



Key Rock Compressor Station

Plant ID No. 109-00104

Rock View, West Virginia

**General Permit G-35A Permit Modification Application**

SLR Ref: 116.00400.00129

September 2015



September 21, 2015

Mr. William F. Durham  
Director  
WVDEP, Division of Air Quality  
601 – 57<sup>th</sup> Street  
Charleston, West Virginia 25304

**Re: G35-A General Permit Modification Application  
Key Rock Compressor Station  
Rock View, West Virginia**

Dear Mr. Durham,

SLR International Corporation has prepared the attached G35-A General Permit Modification Application on behalf of Cranberry Pipeline Corporation for the Key Rock Compressor Station located in Rock View, West Virginia (plant ID No. 109-00104). The facility is currently permitted by General Permit number G35-A010B. SLR is requesting this Modification in order to update the facility registration to more accurately reflect the site's most recent gas compositional analysis measurements.

An updated wet gas analysis was taken on April 22, 2015 from the Key Rock Compressor Station. This sample and GLYCalc emission modeling indicate the need to increase the facility's potential to emit via a G35-A General Permit Modification. The resulting emission increases are reflected in the following table for the dehydration unit still vent. These proposed limits do not trigger any additional permit requirements.

<b>Pollutant</b>	<b>Currently Permitted Emission Limits (tpy)</b>	<b>Proposed Emission Limits (tpy)</b>	<b>Difference between Permitted and Proposed Limits (tpy)</b>
VOC	2.267	14.441	12.17
Benzene	0.120	0.3290	0.21
Ethylbenzene	0.410	1.4080	1.00
Toluene	0.220	0.6833	0.47
Xylene	0.630	2.0000	1.37
n-Hexane	0.0043	0.0757	0.07

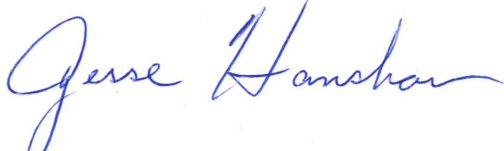
As a result of also accounting for storage vessel and tank truck loading emissions within this application for the first time, the overall facility increase in VOC is actually slightly higher, by 0.459 tpy, than what is accounted for within the dehy changes listed above. The overall increase in VOC emissions, 12.63 tpy, was listed within the public notice delivered to the

September 21, 2015  
William F. Durham  
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*Independent Herald* for publication. The legal advertisement will be forwarded to your office as soon as SLR receives the original affidavit from the newspaper.

If any additional information is needed, please contact me by telephone at (681) 205-8949 or by e-mail at [jhanshaw@slrconsulting.com](mailto:jhanshaw@slrconsulting.com).

Sincerely,  
**SLR International Corporation**



Jesse Hanshaw, P.E.  
Principal Engineer

Cc: Mr. Randy Spencer, Cranberry Pipeline Corporation



**General Permit G-35A Permit Modification Application**  
**Key Rock Compressor Station, Plant ID No. 109-00104**  
**Rock View, West Virginia**

Prepared for:

**Cranberry Pipeline Corporation**  
**c/o Cabot Oil & Gas Corporation**  
**900 Lee Street, East**  
**Suite 1500**  
**Charleston, West Virginia 25301**

This document has been prepared by SLR International Corporation. The material and data in this permit application were prepared under the supervision and direction of the undersigned.

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Nate Lanham  
WV Operations Manager

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Jesse Hanshaw, P.E.  
Principal Engineer



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#### Notes:

ATTACHMENT H	No control devices are used at this facility.
ATTACHMENT M	No Siting Criteria Waiver is necessary due to existing facility.



## **APPLICATION FOR PERMIT**

### **General Permit G-35A Permit Modification Application**

**Key Rock Compressor Station, Plant ID No. 109-00104  
Rock View, West Virginia**

Cranberry Pipeline Corporation  
c/o Cabot Oil & Gas Corporation  
900 Lee Street East, Suite 1500  
Charleston, West Virginia

September 2015



WEST VIRGINIA  
DEPARTMENT OF ENVIRONMENTAL PROTECTION  
DIVISION OF AIR QUALITY  
601 57<sup>th</sup> Street, SE  
Charleston, WV 25304  
Phone: (304) 926-0475 • [www.dep.wv.gov/daq](http://www.dep.wv.gov/daq)

**APPLICATION FOR GENERAL  
PERMIT REGISTRATION**  
*CONSTRUCT, MODIFY, RELOCATE OR  
ADMINISTRATIVELY UPDATE  
A STATIONARY SOURCE OF AIR POLLUTANTS*

☐ CONSTRUCTION    ☒ MODIFICATION    ☐ RELOCATION    ☐ CLASS I ADMINISTRATIVE UPDATE  
☐ CLASS II ADMINISTRATIVE UPDATE

**CHECK WHICH TYPE OF GENERAL PERMIT REGISTRATION YOU ARE APPLYING FOR:**

- |  |  |
|--|--|
| <input type="checkbox"/> <b>G10-D</b> – Coal Preparation and Handling  | <input type="checkbox"/> <b>G40-C</b> – Nonmetallic Minerals Processing                  |
| <input type="checkbox"/> <b>G20-B</b> – Hot Mix Asphalt  | <input type="checkbox"/> <b>G50-B</b> – Concrete Batch                                   |
| <input type="checkbox"/> <b>G30-D</b> – Natural Gas Compressor Stations  | <input type="checkbox"/> <b>G60-C</b> – Class II Emergency Generator                     |
| <input type="checkbox"/> <b>G33-A</b> – Spark Ignition Internal Combustion Engines                                 | <input type="checkbox"/> <b>G65-C</b> – Class I Emergency Generator                      |
| <input checked="" type="checkbox"/> <b>G35-A</b> – Natural Gas Compressor Stations (Flare/Glycol Dehydration Unit) | <input type="checkbox"/> <b>G70-A</b> – Class II Oil and Natural Gas Production Facility |

**SECTION I. GENERAL INFORMATION**

1. Name of applicant (as registered with the WV Secretary of State's Office): CRANBERRY PIPELINE CORPORATION	2. Federal Employer ID No. ( <b>FEIN</b> ): 042989934
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3. Applicant's mailing address: 900 LEE STREET EAST, SUITE 1500 _____ CHARLESTON WV 25301 _____	4. Applicant's physical address: 628 RIVER DRIVE _____ PINEVILLE WV 24874 _____
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5. If applicant is a subsidiary corporation, please provide the name of parent corporation: CABOT OIL & GAS CORPORATION

6. **WV 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 LLC / Registration** (one page) including any name change amendments or other Business Certificate as **Attachment A**.

**SECTION II. FACILITY INFORMATION**

7. Type of plant or facility (stationary source) to be constructed, modified, relocated or administratively updated (e.g., coal preparation plant, primary crusher, etc.):  NATURAL GAS COMPRESSOR STATION AND DEHYDRATION UNIT	8a. Standard Industrial Classification  Classification (SIC) code: 1311	AND	8b. North American Industry System (NAICS) code:  21111
9. DAQ Plant ID No. (for existing facilities only):  109-00104	10. List all current 45CSR13 and other General Permit numbers associated with this process (for existing facilities only):  G35-A010B _____ _____		

**A: PRIMARY OPERATING SITE INFORMATION**

11A. Facility name of primary operating site: KEY ROCK COMPRESSOR STATION _____ _____		12A. Address of primary operating site:  Mailing: <u>PO BOX 1589 PINEVILLE WV 24874</u>  Physical: <u>628 RIVER DR PINEVILLE WV 24874</u>	
13A. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? <span style="float: right;"><input checked="" type="checkbox"/> YES <input type="checkbox"/> NO</span> — IF <b>YES</b> , please explain: <u>THE APPLICANT LEASES THE PROPERTY.</u> _____ — IF <b>NO</b> , YOU ARE NOT ELIGIBLE FOR A PERMIT FOR THIS SOURCE.			
14A. — For <b>Modifications or Administrative Updates</b> 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 <b>MAP</b> as <b>Attachment F</b> .  <u>FROM PINEVILLE ON SR-97/SR-10 NORTH FOR 2.9 MILES. TURN ONTO CR-9/5 (SKIN FORK ROAD) FOR 1.2 MILES. TURN RIGHT ONTO LOCAL ROAD FOR APPROXIMATELY 100 YARDS TO STATION.</u>			
15A. Nearest city or town:  ROCK VIEW		16A. County:  WYOMING	
		17A. UTM Coordinates: Northing (KM): <u>4,162,856</u> Easting (KM): <u>451,178</u> Zone: <u>17</u>	
18A. Briefly describe the proposed new operation or change (s) to the facility:  See <b>Attachment B</b>		19A. Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits):  Latitude: <u>37.61151</u> Longitude: <u>-81.55316</u>	

**B: 1<sup>ST</sup> ALTERNATE OPERATING SITE INFORMATION (only available for G20, G40, & G50 General Permits)**

11B. Name of 1 <sup>st</sup> alternate operating site: _____ _____		12B. Address of 1 <sup>st</sup> alternate operating site:  Mailing: _____ Physical: _____ _____	
13B. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? <span style="float: right;"><input type="checkbox"/> YES <input type="checkbox"/> NO</span> — IF <b>YES</b> , please explain: _____ _____ — IF <b>NO</b> , YOU ARE NOT ELIGIBLE FOR A PERMIT FOR THIS SOURCE.			

14B. — For <b>Modifications or Administrative Updates</b> 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 <b>MAP</b> as <b>Attachment F</b> .  <div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 5px;"></div> <div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 5px;"></div> <div style="border-bottom: 1px solid black; height: 1.2em;"></div>		
15B. Nearest city or town:	16B. County:	17B. UTM Coordinates: Northing (KM): _____ Easting (KM): _____ Zone: _____
18B. Briefly describe the proposed new operation or change (s) to the facility:		19B. Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits): Latitude: _____ Longitude: _____

**C: 2<sup>ND</sup> ALTERNATE OPERATING SITE INFORMATION (only available for G20, G40, & G50 General Permits):**

11C. Name of 2 <sup>nd</sup> alternate operating site:  <div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 5px;"></div> <div style="border-bottom: 1px solid black; height: 1.2em;"></div>	12C. Address of 2 <sup>nd</sup> alternate operating site:  Mailing: _____ Physical: _____ <div style="border-bottom: 1px solid black; height: 1.2em; margin-top: 5px;"></div>	
13C. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? <span style="float: right;"><input type="checkbox"/> YES <input type="checkbox"/> NO</span> — IF <b>YES</b> , please explain: _____ <div style="border-bottom: 1px solid black; height: 1.2em; margin-top: 5px;"></div> — IF <b>NO</b> , YOU ARE NOT ELIGIBLE FOR A PERMIT FOR THIS SOURCE.		
14C. — For <b>Modifications or Administrative Updates</b> 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 <b>MAP</b> as <b>Attachment F</b> .  <div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 5px;"></div> <div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 5px;"></div> <div style="border-bottom: 1px solid black; height: 1.2em;"></div>		
15C. Nearest city or town:	16C. County:	17C. UTM Coordinates: Northing (KM): _____ Easting (KM): _____ Zone: _____
18C. Briefly describe the proposed new operation or change (s) to the facility:		19C. Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits): Latitude: _____ Longitude: _____

<p>20. Provide the date of anticipated installation or change:</p> <p>____/____/____</p> <p><input checked="" type="checkbox"/> If this is an <b>After-The-Fact</b> permit application, provide the date upon which the proposed change did happen: May 1, 2015</p>	<p>21. Date of anticipated Start-up if registration is granted:</p> <p><u>UPON PERMIT ISSUANCE</u></p>
<p>22. Provide maximum projected <b>Operating Schedule</b> of activity/activities outlined in this application if other than 8760 hours/year. (Note: anything other than 24/7/52 may result in a restriction to the facility's operation).</p> <p>Hours per day = Days per week = Weeks per year = Percentage of operation <u>100</u></p> <p>The maximum projected <b>Operating Schedule</b> of activity/activities outlined in this application is <u>8760</u> hours/year.</p>	

### SECTION III. ATTACHMENTS AND SUPPORTING DOCUMENTS

<p>23. Include a check payable to WVDEP – Division of Air Quality with the appropriate <b>application fee</b> (per 45CSR22 and 45CSR13).</p>
<p>24. Include a <b>Table of Contents</b> as the first page of your application package.</p>
<p>All of the required forms and additional information can be found under the Permitting Section (General Permits) of DAQ's website, or requested by phone.</p>
<p>25. Please check all attachments included with this permit application. Please refer to the appropriate reference document for an explanation of the attachments listed below.</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> ATTACHMENT A : CURRENT BUSINESS CERTIFICATE</li> <li><input checked="" type="checkbox"/> ATTACHMENT B: PROCESS DESCRIPTION</li> <li><input checked="" type="checkbox"/> ATTACHMENT C: DESCRIPTION OF FUGITIVE EMISSIONS</li> <li><input checked="" type="checkbox"/> ATTACHMENT D: PROCESS FLOW DIAGRAM</li> <li><input checked="" type="checkbox"/> ATTACHMENT E: PLOT PLAN</li> <li><input checked="" type="checkbox"/> ATTACHMENT F: AREA MAP</li> <li><input checked="" type="checkbox"/> ATTACHMENT G: EQUIPMENT DATA SHEETS AND REGISTRATION SECTION APPLICABILITY FORM</li> <li><input type="checkbox"/> ATTACHMENT H: AIR POLLUTION CONTROL DEVICE SHEETS</li> <li><input checked="" type="checkbox"/> ATTACHMENT I: EMISSIONS CALCULATIONS</li> <li><input checked="" type="checkbox"/> ATTACHMENT J: CLASS I LEGAL ADVERTISEMENT</li> <li><input checked="" type="checkbox"/> ATTACHMENT K: ELECTRONIC SUBMITTAL</li> <li><input checked="" type="checkbox"/> ATTACHMENT L: GENERAL PERMIT REGISTRATION APPLICATION FEE</li> <li><input type="checkbox"/> ATTACHMENT M: SITING CRITERIA WAIVER</li> <li><input type="checkbox"/> ATTACHMENT N: MATERIAL SAFETY DATA SHEETS (MSDS)</li> <li><input type="checkbox"/> ATTACHMENT O: EMISSIONS SUMMARY SHEETS</li> <li><input type="checkbox"/> OTHER SUPPORTING DOCUMENTATION NOT DESCRIBED ABOVE (Equipment Drawings, Aggregation Discussion, etc.)</li> </ul> <p>Please mail an original and two copies of the complete General Permit Registration Application with the signature(s) to the DAQ Permitting Section, at the address shown on the front page of this application. Please <b>DO NOT</b> fax permit applications. For questions regarding applications or West Virginia Air Pollution Rules and Regulations, please refer to the website shown on the front page of the application or call the phone number also provided on the front page of the application.</p>



#### SECTION IV. CERTIFICATION OF INFORMATION

This General Permit Registration Application shall be signed below by a Responsible Official. A Responsible Official is a President, Vice President, Secretary, Treasurer, General Partner, General Manager, a member of a Board of Directors, or Owner, depending on business structure. A business may certify an Authorized Representative who shall have authority to bind the Corporation, Partnership, Limited Liability Company, Association, Joint Venture or Sole Proprietorship. Required records of daily throughput, hours of operation and maintenance, general correspondence, Emission Inventory, Certified Emission Statement, compliance certifications and all required notifications must be signed by a Responsible Official or an Authorized Representative. If a business wishes to certify an Authorized Representative, the official agreement below shall be checked off and the appropriate names and signatures entered. Any administratively incomplete or improperly signed or unsigned Registration Application will be returned to the applicant.

FOR A CORPORATION (domestic or foreign)

☐ I certify that I am a President, Vice President, Secretary, Treasurer or in charge of a principal business function of the corporation

FOR A PARTNERSHIP

☐ I certify that I am a General Partner

FOR A LIMITED LIABILITY COMPANY

☐ I certify that I am a General Partner or General Manager

FOR AN ASSOCIATION

☐ I certify that I am the President or a member of the Board of Directors

FOR A JOINT VENTURE

☐ I certify that I am the President, General Partner or General Manager

FOR A SOLE PROPRIETORSHIP

☐ I certify that I am the Owner and Proprietor

■ I hereby certify that (please print or type) **Randy Spencer** is an Authorized Representative and in that capacity shall represent the interest of the business (e.g., Corporation, Partnership, Limited Liability Company, Association Joint Venture or Sole Proprietorship) and may obligate and legally bind the business. If the business changes its Authorized Representative, a Responsible Official shall notify the Director of the Office of Air Quality immediately, and/or,

I hereby certify that all information contained in this General Permit Registration Application and any supporting documents appended hereto is, to the best of my knowledge, true, accurate and complete, and that all reasonable efforts have been made to provide the most comprehensive information possible

Signature \_\_\_\_\_  
(please use blue ink) Responsible Official Date

Name & Title **Randy Spencer – Safety & Environmental Manager (North)**  
(please print or type)

Signature \_\_\_\_\_  
(please use blue ink) Authorized Representative (if applicable) Date

Applicant's Name \_\_\_\_\_

Phone & Fax \_\_\_\_\_ (304) 347 – 1642 (304) 347 - 1635  
Phone Fax

Email: **randyspencer@cabotog.com**

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

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

DATE: July 19, 2010, 2010

ATTN.: Director

Corporation's / other business entity's Federal Employer I.D. Number 042989934

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

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

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

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

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

  
\_\_\_\_\_  
Dan O. Dinges - President, Chief Executive Officer  
President or Other Authorized Officer

(Vice President, Secretary, Treasurer or other official in charge of a principal business function of the corporation or the business entity)

(If not the President, then the corporation or the business entity must submit certified minutes or bylaws stating legal authority of other authorized officer to bind the corporation or the business entity).

