyst efficiencies listed above are typical based on expected operating conditions.

32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.
Inlet temperature range is 750 F – 1250 F. Engine must be operated between 50 – 100 % load. A/F ratio controller must be set properly with fuel heating value of around 1400 Btu/scf. Engine lube oil shall contain less than 0.5 wt% sulfated ash. Catalyst must not be exposed to the following: antimony, arsenic, chromium, copper, iron, lead, lithium, magnesium, mercury, nickel, phosphorous, potassium, silicon, sodium, sulfur, tin, zinc.

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bwaggener@emittechnologies.com

Prepared For:
Luz Slauter
ANTERO RESOURCES

QUOTE: QUO-14216-N6G2

INFORMATION PROVIDED BY WAUKESHA

Engine:	L7044GSI
Horsepower:	1680
RPM:	1200
Compression Ratio:	8.0
Exhaust Flow Rate:	8886 CFM
Exhaust Temperature:	1225 °F
Reference:	N/A
Fuel:	Natural Gas
Annual Operating Hours:	8760

Uncontrolled Emissions

	g/bhp-hr
NOx:	13.60
CO:	12.80
THC:	2.30
NMHC	0.86
NMNEHC:	0.42
HCHO:	0.05
CH4:	1.46

POST CATALYST EMISSIONS

	% Reduction	g/bhp-hr
NOx:	>96 %	<0.54
CO:	>96 %	<0.51
VOC:	>50 %	<0.21
HCHO:	>76 %	<0.01
CH4:	>70%	<0.44

CONTROL EQUIPMENT

Catalyst Housing

Model:	ELH-4200-1616F-65CEE-361
Manufacturer:	EMIT Technologies, Inc
Element Size:	Rectangle 36" x 15" x 3.5"
Element Qty:	5 Elements
Catalyst Installation:	Accessible Housing
Construction:	10 gauge Carbon Steel
Sample Ports:	9 (0.5" NPT)
Inlet Connections:	16" Flat Face Flange
Outlet Connections:	16" Flat Face Flange
Configuration:	End In / End Out
Silencer:	Integrated
Silencer Grade:	Hospital
Insertion Loss:	35-40 dBA

NOTES:

Variable engine operation will impact the minimum achievable post catalyst emissions.

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WARRANTY

EMIT Technologies, Inc. warrants that the goods supplied will be free from defects in workmanship by EMIT Technologies, Inc. for a period of two (2) years from date of shipment. EMIT Technologies, Inc. will not be responsible for any defects which result from improper use, neglect, failure to properly maintain or which are attributable to defects, errors or omissions in any drawings, specifications, plans or descriptions, whether written or oral, supplied to EMIT Technologies, Inc. by Buyer.

Catalyst performance using an EMIT Air/Fuel ratio controller is dependent upon properly defined set-points, variable with engine and fuel gas composition. Air/fuel ratio controller performance is guaranteed, but not limited, to fuel gas with a HHV content of 1400 BTU/SCF.

Catalyst performance will be guaranteed for a period of 1 year from installation, or 8760 operating hours, whichever comes first. The catalyst shall be operated with an automatic air/fuel ratio controller. The performance guarantee shall not cover the effects of excessive ash masking due to operation at low load, improper engine maintenance, or inappropriate lubrication oil. The performance guarantee shall not cover the effects of continuous engine misfires (cylinder or ignition) exposing the catalyst to excessive exothermic reaction temperatures. In most cases, excluding thermal deactivation, catalyst performance is redeemable by means of proper washing (refer to EMIT Catalyst/Silencer Housing Manual for element wash information, or contact a local EMIT Sales representative).

The exhaust temperature operating range at the converter inlet is a minimum of 600°F for oxidation catalyst and 750 ˚F for NSCR catalyst, and a maximum of 1250°F.

If a properly functioning, high temperature shut down switch is not installed, thermal deactivation of catalyst at sustained temperatures above 1250˚F is not covered. If excessive exposure to over oxygenation of NSCR catalyst occurs due to improperly functioning or non-existent Air/Fuel ratio control, then deactivation of catalyst is not warranted.

The catalyst conversion efficiencies (% reduction) will be guaranteed for engine loads of 50 to 100 percent. Standard Oxidation Catalyst conversion efficiencies (% reduction) will be guaranteed for fuel gas containing less than 1.5% mole fraction of non-methane, non-ethane hydrocarbons. Applications where fuel gas exceeds this level will require a Premium Oxidation Catalyst to maintain guaranteed VOC conversion efficiencies.

Engine lubrication oil shall contain less than 0.5 wt% Sulfated Ash with a maximum allowable specific oil consumption of 0.7 g/bhp-hr. The catalyst shall be limited to a maximum ash loading of 0.022 lb/ft3. Phosphorous and zinc additives are limited to 0.03 wt%. New or Reconstructed engines must operate for a minimum of 50 hours prior to catalyst installation, otherwise the warranty is void.

The catalyst must not be exposed to the following know poisoning agents, including: antimony, arsenic, chromium, copper, iron, lead, lithium, magnesium, mercury, nickel, phosphorous, potassium, silicon, sodium, sulfur, tin, and zinc. Total poison concentrations in the fuel gas must be limited to 0.25 ppm or less for catalyst to function properly.

Shipment - Promised shipping dates are approximate lead times from the point of manufacture and are not guaranteed. EMIT Technologies, Inc. will not be liable for any loss, damage or delay in manufacture or delivery resulting from any cause beyond its control including, but not limited to a period equal to the time lost by reason of that delay. All products will be crated as per best practice to prevent any damage during shipment. Unless otherwise specified, Buyer will pay for any special packing and shipping requirements. Acceptance of goods by common carrier constitutes delivery to Buyer. EMIT Technologies, Inc. shall not be responsible for goods damaged or lost in transit.

Terms: Credit is extended to purchaser for net 30 time period. If payment is not received in the net 30 timeframe, interest on the unpaid balance will accrue at a rate of 1.5% per month from the invoice date.

Order Cancellation Terms: Upon cancellation of an order once submittal of a Purchase Order has occurred, the customer will pay a 25% restocking fee for Catalyst Housings, Catalyst Elements, and Air/Fuel Ratio Controllers; 50% restocking fee for Cooler Top Solutions, Exhaust System Accessories, and other Custom Built Products; 100% of all associated shipping costs incurred by EMIT; 100% of all project expenses incurred by EMIT for Field Services.

Combustor

Attachment M
Air Pollution Control Device Sheet
(FLARE SYSTEM)

Control Device ID No. (must match Emission Units Table): **C-01**

Equipment Information

1. Manufacturer: **Superior Fabrication, Inc.**

   Model No. 60", 4.8 MMBtu/hr

2. Method: ☒ Elevated flare ☐ Ground flare ☐ Other Describe

3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.

4. Method of system used:
   ☐ Steam-assisted ☐ Air-assisted ☐ Pressure-assisted ☒ Non-assisted

5. Maximum capacity of flare:
   71.4 scf/min
   4,282 scf/hr

6. Dimensions of stack:
   Diameter **5** ft.
   Height **15** ft.

7. Estimated combustion efficiency:
   (Waste gas destruction efficiency)
   Estimated: **98** %
   Minimum guaranteed: **98** %

8. Fuel used in burners:
   ☒ Natural Gas
   ☐ Fuel Oil, Number
   ☐ Other, Specify:

9. Number of burners:
   Rating: **4,800,000** BTU/hr

10. Will preheat be used? ☐ Yes ☒ No

11. Describe method of controlling flame:
    Enclosed combustor

12. Flare height: **15** ft

13. Flare tip inside diameter: **5** ft

14. Natural gas flow rate to flare pilot flame per pilot light: **0.27** scf/min
    16.4 scf/hr

15. Number of pilot lights: **1**
    Total **18,466** BTU/hr

16. Will automatic re-ignition be used? TBD
    ☐ Yes ☒ No

17. If automatic re-ignition will be used, describe the method:

18. Is pilot flame equipped with a monitor? ☒ Yes ☐ No
    If yes, what type? ☒ Thermocouple ☐ Infra-Red
    ☐ Ultra Violet ☐ Camera with monitoring control room
    ☐ Other, Describe:

19. Hours of unit operation per year: **8760**

Steam Injection

20. Will steam injection be used? ☐ Yes ☒ No	21. Steam pressure PSIG Minimum Expected: Design Maximum:
22. Total Steam flow rate: LB/hr	23. Temperature: °F
24. Velocity ft/sec	25. Number of jet streams
26. Diameter of steam jets: in	27. Design basis for steam injected: LB steam/LB hydrocarbon
28. How will steam flow be controlled if steam injection is used?	

Characteristics of the Waste Gas Stream to be Burned

29.

Name	Quantity Grains of H_2S/100 ft^3	Quantity (LB/hr, ft^3/hr, etc)	Source of Material
RSV-1	**0**	**2,120 scfh**	**Dehy Still Vent**
RSV-2	**0**	**2,120 scfh**	**Dehy Still Vent**

30. Estimate total combustible to flare: 4,240 LB/hr or (ACF/hr)	
(Maximum mass flow rate of waste gas) 71 scfm	
31. Estimated total flow rate to flare including materials to be burned, carrier gases, auxiliary fuel, etc.: LB/hr or ACF/hr	
32. Give composition of carrier gases:	
33. Temperature of emission stream: °F Heating value of emission stream: **1,126** BTU/ft^3 Mean molecular weight of emission stream: MW =	34. Identify and describe all auxiliary fuels to be burned. BTU/scf BTU/scf BTU/scf BTU/scf
35. Temperature of flare gas: **> 1200** °F	36. Flare gas flow rate: scf/min
37. Flare gas heat content: **1,126** BTU/ft^3	38. Flare gas exit velocity: scf/min
39. Maximum rate during emergency for one major piece of equipment or process unit: **N/A** scf/min	
40. Maximum rate during emergency for one major piece of equipment or process unit: **N/A** BTU/min	
41. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):	
42. Describe the collection material disposal system:	
43. Have you included ***Flare Control Device*** in the Emissions Points Data Summary Sheet? **YES**	

44. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING:	RECORDKEEPING:
See Attachment O	**See Attachment O**
REPORTING:	TESTING:
See Attachment O	**See Attachment O**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

45. Manufacturer's Guaranteed Capture Efficiency for each air pollutant.
N/A – no capture efficiency

46. Manufacturer's Guaranteed Control Efficiency for each air pollutant.
98% control efficiency for VOCs, HAPs, C1, C2

47. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

SFI

SUPERIOR FABRICATION, INC.

801 S. Eastern Avenue, Elk City, OK 73644
Phone: (580) 243-5693 Fax: (580) 243-5507

VOC Shielded Flare

SPECIFICATIONS AND TECHNICAL INFO:

- Dimensions

Flare Tip Diameter	Height (Std Model)	Inlet Connection	Min Capacity	Max Capacity	# of Burner Tips
48”	12’-2”	2” FNPT	0	2.1 mm BTU/hr	210
60”	15’-2”	3” FNPT	0	4.8 mm BTU/hr	480
72”	17’-2”	3” FNPT	0	7.0 mm BTU/hr	720

- Pilot
  - Constant burning pilot
  - 3.5 – 5.0 psig
  - Gas consumption is 16.4 scfh at 5.0 psig
  - #70 Drill orifice, (0.028” dia.)
- Monitoring System
  - SVC True-Lite Igniter. Provides ignition & monitoring via a thermocouple
  - 12/24 volt options
  - Dry contacts for external communication, (12/24 volt)
  - Solar charging, no utility required
  - See www.superiorfab.com for more information on the True-Lite Igniter
- Flare Tip Velocity, 10 fps max.
- Gas heating value, 200 Btu/ft^3. minimum and 3500 Btu/ ft^3 maximum
- Recommended distance from tanks, 75 ft. minimum (see detailed installation instructions)
- Inlet Pressure 2 oz. minimum, 25 oz. maximum

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Revised 2013-04-01

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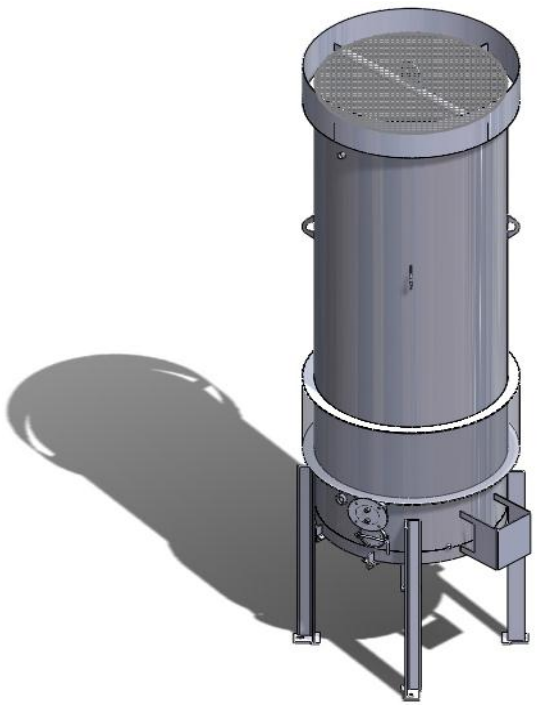
Shielded Flare Gas Capacity Chart

Gas Heating Value		48" Shielded Flare (2.1 MM BTU/hr)			60" Shielded Flare (4.8 MM BTU/hr)			72" Shielded Flare (7.0 MM BTU/hr)	
BTU/ft^3		**CFH**	**MCFD**		**CFH**	**MCFD**		**CFH**	**MCFD**
600		3,500	84		8,000	192		11,667	280
700		3,000	72		6,857	165		10,000	240
800		2,625	63		6,000	144		8,750	210
900		2,333	56		5,333	128		7,778	187
1,000		2,100	50		4,800	115		7,000	168
1,100		1,909	46		4,364	105		6,364	153
1,200		1,750	42		4,000	96		5,833	140
1,300		1,615	39		3,692	89		5,385	129
1,400		1,500	36		3,429	82		5,000	120
1,500		1,400	34		3,200	77		4,667	112
1,600		1,313	32		3,000	72		4,375	105
1,700		1,235	30		2,824	68		4,118	99
1,800		1,167	28		2,667	64		3,889	93
1,900		1,105	27		2,526	61		3,684	88
2,000		1,050	25		2,400	58		3,500	84
2,100		1,000	24		2,286	55		3,333	80
2,200		955	23		2,182	52		3,182	76
2,300		913	22		2,087	50		3,043	73
2,400		875	21		2,000	48		2,917	70
2,500		840	20		1,920	46		2,800	67
2,600		808	19		1,846	44		2,692	65
2,700		778	19		1,778	43		2,593	62
2,800		750	18		1,714	41		2,500	60

