Williams Ohio Valley Midstream LLC
Park Place Corporate Center 2
2000 Commerce Drive
Pittsburgh, PA 15275
(412) 787-7300
(412) 787-6002 fax

July 28, 2015
(Via Federal Express)

Bev McKeone
New Source Review Program Manager
Division of Air Quality
West Virginia Department of Environmental Protection
601 57th Street SE
Charleston, WV 25304-2345

Subject: **Application for 45CSR13 NSR Construction Permit**
Williams Ohio Valley Midstream LLC (OVM)
McCLAIN DEHYDRATION STATION (DS)
Marshall County, West Virginia

Dear Ms. McKeone,

Williams Ohio Valley Midstream LLC (OVM) is submitting an Application for 45CSR13 New Source Review (NSR) Construction Permit for the existing (but previously determined exempt) OVM McClain Dehydration Station (DS), located approx. 1.5 mi east of Moundsville in Marshall County, West Virginia.

This application for 45CSR13 NSR Construction Permit has been prepared and submitted to request authorization for continued operation of the facility, as follows:

Unit ID	Point ID	Emission Unit Description	Year Installed	Design Capacity
DFT-01	1E	5.0 MMscfd Dehydrator - Flash Tank	2012	5.0 MMscfd
DSV-01	2E	5.0 MMscfd Dehydrator - Regenerator/Still Vent	2012	5.0 MMscfd
RBV-01	3E	0.22 MMBtu/hr Reboiler Vent	2012	0.22 MMBtu/hr
FUG	4E	Piping and Equipment Fugitives - Gas/Vapor	2012	na

The facility continues to qualify as a Minor Source under Non-Attainment New Source Review (NNSR), Prevention of Significant Deterioration (PSD), and Title V Operating Permits. The facility is also an Area Source for Hazardous Air Pollutants (HAP) under the National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations and a Minor Source of Carbon Dioxide equivalent (CO2e) emissions under the Greenhouse Gas (GHG) regulations.

If you have any questions concerning this submittal or need additional information, please contact me at (412) 787-4259 or danell.zawaski@williams.com.

Sincerely,

R. Danell Zawaski, PE
Environmental Specialist

Enclosures:

Application for NSR Construction Permit w/ Attachments A through S
Check for Application Fee

APPLICATION FOR 45CSR13
NEW SOURCE REVIEW (NSR) CONSTRUCTION PERMIT

For the:

Williams Ohio Valley Midstream LLC (OVM)

McCLAIN DEHYDRATION STATION (DS)

Marshall County, West Virginia

Submitted to:

WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF AIR QUALITY

Submitted by:

Williams Ohio Valley Midstream LLC
Park Place Corporate Center 2
2000 Commerce Drive
Pittsburgh, PA 15275

Prepared by:

EcoLogic Environmental Consultants, LLC
864 Windsor Court
Santa Barbara, CA 93111

July 2015

APPLICATION FOR
NEW SOURCE REVIEW (NSR) CONSTRUCTION PERMIT

Williams Ohio Valley Midstream LLC (OVM)

McCLAIN DEHYDRATION STATION (DS)

Marshall County, West Virginia

TABLE OF CONTENTS

APPLICATION FOR 45CSR13 NSR CONSTRUCTION PERMIT

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** ☒ **NOT APPLICABLE**

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):*
WILLIAMS OHIO VALLEY MIDSTREAM LLC (OVM)

2. Federal Employer ID No. ***(FEIN):***
27 – 0856707

3. Name of facility *(if different from above):*
McCLAIN DEHYDRATION STATION (DS)

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

5A. Applicant's mailing address:
PARK PLACE CORPORATE CENTER 2
2000 COMMERCE DRIVE, PITTSBURGH, PA 15275

5B. Facility's present physical address:
EAST SIDE OF BEAMS LN (~ 0.8 MI SOUTH OF US-250)
MARSHALL COUNTY, WV 26041

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: **THE WILLIAMS COMPANIES, INC.**

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: **APPLICANT LEASES THE PROPERTY**
– 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 PRODUCTION FACILITY

10. North American Industry Classification System **(NAICS)** code for the facility:
213112 – SUPPORT ACTIVITIES FOR OIL AND GAS OPERATIONS

11A. DAQ Plant ID No. (existing facilities):
EXEMPT

11B. List all current 45CSR13 and 45CSR30 (Title V) permit numbers associated with this process (existing facilities):
(NA)

12A. Directions to the facility:

– 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**.

DIRECTIONS FROM WHEELING AVE IN MOUNDSVILLE:

A. HEAD SOUTHEAST ONTO JEFFERSON AVE ~ 0.7 MI;
B. TURN LEFT ONTO 1ST ST ~ 0.8 MI;
C. TURN LEFT ONTO US-250/WAYNESBURG PK ~ 2.4 MI;
D. TURN RIGHT ONTO BEAMS LN ~ 0.8 MI;
E. TURN LEFT ONTO GRAVEL ACCESS ROAD ~ 0.1 MI;
F. ENTRANCE TO SITE IS STRAIGHT AHEAD.

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

12.B. New site address (if applicable): **NA**	12C. Nearest city or town: **MOUNDSVILLE**	12D. County: **MARSHALL**
12.E. UTM Northing (KM): **4,419.74 KM NORTHING**	12F. UTM Easting (KM): **525.97 KM EASTING**	12G. UTM Zone: **17S**

13. Briefly describe the proposed change(s) at the facility:

NO CHANGES ARE PROPOSED TO THE EXISTING EQUIPMENT, INCLUDING:

- **ONE (1) EXISTING 5.0 MMSCFD TRI-ETHYLENE GLYCOL (TEG) DEHYDRATOR, COMPRISED OF:**
  - **ONE (1) TEG DEHYDRATOR FLASH TANK ((DFT-01) (1E); AND**
  - **ONE (1) TEG DEHYDRATOR REGENERATOR/STILL VENT (DSV-01) (2E)**
- **ONE (1) EXISTING 0.22 MMBTU/HR TEG REBOILER (RBV-01) (3E)**
- **FUGITIVE EMISSIONS (FUG) (4E)**

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

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).

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.**

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

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

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

☒ **General Emission Unit, specify:**

DEHYDRATOR – 5.0 MMSCFD W/ FLASH TANK, REGEN/STILL VENT, AND REBOILER (DFT-01, DSV-01, RBV-01)

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:**

NA

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: **NA**

☐ **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 (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: Don Wicburg *(Please use blue ink)* DATE: 7/30/2015 *(Please use blue ink)*

35B. Printed name of signee: **DON WICBURG**	35C. Title: **VICE PRESIDENT AND GENERAL MANAGER**	
35D. E-mail: **DON.WICBURG@WILLIAMS.COM**	36E. Phone: **(412) 787-4266**	36F. FAX: **(412) 787-6002**
36A. Printed name of contact person: **R. DANELL ZAWASKI, PE**	36B. Title: **ENVIRONMENTAL SPECIALIST**	
36C. E-mail: **DANELL.ZAWASKI@WILLIAMS.COM**	36D. Phone: **(412) 787-4259**	36E. FAX: **(412) 787-6002**

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) (NA)
- ☒ Attachment N: Supporting Emissions Calculations
- ☒ Attachment O: Monitoring/Recordkeeping/Reporting/Testing Plans
- ☒ Attachment P: Public Notice
- ☐ Attachment Q: Business Confidential Claims) (NA)
- ☐ Attachment R: Authority Forms) (NA)
- ☐ Attachment S: Title V Permit Revision Information) (NA)
- ☒ 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.

ATTACHMENT A

Business Certificate

"6. **West Virginia Business Registration**. 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."

- Certificate of Amendment to the Certificate of Authority

  From: CAIMAN EASTERN MIDSTREAM, LLC

  To: WILLIAMS OHIO VALLEY MIDSTREAM LLC

  Date: May 15, 2012

- Certificate of Authority of a Foreign Limited Liability Company

  To: CAIMAN EASTERN MIDSTREAM, LLC

  Date: September 11, 2009

State of West Virginia

Certificate

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

the attached true and exact copy of the Articles of Amendment to the Articles of Organization of

CAIMAN EASTERN MIDSTREAM, LLC

are filed in my office, signed and verified, as required by the provisions of West Virginia Code §31B-2-204 and conform to law. Therefore, I issue this

CERTIFICATE OF AMENDMENT TO THE CERTIFICATE OF AUTHORITY

changing the name of the limited liability company to

WILLIAMS OHIO VALLEY MIDSTREAM LLC

Given under my hand and the Great Seal of the State of West Virginia on this day of May 15, 2012

Natalie E Tennant

Secretary of State

State of West Virginia

Certificate

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

CAIMAN EASTERN MIDSTREAM, LLC

Control Number: 99GIS

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

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 September 11, 2009, 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 September 11, 2009

Natalie E Tennant

Secretary of State

ATTACHMENT B

Location/Topographic Map

"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. Include a MAP as Attachment B."

Address:

Beams Ln
(~ 0.8 mi South of US-250/Waynesburg Pike)
Moundsville, WV 26041

Latitude and Longitude:

39°55'38.5" North x -80°41'45.7" West
(39.9273° North x -80.6960° West)

UTM:

525.97 km Easting x 4,419.74 km Northing x Zone: 17S

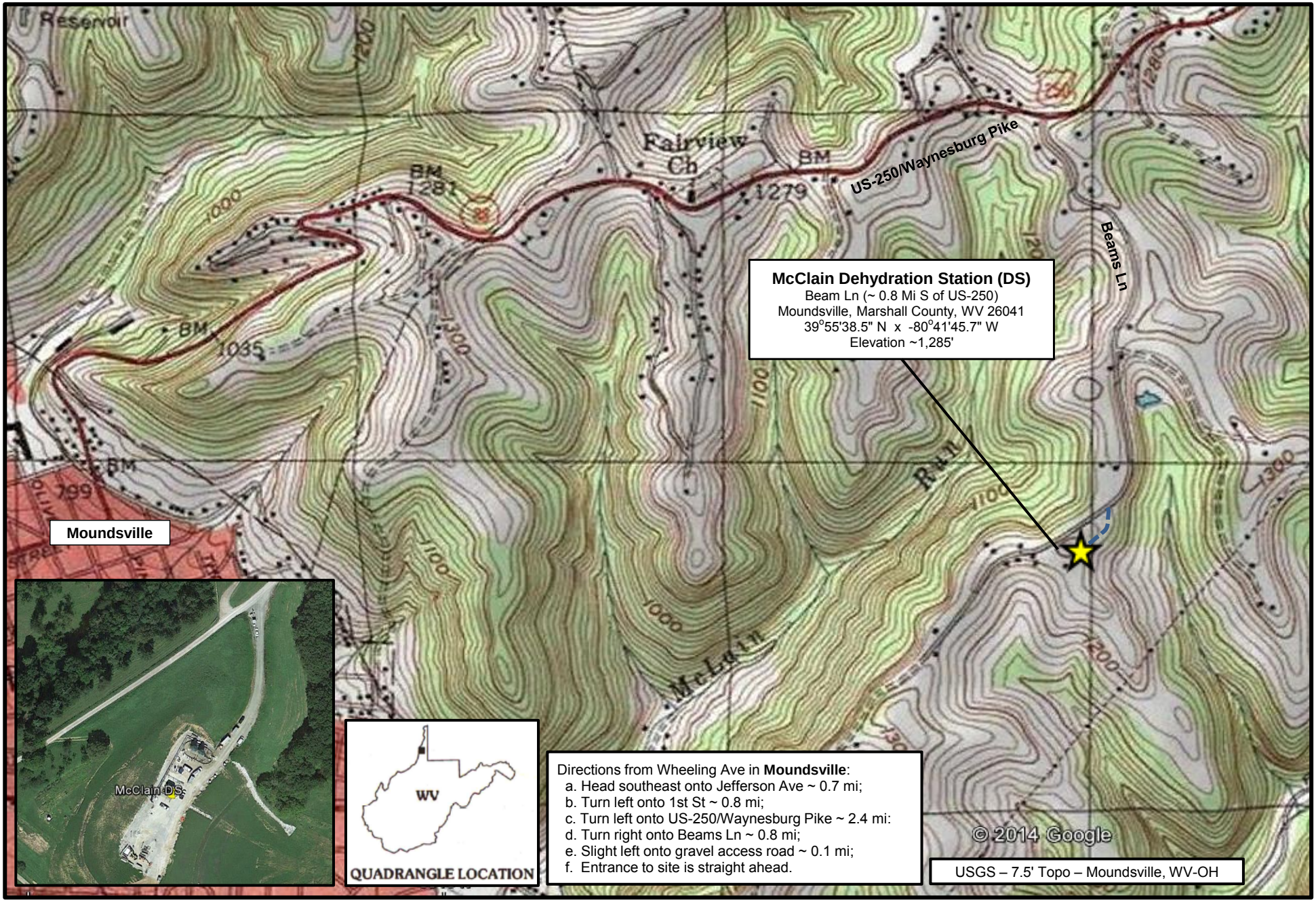
Directions:

From Wheeling Ave in Moundsville:

a. Head southeast onto Jefferson Ave ~ 0.7 mi;
b. Turn left onto 1st St ~ 0.8 mi;
c. Turn left onto US-250/Waynesburg Pike ~ 2.4 mi:
d. Turn right onto Beams Ln ~ 0.8 mi;
e. Slight left onto gravel access road ~ 0.1 mi;
f. Entrance to site is straight ahead.

- USGS – 7.5 Minute Topographic – Moundsville, WV-OH

Attachment B - Location/Topographic Map



ATTACHMENT C

Installation and Start-Up Schedule

"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."

- The OVM McClain DS is an existing (previously determined exempt) operation, including:
    - One 5.0 MMscfd TEG Dehydrator (DFT-01 and DSV-01) (1E and 2E)
    - One (1) 0.22 MMBtu/hr Reboiler (RBV-01) (3E)
    - Fugitive Emissions (FUG) (4E)

ATTACHMENT D

Regulatory Discussion

"18. **Regulatory Discussion**. List all Federal and State air pollution control regulations that you believe are applicable to the proposed process (if known). Discuss applicability and proposed demonstration(s) of compliance (if known). Provide this information as Attachment D."

- **Regulatory Discussion**
  - A. Applicability of New Source Review (NSR) Regulations
  - B. Applicability of Federal Regulations
  - C. Applicability of Source Aggregation
  - D. Applicability of State Regulations

Attachment D
Regulatory Discussion

Williams Ohio Valley Midstream LLC (OVM)
McCLAIN DEHYDRATION STATION (DS)
Application for 45CSR13 NSR Construction Permit

A. Applicability of New Source Review (NSR) Regulations

The following New Source Review (NSR) regulations are potentially applicable to natural gas production facilities. Applicability to the subject facility has been determined as follows:

1. Prevention of Significant Deterioration (PSD) [Not Applicable]

This rule does not apply. The facility is a "PSD Minor Source" for each regulated pollutant, as follows:

- NOx: PSD Natural Minor Source with Pre-Controlled PTE < 250 tpy
- CO: PSD Natural Minor Source with Pre-Controlled PTE < 250 tpy
- VOC: PSD Natural Minor Source with Pre-Controlled PTE < 250 tpy
- SO2: PSD Natural Minor Source with Pre-Controlled PTE < 250 tpy
- PM10/2.5: PSD Natural Minor Source with Pre-Controlled PTE < 250 tpy
- CO2e: PSD Natural Minor Source with Pre-Controlled PTE < 100,000 tpy

2. Non-Attainment New Source Review (NNSR) [Not Applicable]

This rule does not apply. The facility location is designated as either "Maintenance" or "Attainment/Unclassified" for all criteria pollutants.

3. Major Source of Hazardous Air Pollutants (HAPs) [Not Applicable]

This rule does not apply. The facility qualifies as a "HAP Area Source" as follows:

- Each HAP: HAP Area Source with Controlled Individual HAP PTE < 10 tpy
- Total HAPs: HAP Area Source with Controlled Total of All HAPs PTE < 25 tpy

4. Title V Operating Permit (TVOP) [Not Applicable]

This rule does not apply. The facility qualifies as a "Title V Minor Source" as follows:

- NOx: Title V Natural Minor Source with Pre-Controlled PTE < 100 tpy
- CO: Title V Natural Minor Source with Pre-Controlled PTE < 100 tpy
- VOC: Title V Natural Minor Source with Pre-Controlled PTE < 100 tpy
- SO2: Title V Natural Minor Source with Pre-Controlled PTE < 100 tpy
- PM10/2.5: Title V Natural Minor Source with Pre-Controlled PTE < 100 tpy
- Each HAP: Title V Natural Minor Source with Pre-Controlled PTE < 10 tpy
- Total HAPs: Title V Natural Minor Source with Pre-Controlled PTE < 25 tpy
- CO2e: Title V Natural Minor Source with Pre-Controlled < 100,000 tpy

B. Applicability of Federal Regulations

The following federal regulations are potentially applicable to natural gas production facilities. Applicability to the facility has been determined as follows:

1. **NSPS Dc, Steam Generating Units**
   40CFR§60.40c-§60.48c [Not Applicable]

   This rule does not apply because there is no steam generating unit at the facility with a maximum design heat input capacity ≥ 10 MMBtu/hr and ≤ 100 MMBtu/hr (§60.40c(a)).

2. **NSPS Kb, Volatile Organic Liquid Storage Vessels**
   40CFR§60.110b-§60.117b [Not Applicable]

   This rule does not apply because there is no tank used to store volatile organic liquids (VOL) with a design capacity ≥ 75 m3 (19,815 gal, 471.79 bbl) (§60.110b(a)).

3. **NSPS GG, Stationary Gas Turbines**
   40CFR§60.330-§60.335 [Not Applicable]

   This rule does not apply because there is no stationary gas turbine at the facility (§60.330).

4. **NSPS KKK, Leaks from Natural Gas Processing Plants**
   40CFR§60.630-§60.636 [Not Applicable]

   This rule does not apply because the facility is not a natural gas processing plant (§60.630(b)).

5. **NSPS LLL, Onshore Natural Gas Processing: SO2 Emissions**
   40CFR§60.640-§60.648 [Not Applicable]

   This rule does not apply because there is no gas sweetening operation at the facility (§60.640(a)).

6. **NSPS IIII, Compression Ignition Reciprocating Internal Combustion Engines**
   40CFR§60.4200-§60.4219 [Not Applicable]

   This rule does not apply because there is no stationary compression ignition engine at the facility (§60.4200(a)).

7. **NSPS JJJJ, Stationary Spark Ignition (SI) Internal Combustion Engines (ICE)**
   40CFR§60.4230-§60.4248 [Not Applicable]

   This rule does not apply because there is no stationary internal combustion engine at the facility (§60.4230(a)(1)).

8. **NSPS KKKK, Stationary Combustion Turbines**
   40CFR§60.4300-§60.4420 [Not Applicable]

   This rule does not apply because there is no stationary combustion turbine at the (§60.4300).

9. NSPS OOOO, Crude Oil and Natural Gas Production

40CFR§60.5360-§60.5430 [Not Applicable]

This rule does not apply to the pneumatic controllers because they are located between the wellhead and point of custody transfer, are not located at a natural gas processing plant, and their bleed rate is ≤ 6 scfh (§60.5365(d)(i)).

10. NESHAP HH, Oil and Natural Gas Production Facilities

40CFR§63.760-§63.779 [Applicable]

This rule does apply to the triethylene glycol (TEG) dehydrator (DFT-01 and DSV-01). However, because the TEG dehydrator will have an actual annual average benzene emissions < 0.9 megagrams per year, it is exempt from all requirements except to maintain records of actual annual average benzene emissions to demonstrate continuing exemption status (§63.764(e)(1)).

11. NESHAP HHH, Natural Gas Transmission and Storage Facilities

40CFR§63.1270-§63.1289 [Not Applicable]

This rule does not apply because the facility is not a natural gas transmission or storage facility transporting or storing natural gas prior to local distribution (§63.1270(a)).

12. NESHAP YYYY, Stationary Combustion Turbines

40CFR§63.6080-§63.6175 [Not Applicable]

This rule does not apply because there is no stationary gas turbine at the facility (§63.6080).

13. NESHAP ZZZZ, Stationary Reciprocating Internal Combustion Engines (RICE)

40CFR§63.6580-§63.6675 [Not Applicable]

This rule does not apply because there is no stationary reciprocation internal combustion engine at the facility (§63.6560).

14. NESHAP DDDDD, Industrial, Commercial, and Institutional Boilers and Process Heaters – Major Sources

40CFR§63.7480 – §63.7575 [Not Applicable]

This rule does not apply because the facility is not a major source of HAP (§63.7485).

15. NESHAP JJJJJJ, Industrial, Commercial, and Institutional Boilers and Process Heaters – Area Sources

40CFR§63.11193 – §63.11237 [Not Applicable]

This rule does not apply because gas-fired boilers are not subject to the requirements of this subpart (§63.11195(e)). Specifically, “boiler” is defined as an enclosed device using controlled flame combustion in which water is heated to recover thermal energy in the form of steam and/or hot water.

16. Chemical Accident Prevention Provisions

40CFR§68.1-§68.220 [Not Applicable]

This rule does not apply because the facility does not store more than a threshold quantity of a regulated substance in a process (§68.115).

17. Mandatory Greenhouse Gases (GHG) Reporting

40CFR§98.1-§98.9 [Not Applicable]

This rule does not apply. The facility is not subject to a listed source category and the aggregate maximum heat input capacity is < 30 MMBtu/hr from all stationary fuel combustion sources combined (§98.2(a)).