\_\_\_\_\_  
Secretary

**CABOT OIL & GAS CORPORATION**  
**CRANBERRY PIPELINE CORPORATION**

\_\_\_\_\_  
Name of Corporation or business entity

Revision 03/2007





**ATTACHMENT A**

**BUSINESS CERTIFICATE**

**General Permit G-35A Permit Modification Application**

**Key Rock Compressor Station, Plant ID No. 109-00104**  
**Rock View, West Virginia**

Cranberry Pipeline Corporation  
c/o Cabot Oil & Gas Corporation  
900 Lee Street East, Suite 1500  
Charleston, West Virginia

September 2015

**WEST VIRGINIA  
STATE TAX DEPARTMENT  
BUSINESS REGISTRATION  
CERTIFICATE**

ISSUED TO:  
**CRANBERRY PIPELINE CORPORATION**  
**900 LEE ST E 1700**  
**CHARLESTON, WV 25301-1741**

BUSINESS REGISTRATION ACCOUNT NUMBER: **1006-3673**

This certificate is issued on: **06/1/2011**

*This certificate is issued by  
the West Virginia State Tax Commissioner  
in accordance with Chapter 11, Article 12, of the West Virginia Code*

*The person or organization identified on this certificate is registered  
to conduct business in the State of West Virginia at the location above.*

*This certificate is not transferrable and must be displayed at the location for which issued.*

*This certificate shall be permanent until cessation of the business for which the certificate of registration was granted or until it is suspended, revoked or cancelled by the Tax Commissioner.*

*Change in name or change of location shall be considered a cessation of the business and a new certificate shall be required.*

*TRAVELING/STREET VENDORS: Must carry a copy of this certificate in every vehicle operated by them.  
CONTRACTORS, DRILLING OPERATORS, TIMBER/LOGGING OPERATIONS: Must have a copy of  
this certificate displayed at every job site within West Virginia.*

atL006 v.4  
L1111698560



**ATTACHMENT B**

**PROCESS DESCRIPTION**

**General Permit G-35A Permit Modification Application**

**Key Rock Compressor Station, Plant ID No. 109-00104**  
**Rock View, West Virginia**

Cranberry Pipeline Corporation  
c/o Cabot Oil & Gas Corporation  
900 Lee Street East, Suite 1500  
Charleston, West Virginia

September 2015



## PROCESS DESCRIPTION

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### Introduction

The facility currently operates under General Permit G35-A010B. On behalf of Cranberry Pipeline Corporation (Cranberry) SLR is requesting this Modification in order to update the facility registration to more accurately reflect the most recent site measurements.

Recent wet gas analyses from the Key Rock Compressor Station indicates that a G35-A General Permit Modification is required to reflect the facility's adjusted emission levels from the dehydration unit still vent. Updated emission limits are being proposed so that the facility remains in compliance for future inspections. These proposed limits do not trigger any additional permit requirements.

### Proposed Update

This application involves the following:

- Emission increase from previous Class II G35-A General Permit, due to recent wet gas analysis data.

Natural gas enters the facility via pipeline where the wet gas is first compressed to a higher pressure via natural gas-fired compressor engine CE-1. The combustion products from the gas fired engine are a source for criteria pollutants and negligible HAP emissions.

After compression, the wet gas is transferred to the Exterran triethylene glycol (TEG) dehydration unit. The TEG dehydration unit removes excess water from the natural gas stream, at a maximum flow rate of 10 mmscf/day, prior to being transferred off site. Pipeline quality natural gas has a moisture content of 7 pounds per million standard cubic feet. The rich TEG (TEG that is saturated with water) is heated through the reboiler where the entrained water is boiled out of the TEG through the still vent. Once the water has been removed from the TEG, it is then classified as lean TEG and is ready to recirculate through the separation process loop once again.

The Exterran's 0.20 mmBtu/hr reboiler has an exhaust stack that vents the products of combustion, from its heating exchanger, to the atmosphere. The emissions are mostly criteria pollutants from the combustion process.

The lean TEG is recirculated through the unit by a gas-driven Kimray TEG pump, model 5015SC. The pump has a maximum pump rate of 0.83 GPM.

As a result of this proposed permit revision, the tank flashing potential, loading losses and fugitive equipment leaks will be more accurately accounted for along with the new assessment of dehydration emissions based on updated gas measurements.



## **ATTACHMENT C**

### **DESCRIPTION OF FUGITIVE EMISSIONS**

#### **General Permit G-35A Permit Modification Application**

**Key Rock Compressor Station, Plant ID No. 109-00104  
Rock View, West Virginia**

Cranberry Pipeline Corporation  
c/o Cabot Oil & Gas Corporation  
900 Lee Street East, Suite 1500  
Charleston, West Virginia

September 2015

## FUGITIVE EMISSIONS

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“Fugitive emissions” means those emissions which could not reasonably pass through a stack, chimney, vent, or other functionally equivalent opening. Fugitive leaks are leaks from sealed surfaces associated with process equipment. Pollutants of concern include Hazardous Air Pollutants (HAPs), Volatile Organic Compounds (VOCs), and Methane (CH<sub>4</sub>) contained in the gas.

Equipment specific to the gas production and processing operations, which result in fugitive emissions includes units such as separators, pipelines, and pumps. Pneumatic devices such as gas actuated pumps and pressure/level controllers also result in fugitive emissions. Fugitive emissions may also result from process upsets such as pressure relief device releases due to over-pressure. Other process-related sources of emissions include fugitive emissions from flanges, valves, connectors, and fittings, and emissions from routine maintenance activities involving equipment depressurization (blowdown) or complete purging and filter replacement.

The amount of gas vented by pressure and level controllers is dependent on the manufacturer, application, age, and orifice size. In general, controllers in liquid service have larger orifices than those in pressure service. Valves in liquid service are designed to quickly open or close to avoid throttling which can erode the valve seat and reduce the life of the valve. Emissions from gas actuated pumps will be impacted by the gas composition, fuel supply pressure, discharge head (pressure), and the flow rate of the liquid pumped, since manufacturer pump curves estimate gas use based on these variables. Factors affecting blowdown emissions include maintenance schedules, line pressures, and the volume of gas relieved. More frequent maintenance results in more frequent gas relief. Also, since emissions are estimated by HAPcalc, the greater the line pressure and the volume of gas to be relieved, the greater the emissions.

Fugitive emissions at the Key Rock compressor station may emanate from some or all of the following:

1. Storage tanks
2. Emergency and process vents
3. Gas actuated pumps
4. Loading losses (storage tank to tanker truck)
5. Pneumatic devices
6. Blow down & blowout
7. Equipment leaks (connections, flanges, open ended lines, valves)



**ATTACHMENT D**

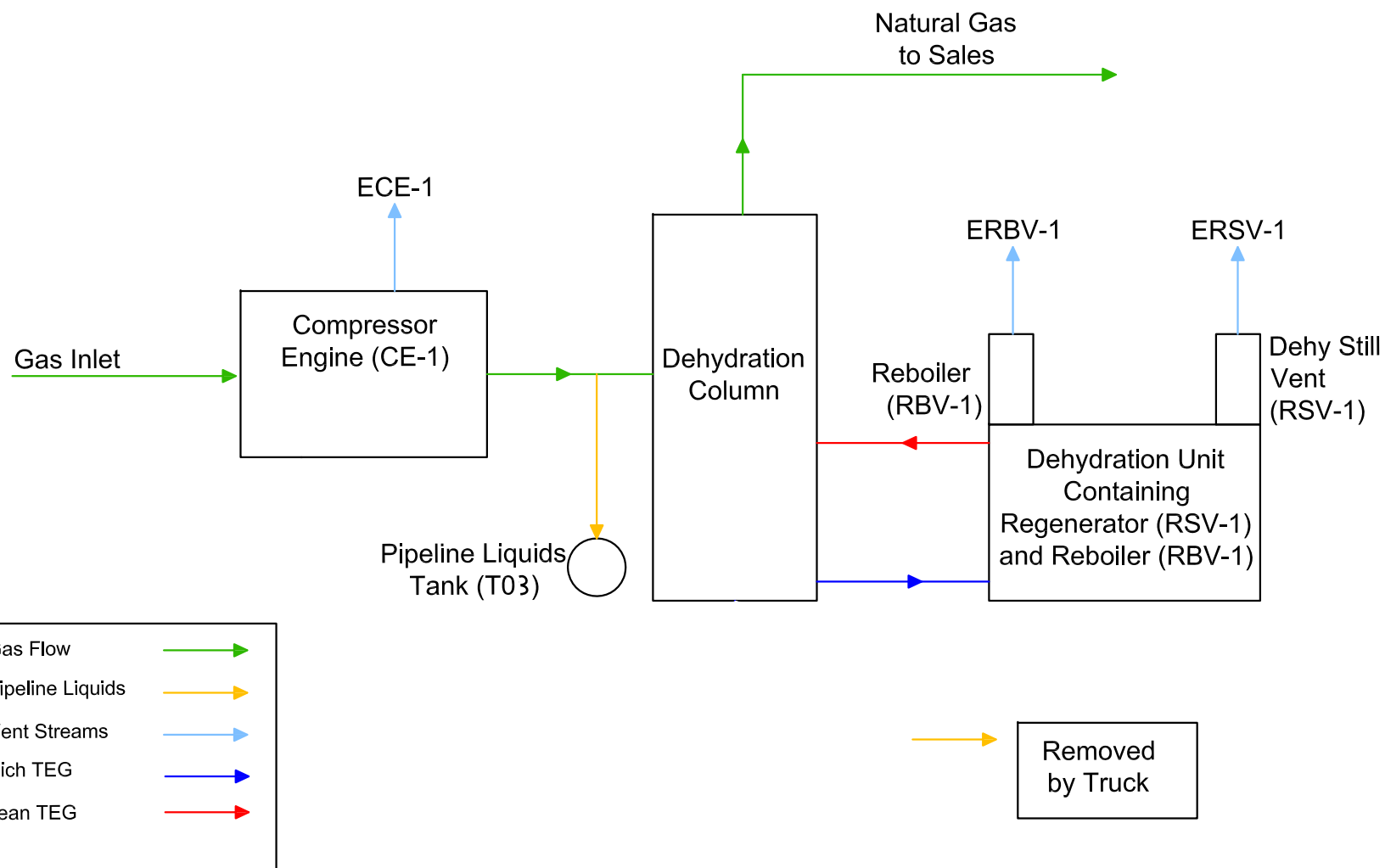
**PROCESS FLOW DIAGRAM**

**General Permit G-35A Permit Modification Application**

**Key Rock Compressor Station, Plant ID No. 109-00104**  
**Rock View, West Virginia**

Cranberry Pipeline Corporation  
c/o Cabot Oil & Gas Corporation  
900 Lee Street East, Suite 1500  
Charleston, West Virginia

September 2015



**Process Flow Diagram**  
**Cranberry Pipeline Corporation**  
**Key Rock Compressor Station - ID # 109-00104**  
**Rock View, West Virginia**





## **ATTACHMENT E**

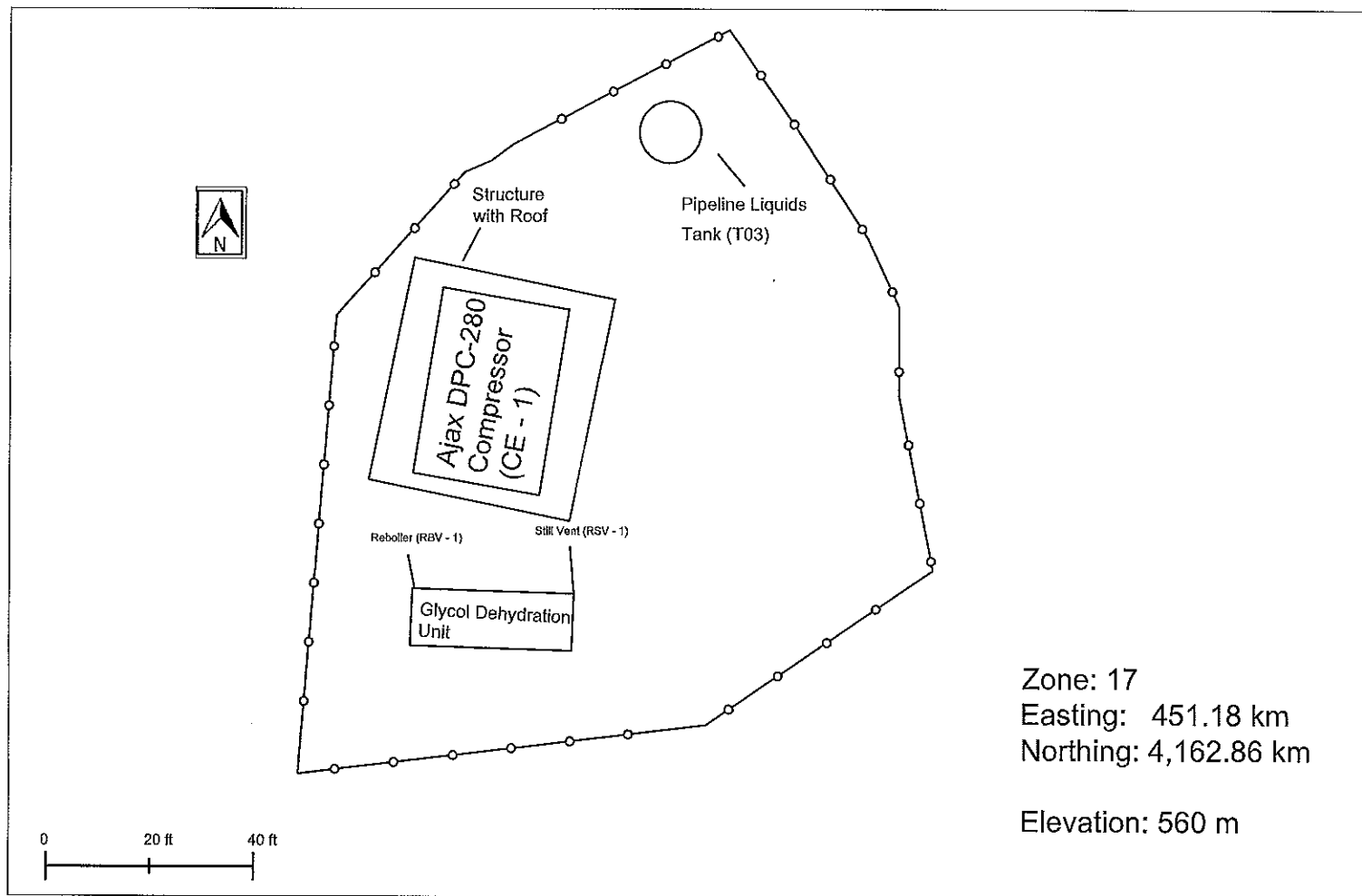
### **PLOT PLAN**

#### **General Permit G-35A Permit Modification Application**

**Key Rock Compressor Station, Plant ID No. 109-00104  
Rock View, West Virginia**

Cranberry Pipeline Corporation  
c/o Cabot Oil & Gas Corporation  
900 Lee Street East, Suite 1500  
Charleston, West Virginia

September 2015



**Plot Plan**  
**Cranberry Pipeline Corporation**  
**Key Rock Compressor Station - ID# 109-00104**  
**Rock View, West Virginia**