BTU/ft^3 = British Thermal Units per cubic foot
CFH = Cubic Feet per Hour
MCFD = Thousand Cubic Feet per Day

Example:
Maximum capacity of a 48" Flare with 1,050 BTU/cu.ft. gas:

$$\frac{2{,}100{,}000}{1{,}050} \times 24 = 48{,}000\ cu.ft./Day (48\ \text{MCFD})$$



Vapor Recovery Units

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): **C-13**

Equipment Information

1. Manufacturer: **HY-BON** Model No. **HB-NK60-15-36DV**	2. Control Device Name: **C-13** Type: **Vapor Recovery Unit for Storage Tanks**
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected: **closed loop system, however claiming 98% efficiency**	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: **46 MSCFD**	10. Capacity: **46 MSCFD**
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any. **N/A**	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal. **Collected materials get recycled back into gas system – closed loop**	

Gas Stream Characteristics

14. Are halogenated organics present?	☐ Yes	☒ No
Are particulates present?	☐ Yes	☒ No
Are metals present?	☐ Yes	☒ No

15. Inlet Emission stream parameters:	**Maximum**	**Typical**
Pressure (mmHg):	776	760
Heat Content (BTU/scf):	1,894	
Oxygen Content (%):	Not specified	
Moisture Content (%):	Not specified	
Relative Humidity (%):	Not specified	

16. Type of pollutant(s) controlled: ☐ SO_x ☐ Odor
☐ Particulate (type): ☒ Other **VOC, HAPs, CO_2e**

17. Inlet gas velocity: N/A ft/sec

18. Pollutant specific gravity:

19. Gas flow into the collector:
46,000 SCFD **@ambient** and **ambient** PSIA

20. Gas stream temperature:
Inlet: **ambient** °F
Outlet: **ambient** °F

21. Gas flow rate:
Design Maximum: **32** ACFM
Average Expected: **32** ACFM

22. Particulate Grain Loading in grains/scf: **N/A**
Inlet:
Outlet:

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	IN Pollutant		Emission Capture Efficiency %	OUT Pollutant		Control Efficiency %
	lb/hr	grains/acf		lb/hr	grains/acf	
A VOC	94.22		98	1.88		N/A
B HAPs	7.51		98	0.15		N/A
C CO2e	259		98	5.38		N/A
D						
E						

24. Dimensions of stack: Height NA ft. Diameter NA ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table:	Particle Size Distribution at Inlet to Collector	Fraction Efficiency of Collector
Particulate Size Range (microns)	**Weight % for Size Range**	**Weight % for Size Range**
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification): **None**

28. Describe the collection material disposal system: **Closed loop system – vapors get recycled back into system**

29. Have you included ***Other Collectores Control Device*** in the Emissions Points Data Summary Sheet? yes

30. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING:	RECORDKEEPING:
See Attachment O	**See Attachment O**
REPORTING:	TESTING:
See Attachment O	**See Attachment O**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

31. Manufacturer's Guaranteed Control Efficiency for each air pollutant.
100% - Closed loop system; 98% claimed to be conservative. Both VRUs have automatic monitoring, shutdown, and alert systems. These systems are fitted with sensors that detect temperature, pressure, liquid levels, suction pressure, and motor overload. Should any of the sensors be triggered indicating a shutdown of the VRU, alarms will sound alerting onsite personnel and streams will be directed to the second VRU or the facility inlet. C-13 is the primary VRU to collect storage tank vapors and C-14 is the backup VRU in times when the primary VRU is undergoing maintenance or is shutdown. This ensures the facility's storage tank vapors are continuously captured and controlled. In the unlikely event that both VRUs are under maintenance or are shutdown, a bypass system is in place to route tank vapors to the facility inlet; specifically the slug catcher. The compressors of each VRU is equipped to recover both wet and dry gas from the storage tanks. Each unit has a variable frequency drive (VFD) for the compressor motor that is able to adapt the VRU compressor's operating speed as needed for varying pressure and temperature conditions.

32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.
None – system has automatic monitoring, shutdown and alerts systems for malfunctions.

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): **C-14**

Equipment Information

1. Manufacturer: **HY-BON** Model No. **HB-NK60-15-36DV**	2. Control Device Name: **C-14** Type: **Back-up Vapor Recovery Unit for Storage Tanks**
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected: **closed loop system, however claiming 98% efficiency**	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: **46 MSCFD**	10. Capacity: **46 MSCFD**
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any. **N/A**	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal. **Collected materials get recycled back into gas system – closed loop**	

Gas Stream Characteristics

14. Are halogenated organics present?	☐ Yes	☒ No
Are particulates present?	☐ Yes	☒ No
Are metals present?	☐ Yes	☒ No

15. Inlet Emission stream parameters:	**Maximum**	**Typical**
Pressure (mmHg):	776	760
Heat Content (BTU/scf):	1,894	
Oxygen Content (%):	Not specified	
Moisture Content (%):	Not specified	
Relative Humidity (%):	Not specified	

16. Type of pollutant(s) controlled: ☐ SO_x ☐ Odor
☐ Particulate (type): ☒ Other **VOC, HAPs, CO_2e**

17. Inlet gas velocity: N/A ft/sec

18. Pollutant specific gravity:

19. Gas flow into the collector:
46,000 SCFD **@ambient** and **ambient** PSIA

20. Gas stream temperature:
Inlet: **ambient** °F
Outlet: **ambient** °F

21. Gas flow rate:
Design Maximum: **32** ACFM
Average Expected: **32** ACFM

22. Particulate Grain Loading in grains/scf: **N/A**
Inlet:
Outlet:

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	IN Pollutant		Emission Capture Efficiency %	OUT Pollutant		Control Efficiency %
	lb/hr	grains/acf		lb/hr	grains/acf	
A VOC	94.22		98	1.88		N/A
B HAPs	7.51		98	0.15		N/A
C CO2e	259		98	5.38		N/A
D						
E						

24. Dimensions of stack: Height NA ft. Diameter NA ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table:	Particle Size Distribution at Inlet to Collector	Fraction Efficiency of Collector
Particulate Size Range (microns)	**Weight % for Size Range**	**Weight % for Size Range**
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification): **None**

28. Describe the collection material disposal system: **Closed loop system – vapors get recycled back into system**

29. Have you included ***Other Collectores Control Device*** in the Emissions Points Data Summary Sheet? yes

30. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING:	RECORDKEEPING:
See Attachment O	**See Attachment O**
REPORTING:	TESTING:
See Attachment O	**See Attachment O**

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

31. Manufacturer's Guaranteed Control Efficiency for each air pollutant.
100% - Closed loop system; 98% claimed to be conservative. Both VRUs have automatic monitoring, shutdown, and alert systems. These systems are fitted with sensors that detect temperature, pressure, liquid levels, suction pressure, and motor overload. Should any of the sensors be triggered indicating a shutdown of the VRU, alarms will sound alerting onsite personnel and streams will be directed to the second VRU or the facility inlet. C-13 is the primary VRU to collect storage tank vapors and C-14 is the backup VRU in times when the primary VRU is undergoing maintenance or is shutdown. This ensures the facility's storage tank vapors are continuously captured and controlled. In the unlikely event that both VRUs are under maintenance or are shutdown, a bypass system is in place to route tank vapors to the facility inlet; specifically the slug catcher. The compressors of each VRU is equipped to recover both wet and dry gas from the storage tanks. Each unit has a variable frequency drive (VFD) for the compressor motor that is able to adapt the VRU compressor's operating speed as needed for varying pressure and temperature conditions.

32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.
None – system has automatic monitoring, shutdown and alerts systems for malfunctions.

DATE:
REFERENCE: Nichols Compressor Station (Representative Inlet Conditions)

MODEL: HB-NK60-15-36DV (VRU design)

DESIGN: **46 MSCFD** based on the following conditions (TBD)

DESIGN CONDITIONS			
Suction Pressure:	**0PSIG**	Discharge Pressure:	**200PSIG**
Suction Temperature:	**100°F**	Discharge Temperature:	**TBD**
Specific Gravity:	**0.093**	"N" Value:	**1.26** (assumed)
Elevation:	**1000FASL**	Ambient Temperature:	**100°F**

COMPONENTS AND MATERIALS

I. COMPRESSOR AND ASSOCIATED EQUIPMENT:

A. Compressor: Rotorcomp Model NK60 rotary screw compressor with internal relief valve, complete with the following:
   1) Rotary Screw Gas End
   2) Oil Separator integral w/compressor
   3) Receiver Tank integral w/compressor
   4) Oil Separator Cartridge integral w/compressor
   5) Thermostat Regulator
   6) Minimum Pressure Valve
   7) Oil Level Sight Glass
   8) Heat Exchanger for Compressor Oil Cooling.
   9) Compressor to be direct driven via a flexible coupling complete with guard.

B. Discharge Check Valve: 1" Wheatley (or equal), threaded end, steel body with stainless steel trim, 275PSIG working pressure.

C. Compressor Capacity Control By-Pass: 1" Kimray Model 130-SMT-D single acting motor valve, ductile iron.

II. ELECTRIC MOTOR:

A. 15HP, 3600RPM, 460/3/60 NEMA B rating with 1.15SF, Class F insulation, and TEFC enclosure. Manufacturer: TECO or equal.

III. SUCTION SCRUBBER:

A. Suction Scrubber: HY-BON Engineering, vertical single compartment standard scrubber. Size 16"OD x 36" seam to seam, 125PSIG working pressure. 4" flanged inlet and outlet, 1" FNPT drain with 1" stainless steel trim ball valve. Ductile iron gagecocks rated at 150 lb. WP complete with guarded heavy duty tubular sight glass. ASME code stamped. No mist extractor is provided in vessel.

B. Liquid Level Switches: (2) Murphy Model LS200 liquid level switches, stainless steel trim and rated for 1500 lb. working pressure, SPDT switch mounted in explosion proof housing for high level and LTP control.

C. Liquid Transfer Pump: Tuthill Model 2LE liquid transfer pump direct coupled to a ¾HP, 1800RPM, 460/3/60, TEFC electric motor. System designed to automatically remove free liquids from the Suction Scrubber.

IV. ELECTRICAL CONTROLS:

A. Motor Starter: NEMA 3R weatherproof panel, shipped loose for remote mounting by others, complete with the following:
   1. Fused disconnect, with external safety handle.
   2. VFD Drive for compressor motor
   3. Dry type transformer, 250VA, 460/120volt.

B. Unit controlled by an EDI VRS Controller mounted in a NEMA 4 weatherproof enclosure and shipped loose for remote mounting by others, complete with the following:
   1. Shutdown Indicators as follows:
      a) High Discharge Temperature
      b) High Discharge Pressure
      c) High Liquid Level – Suction Scrubber
      d) Low Suction Pressure
      e) Low Compressor Oil Pressure
      f) Motor Overload
   2. Skid and panel prewired and tested. All wiring, conduit and fittings on skid are explosion proof as per NEC latest edition. (Class I, Group D, Division II)

C. Electrical controls, mounted inside EDI VRS Controller.
   1. Pressure Transmitters: Pressure Systems pressure transmitters, 4–20mA, stainless steel trim, explosion proof, range as required for service, w/ 1/2" isolation valve. For discharge pressure.

2. High Discharge Temperature: Murphy RTDT temperature transmitter, 4–20mA, stainless steel thermowell, explosion proof, 0–400°F range.
3. Suction Pressure Transmitter: Pressure Systems 4–20mA, explosion proof, stainless steel trim.

V. INSTRUMENTS:

A. Thermometers complete with stainless steel thermowells, and pressure gauges furnished as required.

VI. FABRICATED STEEL SKID:

A. One shop fabricated, heavy duty oilfield type skid, welded up from steel channel sections. Approximate size is 5’ x 8’.

VII. DOCUMENTATION:

A. Two electronic parts and operations manual will be provided. Additional hard copy manuals available at US$350.00 each.

VIII. GENERAL CONSTRUCTION:

A. All 2" and larger piping is 150lb. ASA flanged and welded per the requirements of ANSI B31.3 per the methods described by standard shop welding procedure, HB-02 as qualified per ASME, Section IX (excluding x-rays).
B. All components assembled and unitized per all applicable codes, on skid and shop tested with air.
C. Unit to be cleaned, primed, and painted, final color Desert Tan.
D. Due to the recent and on-going volatility in the carbon and stainless steel markets, our price is subject to change. Please verify the price and delivery when you place the order.
E. This compressor is intended for use in sweet gas service.
F. Service in H2S levels in excess of 20ppm voids the warranty on the compressor.