C. Applicability of Source Aggregation

For New Source Review (NSR) and Title V permitting, the three-part regulatory criteria to determine whether emissions from two or more facilities should be aggregated and treated as a single source are whether the activities:

i) Belong to the same industrial grouping; and
ii) Are located on one or more contiguous or adjacent properties; and
iii) Are under control of the same person (or persons under common control).

i) Same Industrial Grouping

The subject facility will operate under SIC code 1321 (Natural Gas Liquids Extraction). The upstream gas production wells will operate under SIC code 1311 (Crude Petroleum and Natural Gas). Therefore, the subject facility shares the same two-digit major SIC code of 13 as the upstream gas production wells.

ii) Contiguous or Adjacent

The determination of whether two or more facilities are “contiguous” or “adjacent” is made on a case-by-case basis. This determination is proximity based, and it is important to focus on this criteria and whether it meets the common sense notion of a plant. The functional interrelationship of the two or more facilities is not a relevant inquiry in determining whether the facilities are “contiguous” or “adjacent.”

Neither West Virginia nor federal regulations define the terms “contiguous” or “adjacent” or place any definitive restrictions on how distant two emission units can be and still be considered located on contiguous or adjacent properties for the purposes of a single source determination. It is clear, however, that the determination of whether two or more facilities are ‘contiguous” or “adjacent” is based on the plain meaning of the terms “adjacent” and “contiguous”, which consider the physical distance between the facilities. The term contiguous is defined in the dictionary as being in actual contact; touching along a boundary or at a point. The term “adjacent” is defined in the dictionary as not distant, nearby, having a common endpoint or border.

The location of the subject facility was chosen because of suitable characteristics for construction and operation, such as the availability of a reasonably flat grade and accessibility for large trucks and equipment. Williams’ business model is to construct

scalable capacity that contemplates additional production from multiple operators and the initial configuration is merely a foundation for additional opportunities in the area. The subject facility does not need to be located in the immediate vicinity of the upstream wells in order to operate properly. Had suitable land been available elsewhere, the subject facility could have been located farther from the upstream wells and could theoretically be moved farther from the wells without affecting operations. Therefore, despite the fact that the subject facility is located in close proximity to one or many upstream production sources, aggregation of the subject facility with upstream wells does not meet the common sense notion of a plant.

iii) Common Control

Williams OVM operates under its parent company The Williams Companies, Inc. (Williams) and is the sole operator of the subject facility. The closest Williams-operated facility to the subject facility is the Witzgal Dehydration Station (DS), which is located approximately 0.5 miles to the east. The production wells that send natural gas to the subject facility are owned and operated by other companies, which are unaffiliated with Williams. Williams has no ownership stake in any production well that may send natural gas to the subject facility.

Furthermore, neither Williams OVM, nor Williams, exercise operational control over any equipment owned or operated by any natural gas producer upstream of the subject facility. All employees at the subject facility are under the exclusive direction of Williams and are not under the control of any other entity. Similarly, Williams has no authority over employees of the production wells. These companies operate wholly independent of one another. No employees are expected to shuttle back and forth between the subject facility and any production well.

At this time, contracts are in place for the subject facility to process natural gas produced from multiple upstream production wells located throughout the region. As future commercial opportunities are identified, the subject facility will potentially receive gas from other producers. Williams will not have ownership or control of any future wellhead facilities. The producers are, and will be responsible for, any decisions to produce or shut-in wellhead facilities and have no control over the equipment installed, owned, and operated by Williams. Similarly, Williams cannot control the installation or operation of any equipment located at a well site that may be considered an air contamination source.

Summary

The subject facility and the upstream production wells should not be aggregated and treated as a single source of emissions because the subject facility is not under common control with any of the upstream wells. Additionally, the subject facility and the upstream production wells, considered together, do not meet the common sense notion of a plant because the subject facility is expected to service multiple production wells and because the location of the facility was selected for reasons unrelated to the location of the production wells. Accordingly, the subject facility should not be aggregated with the upstream wells in determining major source or PSD status.

D. Applicability of State Regulations

The following State regulations are potentially applicable to natural gas production facilities. Applicability to the facility has been determined as follows:

1. **Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers**
   45CSR2 [Applicable]

   This rule does apply, however, because the dehydrator reboiler (RBV-01) has a maximum design heat input (MDHI) rating < 10 MMBtu/hr, the only requirement is to limit visible emissions to < 10% opacity during normal operations (§45-02-3.1). The reboiler combusts only natural gas which inherently conforms to the visible emission standards.

2. **Prevent and Control the Discharge of Air Pollutants into the Open Air which Causes or Contributes to an Objectionable Odor or Odors**
   45CSR4 [Applicable]

   This rule does apply and states that an objectionable odor is an odor that is deemed objectionable when in the opinion of a duly authorized representative of the Air Pollution Control Commission (Division of Air Quality), based upon their investigations and complaints, such odor is objectionable. No odors have been deemed objectionable.

3. **Control of Air Pollution from Combustion of Refuse**
   45CSR6 [Not Applicable]

   This rule does not apply because there is no refuse combustion performed at the facility.

4. **Prevent and Control Air Pollution from the Emission of Sulfur Oxides**
   45CSR10 [Not Applicable]

   This rule does not apply because there are no “fuel burning units” at the facility w/ a Maximum Design Heat Input (MDHI) rating > 10 MMBtu/hr.

5. **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**
   45CSR13 [Applicable]

   This rule does apply. Williams OVM has published the required Class I legal advertisement notifying the public of their permit application, and paid the appropriate application fee.

6. **Permits for Construction and Major Modification of Major Stationary Sources of Air Pollutants**
   45CSR14 [Not Applicable]

   This rule does not apply because the facility is not a major source of pollutants.

7. **Standards of Performance for New Stationary Sources Pursuant to 40 CFR Part 60**
   45CSR16 [Not Applicable]

   This rule does not apply because the facility is not subject to any New Source Performance Standards (NSPS).

8. **Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution which Cause or Contribute to Nonattainment**
   45CSR19 [Not Applicable]

   This rule does not apply because the facility is a minor (or "deferred") source of all regulated pollutants.

9. **Requirements for Operating Permits**
   45CSR30 [Not Applicable]

   This rule does not apply because the facility is a minor (or "deferred") source of all regulated pollutants.

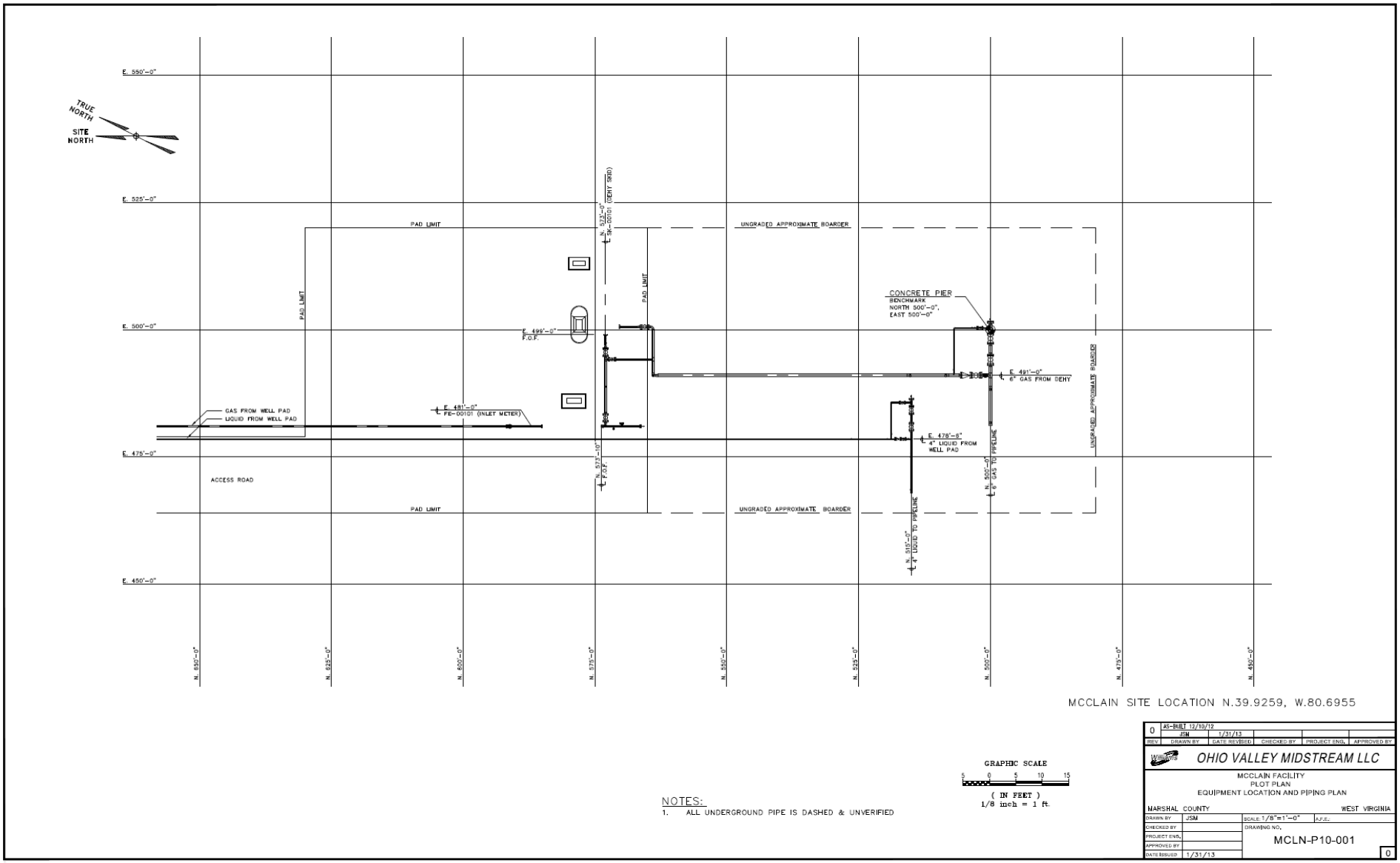
ATTACHMENT E

Plot Plan

"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."

- Plot Plan – OVM McClain DS

Attachment E - Plot Plan



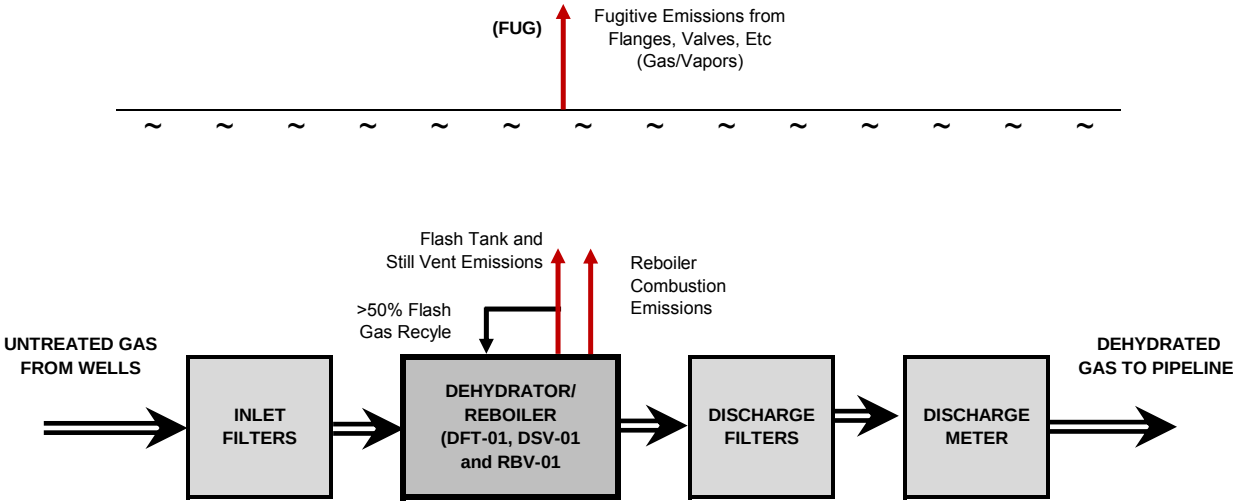
ATTACHMENT F

Detailed Process Flow Diagram

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

- Process Flow Diagram (PFD) – OVM McClain DS

Attachment F
Process Flow Diagram (PFD)



ID No.	EQUIPMENT
DFT-01	5.0 MMscfd TEG Dehydrator Flash Tank
DSV-01	5.0 MMscfd TEG Dehydrator Regenerator/Still Vent
RBV-01	0.22 MMBtu/hr TEG Reboiler
FUG	Piping and Process Fugitives (Gas/Vapor)

ATTACHMENT G

Process Description

"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). "

- **Process Description**
  - A. Project Overview
  - B. Tri-Ethylene Glycol (TEG) Dehydrator (DFT-01 and DSV-01) (1E and 2E)
  - C. Reboiler (RBV-01) (3E)
  - D. Fugitive Emissions (FUG) (4E)

ATTACHMENT G
Process Description

Williams Ohio Valley Midstream LLC (OVM)

McCLAIN DEHYDRATION STATION (DS)

Application for 45CSR13 NSR Construction Permit

A. Project Overview

Williams Ohio Valley Midstream LLC (OVM) is submitting an Application for 45CSR13 New Source Review (NSR) Construction Permit for the existing (but previously determined exempt) OVM McClain Dehydration Station (DS), located approx. 1.5 mi east of Moundsville, in Marshall County, West Virginia.

This application for 45CSR13 NSR Construction Permit has been prepared and submitted to request authorization for continued operation of the facility, as follows:

- One (1) 5.0 MMscfd TEG Dehydrator (DFT-01 and DSV-01) (1E and 2E)
- One (1) 0.22 MMBtu/hr TEG Reboiler (RBV-01) (3E)
- Fugitive Emissions (FUG) (4E)

B. Tri-Ethylene Glycol (TEG) Dehydrator (DFT-01 and DSV-02) (1E and 2E)

One (1) Tri-Ethylene Glycol (TEG) Dehydrator is utilized at the facility. The dehydrator is comprised of a Contactor/Absorber Tower (no vented emissions), Flash Tank (DFT-01), and Regenerator/Still Vent (DSV-01).

The TEG dehydrator is used to remove water vapor from the inlet wet gas stream to meet pipeline specifications. In the dehydration process, the wet inlet gas stream flows through a contactor tower where the gas is contacted with lean glycol. The lean glycol absorbs the water in the gas stream and becomes rich glycol laden with water and trace amounts of hydrocarbons.

The rich glycol is then routed to a flash tank where the glycol pressure is reduced to liberate the lighter end hydrocarbons. Whenever practical, the lighter end hydrocarbons are routed from the flash tank to the reboiler for use as fuel; otherwise these off-gases are vented to the atmosphere.

The rich glycol is then sent from the flash tank to the regenerator/still where the TEG is heated to drive off the water vapor and any remaining hydrocarbons. Once boiled, the glycol is returned to a lean state and used again in the process.

C. Reboiler (RBV-01) (3E)

One (1) 0.22 MMBtu/hr Reboiler (RBV-01) is utilized to supply heat for the Tri-Ethylene Glycol (TEG) Regeneration/Still (DSV-01).

D. Fugitive Emissions (FUG) (4E)

During routine operation of the facility there will be leaks from process piping components such as valves, flanges, connectors, etc. Leaks from the process piping components results in VOC and HAP emissions to the atmosphere.

ATTACHMENT H

Material Safety Data Sheets (MSDS)
(And Representative Gas Analysis)

"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."

- INLET GAS ANALYSIS SUMMARY
- INLET GAS CERTIFICATE OF ANALYSIS
- MATERIAL SAFETY DATA SHEETS (MSDS):
  – Natural Gas
  – Tri-Ethylene Glycol (TEG)

Williams Ohio Valley Midstream LLC (OVM)

McCLAIN DEHYDRATION STATION (DS)

Application for 45CSR13 NSR Construction Permit

ATTACHMENT H - Gas Analysis Summary

Representative Gas Sample: McClain #1H - Sampled 03/16/15

Component	Formula	Molecular Weight (MW)	Mole % (M%)	Mole Fraction (M%/Sum-M%)	Weighted Sum (MW*MF)	Weight % (WS/Sum-WS)	lb/MMscf (WS/UGC#)
Nitrogen	N2	32.00	0.58440	0.005844	0.1870	0.895	492.80
Hydrogen Sulfide	H2S	34.08	0.00000	0.000000	0.0000	0.000	0.00
Carbon Dioxide	CO2	44.01	0.14430	0.001443	0.0635	0.304	167.35
Methane*	CH4	16.04	76.83650	0.768395	12.3269	59.021	32,483.59
Ethane*	C2H6	30.07	14.88230	0.148829	4.4751	21.427	11,792.75
Propane**	C3H8	44.10	5.08130	0.050815	2.2407	10.729	5,904.67
i-Butane**	C4H10	58.12	0.49550	0.004955	0.2880	1.379	758.95
n-Butane**	C4H10	58.12	1.22430	0.012243	0.7116	3.407	1,875.23
Cyclopentane**	C5H10	70.13	0.00000	0.000000	0.0000	0.000	0.00
i-Pentane**	C5H12	72.15	0.20810	0.002081	0.1501	0.719	395.66
n-Pentane**	C5H12	72.15	0.27020	0.002702	0.1950	0.933	513.74
Cyclohexane**	C6H12	84.16	0.01660	0.000166	0.0140	0.067	36.82
Other Hexanes**	C6H14	86.18	0.08710	0.000871	0.0751	0.359	197.80
Heptanes**	C7H16	100.20	0.04810	0.000481	0.0482	0.231	127.01
Methylcyclohexane**	C7H14	98.19	0.01040	0.000104	0.0102	0.049	26.91
C8+ Heavies**	C8H18	114.23	0.02630	0.000263	0.0300	0.144	79.17
n-Hexane***	C6H14	86.18	0.07520	0.000752	0.0648	0.310	170.78
Benzene***	C6H6	78.11	0.00130	0.000013	0.0010	0.005	2.68
Toluene***	C7H8	92.14	0.00240	0.000024	0.0022	0.011	5.83
Ethylbenzene***	C8H10	106.17	0.00000	0.000000	0.0000	0.000	0.00
Xylenes***	C8H10	106.17	0.00180	0.000018	0.0019	0.009	5.04
2,2,4-Trimethylpentane***	C8H18	114.23	0.00005	0.000001	0.0001	0.000	0.15
Totals:			**100.00**	**1.000**	**20.89**	**100.00**	**55,037**
Total VOC:			**7.55**	**0.08**	**3.83**	**18.35**	**10,100**
Total HAP:			**0.08**	**0.001**	**0.07**	**0.34**	**184**

* = Hydrocarbon (HC) ** = also Volatile Organic Compound (VOC) *** = also Hazardous Air Pollutant (HAP)

#UGC (Universal Gas Constant) = 379.482 scf/lb-mol @ 60 ^{o}F and 14.696 psia. Pound "X"/scf = M% of "X" * MW of "X" / UGC

To be conservative, and to account for potential future changes in the gas quality, the following "worst-case" values were assumed:

Component	Formula	Representative Gas Analysis			Assumed "Worst-Case" Gas Analysis		
		Mole %	Wgt %	lb/MMscf	Mole %	Wgt %	lb/MMscf
Carbon Dioxide	CO2	0.14	0.30	167	0.17	0.36	201
Methane	CH4	76.84	59.02	32,484	100.00	100.00	42,275
VOC	C3 thru C10+	7.55	18.35	10,100	9.06	22.02	12,121
n-Hexane	C6H14	0.0752	0.3103	170.78	0.0902	0.3724	205
Benzene	C6H6	0.0013	0.0049	2.68	0.0016	0.0058	3
Toluene	C7H8	0.0024	0.0106	5.83	0.0029	0.0127	7
Ethylbenzene	C8H10	0.0000	0.0000	0.00	0.0100	0.0100	5
Xylenes	C8H10	0.0018	0.0092	5.04	0.0022	0.0110	6
2,2,4-Trimethylpentane	C8H18	0.0001	0.0003	0.15	0.0017	0.0091	5
Total HAP	C6 thru C8	0.0808	0.3352	184.47	0.1085	0.4210	231

ATTACHMENT Hb - Extended Gas Analysis

Legacy Measurement Solutions
Shreveport, LA
318-226-7237

Good
LELAP Certification #
04049

Customer	: 2259 - WILLIAMS	**Date Sampled**	: 03/16/2015
Station ID	: 52047-50	**Date Analyzed**	: 03/24/2015
Cylinder ID	: w7049	**Effective Date**	: 04/01/2015
Producer	:	**Cyl Pressure**	: 1,060
Lease	: MCCLAIN 1H	**Temp**	: 61
Area	: 500 - OVM-CAMERON	**Cylinder Type**	: Spot
State	: WV	**Sample By**	: DP

COMPONENT	MOL%	GPM@14.73(PSIA)
Oxygen	0.0039	0.000
Nitrogen	0.5844	0.000
Methane	76.8365	0.000
Carbon-Dioxide	0.1443	0.000
Ethane	14.8823	3.993
Propane	5.0813	1.405
Iso-Butane	0.4955	0.163
Normal-Butane	1.2243	0.387
Iso-Pentane	0.2081	0.076
Normal-Pentane	0.2702	0.098
2,2-Dimethylbutane	0.0037	0.002
2,3-Dimethylbutane/CycloC5	0.0097	0.003
2-methylpentane	0.0470	0.020
3-methylpentane	0.0267	0.011
Normal-Hexane	0.0752	0.031
2,2-Dimethylpentane	0.0004	0.000
Methylcyclopentane	0.0088	0.003
BENZENE	0.0013	0.000
3,3-Dimethylpentane	0.0000	0.000
CYCLOHEXANE	0.0078	0.003
2-Methylhexane	0.0113	0.005
2,3-Dimethylpentane	0.0026	0.001
3-Methylhexane	0.0120	0.006
1,t2-DMCYC5 / 2,2,4-TMC5	0.0002	0.000
1,t3-Dimethylcyclopentane	0.0003	0.000
N-Heptane	0.0213	0.010
METHYLCYCLOHEXANE	0.0104	0.005
2,5-Dimethylhexane	0.0006	0.000
2,3-Dimethylhexane	0.0013	0.001
TOLUENE	0.0024	0.001
2-Methylheptane	0.0037	0.002
4-Methylheptane	0.0015	0.001
3-Methylheptane	0.0029	0.001
1,t4-Dimethylcyclohexane	0.0017	0.001
N-OCTANE / 1,T2-DMCYC6	0.0062	0.003
1,t3-DMCYC6/1,C4-DMCYC6/1,C2,C3-TMCYC5	0.0000	0.000
2,4,4 TMC6	0.0000	0.000
2,6-Dimethylheptane / 1,C2-DMCYC6	0.0011	0.001
Ethylcyclohexane	0.0000	0.000
O-XYLENE	0.0000	0.000
NONANE	0.0032	0.002
N-DECANE	0.0014	0.001
N-UNDECANE	0.0027	0.002
M-Xylene/P-Xylene	0.0018	0.001
TOTAL	**100.0000**	**6.239**

Wellhead Natural Gas

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Revision Date: 10/02/2013 Version: 1.0

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY

Product Identifier

Product Form: Mixture

Product Name: Wellhead Natural Gas

Synonyms: Wellhead Gas, Raw Gas, Methane, Residue Gas, Natural Gas Sweet, Marsh Gas, Fuel Gas, Petroleum Gas.