## **ATTACHMENT F**

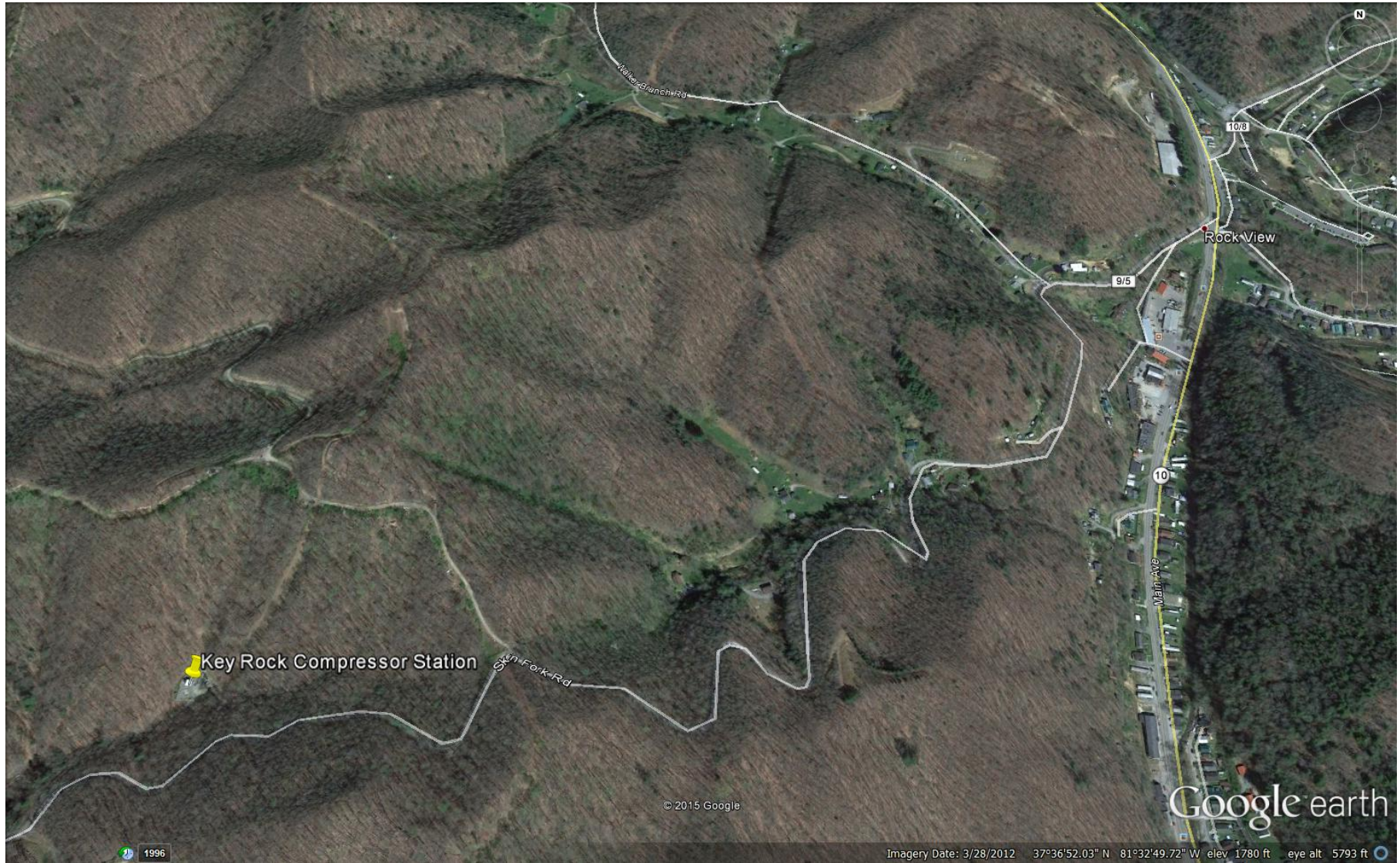
### **AREA MAP**


#### **General Permit G-35A Permit Modification Application**

**Key Rock Compressor Station, Plant ID No. 109-00104  
Rock View, West Virginia**

Cranberry Pipeline Corporation  
c/o Cabot Oil & Gas Corporation  
900 Lee Street East, Suite 1500  
Charleston, West Virginia

September 2015



	<p>G-35 A Permit Modification – Attachment F Cranberry Pipeline Corporation Key Rock Compressor Station Wyoming County, West Virginia</p>
<p>Area Map Page 25 of 96 6/7/31/2015</p>	<p>Job No: 116.00400.00129 09/2015</p>



**ATTACHMENT G**

**AFFECTED SOURCE SHEETS**

**General Permit G-35A Permit Modification Application**

**Key Rock Compressor Station, Plant ID No. 109-00104**  
**Rock View, West Virginia**

Cranberry Pipeline Corporation  
c/o Cabot Oil & Gas Corporation  
900 Lee Street East, Suite 1500  
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September 2015

### General Permit G35-A Registration Section Applicability Form

General Permit G35-A was developed to allow qualified registrants to seek registration for a variety of sources. These sources include internal combustion engines, boilers, reboilers, line heaters, tanks, emergency generators, dehydration units not subject to MACT standards, dehydration units not subject to MACT standards and being controlled by a flare control device, dehydration units not subject to MACT standards and being controlled by recycling the dehydration unit back to flame zone of reboiler, dehydration units not subject to MACT standards being controlled by a thermal oxidizer, and permit exemptions including the less than 1 ton/year benzene exemption, the 40CFR63 Subpart HH - Annual Average Flow of Gas Exemption (3 mmscf/day), and the 40CFR63 Subpart HHH - Annual Average Flow of Gas Exemption (10 mmscf/day). All registered facilities will be subject to Sections 1.0, 1.1, 2.0, 3.0, and 4.0.

General Permit G35-A allows the registrant to choose which sections of the permit that they wish to seek registration under. Therefore, please mark which sections that you are applying for registration under. Please keep in mind, that if this registration is approved, the issued registration will state which sections will apply to your affected facility.

Section 5	Reciprocating Internal Combustion Engines (R.I.C.E.)*	<input checked="" type="checkbox"/>
Section 6	Boilers, Reboilers, and Line Heaters	<input checked="" type="checkbox"/>
Section 7	Tanks	<input checked="" type="checkbox"/>
Section 8	Emergency Generators	<input type="checkbox"/>
Section 9	Dehydration Units Not Subject to MACT Standards	<input checked="" type="checkbox"/>
Section 10	Dehydration Units Not Subject to MACT Standards and being controlled by a flare control device	<input type="checkbox"/>
Section 11	Dehydration Units Not Subject to MACT Standards being controlled by recycling the dehydration unit back to the flame zone of the reboiler	<input type="checkbox"/>
Section 12	Dehydration Units Not Subject to MACT Standards and being controlled by a thermal oxidizer	<input type="checkbox"/>
Section 13	Permit Exemption (Less than 1 ton/year of benzene exemption)	<input checked="" type="checkbox"/>
Section 14	Permit Exemption (40CFR63 Subpart HH – Annual average flow of gas exemption (3 mmscf/day))	<input type="checkbox"/>
Section 15	Permit Exemption (40CFR63 Subpart HHH – Annual average flow of gas exemption (10 mmscf/day))	<input type="checkbox"/>
Section 16	Standards of Performance for Stationary Spark Ignition Internal Combustion Engines (40CFR60 Subpart JJJJ)	<input type="checkbox"/>

**\* Affected facilities that are subject to Section 5 may also be subject to Section 16. Therefore, if the applicant is seeking registration under both sections, please select both.**



## NATURAL GAS FIRED BOILER/LINE HEATER DATA SHEET

Source ID # <sup>1</sup>	Status <sup>2</sup>	Design Heat Input (mmBtu/hr) <sup>3</sup>	Hours of Operation (hrs/yr) <sup>4</sup>	Fuel Heating Value (Btu/scf) <sup>5</sup>
RBV-1	EXIST	0.20	8760	1020

- Enter the appropriate Source Identification Numbers (Source ID #) for each boiler or line heater located at the compressor station. Boilers should be designated BLR-1, BLR-2, BLR-3, etc. Heaters or Line Heaters should be designated HTR-1, HTR-2, HTR-3, etc. Enter glycol dehydration unit Reboiler Vent data on the *Glycol Dehydration Unit Data Sheet*.
- Enter the Status for each boiler or line heater using the following:  

EXIST Existing Equipment  
REM Equipment Removed

NEW Installation of New Equipment
- Enter boiler or line heater design heat input in mmBtu/hr.
- Enter the annual hours of operation in hours/year for each boiler or line heater.
- Enter the fuel heating value in Btu/standard cubic foot.

## NATURAL GAS GLYCOL DEHYDRATION UNIT DATA SHEET

General Glycol Dehydration Unit Data		Manufacturer and Model		Exterran			
		Max Dry Gas Flow Rate (mmscf/day)		10.0			
		Design Heat Input (mmBtu/hr)		0.20			
		Design Type (DEG or TEG)		TEG			
		Source Status <sup>2</sup>		ES			
		Date Installed/Modified/Removed <sup>3</sup>		2014			
		Regenerator Still Vent APCD <sup>4</sup>		None			
		Fuel HV (Btu/scf)		1,020			
		H <sub>2</sub> S Content (gr/100 scf)		0.25			
		Operation (hrs/yr)		8,760			
Source ID # <sup>1</sup>	Vent	Reference <sup>5</sup>	Potential Emissions <sup>6</sup>	lbs/hr	tons/yr	lbs/hr	tons/yr
Reboiler (RBV-1)	Reboiler Vent	AP	NO <sub>x</sub>	0.020	0.086	-	
		AP	CO	0.016	0.072	-	
		AP	VOC	0.001	0.005	-	
		AP	SO <sub>2</sub>	0.000	0.001	-	
		AP	PM <sub>10</sub>	0.001	0.007	-	
Dehy (RSV-1)	Glycol Regenerator Still Vent	GR	VOC	3.300	14.4408	-	
		GR	Benzene	0.0750	0.3286	-	
		GR	Ethylbenzene	0.3215	1.4082	-	
		GR	Toluene	0.1560	0.6833	-	
		GR	Xylenes	0.4558	1.9962	-	
		GR	n-Hexane	0.0173	0.0757	-	

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

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

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

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

MD	Manufacturer's Data	AP	AP-42
GR	GRI-GLYCalc <sup>TM</sup>	OT	Other <u>G35-A010</u> (please list)

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

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

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

West Virginia Department of Environmental Protection

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

Division of Air Quality

40 CFR Part 63; Subpart HH & HHH Registration Form

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): 1,300,000			
Affected facility actual annual average hydrocarbon liquid throughput: (bbl/day): None			
The affected facility processes, upgrades, or stores hydrocarbon liquids prior to custody transfer.		Yes	<input checked="" type="checkbox"/> 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.		<input checked="" type="checkbox"/> Yes	No
The affected facility is: <input type="checkbox"/> prior to a NG processing plant <input type="checkbox"/> a NG processing plant <input checked="" type="checkbox"/> 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).		<input checked="" type="checkbox"/> Yes	No
The affected facility exclusively processes, stores, or transfers black oil.		Yes	<input checked="" type="checkbox"/> No
Initial producing gas-to-oil ratio (GOR): _____ scf/bbl API gravity: _____ degrees			
Section B: Dehydration Unit (if applicable) <sup>1</sup>			
Description: 10 MMscf/day TEG Dehydration Unit			
Date of Installation: 2014	Annual Operating Hours: 8760	Burner rating (MMbtu/hr): 0.20	
Exhaust Stack Height (ft): 25	Stack Diameter (ft): 1.0	Stack Temp (°F): 350 (Still Vent) 212	
Glycol Type: <input checked="" type="checkbox"/> TEG <input type="checkbox"/> EG <input type="checkbox"/> Other:			
Glycol Pump Type: <input type="checkbox"/> Electric <input checked="" type="checkbox"/> Gas If gas, what is the volume ratio? ____ 0.08 ____ ACFM/gpm			
Condenser installed? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Exit Temp. ____ °F Condenser Pressure ____ psig			
Incinerator/flare installed? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Destruction Eff. ____ %			
Other controls installed? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Describe:			
Wet Gas <sup>2</sup> : Gas Temp.: 63 °F Gas Pressure 175 psig (Upstream of Contact Tower) Saturated Gas? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If no, water content ____ lb/MMSCF			
Dry Gas: Gas Flowrate (MMSCFD) Actual 1.3 Design 10.0 (Downstream of Contact Tower) Water Content 7.0 lb/MMSCF			
Lean Glycol: Circulation rate (gpm) Actual <sup>3</sup> 0.40 Maximum <sup>4</sup> 0.83 Pump make/model: Kimray 5015SC			
Glycol Flash Tank (if applicable): Temp.: __NA__ °F Pressure __NA__ psig Vented? Yes <input type="checkbox"/> No <input type="checkbox"/> If no, describe vapor control:			
Stripping Gas (if applicable): NA Source of gas: NA Rate ____ scfm			

**Please attach the following required dehydration unit information:**

1. System map indicating the chain of custody information. See Page 43 of this document for an example of a gas flow schematic. It is not intended that the applicant provide this level of detail for all sources. The level of detail that is necessary is to establish where the custody transfer points are located. This can be accomplished by submitting a process flow diagram indicating custody transfer points and the natural gas flow. However, the DAQ reserves the right to request more detailed information in order to make the necessary decisions.
2. Extended gas analysis from the Wet Gas Stream including mole percents of C<sub>1</sub>-C<sub>8</sub>, 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)	<input type="checkbox"/>	Subject to Subpart HH
	<input type="checkbox"/>	Subject to Subpart HHH
	<input checked="" type="checkbox"/>	Not Subject
	<input checked="" type="checkbox"/>	< 10/25 TPY
	because:	<input type="checkbox"/> Affected facility exclusively handles black oil
		<input type="checkbox"/> The facility wide actual annual average NG throughput is < 650 thousand scf/day and facility wide actual annual average hydrocarbon liquid is < 250 bpd
		<input type="checkbox"/> No affected source is present



## COMPRESSOR STATION EMISSION SUMMARY SHEET FOR HAZARDOUS/TOXIC POLLUTANTS

[illegible]

## General Permit Levels

### Construction, Modification, Relocation, Administrative Update

Class II General Permits – G10-C (Coal Preparation and Handling), G20-B (Hot Mix Asphalt), G30-B (Natural Gas Compressor Stations), G35-A (Natural Gas Compressor Stations with Flares/Glycol Dehydration Units), G40-B (Nonmetallic Minerals Processing), G50-B (Concrete Batch Plant), G60-B (Emergency Generators)

## NATURAL GAS COMPRESSOR/GENERATOR ENGINE DATA SHEET

Source Identification Number <sup>1</sup>		CE-1					
Engine Manufacturer and Model		Ajax DPC-280					
Manufacturer's Rated bhp/rpm		269 bhp / 400 rpm					
Source Status <sup>2</sup>		ES					
Date Installed/Modified/Removed <sup>3</sup>		09/2014					
Engine Manufactured/Reconstruction Date <sup>4</sup>		1981					
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No) <sup>5</sup>		No					
Engine, Fuel and Combustion Data	Engine Type <sup>6</sup>	LB2S					
	APCD Type <sup>7</sup>	A/F					
	Fuel Type <sup>8</sup>	PQ					
	H <sub>2</sub> S (gr/100 scf)	0.25					
	Operating bhp/rpm	269 bhp / 400 rpm					
	BSFC (Btu/bhp-hr)	8200					
	Fuel throughput (ft <sup>3</sup> /hr)	2,162.5					
	Fuel throughput (MMft <sup>3</sup> /yr)	18.94					
Operation (hrs/yr)	8,760						
Reference <sup>9</sup>	Potential Emissions <sup>10</sup>	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
	NO <sub>x</sub>	-	-				
	CO	-	-				
	VOC	-	-				
AP/MD	NO <sub>x</sub>	6.761	29.612				
AP/MD	CO	0.771	3.377				
AP	VOC	0.712	3.117				
AP	SO <sub>2</sub>	0.001	0.006				
AP	PM <sub>10</sub>	0.191	0.838				
AP	PM <sub>2.5</sub>	0.191	0.838				
AP							
AP	Benzene	0.004	0.019				
AP	Toluene	0.002	0.009				
AP	Ethylbenzene	0.000	0.001				
AP	Xylene	0.001	0.003				
AP	n-Hexane	0.001	0.004				
AP/MD	Formaldehyde	0.178	0.779				



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

NS	Construction of New Source (installation)	ES	Existing Source
MS	Modification of Existing Source	RS	Removal of Source
3. Enter the date (or anticipated date) of the engine's installation (construction of source), modification or removal.
4. Enter the date that the engine was manufactured, modified or reconstructed.
5. Is the engine a certified stationary spark ignition internal combustion engine according to 40CFR60 Subpart JJJJ. If so, the engine and control device must be operated and maintained in accordance with the manufacturer's emission-related written instructions. You must keep records of conducted maintenance to demonstrate compliance, but no performance testing is required. If the certified engine is not operated and maintained in accordance with the manufacturer's emission-related written instructions, the engine will be considered a non-certified engine and you must demonstrate compliance according to 40CFR§60.4243a(2)(i) through (iii), as appropriate.

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

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

LB2S	Lean Burn Two Stroke	RB4S	Rich Burn Four Stroke
LB4S	Lean Burn Four Stroke		
7. Enter the Air Pollution Control Device (APCD) type designation(s) using the following codes:
 

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

PQ	Pipeline Quality Natural Gas	RG	Raw Natural Gas
----	------------------------------	----	-----------------
9. Enter the Potential Emissions Data Reference designation using the following codes. Attach all referenced data to this *Compressor/Generator Data Sheet(s)*.
 

MD	Manufacturer's Data	AP	AP-42
GR	GRI-HAPCalc <sup>TM</sup>	OT	Other _____ (please list)
10. Enter each engine's Potential to Emit (PTE) for the listed regulated pollutants in pounds per hour and tons per year. PTE shall be calculated at manufacturer's rated brake horsepower and may reflect reduction efficiencies of listed Air Pollution Control Devices. Emergency generator engines may use 500 hours of operation when calculating PTE. PTE data from this data sheet shall be incorporated in the *Emissions Summary Sheet*.

## STORAGE TANK DATA SHEET

Source ID # <sup>1</sup>	Status <sup>2</sup>	Content <sup>3</sup>	Volume <sup>4</sup>	Dia <sup>5</sup>	Throughput <sup>6</sup>	Orientation <sup>7</sup>	Liquid Height <sup>8</sup>
T03	EXIST	Pipeline Liquids	1,000	5	76,650	VERT	3

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  
 REM Equipment Removed

NEW Installation of New Equipment
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 H**

### **AIR POLLUTION CONTROL DEVICE SHEETS NOT APPLICABLE (SEE NOTE)**

Note: No Air Pollution Control Device affiliated with this Compressor Station.