Attachment N.
Supporting Emissions Calculations

Emission Calculations

EMISSIONS SUMMARY TOTAL

Company:	**Antero Midstream LLC**
Facility Name:	**Nichols Compressor Station**
Facility Location:	**Doddridge County, West Virginia**

UNCONTROLLED POTENTIAL EMISSION SUMMARY

Source	NOx		CO		VOC		SO_2		PM-10		HAPs		Formaldehyde		CO_2e
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	tpy
Engines															
Compressor Engine 1	50.37	198.22	47.41	186.56	1.48	5.83	0.008	0.03	0.27	1.06	0.35	1.38	0.19	0.73	8,206
Compressor Engine 2	50.37	198.22	47.41	186.56	1.48	5.83	0.008	0.03	0.27	1.06	0.35	1.38	0.19	0.73	8,206
Compressor Engine 3	50.37	198.22	47.41	186.56	1.48	5.83	0.008	0.03	0.27	1.06	0.35	1.38	0.19	0.73	8,206
Compressor Engine 4	50.37	198.22	47.41	186.56	1.48	5.83	0.008	0.03	0.27	1.06	0.35	1.38	0.19	0.73	8,206
Compressor Engine 5	50.37	198.22	47.41	186.56	1.48	5.83	0.008	0.03	0.27	1.06	0.35	1.38	0.19	0.73	8,206
Compressor Engine 6	50.37	198.22	47.41	186.56	1.48	5.83	0.008	0.03	0.27	1.06	0.35	1.38	0.19	0.73	8,206
Compressor Engine 7	50.37	198.22	47.41	186.56	1.48	5.83	0.008	0.03	0.27	1.06	0.35	1.38	0.19	0.73	8,206
Compressor Engine 8	50.37	198.22	47.41	186.56	1.48	5.83	0.008	0.03	0.27	1.06	0.35	1.38	0.19	0.73	8,206
Compressor Engine 9	50.37	198.22	47.41	186.56	1.48	5.83	0.008	0.03	0.27	1.06	0.35	1.38	0.19	0.73	8,206
Compressor Engine 10	50.37	198.22	47.41	186.56	1.48	5.83	0.008	0.03	0.27	1.06	0.35	1.38	0.19	0.73	8,206
Compressor Engine 11	50.37	198.22	47.41	186.56	1.48	5.83	0.008	0.03	0.27	1.06	0.35	1.38	0.19	0.73	8,206
Turbines															
Microturbine Generator 1	0.10	0.42	0.26	1.16	0.02	0.11	0.01	0.04	0.02	0.07	0.003	0.01	0.002	0.01	1,166
Microturbine Generator 2	0.10	0.42	0.26	1.16	0.02	0.11	0.01	0.04	0.02	0.07	0.003	0.01	0.002	0.01	1,166
Catalytic Heater for Generator Fuel	0.002	0.01	0.002	0.01	0.0001	0.0006	0.00001	0.00006	0.0002	0.001	0.00004	0.0002	0.000002	0.00001	12
Dehydrator															
TEG Dehydrator 1	---	---	---	---	70.01	306.64	---	---	---	---	9.56	41.85	---	---	6,856
TEG Dehydrator 2	---	---	---	---	70.01	306.64	---	---	---	---	9.56	41.85	---	---	6,856
Reboiler 1	0.15	0.64	0.12	0.54	0.01	0.04	0.001	0.004	0.01	0.05	0.003	0.01	0.0001	0.0005	771
Reboiler 2	0.15	0.64	0.12	0.54	0.01	0.04	0.001	0.004	0.01	0.05	0.003	0.01	0.0001	0.0005	771
Combustors															
Combustor and Pilot	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Hydrocarbon Loading															
Truck Loadout	---	---	---	---	57.54	7.87	---	---	---	---	4.53	0.62	---	---	21.4
Fugitive Emissions															
Component Leak Emissions	---	---	---	---	2.41	10.57	---	---	---	---	0.11	0.48	---	---	142
Venting Emissions	---	---	---	---	---	8.88	---	---	---	---	---	0.40	---	---	642
Fugitive Dust Emissions	---	---	---	---	---	---	---	---	0.30	1.30	---	---	---	---	---
Storage Tanks															
Produced Water Tanks	---	---	---	---	0.17	0.75	---	---	---	---	0.01	0.06	---	---	2
Settler Tank	---	---	---	---	91.49	400.72	---	---	---	---	7.30	31.96	---	---	1,104
Condensate Tanks	---	---	---	---	2.56	11.20	---	---	---	---	0.20	0.88	---	---	30
Total Facility PTE =	**554.56**	**2,182.61**	**522.26**	**2,055.61**	**310.56**	**1,117.69**	**0.11**	**0.44**	**3.33**	**13.25**	**35.12**	**133.33**	**2.04**	**8.03**	**109,805**

EMISSIONS SUMMARY TOTAL

Company:	**Antero Midstream LLC**
Facility Name:	**Nichols Compressor Station**
Facility Location:	**Doddridge County, West Virginia**

CONTROLLED POTENTIAL EMISSION SUMMARY

Source	NOx		CO		VOC		SO_2		PM-10		HAPs		Formaldehyde		CO_2e
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	tpy
Engines															
Compressor Engine 1	2.01	7.93	1.90	7.46	0.74	2.92	0.008	0.03	0.27	1.06	0.13	0.51	0.04	0.17	7,841
Compressor Engine 2	2.01	7.93	1.90	7.46	0.74	2.92	0.008	0.03	0.27	1.06	0.13	0.51	0.04	0.17	7,841
Compressor Engine 3	2.01	7.93	1.90	7.46	0.74	2.92	0.008	0.03	0.27	1.06	0.13	0.51	0.04	0.17	7,841
Compressor Engine 4	2.01	7.93	1.90	7.46	0.74	2.92	0.008	0.03	0.27	1.06	0.13	0.51	0.04	0.17	7,841
Compressor Engine 5	2.01	7.93	1.90	7.46	0.74	2.92	0.008	0.03	0.27	1.06	0.13	0.51	0.04	0.17	7,841
Compressor Engine 6	2.01	7.93	1.90	7.46	0.74	2.92	0.008	0.03	0.27	1.06	0.13	0.51	0.04	0.17	7,841
Compressor Engine 7	2.01	7.93	1.90	7.46	0.74	2.92	0.008	0.03	0.27	1.06	0.13	0.51	0.04	0.17	7,841
Compressor Engine 8	2.01	7.93	1.90	7.46	0.74	2.92	0.008	0.03	0.27	1.06	0.13	0.51	0.04	0.17	7,841
Compressor Engine 9	2.01	7.93	1.90	7.46	0.74	2.92	0.008	0.03	0.27	1.06	0.13	0.51	0.04	0.17	7,841
Compressor Engine 10	2.01	7.93	1.90	7.46	0.74	2.92	0.008	0.03	0.27	1.06	0.13	0.51	0.04	0.17	7,841
Compressor Engine 11	2.01	7.93	1.90	7.46	0.74	2.92	0.008	0.03	0.27	1.06	0.13	0.51	0.04	0.17	7,841
Turbines															
Microturbine Generator 1	0.10	0.42	0.26	1.16	0.02	0.11	0.01	0.04	0.02	0.07	0.003	0.01	0.002	0.01	1,166
Microturbine Generator 2	0.10	0.42	0.26	1.16	0.02	0.11	0.01	0.04	0.02	0.07	0.003	0.01	0.002	0.01	1,166
Catalytic Heater for Generator Fuel	0.002	0.01	0.002	0.01	0.0001	0.0006	0.00001	0.00006	0.0002	0.001	0.00004	0.0002	0.000002	0.00001	12
Dehydrator															
TEG Dehydrator 1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
TEG Dehydrator 2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Reboiler 1	0.15	0.64	0.12	0.54	1.12	4.92	0.001	0.004	0.01	0.05	0.05	0.22	0.0001	0.0005	893
Reboiler 2	0.15	0.64	0.12	0.54	1.12	4.92	0.001	0.004	0.01	0.05	0.05	0.22	0.0001	0.0005	893
Combustion															
Combustor and Pilot	0.33	1.44	1.78	7.79	1.91	8.36	0.00001	0.00005	0.0001	0.0006	0.34	1.51	---	---	2,663
Hydrocarbon Loading															
Truck Loadout	---	---	---	---	57.54	7.87	---	---	---	---	4.53	0.62	---	---	21.4
Fugitive Emissions															
Component Leak Emissions	---	---	---	---	2.41	10.57	---	---	---	---	0.11	0.48	---	---	142
Venting Emissions	---	---	---	---	---	8.88	---	---	---	---	---	0.40	---	---	642
Fugitive Dust Emissions	---	---	---	---	---	---	---	---	0.30	1.30	---	---	---	---	---
Storage Tanks															
Produced Water Tanks	---	---	---	---	0.003	0.02	---	---	---	---	0.0003	0.001	---	---	0.04
Settler Tank	---	---	---	---	1.83	8.01	---	---	---	---	0.15	0.64	---	---	23
Condensate Tanks	---	---	---	---	0.05	0.22	---	---	---	---	0.004	0.02	---	---	0.6
Total Facility PTE =	**22.98**	**90.80**	**23.41**	**93.28**	**74.20**	**86.05**	**0.11**	**0.44**	**3.33**	**13.25**	**6.67**	**9.74**	**0.49**	**1.94**	**93,874**

Compressor Engine Emission Calculations

Company:	**Antero Midstream LLC**
Facility Name:	**Nichols Compressor Station**
Facility Location:	**Doddridge County, West Virginia**
Source Description:	**Compressor Engines**

Source Information-Per Engine

Emission Unit ID:	CE-01 through CE-11	
Engine Make/Model	Waukesha 7044 GSI	
Service	Compression	
Controls - Y or N / Type	Y	NSCR/AFRC
Site Horsepower Rating[1]	1,680	hp
Fuel Consumption (BSFC)[1]	8,295	Btu/(hp-hr)
Heat Rating[2]	13.94	MMBtu/hr
Fuel Consumption[2,3]	97.45	MMscf/yr
Fuel Consumption[1]	12,360	scf/hr
Fuel Heating Value	1,126	Btu/scf
Operating Hours	8,760	hrs/yr

Notes:

1. Values from Waukesha specification sheet.
2. Calculated values.
3. Annual fuel consumption is 90% of maximum fuel consumption at 100% load.

Potential Emissions per Engine

	Uncontrolled					***Controlled***					
Pollutant	**Emission Factor**		**Estimated Emissions**			**Emission Factor**		**Estimated Emissions**			**Source of Emissions Factors**
	(lb/MMBtu)	**(g/bhp-hr)**	**(lb/hr)**	**(lb/yr)[4]**	**(tpy)[4]**	**(lb/MMBtu)**	**(g/bhp-hr)**	**(lb/hr)**	**(lb/yr)[4]**	**(tpy)[4]**	
NO_x[1,5]	---	13.6	50.37	---	198.22	---	0.54	2.01	---	7.93	Manufacturer's Specs - uncontrolled, Catalyst Specs - controlled
CO[1,5]	---	12.8	47.41	---	186.56	---	0.51	1.90	---	7.46	Manufacturer's Specs - uncontrolled, Catalyst Specs - controlled
VOC[1,5]	---	0.40	1.48	---	5.83	---	0.20	0.74	---	2.92	Manufacturer's Specs - uncontrolled, Catalyst Specs - controlled
SO_2	5.88E-04	---	0.0082	---	0.032	5.88E-04	---	0.0082	---	0.032	AP-42, Chapter 3.2, Table 3.2-3
$PM_{2.5}/PM_{10}$	1.94E-02	---	0.27	---	1.06	1.94E-02	---	0.27	---	1.06	AP-42, Chapter 3.2, Table 3.2-3
Total PM	1.94E-02	---	0.27	---	1.06	1.94E-02	---	0.27	---	1.06	AP-42, Chapter 3.2, Table 3.2-3
1,1,2,2-Tetrachloroethane[6]	2.53E-05	---	0.00035	2.77	0.0014	1.27E-05	---	0.00018	1.39	0.00069	AP-42, Chapter 3.2, Table 3.2-3 - uncontrolled, see Note 6 - controlled
1,3-Butadiene[6]	6.63E-04	---	0.0092	72.72	0.036	3.32E-04	---	0.0046	36.36	0.018	AP-42, Chapter 3.2, Table 3.2-3 - uncontrolled, see Note 6 - controlled
Acetaldehyde[6]	2.79E-03	---	0.039	306.0	0.15	1.40E-03	---	0.019	153.0	0.077	AP-42, Chapter 3.2, Table 3.2-3 - uncontrolled, see Note 6 - controlled
Acrolein[6]	2.63E-03	---	0.037	288.5	0.14	1.32E-03	---	0.018	144.2	0.072	AP-42, Chapter 3.2, Table 3.2-3 - uncontrolled, see Note 6 - controlled
Benzene[6]	1.58E-03	---	0.022	173.3	0.087	7.90E-04	---	0.011	86.6	0.043	AP-42, Chapter 3.2, Table 3.2-3 - uncontrolled, see Note 6 - controlled
Ethylbenzene[6]	2.48E-05	---	0.00035	2.72	0.0014	1.24E-05	---	0.00017	1.36	0.00068	AP-42, Chapter 3.2, Table 3.2-3 - uncontrolled, see Note 6 - controlled
Formaldehyde[1,5]	---	0.05	0.19	1,458	0.73	---	0.01	0.044	349.8	0.17	Manufacturer's Specs - uncontrolled, Catalyst Specs - controlled
Methanol[6]	3.06E-03	---	0.043	335.6	0.17	1.53E-03	---	0.021	167.8	0.084	AP-42, Chapter 3.2, Table 3.2-3 - uncontrolled, see Note 6 - controlled
Methylene Chloride	4.12E-05	---	0.00057	4.52	0.0023	4.12E-05	---	0.00057	4.52	0.0023	AP-42, Chapter 3.2, Table 3.2-3
PAH	1.41E-04	---	0.0020	15.46	0.0077	1.41E-04	---	0.0020	15.46	0.0077	AP-42, Chapter 3.2, Table 3.2-3
Toluene[6]	5.58E-04	---	0.0078	61.20	0.031	2.79E-04	---	0.0039	30.60	0.015	AP-42, Chapter 3.2, Table 3.2-3 - uncontrolled, see Note 6 - controlled
Xylenes[6]	1.95E-04	---	0.0027	21.39	0.011	9.75E-05	---	0.0014	10.69	0.0053	AP-42, Chapter 3.2, Table 3.2-3 - uncontrolled, see Note 6 - controlled
Other HAPs[2]	2.10E-04	---	0.0029	23.01	0.012	2.10E-04	---	0.0029	23.01	0.012	AP-42, Chapter 3.2, Table 3.2-3
Total HAPS			0.35	2,765	1.38			0.13	1,025	0.51	
Pollutant	**Emission Factor**		**Estimated Emissions**			**Emission Factor**		**Estimated Emissions**			**Source of Emissions Factors**
	(kg/MMBtu)	**(g/bhp-hr)**	**(lb/hr)**	**(lb/yr)[4]**	**(tpy)[4]**	**(kg/MMBtu)**	**(g/bhp-hr)**	**(lb/hr)**	**(lb/yr)[4]**	**(tpy)[4]**	
CO_2[1]	---	527	1,952	---	7,681	---	527	1,952	---	7,681	Manufacturer's Specs
CH_4[1,5]	---	1.43	5.30	---	20.84	---	0.43	1.59	---	6.25	Manufacturer's Specs - uncontrolled, Catalyst Specs - controlled
N_2O	0.0001	---	0.0031	---	0.012	0.0001	---	0.0031	---	0.012	40 CFR Part 98, Subpart C, Table C-2
CO_2e[2]	---	---	2,085	---	8,206	---	---	1,993	---	7,841	40 CFR Part 98, Subpart A, Table A-1, effective January 2014

Notes:

4. Annual Emissions are based on engines operating with 90% fuel of total fuel usage.
5. Due to variable load conditions, the catalyst efficiency may vary. The catalyst efficiencies used in the emissions are typical based on expected operating conditions.
6. Denoted HAPs are also VOCs and will be controlled by the catalysts by the same reduction efficiency.