Intended Use of the Product

Use of the Substance/Mixture: Fuel.

Name, Address, and Telephone of the Responsible Party

Company

Williams, Inc.
One Williams Center
Tulsa, OK 74172, US
T 800-688-7507
enterpriseehs@williams.com

Emergency Telephone Number

Emergency number : 800-424-9300

SECTION 2: HAZARDS IDENTIFICATION

Classification of the Substance or Mixture

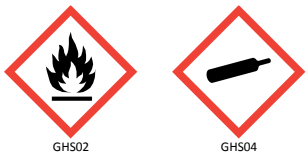
Classification (GHS-US)

Simple Asphy
Flam. Gas 1 H220
Compressed gas H280

Label Elements

GHS-US Labeling

Hazard Pictograms (GHS-US) :



GHS02 GHS04

Signal Word (GHS-US) : Danger

Hazard Statements (GHS-US) : H220 - Extremely flammable gas
H280 - Contains gas under pressure; may explode if heated
May displace oxygen and cause rapid suffocation

Precautionary Statements (GHS-US) : P210 - Keep away from heat, sparks, open flames, hot surfaces. - No smoking.
P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381 - Eliminate all ignition sources if safe to do so.
P403 - Store in a well-ventilated place.
P410+P403 - Protect from sunlight. Store in a well-ventilated place.

Other Hazards

Other Hazards Not Contributing to the Classification: Contains hydrogen sulfide. Hydrogen sulfide is a highly flammable, explosive gas under certain conditions, is a toxic gas, and may be fatal. Gas can accumulate in the headspace of closed containers, use caution when opening sealed containers. Heating the product or containers can cause thermal decomposition of the product and release hydrogen sulfide. Exposure may aggravate those with pre existing eye, skin, or respiratory conditions.

Unknown Acute Toxicity (GHS-US) Not available

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Mixture

Name	Product identifier	% (w/w)	Classification (GHS-US)
Methane	(CAS No) 74-82-8	> 75	Simple Asphy

Wellhead Natural Gas

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

			Flam. Gas 1, H220 Liquefied gas, H280
Ethane	(CAS No) 74-84-0	< 20	Simple Asphy Flam. Gas 1, H220 Liquefied gas, H280
Propane	(CAS No) 74-98-6	< 10	Simple Asphy Flam. Gas 1, H220 Liquefied gas, H280
Carbon dioxide	(CAS No) 124-38-9	< 10	Simple Asphy Compressed gas, H280
Butane	(CAS No) 106-97-8	< 5	Simple Asphy Flam. Gas 1, H220 Liquefied gas, H280
Nitrogen	(CAS No) 7727-37-9	< 5	Simple Asphy Compressed gas, H280
Hydrogen sulfide	(CAS No) 7783-06-4	<= 0.0004	Flam. Gas 1, H220 Liquefied gas, H280 Acute Tox. 2 (Inhalation:gas), H330 Aquatic Acute 1, H400

Full text of H-phrases: see section 16

SECTION 4: FIRST AID MEASURES

Description of First Aid Measures

General: Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible). If frostbite or freezing occurs, immediately flush with plenty of lukewarm water to GENTLY warm the affected area. Do not use hot water. Do not rub affected area. Get immediate medical attention.

Inhalation: When symptoms occur: go into open air and ventilate suspected area.Remove to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER/doctor/physician if you feel unwell

Skin Contact: Remove contaminated clothing. Drench affected area with water for at least 15 minutes. Obtain medical attention if irritation persists.Thaw frosted parts with lukewarm water. Do not rub affected area.

Eye Contact: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.Obtain medical attention if irritation persists

Ingestion: Rinse mouth.Do NOT induce vomiting.Get immediate medical attention.

Most Important Symptoms and Effects Both Acute and Delayed

General: May cause frostbite on contact with the liquid.Butane is an asphyxiant. Lack of oxygen can be fatal

Inhalation: Gas can be toxic as a simple asphyxiant by displacing oxygen from the air.Asphyxia by lack of oxygen: risk of death.May cause drowsiness or dizziness

Skin Contact: Contact with the liquid may cause cold burns/frostbite

Eye Contact: This gas is non-irritating; but direct contact with liquefied/pressurized gas or frost particles may produce severe and possibly permanent eye damage from freeze burns

Ingestion: Ingestion is not considered a potential route of exposure. Non-irritating; but solid and liquid forms of this material and pressurized gas may cause freeze burns.

Chronic Symptoms: Contains a small amount of Hydrogen Sulfide, symptoms of overexposure are headaches, dizziness, nausea, coughing, respiratory irritation, eye irritation, skin irritation, pain in the nose, and loss of consciousness. Heating of the product may release higher amounts of Hydrogen Sulfide (H_2S).

Indication of Any Immediate Medical Attention and Special Treatment Needed

If exposed or concerned, get medical advice and attention.

SECTION 5: FIREFIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media: Foam, dry chemical, carbon dioxide, water spray, fog

Unsuitable Extinguishing Media: Do not use a heavy water stream. Use of heavy stream of water may spread fire

Special Hazards Arising From the Substance or Mixture

Fire Hazard: Extremely flammable gas

Explosion Hazard: May form flammable/explosive vapor-air mixture.Heating may cause an explosion.Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries.

Reactivity: Hazardous reactions will not occur under normal conditions.

Advice for Firefighters

Precautionary Measures Fire: Exercise caution when fighting any chemical fire

Firefighting Instructions: Leaking gas fire: Do not extinguish, unless leak can be stopped safely.In case of leaking gas fire, eliminate all ignition sources if safe to do so.Use water spray or fog for cooling exposed containers.In case of major fire and large quantities: Evacuate area. Fight fire remotely due to the risk of explosion.

Protection During Firefighting: Do not enter fire area without proper protective equipment, including respiratory protection.

Hazardous Combustion Products: Carbon oxides (CO, CO_2).Hydrocarbon, sulfur dioxide (SO_2), and Hydrogen sulfide (H_2S) fatal and irritating gases

Other information: Do not allow run-off from fire fighting to enter drains or water courses

Reference to Other Sections

Refer to section 9 for flammability properties.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

General Measures: Use special care to avoid static electric charges.Eliminate every possible source of ignition.Keep away from heat/sparks/open flames/hot surfaces - No smoking.Avoid breathing (dust, vapor, mist, gas).Use only outdoors or in a well-ventilated area.Ruptured cylinders may rocket.Do not allow product to spread into the environment

For Non-Emergency Personnel

Protective Equipment: Use appropriate personal protection equipment (PPE).

Emergency Procedures: Evacuate unnecessary personnel.

For Emergency Personnel

Protective Equipment: Equip cleanup crew with proper protection.

Emergency Procedures: Ventilate area.

Environmental Precautions

Prevent entry to sewers and public waters.Avoid release to the environment

Methods and Material for Containment and Cleaning Up

For Containment: Notify authorities if liquid enters sewers or public waters.Use only non-sparking tools

Methods for Cleaning Up: Clear up spills immediately and dispose of waste safely.Isolate area until gas has dispersed.Use water spray to disperse vapors.For water based spills contact appropriate authorities and abide by local regulations for hydrocarbon spills into waterways.Contact competent authorities after a spill

Reference to Other Sections

See heading 8, Exposure Controls and Personal Protection.

SECTION 7: HANDLING AND STORAGE

Precautions for Safe Handling

Additional Hazards When Processed: Handle empty containers with care because residual vapors are flammable.Extremely flammable gas.Do not pressurize, cut, or weld containers. Do not puncture or incinerate container.Liquid gas can cause frost-type burns. If stored under heat for extended periods or significantly agitated, this material might evolve or release hydrogen sulfide, a toxic, flammable gas, which can raise and widen this material's actual flammability limits and significantly lower its auto-ignition temperature. Hydrogen sulfide can be fatal.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures.Wash hands and other exposed areas with mild soap and water before eating, drinking, or smoking and again when leaving work.Do no eat, drink or smoke when using this product

Technical Measures: Proper grounding procedures to avoid static electricity should be followed.Comply with applicable regulations.

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Storage Conditions: Store in a dry, cool and well-ventilated place.Keep container closed when not in use. Keep in fireproof place.Store in a well-ventilated place. Keep container tightly closed.Keep/Store away from extremely high or low temperatures, ignition sources, direct sunlight, incompatible materials. Store in original container.

Incompatible Materials: strong acids,Strong bases,Strong oxidizers,chlorine,Halogenated compounds

Conditions for Safe Storage, Including Any Incompatibilities Not available

Specific End Use(s)

Fuel.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

Hydrogen sulfide (7783-06-4)		
USA ACGIH	ACGIH TWA (ppm)	1 ppm
USA ACGIH	ACGIH STEL (ppm)	5 ppm
USA OSHA	OSHA PEL (Ceiling) (ppm)	20 ppm
USA NIOSH	NIOSH REL (ceiling) (mg/m3)	15 mg/m³
USA NIOSH	NIOSH REL (ceiling) (ppm)	10 ppm
USA IDLH	US IDLH (ppm)	100 ppm
Alberta	OEL Ceiling (mg/m³)	21 mg/m³
Alberta	OEL Ceiling (ppm)	15 ppm
Alberta	OEL TWA (mg/m³)	14 mg/m³
Alberta	OEL TWA (ppm)	10 ppm
British Columbia	OEL Ceiling (ppm)	10 ppm
Manitoba	OEL STEL (ppm)	5 ppm
Manitoba	OEL TWA (ppm)	1 ppm
New Brunswick	OEL STEL (mg/m³)	21 mg/m³
New Brunswick	OEL STEL (ppm)	15 ppm
New Brunswick	OEL TWA (mg/m³)	14 mg/m³
New Brunswick	OEL TWA (ppm)	10 ppm
Newfoundland & Labrador	OEL STEL (ppm)	5 ppm
Newfoundland & Labrador	OEL TWA (ppm)	1 ppm
Nova Scotia	OEL STEL (ppm)	5 ppm
Nova Scotia	OEL TWA (ppm)	1 ppm
Nunavut	OEL Ceiling (mg/m³)	28 mg/m³
Nunavut	OEL Ceiling (ppm)	20 ppm
Nunavut	OEL STEL (mg/m³)	21 mg/m³
Nunavut	OEL STEL (ppm)	15 ppm
Nunavut	OEL TWA (mg/m³)	14 mg/m³
Nunavut	OEL TWA (ppm)	10 ppm
Northwest Territories	OEL Ceiling (mg/m³)	28 mg/m³
Northwest Territories	OEL Ceiling (ppm)	20 ppm
Northwest Territories	OEL STEL (mg/m³)	21 mg/m³
Northwest Territories	OEL STEL (ppm)	15 ppm
Northwest Territories	OEL TWA (mg/m³)	14 mg/m³
Northwest Territories	OEL TWA (ppm)	10 ppm
Ontario	OEL STEL (ppm)	15 ppm
Ontario	OEL TWA (ppm)	10 ppm
Prince Edward Island	OEL STEL (ppm)	5 ppm
Prince Edward Island	OEL TWA (ppm)	1 ppm
Québec	VECD (mg/m³)	21 mg/m³
Québec	VECD (ppm)	15 ppm

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Québec	VEMP (mg/m³)	14 mg/m³
Québec	VEMP (ppm)	10 ppm
Saskatchewan	OEL STEL (ppm)	15 ppm
Saskatchewan	OEL TWA (ppm)	10 ppm
Yukon	OEL STEL (mg/m³)	27 mg/m³
Yukon	OEL STEL (ppm)	15 ppm
Yukon	OEL TWA (mg/m³)	15 mg/m³
Yukon	OEL TWA (ppm)	10 ppm

Propane (74-98-6)		
USA ACGIH	ACGIH TWA (ppm)	1000 ppm
USA OSHA	OSHA PEL (TWA) (mg/m3)	1800 mg/m³
USA OSHA	OSHA PEL (TWA) (ppm)	1000 ppm
USA NIOSH	NIOSH REL (TWA) (mg/m3)	1800 mg/m³
USA NIOSH	NIOSH REL (TWA) (ppm)	1000 ppm
USA IDLH	US IDLH (ppm)	2100 ppm (10% LEL)
Alberta	OEL TWA (ppm)	1000 ppm
British Columbia	OEL TWA (ppm)	1000 ppm
Manitoba	OEL TWA (ppm)	1000 ppm
Newfoundland & Labrador	OEL TWA (ppm)	1000 ppm
Nova Scotia	OEL TWA (ppm)	1000 ppm
Ontario	OEL TWA (ppm)	1000 ppm
Prince Edward Island	OEL TWA (ppm)	1000 ppm
Québec	VEMP (mg/m³)	1800 mg/m³
Québec	VEMP (ppm)	1000 ppm
Saskatchewan	OEL STEL (ppm)	1250 ppm
Saskatchewan	OEL TWA (ppm)	1000 ppm

Butane (106-97-8)		
USA ACGIH	ACGIH TWA (ppm)	1000 ppm
USA NIOSH	NIOSH REL (TWA) (mg/m3)	1900 mg/m³
USA NIOSH	NIOSH REL (TWA) (ppm)	800 ppm
Alberta	OEL TWA (ppm)	1000 ppm
British Columbia	OEL STEL (ppm)	750 ppm
British Columbia	OEL TWA (ppm)	600 ppm
Manitoba	OEL TWA (ppm)	1000 ppm
New Brunswick	OEL TWA (mg/m³)	1900 mg/m³
New Brunswick	OEL TWA (ppm)	800 ppm
Newfoundland & Labrador	OEL TWA (ppm)	1000 ppm
Nova Scotia	OEL TWA (ppm)	1000 ppm
Nunavut	OEL STEL (mg/m³)	2576 mg/m³
Nunavut	OEL STEL (ppm)	1000 ppm
Nunavut	OEL TWA (mg/m³)	1901 mg/m³
Nunavut	OEL TWA (ppm)	800 ppm
Northwest Territories	OEL STEL (mg/m³)	2576 mg/m³
Northwest Territories	OEL STEL (ppm)	1000 ppm
Northwest Territories	OEL TWA (mg/m³)	1901 mg/m³
Northwest Territories	OEL TWA (ppm)	800 ppm
Ontario	OEL TWA (ppm)	800 ppm
Prince Edward Island	OEL TWA (ppm)	1000 ppm
Québec	VEMP (mg/m³)	1900 mg/m³

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Québec	VEMP (ppm)	800 ppm
Saskatchewan	OEL STEL (ppm)	1250 ppm
Saskatchewan	OEL TWA (ppm)	1000 ppm
Yukon	OEL STEL (mg/m³)	1600 mg/m³
Yukon	OEL STEL (ppm)	750 ppm
Yukon	OEL TWA (mg/m³)	1400 mg/m³
Yukon	OEL TWA (ppm)	600 ppm

Carbon dioxide (124-38-9)		
USA ACGIH	ACGIH TWA (ppm)	5000 ppm
USA ACGIH	ACGIH STEL (ppm)	30000 ppm
USA OSHA	OSHA PEL (TWA) (mg/m3)	9000 mg/m³
USA OSHA	OSHA PEL (TWA) (ppm)	5000 ppm
USA NIOSH	NIOSH REL (TWA) (mg/m3)	9000 mg/m³
USA NIOSH	NIOSH REL (TWA) (ppm)	5000 ppm
USA NIOSH	NIOSH REL (STEL) (mg/m3)	54000 mg/m³
USA NIOSH	NIOSH REL (STEL) (ppm)	30000 ppm
USA IDLH	US IDLH (ppm)	40000 ppm
Alberta	OEL STEL (mg/m³)	54000 mg/m³
Alberta	OEL STEL (ppm)	30000 ppm
Alberta	OEL TWA (mg/m³)	9000 mg/m³
Alberta	OEL TWA (ppm)	5000 ppm
British Columbia	OEL STEL (ppm)	15000 ppm
British Columbia	OEL TWA (ppm)	5000 ppm
Manitoba	OEL STEL (ppm)	30000 ppm
Manitoba	OEL TWA (ppm)	5000 ppm
New Brunswick	OEL STEL (mg/m³)	54000 mg/m³
New Brunswick	OEL STEL (ppm)	30000 ppm
New Brunswick	OEL TWA (mg/m³)	9000 mg/m³
New Brunswick	OEL TWA (ppm)	5000 ppm
Newfoundland & Labrador	OEL STEL (ppm)	30000 ppm
Newfoundland & Labrador	OEL TWA (ppm)	5000 ppm
Nova Scotia	OEL STEL (ppm)	30000 ppm
Nova Scotia	OEL TWA (ppm)	5000 ppm
Nunavut	OEL STEL (mg/m³)	27000 mg/m³
Nunavut	OEL STEL (ppm)	15000 ppm
Nunavut	OEL TWA (mg/m³)	9000 mg/m³
Nunavut	OEL TWA (ppm)	5000 ppm
Northwest Territories	OEL STEL (mg/m³)	27000 mg/m³
Northwest Territories	OEL STEL (ppm)	15000 ppm
Northwest Territories	OEL TWA (mg/m³)	9000 mg/m³
Northwest Territories	OEL TWA (ppm)	5000 ppm
Ontario	OEL STEL (ppm)	30000 ppm
Ontario	OEL TWA (ppm)	5000 ppm
Prince Edward Island	OEL STEL (ppm)	30000 ppm
Prince Edward Island	OEL TWA (ppm)	5000 ppm
Québec	VECD (mg/m³)	54000 mg/m³
Québec	VECD (ppm)	30000 ppm
Québec	VEMP (mg/m³)	9000 mg/m³
Québec	VEMP (ppm)	5000 ppm
Saskatchewan	OEL STEL (ppm)	30000 ppm

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Saskatchewan	OEL TWA (ppm)	5000 ppm
Yukon	OEL STEL (mg/m³)	27000 mg/m³
Yukon	OEL STEL (ppm)	15000 ppm
Yukon	OEL TWA (mg/m³)	9000 mg/m³
Yukon	OEL TWA (ppm)	5000 ppm

Nitrogen (7727-37-9)		

Methane (74-82-8)		
USA ACGIH	ACGIH TWA (ppm)	1000 ppm
British Columbia	OEL TWA (ppm)	1000 ppm
Manitoba	OEL TWA (ppm)	1000 ppm
Newfoundland & Labrador	OEL TWA (ppm)	1000 ppm
Nova Scotia	OEL TWA (ppm)	1000 ppm
Ontario	OEL TWA (ppm)	1000 ppm
Prince Edward Island	OEL TWA (ppm)	1000 ppm
Saskatchewan	OEL STEL (ppm)	1250 ppm
Saskatchewan	OEL TWA (ppm)	1000 ppm

Ethane (74-84-0)		
USA ACGIH	ACGIH TWA (ppm)	1000 ppm
Alberta	OEL TWA (ppm)	1000 ppm
British Columbia	OEL TWA (ppm)	1000 ppm
Manitoba	OEL TWA (ppm)	1000 ppm
Newfoundland & Labrador	OEL TWA (ppm)	1000 ppm
Nova Scotia	OEL TWA (ppm)	1000 ppm
Ontario	OEL TWA (ppm)	1000 ppm
Prince Edward Island	OEL TWA (ppm)	1000 ppm
Saskatchewan	OEL STEL (ppm)	1250 ppm
Saskatchewan	OEL TWA (ppm)	1000 ppm

Exposure Controls

Appropriate Engineering Controls: Gas detectors should be used when flammable gases/vapours may be released.Ensure adequate ventilation, especially in confined areas.Proper grounding procedures to avoid static electricity should be followed.Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.Use explosion-proof equipment

Personal Protective Equipment: Protective goggles.Protective clothing.Respiratory protection of the dependent type.Insulated gloves

Materials for Protective Clothing: Chemically resistant materials and fabrics.Wear fire/flame resistant/retardant clothing

Hand Protection: Wear chemically resistant protective gloves.Insulated gloves

Eye Protection: Chemical goggles or face shield.