## **General Permit G-35A Permit Modification Application**

**Key Rock Compressor Station, Plant ID No. 109-00104  
Rock View, West Virginia**

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September 2015



**ATTACHMENT I**

**EMISSIONS CALCULATIONS**

**General Permit G-35A Permit Modification Application**

**Key Rock Compressor Station, Plant ID No. 109-00104**  
**Rock View, West Virginia**

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September 2015

**Table 1. Annual Potential To Emit (PTE) Summary**  
**Cranberry Pipeline Corporation - Key Rock Compressor Station**

Proposed - Criteria PTE									
Source	PM	PM10	PM2.5	SO2	NOx	CO	VOC	HAPs	CO2e*
Engine - CE-1 (ton/yr)	0.838	0.838	0.838	0.006	29.612	3.377	3.117	1.014	1130.480
Reboilers - RBV-1 (ton/yr)	0.007	0.007	0.007	0.001	0.086	0.072	0.005	0.002	102.501
Dehys RSV-1 (ton/yr)	--	--	--	--	--	--	14.441	4.505	385.313
Storage Tank T03 (ton/yr)							0.319		
Truck Loading (tons/yr)							0.140		
Fugitives (ton/yr)	--	--	--	--	--	--	0.940	--	22.718
<b>Total Emissions (ton/yr)</b>	<b>0.844</b>	<b>0.844</b>	<b>0.844</b>	<b>0.006</b>	<b>29.698</b>	<b>3.449</b>	<b>18.962</b>	<b>5.520</b>	<b>1641.011</b>
<b>Total Emissions (lb/day)</b>	<b>4.626</b>	<b>4.626</b>	<b>4.626</b>	<b>0.034</b>	<b>162.727</b>	<b>18.898</b>	<b>103.902</b>	<b>30.245</b>	<b>8991.843</b>
<b>Total Emissions (lb/hr)</b>	<b>0.193</b>	<b>0.193</b>	<b>0.193</b>	<b>0.001</b>	<b>6.780</b>	<b>0.787</b>	<b>4.329</b>	<b>1.260</b>	<b>374.660</b>

Previous Emission Summary (G35-A010B) - Criteria PTE									
Source	PM	PM10	PM2.5	SO2	NOx	CO	VOC	HAPs	CO2e
Engine - CE-1 (ton/yr)	0.838	0.838	0.838	0.006	29.61	3.38	3.117	1.01	1130.480
Reboilers - RBV-1 (ton/yr)	0.007	0.007	0.007	0.001	0.09	0.07	0.005	0.00	102.501
Dehy - RSV-1 (ton/yr)	--	--	--	--	--	--	2.267	1.38	385.313
Storage Tank T03 (ton/yr)									
Truck Loading (ton/yr)									
Fugitives (ton/yr)	--	--	--	--	--	--	0.940	--	22.718
<b>Total Emissions (ton/yr)</b>	<b>0.844</b>	<b>0.844</b>	<b>0.844</b>	<b>0.006</b>	<b>29.698</b>	<b>3.449</b>	<b>6.328</b>	<b>2.391</b>	<b>1641.011</b>
<b>Total Emissions (lb/day)</b>	<b>4.626</b>	<b>4.626</b>	<b>4.626</b>	<b>0.034</b>	<b>162.727</b>	<b>18.898</b>	<b>34.676</b>	<b>13.102</b>	<b>8991.843</b>
<b>Total Emissions (lb/hr)</b>	<b>0.193</b>	<b>0.193</b>	<b>0.193</b>	<b>0.001</b>	<b>6.780</b>	<b>0.787</b>	<b>1.445</b>	<b>0.546</b>	<b>374.660</b>

Proposed Difference of Emissions									
	PM	PM10	PM2.5	SO2	NOx	CO	VOC	HAPs	CO2e
<b>Total Emissions (ton/yr)</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>12.634</b>	<b>3.129</b>	<b>0.000</b>

HAP PTE					
Annual HAP PTE	Engine Emissions (ton/yr)	Dehy Emissions (ton/yr)	Reboiler Emissions (ton/yr)	Total HAPs (ton/yr)	Total HAPs (lb/hr)
1,1,2,2-Tetrachloroethane	6.41E-04	-	-	6.41E-04	1.46E-04
1,1,2-Trichloroethane	5.09E-04	-	-	5.09E-04	1.16E-04
1,3-Butadiene	7.92E-03	-	-	7.92E-03	1.81E-03
1,3-Dichloropropene	4.23E-04	-	-	4.23E-04	9.66E-05
2-Methylnaphthalene	2.07E-04	-	-	2.07E-04	4.72E-05
2,2,4-Trimethylpentane	8.17E-03	-	-	8.17E-03	1.87E-03
Acetaldehyde	7.50E-02	-	-	7.50E-02	1.71E-02
Acrolein	7.52E-02	-	-	7.52E-02	1.72E-02
Arsenic	--	-	1.72E-07	1.72E-07	3.92E-08
Benzene	1.87E-02	3.29E-01	1.80E-06	3.47E-01	7.93E-02
Beryllium	--	-	1.03E-08	1.03E-08	2.35E-09
Biphenyl	3.82E-05	-	-	3.82E-05	8.71E-06
Cadmium	--	-	9.45E-07	9.45E-07	2.16E-07
Carbon Tetrachloride	5.86E-04	-	-	5.86E-04	1.34E-04
Chlorobenzene	4.29E-04	-	-	4.29E-04	9.79E-05
Chloroform	4.55E-04	-	-	4.55E-04	1.04E-04
Chromium	--	-	1.20E-06	1.20E-06	2.75E-07
Cobalt	--	-	7.21E-08	7.21E-08	1.65E-08
Dichlorobenzene	--	-	1.03E-06	1.03E-06	2.35E-07
Ethylbenzene	1.04E-03	1.408	-	1.41E+00	3.217E-01
Ethylene Dibromide	7.09E-04	-	-	7.09E-04	1.62E-04
Formaldehyde	0.779	-	6.44E-05	7.79E-01	1.78E-01
Lead	--	-	4.29E-07	4.29E-07	9.80E-08
Manganese	--	-	3.26E-07	3.26E-07	7.45E-08
Mercury	--	-	2.23E-07	2.23E-07	5.10E-08
Methanol	2.40E-02	-	-	2.40E-02	5.47E-03
Methylene Chloride	1.42E-03	-	-	1.42E-03	3.24E-04
n-Hexane	-	7.57E-02	1.55E-03	7.73E-02	1.76E-02
Naphthalene	9.30E-04	-	5.24E-07	9.31E-04	2.13E-04
Nickel	--	-	1.80E-06	1.80E-06	4.12E-07
PAH (POM)	1.29E-03	-	1.11E-06	1.30E-03	2.96E-04
Phenol	4.07E-04	-	-	4.07E-04	9.29E-05
Selenium	--	-	2.06E-08	2.06E-08	4.71E-09
Styrene	5.29E-04	-	-	5.29E-04	1.21E-04
Toluene	9.30E-03	6.833E-01	2.92E-06	6.93E-01	1.58E-01
Vinyl Chloride	2.39E-04	-	-	2.39E-04	5.45E-05
Xylenes	2.59E-03	1.996E+00	-	2.00E+00	4.563E-01
<b>Totals</b>	<b>1.01E+00</b>	<b>4.49E+00</b>	<b>1.62E-03</b>	<b>5.50E+00</b>	<b>1.256354789</b>

\*Although the new gas analysis shows a decrease in the CO<sub>2</sub>e from the Dehy Still Vent, the operator is requesting the current emission limit be left in-place in anticipation of changing gas concentrations in the future.

**Table 2. Natural Gas-Fired Compressor Emissions (CE1)**  
**Cranberry Pipeline Corporation - Key Rock Compressor Station**

Pollutant	Emission Factor	PTE (lb/hr)	PTE <sup>(a)</sup> (tons/yr)
<b>Criteria Pollutants</b>			
PM/PM10/PM2.5	8.67E-02 lb/MMBtu (2)	1.91E-01	8.38E-01
SO <sub>2</sub>	5.88E-04 lb/MMBtu (2)	1.30E-03	5.68E-03
NOx	1.14E+01 g/HP-hr (1)	6.761	29.612
CO	1.30E+00 g/HP-hr (1)	0.771	3.377
VOC	1.20E+00 g/HP-hr (2)	0.712	3.117
<b>Hazardous Air Pollutants</b>			
1,1,2,2-Tetrachloroethane	6.63E-05 lb/MMBtu (2)	1.46E-04	6.41E-04
1,1,2-Trichloroethane	5.27E-05 lb/MMBtu (2)	1.16E-04	5.09E-04
1,3-Butadiene	8.20E-04 lb/MMBtu (2)	1.81E-03	7.92E-03
1,3-Dichloropropene	4.38E-05 lb/MMBtu (2)	9.66E-05	4.23E-04
2-Methylnaphthalene	2.14E-05 lb/MMBtu (2)	4.72E-05	2.07E-04
2,2,4-Trimethylpentane	8.46E-04 lb/MMBtu (2)	1.87E-03	8.17E-03
Acetaldehyde	7.76E-03 lb/MMBtu (2)	1.71E-02	7.50E-02
Acrolein	7.78E-03 lb/MMBtu (2)	1.72E-02	7.52E-02
Benzene	1.94E-03 lb/MMBtu (2)	4.28E-03	1.87E-02
Biphenyl	3.95E-06 lb/MMBtu (2)	8.71E-06	3.82E-05
Carbon Tetrachloride	6.07E-05 lb/MMBtu (2)	1.34E-04	5.86E-04
Chlorobenzene	4.44E-05 lb/MMBtu (2)	9.79E-05	4.29E-04
Chloroform	4.71E-05 lb/MMBtu (2)	1.04E-04	4.55E-04
Ethylbenzene	1.08E-04 lb/MMBtu (2)	2.38E-04	1.04E-03
Ethylene Dibromide	7.34E-05 lb/MMBtu (2)	1.62E-04	7.09E-04
Formaldehyde	8.06E-02 lb/MMBtu* (1)	1.78E-01	7.79E-01
Methanol	2.48E-03 lb/MMBtu (2)	5.47E-03	2.40E-02
Methylene Chloride	1.47E-04 lb/MMBtu (2)	3.24E-04	1.42E-03
n-Hexane	4.45E-04 lb/MMBtu (2)	9.82E-04	4.30E-03
Naphthalene	9.63E-05 lb/MMBtu (2)	2.12E-04	9.30E-04
PAH (POM)	1.34E-04 lb/MMBtu (2)	2.96E-04	1.29E-03
Phenol	4.21E-05 lb/MMBtu (2)	9.29E-05	4.07E-04
Styrene	5.48E-05 lb/MMBtu (2)	1.21E-04	5.29E-04
Toluene	9.63E-04 lb/MMBtu (2)	2.12E-03	9.30E-03
Vinyl Chloride	2.47E-05 lb/MMBtu (2)	5.45E-05	2.39E-04
Xylenes	2.68E-04 lb/MMBtu (2)	5.91E-04	2.59E-03
<b>Total HAP</b>		<b>0.231</b>	<b>1.014</b>
<b>Greenhouse Gas Emissions</b>			
CO <sub>2</sub>	116.89 lb/MMBtu (3)	2.58E+02	1.13E+03
CH <sub>4</sub>	2.2E-03 lb/MMBtu (3)	4.86E-03	2.13E-02
N <sub>2</sub> O	2.2E-04 lb/MMBtu (3)	4.86E-04	2.13E-03
CO <sub>2</sub> e <sup>(b)</sup>	-	258.10	1130.48

**Calculations:** If emission factor note 1 is used, use calculation (a). If emission factor note 2 or 3 is used, use calculation (b).

(a) Annual emissions (tons/yr) = [Emission Factor (g/HP-hr)] x [Power Output (HP)] x [Hours of Operation (hrs/yr)] x [Number of engines] x [1.0231131 x 10<sup>-6</sup> (ton/gram)]

(b) Annual emissions (tons/yr) = [Emission Factor (lbs/MMBtu)] x Brake Specific Fuel Consumption (BTU/HP-hr) x Power Output (HP) x [Number of engines] x [8760 (hrs/yr)] x [1 ton/2000 lbs]

(c) lb/MMBtu = [Emission Factor (g/HP-hr)] / [Brake Specific Fuel Consumption (BTU/HP-hr)] / [1 lb / 454 grams] x 1,000,000

Engine Power Output (kW) =	201	
Engine Power Output (hp) =	269	
Number of Engines Operating at a Time =	1	
Average BSFC (BTU/HP-hr) =	8,200	(4)
Heat Content Natural Gas(Btu/scf) =	1,020.0	(5)
Fuel Throughput (ft3/hr) =	2,162.5	(6)
PTE Hours of Operation =	8,760	

(b) CO<sub>2</sub> equivalent = [(CO<sub>2</sub> emissions)\*(GWP<sub>CO2</sub>)]+[(CH<sub>4</sub> emissions)\*(GWP<sub>CH4</sub>)]+[(N<sub>2</sub>O emissions)\*(GWP<sub>N2O</sub>)]  
Global Warming Potential (GWP)

CO <sub>2</sub>	1	(7)
CH <sub>4</sub>	25	(7)
N <sub>2</sub> O	298	(7)

**Notes:**

(1) Emission factors from Ajax spec sheet.

\*Ajax Emission Factor provided in g/HP-hr. Converted to lb/MMBtu. See Calculation (c).

(2) AP-42, Chapter 3.2, Table 3.2-1. *Natural Gas-fired Reciprocating Engines* (7/00). Uncontrolled Emission Factors for 2-Stroke Lean-Burn Engines.

(3) Emission factors are from 40 CFR 98, Subpart C, Table C-1 and C-2.

(4) Fuel consumption from manufacturer's specification sheet.

(5) Value obtained from AP-42, section 4.1.1.

(6) Fuel throughput = BSFC (BTU/HP-hr) x Power (HP) / Heat Content (BTU/scf)

(7) Global Warming Potentials obtained from 40 CFR 98, Subpart A, Table A-1

**Table 3. Fugitive Leak Emissions**  
**Cranberry Pipeline Corporation - Key Rock Compressor Station**

Fugitive emissions from valves and fittings are calculated using the major equipment default component count approach from 40 CFR Part 98 because site-specific component counts have not been collected.

Pollutant	Emission Factor Total Gas Losses	Annual emission losses <sup>(a)</sup> (tons/yr)
Valves	1.30E-05 kg/hr/source (1)	0.0208
Pressure Relief Valves	1.20E-04 kg/hr/source (1)	0.0081
Connector	1.20E-04 kg/hr/source (1)	0.8874
Open-ended Lines	1.20E-04 kg/hr/source (1)	0.0203
<b>Total Gas Estimated</b>	<b>- -</b>	<b>0.9366</b>

**Calculations:**

(a) Annual emission losses (tons/yr) = [Emission Factor (kg/hr/source)] x [Number of Sources] x [Hours of Operation per Year] x [0.001102 tons/ kg]

Number of Components in Gas Service

Valves=	166	(2)
Pressure Relief Valves=	7	(2)
Connectors=	766	(2)
Open-ended lines	18	(2)

Maximum Hour of Operation = 8,760

Compound	Fraction <sup>(3)</sup>	Potential Annual Emissions (tons/yr) <sup>(b)</sup>
C6 +	0.00021	0.0002
Nitrogen	0.00534	0.0050
Methane	0.97025	0.9087
CO2	0.00066	0.0006
Ethane	0.02007	0.0188
Propane	0.00248	0.0023
i Butane	0.0003	0.0003
n Butane	0.0005	0.0005
i Pentane	0.00012	0.0001
n Pentane	0.0001	0.0001
<b>Total VOC Emissions</b>		<b>0.0035</b>
<b>Total CO2e<sup>(c)</sup></b>		<b>22.72</b>

(b) Potential Annual Emissions (tons/yr) = Annual Emission Losses (TPY) X ( compound **Weight** fraction)

(c) CO<sub>2</sub> equivalent = [(CO<sub>2</sub> emissions) x (GWP<sub>CO2</sub>)]+[(CH<sub>4</sub> emissions) x (GWP<sub>CH4</sub>)]+[(N<sub>2</sub>O emissions) x (GWP<sub>N2O</sub>)]

Global Warming Potential (GWP)

CO <sub>2</sub>	1	(4)
CH <sub>4</sub>	25	(4)
N <sub>2</sub> O	298	(4)

**Notes:**

(1) Emission factors from *Protocol for Equipment Leak Emission Estimates* Table 2-3 Marketing Terminal Average Emission Factors

(2) *Default Average Component Counts for Major Onshore Natural Gas Production Equipment* from 40 CFR 98, Subpart W, Table W-1B

(3) Gas Analysis Results from Key Rock.