Example Calculations

lb/hr = (g/hp-hr) * (hp) * (1 lb/453.6 g) or (lb/MMBtu) * (MMBtu/hr)

tpy = (MMscf/yr) * (Btu/scf) * (10^6 Btu/MMBtu) * (g/hp-hr) / (Btu/hp-hr) * (1 lb/453.59 g) * (1 ton/2000 lb) or (MMscf/yr) * (Btu/scf) * (lb/MMBtu) *(1 ton/2000 lb)

Microturbine Generator Emission Calculations

Company:	**Antero Midstream LLC**
Facility Name:	**Nichols Compressor Station**
Facility Location:	**Doddridge County, West Virginia**
Source Description:	**Microturbine Generators**

Source Information

Emission Unit ID:	GEN-1 & GEN-2	
Make/Model	Capstone C200 Standard	
Microturbine Rating	200	kWe
Net Heat Rate	10,300	Btu/kWhe
Heat Input [1]	2.47	MMBtu/hr
Operating Hours	8,760	hrs/yr

Notes:

1) Calculated

Potential Emissions per Generator

	Uncontrolled					***Controlled***					
Pollutant	**Emission Factor**		**Estimated Emissions**			**Emission Factor**		**Estimated Emissions**			**Source of Emissions Factors**
	(lb/MMBtu)	**(lb/MWhe)**	**(lb/hr)**	**(lb/yr)**	**(tpy)**	**(lb/MMBtu)**	**(lb/MWhe)**	**(lb/hr)**	**(lb/yr)**	**(tpy)**	
NOx	---	0.40	0.10	---	0.42	---	0.40	0.10	---	0.42	Manufacturer Specifications
CO	---	1.10	0.26	---	1.16	---	1.10	0.26	---	1.16	Manufacturer Specifications
VOC	---	0.10	0.024	---	0.11	---	0.10	0.024	---	0.11	Manufacturer Specifications
SO_2	3.40E-03	---	0.0084	---	0.037	3.40E-03	---	0.0084	---	0.037	AP-42, Chapter 3.1, Table 3.1-2a
$PM_{2.5}/PM_{10}$	6.60E-03	---	0.016	---	0.071	6.60E-03	---	0.016	---	0.071	AP-42, Chapter 3.1, Table 3.1-2a
1,3-Butadiene	4.30E-07	---	1.06E-06	0.0093	0.0000047	4.30E-07	---	1.06E-06	0.0093	0.0000047	AP-42, Chapter 3.1, Table 3.1-3
Acetaldehyde	4.00E-05	---	9.89E-05	0.87	0.00043	4.00E-05	---	9.89E-05	0.87	0.00043	AP-42, Chapter 3.1, Table 3.1-3
Acrolein	6.40E-06	---	1.58E-05	0.14	0.000069	6.40E-06	---	1.58E-05	0.14	0.000069	AP-42, Chapter 3.1, Table 3.1-3
Benzene	1.20E-05	---	2.97E-05	0.26	0.00013	1.20E-05	---	2.97E-05	0.26	0.00013	AP-42, Chapter 3.1, Table 3.1-3
Ethylbenzene	3.20E-05	---	7.91E-05	0.69	0.00035	3.20E-05	---	7.91E-05	0.69	0.00035	AP-42, Chapter 3.1, Table 3.1-3
Formaldehyde	7.10E-04	---	1.76E-03	15.37	0.0077	7.10E-04	---	1.76E-03	15.37	0.0077	AP-42, Chapter 3.1, Table 3.1-3
Naphthalene	1.30E-06	---	3.21E-06	0.028	0.000014	1.30E-06	---	3.21E-06	0.028	0.000014	AP-42, Chapter 3.1, Table 3.1-3
PAH	2.20E-06	---	5.44E-06	0.048	0.000024	2.20E-06	---	5.44E-06	0.048	0.000024	AP-42, Chapter 3.1, Table 3.1-3
Propylene Oxide	2.90E-05	---	7.17E-05	0.63	0.00031	2.90E-05	---	7.17E-05	0.63	0.00031	AP-42, Chapter 3.1, Table 3.1-3
Toluene	1.30E-04	---	3.21E-04	2.82	0.0014	1.30E-04	---	3.21E-04	2.82	0.0014	AP-42, Chapter 3.1, Table 3.1-3
Xylenes	6.40E-05	---	1.58E-04	1.39	0.00069	6.40E-05	---	1.58E-04	1.39	0.00069	AP-42, Chapter 3.1, Table 3.1-3
Total HAPS			0.0025	22.25	0.011			0.0025	22.25	0.011	
Pollutant	**Emission Factor**		**Estimated Emissions**			**Emission Factor**		**Estimated Emissions**			**Source of Emissions Factors**
	(kg/MMBtu)	**(lb/MWhe)**	**(lb/hr)**		**(tpy)**	**(kg/MMBtu)**	**(lb/MWhe)**	**(lb/hr)**		**(tpy)**	
CO_2	---	1,330	266.0	---	1,165	---	1,330	266.0	---	1,165	Manufacturer Specifications
CH_4	0.001	---	0.0055	---	0.024	0.001	---	0.0055	---	0.024	40 CFR Part 98, Subpart C, Table C-2
N_2O	0.0001	---	0.00055	---	0.0024	0.0001	---	0.00055	---	0.0024	40 CFR Part 98, Subpart C, Table C-2
CO_2e	---	---	266	---	1,166	---	---	266	---	1,166	40 CFR Part 98, Subpart A, Table A-1, effective January 2014

Example Calculations

lb/hr = (lb/Mwhe) * kWe * (1 MWe/1000 kWe) or (lb/MMBtu) * (MMBtu/hr) or (kg/MMBtu) * (MMBtu/hr) * (2.21 lb/kg)

tpy = (lb/hr) * (hr/yr) * (ton/2000 lb)

Natural Gas Fueled Catalytic Heater Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Nichols Compressor Station**
Location:	**Doddridge County, West Virginia**
Source Description:	**Catalytic Heater for Generator Fuel**

Source Information

Emission Unit ID:	CATHT1	
Source Description:	Generator Fuel Heater	
Hours of Operation	8,760	hr/yr
Design Heat Rate	0.024	MMBtu/hr
Fuel Heat Value	1,020	Btu/scf
Fuel Use	0.21	MMscf/yr

Emission Calculations per Reboiler

Pollutant	Emission Factor (lb/MMscf)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
NO_X	100	0.0024	0.010	AP-42 Ch. 1.4 Table 1.4-1
CO	84	0.0020	0.0087	AP-42 Ch. 1.4 Table 1.4-1
VOC	5.5	0.00013	0.00057	AP-42 Ch. 1.4 Table 1.4-2
PM_{10}	7.6	0.00018	0.00078	AP-42 Ch. 1.4 Table 1.4-2
SO_2	0.6	0.000014	0.000062	AP-42 Ch. 1.4 Table 1.4-2
Formaldehyde	0.075	0.0000018	0.0000077	AP-42 Ch. 1.4 Table 1.4-3
Total HAPs (including HCHO)	1.9	0.000044	0.00019	AP-42 Ch. 1.4 Table 1.4-3
Pollutant	**Emission Factor (kg/MMBtu)**	**Emissions (lb/hr)**	**Emissions (tpy)**	**Emission Factor Source**
Carbon Dioxide	53.06	2.81	12.3	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.000053	0.00023	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.0000053	0.000023	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	2.82	12.3	40 CFR Part 98, Subpart A, Table A-1

Sample Calculations:

$$\text{Fuel Consumption (MMscf/yr)} = \frac{\text{Heater Size (MMBtu/hr)} * \text{Hours of Operation (hrs/yr)}}{\text{Fuel Heat Value (Btu/scf)}}$$

$$\text{Emissions (tons/yr)} = \frac{\text{Emission Factor (lbs/MMscf)} * \text{Fuel Consumption (MMscf/yr)}}{\text{2,000 (lbs/ton)}}$$

Dehydrator Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Nichols Compressor Station**
Facility Location:	**Doddridge County, West Virginia**
Source Description:	**Dehydrator Units**

Potential Emissions per Dehydrator

Pollutant	Emission Unit ID: RSV-1 and RSV-2			
	Dehydrator Still Vent		Dehydrator Flash Tank	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Uncontrolled Emissions [1]				
VOC	47.69	208.9	22.32	97.77
Total HAPs	8.59	37.64	0.96	4.21
Benzene	1.28	5.59	0.019	0.084
Toluene	2.92	12.79	0.025	0.11
Ethylbenzene	0.0022	0.0095	0.000013	0.000056
Xylenes	0.47	2.04	0.0020	0.0085
n-Hexane	3.93	17.20	0.92	4.01
Methane	41.04	179.8	21.47	94.02
Carbon Dioxide	1.78	7.81	0.87	3.83
CO_2e	1,028	4,502	537.5	2,354
Controlled Emissions [2,3]				
VOC	0.95	4.18	1.12	4.89
Total HAPs	0.17	0.75	0.048	0.21
Benzene	0.026	0.11	0.0010	0.0042
Toluene	0.058	0.26	0.0012	0.0054
Ethylbenzene	0.000043	0.00019	0.00000064	0.0000028
Xylenes	0.0093	0.041	0.00010	0.00043
n-Hexane	0.079	0.34	0.046	0.20
Methane	0.82	3.60	1.07	4.70
Carbon Dioxide	1.78	7.81	0.87	3.83
CO_2e	22.30	97.69	27.71	121.4

[1]Uncontrolled emissions from ProMax 3.2 simulation from Stream "29" for the still vent before the condenser and combustor and Stream "Fuel" for the flash tank before the reboiler.

[2]Controlled emissions include the glycol still vent is equipped with a condenser is emissions are sent a combustor with 98% control efficiency.

[3]Controlled emissions include the flash tank gas is sent to the reboiler to be used as fuel with a 95% combustion efficiency.

Natural Gas Fueled Dehydrator Reboiler Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Nichols Compressor Station**
Location:	**Doddridge County, West Virginia**
Source Description:	**Dehydrator Reboilers**

Source Information

Emission Unit ID:	RBV-1 and RBV-2	
Source Description:	Dehydrator Reboiler	
Hours of Operation	8,760	hr/yr
Design Heat Rate	1.5	MMBtu/hr
Fuel Heat Value	1,020	Btu/scf
Fuel Use	12.9	MMscf/yr

Emission Calculations per Reboiler

Pollutant	Emission Factor (lb/MMscf)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
NO_X	100	0.15	0.64	AP-42 Ch. 1.4 Table 1.4-1
CO	84	0.12	0.54	AP-42 Ch. 1.4 Table 1.4-1
VOC	5.5	0.0081	0.035	AP-42 Ch. 1.4 Table 1.4-2
PM_{10}	7.6	0.011	0.049	AP-42 Ch. 1.4 Table 1.4-2
SO_2	0.6	0.00088	0.0039	AP-42 Ch. 1.4 Table 1.4-2
Formaldehyde	0.075	0.00011	0.00048	AP-42 Ch. 1.4 Table 1.4-3
Total HAPs (including HCHO)	1.9	0.0028	0.012	AP-42 Ch. 1.4 Table 1.4-3
Pollutant	**Emission Factor (kg/MMBtu)**	**Emissions (lb/hr)**	**Emissions (tpy)**	**Emission Factor Source**
Carbon Dioxide	53.06	175.9	770.4	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.0033	0.015	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.00033	0.0015	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	176.1	771.2	40 CFR Part 98, Subpart A, Table A-1

Sample Calculations:

$$\text{Fuel Consumption (MMscf/yr)} = \frac{\text{Heater Size (MMBtu/hr)} * \text{Hours of Operation (hrs/yr)}}{\text{Fuel Heat Value (Btu/scf)}}$$

$$\text{Emissions (tons/yr)} = \frac{\text{Emission Factor (lbs/MMscf)} * \text{Fuel Consumption (MMscf/yr)}}{\text{2,000 (lbs/ton)}}$$

Combustor Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Nichols Compressor Station**
Facility Location:	**Doddridge County, West Virginia**
Source Description:	**Combustor for Dehydrator Still Vent Gas**
Emission Unit ID:	**C-01**

Combusted Gas Emissions

Combustor Heat Input :	4.80	MMBtu/hr
Vent Gas to Combustor Rate:	4,265	scf/hr
Gas Heating Value:	1,126	Btu/scf
Hours of Operation:	8,760	hr/yr

Pollutant	Emission Factor[1] (lb/MMBtu)	Emissions (lbs/hr)	Emissions (tons/yr)
Particulate Matter ($PM/PM_{10}/PM_{2.5}$)	N/A - Smokeless Design		
Nitrogen Oxides (NO_x)	0.068	0.33	1.43
Carbon Monoxide (CO)	0.37	1.78	7.78

[1] Emission Factors from Table 13.5-1 of AP-42 Section 13.5 (Sept 1991)

Pilot Emissions

Pilot Heating Value:	1,126	Btu/scf
Hours of Operation:	8,760	hr/yr
Total Pilot Natural Gas Usage:	1.64E-05	MMscf/hr

Pollutant	Emission Factor (lb/MMscf)	Emissions (lbs/hr)	Emissions (tons/yr)
Particulate Matter ($PM/PM_{10}/PM_{2.5}$)[2]	7.6	1.38E-04	6.02E-04
Nitrogen Oxides (NO_x)[2]	100	1.81E-03	7.93E-03
Sulfur Dioxide (SO_2)[2]	0.6	1.09E-05	4.76E-05
Carbon Monoxide (CO)[2]	84	1.52E-03	6.66E-03
Volatile Organic Compounds (VOC)[2]	5.5	9.95E-05	4.36E-04
Total HAPs[2,3]	1.88	3.40E-05	1.49E-04

[2] Emission Factors from AP-42 Tables 1.4-1, 1.4-2, 1.4-3, and 1.4-4 (7/98).

[3] Sum of Emissions Factors published for pollutants classified as "HAPS" under AP-42 Table 1.4-3.