Skin and Body Protection: Not available

Respiratory Protection: Use a NIOSH-approved self-contained breathing apparatus whenever exposure may exceed established Occupational Exposure Limits.

Thermal Hazard Protection: Wear suitable protective clothing.

Other Information: When using, do not eat, drink or smoke.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on Basic Physical and Chemical Properties

Physical State : Gas

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Appearance	:	Clear, Colorless gas
Odor	:	Contains Ethyl Mercaptan for leak detection, which has a skunk-like odor, odorless.
Odor Threshold	:	Not available
pH	:	Not available
Relative Evaporation Rate (butylacetate=1)	:	Not available
Melting Point	:	Not available
Freezing Point	:	Not available
Boiling Point	:	-157 °C (-250.6°F)
Flash Point	:	-187 °C (-304.6°F)
Auto-ignition Temperature	:	> 288 °C (>550.4°F)
Decomposition Temperature	:	Not available
Flammability (solid, gas)	:	Extremely flammable gas
Lower Flammable Limit	:	3 %
Upper Flammable Limit	:	17 %
Vapor Pressure	:	40 mm Hg @25°C (77°F)
Relative Vapor Density at 20 °C	:	0.6
Relative Density	:	Not available
Specific Gravity	:	Not available
Solubility	:	Not available
Log Pow	:	Not available
Log Kow	:	Not available
Viscosity, Kinematic	:	Not available
Viscosity, Dynamic	:	Not available
Explosion Data – Sensitivity to Mechanical Impact	:	Not available
Explosion Data – Sensitivity to Static Discharge	:	Not available

SECTION 10: STABILITY AND REACTIVITY

Reactivity: Hazardous reactions will not occur under normal conditions.

Chemical Stability: Extremely flammable gas.Stable at standard temperature and pressure.

Possibility of Hazardous Reactions: Hazardous polymerization will not occur.

Conditions to Avoid: Direct sunlight.Extremely high or low temperatures.Open flame.Overheating.Heat.Sparks.Incompatible materials. Avoid ignition sources

Incompatible Materials: Strong acids.Strong bases.Strong oxidizers.Halogenated compounds.Chlorine

Hazardous Decomposition Products: Carbon oxides (CO, CO2).hydrocarbons. Sulfur dioxide and hydrogen sulfide are fatal and irritating gases.

SECTION 11: TOXICOLOGICAL INFORMATION

Information on Toxicological Effects - Product

Acute Toxicity : Not classified

LD50 and LC50 Data Not available

Skin Corrosion/Irritation: Not classified

Serious Eye Damage/Irritation: Not classified

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: Not classified

Specific Target Organ Toxicity (Repeated Exposure): Not classified

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): Not classified

Aspiration Hazard: Not classified

Symptoms/Injuries After Inhalation: Gas can be toxic as a simple asphyxiant by displacing oxygen from the air. Asphyxia by lack of oxygen: risk of death. May cause drowsiness or dizziness.

Symptoms/Injuries After Skin Contact: Contact with the liquid may cause cold burns/frostbite.

Symptoms/Injuries After Eye Contact: This gas is non-irritating; but direct contact with liquefied/pressurized gas or frost particles may produce severe and possibly permanent eye damage from freeze burns.

Symptoms/Injuries After Ingestion: Ingestion is not considered a potential route of exposure. Non-irritating; but solid and liquid forms of this material and pressurized gas may cause freeze burns.

Information on Toxicological Effects - Ingredient(s)

LD50 and LC50 Data

Hydrogen sulfide (7783-06-4)	
LC50 Inhalation Rat (mg/l)	0.99 mg/l (Exposure time: 1 h)
ATE (gases)	100.000 ppmV/4h

Propane (74-98-6)	
LC50 Inhalation Rat (mg/l)	658 mg/l (Exposure time: 4 h)

Butane (106-97-8)	
LC50 Inhalation Rat (mg/l)	658 mg/l (Exposure time: 4 h)

Ethane (74-84-0)	
LC50 Inhalation Rat (mg/l)	658 mg/l (Exposure time: 4 h)

SECTION 12: ECOLOGICAL INFORMATION

Toxicity

Wellhead Natural Gas (CAS Mixture)	
LC50 Fish 1	0.002 mg/l (Exposure time: 96 h - Species: Coregonus clupeaformis)

Hydrogen sulfide (7783-06-4)	
LC50 Fish 1	0.0448 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [flow-through])
EC50 Daphnia 1	0.022 mg/l (Exposure time: 96 h - Species: Gammarus pseudolimnaeus)
LC 50 Fish 2	0.016 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through])

Persistence and Degradability

Wellhead Natural Gas	
Persistence and Degradability	Not established.

Bioaccumulative Potential

Wellhead Natural Gas	
Bioaccumulative Potential	Not established.

Hydrogen sulfide (7783-06-4)	
BCF fish 1	(no bioaccumulation expected)
Log Pow	0.45 (at 25 °C)

Propane (74-98-6)	
Log Pow	2.3

Butane (106-97-8)	
Log Pow	2.89

Carbon dioxide (124-38-9)	
BCF fish 1	(no bioaccumulation)
Log Pow	0.83

Ethane (74-84-0)	
Log Pow	<= 2.8

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Mobility in Soil Not available

Other Adverse Effects

Other adverse effects: Can cause frost damage to vegetation. Has photochemical ozone creation potential.

Other Information: Avoid release to the environment.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal Recommendations: Dispose of waste material in accordance with all local, regional, national, provincial, territorial and international regulations.

Additional Information: Handle empty containers with care because residual vapors are flammable. Empty gas cylinders should be returned to the vendor for recycling or refilling.

SECTION 14: TRANSPORT INFORMATION

In Accordance With ICAO/IATA/DOT/TDG

UN Number

UN-No.(DOT): 1971

DOT NA no.: UN1971

UN Proper Shipping Name

DOT Proper Shipping Name : Natural gas, compressed (with high methane content)

Hazard Labels (DOT) : 2.1 - Flammable gases

DOT Packaging Exceptions (49 CFR 173.xxx) : 306

DOT Packaging Non Bulk (49 CFR 173.xxx) : 302

DOT Packaging Bulk (49 CFR 173.xxx) : 302

Additional Information

Emergency Response Guide (ERG) Number : 115

Transport by sea

DOT Vessel Stowage Location : E - The material may be stowed ''on deck'' or ''under deck'' on a cargo vessel and on a passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers, or one passenger per each 3 m of overall vessel length, but is prohibited from carriage on passenger vessels in which the limiting number of passengers is exceeded.

DOT Vessel Stowage Other : 40 - Stow ''clear of living quarters''

Air transport

DOT Quantity Limitations Passenger Aircraft/Rail (49 CFR 173.27) : Forbidden

DOT Quantity Limitations Cargo Aircraft Only (49 CFR 175.75) : 150 kg

SECTION 15: REGULATORY INFORMATION

US Federal Regulations

Wellhead Natural Gas	
SARA Section 311/312 Hazard Classes	Fire hazard Immediate (acute) health hazard Sudden release of pressure hazard

Hydrogen sulfide (7783-06-4)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
Listed on SARA Section 302 (Specific toxic chemical listings)	
Listed on SARA Section 313 (Specific toxic chemical listings)	
SARA Section 302 Threshold Planning Quantity (TPQ)	500
SARA Section 313 - Emission Reporting	1.0 %

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Propane (74-98-6)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

Butane (106-97-8)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

Carbon dioxide (124-38-9)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

Nitrogen (7727-37-9)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

Methane (74-82-8)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

Ethane (74-84-0)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

US State Regulations

Hydrogen sulfide (7783-06-4)
U.S. - California - SCAQMD - Toxic Air Contaminants - Non-Cancer Acute
U.S. - California - SCAQMD - Toxic Air Contaminants - Non-Cancer Chronic
U.S. - California - Toxic Air Contaminant List (AB 1807, AB 2728)
U.S. - Colorado - Hazardous Wastes - Discarded Chemical Products, Off-Specification Species, Container and Spill Residues
U.S. - Connecticut - Hazardous Air Pollutants - HLVs (30 min)
U.S. - Connecticut - Hazardous Air Pollutants - HLVs (8 hr)
U.S. - Delaware - Accidental Release Prevention Regulations - Sufficient Quantities
U.S. - Delaware - Accidental Release Prevention Regulations - Threshold Quantities
U.S. - Delaware - Accidental Release Prevention Regulations - Toxic Endpoints
U.S. - Delaware - Pollutant Discharge Requirements - Reportable Quantities
U.S. - Hawaii - Occupational Exposure Limits - STELs
U.S. - Hawaii - Occupational Exposure Limits - TWAs
U.S. - Idaho - Non-Carcinogenic Toxic Air Pollutants - Acceptable Ambient Concentrations
U.S. - Idaho - Non-Carcinogenic Toxic Air Pollutants - Emission Levels (ELs)
U.S. - Idaho - Occupational Exposure Limits - Acceptable Maximum Peak Above the Ceiling Concentration for an 8-Hour Shift
U.S. - Idaho - Occupational Exposure Limits - Ceilings
U.S. - Idaho - Occupational Exposure Limits - TWAs
U.S. - Louisiana - Reportable Quantity List for Pollutants
U.S. - Maine - Air Pollutants - Hazardous Air Pollutants
U.S. - Massachusetts - Allowable Ambient Limits (AALs)
U.S. - Massachusetts - Allowable Threshold Concentrations (ATCs)
U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 1
U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 2
U.S. - Massachusetts - Oil & Hazardous Material List - Reportable Quantity
U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 1
U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 2
U.S. - Massachusetts - Right To Know List
U.S. - Massachusetts - Threshold Effects Exposure Limits (TELs)
U.S. - Michigan - Occupational Exposure Limits - STELs
U.S. - Michigan - Occupational Exposure Limits - TWAs
U.S. - Michigan - Polluting Materials List
U.S. - Michigan - Process Safety Management Highly Hazardous Chemicals
U.S. - Minnesota - Chemicals of High Concern
U.S. - Minnesota - Hazardous Substance List
U.S. - Minnesota - Permissible Exposure Limits - STELs
U.S. - Minnesota - Permissible Exposure Limits - TWAs

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U.S. - Montana - Ambient Air Quality Standards
U.S. - New Hampshire - Regulated Toxic Air Pollutants - Ambient Air Levels (AALs) - 24-Hour
U.S. - New Hampshire - Regulated Toxic Air Pollutants - Ambient Air Levels (AALs) - Annual
U.S. - New Jersey - Discharge Prevention - List of Hazardous Substances
U.S. - New Jersey - Environmental Hazardous Substances List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - New Jersey - Special Health Hazards Substances List
U.S. - New Jersey - TCPA - Extraordinarily Hazardous Substances (EHS)
U.S. - New Mexico - Air Quality - Ambient Air Quality Standards
U.S. - New York - Occupational Exposure Limits - TWAs
U.S. - New York - Reporting of Releases Part 597 - List of Hazardous Substances
U.S. - North Carolina - Control of Toxic Air Pollutants
U.S. - North Dakota - Ambient Air Quality Standards - Maximum Permissible Concentrations
U.S. - North Dakota - Hazardous Wastes - Discarded Chemical Products, Off-Specification Species, Container and Spill Residues
U.S. - Ohio - Accidental Release Prevention - Threshold Quantities
U.S. - Ohio - Extremely Hazardous Substances - Threshold Quantities
U.S. - Oregon - Permissible Exposure Limits - Ceilings
U.S. - Oregon - Permissible Exposure Limits - STELs
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List
U.S. - Pennsylvania - RTK (Right to Know) List
U.S. - Rhode Island - Air Toxics - Acceptable Ambient Levels - 1-Hour
U.S. - Rhode Island - Air Toxics - Acceptable Ambient Levels - 24-Hour
U.S. - Rhode Island - Air Toxics - Acceptable Ambient Levels - Annual
U.S. - South Carolina - Toxic Air Pollutants - Maximum Allowable Concentrations
U.S. - South Carolina - Toxic Air Pollutants - Pollutant Categories
U.S. - Tennessee - Occupational Exposure Limits - STELs
U.S. - Tennessee - Occupational Exposure Limits - TWAs
U.S. - Texas - Drinking Water Standards - Secondary Constituent Levels (SCLs)
U.S. - Texas - Effects Screening Levels - Long Term
U.S. - Texas - Effects Screening Levels - Short Term
U.S. - Vermont - Hazardous Waste - Hazardous Constituents
U.S. - Vermont - Permissible Exposure Limits - STELs
U.S. - Vermont - Permissible Exposure Limits - TWAs
U.S. - Virginia - Water Quality Standards - Chronic Freshwater Aquatic Life
U.S. - Virginia - Water Quality Standards - Chronic Saltwater Aquatic Life
U.S. - Washington - Dangerous Waste - Dangerous Waste Constituents List
U.S. - Washington - Dangerous Waste - Discarded Chemical Products List
U.S. - Washington - Permissible Exposure Limits - STELs
U.S. - Washington - Permissible Exposure Limits - TWAs
U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights 25 Feet to Less Than 40 Feet
U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights 40 Feet to Less Than 75 Feet
U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights 75 Feet or Greater
U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights Less Than 25 Feet
U.S. - Wyoming - Process Safety Management - Highly Hazardous Chemicals
U.S. - Alaska - Water Quality Standards - Chronic Aquatic Life Criteria for Fresh Water
U.S. - Alaska - Water Quality Standards - Chronic Aquatic Life Criteria for Marine Water

Propane (74-98-6)

U.S. - Connecticut - Hazardous Air Pollutants - HLVs (30 min)
U.S. - Connecticut - Hazardous Air Pollutants - HLVs (8 hr)
U.S. - Delaware - Accidental Release Prevention Regulations - Sufficient Quantities
U.S. - Delaware - Accidental Release Prevention Regulations - Threshold Quantities
U.S. - Delaware - Pollutant Discharge Requirements - Reportable Quantities

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U.S. - Hawaii - Occupational Exposure Limits - TWAs
U.S. - Idaho - Occupational Exposure Limits - TWAs
U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 1
U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 2
U.S. - Massachusetts - Oil & Hazardous Material List - Reportable Quantity
U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 1
U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 2
U.S. - Massachusetts - Right To Know List
U.S. - Michigan - Occupational Exposure Limits - TWAs
U.S. - Minnesota - Hazardous Substance List
U.S. - Minnesota - Permissible Exposure Limits - TWAs
U.S. - New Jersey - Discharge Prevention - List of Hazardous Substances
U.S. - New Jersey - Environmental Hazardous Substances List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - New Jersey - Special Health Hazards Substances List
U.S. - New Jersey - TCPA - Extraordinarily Hazardous Substances (EHS)
U.S. - New York - Occupational Exposure Limits - TWAs
U.S. - Ohio - Accidental Release Prevention - Threshold Quantities
U.S. - Oregon - Permissible Exposure Limits - TWAs
U.S. - Pennsylvania - RTK (Right to Know) List
U.S. - Tennessee - Occupational Exposure Limits - TWAs
U.S. - Texas - Effects Screening Levels - Long Term
U.S. - Texas - Effects Screening Levels - Short Term
U.S. - Vermont - Permissible Exposure Limits - TWAs
U.S. - Washington - Permissible Exposure Limits - STELs
U.S. - Washington - Permissible Exposure Limits - TWAs

Butane (106-97-8)

U.S. - Connecticut - Hazardous Air Pollutants - HLVs (30 min)
U.S. - Connecticut - Hazardous Air Pollutants - HLVs (8 hr)
U.S. - Delaware - Accidental Release Prevention Regulations - Sufficient Quantities
U.S. - Delaware - Accidental Release Prevention Regulations - Threshold Quantities
U.S. - Delaware - Pollutant Discharge Requirements - Reportable Quantities
U.S. - Hawaii - Occupational Exposure Limits - TWAs
U.S. - Maine - Chemicals of High Concern
U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 1
U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 2
U.S. - Massachusetts - Oil & Hazardous Material List - Reportable Quantity
U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 1
U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 2
U.S. - Massachusetts - Right To Know List
U.S. - Michigan - Occupational Exposure Limits - TWAs
U.S. - Minnesota - Chemicals of High Concern
U.S. - Minnesota - Hazardous Substance List
U.S. - Minnesota - Permissible Exposure Limits - TWAs
U.S. - New Jersey - Discharge Prevention - List of Hazardous Substances
U.S. - New Jersey - Environmental Hazardous Substances List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - New Jersey - Special Health Hazards Substances List
U.S. - New Jersey - TCPA - Extraordinarily Hazardous Substances (EHS)
U.S. - Ohio - Accidental Release Prevention - Threshold Quantities
U.S. - Oregon - Permissible Exposure Limits - TWAs
U.S. - Pennsylvania - RTK (Right to Know) List

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U.S. - Tennessee - Occupational Exposure Limits - TWAs
U.S. - Texas - Effects Screening Levels - Long Term
U.S. - Texas - Effects Screening Levels - Short Term
U.S. - Vermont - Permissible Exposure Limits - TWAs
U.S. - Washington - Permissible Exposure Limits - STELs
U.S. - Washington - Permissible Exposure Limits - TWAs

Carbon dioxide (124-38-9)

U.S. - Hawaii - Occupational Exposure Limits - STELs
U.S. - Hawaii - Occupational Exposure Limits - TWAs
U.S. - Idaho - Occupational Exposure Limits - TWAs
U.S. - Maine - Air Pollutants - Greenhouse Gases (GHG)
U.S. - Massachusetts - Oil & Hazardous Material List - Reportable Quantity
U.S. - Massachusetts - Right To Know List
U.S. - Massachusetts - Volatile Organic Compounds Exempt From Requirements
U.S. - Michigan - Occupational Exposure Limits - STELs
U.S. - Michigan - Occupational Exposure Limits - TWAs
U.S. - Minnesota - Hazardous Substance List
U.S. - Minnesota - Permissible Exposure Limits - STELs
U.S. - Minnesota - Permissible Exposure Limits - TWAs
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - New York - Occupational Exposure Limits - TWAs
U.S. - Oregon - Permissible Exposure Limits - TWAs
U.S. - Pennsylvania - RTK (Right to Know) List
U.S. - Tennessee - Occupational Exposure Limits - STELs
U.S. - Tennessee - Occupational Exposure Limits - TWAs
U.S. - Texas - Effects Screening Levels - Long Term
U.S. - Texas - Effects Screening Levels - Short Term
U.S. - Vermont - Permissible Exposure Limits - STELs
U.S. - Vermont - Permissible Exposure Limits - TWAs
U.S. - Washington - Permissible Exposure Limits - STELs
U.S. - Washington - Permissible Exposure Limits - TWAs

Nitrogen (7727-37-9)

U.S. - Massachusetts - Oil & Hazardous Material List - Reportable Quantity
U.S. - Massachusetts - Right To Know List
U.S. - Minnesota - Hazardous Substance List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) List
U.S. - Washington - Permissible Exposure Limits - Simple Asphyxiants

Methane (74-82-8)

U.S. - Delaware - Accidental Release Prevention Regulations - Sufficient Quantities
U.S. - Delaware - Accidental Release Prevention Regulations - Threshold Quantities
U.S. - Delaware - Pollutant Discharge Requirements - Reportable Quantities
U.S. - Delaware - Volatile Organic Compounds Exempt from Requirements
U.S. - Maine - Air Pollutants - Greenhouse Gases (GHG)
U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 1
U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 2
U.S. - Massachusetts - Oil & Hazardous Material List - Reportable Quantity
U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 1
U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 2
U.S. - Massachusetts - Right To Know List
U.S. - Massachusetts - Volatile Organic Compounds Exempt From Requirements

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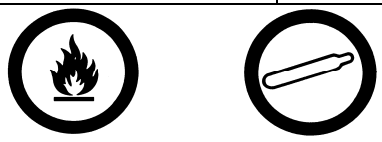
U.S. - Minnesota - Hazardous Substance List
U.S. - New Jersey - Discharge Prevention - List of Hazardous Substances
U.S. - New Jersey - Environmental Hazardous Substances List
U.S. - New Jersey - Excluded Volatile Organic Compounds
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - New Jersey - Special Health Hazards Substances List
U.S. - New Jersey - TCPA - Extraordinarily Hazardous Substances (EHS)
U.S. - Ohio - Accidental Release Prevention - Threshold Quantities
U.S. - Oregon - Permissible Exposure Limits - TWAs
U.S. - Pennsylvania - RTK (Right to Know) List
U.S. - Texas - Effects Screening Levels - Long Term
U.S. - Texas - Effects Screening Levels - Short Term
U.S. - Washington - Permissible Exposure Limits - Simple Asphyxiants

Ethane (74-84-0)

U.S. - Connecticut - Hazardous Air Pollutants - HLVs (30 min)
U.S. - Connecticut - Hazardous Air Pollutants - HLVs (8 hr)
U.S. - Delaware - Accidental Release Prevention Regulations - Sufficient Quantities
U.S. - Delaware - Accidental Release Prevention Regulations - Threshold Quantities
U.S. - Delaware - Pollutant Discharge Requirements - Reportable Quantities
U.S. - Delaware - Volatile Organic Compounds Exempt from Requirements
U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 1
U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 2
U.S. - Massachusetts - Oil & Hazardous Material List - Reportable Quantity
U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 1
U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 2
U.S. - Massachusetts - Right To Know List
U.S. - Massachusetts - Volatile Organic Compounds Exempt From Requirements
U.S. - Minnesota - Hazardous Substance List
U.S. - New Jersey - Discharge Prevention - List of Hazardous Substances
U.S. - New Jersey - Environmental Hazardous Substances List
U.S. - New Jersey - Excluded Volatile Organic Compounds
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - New Jersey - Special Health Hazards Substances List
U.S. - New Jersey - TCPA - Extraordinarily Hazardous Substances (EHS)
U.S. - Ohio - Accidental Release Prevention - Threshold Quantities
U.S. - Oregon - Permissible Exposure Limits - TWAs
U.S. - Pennsylvania - RTK (Right to Know) List
U.S. - Texas - Effects Screening Levels - Long Term
U.S. - Texas - Effects Screening Levels - Short Term
U.S. - Washington - Permissible Exposure Limits - Simple Asphyxiants

Canadian Regulations

Wellhead Natural Gas	
WHMIS Classification	Class B Division 1 - Flammable Gas Class A - Compressed Gas



Hydrogen sulfide (7783-06-4)

Listed on the Canadian DSL (Domestic Substances List) inventory.
Listed on the Canadian Ingredient Disclosure List

Wellhead Natural Gas

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WHMIS Classification	Class A - Compressed Gas Class B Division 1 - Flammable Gas Class D Division 1 Subdivision A - Very toxic material causing immediate and serious toxic effects Class D Division 2 Subdivision B - Toxic material causing other toxic effects

Propane (74-98-6)	
Listed on the Canadian DSL (Domestic Substances List) inventory.	
WHMIS Classification	Class A - Compressed Gas Class B Division 1 - Flammable Gas

Butane (106-97-8)	
Listed on the Canadian DSL (Domestic Substances List) inventory. Listed on the Canadian Ingredient Disclosure List	
WHMIS Classification	Class A - Compressed Gas Class B Division 1 - Flammable Gas

Carbon dioxide (124-38-9)	
Listed on the Canadian DSL (Domestic Substances List) inventory. Listed on the Canadian Ingredient Disclosure List	
WHMIS Classification	Class A - Compressed Gas

Nitrogen (7727-37-9)	
Listed on the Canadian DSL (Domestic Substances List) inventory.	
WHMIS Classification	Class A - Compressed Gas

Methane (74-82-8)	
Listed on the Canadian DSL (Domestic Substances List) inventory.	
WHMIS Classification	Class A - Compressed Gas Class B Division 1 - Flammable Gas

Ethane (74-84-0)	
Listed on the Canadian DSL (Domestic Substances List) inventory.	
WHMIS Classification	Class A - Compressed Gas Class B Division 1 - Flammable Gas

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by CPR.