(4) Global Warming Potentials obtained from 40 CFR 98, Subpart A, Table A-1

**Table 4. Dehydration Unit Still Vent Emissions (RSV-1)  
Cranberry Pipeline Corporation - Key Rock Compressor Station**

Source	PTE (lb/hr)	PTE (lb/day)	PTE <sup>(1)</sup> (tons/yr)	20% Emission Factor Increase (tons/yr)
<b>Criteria Pollutants</b>				
VOC	2.7475	65.9397	12.0340	14.4408
<b>Hazardous Air Pollutants</b>				
n-Hexane	0.0144	0.3458	0.0631	0.0757
2, 2, 4-Trimethylpentane	0.0024	0.0575	0.0105	0.0126
Benzene	0.0625	1.5003	0.2738	0.3286
Toluene	0.1300	3.1200	0.5694	0.6833
Ethylbenzene	0.2679	6.4301	1.1735	1.4082
Xylenes	0.3798	9.1151	1.6635	1.9962
<b>Total HAP</b>	<b>0.8570</b>	<b>20.5688</b>	<b>3.7538</b>	<b>4.5046</b>
<b>Greenhouse Gas Emissions</b>				
CO <sub>2</sub>			-	
CH <sub>4</sub>	2.5042	60.1008	10.9684	13.1621
N <sub>2</sub> O	-	-	-	
CO <sub>2</sub> e <sup>(a)</sup>	62.61	1502.52	274.21	329.0520
<b>Calculations:</b>				
(a) CO <sub>2</sub> equivalent = [(CO <sub>2</sub> emissions)*(GWP <sub>CO2</sub> )]+[(CH <sub>4</sub> emissions)*(GWP <sub>CH4</sub> )]+[(N <sub>2</sub> O emissions)*(GWP <sub>N2O</sub> )] Global Warming Potential (GWP)				
	CO <sub>2</sub>	1	(2)	
	CH <sub>4</sub>	25	(2)	
	N <sub>2</sub> O	298	(2)	
<b>Notes:</b>				
(1) Emissions Calculated utilizing GRI-GLYCalc and reflect Combined Regenerator Vent/ Flash Gas Emissions				
(2) Global Warming Potentials obtained from 40 CFR 98, Subpart A, Table A-1				



Table 5. Reboiler Rates and Emissions (RBV-1) Cranberry Pipeline Corporation - Key Rock Compressor Station				
Pollutant	Emission Factor		Emissions (lb/hr)	Emissions (tons/year)
Criteria Pollutants				
PM/PM10/PM2.5	7.6 lb/MMcf	(1)	1.49E-03	6.53E-03
SO <sub>2</sub>	0.6 lb/MMcf	(1)	1.18E-04	5.15E-04
NOx	100 lb/MMcf	(2)	1.96E-02	8.59E-02
CO	84 lb/MMcf	(2)	1.65E-02	7.21E-02
VOC	5.5 lb/MMcf	(1)	1.08E-03	4.72E-03
Hazardous Air Pollutants				
Arsenic	2.0E-04 lb/MMcf	(3)	3.92E-08	1.72E-07
Benzene	2.1E-03 lb/MMcf	(4)	4.12E-07	1.80E-06
Beryllium	1.2E-05 lb/MMcf	(3)	2.35E-09	1.03E-08
Cadmium	1.1E-03 lb/MMcf	(3)	2.16E-07	9.45E-07
Chromium	1.4E-03 lb/MMcf	(3)	2.75E-07	1.20E-06
Cobalt	8.4E-05 lb/MMcf	(3)	1.65E-08	7.21E-08
Dichlorobenzene	1.2E-03 lb/MMcf	(4)	2.35E-07	1.03E-06
Formaldehyde	7.5E-02 lb/MMcf	(4)	1.47E-05	6.44E-05
Hexane	1.8E+00 lb/MMcf	(4)	3.53E-04	1.55E-03
Lead	5.0E-04 lb/MMcf	(3)	9.80E-08	4.29E-07
Manganese	3.8E-04 lb/MMcf	(3)	7.45E-08	3.26E-07
Mercury	2.6E-04 lb/MMcf	(3)	5.10E-08	2.23E-07
Naphthalene	6.1E-04 lb/MMcf	(4)	1.20E-07	5.24E-07
Nickel	2.1E-03 lb/MMcf	(3)	4.12E-07	1.80E-06
PAH/POM	1.3E-03 lb/MMcf	(4)	2.53E-07	1.11E-06
Selenium	2.4E-05 lb/MMcf	(3)	4.71E-09	2.06E-08
Toluene	3.4E-03 lb/MMcf	(4)	6.67E-07	2.92E-06
Total HAP	1.9E+00 lb/MMCF		3.71E-04	1.62E-03
Greenhouse Gas Emissions				
CO <sub>2</sub>	116.89 lb/MMBtu	(5)	23.38	102.395
CH <sub>4</sub>	2.2E-03 lb/MMBtu	(5)	4.41E-04	1.93E-03
N <sub>2</sub> O	2.20E-04 lb/MMBtu	(5)	4.41E-05	1.93E-04
CO <sub>2</sub> e <sup>(b)</sup>	-	-	23.40	102.501
Total			23.417	102.568
Calculations:				
(a) Annual emissions (tons/yr) = [Annual Usage (MMBtu/yr or MMCF/yr)]x [Number of Identical Heaters]x [Emission Factor (lb/MMBtu or lb/MMCF)] / [2,000 lb/ton]				
Number Reboilers 1				
Fuel Use (MMBtu/hr) = 0.2				
Hours of Operation (hr/yr)= 8760				
PTE Fuel Use (MMcf/yr) = 1.7 (7)				
(b) CO <sub>2</sub> equivalent = [(CO <sub>2</sub> emissions)*(GWP <sub>CO2</sub> )]+[(CH <sub>4</sub> emissions)*(GWP <sub>CH4</sub> )]+[(N <sub>2</sub> O emissions)*(GWP <sub>N2O</sub> )]				
Global Warming Potential (GWP)				
CO <sub>2</sub> 1 (6)				
CH <sub>4</sub> 25 (6)				
N <sub>2</sub> O 298 (6)				
Notes:				
(1) AP-42, Chapter 1.4, Table 1.4-2. Emission Factors For Criteria Pollutants and Greenhouse Gases From Natural Gas Combustion, July 1998.				
(2) AP-42, Chapter 1.4, Table 1.4-1. Emission Factors For Nitrogen Oxides (Nox) and Carbon Monoxide(CO) From Natural Gas Combustion, July 1998.				
(3) AP-42, Chapter 1.4, Table 1.4-4. Emission Factors For Metals From Natural Gas Combustion, July 1998.				
(4) AP-42, Chapter 1.4, Table 1.4-3. Emission Factors for Speciated Organic Compounds from Natural Gas Combustion, July 1998.				
(5) Emission factors are from 40 CFR 98, Subpart C, Table C-1 and C-2.				
(6) Global Warming Potentials obtained from 40 CFR 98, Subpart A, Table A-1				
(7) MMBtu to MMcf conversion factor is 1020. AP-42, Chapter 1.4				

**Table 6. Tank Emissions**  
**Cranberry Pipeline Corporation - Key Rock Compressor Station**

Emission Unit	Tank Contents	Control Devices	Tank Throughput (bbls/day)	Flashing/Working/Breathing Em. Factor (lbs/bbls)		VOC Emissions (lbs/day)	VOC Emissions (lb/hr)	VOC Emissions (tons/yr)
T01	Pipeline Liquid	None	5	0.350	(1)		0.07	0.32
						1.75		

Note: This tank is filled by the liquids captured from the dehy and compressor suction pots.

**Calculations:**

**Notes:**

(1) Flashing/Working/Breathing losses calculated from pressurized liquid sample taken by FESCO and modeled using E+P Tanks 2.0  
The sample was taken from the Putnam B6 site on 4-25-13 and is assumed to be representative worst case with respect to Hamon

**Table 7. Truck Loading (TL) VOC Emissions  
Cranberry Pipeline Corporation - Key Rock Compressor Station**

Contents	Volume Transferred <sup>3</sup>	Loading Loss <sup>(a)</sup> (lb VOC/1000gal)	PTE VOC Emissions (lb/hr)	PTE VOC Emissions (ton/yr) <sup>(b)</sup>
Pipeline Liquids	76,650 gal/yr	3.659	0.032	0.140
<b>Total</b>			<b>0.032</b>	<b>0.140</b>

**Calculations:**

(a) Loading Loss (lbs/1000 gal) =  $12.46 \times [\text{Saturation Factor}] \times [\text{True Vapor Pressure of Liquid Loaded (psia)}] \times [\text{Molecular Weight of Vapors (lbs/lbmole)}] / [\text{Temperature of Bulk Liquid Loaded (°R)}]$

(b) Annual Emissions(tons/yr) =  $[\text{Loading Loss (lb VOC/ 1000 gal)}] \times [\text{Volume Transferred(gal/yr)}] / 1000 / 2000$

	<u>Pipeline liquids</u>	
Saturation factor	0.60	Note <sup>(1)</sup>
Pvap (psia)	7.70	Note <sup>(2)</sup>
Molecular Weight Vap (lb/lbmol)	33.37	Note <sup>(2)</sup>
Bulk Liquid Temperature (F)	65.00	Note <sup>(2)</sup>

**Notes:**

(1) AP-42 Section 5.2

(2) Putnam B6 Compressor Station Pressurized Separator Sampling and Emission Estimation Report, August 2013

(3) Annual rates based on maximum throughput of 5 bbls/d

## GRI-GLYCalc VERSION 4.0 - SUMMARY OF INPUT VALUES

Case Name: Key Rock Compressor Station

File Name: N:\West Virginia\Cabot\Projects\2015\Air Permits\General Permits\Key

Rock Gen. G35-A Permit Modification\Attachments\Cabot - Key Rock G-35 Mod

GLYCalc Max.ddf

Date: August 19, 2015

## DESCRIPTION:

Description: Key Rock Permit Modification - Wet Gas  
Report - Sampled on 4/22/2015 PTE

Annual Hours of Operation: 8760.0 hours/yr

## WET GAS:

Temperature: 63.04 deg. F

Pressure: 175.44 psig

Wet Gas Water Content: Saturated

Component	Conc. (vol %)
Carbon Dioxide	0.0535
Nitrogen	0.5173
Methane	96.5396
Ethane	2.3263
Propane	0.2372
Isobutane	0.0338
n-Butane	0.0492
Isopentane	0.0236
n-Pentane	0.0010
Cyclopentane	0.0010
n-Hexane	0.0083
Cyclohexane	0.0019
Other Hexanes	0.0145
Heptanes	0.0206
Methylcyclohexane	0.0073
2,2,4-Trimethylpentane	0.0010
Benzene	0.0010
Toluene	0.0010
Ethylbenzene	0.0010
Xylenes	0.0010
C8+ Heavies	0.0490

## DRY GAS:

Flow Rate: 10.0 MMSCF/day  
Water Content: 7.0 lbs. H2O/MMSCF

## LEAN GLYCOL:

Glycol Type: TEG  
Water Content: 1.5 wt% H2O  
Flow Rate: 0.8 gpm

PUMP:

---

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

## GRI-GLYCalc VERSION 4.0 - AGGREGATE CALCULATIONS REPORT

Case Name: Key Rock Compressor Station

File Name: N:\West Virginia\Cabot\Projects\2015\Air Permits\General Permits\Key

Rock Gen. G35-A Permit Modification\Attachments\Cabot - Key Rock G-35 Mod

GLYCalc Max.ddf

Date: August 19, 2015

## DESCRIPTION:

Description: Key Rock Permit Modification - Wet Gas  
Report - Sampled on 4/22/2015 PTE

Annual Hours of Operation: 8760.0 hours/yr

## EMISSIONS REPORTS:

## UNCONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	2.5042	60.101	10.9684
Ethane	0.1589	3.814	0.6960
Propane	0.0372	0.894	0.1631
Isobutane	0.0101	0.243	0.0443
n-Butane	0.0191	0.459	0.0839
Isopentane	0.0137	0.328	0.0599
n-Pentane	0.0007	0.018	0.0033
Cyclopentane	0.0025	0.060	0.0110
n-Hexane	0.0144	0.346	0.0631
Cyclohexane	0.0123	0.295	0.0539
Other Hexanes	0.0184	0.442	0.0807
Heptanes	0.0946	2.272	0.4146
Methylcyclohexane	0.0782	1.877	0.3425
2,2,4-Trimethylpentane	0.0024	0.058	0.0105
Benzene	0.0625	1.500	0.2738
Toluene	0.1300	3.120	0.5694
Ethylbenzene	0.2679	6.430	1.1735
Xylenes	0.3798	9.115	1.6635
C8+ Heavies	1.6034	38.483	7.0231
Total Emissions	5.4106	129.854	23.6984
Total Hydrocarbon Emissions	5.4106	129.854	23.6984
Total VOC Emissions	2.7475	65.940	12.0340
Total HAP Emissions	0.8570	20.568	3.7537
Total BTEX Emissions	0.8402	20.165	3.6801

## EQUIPMENT REPORTS:

## ABSORBER

Calculated Absorber Stages: 1.32  
 Specified Dry Gas Dew Point: 7.00 lbs. H<sub>2</sub>O/MMSCF  
     Temperature: 63.0 deg. F  
     Pressure: 175.4 psig  
     Dry Gas Flow Rate: 10.0000 MMSCF/day  
 Glycol Losses with Dry Gas: 0.0066 lb/hr  
     Wet Gas Water Content: Saturated  
 Calculated Wet Gas Water Content: 75.51 lbs. H<sub>2</sub>O/MMSCF  
 Calculated Lean Glycol Recirc. Ratio: 1.74 gal/lb H<sub>2</sub>O

Component	Remaining in Dry Gas	Absorbed in Glycol
Water	9.26%	90.74%
Carbon Dioxide	99.96%	0.04%
Nitrogen	100.00%	0.00%
Methane	100.00%	0.00%
Ethane	99.99%	0.01%
Propane	99.98%	0.02%
Isobutane	99.97%	0.03%
n-Butane	99.95%	0.05%
Isopentane	99.94%	0.06%
n-Pentane	99.92%	0.08%
Cyclopentane	99.69%	0.31%
n-Hexane	99.83%	0.17%
Cyclohexane	99.31%	0.69%
Other Hexanes	99.88%	0.12%
Heptanes	99.60%	0.40%
Methylcyclohexane	99.02%	0.98%
2,2,4-Trimethylpentane	99.82%	0.18%
Benzene	92.73%	7.27%
Toluene	87.18%	12.82%
Ethylbenzene	77.06%	22.94%
Xylenes	67.47%	32.53%
C8+ Heavies	98.27%	1.73%

## REGENERATOR

No Stripping Gas used in regenerator.

Component	Remaining in Glycol	Distilled Overhead
Water	19.67%	80.33%
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	0.41%	99.59%
n-Pentane	0.43%	99.57%

Cyclopentane	0.48%	99.52%
n-Hexane	0.46%	99.54%
Cyclohexane	3.14%	96.86%
Other Hexanes	0.90%	99.10%
Heptanes	0.48%	99.52%
Methylcyclohexane	3.95%	96.05%
2,2,4-Trimethylpentane	1.40%	98.60%
Benzene	4.99%	95.01%
Toluene	7.90%	92.10%
Ethylbenzene	10.40%	89.60%
Xylenes	12.91%	87.09%
C8+ Heavies	11.94%	88.06%

## STREAM REPORTS:

## WET GAS STREAM

Temperature: 63.04 deg. F  
 Pressure: 190.14 psia  
 Flow Rate: 4.17e+005 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	1.59e-001	3.15e+001
Carbon Dioxide	5.35e-002	2.59e+001
Nitrogen	5.17e-001	1.59e+002
Methane	9.65e+001	1.70e+004
Ethane	2.33e+000	7.69e+002
Propane	2.37e-001	1.15e+002
Isobutane	3.38e-002	2.16e+001
n-Butane	4.92e-002	3.14e+001
Isopentane	2.36e-002	1.87e+001
n-Pentane	1.00e-003	7.93e-001
Cyclopentane	1.00e-003	7.71e-001
n-Hexane	8.30e-003	7.86e+000
Cyclohexane	1.90e-003	1.76e+000
Other Hexanes	1.45e-002	1.37e+001
Heptanes	2.06e-002	2.27e+001
Methylcyclohexane	7.30e-003	7.88e+000
2,2,4-Trimethylpentane	1.00e-003	1.26e+000
Benzene	1.00e-003	8.59e-001
Toluene	1.00e-003	1.01e+000
Ethylbenzene	1.00e-003	1.17e+000
Xylenes	1.00e-003	1.17e+000
C8+ Heavies	4.90e-002	9.18e+001
Total Components	100.00	1.83e+004



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DRY GAS STREAM

Temperature: 63.04 deg. F  
 Pressure: 190.14 psia  
 Flow Rate: 4.17e+005 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	1.47e-002	2.92e+000
Carbon Dioxide	5.35e-002	2.59e+001
Nitrogen	5.18e-001	1.59e+002
Methane	9.66e+001	1.70e+004
Ethane	2.33e+000	7.69e+002
Propane	2.37e-001	1.15e+002
Isobutane	3.38e-002	2.16e+001
n-Butane	4.92e-002	3.14e+001
Isopentane	2.36e-002	1.87e+001
n-Pentane	1.00e-003	7.93e-001
Cyclopentane	9.98e-004	7.69e-001
n-Hexane	8.29e-003	7.85e+000
Cyclohexane	1.89e-003	1.75e+000
Other Hexanes	1.45e-002	1.37e+001
Heptanes	2.05e-002	2.26e+001
Methylcyclohexane	7.24e-003	7.80e+000
2,2,4-Trimethylpentane	9.99e-004	1.25e+000
Benzene	9.28e-004	7.96e-001
Toluene	8.73e-004	8.83e-001
Ethylbenzene	7.71e-004	8.99e-001
Xylenes	6.75e-004	7.87e-001
C8+ Heavies	4.82e-002	9.02e+001
Total Components	100.00	1.83e+004

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LEAN GLYCOL STREAM

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Temperature: 63.04 deg. F  
 Flow Rate: 8.30e-001 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.84e+001	4.60e+002
Water	1.50e+000	7.00e+000
Carbon Dioxide	2.02e-013	9.44e-013
Nitrogen	5.83e-014	2.72e-013
Methane	2.19e-018	1.02e-017
Ethane	6.01e-009	2.81e-008
Propane	1.95e-010	9.11e-010
Isobutane	4.71e-011	2.20e-010
n-Butane	8.01e-011	3.74e-010
Isopentane	1.21e-005	5.66e-005
n-Pentane	6.90e-007	3.22e-006
Cyclopentane	2.60e-006	1.21e-005
n-Hexane	1.44e-005	6.73e-005
Cyclohexane	8.55e-005	3.99e-004

Other Hexanes	3.60e-005	1.68e-004
Heptanes	9.87e-005	4.61e-004
Methylcyclohexane	6.89e-004	3.22e-003
2,2,4-Trimethylpentane	7.29e-006	3.41e-005
Benzene	7.03e-004	3.28e-003
Toluene	2.39e-003	1.11e-002
Ethylbenzene	6.66e-003	3.11e-002
Xylenes	1.21e-002	5.63e-002
C8+ Heavies	4.66e-002	2.17e-001
<hr/>		
Total Components	100.00	4.67e+002

# RICH GLYCOL AND PUMP GAS STREAM

Temperature: 63.04 deg. F  
 Pressure: 190.14 psia  
 Flow Rate: 8.98e-001 gpm  
 NOTE: Stream has more than one phase.