Total Combustor Emissions

Pollutant	Total Potential Emission Rate (tons/year)
Particulate Matter ($PM/PM_{10}/PM_{2.5}$)	6.02E-04
Nitrogen Oxides (NO_x)	1.44
Sulfur Dioxide (SO_2)	4.76E-05
Carbon Monoxide (CO)	7.79
Volatile Organic Compounds (VOC)	4.36E-04
Total HAPs	1.49E-04

Greenhouse Gas Emissions

Pollutant	Emission Factor (kg/MMBtu)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
Carbon Dioxide	53.06	562.9	2,465	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.011	0.046	40 CFR Part 98, Subpart C, Table C-2
Nitrogen Dioxide	0.0001	0.0011	0.0046	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	563.4	2,468	40 CFR Part 98, Subpart A, Table A-1

Settling Tank Flashing Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Nichols Compressor Station**
Facility Location:	**Doddridge County, West Virginia**
Source Description:	**Settling Tank Flashing Emissions**
Emission Unit ID:	**T03**

Settling Tank Throughput: **196** bbl/day

Settling Tank Flashing Emissions

Component	Uncontrolled Flashing Emissions [1] (lb/hr)	Uncontrolled Flashing Emissions (tons/yr)	Controlled Flashing Emissions [2] (lb/hr)	Controlled Flashing Emissions [2] (tons/yr)
Methane	9.89	43.33	0.20	0.87
Ethane	19.40	84.97	0.39	1.70
Propane	23.77	104.1	0.48	2.08
i-Butane	7.94	34.79	0.16	0.70
n-Butane	17.54	76.84	0.35	1.54
i-Pentane	9.19	40.24	0.18	0.80
n-Pentane	9.99	43.75	0.20	0.88
Hexanes	5.31	23.28	0.11	0.47
Heptanes	5.91	25.88	0.12	0.52
Octanes	2.12	9.27	0.042	0.19
Nonanes	0.014	0.060	0.00028	0.0012
Decanes+	0.87	3.80	0.017	0.076
Benzene	0.096	0.42	0.0019	0.0084
Toluene	0.17	0.74	0.0034	0.015
Ethylbenzene	0.00012	0.00053	0.0000024	0.000011
Xylenes	0.019	0.085	0.00039	0.0017
n-Hexane	6.88	30.13	0.14	0.60
Nitrogen	0.055	0.24	0.055	0.24
Carbon Dioxide	0.20	0.86	0.20	0.86
Water	3.41	14.92	3.41	14.92
VOC Subtotal	89.82	393.4	1.80	7.87
HAP Subtotal	7.16	31.38	0.14	0.63
CO_2e Subtotal	247.5	1,084	5.14	22.52
Total	122.8	537.7	6.04	26.45

Notes:

1. Flashing emissions calculated by ProMax 3.2 Stream "43". Flashing only occurs in the settling tank as all pressurized fluids flow into the settling tank and then separate out at atmospheric conditions to the condensate and produced water tanks.

2. Tanks are controlled by a VRU with assumed 98% capture efficiency; but will likely be higher as vapors are recycled back into the system

Storage Tank Working and Breathing Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Nichols Compressor Station**
Facility Location:	**Doddridge County, West Virginia**
Source Description:	**W&B Storage Tank Emissions**
Emission Unit ID:	**T01 through T05**

TANK DESCRIPTION	Uncontrolled VOC Emissions[1] (tons/yr)	Uncontrolled CH_4 Emissions[3] (tons/yr)	Uncontrolled CO_2e Emissions (tons/yr)	Uncontrolled HAP Emissions[4] (tons/yr)
400 bbl Hydrocarbon Storage Tank (T04)	5.60	0.61	15.20	0.44
400 bbl Hydrocarbon Storage Tank (T05)	5.60	0.61	15.20	0.44
400 bbl Settling Tank (T03)	7.30	0.79	19.82	0.57
400 bbl Produced Water Storage Tank[2] (T01)	0.38	0.041	1.02	0.030
400 bbl Produced Water Storage Tank[2] (T02)	0.38	0.041	1.02	0.030
TOTAL	**19.26**	**2.09**	**52.28**	**1.51**

TANK DESCRIPTION	Controlled VOC Emissions[5] (tons/yr)	Controlled CH_4 Emissions[5] (tons/yr)	Controlled CO_2e Emissions[5] (tons/yr)	Controlled HAP Emissions[5] (tons/yr)
400 bbl Hydrocarbon Storage Tank (T04)	0.11	0.012	0.30	0.0088
400 bbl Hydrocarbon Storage Tank (T05)	0.11	0.012	0.30	0.0088
400 bbl Settling Tank (T03)	0.15	0.016	0.40	0.011
400 bbl Produced Water Storage Tank2 (T01)	0.0075	0.00082	0.020	0.00059
400 bbl Produced Water Storage Tank2 (T02)	0.0075	0.00082	0.020	0.00059
TOTAL	**0.39**	**0.04**	**1.05**	**0.03**

Notes:

1. EPA Tanks 4.0.9d used to calculate standing, working, and breathing (S,W,B) emissions. Model was run on a per tank basis so as to not underestimate emissions.

2. Produced water assumed to have no more than 10% hydrocarbon liquid

3. Methane emissions estimated assuming 73% VOC and 8% CH_4 in tank vent gas based on ProMax 3.2 simulation.

4. HAP emissions estimated assuming 73% VOC and 5.8% HAPs in the tank vent gas based on ProMax 3.2 simulation.

5. Tanks are controlled by a VRU with assumed 98% capture efficiency; but will likely be higher as vapors are recycled back into the system.

Truck Loading Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Nichols Compressor Station**
Facility Location:	**Doddridge County, West Virginia**
Source Description:	**Production Liquids Truck Loadout**
Emission Unit ID:	**EPLOR**

AP - 42, Chapter 5.2 $L_L = 12.46 \times S \times P \times M / T$

L_L = Loading Loss Emission Factor (lbs VOC/1000 gal loaded)
- S = Saturation Factor
- P = True Vapor Pressure of the Loaded Liquid (psia)
- M = Vapor Molecular Weight of the Loaded Liquid (lbs/lbmol)
- T = Temperature of Loaded Liquid (ºR)

VOC Emissions (tpy) = $\dfrac{L_L \text{ (lbs VOC/1000 gal)} * 42 \text{ gal/bbl} * 365 \text{ days/year} * \text{production (bbl/day)}}{1000 \text{ gal} * 2000 \text{ lbs/ton}}$

								Uncontrolled		
Source	**S[1]**	**P (psia)[2]**	**M[2]**	**T (ºF)[3]**	**T (ºR)**	**L_L (lb/1000 gal)**	**Production (bbl/day)**	**VOC (tpy)**	**HAP[5] (tpy)**	**CO_2e[6] (tpy)**
Condensate	0.6	7.7	60	52	511.81	6.78	151	**7.85**	**0.62**	**21.30**
Produced Water[4]	0.6	7.7	60	52	511.81	0.68	45	**0.02**	**0.002**	**0.06**

Notes:
1. Saturation factor from AP-42, Table 5.2-1 (Submerged loading (bottom loading): dedicated normal service)
2. True vapor pressure and molecular weight retrieved from EPA Tanks 4.0.9d runs.
3. Temperature based on the annual average temperature for Elkins, West Virginia (EPA Tanks 4.0.9d runs).
4. Produced water assumed to have no more than 10% hydrocarbon liquid.
5. HAP emissions estimated from HAP weight% to VOC weight % ratio from settling tank flash gas.
6. CO_2e emissions estimated from CH_4 weight % to VOC weight % ratio from settling tank flash gas.

Assume 1 truck loaded per hour, 200 bbl truck, for short term emissions

								Uncontrolled		
Source	**S[1]**	**P (psia)[2]**	**M[2]**	**T (ºF)[3]**	**T (ºR)**	**L_L (lb/1000 gal)**	**Loading bbl/hr**	**VOC (lb/hr)**	**HAP[5] (lb/hr)**	**CO_2e[6] (lb/hr)**
Condensate	0.6	7.7	60	52	511.81	6.78	200	**56.97**	**4.48**	**154.7**
Produced Water[4]	0.6	7.7	60	52	511.81	0.68	200	**0.57**	**0.04**	**1.55**

Component Fugitive Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Nichols Compressor Station**
Facility Location:	**Doddridge 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	2,500	8,760	3.90E-04	0.20	9.41	1.88
Valves - Gas Service	1,000	8,760	4.50E-03	0.20	43.45	8.69
Total Emissions (tons/yr)					**52.87**	**10.57**

HAPs Fugitive Emissions										
Equipment Type and Service	**Benzene Weight Fraction[3]**	**Benzene Emissions (tpy)**	**Toluene Weight Fraction[3]**	**Toluene Emissions (tpy)**	**Ethylbenzene Weight Fraction[3]**	**Ethylbenzene Emissions (tpy)**	**Xylene Weight Fraction[3]**	**Xylene Emissions (tpy)**	**n-Hexane Weight Fraction[3]**	**n-Hexane Emissions (tpy)**
Flanges - Gas Service	1.21E-04	1.14E-03	3.36E-04	3.17E-03	0.00E+00	---	9.80E-05	9.23E-04	8.60E-03	8.09E-02
Valves - Gas Service	1.21E-04	5.25E-03	3.36E-04	1.46E-02	0.00E+00	---	9.80E-05	4.26E-03	8.60E-03	3.74E-01
Total Emissions (tons/yr)		**0.006**		**0.02**		**---**		**0.005**		**0.45**

1) Component counts from Engineering Lists.

2) API average emission factors are for oil and gas production operations - Table 2.4, EPA Protocol for Equipment Leak Emission Estimates - 1995.

3) VOC and HAP weight fractions are based on a ratio from Total Hydrocarbon weight fraction from a gas analysis from a site-specific ProMax 3.2 simulation.

GHG Fugitive Emissions								
Equipment Type	**Number of Units [1]**	**Hours of Operation (hours/yr)**	**Emission Factor[4] (scf/hr-unit)**	**CH_4 Concentration[5]**	**CO_2 Concentration[5]**	**CH_4 Emissions (tpy)**	**CO_2 Emissions (tpy)**	**CO_2e Emissions (tpy)**
Flanges	2,500	8,760	0.003	0.98	0.011	1.23	0.038	30.79
Valves	1,000	8,760	0.027	0.98	0.011	4.43	0.14	110.83
Total Emissions (tons/yr)						**5.66**	**0.17**	**141.61**

4) Emission factors from 40 CFR Part 98 Subpart W, Table W1-A; Gas service where available, else light crude service

5) CH_4 and CO_2 concentrations as defined in 40 CFR Part 98.233(r)

Fugitive Emissions From Venting Episodes

Company:	**Antero Midstream LLC**
Facility Name:	**Nichols Compressor Station**
Facility Location:	**Doddridge County, West Virginia**
Source Description:	**Fugitive Emissions-Venting Episodes**

VOC Venting Emissions						
Type of Event[1]	**Number Of Events (event/yr)**	**Amount Vented per Event (scf/event)**	**Molecular Weight of Vented Gas (lb/lb-mol)**	**Total Emissions (ton/yr)**	**VOC Weight Fraction[3]**	**VOC Emissions (ton/yr)**
Compressor Blowdown[2]	264	5,000	21.43	37.27	0.20	7.45
Plant Shutdown	2	100,000	21.43	5.65	0.20	1.13
Pigging Venting	52	1,000	21.43	1.47	0.20	0.29
Total Emissions (tons/yr)						**8.88**

HAPs Venting Emissions										
Type of Event[1]	**Benzene Weight Fraction[3]**	**Benzene Emissions (tpy)**	**Toluene Weight Fraction[3]**	**Toluene Emissions (tpy)**	**Ethylbenzene Weight Fraction[3]**	**Ethylbenzene Emissions (tpy)**	**Xylene Weight Fraction[3]**	**Xylene Emissions (tpy)**	**n-Hexane Weight Fraction[3]**	**n-Hexane Emissions (tpy)**
Compressor Blowdown[2]	1.19E-04	4.44E-03	3.31E-04	1.24E-02	0.00E+00	---	9.66E-05	3.60E-03	8.47E-03	3.16E-01
Plant Shutdown	1.19E-04	6.73E-04	3.31E-04	1.87E-03	0.00E+00	---	9.66E-05	5.46E-04	8.47E-03	4.78E-02
Pigging Venting	1.19E-04	1.75E-04	3.31E-04	4.87E-04	0.00E+00	---	9.66E-05	1.42E-04	8.47E-03	1.24E-02
Total Emissions (tons/yr)		**0.005**		**0.01**		**---**		**0.004**		**0.38**

GHG Venting Emissions								
Type of Event[1]	**Number Of Events (event/yr)**	**Amount Vented per Event (scf/event)**	**Molecular Weight of Vented Gas (lb/lb-mol)**	**CH_4 Weight Fraction[3]**	**CO_2 Weight Fraction[3]**	**CH_4 Emissions (ton/yr)**	**CO_2 Emissions (ton/yr)**	**CO_2e Emissions (tpy)**
Compressor Blowdown[2]	264	5,000	21.43	0.58	0.0042	21.54	0.16	538.71
Plant Shutdown	2	100,000	21.43	0.58	0.0042	3.26	0.024	81.62
Pigging Venting	52	1,000	21.43	0.58	0.0042	0.85	0.0061	21.22
Total Emissions (tons/yr)						**25.65**	**0.19**	**641.56**

1) Estimated number of events and venting per event from engineering based on other facilities

2) Total number of compressor blowdowns based on 12 blowdowns per compressor.

3) Weight Fractions are from a gas analysis from a site-specific ProMax 3.2 simulation.

Fugitive Dust Emissions

Company:	**Antero Midstream LLC**
Facility Name:	**Nichols Compressor Station**
Facility Location:	**Doddridge County, West Virginia**
Source Description:	**Fugitive Dust Emissions**

Gravel Access Road	Loaded Truck Weight[1]	Trips per year[2]	Trips per day[2]	Distance per round trip (truck in and out)[3]		VMT per year[4]
	tons			feet	miles	miles
Condensate Tank Truck	40.00	365	1.0	15,840	3.00	1,095
Produced Water Tank Truck	40.00	365	1.0	15,840	3.00	1,095

Equation Parameter	PM-10/PM2.5	PM-Total
E, annual size-specific emission factor for PM_{10} & $PM_{2.5}$ (upaved industrial roads) extrapolated for natural mitigation[6]	**see table below**	**see table below**
k, Particle size multiplier for particle size range (PM_{10}), (lb/VMT) (Source: AP-42 Table 13.2.2-2)	**1.5**	**4.9**
k, Particle size multiplier for particle size range ($PM_{2.5}$), (lb/VMT) (Source: AP-42 Table 13.2.2-2)	**0.15**	
s, surface material silt content, (%) (Source: AP-42 Table 13.2.2-1)	**4.8**	**4.8**
W, mean weight (tons) of the vehicles traveling the road	**40.00**	**40.00**
a, constant for PM_{10} and $PM_{2.5}$ on industrial roads (Source: AP-42 Table 13.2.2-2)	**0.9**	**0.7**
b, constant for PM_{10} and $PM_{2.5}$ on industrial roads (Source: AP-42 Table 13.2.2-2)	**0.45**	**0.45**
P, number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period, based on AP-42 Figure 13.2.2-1.	**160**	**160**

$$E=\left[k\left(\frac{s}{12}\right)^{a}\times\left(\frac{W}{3}\right)^{b}\right]\times\left(365-P/365\right)$$

Source of Equation: AP-42 Section 13.2.2

PM_{10} Emissions

Emission Factor (lb/VMT)	Vehicle miles traveled (VMT/yr)[4]	Annual Uncontrolled PM_{10} Emissions (tpy)
1.18	2,190.0	1.30

$PM_{2.5}$ Emissions (tons/yr)

Emission Factor (lb/VMT)	Vehicle miles traveled (VMT/yr)[4]	Annual Uncontrolled $PM_{2.5}$ Emissions (tpy)
0.12	2,190.0	0.13

PM- Total Emissions (tons/yr)

Emission Factor (lb/VMT)	Vehicle miles traveled (VMT/yr)[4]	Annual Uncontrolled PM-Total Emissions (tpy)
4.65	2,190.0	5.09

Notes:

1. Loaded truck weight is based on typical weight limit for highway vehicles.
2. Based on production, it's assumed a maximum of one condensate truck (200 bbl truck) and one produced water truck (200 bbl truck) will be onsite per day.
3. Distance per round trip is based on the site layout. The one way distance is measured as 7,920 feet for the gravel access road.
4. VMT/yr = Trips/yr x Roundtrip Distance
5. Hourly emissions determined from tons per year calculation using 2,000 lb/ton and 8,760 hours per year.