SECTION 16: OTHER INFORMATION

Revision date : 10/02/2013

Other Information : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200

GHS Full Text Phrases:

Acute Tox. 2 (Inhalation:gas)	Acute toxicity (inhalation:gas) Category 2
Aquatic Acute 1	Hazardous to the aquatic environment - Acute Hazard Category 1
Compressed gas	Gases under pressure Compressed gas
Flam. Gas 1	Flammable gases Category 1
Liquefied gas	Gases under pressure Liquefied gas
Simple Asphy	Simple Asphyxiant
H220	Extremely flammable gas
H280	Contains gas under pressure; may explode if heated
H330	Fatal if inhaled
H400	Very toxic to aquatic life

Party Responsible for the Preparation of This Document

Wellhead Natural Gas

Safety Data Sheet

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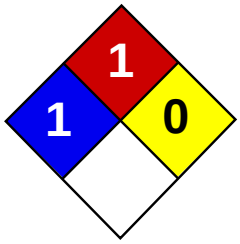
Williams, Inc.
One Williams Center
Tulsa, OK 74172, US
800-688-7507

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product

North America GHS US 2012 & WHMIS

ScienceLab.com
Chemicals & Laboratory Equipment



Health	1
Fire	1
Reactivity	0
Personal Protection	J

Material Safety Data Sheet
Triethylene glycol MSDS

Section 1: Chemical Product and Company Identification

Product Name: Triethylene glycol

Catalog Codes: SLT2644

CAS#: 112-27-6

RTECS: YE4550000

TSCA: TSCA 8(b) inventory: Triethylene glycol

CI#: Not available.

Synonym: 2,2'-[1,2-Ethanediylbis(oxy)]bisethanol

Chemical Formula: C6H14O4

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Triethylene glycol	112-27-6	100

Toxicological Data on Ingredients: Triethylene glycol: ORAL (LD50): Acute: 17000 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of eye contact (irritant), of ingestion. Slightly hazardous in case of inhalation. Inflammation of the eye is characterized by redness, watering, and itching.

Potential Chronic Health Effects:
Very hazardous in case of eye contact (irritant). Slightly hazardous in case of inhalation. CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, the nervous system. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact: No known effect on skin contact, rinse with water for a few minutes.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation: Not available.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 371°C (699.8°F)

Flash Points: CLOSED CUP: 177°C (350.6°F). OPEN CUP: 165.5°C (329.9°F).

Flammable Limits: LOWER: 0.9% UPPER: 9.2%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Absorb with an inert material and put the spilled material in an appropriate waste disposal. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. Avoid contact with eyes If ingested, seek medical advice immediately and show the container or the label.

Storage:

Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection: Splash goggles. Lab coat.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Boots. Gloves. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Hygroscopic liquid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 150.18 g/mole

Color: Colorless.

pH (1% soln/water): Not available.

Boiling Point: 285°C (545°F)

Melting Point: -5°C (23°F)

Critical Temperature: Not available.

Specific Gravity: 1.1274 (Water = 1)

Vapor Pressure: Not available.

Vapor Density: 5.17 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 17000 mg/kg [Rat].

Chronic Effects on Humans: The substance is toxic to kidneys, the nervous system.

Other Toxic Effects on Humans:
Very hazardous in case of ingestion. Slightly hazardous in case of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Triethylene glycol TSCA 8(b) inventory: Triethylene glycol

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC): R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 1

Reactivity: 0

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Not applicable. Lab coat. Not applicable. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:31 PM

Last Updated: 05/21/2013 12:00 PM

ATTACHMENT I

Emission Units Table

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

- Emissions Unit Table

ATTACHMENT I - EMISSION UNITS TABLE

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

Unit ID[1]	Pt ID[2]	Description	Installed	Capacity	Type[3]	Control[4]
DFT-01	1E	5.0 MMscfd Dehydrator - Flash Tank	2012	5.0 MMscfd	Existing	na
DSV-01	2E	5.0 MMscfd Dehydrator - Regenerator/Still Vent	2012	5.0 MMscfd	Existing	na
RBV-01	3E	0.22 MMBtu/hr Reboiler Vent	2012	0.22 MMBtu/hr	Existing	na

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

ATTACHMENT J

Emission Points Data Summary Sheet

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

- Table 1 – Emissions Data
- Table 2 – Release Parameter Data

Williams Ohio Valley Midstream LLC (OVM)

McCLAIN DEHYDRATION STATION (DS)

Application for 45CSR13 NSR Construction Permit

ATTACHMENT J - EMISSION POINTS DATA SUMMARY SHEET

Table 1: Emissions Data

Unit ID	Type[1]	Emission Unit		Control Device		Vent Time		Pollutant[3]	Pre-Controlled[4]		Controlled[5]		Emission Phase	Est. Method[6]	Concen-tration[7]
		Point	Source	ID	Type	Term[2]	hr/yr		lb/hr	ton/yr	lb/hr	ton/yr			
DFT-01	5.0 MMscfd TEG Dehydrator Flash Tank Upward Vertical Stack	1E	TEG Dehy Flash Tank	na	na	C	8,760	VOC	6.31	27.63	6.31	27.63	gas	GLYCalc	
								n-Hexane	0.15	0.64	0.15	0.64	gas	GLYCalc	
								Benzene	0.01	0.06	0.01	0.06	gas	GLYCalc	
								Toluene	0.03	0.13	0.03	0.13	gas	GLYCalc	
								E-benzene	4.9E-04	2.2E-03	4.9E-04	0.00	gas	GLYCalc	
								Xylenes	0.02	0.07	0.02	0.07	gas	GLYCalc	
								Total HAP	0.21	0.90	0.21	0.90	gas	GLYCalc	
								CO2e	357	1,565	357	1,565	gas	GLYCalc	
DSV-01	5.0 MMscfd TEG Dehydrator Regenerator/Still Vent Upward Vertical Stack	2E	TEG Dehy Still Vent	na	na	C	8,760	VOC	2.30	10.07	2.30	10.07	gas	GLYCalc	
								n-Hexane	0.05	0.23	0.05	0.23	gas	GLYCalc	
								Benzene	0.13	0.58	0.13	0.58	gas	GLYCalc	
								Toluene	0.40	1.74	0.40	1.74	gas	GLYCalc	
								E-benzene	0.01	0.05	0.01	0.05	gas	GLYCalc	
								Xylenes	0.53	2.34	0.53	2.34	gas	GLYCalc	
								Total HAP	1.13	4.94	1.13	4.94	gas	GLYCalc	
								CO2e	4.47	19.58	4.47	19.58	gas	GLYCalc	
RBV-01	0.22 MMBtu/hr TEG Reboiler Upward Vertical Stack	3E	TEG Reboiler	na	na	C	8,760	NOX	0.02	0.10	0.02	0.10	gas	AP-42	
								CO	0.02	0.08	0.02	0.08	gas	AP-42	
								VOC	1.2E-03	0.01	1.2E-03	0.01	gas	AP-42	
								SO2	1.3E-04	5.7E-04	1.3E-04	5.7E-04	gas	AP-42	
								PM10/2.5	1.7E-03	0.01	1.7E-03	0.01	solid/gas	AP-42	
								HCHO	1.6E-05	7.2E-05	1.6E-05	7.2E-05	gas	AP-42	
								n-Hexane	3.9E-04	1.7E-03	3.9E-04	1.7E-03	gas	AP-42	
								Benzene	4.6E-07	2.0E-06	4.6E-07	2.0E-06	gas	AP-42	
								Toluene	7.4E-07	3.2E-06	7.4E-07	3.2E-06	gas	AP-42	
								Total HAP	4.1E-04	1.8E-03	4.1E-04	1.8E-03	gas	AP-42	
								CO2e	26	114	26	114	gas	40CFR98	

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

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

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

.

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

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

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

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

7 Provide for all pollutant emissions. Typically, the units of parts per million by volume (ppmv). If the emission is a mineral acid (sulfuric, nitric, hydrochloric or phosphoric) use units of milligram per dry cubic meter (mg/m3) at standard conditions (68 °F and 29.92 inches Hg) (see 45CSR7). If the pollutant is SO2, use units of ppmv (See 45CSR10).

ATTACHMENT J - EMISSION POINTS DATA SUMMARY SHEET

Table 2: Release Parameter Data

Unit ID	Emission Point ID No. *(Must match Emission Units Table)*	Inner Diameter (ft.)	Exit Gas			Emission Point Elevation (ft)		UTM Coordinates (km)	
			Temp. (oF)	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
DFT-01	**1E**	**0.3**	**150**	**10**	**na**	**1,285**	**12**	**4,419.74**	**525.97**
DSV-01	**2E**	**0.3**	**212**	**10**	**na**	**1,285**	**12**	**4,419.74**	**525.97**
RBV-01	**3E**	**0.3**	**600**	**na**	**na**	**1,285**	**12**	**4,419.74**	**525.97**

[1] Give at operating conditions. Include inerts.

[2] Release height of emissions above ground level.

ATTACHMENT K

Fugitive Emissions Data Summary Sheet

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

- Table 1 – Emissions Data
- Application Forms Checklist
- Fugitive Emissions Summary

Williams Ohio Valley Midstream LLC (OVM)

McCLAIN DEHYDRATION STATION (DS)

Application for 45CSR13 NSR Construction Permit

ATTACHMENT K - FUGITIVE EMISSIONS SUMMARY SHEET

Table 1: Emissions Data

Unit ID	Type[1]	Emission Unit		Control Device		Vent Time		Pollutant[3]	Pre-Controlled[4]		Controlled[5]		Emission Phase	Est. Method[6]	Concen-tration[7]
		Point	Source	ID	Type	Term[2]	hr/yr		lb/hr	ton/yr	lb/hr	ton/yr			
FUG	Fugitive (Gas/ Vapor)	4E	Station Piping	na	na	C	8,760	VOC	0.77	3.39	0.77	3.39	gas	AP-42	
								n-Hexane	0.01	0.06	0.01	0.06	gas	AP-42	
								Benzene	2.1E-04	9.0E-04	2.1E-04	9.0E-04	gas	AP-42	
								Toluene	4.5E-04	2.0E-03	4.5E-04	2.0E-03	gas	AP-42	
								E-benzene	3.5E-04	1.5E-03	3.5E-04	1.5E-03	gas	AP-42	
								Xylenes	3.9E-04	1.7E-03	3.9E-04	1.7E-03	gas	AP-42	
								Total HAP	0.01	0.06	0.01	0.06	gas	AP-42	
								CO2e	88	385	88	385	gas	AP-42	

Process Piping and Equipment Fugitives

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

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

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

.

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

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

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

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

7 Provide for all pollutant emissions. Typically, the units of parts per million by volume (ppmv). If the emission is a mineral acid (sulfuric, nitric, hydrochloric or phosphoric) use units of milligram per dry cubic meter (mg/m3) at standard conditions (68 °F and 29.92 inches Hg) (see 45CSR7). If the pollutant is SO2, use units of ppmv (See 45CSR10).

ATTACHMENT 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, then complete Table 1 of the NONMETALLIC MINERALS PROCESSING EMISSIONS UNIT DATA SHEET.

3.) Will there be Liquid Loading/Unloading Operations?

☐ Yes ☑ No

☐ If Yes, then complete the If Yes, then 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, then 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, then 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, then complete the GENERAL EMISSIONS UNIT DATA SHEET.

7.) Will there be any other activities that generate fugitive emissions?

☐ Yes ☑ No

☐ If Yes, then 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 Pre-Controlled Emissions [2]		Maximum Potential Controlled Emissions [3]		Est. Method Used [4]
		lb/hr	ton/yr	lb/hr	ton/yr	
Paved Haul Roads	**na**	**---**	**---**	**---**	**---**	**---**
Unpaved Haul Roads	**na**	**---**	**---**	**---**	**---**	**---**
Storage Pile Emissions	**na**	**---**	**---**	**---**	**---**	**---**
Liquid Loading (TLO)	**na**	**---**	**---**	**---**	**---**	**---**
Wastewater Treatment	**na**	**---**	**---**	**---**	**---**	**---**
Equipment Leaks - (FUG) (4E) (Note, the facility is NOT subject to LDAR)	**VOC**	**0.77**	**3.39**	**0.77**	**3.39**	**EE**
	n-Hexane	**0.01**	**0.06**	**0.01**	**0.06**	**EE**
	Benzene	**2.1E-04**	**9.0E-04**	**2.1E-04**	**9.0E-04**	**EE**
	Toluene	**4.5E-04**	**2.0E-03**	**4.5E-04**	**2.0E-03**	**EE**
	E-Benzene	**3.5E-04**	**1.5E-03**	**3.5E-04**	**1.5E-03**	**EE**
	Xylenes	**3.9E-04**	**0.00**	**3.9E-04**	**0.00**	**EE**
	Total HAP	**0.01**	**0.06**	**1.5E-02**	**0.06**	**EE**
	CO2e	**88**	**385**	**88**	**385**	**EE**
General Clean-up VOC Emissions	**na**	**---**	**---**	**---**	**---**	**---**
Other	**na**	**---**	**---**	**---**	**---**	**---**

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

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

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

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

ATTACHMENT L

Emissions Unit Data Sheet(s)

"28. Fill out the **Emissions Unit Data Sheet(s**) as Attachment L."

- Natural Gas Glycol Dehydration Unit Data Sheets
  - TEG Dehydrator Flash Tank (DFT-01) (1E)
  - TEG Dehydrator Regenerator/Still Vent (DSV-01) (2E)
  - TEG Dehydrator Reboiler (RBV-01) (3E)
- 40 CFR Part 63; Subpart HH & HHH Registration Form
  - TEG Dehydrator (DFT-01 and DSV-01) (1E and 2E)
- Leak Source Data Sheet (FUG) (4E)
- Storage Tank Data Sheet

Williams Ohio Valley Midstream LLC (OVM)

McCLAIN DEHYDRATION STATION (DS)

Application for 45CSR13 NSR Construction Permit

ATTACHMENT L - NATURAL GAS GLYCOL DEHYDRATION UNIT DATA SHEET

General Glycol Dehydration Unit Data							
		Compressor Station		**McClain DS**			
		Manufacturer and Model		**TBD**			
		Max Dry Gas Flow Rate (MMscfd)		**5.0**			
		Heat Input (MMBtu/hr) - HHV		**0.22**			
		Design Type (DEG or TEG)		**TEG**			
		Source Status[2]		**ES**			
		Date Installed/Modified/Removed[3]		**2012**			
		Regenerator Still Vent APCD[4]		**None**			
		Fuel HV (Btu/scf) - HHV		**1,020**			
		H_2S Content (gr/100 scf)		**0.2**			
		Operation (hrs/yr)		**8,760**			
Source ID #[1]	Vent	Reference[5]	PTE[6]	lbs/hr	tons/yr	lbs/hr	tons/yr
DFT-01	Dehydrator 01 Flash Tank (50% "Recycle" as Fuel in the Reboiler)	GRI-GLYCalc	VOC	**6.31**	**27.63**		
		GRI-GLYCalc	n-Hexane	**0.15**	**0.64**		
		GRI-GLYCalc	Benzene	**1.4E-02**	**0.06**		
		GRI-GLYCalc	Toluene	**0.03**	**0.13**		
		GRI-GLYCalc	Ethylbenzene	**0.00**	**0.00**		
		GRI-GLYCalc	Xylenes	**0.02**	**0.07**		
		GRI-GLYCalc	Tot HAP	**0.21**	**0.90**		
		GRI-GLYCalc	CO2e	**357**	**1,565**		
DSV-01	Dehydrator 01 Glycol Regenerator Still Vent	GRI-GLYCalc	VOC	**2.30**	**10.07**		
		GRI-GLYCalc	n-Hexane	**0.05**	**0.23**		
		GRI-GLYCalc	Benzene	**0.13**	**0.58**		
		GRI-GLYCalc	Toluene	**0.40**	**1.74**		
		GRI-GLYCalc	Ethylbenzene	**1.1E-02**	**0.05**		
		GRI-GLYCalc	Xylenes	**0.53**	**2.34**		
		GRI-GLYCalc	Tot HAP	**1.13**	**4.94**		
		GRI-GLYCalc	CO2e	**4**	**20**		
RBV-01	Dehydrator 01 Reboiler Vent	AP	NOX	**0.02**	**0.10**		
		AP	CO	**0.02**	**0.08**		
		AP	VOC	**1.2E-03**	**0.01**		
		AP	SO2	**1.3E-04**	**5.7E-04**		
		AP	PM10/2.5	**1.7E-03**	**0.01**		
		AP	Tot HAP	**4.1E-04**	**1.8E-03**		
		40CFR98	CO2e	**26**	**114**		

ATTACHMENT L - NATURAL GAS GLYCOL DEHYDRATION UNIT DATA SHEET - Continued

Notes to **NATURAL GAS GLYCOL DEHYDRATION UNIT DATA SHEET**

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-GLYCalcTM
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-GLYCalcTM (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-GLYCalcTM 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-GLYCalcTM 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):	**5.0 MM**
Affected facility actual annual average hydrocarbon liquid throughput: (bbl/day):	**na**
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.

The affected facility is: ☑ prior to a NG processing plant ☐ 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).

The affected facility exclusively processes, stores, or transfers black oil with an initial producing gas-to-oil ratio (GOR): **na** scf/bbl API gravity: **na** degrees

Section B: Dehydration Unit (if applicable)[1]

Description: **5.0 MMscfd - TEG Dehy 01 (DFT-01 and DSV-01) (1E and 2E)**

Date of Installation:	**2012**	Annual Operating Hours:	**8,760**	Burner rating (MMbtu/hr):	**0.22**
Exhaust Stack Height (ft):	**12.0**	Stack Diameter (ft):	**0.3**	Stack Temp. (oF):	**150**

Glycol Type:	☑ TEG	☐ EG	☐ Other: **na**		
Glycol Pump Type:	☐ Elect	☑ Gas	If Gas, what is the volume ratio?: **0.08 acfm/gpm**		
Condenser installed?	☐ Yes	☑ No	Exit Temp: **na**	Condenser Pressure: **na**	
Incinerator/flare installed?	☐ Yes	☑ No	Destruction Eff.: **na**		
Other controls installed?	☐ Yes	☑ No	Describe: **na**		
Wet Gas2: (Upstream of Contact Tower)		Gas Temperature: **60 oF**	Gas Pressure: **1,000 psig**		
		Saturated Gas?: ☑ Yes	☐ No	If no, water content?: na	
Dry Gas: (Downstream of Contact Tower)		Gas Flowrate: Actual: **5.0 MMscfd**		Design: **5.0 MMscfd**	
		Water Content: **5.0 lb/MMscf**			
Lean Glycol:		Circulation Rate: Actual[3]: **0.83 gpm**		Max[4]: **1.5 gpm**	
		Pump make/model: **Kimray 9015 PV**			
Glycol Flash Tank (if applicable):		Temp: **150 oF**	Pressure: **50 psig**	Vented: ☑ Yes	☐ No
		If no, describe vapor control: **Recycle to Reboiler, Otherwise Vented**			
Stripping Gas (if applicable):		Source of Gas **na**	Rate: **na**		

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 percent of C1-C8, 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 -- However, ***EXEMPT*** because the facility is an area source of HAP emissions ***and*** the actual average emissions of benzene from the glycol dehydration unit process vent to the atmosphere is < 0.90 megagram per year (1.0 tpy); see 40CFR§63.764(e)(1)(ii).