Component	Conc. (wt%)	Loading (lb/hr)
<hr/>		
TEG	9.17e+001	4.60e+002
Water	7.11e+000	3.56e+001
Carbon Dioxide	2.55e-003	1.28e-002
Nitrogen	4.66e-003	2.33e-002
Methane	5.00e-001	2.50e+000
Ethane	3.17e-002	1.59e-001
Propane	7.44e-003	3.72e-002
Isobutane	2.02e-003	1.01e-002
n-Butane	3.82e-003	1.91e-002
Isopentane	2.74e-003	1.37e-002
n-Pentane	1.49e-004	7.48e-004
Cyclopentane	5.04e-004	2.52e-003
n-Hexane	2.89e-003	1.45e-002
Cyclohexane	2.54e-003	1.27e-002
Other Hexanes	3.71e-003	1.86e-002
Heptanes	1.90e-002	9.51e-002
Methylcyclohexane	1.63e-002	8.14e-002
2,2,4-Trimethylpentane	4.86e-004	2.43e-003
Benzene	1.31e-002	6.58e-002
Toluene	2.82e-002	1.41e-001
Ethylbenzene	5.97e-002	2.99e-001
Xylenes	8.71e-002	4.36e-001
C8+ Heavies	3.64e-001	1.82e+000
<hr/>		
Total Components	100.00	5.01e+002

# REGENERATOR OVERHEADS STREAM

Temperature: 212.00 deg. F  
 Pressure: 14.70 psia  
 Flow Rate: 6.72e+002 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	8.96e+001	2.86e+001
Carbon Dioxide	1.64e-002	1.28e-002
Nitrogen	4.70e-002	2.33e-002
Methane	8.81e+000	2.50e+000
Ethane	2.98e-001	1.59e-001
Propane	4.77e-002	3.72e-002
Isobutane	9.83e-003	1.01e-002
n-Butane	1.86e-002	1.91e-002
Isopentane	1.07e-002	1.37e-002
n-Pentane	5.82e-004	7.44e-004
Cyclopentane	2.02e-003	2.51e-003
n-Hexane	9.43e-003	1.44e-002
Cyclohexane	8.25e-003	1.23e-002
Other Hexanes	1.21e-002	1.84e-002
Heptanes	5.33e-002	9.46e-002
Methylcyclohexane	4.49e-002	7.82e-002
2,2,4-Trimethylpentane	1.19e-003	2.40e-003
Benzene	4.52e-002	6.25e-002
Toluene	7.96e-002	1.30e-001
Ethylbenzene	1.42e-001	2.68e-001
Xylenes	2.02e-001	3.80e-001
C8+ Heavies	5.31e-001	1.60e+000
Total Components	100.00	3.40e+001

**- Certificate of Analysis -**

**Final Report**

**Company Name:** CABOT

**Report Date:** 5/1/2015

**Report Number:** 31297-0

**Chain of Custody #:** 04272015

**Lab Analyst:** WG

**Project Comments:** NG EXTENDED

**Lab ID:** 15043510

**Date Sampled:** 4/22/2015 8:10:00AM

**Sample Type:** Natural Gas

**Date Received:** 4/27/2015

**Your Sample ID:** KEY ROCK #1

**Analysis Date:** 04/30/15

Method	Analyte	Result	Units	MDL/PQL
Collection	Sampler	EAS	-	
	Sampling Temp	58.0	°F	
	Sample PSI	145	-	
GPA 2145	Temperature (heating value)	60.0	°F	
	Temperature (density)	60.0	°F	
	Atmospheric Pressure	14.696	PSIA	
per GPA 2172	Molar Mass	16.6700	-	
	Relative Density	0.5765	-	
	Compressibility Factor	0.9979	-	
per GPA 2172	Btu/Gal	60153.0	BTU/Gal	
	Btu/Ideal CF	1033.9	BTU/Ideal CF	
	Btu/Real CF	1036.1	BTU/Real CF	
GPA 2286	Helium	0.0213	Mole %	0.001
	Hydrogen	0.0931	Mole %	0.001
	Nitrogen	0.5173	Mole %	0.001
	Oxygen	<0.0010	Mole %	0.001
	Methane	96.5396	Mole %	0.001
	Carbon Dioxide	0.0535	Mole %	0.001
	Ethane	2.3263	Mole %	0.001
	Propane	0.2372	Mole %	0.001
	I-Butane	0.0338	Mole %	0.001
	N-Butane	0.0492	Mole %	0.001
	I-Pentane	0.0236	Mole %	0.001
	N-Pentane	<0.0010	Mole %	0.001

Lab ID: 15043510

Date Sampled: 4/22/2015 8:10:00AM

Sample Type: Natural Gas

Date Received: 4/27/2015

Your Sample ID: KEY ROCK #1

Analysis Date: 04/30/15

Method	Analyte	Result	Units	MDL/PQL
GPA 2286	Hexanes Plus	0.1051	Mole %	0.001
	Carbon Monoxide	<0.0010	Mole %	0.001
	2,2-Dimethylbutane	0.0025	Mole %	0.001
	2,3-Dimethylbutane	<0.0010	Mole %	0.001
	2-Methylpentane	0.0064	Mole %	0.001
	3-Methylpentane	0.0056	Mole %	0.001
	N-Hexane	0.0083	Mole %	0.001
	2,2-Dimethylpentane	<0.0010	Mole %	0.001
	Methylcyclopentane	0.0035	Mole %	0.001
	Benzene	<0.0010	Mole %	0.001
	3-dimethylpentane	<0.0010	Mole %	0.001
	Cyclohexane	0.0019	Mole %	0.001
	2-Methylhexane/2,3-Dimethylpentane	0.0073	Mole %	0.001
	3-Methylhexane	0.0055	Mole %	0.001
	3-Dimethylcyclopentane	<0.0010	Mole %	0.001
	3-Ethylpentane	<0.0010	Mole %	0.001
	2,2,4-Trimethylpentane	<0.0010	Mole %	0.001
	N-Heptane	0.0078	Mole %	0.001
	Methylcyclohexane	0.0073	Mole %	0.001
	2,5-Dimethylhexane	0.0027	Mole %	0.001
	1,t-2,c-4-trimethylcyclopentane	<0.0010	Mole %	0.001
	2,2,3-Trimethylpentane	<0.0010	Mole %	.001
	Toluene	<0.0010	Mole %	0.001
	2-Methylheptane	<0.0010	Mole %	0.001
	4-Methylheptane	0.0053	Mole %	0.001
	3-Methylheptane	0.0042	Mole %	0.001
	2,2,5-trimethylhexane	0.0017	Mole %	0.001
	N-Octane	0.0073	Mole %	0.001
	2,2,4,4-tetramethylpentane	<0.0010	Mole %	0.001
	2,2,4-trimethylhexane	<0.0010	Mole %	0.001
	isopropylcyclopentane	<0.0010	Mole %	0.001

Lab ID: 15043510

Date Sampled: 4/22/2015 8:10:00AM

Sample Type: Natural Gas

Date Received: 4/27/2015

Your Sample ID: KEY ROCK #1

Analysis Date: 04/30/15

Method	Analyte	Result	Units	MDL/PQL
GPA 2286	2,2-dimethylheptane	<0.0010	Mole %	0.001
	2,4-dimethylheptane	<0.0010	Mole %	0.001
	2,2,3-trimethylhexane	<0.0010	Mole %	0.001
	Ethylbenzene	<0.0010	Mole %	0.001
	2,2,3,3-tetramethylpentane	<0.0010	Mole %	0.001
	1,t-2,t-4-trimethylcyclohexane	<0.0010	Mole %	0.001
	M/P Xylene	<0.0010	Mole %	0.001
	2-Methyloctane	0.0033	Mole %	0.001
	O-Xylene	<0.0010	Mole %	0.001
	3-Methyloctane	0.0025	Mole %	0.001
	1,1,2-trimethylcyclohexane	<0.0010	Mole %	0.001
	isobutylcyclopentane	<0.0010	Mole %	0.001
	N-Nonane	0.0098	Mole %	0.001
	1,c-2,t-3,trimethylcyclohexane	<0.0010	Mole %	0.001
	Isopropylbenzene	<0.0010	Mole %	0.001
	2,2-dimethyloctane	<0.0010	Mole %	0.001
	isopropylcyclohexane	<0.0010	Mole %	0.001
	Cyclooctane	<0.0010	Mole %	0.001
	n-butylcyclopentane	<0.0010	Mole %	0.001
	propylcyclohexane	<0.0010	Mole %	0.001
	N-Propylbenzene	<0.0010	Mole %	0.001
	m-ethyltoluene	<0.0010	Mole %	0.001
	p-ethyltoluene	<0.0010	Mole %	0.001
	1,3,5-Trimethylbenzene	<0.0010	Mole %	0.001
	2-methylnonane	<0.0010	Mole %	0.001
	3-ethyloctane	<0.0010	Mole %	0.001
	3-methylnonane	<0.0010	Mole %	0.001
	t-butylbenzene	<0.0010	Mole %	0.001
	n-decane	0.0019	Mole %	0.001
	i-butylbenzene	<0.0010	Mole %	0.001
	sec-butylbenzene	<0.0010	Mole %	0.001

**Lab ID:** 15043510

**Date Sampled:** 4/22/2015 8:10:00AM

**Sample Type:** Natural Gas

**Date Received:** 4/27/2015

**Your Sample ID:** KEY ROCK #1

**Analysis Date:** 04/30/15

Method	Analyte		Result	Units	MDL/PQL
GPA 2286	T-Butylcyclohexane	n-	<0.0010	Mole %	0.001
	Butylcyclohexane		<0.0010	Mole %	0.001
	n-Butylbenzene		<0.0010	Mole %	0.001
	n-undecane		0.0103	Mole %	0.001

Joe Arnold

Laboratory QA/QC Manager

Results relate only to items tested. Samples tested as received. This report may not be reproduced except in full with the approval of R. L. Laughlin.



**Estimated Exhaust Emissions Based On PLQNG, 1500 FASL Elevation and an average Ambient Temperature of 65 Degrees F**

**For Emissions Permits, please contact Ajax for emissions data based on specific site conditions**

Ajax Engine Model	Emissions ( Gm / Bhph)					BSFC	RPM	BHP	BMEP	Exhaust Stack						No. Of Cyl's	Bore	Stroke
	NOx	CO	HCT	NMHC	CH2O					Dia. (in.)	Height (in.)	Temp (Deg.F)	Flow (acfm)	Flow (lb/m)	Velocity (ft/m)			
DPC-230	4.4	2.4	12.7	1.8	0.3	8700	360	221	55.0	12	190	440	1730	71	2203	2	13.25	16
DPC-230 LE	2.0	2.2	7.7	1.3	0.3	8100	360	221	55.0	12	190	400	1670	72	2126	2	13.25	16
<b>DPC-280</b>	<b>11.4</b>	<b>1.3</b>	<b>6.8</b>	<b>1.2</b>	<b>0.3</b>	<b>8200</b>	<b>400</b>	<b>269</b>	<b>60.3</b>	<b>12</b>	<b>190</b>	<b>470</b>	<b>2030</b>	<b>80</b>	<b>2585</b>	<b>2</b>	<b>13.25</b>	<b>16</b>
DPC-280 LE	2.0	1.4	5.5	1.1	0.3	7800	400	269	60.3	12	190	450	1990	81	2534	2	13.25	16
DPC-300	4.1	1.9	16.0	2.2	0.3	8700	360	288	56.0	13.25	260	435	2210	91	2308	2	15	16
DPC-300 LE	2.0	1.6	8.8	1.4	0.3	8200	360	288	56.0	13.25	260	435	2230	92	2329	2	15	16
DPC-360	6.3	1.4	14.6	2.1	0.3	8400	400	346	60.5	13.25	260	480	2630	103	2747	2	15	16
DPC-360 LE	2.0	1.1	6.4	1.2	0.3	7900	400	346	60.5	13.25	260	480	2690	105	2809	2	15	16
DPC-450 LE	2.7	1.2	6.0	1.1	0.3	7800	400	432	64.6	17.25	190	500	3220	124	1984	3	13.25	16
DPC-540	8.6	1.3	12.3	1.4	0.3	8300	400	540	63.0	17.25	303	465	3890	155	2397	3	15	16
DPC-540 LE	2.0	1.0	6.0	1.1	0.3	7800	400	540	63.0	17.25	303	465	3970	158	2446	3	15	16
DPC-600	13.0	1.2	8.5	1.6	0.3	8200	400	576	67.2	17.25	303	515	4110	155	2532	3	15	16
DPC-600 LE	6.5	0.9	5.9	1.1	0.3	7800	400	576	67.2	17.25	303	515	4190	158	2582	3	15	16
DPC-720	9.5	1.3	9.0	1.8	0.3	8300	400	720	63.0	17.25	241	465	5190	207	3198	4	15	16
DPC-720 LE	2.0	1.0	6.0	1.1	0.3	7800	400	720	63.0	17.25	241	465	5300	211	3266	4	15	16
DPC-800	13.0	1.2	8.5	1.8	0.3	8200	400	768	67.2	17.25	241	515	5480	207	3377	4	15	16
DPC-800 LE	6.5	1.0	5.9	1.1	0.3	7800	400	768	67.2	17.25	241	515	5590	211	3444	4	15	16
DPC-2201	10.0	1.3	5.5	1.1	0.3	8000	440	148	60.4	12	190	490	1160	45	1477	1	13.25	16
DPC-2201 LE	2.0	1.4	5.4	1.2	0.3	7800	440	148	60.4	12	190	490	1200	47	1528	1	13.25	16
DPC-2202	10.0	1.3	5.5	1.1	0.3	8000	440	296	60.4	12	190	470	2280	90	2903	2	13.25	16
DPC-2202 LE	2.0	1.4	5.4	1.2	0.3	7800	440	296	60.4	12	190	470	2350	93	2992	2	13.25	16
DPC-2801	5.5	1.4	10.5	1.7	0.3	8200	440	192	61.1	13.25	256	460	1450	58	1514	1	15	16
DPC-2801 LE	2.0	1.2	6.1	1.2	0.3	7800	440	192	61.1	13.25	256	460	1490	60	1556	1	15	16
DPC-2802	5.5	1.3	10.5	1.7	0.3	8200	440	422	70.1	13.25	260	465	2910	116	3039	2	15	16
DPC-2802 LE	2.0	1.2	6.1	1.2	0.3	7800	440	384	61.1	13.25	260	465	3000	119	3133	2	15	16
DPC-2802 LE*	2.0	1.2	6.1	1.2	0.3	7800	440	384	61.1	14.13	260	465	3000	119	2757	2	15	16
DPC-2803	12.0	1.2	9.9	1.6	0.3	8000	440	634	67.3	17.25	303	465	4380	174	2699	3	15	16
DPC-2803 LE	2.0	1.2	6.1	1.2	0.3	7800	440	600	63.7	17.25	241	515	4740	179	2921	3	15	16
DPC-2804	12.0	1.2	9.9	1.6	0.3	8000	440	845	67.2	17.25	241	465	5840	233	3598	4	15	16
DPC-2804 LE	2.0	1.2	6.1	1.2	0.3	7800	440	800	63.7	17.25	241	515	6320	239	3894	4	15	16

Site Altitude = 0 - 1500 FASL

Date: August 2004

NOx = Nitrogen Oxide

FASL = Feet Above Sea Level

Site Fuel Composition = Pipeline Quality Natural Gas (PLQNG)

CO = Carbon Monoxide

ACFM = Actual Cubic Feet Per Minute

Ambient Temp For Defining Maximum Load = 100 Deg F

HCT = Total Unburned Hydrocarbons

BMEP = Brake Mean Effective Pressure

Ambient Temp For Defining Exhaust Emissions = 65 Deg F

NMHC= Non-Methane Hydrocarbons

BSFC = Brake Specific Fuel Consumption

The above emissions and performance data is contingent on:

CH2O = Formaldehyde

- 1.) Engine must be maintained in good working order.
- 2.) Engine modifications or upgrades from the original factory configuration must meet Ajax specifications and installation guidelines.
- 3.) Engine operating parameters must be consistent with those specified in the Ajax manual.