Facility Gas Analysis

	MOL %	MW lb/lb-mol	Component Weight lb/lb-mol	Wt. Fraction
Methane	77.22	16.04	12.39	0.58
Ethane	14.24	30.07	4.28	0.20
Propane	4.16	44.10	1.84	0.086
i-Butane	0.58	58.12	0.34	0.016
n-Butane	1.08	58.12	0.63	0.029
i-Pentane	0.34	72.15	0.24	0.011
n-Pentane	0.35	72.15	0.25	0.012
Hexanes	0.17	106.72	0.18	0.0084
Heptanes	0.23	100.20	0.23	0.011
Octanes	0.13	114.23	0.15	0.0071
Nonanes	0.0060	128.26	0.0077	0.00036
Decanes	0.2771	142.29	0.39	0.018
n-Hexane	0.21	86.18	0.18	0.0085
Benzene	0.0033	78.11	0.0026	0.00012
Toluene	0.0077	92.14	0.0071	0.00033
Ethylbenzene	0.000	106.16	0.000	0.000
Xylenes	0.0020	106.16	0.0021	0.000097
Nitrogen	0.79	28.01	0.22	0.010
Carbon Dioxide	0.20	44.01	0.090	0.0042
Totals	100.0		21.43	1.00

Heating Value (Btu/scf)	1,125.5
Molecular weight	21.43
VOC weight fraction	0.20
Methane weight fraction	0.58
THC weight fraction	0.99
VOC of THC wt fraction	0.20
CH4 of THC wt fraction	0.59
Benzene of THC wt fraction	0.00012
Toluene of THC wt fraction	0.0003
E-benzene of THC wt fraction	0.0000000
Xylene of THC wt fraction	0.000098
n-Hexane of THC wt fraction	0.0086

1. Site-specific ProMax 3.2 analysis from Stream "Fuel Gas".

Facility Flash Gas Analysis

	MOL %	MW lb/lb-mol	Component Weight lb/lb-mol	Wt. Fraction
Methane	21.05	16.04	3.38	0.080
Ethane	22.02	30.07	6.62	0.16
Propane	18.41	44.10	8.12	0.19
i-Butane	4.66	58.12	2.71	0.064
n-Butane	10.30	58.12	5.99	0.14
i-Pentane	4.35	72.15	3.14	0.074
n-Pentane	4.73	72.15	3.41	0.081
Hexanes	2.11	106.72	2.25	0.053
Heptanes	2.01	100.20	2.02	0.048
Octanes	0.63	114.23	0.72	0.017
Nonanes	0.0037	128.26	0.0047	0.00011
Decanes	0.21	142.29	0.30	0.0070
n-Hexane	2.73	86.18	2.35	0.055
Benzene	0.042	78.11	0.033	0.00078
Toluene	0.063	92.14	0.058	0.0014
Ethylbenzene	0.000039	106.17	0.000041	0.0000010
Xylenes	0.0062	106.16	0.0066	0.00016
Nitrogen	0.067	28.01	0.019	0.00044
Carbon Dioxide	0.15	44.01	0.067	0.0016
Water	6.46	18.01	1.16	0.027
Totals	100.0		42.35	1.00

Molecular weight	42.35
VOC weight fraction	0.73
Methane weight fraction	0.080
THC weight fraction	0.97
VOC of THC wt fraction	0.76
CH4 of THC wt fraction	0.082
Benzene of THC wt fraction	0.00080
Toluene of THC wt fraction	0.0014
E-benzene of THC wt fraction	0.0000010
Xylene of THC wt fraction	0.00016
n-Hexane of THC wt fraction	0.057

1. Site-specific ProMax 3.2 analysis from Stream "43" off of the settling tank.

ProMax 3.2

Bryan Research & Engineering, Inc.

ProMax® 3.2

with

TSWEET® & PROSIM®

Simulation Report

Project: Nichols - 800PSIG Discharge Emissions Rev C.pmx

Licensed to Kahuna Ventures, LLC and Affiliates

Client Name: Antero Resources Appalachain
Location: Cottrill
Job: Cottrill Rev A

ProMax Filename: K:\Antero Appalachian\Nichols Station-WV\Eng-Proc\BRE Model\Nichols - 800PSIG Discharge Emissions Rev C.pmx
ProMax Version: 3.2.13330.0
Simulation Initiated: 6/27/2014 3:30:05 PM

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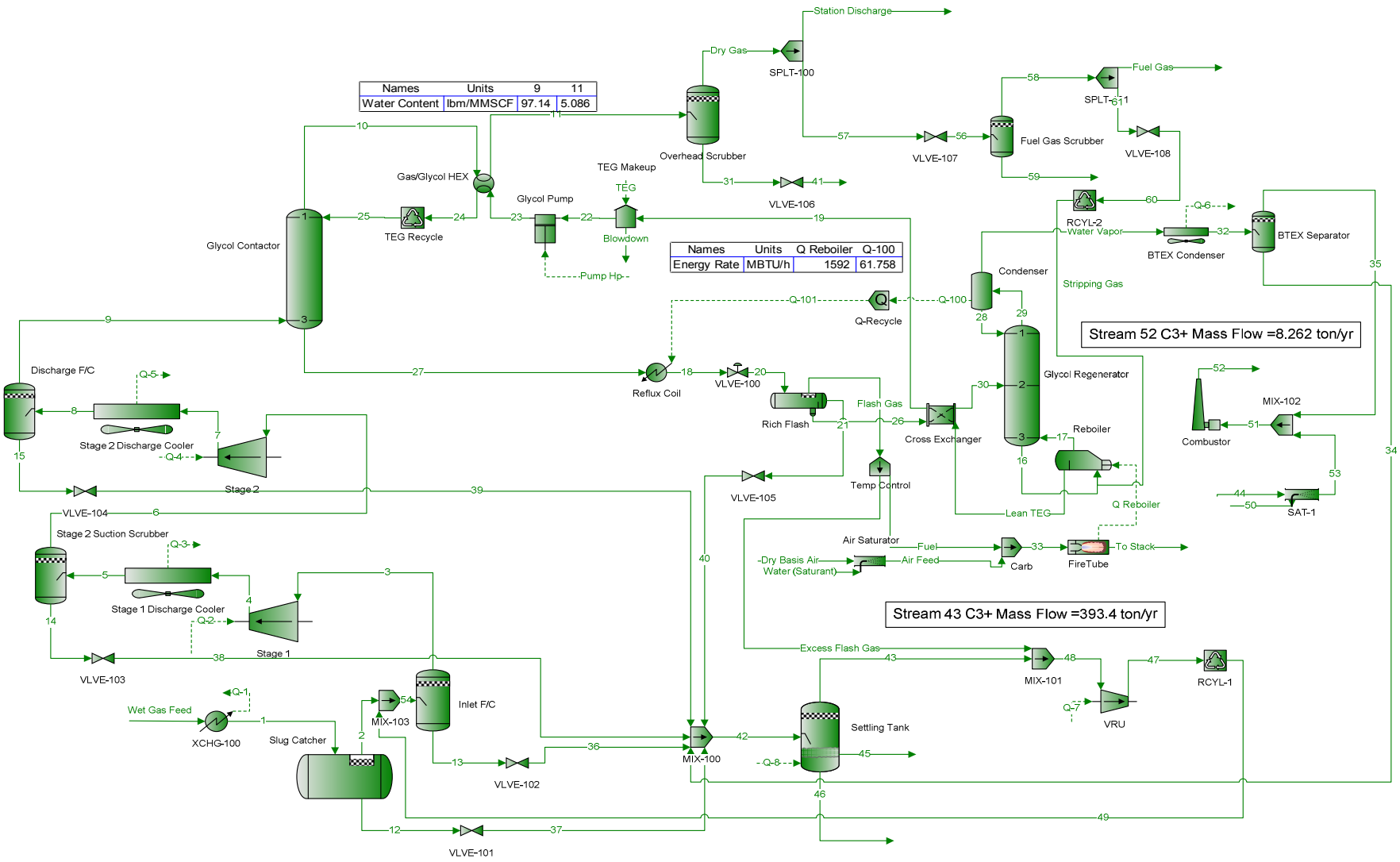
Report Navigator can be activated via the ProMax Navigator Toolbar.
An asterisk (*), throughout the report, denotes a user specified value.
A question mark (?) after a value, throughout the report, denotes an extrapolated or approximate value.