☐ Subject to Subpart HHH

☐ Not Subject

Because:

- ☐ < 10/25 TPY
- ☐ Affected facility exclusively handles black oil.
- ☐ 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.

Leak Source Data Sheet

Source Category	Pollutant	No. of Source Components[1]	No. of Components Monitored[2]	Ave Time to Repair (Days)[3]	Est. Annual Emissions (lb/yr)[4]
Pumps[5]	Light Liquid VOC[6,7]				
	Heavy Liquid VOC[8]				
	Non-VOC[9]				
Valves[10]	Gas VOC				
	Light Liquid VOC				
	Heavy Liquid VOC				
	Non-VOC				
Safety Relief Valves[11]	Gas VOC				
	Non-VOC				
Open-Ended Lines[12]	Gas VOC				
	Non-VOC				
Sampling Connections[13]	Gas VOC				
	Non-VOC				
Compressors	Gas VOC				
	Non-VOC				
Flanges	Gas VOC				
	Non-VOC				
Other	Gas VOC				
	Non-VOC				

See Attachment N for Emissions Summary.

ATTACHMENT L - STORAGE TANK DATA SHEET

Source ID	Status	Contents	Volume (gal)	Diam (ft)	Thru-Put (gal/yr)	Orientation	Ave Liq Hght (ft)
---	Existing	Methanol	325	4.0	3,900	Horiz	3.0
---	Existing	Glycol	200	4.0	2,400	Horiz	3.0

Notes to STORAGE TANK DATA SHEET

1. Enter the appropriate Source Identification Numbers (Source ID #) for each storage tank located at the compressor station. Tanks should be designated T01, T02, T03, etc.
2. Enter storage tank Status using the following:
   - EXIST Existing Equipment
   - NEW Installation of New Equipment
   - REM Equipment Removed
3. Enter storage tank content such as condensate, pipeline liquids, glycol (DEG or TEG), lube oil, etc.
4. Enter storage tank volume in gallons.
5. Enter storage tank diameter in feet.
6. Enter storage tank throughput in gallons per year.
7. Enter storage tank orientation using the following:
   - VERT Vertical Tank
   - HORZ Horizontal Tank
8. Enter storage tank average liquid height in feet.

ATTACHMENT M

Air Pollution Control Device Sheet(s)

(NOT APPLICABLE)

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

ATTACHMENT N

Supporting Emissions Calculations

"30. Provide all **Supporting Emissions Calculations** as Attachment N."

Emission Summary Spreadsheets

- Potential to Emit (PTE)
- Greenhouse Gas (GHG)

Unit-Specific Emission Spreadsheets

- Dehydrator – 5.0 MMscfd (DFT-01 and DSV-01) (1E and 2E)
- Reboiler – 0.22 MMBtu/hr (RBV-01) (3E)
- Process Piping Fugitive – Gas/Vapor (FUG) (4E)

GRI-GLYCalc Analysis

- Dehydrator – 5.0 MMscfd (DFT-01 and DSV-01) (1E and 2E)

Facility Total – Potential to Emit (PTE)

Unit ID	Point ID	Control ID	Description	NOX		CO		VOC		SO2		PM10/2.5	
				lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
DFT-01	1E	na	5.0 MMscfd Dehydrator - Flash Tank	---	---	---	---	6.31	27.63	---	---	---	---
DSV-01	2E	na	5.0 MMscfd Dehydrator - Regenerator/Still Vent	---	---	---	---	2.30	10.07	---	---	---	---
RBV-01	3E	na	0.22 MMBtu/hr Reboiler Vent	0.02	0.10	0.02	0.08	1.2E-03	0.01	1.3E-04	5.7E-04	1.7E-03	0.01
			TOTAL PTE (w/o FUG):	**0.02**	**0.10**	**0.02**	**0.08**	**8.61**	**37.71**	**1.3E-04**	**5.7E-04**	**0.00**	**0.01**
			Title V Permit Threshold:	**---**	**100**	**---**	**100**	**---**	**100**	**---**	**100**	**---**	**100**
FUG	4E	na	Piping and Equipment Fugitives - Gas/Vapor	---	---	---	---	0.77	3.39	---	---	---	---
			TOTAL PTE (w/FUG):	**0.02**	**0.10**	**0.02**	**0.08**	**9.38**	**41.10**	**1.3E-04**	**5.7E-04**	**1.7E-03**	**0.01**
			WV-DEP NSR Permit Threshold:	6 lb/hr *AND* 10 tpy		6 lb/hr *AND* 10 tpy		6 lb/hr *AND* 10 tpy		6 lb/hr *AND* 10 tpy		6 lb/hr *AND* 10 tpy	

Unit ID	Point ID	Control ID	HCHO		n-Hexane		Benzene		Toluene		Ethylbenzene		Xylenes		Total HAP	
			lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
DFT-01	1E	na	---	---	0.15	0.64	1.4E-02	6.3E-02	0.03	0.13	4.9E-04	2.2E-03	0.02	0.07	0.21	0.90
DSV-01	2E	na	---	---	0.05	0.23	0.13	0.58	0.40	1.74	1.1E-02	5.0E-02	0.53	2.34	1.13	4.94
RBV-01	3E	na	1.6E-05	7.2E-05	3.9E-04	1.7E-03	4.6E-07	2.0E-06	7.4E-07	3.2E-06	---	---	---	---	4.1E-04	1.8E-03
		PTE (w/o FUG):	**1.6E-05**	**7.2E-05**	**0.20**	**0.88**	**0.15**	**0.65**	**0.43**	**1.86**	**0.01**	**0.05**	**0.55**	**2.41**	**1.34**	**5.85**
		Title V:	---	10	---	10	---	10	---	10	---	10	---	10	---	25
FUG	4E	na	---	---	0.01	0.06	2.1E-04	9.0E-04	4.5E-04	2.0E-03	3.5E-04	1.5E-03	3.9E-04	1.7E-03	0.01	0.06
		PTE (w/FUG):	**1.6E-05**	**7.2E-05**	**0.21**	**0.93**	**0.15**	**0.65**	**0.43**	**1.87**	**0.01**	**0.05**	**0.55**	**2.41**	**1.35**	**5.91**
		WV-DEP:	2 lb/hr *OR* 0.5 tpy		2 lb/hr *OR* 5 tpy		2 lb/hr *OR* 5 tpy		2 lb/hr *OR* 5 tpy		2 lb/hr *OR* 5 tpy		2 lb/hr *OR* 5 tpy		2 lb/hr *OR* 5 tpy	

Notes: 1 - Emissions are based on operation at 100% of rated load for 8,760 hrs/yr.
2 - VOC is volatile organic compounds, as defined by EPA, and includes HCHO (formaldehyde).
3 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5.
4 - HCHO is formaldehyde; Total HAP includes HCHO, n-hexane, BTEX (benzene, toluene, ethylbenzene, xylene), 2,2,4-TMP (i-octane), acetaldehyde, acrolein, and methanol.

Greenhouse Gas (GHG) Potential-to-Emit (PTE)

Unit ID	Point ID	Control ID	Description	Heat Input MMBtu/hr (HHV)	Hours of Operation hr/yr	kg/MMBtu: GWP: CO2 tpy	53.06 1 CO2e tpy	kg/MMBtu: GWP: CH4 tpy	1.00E-03 25 CO2e tpy	kg/MMBtu: GWP: N2O tpy	1.00E-04 298 CO2e tpy	TOTAL CO2e tpy
DFT-01	1E	na	5.0 MMscfd Dehydrator - Flash Tank	---	8,760	---	---	63	1,565	---	---	1,565
DSV-01	2E	na	5.0 MMscfd Dehydrator - Regenerator/Still Vent	---	8,760	---	---	0.8	20	---	---	20
RBV-01	3E	na	0.22 MMBtu/hr Reboiler Vent	0.22	8,760	114	114	0.00	0.1	2.1E-04	0.1	114

					TOTAL FACILITY-WIDE PTE (w/o FUG):	**114**		**63**		**0.00**		**1,698**
					NSR/PSD Threshold: (	**250**	**- OR -**	**250**	**- OR -**	**250**	**) - AND -**	**100,000**
					Title V Major Source Threshold:	**na**		**na**		**na**		**100,000**
FUG	4E	na	Piping and Equipment Fugitives - Gas/Vapor	---	8,760	---	---	15	385	---	---	385
					TOTAL FACILITY-WIDE PTE (w/ FUG):	**114**		**79**		**0.00**		**2,083**

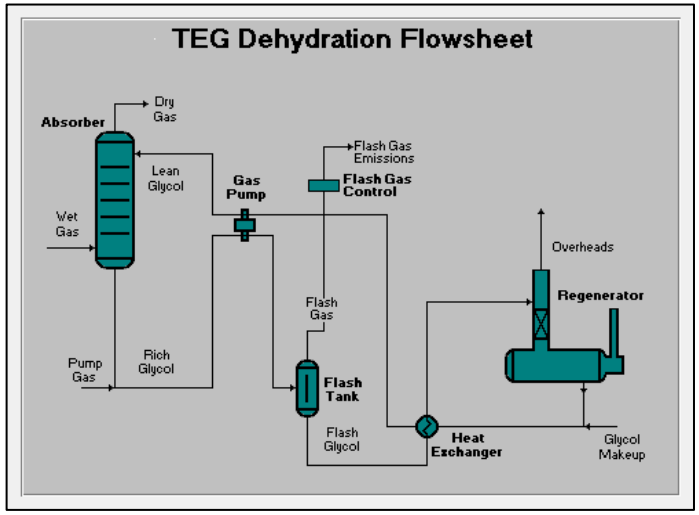
Notes:
1 - Emissions are based on operation at 100% of rated load.
2 - Engine CO2 and CH4 emissions are based on vendor specifications.
3 - Fugitive CH4 emissions are based on EPA Fugitive Emission Factors for Oil and Gas Production Operations.
4 - All other GHG emissions are based on default values in 40CFR98, Subpart C, Table C-1.
5 - High Heat Value (HHV) = Low Heat Value (LHV) / 0.90.
6 - GHG NSR/PSD Thresholds and Title V Major Source Thresholds are applicable only if other regulated air pollutants exceed the corresponding Thresholds.

Tri-Ethylene Glycol (TEG) Dehydrator – 5.0 MMscfd

Unit ID	Description	Capacity	Reference	Pollutant	GRI-GLYCalc Pre-Control Emission		"Worst-Case" Pre-Control Emissions		Control Efficiency	Controlled Emissions	
					lb/hr	tpy	lb/hr	tpy	%	lb/hr	tpy
DFT-01	**Tri-Ethylene Glycol (TEG) Dehydrator 01** **Flash Tank Vent** (≥ 50% Recycle)	Flow Rate **5.0** MMscfd **8,760** hr/yr	GRI-GLYCalc 4.0	VOC	5.26	23.03	6.31	27.63	0.0%	**6.31**	**27.63**
			GRI-GLYCalc 4.0	n-Hexane	0.12	0.53	0.15	0.64	0.0%	**0.15**	**0.64**
			GRI-GLYCalc 4.0	Benzene	0.01	0.05	0.01	0.06	0.0%	**0.01**	**0.06**
			GRI-GLYCalc 4.0	Toluene	0.02	0.10	0.03	0.13	0.0%	**0.03**	**0.13**
			GRI-GLYCalc 4.0	Ethylbenzene	4.1E-04	1.8E-03	4.9E-04	2.2E-03	0.0%	**4.9E-04**	**2.2E-03**
			GRI-GLYCalc 4.0	Xylenes	0.01	0.06	0.02	0.07	0.0%	**0.02**	**0.07**
			GRI-GLYCalc 4.0	2,2,4-TMP	9.1E-05	4.0E-04	1.1E-04	4.8E-04	0.0%	**1.1E-04**	**4.8E-04**
			GRI-GLYCalc 4.0	Tot HAP	0.17	0.75	0.21	0.90	0.0%	**0.21**	**0.90**
			GRI-GLYCalc 4.0	CH4	11.91	52.15	14.29	62.58	0.0%	**14.29**	**62.58**
			40CFR98 - Table A-1	CO2e	298	1,304	357	1,565	0.0%	**357**	**1,565**
DSV-01	**Tri-Ethylene Glycol (TEG) Dehydrator 01** **Regenerator/Still Vent**	Flow Rate **5.0** MMscfd **8,760** hr/yr	GRI-GLYCalc 4.0	VOC	1.92	8.40	2.30	10.07	0.0%	**2.30**	**10.07**
			GRI-GLYCalc 4.0	n-Hexane	0.04	0.20	0.05	0.23	0.0%	**0.05**	**0.23**
			GRI-GLYCalc 4.0	Benzene	0.11	0.49	0.13	0.58	0.0%	**0.13**	**0.58**
			GRI-GLYCalc 4.0	Toluene	0.33	1.45	0.40	1.74	0.0%	**0.40**	**1.74**
			GRI-GLYCalc 4.0	Ethylbenzene	0.01	0.04	1.1E-02	0.05	0.0%	**1.1E-02**	**0.05**
			GRI-GLYCalc 4.0	Xylenes	0.44	1.95	0.53	2.34	0.0%	**0.53**	**2.34**
			GRI-GLYCalc 4.0	2,2,4-TMP	2.3E-05	1.0E-04	2.7E-05	1.2E-04	0.0%	**2.7E-05**	**1.2E-04**
			GRI-GLYCalc 4.0	Tot HAP	0.94	4.12	1.13	4.94	0.0%	**1.13**	**4.94**
			GRI-GLYCalc 4.0	CH4	0.15	0.65	0.18	0.78	0.0%	**0.18**	**0.78**
			40CFR98 - Table A-1	CO2e	4	16	4	20	na	**4**	**20**

Notes:
1 - Used GRI-GLYCalc V4.0 to calculate flash tank emissions and regenerator/still vent emissions.
2 - GRI-GLYCalc 4.0 Model Results are based on the following input:
- Wet Gas: 60 oF and 1,000 psig, H2O Saturated
- Gas Analysis: See Attachment H
- Dry Gas: 5.0 MMscfd, 5.0 lb-H2O/MMscf
- Lean Glycol: 1.5 wt% H2O
- Glycol Pump: Gas Injection, 1.5 gpm max
- Flash Tank: 150 oF, 50 psig, 50% Recycle
- Stripping Gas: None
- Regen Control: None

3 - Total HAP includes n-hexane, BTEX (benzene, toluene, ethylbenzene, xylene), and other components.
4 - A 20% contingency has been added to the GRI-GLYCalc model results to account for potential future changes in gas quality.



Reboiler – 0.22 MMBtu/hr

Unit ID	Description	Reference	Pollutant	Emission Factor		Pre-Controlled Emissions		Control Efficiency	Controlled Emissions	
				lb/MMscf	lb/MMBtu	lb/hr	tpy	%	lb/hr	tpy
		EPA AP-42 Table 1.4-1	NOX	100.00	0.10	0.02	0.10	na	**0.02**	**0.10**
	Reboiler 01	EPA AP-42 Table 1.4-1	CO	84.00	0.08	0.02	0.08	na	**0.02**	**0.08**
		EPA AP-42 Table 1.4-2	VOC	5.50	0.01	0.00	0.01	na	**0.00**	**0.01**
	8,760 hr/yr	EPA AP-42 Table 1.4-2	SO2	0.60	5.9E-04	1.3E-04	5.7E-04	na	**1.3E-04**	**5.7E-04**
		EPA AP-42 Table 1.4-2	PM10/2.5	7.60	0.01	0.00	0.01	na	**0.00**	**0.01**
		EPA AP-42 Table 1.4-3	HCHO	0.08	7.4E-05	1.6E-05	7.2E-05	na	**1.6E-05**	**7.2E-05**
		EPA AP-42 Table 1.4-3	n-Hexane	1.80	1.8E-03	3.9E-04	1.72E-03	na	**3.9E-04**	**1.7E-03**
	0.20 MMBtu/hr (LHV)	EPA AP-42 Table 1.4-3	Benzene	2.1E-03	2.1E-06	4.6E-07	2.0E-06	na	**4.6E-07**	**2.0E-06**
RBV-01	**0.22 MMBtu/hr (HHV)**	EPA AP-42 Table 1.4-3	Toluene	3.4E-03	3.3E-06	7.4E-07	3.2E-06	na	**7.4E-07**	**3.2E-06**
		EPA AP-42 Table 1.4-3	Ethylbenzene	---	---	---	---	---	**---**	**---**
	920 Btu/scf (LHV)	EPA AP-42 Table 1.4-3	Xylenes	---	---	---	---	---	**---**	**---**
	1,020 Btu/scf (HHV)	EPA AP-42 Table 1.4-3	2,2,4-TMP	---	---	---	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	Other HAP	1.9E-03	1.9E-06	4.1E-07	1.8E-06	na	**4.1E-07**	**1.8E-06**
	1,752 MMBtu/yr (LHV)	EPA AP-42 Table 1.4-3	Tot HAP	1.88	1.8E-03	4.1E-04	1.8E-03	na	**4.1E-04**	**1.8E-03**
	1,947 MMBtu/yr (HHV)	40CFR98 - Table C-1	CO2	119,317	117	26	114	na	**26**	**114**
	218 scf/hr	40CFR98 - Table C-2	CH4	2.25	2.2E-03	4.9E-04	2.1E-03	na	**4.9E-04**	**2.1E-03**
	1.91 MMscf/yr	40CFR98 - Table C-2	N2O	0.22	2.2E-04	4.9E-05	2.1E-04	na	**4.9E-05**	**2.1E-04**
		40CFR98 - Table A-1	CO2e	119,440	117	26	114	na	**26**	**114**

Notes:
1 - The combustion emission factors are based on a default fuel heat content of 1,020 Btu/scf (HHV).
2 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5.
3 - HCHO is formaldehyde; Total HAP includes, but not limited to, HCHO, n-hexane, BTEX (benzene, toluene, ethylbenzene, xylene), 2,2,4-TMP, acetaldehyde, acrolein, and MeOH.
4 - **Emission factors in AP-42 are NOT EPA-recommended emission limits.** Because emission factors essentially represent an average of a range of emission rates, a permit limit using an AP-42 emission factor would result in half of the sources being in noncompliance.