\* = DPC-2802LE Tilt Muffler Package

Prepared By: Bruce Chrisman, (405) 619-5058

Email: chrismab@ccc-ces.com

**Fuel Composition (PLQNG):**

Compound	Formula	% Volume
Nitrogen	N2	0.72
Carbon Dioxide	CO2	1.14
Methane	CH4	92.84
Ethane	C2H6	4.10
Propane	C3H8	1.20
Total Volume % =		100.00





## **ATTACHMENT J**

### **CLASS I LEGAL ADVERTISEMENT**

#### **General Permit G-35A Permit Modification Application**

**Key Rock Compressor Station, Plant ID No. 109-00104  
Rock View, West Virginia**

Cranberry Pipeline Corporation  
c/o Cabot Oil & Gas Corporation  
900 Lee Street East, Suite 1500  
Charleston, West Virginia

September 2015

## **AIR QUALITY PERMIT NOTICE**

### **Notice of Application**

Notice is given that Cranberry Pipeline Corporation has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a Modification, for a Natural Gas Compression & Dehydration Station located on Skin Fork Rd off of WV State Road 97/SR-10, near Rock View, Wyoming County, West Virginia. The latitude and longitude coordinates are: 37.61151° and -81.55316°.

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

<b>Pollutant</b>	<b>Increased Potential (ton/yr)</b>
VOC	12.63
Benzene	0.21
Ethylbenzene	1.00
Toluene	0.47
Xylene	1.37
n-Hexane	0.07

The modification of operation will take place upon issuance of permit. Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57<sup>th</sup> Street, SE, Charleston, WV 25304, for at least 30 calendar days from the date of publication of this notice.

Any questions regarding this permit application should be directed to the DAQ at (304) 926-0499, extension 1227, during normal business hours.

Dated this the xx day of September 2015.

By: Cranberry Pipeline Corporation  
Randy Spencer  
Environmental Health & Safety Manager  
900 Lee St. E Suite 1500  
Charleston, WV 25301



**ATTACHMENT K**

**ELECTRONIC SUBMITTAL DISKETTE**

**General Permit G-35A Permit Modification Application**

**Key Rock Compressor Station, Plant ID No. 109-00104**  
**Rock View, West Virginia**

Cranberry Pipeline Corporation  
c/o Cabot Oil & Gas Corporation  
900 Lee Street East, Suite 1500  
Charleston, West Virginia

September 2015



## **ATTACHMENT L**

### **GENERAL PERMIT REGISTRATION APPLICATION FEE**

#### **General Permit G-35A Permit Modification Application**

**Key Rock Compressor Station, Plant ID No. 109-00104  
Rock View, West Virginia**

Cranberry Pipeline Corporation  
c/o Cabot Oil & Gas Corporation  
900 Lee Street East, Suite 1500  
Charleston, West Virginia

September 2015

**CRANBERRY PIPELINE CORPORATION**

62332 WVDEP - OFFICE OF AIR QUALITY

CHECK NO. 2900221627

ACCT VOUCHER INVOICE

INVOICE

MO/YR NUMBER DATE

NUMBER

GROSS AMOUNT

DISCOUNT

NET AMOUNT

08/15 414675 08/11/15 08/11/15 062332B

3000.00

.00

3000.00

DESCRIPTION: SND CK TO PGH-SHERRY KLIBER

TOTAL FOR CHECK

3000.00



Please Address Inquiries Regarding This Payment To: Accounts Payable, Cranberry Pipeline Corp., P.O. Box 4544, Houston, TX 77210-4544  
Or Call: 1.800.434.3985

SIGN UP TO RECEIVE YOUR FUNDS ELECTRONICALLY and DETAIL VIA EMAILED PDF!

Go to <http://www.cabotog.com> and CLICK ON VENDOR INFO, VENDOR EFT (DIRECT DEPOSIT) and follow the instructions on the form

THIS DOCUMENT HAS A COLORED BACKGROUND AND MICROPRINTING IN THE SIGNATURE LINE, MAGNIFY TO VERIFY ORIGINAL CHECK.

**CRANBERRY PIPELINE CORPORATION**

PO BOX 4544, Houston, TX 77210-4544

JPMorgan Chase Bank, N.A.

Columbus, Ohio 43271

\*\*\*\*\*3,000 DOLLARS \*\*\*00 CENTS

Check Number **2900221627** 56-1544/441 633681747

Check Date 8/11/15

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										THREE THOUSAND ZERO ZERO ZERO PERIOD ZERO ZERO							

**TO THE ORDER OF**

WVDEP - OFFICE OF AIR QUALITY

62332

601 57TH ST SE  
CHARLESTON

WV 25304 2345

CRANBERRY PIPELINE CORPORATION

AUTHORIZED REPRESENTATIVE

ACCOUNTS PAYABLE

VOID AFTER 90 DAYS

THIS DOCUMENT CONTAINS A TRUE WATER MARK AND VISIBLE FIBERS

22/09/2015

⑈ 2900221627 ⑈ ⑆044115443⑆

633681747⑈



## **ATTACHMENT M**

### **SITING CRITERIA WAIVER NOT APPLICABLE (SEE NOTE)**

Note: No Siting Criteria Waiver is necessary due to existing facility.

## **General Permit G-35A Permit Modification Application**

**Key Rock Compressor Station, Plant ID No. 109-00104  
Rock View, West Virginia**

Cranberry Pipeline Corporation  
c/o Cabot Oil & Gas Corporation  
900 Lee Street East, Suite 1500  
Charleston, West Virginia

September 2015



## **ATTACHMENT N**

### **MATERIAL SAFETY DATA SHEETS (MSDS)**

#### **General Permit G-35A Permit Modification Application**

**Key Rock Compressor Station, Plant ID No. 109-00104  
Rock View, West Virginia**

Cranberry Pipeline Corporation  
c/o Cabot Oil & Gas Corporation  
900 Lee Street East, Suite 1500  
Charleston, West Virginia

September 2015

September 2015



# UNOCAL MATERIAL SAFETY DATA SHEET

Product Name: Processed Natural Gas  
Product Code: None

Page 1 of 8

## 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Processed Natural Gas  
Product Code: None  
Synonyms: Dry Gas  
Generic Name: Natural Gas  
Chemical Family: Paraffin hydrocarbon  
  
Responsible Party: Unocal Corporation  
Union Oil Company of California  
14141 Southwest Freeway  
Sugar Land, Texas  
77478

For further information contact MSDS Coordinator  
8am - 4pm Central Time, Mon - Fri: 281-287-5310

## EMERGENCY OVERVIEW

### 24 Hour Emergency Telephone Numbers:

For Chemical Emergencies:  
Spill, Leak, Fire or Accident  
Call CHEMTREC  
North America: (800)424-9300  
Others: (703)527-3887(collect)

For Health Emergencies:  
California Poison  
Control System  
(800)356-3129

**Health Hazards:** Use with adequate ventilation.

**Physical Hazards:** Flammable gas. Can cause flash fire. Gas displaces oxygen available for breathing. Keep away from heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, mechanical/electrical equipment). Do not enter storage areas or confined space unless adequately ventilated.

< Physical Form: Gas  
< Appearance: Colorless  
< Odor: Odorless in the absence of H<sub>2</sub>S or mercaptans

NFPA HAZARD CLASS: Health: 1 (Slight)  
Flammability: 4 (Extreme)  
Reactivity: 0 (Least)

Issue Date: 03/18/03  
Revised Sections: 1, 3

Status: Final Revised



## UNOCAL

Product Name: Processed Natural Gas  
 Product Code: None

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## 2. COMPOSITION/INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS	% Weight	EXPOSURE GUIDELINE		
		Limits	Agency	Type
Methane CAS# 74-82-8	98	1000 ppm	MSHA	TWA
Carbon Dioxide CAS# 124-38-9	0-5	5000 ppm	ACGIH	TWA
		30000 ppm	ACGIH	STEL
		5000 ppm	OSHA	TWA
		5000 ppm	MSHA	TWA
		5000 ppm	Cal.OSHA	TWA
		30000 ppm	Cal.OSHA	STEL
Nitrogen CAS# 7727-37-9	0-5	1000 ppm	MSHA	TWA
Ethane CAS# 74-84-0	1	1000 ppm	MSHA	TWA

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

## 3. HAZARDS IDENTIFICATION

POTENTIAL HEALTH EFFECTS:

**Eye:** Not expected to be an eye irritant.

**Skin:** Skin contact is unlikely. Skin absorption is unlikely.

**Inhalation (Breathing):** Asphyxiant. High concentrations in confined spaces may limit oxygen available for breathing.

**Ingestion (Swallowing):** This material is a gas under normal atmospheric conditions and ingestion is unlikely.

**Signs and Symptoms:** Light hydrocarbon gases are simple asphyxiants which, at high enough concentrations, can reduce the amount of oxygen available for breathing. Symptoms of overexposure can include shortness of breath, drowsiness, headaches, confusion,

Issue Date: 03/18/03  
 Revised Sections: 1, 3

Status: Final Revised

UNOCAL

Product Name: Processed Natural Gas  
Product Code: None

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decreased coordination, visual disturbances and vomiting, and are reversible if exposure is stopped. Continued exposure can lead to hypoxia (inadequate oxygen), cyanosis (bluish discoloration of the skin), numbness of the extremities, unconsciousness and death. High concentrations of carbon dioxide can increase heart rate and blood pressure.

**Cancer:** No data available.

**Target Organs:** No data available.

**Developmental:** Limited data - See Other Comments, below.

**Other Comments:** High concentrations may reduce the amount of oxygen available for breathing, especially in confined spaces. Hypoxia (inadequate oxygen) and respiratory acidosis (increased carbon dioxide in blood), during pregnancy may have adverse effects on the developing fetus. Exposure during pregnancy to high concentrations of carbon monoxide, which is produced during the combustion of hydrocarbon gases, can also cause harm to the developing fetus.

**Pre-Existing Medical Conditions:** None known.

#### 4. FIRST AID MEASURES

**Eye:** If irritation or redness develops, move victim away from exposure and into fresh air. Flush eyes with clean water. If symptoms persist, seek medical attention.

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

**Inhalation (Breathing):** If respiratory symptoms develop, move victim away from source of exposure and into fresh air. If symptoms persist, seek medical attention. If victim is not breathing, immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

**Ingestion (Swallowing):** This material is a gas under normal atmospheric conditions and ingestion is unlikely.

Issue Date: 03/18/03  
Revised Sections: 1, 3

Status: Final Revised

# UNOCAL

Product Name: Processed Natural Gas  
Product Code: None

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## 5. FIRE FIGHTING MEASURES

**Flammable Properties:** Flash Point: Not applicable (gas)  
OSHA Flammability Class: Flammable gas  
LEL / UEL: No data  
Autoignition Temperature: 800-1000°F

**Unusual Fire & Explosion Hazards:** This material is flammable and may be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, or mechanical/electrical equipment). Vapors may travel considerable distances to a source of ignition where they can ignite, flashback, or explode. May create vapor/air explosion hazard indoors, outdoors, or in sewers. If container is not properly cooled, it can rupture in the heat of a fire. Closed containers exposed to extreme heat can rupture due to pressure buildup.

**Extinguishing Media:** Dry chemical or carbon dioxide is recommended. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.

**Fire Fighting Instructions:** For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear. When the potential chemical hazard is unknown, in enclosed or confined spaces, or when explicitly required by DOT, a self-contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8). Isolate immediate hazard area, keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. If this cannot be done, allow fire to burn. Move undamaged containers from immediate hazard area if it can be done with minimal risk. Stay away from ends of container. Water spray may be useful in minimizing or dispersing vapors. Cool equipment exposed to fire with water, if it can be done with minimal risk.

## 6. ACCIDENTAL RELEASE MEASURES

Flammable. Keep all sources of ignition and hot metal surfaces away from spill/release. The use of explosion-proof equipment is recommended. Stay upwind and away from spill/release. Notify persons down wind of spill/release, isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done with

Issue Date: 03/18/03  
Revised Sections: 1, 3

Status: Final Revised



## UNOCAL

Product Name: Processed Natural Gas

Product Code: None

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minimal risk. Wear appropriate protective equipment including respiratory protection as conditions warrant (see Section 8). Notify fire authorities and appropriate federal, state, and local agencies. Water spray may be useful in minimizing or dispersing vapors (see Section 5).

### 7. HANDLING AND STORAGE

**Handling:** The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes). Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits (see Section 2 and 8). Use good personal hygiene practice.

**Storage:** Keep container(s) tightly closed. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Post area "No Smoking or Open Flame." Store only in approved containers. Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage. Outdoor or detached storage is preferred.

### 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**Engineering controls:** If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits (see Section 2), additional ventilation or exhaust systems may be required. Where explosive mixtures may be present, electrical systems safe for such locations must be used (see appropriate electrical codes).

#### Personal Protective Equipment (PPE):

**Respiratory:** Wear a positive pressure air supplied respirator in oxygen deficient environments (oxygen content <19.5%). A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use.

**Skin:** Not required based on the hazards of the material. However, it is considered good practice to wear gloves when handling chemicals.

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Product Name: Processed Natural Gas

Product Code: None

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**Eye/Face:** While contact with this material is not expected to cause irritation, the use of approved eye protection to safeguard against potential eye contact is considered good practice.

**Other Protective Equipment:** A source of clean water should be available in the work area for flushing eyes and skin. Impervious clothing should be worn as needed. Self-contained respirators should be available for non-routine and emergency situations.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm).

Flash Point: Not applicable (gas)

Flammable/Explosive Limits (%): No data

Autoignition Temperature: 800-1000°F

Appearance: Colorless

Physical State: Gas

Odor: Odorless in the absence of H<sub>2</sub>S or mercaptans

Vapor Pressure (mm Hg): No data

Vapor Density (air=1): <1

Boiling Point: -259°F

Freezing/Melting Point: No data

Solubility in Water: Slight

Specific Gravity: 0.30+ (Air=1)

Percent Volatile: 100 vol. %

Evaporation Rate (nBuAc=1): N/A (Gas)

## 10. STABILITY AND REACTIVITY

**Chemical Stability:** Stable under normal conditions of storage and handling.

**Conditions To Avoid:** Avoid all possible sources of ignition (see Sections 5 & 7).

**Incompatible Materials:** Avoid contact with strong oxidizing agents.

**Hazardous Decomposition Products:** Combustion can yield carbon dioxide and carbon monoxide.

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UNOCAL

Product Name: Processed Natural Gas

Product Code: None

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**Hazardous Polymerization:** Will not occur.

**11. TOXICOLOGICAL INFORMATION**

No definitive information available on carcinogenicity, mutagenicity, target organs or developmental toxicity.

**12. DISPOSAL CONSIDERATIONS**

This material, if discarded as produced, would be a RCRA "characteristic" hazardous waste due to the characteristic(s) of ignitability (D001). If the material is spilled to soil or water, characteristic testing of the contaminated materials is recommended. Further, this material is subject to the land disposal restriction in 40 CFR 268.40 and may require treatment prior to disposal to meet specific standards. Consult state and local regulations to determine whether they are more stringent than the federal requirements.

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

**13. TRANSPORT INFORMATION**

DOT Proper Shipping Name / Technical Name: Hydrocarbon Gas, Liquified  
N.O.S. (Methane)

Hazard Class or Division: 2.1

ID #: UN1965

**14. REGULATORY INFORMATION**

This material contains the following chemicals subject to the reporting requirements of **SARA 313** and 40 CFR 372:

--None--

**Warning:** This material contains the following chemicals which are known to the State of California to cause cancer, birth defects or

Issue Date: 03/18/03

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Revised Sections: 1, 3

UNOCAL

Product Name: Processed Natural Gas  
Product Code: None

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other reproductive harm, and are subject to the requirements of **California Proposition 65** (CA Health & Safety Code Section 25249.5):

--None Known--

This material has not been identified as a carcinogen by NTP, IARC, or OSHA.

**EPA (CERCLA) Reportable Quantity:** --None--

**15. DOCUMENTARY INFORMATION**

Issue Date: 03/18/03  
Previous Issue Date: 11/29/99  
Product Code: None  
Previous Product Code: None

**16. DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES**

The information in this document is believed to be correct as of the date issued. **HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THIS INFORMATION, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE.** This information and product are furnished on the condition that the person receiving them shall make his own determination as to the suitability of the product for his particular purpose and on the condition that he assume the risk of his use thereof.

Issue Date: 03/18/03  
Revised Sections: 1, 3

Status: Final Revised

## Safety Data Sheet

Natural Gas Condensate, Sweet or Sour

J.P. Morgan Ventures Energy Corp.  
JP Morgan Commodities Canada Corp.