Names	Units	9	11
Water Content	lbm/MMSCF	97.14	5.086

Names	Units	Q Reboiler	Q-100
Energy Rate	MBTU/h	1592	61.758

Process Streams		Excess Flash Gas	Flash Gas	Fuel	Fuel Gas	Stripping Gas	TEG	To Stack	42	43	44	45	46	47	48	51	52
Composition	Status:	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: **Total**	From Block:	Temp Control	Rich Flash	Temp Control	SPLT-101	RCYL-2	--	FireTube	MIX-100	Settling Tank	--	Settling Tank	Settling Tank	VRU	MIX-101	MIX-102	Combustor
	To Block:	MIX-101	Temp Control	Carb	--	Reboiler	TEG Makeup	--	Settling Tank	MIX-101	SAT-1	--	--	RCYL-1	VRU	Combustor	--
Mole Fraction		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Methane		56.1841	56.1841	56.1841	77.9105	77.9099	0*	0	1.19421	21.0523	0*	0.101897	0.000444236	21.0523	21.0523	3.73248	0.0728537
Ethane		24.9218	24.9218	24.9218	14.3180	14.3182	0*	0	1.37284	22.0250	0*	0.581581	0.000510612	22.0250	22.0250	0.888387	0.0173403
Propane		10.0030	10.0030	10.0030	4.15295	4.15323	0*	0	1.43029	18.4052	0*	1.57538	0.000403876	18.4052	18.4052	0.374894	0.00731750
i-Butane		1.33122	1.33122	1.33122	0.570864	0.570934	0*	0	0.510019	4.66490	0*	0.967094	3.75245E-05	4.66490	4.66490	0.0563973	0.00110081
n-Butane		2.94907	2.94907	2.94907	1.04683	1.04698	0*	0	1.33720	10.3041	0*	2.94648	0.000190667	10.3041	10.3041	0.145911	0.00284802
i-Pentane		0.925572	0.925572	0.925572	0.307595	0.307635	0*	0	1.05408	4.34763	0*	3.12843	5.04752E-05	4.34763	4.34763	0.0695037	0.00135663
n-Pentane		0.997008	0.997008	0.997008	0.305585	0.305615	0*	0	1.41857	4.72670	0*	4.45018	5.83355E-05	4.72670	4.72670	0.0868978	0.00169615
i-C6		0.362823	0.362823	0.362823	0.112803	0.112784	0*	0	1.30595	2.10544	0*	4.57628	1.26469E-05	2.10544	2.10544	0.0438440	0.000855785
n-Hexane		0.446032	0.446032	0.446032	0.137707	0.137658	0*	0	2.23291	2.72551	0*	8.01112	1.27860E-05	2.72551	2.72551	0.0653593	0.00127574
Benzene		0.0102917	0.0102917	0.0102917	0.00190328	0.00190266	0*	0	0.0352262	0.0421561	0*	0.126346	8.23710E-05	0.0421561	0.0421561	0.0233592	0.000455944
Cyclohexane		0	0	0	0	0	0*	0	0	0	0*	0	0	0	0	0	0
i-C7		0.0450606	0.0450606	0.0450606	0.0146425	0.0146269	0*	0	0.563426	0.328608	0*	2.09807	1.23984E-06	0.328608	0.328608	0.00988993	0.000193040
n-Heptane		0.226340	0.226340	0.226340	0.0746065	0.0745082	0*	0	3.76996	1.68464	0*	14.1482	5.71438E-06	1.68464	1.68464	0.0618099	0.00120646
Toluene		0.0111753	0.0111753	0.0111753	0.00229731	0.00229409	0*	0	0.157250	0.0626382	0*	0.591502	0.000101125	0.0626382	0.0626382	0.0444934	0.000868461
i-Octane		0.0141662	0.0141662	0.0141662	0.00476870	0.00476304	0*	0	0.217166	0.103114	0*	0.813703	7.98682E-08	0.103114	0.103114	0.00358236	6.99235E-05
n-Octane		0.0564732	0.0564732	0.0564732	0.0208886	0.0208499	0*	0	3.40997	0.529433	0*	13.0094	1.64550E-06	0.529433	0.529433	0.0258891	0.000505325
Ethylbenzene		5.09067E-06	5.09067E-06	5.09067E-06	1.23975E-06	1.23770E-06	0*	0	0.000295701	3.88344E-05	0*	0.00112951	5.00681E-08	3.88344E-05	3.88344E-05	2.87124E-05	5.60433E-07
o-Xylene		0.000771816	0.000771816	0.000771816	0.000174082	0.000173854	0*	0	0.0614447	0.00621606	0*	0.235096	1.18523E-05	0.00621606	0.00621606	0.00621816	0.000121371
Nonane		0.000299934	0.000299934	0.000299934	0.000129217	0.000129205	0*	0	0.0671829	0.00367668	0*	0.257752	1.68631E-08	0.00367668	0.00367668	0.000247508	4.83107E-06
Decane		0.0127587	0.0127587	0.0127587	0.00669937	0.00671537	0*	0	11.0035	0.207953	0*	42.2997	5.43406E-07	0.207953	0.207953	0.0185786	0.000362633
Water		0.498862	0.498862	0.498862	0.0107124	0.0107135	0.827516*	17.4390	68.8458	6.45601	0*	0.0786896	99.9980	6.45601	6.45601	6.79925	21.6219
Triethylene Glycol		0.000382795	0.000382795	0.000382795	9.66686E-05	9.66761E-05	99.1725*	0	4.14714E-05	1.80301E-10	0*	2.61019E-08	6.05599E-05	1.80301E-10	1.80301E-10	7.05845E-11	1.37773E-12
Nitrogen		0.168194	0.168194	0.168194	0.795232	0.795223	0*	70.7941	0.00375535	0.0672059	78.104*	0.000107960	6.95355E-07	0.0672059	0.0672059	68.3590	66.7145
Oxygen		0	0	0	0	0	0*	0.552926	0	0	20.947*	0	0	0	0	18.3236	0.854978
Argon		0	0	0	0	0	0*	0.830150	0	0	0.916*	0	0	0	0	0.801280	0.782004
Carbon Dioxide		0.834670	0.834670	0.834670	0.205032	0.205032	0*	10.3838	0.00891989	0.151564	0.033*	0.00183035	5.76735E-05	0.151564	0.151564	0.0591052	9.26857
Carbon Monoxide		0	0	0	0	0	0*	0	0	0	0*	0	0	0	0	0	0.647612
Mass Flow		lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h
Methane		0	42.9310	42.9310	5410.31	79.0462	0*	0	10.1198	9.89282	0*	0.224382	0.00257748	9.89282	9.89282	82.0824	1.64165
Ethane		0	35.6932	35.6932	1863.61	27.2286	0*	0	21.8052	19.3992	0*	2.40041	0.00555292	19.3992	19.3992	36.6187	0.732375
Propane		0	21.0093	21.0093	792.697	11.5824	0*	0	33.3148	23.7730	0*	9.53531	0.00644101	23.7730	23.7730	22.6613	0.453226
i-Butane		0	3.68535	3.68535	143.625	2.09867	0*	0	15.6584	7.94205	0*	7.71554	0.000788802	7.94205	7.94205	4.49347	0.0898694
n-Butane		0	8.16420	8.16420	263.375	3.84855	0*	0	41.0541	17.5428	0*	23.5072	0.00400801	17.5428	17.5428	11.6255	0.232510
i-Pentane		0	3.18073	3.18073	96.0647	1.40372	0*	0	40.1716	9.18821	0*	30.9821	0.00131710	9.18821	9.18821	6.87414	0.137483
n-Pentane		0	3.42622	3.42622	95.4371	1.39451	0*	0	54.0627	9.98932	0*	44.0719	0.00152220	9.98932	9.98932	8.59447	0.171889
i-C6		0	1.48924	1.48924	42.0784	0.614677	0*	0	59.4467	5.31465	0*	54.1316	0.000394164	5.31465	5.31465	5.17935	0.103587
n-Hexane		0	1.83078	1.83078	51.3682	0.750245	0*	0	101.642	6.87986	0*	94.7615	0.000398500	6.87986	6.87986	7.72097	0.154419
Benzene		0	0.0382905	0.0382905	0.643539	0.00939930	0*	0	1.45345	0.0964553	0*	1.35467	0.00232703	0.0964553	0.0964553	2.50124	0.0500249
Cyclohexane		0	0	0	0	0	0*	0	0	0	0*	0	0	0	0	0	0
i-C7		0	0.215060	0.215060	6.35107	0.0926926	0*	0	29.8216	0.964503	0*	28.8570	4.49316E-05	0.964503	0.964503	1.35847	0.0271695
n-Heptane		0	1.08025	1.08025	32.3600	0.472169	0*	0	199.541	4.94461	0*	194.596	0.000207089	4.94461	4.94461	8.49016	0.169803
Toluene		0	0.0490443	0.0490443	0.916253	0.0133680	0*	0	7.65329	0.169055	0*	7.48087	0.00336985	0.169055	0.169055	5.61977	0.112395
i-Octane		0	0.0770753	0.0770753	2.35793	0.0344093	0*	0	13.1034	0.345017	0*	12.7584	3.29958E-06	0.345017	0.345017	0.560951	0.0112190
n-Octane		0	0.307259	0.307259	10.3285	0.150625	0*	0	205.752	1.77147	0*	203.980	6.79802E-05	1.77147	1.77147	4.05390	0.0810779
Ethylbenzene		0	2.57421E-05	2.57421E-05	0.000569734	8.31028E-06	0*	0	0.0165826	0.000120767	0*	0.0164599	1.92244E-06	0.000120767	0.000120767	0.00417861	8.35722E-05
o-Xylene		0	0.00390285	0.00390285	0.0800002	0.00116730	0*	0	3.44575	0.0193306	0*	3.42596	0.000455088	0.0193306	0.0193306	0.904951	0.0180990
Nonane		0	0.00183226	0.00183226	0.0717381	0.00104802	0*	0	4.55147	0.0138127	0*	4.53766	7.82207E-07	0.0138127	0.0138127	0.0435157	0.000870313
Decane		0	0.0864656	0.0864656	4.12609	0.0604277	0*	0	826.983	0.866688	0*	826.117	2.79630E-05	0.866688	0.866688	3.62362	0.0724725
Water		0	0.428064	0.428064	0.835375	0.0122065	0.00173620*	247.432	655.144	3.40686	0*	0.194587	651.543	3.40686	3.40686	167.913	547.132
Triethylene Glycol		0	0.00273807	0.00273807	0.0628395	0.000918181	1.73446*	0	0.00328972	7.93119E-10	0*	5.38046E-07	0.00328918	7.93119E-10	7.93119E-10	1.45306E-08	2.90611E-10
Nitrogen		0	0.224421	0.224421	96.4306	1.40887	0*	1561.91	0.0555692	0.0551470	2623.67*	0.000415132	7.04504E-06	0.0551470	0.0551470	2625.08	2625.08
Oxygen		0	0	0	0	0	0*	13.9346	0	0	803.759*	0	0	0	0	803.759	38.4278
Argon		0	0	0	0	0	0*	26.1182	0	0	43.8794*	0	0	0	0	43.8794	43.8794
Carbon Dioxide		0	1.74964	1.74964	39.0591	0.570670	0*	359.911	0.207360	0.195385	1.74153*	0.0110570	0.000917980	0.195385	0.195385	3.56577	572.949
Carbon Monoxide		0	0	0	0	0	0*	0	0	0	0*	0	0	0	0	0	25.4793

Process Streams		Excess Flash Gas	Flash Gas	Fuel	Fuel Gas	Stripping Gas	TEG	To Stack	42	43	44	45	46	47	48	51	52
Properties	**Status:**	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: Total	**From Block:**	Temp Control	Rich Flash	Temp Control	SPLT-101	RCYL-2	--	FireTube	MIX-100	Settling Tank	--	Settling Tank	Settling Tank	VRU	MIX-101	MIX-102	Combustor
	To Block:	MIX-101	Temp Control	Carb	--	Reboiler	TEG Makeup	--	Settling Tank	MIX-101	SAT-1	--	--	RCYL-1	VRU	Combustor	--
Property	**Units**																
Temperature	°F		131.578	131.578	82.8630	70.2192	100*	1550.01	69.2651	100*	100*	100	100	318.001	100	102.093	3393.93
Pressure	psig	60.3041	60.3041	60.3041	150	0.5	10.3041*	0.00405122*	0.00405122	0.00405122	0.0500000*	0.00405122	0.00405122	200*	0.00405122	0.00405122	0.00405122
Mole Fraction Vapor	%		100	100	100	100	0	100	4.00121	100	100	0	0	100	100	100	100
Mole Fraction Light Liquic	%		0	0	0	0	100	0	27.2570	0	0	100	100	0	0	0	0
Mole Fraction Heavy Liquic	%		0	0	0	0	0	0	68.7418	0	0	0	0	0	0	0	0
Molecular Weight	lb/lbmol	26.3851	26.3851	26.3851	20.6811	20.6812	149.079	28.0519	44.0155	41.9126	28.9628	112.969	18.0158	41.9126	41.9126	28.1379	27.4610
Mass Density	lb/ft^3		0.318997	0.318997	0.608497	0.0554800	69.4613	0.0191157	2.72416	0.103931	0.0711237	43.0419	61.9441	1.15922	0.103931	0.0686564	0.00975998
Molar Flow	lbmol/h	0	4.76307	4.76307	432.868	6.32437	0.0116462	78.7576	52.8224	2.92920	119.914*	13.7264	36.1669	2.92920	2.92920	137.082	140.461
Mass Flow	lb/h	0	125.674	125.674	8952.20	130.796	1.73620	2209.30	2325.01	122.770	3473.05	1550.66	651.576	122.770	122.770	3857.21	3857.21
Vapor Volumetric Flow	ft^3/h		393.966	393.966	14712.0	2357.52	0.0249952	115575	853.477	1181.27	48831.1	36.0268	10.5188	105.908	1181.27	56181.4	395207
Liquid Volumetric Flow	gpm		49.1179	49.1179	1834.22	293.925	0.00311629	14409.4	106.408	147.275	6088.04	4.49165	1.31143	13.2041	147.275	7004.44	49272.5
Std Vapor Volumetric Flow	MMSCFD	0	0.0433803	0.0433803	3.9424	0.0576	0.000106069	0.717295	0.481087	0.0266780	1.09213	0.125015	0.329394	0.0266780	0.0266780	1.24850	1.27927
Std Liquid Volumetric Flow	sgpm	0	0.652371	0.652371	52.4529	0.766359	0.00307300	5.30665	6.19059	0.488243	7.97406	4.39974	1.30261	0.488243	0.488243	9.37584	9.21477
Compressibility			0.977687	0.977687	0.961410	0.996134	0.00893344	1.00023	0.0418432	0.987007	0.999777	0.00642379	0.000711829	0.930126	0.987007	0.999335	1.00013
Specific Gravity			0.911006	0.911006	0.714063	0.714066	1.11371	0.968557		1.44713	1.00001	0.690117	0.993188	1.44713	1.44713	0.971526	0.948154
API Gravity							-7.08450					68.1229	10.0142				
Enthalpy	Btu/h	0	-177967	-177967	-1.47360E+07	-215299	-3983.13	-1.87224E+06	-6.05962E+06	-145450	12096.9	-1.42947E+06	-4.42988E+06	-133390	-145450	-1.24119E+06	-1.24119E+06
Mass Enthalpy	Btu/lb	-1416.10	-1416.10	-1416.10	-1646.08	-1646.07	-2294.17	-847.435	-2606.28	-1184.73	3.48308	-921.844	-6798.71	-1086.50	-1184.73	-321.785	-321.785
Mass Cp	Btu/(lb*°F)		0.481653	0.481653	0.502563	0.479023	0.539612	0.316955	0.632441	0.427781	0.240696	0.516581	0.981978	0.567938	0.427781	0.262009	0.364996?
Ideal Gas CpCv Ratic			1.18919	1.18919	1.24854	1.25190	1.03241	1.28761	1.12520	1.12540	1.39945	1.04533	1.32440	1.09481	1.12540	1.36979	1.24708
Dynamic Viscosity	cP		0.0109848	0.0109848	0.0109274	0.0105099	21.1327	0.0438058		0.00902431	0.0188343	0.439784	0.700507	0.0126724	0.00902431	0.0180788	0.0684044
Kinematic Viscosity	cSt		2.14972	2.14972	1.12109	11.8261	18.9929	143.061		5.42060	16.5315	0.637863	0.705978	0.682449	5.42060	16.4387	437.536
Thermal Conductivity	Btu/(h*ft*°F)		0.0177115	0.0177115	0.0181333	0.0170911	0.112147	0.0441611		0.0123440	0.0153735	0.0704804	0.360034	0.0220115	0.0123440	0.0154486	0.07621117
Surface Tension	lbf/ft						0.00300897					0.00132125?	0.00481543				
Net Ideal Gas Heating Value	Btu/ft^3	1401.28	1401.28	1401.28	1125.55	1125.55	3739.81	0	1606.78	2131.91	0	5728.23	0.0443199	2131.91	2131.91	83.4533	3.70451
Net Liquid Heating Value	Btu/lb	20049.2	20049.2	20049.2	20593.6	20593.6	9254.99	-130.874	13436.8	19130.0	-0.0375093	19077.0	-1058.78	19130.0	19130.0	1073.80	-110.352
Gross Ideal Gas Heating Value	Btu/ft^3	1536.66	1536.66	1536.66	1241.18	1241.19	4089.09	8.77358	1767.71	2320.92	0	6174.61	50.3569	2320.92	2320.92	94.7534	14.7363
Gross Liquid Heating Value	Btu/lb	21996.4	21996.4	21996.4	22715.4	22715.4	10144.1	-12.1860	14823.9	20841.2	-0.0375093	20575.9	1.00179	20841.2	20841.2	1226.19	42.0966

Tanks 4.0.9d
Condensate Tanks (T04 and T05)

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	Nichols CS1
City:	Doddridge County
State:	West Virginia
Company:	
Type of Tank:	Vertical Fixed Roof Tank
Description:	2 x 400 bbl Condensate Tanks

Tank Dimensions

Shell Height (ft):	20.00
Diameter (ft):	12.00
Liquid Height (ft) :	19.00
Avg. Liquid Height (ft):	10.00
Volume (gallons):	16,074.56
Turnovers:	71.96
Net Throughput(gal/yr):	1,156,648.50
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	Gray/Medium
Shell Condition	Good
Roof Color/Shade:	Gray/Medium
Roof Condition:	Good

Roof Characteristics

Type:	Dome
Height (ft)	1.00
Radius (ft) (Dome Roof)	12.00

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Elkins, West Virginia (Avg Atmospheric Pressure = 13.73 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

Nichols CS1 - Vertical Fixed Roof Tank
Doddridge County, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 15.0)	All	57.20	47.16	67.23	52.14	7.7391	6.4053	9.2837	60.0000			92.00	Option 4: RVP=15, ASTM Slope=3