Process Piping Fugitives – Gas/Vapor

Unit ID	Description	Component (Unit) Type	Unit Count	THC Factor	THC Emissions	CH4 100.00% Wgt		CO2e 2,500% Wgt		VOC 22.02% Wgt	
				lb/hr/Unit	lb/hr	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
FUG	Piping and Equipment Fugitives (Gas/Vapor Service) **8,760 hr/yr**	Valves	257	0.00992	2.55	2.55	11.17	63.7	279	0.56	2.46
		Pump Seals	0	0.00529	---	---	---	---	---	---	---
		Others	30	0.01940	0.58	0.58	2.55	14.6	64	0.13	0.56
		Connectors	737	0.00044	0.32	0.32	1.42	8.1	36	0.07	0.31
		Flanges	120	0.00086	---	---	---	---	---	---	---
		Open-ended lines	14	0.00441	0.06	0.06	0.27	1.5	7	0.01	0.06
		TOTAL FUGITIVE EMISSIONS:				**3.52**	**15.41**	**87.9**	**385**	**0.77**	**3.39**

Component (Unit) Type	n-Hexane 0.37% Wgt		Benzene 0.01% Wgt		Toluene 0.01% Wgt		Ethylbenzene 0.01% Wgt		Xylenes 0.01% Wgt		Total HAP 0.42% Wgt	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Valves	9.5E-03	4.2E-02	1.5E-04	6.5E-04	3.2E-04	1.4E-03	2.5E-04	1.1E-03	2.8E-04	1.2E-03	1.1E-02	0.05
Pump Seals	---	---	---	---	---	---	---	---	---	---	---	---
Others	2.2E-03	9.5E-03	3.4E-05	1.5E-04	7.4E-05	3.2E-04	5.8E-05	2.5E-04	6.4E-05	2.8E-04	0.00	0.01
Connectors	1.2E-03	5.3E-03	1.9E-05	8.3E-05	4.1E-05	1.8E-04	3.2E-05	1.4E-04	3.6E-05	1.6E-04	1.4E-03	0.01
Flanges	---	---	---	---	---	---	---	---	---	---	---	---
Open-ended lines	2.3E-04	1.0E-03	3.6E-06	1.6E-05	7.8E-06	3.4E-05	6.2E-06	2.7E-05	6.8E-06	3.0E-05	2.6E-04	1.1E-03
TOTAL FUGITIVES:	**1.3E-02**	**0.06**	**2.1E-04**	**9.0E-04**	**4.5E-04**	**2.0E-03**	**3.5E-04**	**1.5E-03**	**3.9E-04**	**1.7E-03**	**1.5E-02**	**0.06**

Notes:
1 - Assumed 8,760 hours per year of fugitive emissions.
2 - Gas/Vapor emissions calculated using EPA factors for Oil and Gas Production Operations.
(Protocol for Equipment Leak Emission Estimates, 1995, EPA-453/R-95-017).
3 - Component (unit) counts are based on default counts for compressor stations (GRI-GLYCalc-HAP Model).
4 - "Other" components include compressor seals, relief valves, diaphragms, drains, meters, etc.
5 - THC = Total Hydrocarbons, including Methane (CH4) and Ethane (C2H6).
6 - VOC = Non-Methane/Non-Ethane THC. (Designated C3+)
7 - HAP = Hazardous Air Pollutants as designated by EPA, in this case primarily n-Hexane and BTEX.
8 - To be conservative, the following gas characteristics were assumed:

Pollutant	Gas Analysis	Estimated
CH4	59.02 % WGT	100.00 % WGT
VOC	18.35 % WGT	22.02 % WGT
n-Hexane	0.3103 % WGT	0.3724 % WGT
Benzene	0.0049 % WGT	0.0058 % WGT

Pollutant	Gas Analysis	Estimated
Toluene	0.0106 % WGT	0.0127 % WGT
E-benzene	0.0000 % WGT	0.0100 % WGT
Xylenes	0.0092 % WGT	0.0110 % WGT
Total HAP	0.3352 % WGT	0.4210 % WGT

Potentially Applicable

AP-42 and GHG EMISSION FACTORS

(Preferentially use test data or vendor data where available)

	Pollutant	GAS-FIRED ENGINES			GAS-FIRED TURBINES		
		AP-42 Table 3.2-1; 3.2-2; 3.2-3 07/00			AP-42 Table 3.1-1; 3.1-2a; 3.1-3 04/00		
		2SLB lb/MMBtu	4SLB lb/MMBtu	4SRB lb/MMBtu	Uncontrolled lb/MMBtu	Water Injection lb/MMBtu	Lean Pre-Mix# lb/MMBtu
CRITERIA	NOX (≥ 90% Load)	3.17E+00	4.08E+00	2.21E+00	3.20E-01	1.30E-01	9.90E-02
	CO (≥ 90% Load)	3.86E-01	3.17E-01	3.72E+00	8.20E-02	3.00E-02	1.50E-02
	THC (TOC)	1.64E+00	1.47E+00	3.58E-01	1.10E-02	1.10E-02	1.10E-02
	NMHC (THC-CH4)	1.90E-01	2.20E-01	1.28E-01	2.40E-03	2.40E-03	2.40E-03
	NMNEHC (NMHC-C2H6)	1.19E-01	1.15E-01	5.76E-02	2.10E-03	2.10E-03	2.10E-03
	VOC	1.20E-01	1.18E-01	2.96E-02	2.10E-03	2.10E-03	2.10E-03
	SO2*** (2,000 gr-S/MMscf)	5.88E-04	5.88E-04	5.88E-04	5.88E-04	5.88E-04	5.88E-04
	PM10/2.5 (Filter+Cond)	4.83E-02	9.99E-03	1.94E-02	6.60E-03	6.60E-03	6.60E-03
HAPs	Benzene	1.94E-03	4.40E-04	1.58E-03	1.20E-05	1.20E-05	9.10E-07
	Ethylbenzene	1.08E-04	3.97E-05	2.48E-05	3.20E-05	3.20E-05	3.20E-05
	Formaldehyde (HCHO)	5.52E-02	5.28E-02	2.05E-02	7.10E-04	7.10E-04	2.00E-05
	n-Hexane	4.45E-04	1.11E-03	---	---	---	---
	Toluene	9.63E-04	4.08E-04	5.58E-04	1.30E-04	1.30E-04	1.30E-04
	TMP, 2,2,4- (i-Octane)	8.46E-04	2.50E-04	---	---	---	---
	Xylenes	2.68E-04	1.84E-04	1.95E-04	6.40E-05	6.40E-05	6.40E-05
	Other HAPs	1.96E-02	1.69E-02	9.42E-03	1.06E-04	1.06E-04	1.06E-04
GHG	CO2**** (GWP=1)	1.17E+02	1.17E+02	1.17E+02	1.17E+02	1.17E+02	1.17E+02
	CH4 (GWP=25)	1.45E+00	1.25E+00	2.30E-01	8.60E-03	8.60E-03	8.60E-03
	N2O (GWP=298)	*2.20E-04*	*2.20E-04*	*2.20E-04*	3.00E-03	3.00E-03	3.00E-03
	CO2e	*1.53E+02*	*1.48E+02*	*1.23E+02*	*1.18E+02*	*1.18E+02*	*1.18E+02*

(#Lean Pre-Mix - aka: Dry Low Emissions (DLE or DLN) and SoLoNOX)

	Pollutant	GAS-FIRED EXTERNAL COMBUSTION			FLARES	DIESEL ENGINES
		AP-42 Table 1.4-1; 1.4-2; 1.4-3 (<100 MMBtu/hr) 07/98			13.5-1 01/95	3.3-1; 3.3-2 10/96
		Uncontrolled lb/MMBtu	LoNOX Burners lb/MMBtu	Flue Gas Recirc lb/MMBtu	(Combustion) lb/MMBtu	Uncontrolled lb/MMBtu
CRITERIA	NOX	9.80E-02	4.90E-02	3.14E-02	6.80E-02	4.41E+00
	CO	8.24E-02	8.24E-02	8.24E-02	3.70E-01	9.50E-01
	THC (TOC)	1.08E-02	1.08E-02	1.08E-02	1.40E-01	3.60E-01
	NMHC (THC-CH4)	8.53E-03	8.53E-03	8.53E-03	1.38E-01	3.53E-01
	NMNEHC (NMHC-C2H6)	5.49E-03	5.49E-03	5.49E-03	*5.49E-03*	3.50E-01
	VOC	5.39E-03	5.39E-03	5.39E-03	*5.39E-03*	3.60E-01
	SO2 (2,000 gr-S/MMscf)	5.88E-04	5.88E-04	5.88E-04	*5.88E-04*	2.90E-01
	PM10/2.5 (Filter+Condense)	7.45E-03	7.45E-03	7.45E-03	*7.45E-03*	3.10E-01
HAPs	Benzene	2.06E-06	2.06E-06	2.06E-06	*2.06E-06*	9.33E-04
	Ethylbenzene	---	---	---	---	---
	HCHO (Formaldehyde)	7.35E-05	7.35E-05	7.35E-05	*7.35E-05*	1.18E-03
	n-Hexane	1.76E-03	1.76E-03	1.76E-03	*1.76E-03*	---
	Toluene	3.33E-06	3.33E-06	3.33E-06	*3.33E-06*	4.09E-04
	2,2,4-TMP (i-Octane)	---	---	---	---	---
	Xylenes	---	---	---	---	2.85E-04
	Other HAPs	1.86E-06	1.86E-06	1.86E-06	*1.86E-06*	1.05E-03
GHG	CO2 (GWP=1)	1.18E+02	1.18E+02	1.18E+02	*1.18E+02*	1.64E+02
	CH4 (GWP=25)	2.25E-03	2.25E-03	2.25E-03	*2.25E-03*	*6.61E-03*
	N2O (GWP=298)	2.16E-03	6.27E-04	6.27E-04	*2.16E-03*	*1.32E-03*
	CO2e	*1.18E+02*	*1.18E+02*	*1.18E+02*	*1.18E+02*	*1.65E+02*

40 CFR 98 - DEFAULT EMISSION FACTORS				
Fuel Type	Table C-1 to Subpart C of Part 98		Table C-2 to Subpart C of Part 98	
	Default HHV	Carbon Dioxide lb CO2/MMBtu	Methane lb CH4/MMBtu	Nitrous Oxide lb N2O/MMBtu
Fuel Oil No. 2 (Diesel)	0.138 MMBtu/gal	1.61E+02	6.61E-03	1.32E-03
Natural Gas	1,028 MMBtu/scf	1.17E+02	2.20E-03	2.20E-04

Global Warming Potential (100 Yr) (GWP)		
Table A-1 to Subpart A of Part 98		
CO2	CH4*	N2O#
1	25	298

#Revised by EPA on 11/29/13

Conversion Factors

http://www.onlineconversion.com/

1.0 lb	=	453.5924 g
1.0 kg	=	2.2046 lb
1.0 hp	=	2,544.4332 Btu/hr
1.0 hp	=	745.6999 Watt
1.0 kW	=	3,412.1416 Btu/hr
1.0 kW-hr	=	1.3400 hp-hr
1.0 cf	=	7.4805 gal
1.0 gal H2O	=	8.3378 lb
1.0 cf H2O	=	62.3711 lb
1.0 m	=	3.2808 ft
1.0 km	=	0.6214 mi
1.0 acre	=	43,560.1742 ft2
1.0 °F	=	(°C*9/5)+32
1.0 °R	=	°F+459.67
1.0 %	=	10,000 ppm
UGC (stp)	=	379.48 scf/lb-mol

*Converted Ext Comb Emission Factors to lb/MMBtu by dividing lb/MMscf by AP-42 default HHV of 1,020 Btu/scf.

**Converted GHG Emission Factors to lb/MMBtu by multiplying kg/MMBtu by 2.2046 lb/kg.

***Assumes 100% conversion of fuel sulfur to SO2 (2,000 gr/MMscf).

****Assumes 99.5% conversion of fuel carbon to CO2 for natural gas.

Rev 03/01/14

GRI-GLYCalc VERSION 4.0 - EMISSIONS SUMMARY

Case Name: 5.0 MMscfd - McClain TEG Dehydrator 01
File Name: C:\projects2\wfs\OVM\McClain\R13\00 - Att-Nb - McClain DS - NSR - Dehy-01 GLYCalc - 07.28.15.ddf
Date: July 28, 2015

UNCONTROLLED REGENERATOR EMISSIONS DSV-01 (2E)

Component	lbs/hr	lbs/day	tons/yr
Methane	0.1490	3.575	0.6525
Ethane	0.2161	5.186	0.9464
Propane	0.2290	5.496	1.0030
Isobutane	0.0466	1.117	0.2039
n-Butane	0.1634	3.922	0.7157
Isopentane	0.0364	0.873	0.1593
n-Pentane	0.0650	1.561	0.2849
n-Hexane	0.0447	1.072	0.1957
Cyclohexane	0.0895	2.147	0.3918
Other Hexanes	0.0349	0.839	0.1530
Heptanes	0.0832	1.997	0.3644
Methylcyclohexane	0.0737	1.770	0.3230
2,2,4-Trimethylpentane	<0.0001	0.001	0.0001
Benzene	0.1109	2.662	0.4859
Toluene	0.3307	7.936	1.4482
Ethylbenzene	0.0095	0.227	0.0415
Xylenes	0.4446	10.670	1.9473
C8+ Heavies	0.1548	3.715	0.6780
Total Emissions	2.2819	54.765	9.9946
Total Hydrocarbon Emissions	2.2819	54.765	9.9946
Total VOC Emissions	1.9168	46.004	8.3957
Total HAP Emissions	0.9403	22.568	4.1187
Total BTEX Emissions	0.8956	21.496	3.9229

FLASH GAS EMISSIONS DFT-01 (1E)

Component	lbs/hr	lbs/day	tons/yr
Methane	11.9074	285.779	52.1546
Ethane	5.0758	121.818	22.2318
Propane	2.7561	66.146	12.0717
Isobutane	0.3841	9.218	1.6822
n-Butane	1.0533	25.279	4.6134
Isopentane	0.2135	5.124	0.9351
n-Pentane	0.3103	7.448	1.3593
n-Hexane	0.1217	2.922	0.5332
Cyclohexane	0.0600	1.441	0.2629
Other Hexanes	0.1252	3.006	0.5485
Heptanes	0.1136	2.727	0.4977
Methylcyclohexane	0.0398	0.955	0.1743
2,2,4-Trimethylpentane	0.0001	0.002	0.0004
Benzene	0.0121	0.289	0.0528
Toluene	0.0239	0.574	0.1048
Ethylbenzene	0.0004	0.010	0.0018
Xylenes	0.0137	0.330	0.0602
C8+ Heavies	0.0292	0.700	0.1277

Total Emissions	22.2403	533.767	97.4126
Total Hydrocarbon Emissions	22.2403	533.767	97.4126
Total VOC Emissions	5.2571	126.171	23.0261
Total HAP Emissions	0.1720	4.127	0.7532
Total BTEX Emissions	0.0501	1.203	0.2196

FLASH TANK OFF GAS

Component	lbs/hr	lbs/day	tons/yr
Methane	23.8149	571.558	104.3093
Ethane	10.1515	243.636	44.4636
Propane	5.5122	132.293	24.1435
Isobutane	0.7681	18.435	3.3645
n-Butane	2.1066	50.558	9.2269
Isopentane	0.4270	10.248	1.8702
n-Pentane	0.6207	14.896	2.7186
n-Hexane	0.2435	5.844	1.0665
Cyclohexane	0.1201	2.881	0.5259
Other Hexanes	0.2505	6.011	1.0971
Heptanes	0.2272	5.454	0.9953
Methylcyclohexane	0.0796	1.910	0.3487
2,2,4-Trimethylpentane	0.0002	0.004	0.0007
Benzene	0.0241	0.579	0.1056
Toluene	0.0478	1.148	0.2095
Ethylbenzene	0.0008	0.020	0.0036
Xylenes	0.0275	0.660	0.1204
C8+ Heavies	0.0583	1.400	0.2554
Total Emissions	44.4806	1067.535	194.8251
Total Hydrocarbon Emissions	44.4806	1067.535	194.8251
Total VOC Emissions	10.5142	252.341	46.0523
Total HAP Emissions	0.3439	8.254	1.5063
Total BTEX Emissions	0.1003	2.406	0.4391

COMBINED REGENERATOR VENT/FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	12.0564	289.354	52.8071
Ethane	5.2918	127.004	23.1782
Propane	2.9851	71.642	13.0747
Isobutane	0.4306	10.335	1.8861
n-Butane	1.2167	29.201	5.3291
Isopentane	0.2499	5.997	1.0944
n-Pentane	0.3754	9.009	1.6442
n-Hexane	0.1664	3.994	0.7289
Cyclohexane	0.1495	3.588	0.6548
Other Hexanes	0.1602	3.844	0.7016
Heptanes	0.1968	4.723	0.8620
Methylcyclohexane	0.1135	2.725	0.4973
2,2,4-Trimethylpentane	0.0001	0.003	0.0005
Benzene	0.1230	2.952	0.5387
Toluene	0.3546	8.510	1.5530
Ethylbenzene	0.0099	0.237	0.0433
Xylenes	0.4583	11.000	2.0076
C8+ Heavies	0.1839	4.415	0.8057

Total Emissions	24.5222	588.532	107.4072
Total Hydrocarbon Emissions	24.5222	588.532	107.4072
Total VOC Emissions	7.1739	172.175	31.4219
Total HAP Emissions	1.1123	26.695	4.8719
Total BTEX Emissions	0.9458	22.699	4.1425

GRI-GLYCalc VERSION 4.0 - SUMMARY OF INPUT VALUES

Case Name: 5.0 MMscfd - McClain TEG Dehydrator 01
File Name: C:\projects2\wfs\OVM\McClain\R13\00 - Att-Nb - McClain DS - NSR - Dehy-01 GLYCalc - 07.28.15.ddf
Date: July 28, 2015

DESCRIPTION:

Description: Inlet Gas @ 60 oF, 1000 psig
Gas analysis for McClain #1H dated 04-01-15
Gas Injection Pump - 1.5 gpm max.
Flash Tank w/ 50% Recycle

Annual Hours of Operation: 8760.0 hours/yr

WET GAS:

Temperature: 60.00 deg. F
Pressure: 1000.00 psig
Wet Gas Water Content: Saturated

Component	Conc. (vol %)
Carbon Dioxide	0.1443
Nitrogen	0.5844
Methane	76.8365
Ethane	14.8823
Propane	5.0813
Isobutane	0.4955
n-Butane	1.2243
Isopentane	0.2081
n-Pentane	0.2702
n-Hexane	0.0752
Cyclohexane	0.0166
Other Hexanes	0.0871
Heptanes	0.0481
Methylcyclohexane	0.0104
2,2,4-Trimethylpentane	0.0000
Benzene	0.0013
Toluene	0.0024
Ethylbenzene	0.0000
Xylenes	0.0018
C8+ Heavies	0.0263

DRY GAS:

Flow Rate: 5.0 MMSCF/day
Water Content: 5.0 lbs. H2O/MMSCF

LEAN GLYCOL:

Glycol Type: TEG
Water Content: 1.5 wt% H2O
Flow Rate: 1.5 gpm

PUMP:

Glycol Pump Type: Gas Injection
Gas Injection Pump Volume Ratio: 0.080 acfm gas/gpm glycol

FLASH TANK:

Flash Control: Combustion device
Flash Control Efficiency: 50.00 %
Temperature: 150.0 deg. F
Pressure: 50.0 psig

GRI-GLYCalc VERSION 4.0 - AGGREGATE CALCULATIONS REPORT

Case Name: 5.0 MMscfd - McClain TEG Dehydrator 01
File Name: C:\projects2\wfs\OVM\McClain\R13\00 - Att-Nb - McClain DS - NSR - Dehy-01 GLYCalc - 07.28.15.ddf
Date: July 28, 2015

DESCRIPTION:

Description: Inlet Gas @ 60 oF, 1000 psig
Gas analysis for McClain #1H dated 04-01-15
Gas Injection Pump - 1.5 gpm max.
Flash Tank w/ 50% Recycle

Annual Hours of Operation: 8760.0 hours/yr

EMISSIONS REPORTS:

UNCONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	0.1490	3.575	0.6525
Ethane	0.2161	5.186	0.9464
Propane	0.2290	5.496	1.0030
Isobutane	0.0466	1.117	0.2039
n-Butane	0.1634	3.922	0.7157
Isopentane	0.0364	0.873	0.1593
n-Pentane	0.0650	1.561	0.2849
n-Hexane	0.0447	1.072	0.1957
Cyclohexane	0.0895	2.147	0.3918
Other Hexanes	0.0349	0.839	0.1530
Heptanes	0.0832	1.997	0.3644
Methylcyclohexane	0.0737	1.770	0.3230
2,2,4-Trimethylpentane	<0.0001	0.001	0.0001
Benzene	0.1109	2.662	0.4859
Toluene	0.3307	7.936	1.4482
Ethylbenzene	0.0095	0.227	0.0415
Xylenes	0.4446	10.670	1.9473
C8+ Heavies	0.1548	3.715	0.6780
Total Emissions	2.2819	54.765	9.9946
Total Hydrocarbon Emissions	2.2819	54.765	9.9946
Total VOC Emissions	1.9168	46.004	8.3957
Total HAP Emissions	0.9403	22.568	4.1187
Total BTEX Emissions	0.8956	21.496	3.9229

FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	11.9074	285.779	52.1546
Ethane	5.0758	121.818	22.2318
Propane	2.7561	66.146	12.0717
Isobutane	0.3841	9.218	1.6822
n-Butane	1.0533	25.279	4.6134
Isopentane	0.2135	5.124	0.9351

n-Pentane	0.3103	7.448	1.3593
n-Hexane	0.1217	2.922	0.5332
Cyclohexane	0.0600	1.441	0.2629
Other Hexanes	0.1252	3.006	0.5485
Heptanes	0.1136	2.727	0.4977
Methylcyclohexane	0.0398	0.955	0.1743
2,2,4-Trimethylpentane	0.0001	0.002	0.0004
Benzene	0.0121	0.289	0.0528
Toluene	0.0239	0.574	0.1048
Ethylbenzene	0.0004	0.010	0.0018
Xylenes	0.0137	0.330	0.0602
C8+ Heavies	0.0292	0.700	0.1277
Total Emissions	22.2403	533.767	97.4126
Total Hydrocarbon Emissions	22.2403	533.767	97.4126
Total VOC Emissions	5.2571	126.171	23.0261
Total HAP Emissions	0.1720	4.127	0.7532
Total BTEX Emissions	0.0501	1.203	0.2196

FLASH TANK OFF GAS

Component	lbs/hr	lbs/day	tons/yr
Methane	23.8149	571.558	104.3093
Ethane	10.1515	243.636	44.4636
Propane	5.5122	132.293	24.1435
Isobutane	0.7681	18.435	3.3645
n-Butane	2.1066	50.558	9.2269
Isopentane	0.4270	10.248	1.8702
n-Pentane	0.6207	14.896	2.7186
n-Hexane	0.2435	5.844	1.0665
Cyclohexane	0.1201	2.881	0.5259
Other Hexanes	0.2505	6.011	1.0971
Heptanes	0.2272	5.454	0.9953
Methylcyclohexane	0.0796	1.910	0.3487
2,2,4-Trimethylpentane	0.0002	0.004	0.0007
Benzene	0.0241	0.579	0.1056
Toluene	0.0478	1.148	0.2095
Ethylbenzene	0.0008	0.020	0.0036
Xylenes	0.0275	0.660	0.1204
C8+ Heavies	0.0583	1.400	0.2554
Total Emissions	44.4806	1067.535	194.8251
Total Hydrocarbon Emissions	44.4806	1067.535	194.8251
Total VOC Emissions	10.5142	252.341	46.0523
Total HAP Emissions	0.3439	8.254	1.5063
Total BTEX Emissions	0.1003	2.406	0.4391

COMBINED REGENERATOR VENT/FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	12.0564	289.354	52.8071
Ethane	5.2918	127.004	23.1782
Propane	2.9851	71.642	13.0747
Isobutane	0.4306	10.335	1.8861
n-Butane	1.2167	29.201	5.3291
Isopentane	0.2499	5.997	1.0944

n-Pentane	0.3754	9.009	1.6442
n-Hexane	0.1664	3.994	0.7289
Cyclohexane	0.1495	3.588	0.6548
Other Hexanes	0.1602	3.844	0.7016
Heptanes	0.1968	4.723	0.8620
Methylcyclohexane	0.1135	2.725	0.4973
2,2,4-Trimethylpentane	0.0001	0.003	0.0005
Benzene	0.1230	2.952	0.5387
Toluene	0.3546	8.510	1.5530
Ethylbenzene	0.0099	0.237	0.0433
Xylenes	0.4583	11.000	2.0076
C8+ Heavies	0.1839	4.415	0.8057
Total Emissions	24.5222	588.532	107.4072
Total Hydrocarbon Emissions	24.5222	588.532	107.4072
Total VOC Emissions	7.1739	172.175	31.4219
Total HAP Emissions	1.1123	26.695	4.8719
Total BTEX Emissions	0.9458	22.699	4.1425

COMBINED REGENERATOR VENT/FLASH GAS EMISSION CONTROL REPORT:

Component	Uncontrolled tons/yr	Controlled tons/yr	% Reduction
Methane	104.9617	52.8071	49.69
Ethane	45.4100	23.1782	48.96
Propane	25.1464	13.0747	48.01
Isobutane	3.5684	1.8861	47.14
n-Butane	9.9426	5.3291	46.40
Isopentane	2.0296	1.0944	46.07
n-Pentane	3.0035	1.6442	45.26
n-Hexane	1.2621	0.7289	42.25
Cyclohexane	0.9177	0.6548	28.65
Other Hexanes	1.2501	0.7016	43.88
Heptanes	1.3597	0.8620	36.60
Methylcyclohexane	0.6716	0.4973	25.96
2,2,4-Trimethylpentane	0.0009	0.0005	42.14
Benzene	0.5915	0.5387	8.93
Toluene	1.6578	1.5530	6.32
Ethylbenzene	0.0451	0.0433	3.97
Xylenes	2.0678	2.0076	2.91
C8+ Heavies	0.9334	0.8057	13.68
Total Emissions	204.8197	107.4072	47.56
Total Hydrocarbon Emissions	204.8197	107.4072	47.56
Total VOC Emissions	54.4480	31.4219	42.29
Total HAP Emissions	5.6251	4.8719	13.39
Total BTEX Emissions	4.3621	4.1425	5.03

EQUIPMENT REPORTS:

ABSORBER

NOTE: Because the Calculated Absorber Stages was below the minimum allowed, GRI-GLYCalc has set the number of Absorber Stages to 1.25 and has calculated a revised Dry Gas Dew Point.

Calculated Absorber Stages:	1.25
Calculated Dry Gas Dew Point:	0.55 lbs. H2O/MMSCF
Temperature:	60.0 deg. F
Pressure:	1000.0 psig
Dry Gas Flow Rate:	5.0000 MMSCF/day
Glycol Losses with Dry Gas:	0.0317 lb/hr
Wet Gas Water Content:	Saturated
Calculated Wet Gas Water Content:	17.05 lbs. H2O/MMSCF
Calculated Lean Glycol Recirc. Ratio:	26.17 gal/lb H2O

Component	Remaining in Dry Gas	Absorbed in Glycol
Water	3.21%	96.79%
Carbon Dioxide	99.43%	0.57%
Nitrogen	99.96%	0.04%
Methane	99.97%	0.03%
Ethane	99.90%	0.10%
Propane	99.85%	0.15%
Isobutane	99.80%	0.20%
n-Butane	99.74%	0.26%
Isopentane	99.76%	0.24%
n-Pentane	99.68%	0.32%
n-Hexane	99.51%	0.49%
Cyclohexane	97.59%	2.41%
Other Hexanes	99.63%	0.37%
Heptanes	99.15%	0.85%
Methylcyclohexane	97.59%	2.41%
2,2,4-Trimethylpentane	99.68%	0.32%
Benzene	76.11%	23.89%
Toluene	69.17%	30.83%
Ethylbenzene	65.04%	34.96%
Xylenes	55.35%	44.65%
C8+ Heavies	99.45%	0.55%

FLASH TANK

Flash Control:	Combustion device
Flash Control Efficiency:	50.00 %
Flash Temperature:	150.0 deg. F
Flash Pressure:	50.0 psig

Component	Left in Glycol	Removed in Flash Gas
Water	99.40%	0.60%
Carbon Dioxide	5.89%	94.11%
Nitrogen	0.61%	99.39%
Methane	0.62%	99.38%
Ethane	2.08%	97.92%
Propane	3.99%	96.01%
Isobutane	5.71%	94.29%
n-Butane	7.20%	92.80%
Isopentane	8.05%	91.95%
n-Pentane	9.71%	90.29%

n-Hexane	15.76%	84.24%
Cyclohexane	44.32%	55.68%
Other Hexanes	12.72%	87.28%
Heptanes	27.06%	72.94%
Methylcyclohexane	49.93%	50.07%
2,2,4-Trimethylpentane	16.35%	83.65%
Benzene	83.02%	16.98%
Toluene	88.35%	11.65%
Ethylbenzene	92.87%	7.13%
Xylenes	94.92%	5.08%
C8+ Heavies	74.80%	25.20%

REGENERATOR

No Stripping Gas used in regenerator.

Component	Remaining in Glycol	Distilled Overhead
Water	79.06%	20.94%
Carbon Dioxide	0.00%	100.00%
Nitrogen	0.00%	100.00%
Methane	0.00%	100.00%
Ethane	0.00%	100.00%
Propane	0.00%	100.00%
Isobutane	0.00%	100.00%
n-Butane	0.00%	100.00%
Isopentane	2.69%	97.31%
n-Pentane	2.58%	97.42%
n-Hexane	1.92%	98.08%
Cyclohexane	6.40%	93.60%
Other Hexanes	4.25%	95.75%
Heptanes	1.35%	98.65%
Methylcyclohexane	7.11%	92.89%
2,2,4-Trimethylpentane	4.64%	95.36%
Benzene	5.95%	94.05%
Toluene	8.86%	91.14%
Ethylbenzene	11.11%	88.89%
Xylenes	13.51%	86.49%
C8+ Heavies	10.59%	89.41%

STREAM REPORTS:

WET GAS STREAM

Temperature: 60.00 deg. F
Pressure: 1014.70 psia
Flow Rate: 2.09e+005 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	3.59e-002	3.55e+000
Carbon Dioxide	1.44e-001	3.49e+001

Nitrogen	5.84e-001	8.99e+001
Methane	7.68e+001	6.77e+003
Ethane	1.49e+001	2.46e+003
Propane	5.08e+000	1.23e+003
Isobutane	4.95e-001	1.58e+002
n-Butane	1.22e+000	3.91e+002
Isopentane	2.08e-001	8.25e+001
n-Pentane	2.70e-001	1.07e+002
n-Hexane	7.52e-002	3.56e+001
Cyclohexane	1.66e-002	7.68e+000
Other Hexanes	8.71e-002	4.12e+001
Heptanes	4.81e-002	2.65e+001
Methylcyclohexane	1.04e-002	5.61e+000
2,2,4-Trimethylpentane	5.00e-005	3.14e-002
Benzene	1.30e-003	5.58e-001
Toluene	2.40e-003	1.21e+000
Ethylbenzene	5.00e-005	2.92e-002
Xylenes	1.80e-003	1.05e+000
C8+ Heavies	2.63e-002	2.46e+001
Total Components	100.00	1.15e+004

DRY GAS STREAM

Temperature: 60.00 deg. F
Pressure: 1014.70 psia
Flow Rate: 2.08e+005 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	1.15e-003	1.14e-001
Carbon Dioxide	1.44e-001	3.47e+001
Nitrogen	5.85e-001	8.99e+001
Methane	7.69e+001	6.77e+003
Ethane	1.49e+001	2.46e+003
Propane	5.08e+000	1.23e+003
Isobutane	4.95e-001	1.58e+002
n-Butane	1.22e+000	3.90e+002
Isopentane	2.08e-001	8.23e+001
n-Pentane	2.70e-001	1.07e+002
n-Hexane	7.49e-002	3.54e+001
Cyclohexane	1.62e-002	7.49e+000
Other Hexanes	8.68e-002	4.11e+001
Heptanes	4.77e-002	2.63e+001
Methylcyclohexane	1.02e-002	5.47e+000
2,2,4-Trimethylpentane	4.99e-005	3.13e-002
Benzene	9.90e-004	4.25e-001
Toluene	1.66e-003	8.40e-001
Ethylbenzene	3.25e-005	1.90e-002
Xylenes	9.97e-004	5.81e-001
C8+ Heavies	2.62e-002	2.45e+001
Total Components	100.00	1.15e+004

LEAN GLYCOL STREAM

Temperature: 60.00 deg. F

Flow Rate: 1.50e+000 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.85e+001	8.32e+002
Water	1.50e+000	1.27e+001
Carbon Dioxide	2.35e-012	1.98e-011
Nitrogen	4.58e-013	3.87e-012
Methane	9.28e-018	7.84e-017
Ethane	1.40e-007	1.19e-006
Propane	8.71e-009	7.36e-008
Isobutane	1.10e-009	9.27e-009
n-Butane	3.00e-009	2.53e-008
Isopentane	1.19e-004	1.00e-003
n-Pentane	2.04e-004	1.73e-003
n-Hexane	1.04e-004	8.76e-004
Cyclohexane	7.24e-004	6.11e-003
Other Hexanes	1.84e-004	1.55e-003
Heptanes	1.34e-004	1.13e-003
Methylcyclohexane	6.68e-004	5.64e-003
2,2,4-Trimethylpentane	1.82e-007	1.54e-006
Benzene	8.31e-004	7.01e-003
Toluene	3.81e-003	3.21e-002
Ethylbenzene	1.40e-004	1.18e-003
Xylenes	8.23e-003	6.95e-002
C8+ Heavies	2.17e-003	1.83e-002
Total Components	100.00	8.44e+002

RICH GLYCOL AND PUMP GAS STREAM

Temperature: 60.00 deg. F
Pressure: 1014.70 psia
Flow Rate: 1.61e+000 gpm
NOTE: Stream has more than one phase.

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.29e+001	8.31e+002
Water	1.80e+000	1.61e+001
Carbon Dioxide	3.46e-002	3.10e-001
Nitrogen	3.64e-002	3.26e-001
Methane	2.68e+000	2.40e+001
Ethane	1.16e+000	1.04e+001
Propane	6.41e-001	5.74e+000
Isobutane	9.10e-002	8.15e-001
n-Butane	2.54e-001	2.27e+000
Isopentane	5.19e-002	4.64e-001
n-Pentane	7.68e-002	6.87e-001
n-Hexane	3.23e-002	2.89e-001
Cyclohexane	2.41e-002	2.16e-001
Other Hexanes	3.21e-002	2.87e-001
Heptanes	3.48e-002	3.12e-001
Methylcyclohexane	1.78e-002	1.59e-001
2,2,4-Trimethylpentane	2.27e-005	2.03e-004
Benzene	1.59e-002	1.42e-001
Toluene	4.59e-002	4.11e-001
Ethylbenzene	1.28e-003	1.15e-002

Xylenes	6.05e-002	5.42e-001
C8+ Heavies	2.59e-002	2.31e-001
Total Components	100.00	8.95e+002

FLASH TANK OFF GAS STREAM

Temperature: 150.00 deg. F
Pressure: 64.70 psia
Flow Rate: 7.77e+002 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	2.64e-001	9.75e-002
Carbon Dioxide	3.23e-001	2.91e-001
Nitrogen	5.65e-001	3.24e-001
Methane	7.25e+001	2.38e+001
Ethane	1.65e+001	1.02e+001
Propane	6.11e+000	5.51e+000
Isobutane	6.46e-001	7.68e-001
n-Butane	1.77e+000	2.11e+000
Isopentane	2.89e-001	4.27e-001
n-Pentane	4.20e-001	6.21e-001
n-Hexane	1.38e-001	2.43e-001
Cyclohexane	6.97e-002	1.20e-001
Other Hexanes	1.42e-001	2.50e-001
Heptanes	1.11e-001	2.27e-001
Methylcyclohexane	3.96e-002	7.96e-002
2,2,4-Trimethylpentane	7.26e-005	1.70e-004
Benzene	1.51e-002	2.41e-002
Toluene	2.54e-002	4.78e-002
Ethylbenzene	3.76e-004	8.17e-004
Xylenes	1.27e-002	2.75e-002
C8+ Heavies	1.67e-002	5.83e-002
Total Components	100.00	4.52e+001

FLASH TANK GLYCOL STREAM

Temperature: 150.00 deg. F
Flow Rate: 1.51e+000 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.78e+001	8.31e+002
Water	1.88e+000	1.60e+001
Carbon Dioxide	2.14e-003	1.82e-002
Nitrogen	2.35e-004	2.00e-003
Methane	1.75e-002	1.49e-001
Ethane	2.54e-002	2.16e-001
Propane	2.69e-002	2.29e-001
Isobutane	5.48e-003	4.66e-002
n-Butane	1.92e-002	1.63e-001
Isopentane	4.40e-003	3.74e-002
n-Pentane	7.86e-003	6.68e-002
n-Hexane	5.36e-003	4.55e-002
Cyclohexane	1.12e-002	9.56e-002
Other Hexanes	4.29e-003	3.65e-002

Heptanes	9.92e-003	8.43e-002
Methylcyclohexane	9.34e-003	7.94e-002
2,2,4-Trimethylpentane	3.90e-006	3.32e-005
Benzene	1.39e-002	1.18e-001
Toluene	4.27e-002	3.63e-001
Ethylbenzene	1.25e-003	1.07e-002
Xylenes	6.05e-002	5.14e-001
C8+ Heavies	2.04e-002	1.73e-001
Total Components	100.00	8.50e+002

FLASH GAS EMISSIONS

Flow Rate: 1.87e+003 scfh
Control Method: Combustion Device
Control Efficiency: 50.00

Component	Conc. (vol%)	Loading (lb/hr)
Water	4.98e+001	4.42e+001
Carbon Dioxide	2.94e+001	6.37e+001
Nitrogen	2.35e-001	3.24e-001
Methane	1.51e+001	1.19e+001
Ethane	3.43e+000	5.08e+000
Propane	1.27e+000	2.76e+000
Isobutane	1.34e-001	3.84e-001
n-Butane	3.68e-001	1.05e+000
Isopentane	6.01e-002	2.13e-001
n-Pentane	8.73e-002	3.10e-001
n-Hexane	2.87e-002	1.22e-001
Cyclohexane	1.45e-002	6.00e-002
Other Hexanes	2.95e-002	1.25e-001
Heptanes	2.30e-002	1.14e-001
Methylcyclohexane	8.23e-003	3.98e-002
2,2,4-Trimethylpentane	1.51e-005	8.49e-005
Benzene	3.13e-003	1.21e-002
Toluene	5.27e-003	2.39e-002
Ethylbenzene	7.82e-005	4.09e-004
Xylenes	2.63e-003	1.37e-002
C8+ Heavies	3.48e-003	2.92e-002
Total Components	100.00	1.30e+002

REGENERATOR OVERHEADS STREAM

Temperature: 212.00 deg. F
Pressure: 14.70 psia
Flow Rate: 8.62e+001 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	8.20e+001	3.35e+000
Carbon Dioxide	1.82e-001	1.82e-002
Nitrogen	3.14e-002	2.00e-003
Methane	4.09e+000	1.49e-001
Ethane	3.16e+000	2.16e-001
Propane	2.29e+000	2.29e-001

Isobutane	3.53e-001	4.66e-002
n-Butane	1.24e+000	1.63e-001
Isopentane	2.22e-001	3.64e-002
n-Pentane	3.97e-001	6.50e-002
n-Hexane	2.28e-001	4.47e-002
Cyclohexane	4.68e-001	8.95e-002
Other Hexanes	1.78e-001	3.49e-002
Heptanes	3.65e-001	8.32e-002
Methylcyclohexane	3.31e-001	7.37e-002
2,2,4-Trimethylpentane	1.22e-004	3.16e-005
Benzene	6.25e-001	1.11e-001
Toluene	1.58e+000	3.31e-001
Ethylbenzene	3.93e-002	9.47e-003
Xylenes	1.84e+000	4.45e-001
C8+ Heavies	4.00e-001	1.55e-001
Total Components	100.00	5.66e+000

ATTACHMENT O

Monitoring/Recordkeeping/Reporting/Testing Plans

"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."

- Monitoring/Recordkeeping/Reporting/Testing Plans
  A. Monitoring and Recordkeeping
  B. Notification and Reporting
  C. Testing

ATTACHMENT O
Monitoring/Recordkeeping/Reporting/Testing Plans

Williams Ohio Valley Midstream LLC (OVM)
M^{C}CLAIN DEHYDRATION COMPRESSOR STATION (DS)
Application for 45CSR13 NSR Construction Permit

Williams Ohio Valley Midstream LLC (OVM) proposes the following monitoring, recordkeeping, reporting and testing requirements at the subject DS.

Monitoring and Recordkeeping

1. Monitor and record quantity of natural gas treated in the TEG dehydrator.
2. Monitor and record quantity of natural gas consumed in the reboiler.
3. Maintain a record of the potential to emit (PTE) HAP calculations for the entire facility.
4. These records shall be maintained on site, or in a readily available off-site location, for a period of five (5) years.

Testing

No testing is required.

ATTACHMENT P
Public Notice

"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."

The applicant shall cause such legal advertisement to appear a minimum of one (1) day in the newspaper most commonly read in the area where the facility exists or will be constructed. The notice must be published no earlier than five (5) working days of receipt by this office of your application. The original affidavit of publication must be received by this office no later than the last day of the public comment period.

Types and amounts of pollutants discharged must include all regulated pollutants (PM, PM10, VOC, SO2, Xylene, etc.) and their potential to emit or the permit level being sought in units of tons per year (including fugitive emissions).

- Legal Advertisement (as shown) will be placed in a newspaper of general circulation in the area where the source is located (See 45CSR§13-8.3 thru 45CSR§13-8.5).

- An Affidavit of Publication shall be submitted immediately upon receipt.

ATTACHMENT P
Public Notice

AIR QUALITY PUBLIC NOTICE
Notice of Application

Notice is given that Williams Ohio Valley Midstream LLC has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a 45CSR13 NSR Construction Permit for an existing natural gas compressor station, off Beam Ln, approximately 1.5 mi East of Moundsville, in Marshall County, West Virginia.

The latitude and longitude coordinates are 39.9274 degrees North x -80.6960 degrees West.

The applicant estimates the total potential to discharge the following regulated air pollutants will be:

0.10	tons of nitrogen oxides per year
0.08	tons of carbon monoxide per year
41.10	tons of volatile organic compounds per year
<0.01	tons of sulfur dioxide per year
0.01	tons of particulate matter per year
<0.01	tons of formaldehyde per year
0.65	tons of benzene per year
2.41	tons of xylenes per year
5.91	tons of total hazardous air pollutants per year
2,083	tons of carbon dioxide equivalent per year

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

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

Dated this the _____ day of _____ 2015.

By: Williams Ohio Valley Midstream LLC
Don Wicburg
Vice President and General Manager
100 Teletech Drive, Suite 2
Moundsville, WV 26041

ATTACHMENT Q

Business Confidential Claims

(NOT APPLICABLE)

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also

ATTACHMENT R

Authority Forms

(NOT APPLICABLE)

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also

ATTACHMENT S

Title V Permit Revision Information

(NOT APPLICABLE)

APPLICATION FEE

NSR Construction Permit

- Include a check payable to WVDEP – Division of Air Quality.
- As per WV Rule 22 (45CSR22) filed on May 6, 1991, a **minimum fee of $1,000** must be submitted for each 45CSR13 permit application filed with the WVDEP-DAQ.
- Additional charges may apply, depending on the nature of the application as outlined in Section 3.4.b. of Regulation 22, and shown below:
  - **NESHAP Requirements: $2,500 (HH)**

Total application fee is **$3,500** [= $1,000 minimum fee + $2,500 additional fees]

***** End of Application for 45CSR13 NSR Permit ****

After printing this label:
1. Use the 'Print' button on this page to print your label to your laser or inkjet printer.
2. Fold the printed page along the horizontal line.
3. Place label in shipping pouch and affix it to your shipment so that the barcode portion of the label can be read and scanned.

Warning: Use only the printed original label for shipping. Using a photocopy of this label for shipping purposes is fraudulent and could result in additional billing charges, along with the cancellation of your FedEx account number.
Use of this system constitutes your agreement to the service conditions in the current FedEx Service Guide, available on fedex.com.FedEx will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay, non-delivery,misdelivery,or misinformation, unless you declare a higher value, pay an additional charge, document your actual loss and file a timely claim.Limitations found in the current FedEx Service Guide apply. Your right to recover from FedEx for any loss, including intrinsic value of the package, loss of sales, income interest, profit, attorney's fees, costs, and other forms of damage whether direct, incidental,consequential, or special is limited to the greater of $100 or the authorized declared value. Recovery cannot exceed actual documented loss.Maximum for items of extraordinary value is $1,000, e.g. jewelry, precious metals, negotiable instruments and other items listed in our ServiceGuide. Written claims must be filed within strict time limits, see current FedEx Service Guide.