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

Nichols CS1 - Vertical Fixed Roof Tank
Doddridge County, West Virginia

Annual Emission Calcaulations

Standing Losses (lb):	3,747.5337
Vapor Space Volume (cu ft):	1,188.0456
Vapor Density (lb/cu ft):	0.0837
Vapor Space Expansion Factor:	0.5480
Vented Vapor Saturation Factor:	0.1884
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	1,188.0456
Tank Diameter (ft):	12.0000
Vapor Space Outage (ft):	10.5046
Tank Shell Height (ft):	20.0000
Average Liquid Height (ft):	10.0000
Roof Outage (ft):	0.5046
Roof Outage (Dome Roof)	
Roof Outage (ft):	0.5046
Dome Radius (ft):	12.0000
Shell Radius (ft):	6.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0837
Vapor Molecular Weight (lb/lb-mole):	60.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	7.7391
Daily Avg. Liquid Surface Temp. (deg. R):	516.8667
Daily Average Ambient Temp. (deg. F):	49.0583
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	511.8083
Tank Paint Solar Absorptance (Shell):	0.6800
Tank Paint Solar Absorptance (Roof):	0.6800
Daily Total Solar Insulation Factor (Btu/sqft day):	1,193.8870
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.5480
Daily Vapor Temperature Range (deg. R):	40.1436
Daily Vapor Pressure Range (psia):	2.8784
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	7.7391
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	6.4053
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	9.2837
Daily Avg. Liquid Surface Temp. (deg R):	516.8667
Daily Min. Liquid Surface Temp. (deg R):	506.8308
Daily Max. Liquid Surface Temp. (deg R):	526.9026
Daily Ambient Temp. Range (deg. R):	24.1833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.1884
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	7.7391
Vapor Space Outage (ft):	10.5046
Working Losses (lb):	7,462.8782
Vapor Molecular Weight (lb/lb-mole):	60.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	7.7391
Annual Net Throughput (gal/yr.):	1,156,648.5000
Annual Turnovers:	71.9552
Turnover Factor:	0.5836
Maximum Liquid Volume (gal):	16,074.5628
Maximum Liquid Height (ft):	19.0000
Tank Diameter (ft):	12.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	11,210.4119

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

Nichols CS1 - Vertical Fixed Roof Tank
Doddridge County, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP 15.0)	7,462.88	3,747.53	11,210.41

Tanks 4.0.9d
Produced Water Tanks (T01 and T02)

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	Nichols CS1
City:	Doddridge County
State:	West Virginia
Company:	
Type of Tank:	Vertical Fixed Roof Tank
Description:	2 x 400 bbl Produced Water Tanks

Tank Dimensions

Shell Height (ft):	20.00
Diameter (ft):	12.00
Liquid Height (ft) :	19.00
Avg. Liquid Height (ft):	10.00
Volume (gallons):	16,074.56
Turnovers:	21.31
Net Throughput(gal/yr):	342,625.50
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	Gray/Medium
Shell Condition	Good
Roof Color/Shade:	Gray/Medium
Roof Condition:	Good

Roof Characteristics

Type:	Dome
Height (ft)	1.00
Radius (ft) (Dome Roof)	12.00

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Elkins, West Virginia (Avg Atmospheric Pressure = 13.73 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

Nichols CS1 - Vertical Fixed Roof Tank
Doddridge County, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 15.0)	All	57.20	47.16	67.23	52.14	7.7391	6.4053	9.2837	60.0000			92.00	Option 4: RVP=15, ASTM Slope=3

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

Nichols CS1 - Vertical Fixed Roof Tank
Doddridge County, West Virginia

Annual Emission Calcaulations

Standing Losses (lb):	3,747.5337
Vapor Space Volume (cu ft):	1,188.0456
Vapor Density (lb/cu ft):	0.0837
Vapor Space Expansion Factor:	0.5480
Vented Vapor Saturation Factor:	0.1884
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	1,188.0456
Tank Diameter (ft):	12.0000
Vapor Space Outage (ft):	10.5046
Tank Shell Height (ft):	20.0000
Average Liquid Height (ft):	10.0000
Roof Outage (ft):	0.5046
Roof Outage (Dome Roof)	
Roof Outage (ft):	0.5046
Dome Radius (ft):	12.0000
Shell Radius (ft):	6.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0837
Vapor Molecular Weight (lb/lb-mole):	60.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	7.7391
Daily Avg. Liquid Surface Temp. (deg. R):	516.8667
Daily Average Ambient Temp. (deg. F):	49.0583
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	511.8083
Tank Paint Solar Absorptance (Shell):	0.6800
Tank Paint Solar Absorptance (Roof):	0.6800
Daily Total Solar Insulation Factor (Btu/sqft day):	1,193.8870
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.5480
Daily Vapor Temperature Range (deg. R):	40.1436
Daily Vapor Pressure Range (psia):	2.8784
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	7.7391
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	6.4053
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	9.2837
Daily Avg. Liquid Surface Temp. (deg R):	516.8667
Daily Min. Liquid Surface Temp. (deg R):	506.8308
Daily Max. Liquid Surface Temp. (deg R):	526.9026
Daily Ambient Temp. Range (deg. R):	24.1833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.1884
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	7.7391
Vapor Space Outage (ft):	10.5046
Working Losses (lb):	3,788.0419
Vapor Molecular Weight (lb/lb-mole):	60.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	7.7391
Annual Net Throughput (gal/yr.):	342,625.5000
Annual Turnovers:	21.3148
Turnover Factor:	1.0000
Maximum Liquid Volume (gal):	16,074.5628
Maximum Liquid Height (ft):	19.0000
Tank Diameter (ft):	12.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	7,535.5756

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

Nichols CS1 - Vertical Fixed Roof Tank
Doddridge County, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP 15.0)	3,788.04	3,747.53	7,535.58

Tanks 4.0.9d
Settling Tank (T03)

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	Nichols CS1
City:	Doddridge County
State:	West Virginia
Company:	
Type of Tank:	Vertical Fixed Roof Tank
Description:	1 x 400 bbl Settling Tank

Tank Dimensions

Shell Height (ft):	20.00
Diameter (ft):	12.00
Liquid Height (ft) :	19.00
Avg. Liquid Height (ft):	10.00
Volume (gallons):	16,074.56
Turnovers:	186.54
Net Throughput(gal/yr):	2,998,548.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	Gray/Medium
Shell Condition	Good
Roof Color/Shade:	Gray/Medium
Roof Condition:	Good

Roof Characteristics

Type:	Dome
Height (ft)	1.00
Radius (ft) (Dome Roof)	12.00

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Elkins, West Virginia (Avg Atmospheric Pressure = 13.73 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

Nichols CS1 - Vertical Fixed Roof Tank
Doddridge County, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 15.0)	All	57.20	47.16	67.23	52.14	7.7391	6.4053	9.2837	60.0000			92.00	Option 4: RVP=15, ASTM Slope=3

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

Nichols CS1 - Vertical Fixed Roof Tank
Doddridge County, West Virginia

Annual Emission Calcaulations

Standing Losses (lb):	3,747.5337
Vapor Space Volume (cu ft):	1,188.0456
Vapor Density (lb/cu ft):	0.0837
Vapor Space Expansion Factor:	0.5480
Vented Vapor Saturation Factor:	0.1884
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	1,188.0456
Tank Diameter (ft):	12.0000
Vapor Space Outage (ft):	10.5046
Tank Shell Height (ft):	20.0000
Average Liquid Height (ft):	10.0000
Roof Outage (ft):	0.5046
Roof Outage (Dome Roof)	
Roof Outage (ft):	0.5046
Dome Radius (ft):	12.0000
Shell Radius (ft):	6.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0837
Vapor Molecular Weight (lb/lb-mole):	60.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	7.7391
Daily Avg. Liquid Surface Temp. (deg. R):	516.8667
Daily Average Ambient Temp. (deg. F):	49.0583
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	511.8083
Tank Paint Solar Absorptance (Shell):	0.6800
Tank Paint Solar Absorptance (Roof):	0.6800
Daily Total Solar Insulation Factor (Btu/sqft day):	1,193.8870
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.5480
Daily Vapor Temperature Range (deg. R):	40.1436
Daily Vapor Pressure Range (psia):	2.8784
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	7.7391
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	6.4053
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	9.2837
Daily Avg. Liquid Surface Temp. (deg R):	516.8667
Daily Min. Liquid Surface Temp. (deg R):	506.8308
Daily Max. Liquid Surface Temp. (deg R):	526.9026
Daily Ambient Temp. Range (deg. R):	24.1833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.1884
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	7.7391
Vapor Space Outage (ft):	10.5046
Working Losses (lb):	10,856.8621
Vapor Molecular Weight (lb/lb-mole):	60.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	7.7391
Annual Net Throughput (gal/yr.):	2,998,548.0000
Annual Turnovers:	186.5399
Turnover Factor:	0.3275
Maximum Liquid Volume (gal):	16,074.5628
Maximum Liquid Height (ft):	19.0000
Tank Diameter (ft):	12.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	14,604.3957

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

Nichols CS1 - Vertical Fixed Roof Tank
Doddridge County, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP 15.0)	10,856.86	3,747.53	14,604.40

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 Nichols Compressor Station, including federal and state regulatory requirements.

1. Summary of Key Operational Throughput Limits

a. Maximum wet gas throughput into each Dehy (RSV-1 and RSV-2): 60 MMscf/day or 21,900 MMscf/year.

b. Maximum liquids loaded out (EPLOR): 2,998,548 gallons per year.

c. Maximum fuel use of all compressor engines (CE-01 through CE-11): 1,072.00 MMscf/year

2. Operational Requirements

a. Compressor engines will operate with the catalytic converter in place at all times and will be fueled by natural gas only.

b. Catalysts installed on all compressor engines will be operated per manufacturer instructions.

c. Reciprocating compressor rod packing will be replaced within 36 months of last packing/startup or within 26,000 operating hours, whichever comes first.

d. Microturbines will be be fueled by natural gas only.

e. Each dehydrator reboiler will be operated at no more than 1.5 MMBtu/hr and fueled only by natural gas or off-gases from the dehydrator flash tanks.

f. No fuel-burning unit of any kind will have opacity greater than 10 percent based on a six minute block average observation.

g. The combustor capacity will not exceed 4.80 MMBtu/hr, will achieve 98 percent destruction efficiency, will operate at all times that gas is vented to it, will have a flame present at all times, and will have no visible emissions other than for periods not to exceed a total of 5 minutes during any 2 consecutive hours.

h. The combustor will be operated per manufacturer instructions.

i. Produced water, Condensate, and Settling storage tanks potential emissions shall be routed to the VRU with recovery greater than 98 percent at all times.

j. Storage tanks must be covered and routed to a closed vent system with no detectable emissions.

k. Liquid loadout trucks must use the submerged-fill method.

l. Dehydrator still vents must be controlled by the combustor.

3. Monitoring

a. Non-certified engines will be stack tested within 1 year of startup and every 8,760 hours of operation thereafter.

b. Catalyst inlet temperature will be monitored.

c. Compressor run time will be monitored as well as number of months since compressor rod repacking.

d. Daily, monthly, and rolling 12-month average of the wet gas throughput for the dehydrators will be monitored.

e. Initial Method 22 observations of each reboiler exhaust and combustor will be conducted for a minimum of 2 hours.

f. Monthly Method 22 observations of each reboiler exhaust and combustor will be conducted for a minimum of 10 minutes each.

g. Monthly olfactory, visual, and auditory inspections of the tanks closed vent and control system (combustor) will be conducted for leaks or defects that could result in emissions. Leaks will be repaired as soon as practicable (no later than 5 days for first attempt).

h. The presence of combustor flame will be continuously monitored by a thermocouple.

i. Monthly and rolling twelve-month average of the amount of liquids loaded out will be monitored.

4. Recordkeeping

a. Records will be kept on-site for a minimum of 2 years, and in company records (on or off-site) for a minimum of 5 years.

b. Records will be kept of inspection, observations, preventive maintenance, malfunctions, and shutdowns of all onsite equipment.

c. Records will be kept of the date, time, duration of each time that a flame is not present at the combustor, and startup, shutdown, malfunctions of the combustor.

d. Records will be kept of engine maintenance and engine run time.

e. Records will be kept of catalyst inlet temperature.

f. Records will be kept of the actual annual average natural gas throughput in the dehydrators.

5. Notifications and Reports

a. WVDAQ will be notified within 30 calendar days of commencement of construction.

b. WVDAQ will be notified within 30 calendar days of startup.

c. Upon startup, a Certificate to Operate (CTO) application will be filed and fees paid to WVDAQ for the period from startup to the following June 30 and then annually the CTO will be renewed and fees paid. CTO will be maintained on-site.

d. An annual report will be filed for compliance with 40 CFR 60 Subpart OOOO for the compressors and storage tanks (for settling tank only) within 90 days after one year of operation (i.e., within 90 days after 12 months after initial startup).

e. For stack testing, a protocol will be filed at least 30 days prior to test and WVDAQ and EPA will be notified of the test at least 15 days prior to test. Results will be reported within 60 days of test.

f. If operations are suspended for 60 days or more, WVDAQ will be notified within 2 weeks after the 60th day.

Attachment P.
Public Notice

AIR QUALITY PERMIT NOTICE
Notice of Application – Nichols Compressor Station

Notice is given that Antero Midstream LLC has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a modification to the existing 45CSR13 Construction Permit R13-3201 for the Nichols Compressor Station located at 2189 Long Run Road, in Doddridge County, West Virginia. The latitude and longitude coordinates are: 39.2926N, 80.8695W.

The applicant estimates the change in the potential to discharge of the following Regulated Air Pollutants will be:

Regulated Air Pollutant	Modified Potential Emissions (tons/yr)
Nitrogen Oxides (NOx)	62.39
Carbon Monoxide (CO)	35.82
Volatile Organic Compounds (VOC)	-10.06
Particulate Matter less than 10 µm (PM_{10})	6.78
Particulate Matter less than 2.5 µm ($PM_{2.5}$)	5.61
Sulfur Dioxide (SO_2)	0.05
Formaldehyde (HCHO)	0.15
Acetaldehyde	-0.09
Acrolein	-0.10
Benzene	-0.02
Methanol	-0.11
Total HAPs	-2.65
Greenhouse Gases (CO_2e)	5,182

Please note that negative numbers in the table indicate a decrease in potential to emit.

Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57th Street, SE, Charleston, WV 25304, for at least 30 calendar days from the date of publication of this notice.

Any questions regarding this permit application should be directed to the DAQ at (304) 926-0499, extension 1227, during normal business hours.
Dated the 7th day of August 2015.

By: Antero Midstream LLC
Luz C. Slauter
Midstream 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: _____, _____

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 Lou Ann Lee (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.

Troy Roach, Vice President - EHS

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