### 1. PRODUCT AND COMPANY IDENTIFICATION

<b>Product Name</b>	Natural Gas Condensate, Sweet or Sour	
<b>Synonyms</b>	Sweet Condensate, Sour Condensate, Lease Condensate (Sweet or Sour), Field Condensate (Sweet or Sour), Casing Head Gasoline (Sweet or Sour), Natural Gas Liquids (Sweet or Sour), Gas Drips (Sweet or Sour), Natural Gas Condensate C2-C8 (Sweet or Sour)	
<b>Chemical Family</b>	Petroleum Hydrocarbon	
<b>Intended Use</b>	Feedstock	
<b>MARPOL Annex I Category</b>	Naphthas and Condensates	
<b>Supplier</b>	J.P. Morgan Ventures Energy Corp. 383 Madison Avenue, 10th Floor New York, NY 10017	JP Morgan Commodities Canada Corp. Suite 600, Vintage Towers II, 326 11 <sup>th</sup> Avenue SW Calgary, Alberta T2R 0C5
<b>24 Hour Emergency Numbers</b>	<b>Chemtrec:</b> 800-424-9300 <b>JP Morgan Technical Information:</b> 212-834-5788 (USA), 403-532-2000 (Canada) <b>California Poison Control:</b> 800-356-3219	

### 2. HAZARDS IDENTIFICATION

#### GHS Classification

H224	Flammable liquid – Category 1
H304	May be fatal if swallowed and enters airways – Category 1
H319	Eye damage/irritation – Category 2
H335	May cause respiratory irritation – Category 3
H336	Specific target organ toxicity (single exposure) – Category 3
H350	Carcinogenicity – Category 1B
H411	Hazardous to the aquatic environment, chronic toxicity – Category 2

#### Hazards Not Otherwise Classified

May contain or release poisonous hydrogen sulfide gas

#### Label Elements



**Signal Words** Danger

#### GHS Hazard Statements

H224	Extremely flammable liquid and vapor
H350	May cause cancer
H304	May be fatal if swallowed and enters airways
H319	Causes serious eye irritation
H336	May cause drowsiness or dizziness
H315	Causes skin irritation
H331	Toxic if inhaled
H411	Toxic to aquatic life with long lasting effects

#### GHS Precautionary Statements

P201	Obtain special instructions before use
P202	Do not handle until all safety precautions have been read and understood
P210	Keep away from heat/sparks/open flames/hot surfaces – no smoking
P233	Keep container tightly closed
P240	Ground/bond container and receiving equipment



## Safety Data Sheet

Natural Gas Condensate, Sweet or Sour

J.P. Morgan Ventures Energy Corp.  
JP Morgan Commodities Canada Corp.

### 2. HAZARDS IDENTIFICATION

P241	Use explosion-proof electrical/ventilating/lighting equipment
P242	Use only non-sparking tools
P243	Take precautionary measures against static discharge
P261	Avoid breathing dust/fume/gas/mist/vapours/spray
P264	Wash thoroughly after handling
P271	Use only outdoors or in a well-ventilated area
P273	Avoid release to the environment
P280	Wear protective gloves / protective clothing / eye protection / face protection
P361, P352, P362	IF ON SKIN OR HAIR: Remove/take off immediately all contaminated clothing. Wash with plenty of soap and water. Take off contaminated clothing and wash before reuse.
P305,P351,P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P313	If eye irritation persists, get medical advice/attention
P301,P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
P331	Do NOT induce vomiting
P304,P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P312	Call a POISON CENTER or doctor/physician if you feel unwell
P370,P378	In case of fire: Use dry chemical, carbon dioxide, or foam for extinction
P391	Collect spillage
P405	Store locked up
P403,P233, P235	Store in a well-ventilated place. Keep container tightly closed, Keep cool
P501	Dispose of contents/container to approved facility

### 3. COMPOSITION / INFORMATION ON INGREDIENTS

Components	CAS Registration No.	Concentration (%)
Natural Gas Condensate C2-C8	68919-39-1	100
Benzene	71-43-2	0.1 - 5
n-Butane	106-97-8	5 - 15
Cyclohexane	110-82-7	< 1 - 5
Ethyl Benzene	100-41-4	< 1 - 3
n-Heptane	142-82-5	10 - 20
n-Hexane	110-54-3	2 - 50
Hexane (all isomers)	mixture	2 - 50
Hydrogen Sulfide	7783-06-4	< 0.1 - 20
Methylcyclohexane	108-87-2	5 - 10
n-Nonane	111-84-2	5 - 15
n-Octane	111-65-9	10 - 20
n-Pentane	109-66-0	5 - 20
n-Propane	74-98-6	<1 - 8
Toluene	108-88-3	< 1 - 15
1,2,4 Trimethyl Benzene	95-63-6	< 1 - 4
Xylene, all isomers	1330-20-7	< 1 - 12

### 4. FIRST AID MEASURES

<b>Inhalation (Breathing)</b>	Move the exposed person to fresh air. If not breathing, clear airways and give artificial respiration. If breathing is difficult, humidified oxygen should be administered by qualified personnel. Seek medical attention if breathing difficulties continue.
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## Safety Data Sheet

Natural Gas Condensate, Sweet or Sour

J.P. Morgan Ventures Energy Corp.  
JP Morgan Commodities Canada Corp.

### 4. FIRST AID MEASURES

<b>Eye Contact</b>	Flush eyes with water for at least 15 minutes. Hold eyelids apart to ensure complete irrigation of the eye. Remove contact lenses, if worn, after initial flushing. Do not use eye ointment. Seek medical attention.
<b>Skin Contact</b>	Remove contaminated shoes and clothing, and flush affected areas with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. If skin surface is not damaged, clean affected area thoroughly with mild soap and water. Seek medical attention if tissue appears damaged or if pain or irritation persists. Launder or discard contaminated clothing.
<b>Ingestion (Swallowing)</b>	Aspiration hazard. Do not induce vomiting or give anything by mouth because the material can enter the lungs and cause severe lung damage. If spontaneous vomiting is about to occur, place victim's head below knees. If victim is drowsy or unconscious, place on the left side with head down. Do not leave victim unattended and observe closely for adequacy of breathing. Seek medical attention
<b>Most Important Symptoms and Effects</b>	<b>Acute:</b> Headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue <b>Delayed:</b> Dry skin and possible irritation with repeated or prolonged exposure
<b>Potential Acute Health Effects</b>	<b>Inhalation:</b> Breathing high concentrations may be harmful. Mist or vapor can irritate the throat and lungs. Breathing this material may cause central nervous system depression with symptoms including nausea, headache, dizziness, fatigue, drowsiness or unconsciousness. This material may contain or liberate hydrogen sulfide, a poisonous gas with the smell of rotten eggs. Hydrogen sulfide and other hazardous vapors may evolve and collect in the headspace of storage tanks or other enclosed vessels. The smell disappears rapidly because of olfactory fatigue so odor may not be a reliable indicator of exposure. Effects of overexposure include irritation of the eyes, nose, throat and respiratory tract, blurred vision, photophobia (light sensitivity) and pulmonary edema (fluid accumulation in lungs). Severe exposures can result in nausea, vomiting, muscle weakness or convulsions, respiratory failure and death. <b>Eye Contact:</b> This product can cause eye irritation from short-term contact with liquid, mists or vapors. Symptoms include stinging, watering, redness and swelling. Effects may be more serious with repeated or prolonged contact. Hydrogen sulfide vapors may cause moderate to severe eye irritation and photophobia (light sensitivity). <b>Skin Contact:</b> This product is a skin irritant. Contact may cause redness, itching, burning and skin damage. <b>Ingestion:</b> Ingestion may result in nausea, vomiting, diarrhea and restlessness. Aspiration (inadvertent suction) of liquid into the lungs must be avoided as even small quantities in the lungs can produce chemical pneumonitis, pulmonary edema or hemorrhage and even death.
<b>Potential Chronic Health Effects</b>	Chronic effects of overexposure are similar to acute effects including central nervous system (CNS) effects and CNS depression. Effects may also include irritation of the digestive tract, irritation of the respiratory tract, nausea, vomiting and skin dermatitis.
<b>Notes to Physician</b>	This material may contain or liberate hydrogen sulfide. In high doses, hydrogen sulfide may produce pulmonary edema and respiratory depression or paralysis. The first priority in treatment should be providing adequate ventilation and administering 100% oxygen. If unresponsive to supportive care, nitrites (amyl nitrite by inhalation or sodium nitrite by I.V.) may be an effective antidote, if delivered within the first few minutes of exposure. For adults, the dose is 10 ml of a 3NaNO <sub>2</sub> solution (0.5 gm NaNO <sub>2</sub> in 15 ml water) IV over 2 to 4 minutes. The dosage should be adjusted in children or in the

## Safety Data Sheet

Natural Gas Condensate, Sweet or Sour

J.P. Morgan Ventures Energy Corp.  
JP Morgan Commodities Canada Corp.

### 4. FIRST AID MEASURES

presence of anemia and methemoglobin levels, arterial blood gases, and electrolytes should be monitored.

Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of hydrocarbon solvents (e.g., in enclosed spaces or with deliberate abuse). The use of other drugs with less arrhythmogenic potential should be considered. If sympathomimetic drugs are administered, observe for the development of cardiac arrhythmias.

Ingestion of this product or subsequent vomiting may result in aspiration of light hydrocarbon liquid, which may cause pneumonitis. Inhalation overexposure can produce toxic effects, monitor for respiratory distress. If cough or breathing difficulties develop, evaluate for upper respiratory tract inflammation, bronchitis and pneumonitis.

Skin contact may aggravate an existing dermatitis. High pressure injection injuries may cause necrosis of underlying tissue regardless of superficial appearance.

Federal regulations (29 CFR 1910.1028) specify medical surveillance programs for certain exposures to benzene above the action level or PEL (specified in Section (i)(1)(i) of the Standard). In addition, employees exposed in an emergency situation shall, as described in Section (i)(4)(i), provide a urine sample at the end of the shift for measurement of urine phenol.

### 5. FIRE FIGHTING MEASURES

<b>Flammability Classification</b>	OSHA Classification (29 CFR 1910.1200): Flammable Liquid NFPA Class-1B Flammable Liquid NFPA Ratings: Health: 3, Flammability: 4, Reactivity: 0
<b>Flash Point</b>	< -46°C, < -50°F (ASTM D-56)
<b>Flammable Limits</b>	Lower Limit: < 1% Upper Limit: 10%
<b>Autoignition Temperature</b>	232°C, 450°F
<b>Combustion Products</b>	Highly dependent on combustion conditions. Fume, smoke, carbon monoxide, carbon dioxide, sulfur and nitrogen oxides, aldehydes and unburned hydrocarbons.
<b>Fire and Explosion Hazards</b>	This material is extremely flammable and can be ignited by heat, sparks, flames or other sources of ignition (e.g., static electricity, pilot lights, mechanical/electrical equipment and electronic devices such as cell phones, computers, calculators and pagers which have not been certified as intrinsically safe). Vapors are heavier than air and can accumulate in low areas. May create vapor/air explosion hazard indoors, in confined spaces, outdoors or in sewers. Vapors may travel considerable distances to a remote source of ignition where they can ignite, flash back or explode. Product can accumulate a static charge that may cause a fire or explosion. A product container, if not properly cooled, can rupture in the heat of a fire.
<b>Extinguishing Media</b>	Dry chemical, carbon dioxide or foam is recommended. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Water may be

## Safety Data Sheet

Natural Gas Condensate, Sweet or Sour

J.P. Morgan Ventures Energy Corp.  
JP Morgan Commodities Canada Corp.

### 5. FIRE FIGHTING MEASURES

ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters.

**Fire Fighting** Use water spray to cool fire-exposed containers and to protect personnel. Isolate immediate hazard area and keep unauthorized personnel out. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water. Avoid spreading burning liquid with water used for cooling. For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, or when explicitly required by regulations, a self-contained breathing apparatus should be worn. Wear other appropriate protective equipment as conditions warrant.

### 6. ACCIDENTAL RELEASE MEASURES

**Personal Precautions** Extremely Flammable. Spillage of liquid product will create a fire hazard and may form an explosive atmosphere. Keep all sources of ignition and hot metal surfaces away from spill/release. The use of explosion-proof electrical equipment is recommended. Product may contain or release poisonous hydrogen sulfide gas. If the presence of dangerous amounts of H<sub>2</sub>S around the spilled product is suspected, additional or special actions may be warranted including access restrictions and the use of protective equipment. Stay upwind and away from spill/release. Isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment as conditions warrant per Exposure Controls/Personal Protection guidelines.

**Environmental Precautions** Stop the leak if it can be done without risk. Prevent spilled material from entering waterways, sewers, basements or confined areas. Contain release to prevent further contamination of soils, surface water or groundwater. Clean up spill as soon as possible using appropriate techniques such as applying non-combustible absorbent materials or pumping. All equipment used when handling the product must be grounded. A vapor suppressing foam may be used to reduce vapors. Use clean non-sparking tools to collect absorbed material. Where feasible and appropriate, remove contaminated soil.

**Methods for Containment and Clean Up** Immediate cleanup of any spill is recommended. Build dike far ahead of spill for containment and later recovery or disposal of spilled material. Absorb spill with inert material such as sand or vermiculite and place in suitable container for disposal. If spilled on water, remove with appropriate equipment like skimmers, booms or absorbents. In case of soil contamination, remove contaminated soil for remediation or disposal in accordance with applicable regulations.

**Reporting** Report spills/releases as required, to appropriate local, state and federal authorities. US Coast Guard and Environmental Protection Agency regulations require immediate reporting of spills/release that could reach any waterway including intermittent dry creeks. Report spill/release to the National Response Center at (800) 424-8802. In case of accident or road spill, notify Chemtrec at (800) 424-9300.

### 7. HANDLING AND STORAGE

**Precautions for Safe Handling** Extremely flammable. May vaporize easily at ambient temperatures. The vapor is heavier than air and may create an explosive mixture of vapor and air. Beware of accumulation in confined spaces and low lying areas.

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### 7. HANDLING AND STORAGE

Use non-sparking tools and explosion-proof equipment. Open container slowly to relieve any pressure. Bond and ground all equipment when transferring from one vessel to another. Can accumulate static charge by flow or agitation. Can be ignited by static discharge. Explosion-proof electrical equipment is recommended and may be required by fire codes.

Warning! Use of this material in spaces without adequate ventilation may result in the generation of hazardous levels of combustion products and/or inadequate oxygen levels for breathing. Odor is an inadequate warning for hazardous conditions.

To prevent and minimize fire or explosion risk from static accumulation and discharge, effectively bond and/or ground product transfer system. Do not use electronic devices (such as cellular phones, computers, calculators, pagers, etc.) in or around any fueling operation or storage area unless the devices are certified as intrinsically safe. Electrical equipment and fittings should comply with local fire codes.

#### Precautions for Safe Storage

Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces and all sources of ignition. Post area warnings: 'No Smoking or Open Flame'. Keep away from incompatible material. Outdoor or detached storage of portable containers is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

In a tank, barge or other closed container, the vapor space above materials containing hydrogen sulfide may result in concentrations of H<sub>2</sub>S immediately dangerous to life or health. Check atmosphere for oxygen content, H<sub>2</sub>S and flammability prior to entry.

Portable containers should never be filled while they are in or on a motor vehicle or marine craft. Static electricity may ignite vapors when filling non-grounded containers or vehicles on trailers. To avoid static buildup, do not use a nozzle lock open device. Use only approved containers. Keep containers tightly closed. Place the container on the ground before filling. Keep the nozzle in contact with the container during filling.

Empty containers retain liquid and vapor residues and can be dangerous. Do NOT pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat, flame, sparks, static electricity or other sources of ignition; they may explode and cause injury or death. Do not attempt to refill or clean containers since residue is difficult to remove. Empty drums should be completely drained, properly closed and returned to the supplier or a qualified drum reconditioner. All containers should be disposed of in an environmentally safe manner in accordance with government regulations.

### 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Component	ACGIH Exposure Limits	OSHA Exposure Limits	NIOSH Exposure Limits
Natural Gas Condensate	300 ppm TWA 500 ppm STEL (as gasoline)	300 ppm TWA 500 ppm STEL (as petroleum distillate (naphtha))	450 ppm TWA 1100 ppm IDLH (as petroleum distillate (naphtha))
Benzene	0.5 ppm TWA 2.5 ppm STEL Skin	1 ppm TWA 5 ppm STEL Skin	0.5 ppm TWA 1 ppm STEL Skin 500 ppm IDLH
n-Butane	800 ppm TWA		800 ppm TWA

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### 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Component	ACGIH Exposure Limits	OSHA Exposure Limits	NIOSH Exposure Limits
Cyclohexane	100 ppm TWA	300 ppm TWA	300 ppm TWA 1300 ppm IDLH
Ethyl Benzene	100 ppm TWA 125 ppm STEL	100 ppm TWA 125 ppm STEL	100 ppm TWA 125 ppm STEL 800 ppm IDLH
n-Heptane	400 ppm TWA 500 ppm STEL	500 ppm TWA	85 ppm TWA 440 ppm Ceiling 750 ppm IDLH
n-Hexane	50 ppm TWA Skin	500 ppm TWA	50 ppm TWA 1100 ppm IDLH
Hexane (all isomers)	500 ppm TWA 1000 ppm STEL		100 ppm TWA 510 ppm IDLH Ceiling
Hydrogen Sulfide	10 ppm TWA 15 ppm STEL	20 ppm Ceiling 50 ppm Peak	10 ppm Ceiling 100 ppm IDLH
Methylcyclohexane	400 ppm TWA	500 ppm TWA	400 ppm TWA 1200 ppm IDLH
n-Nonane	200 ppm TWA		200 ppm TWA
n-Octane	300 ppm TWA	500 ppm TWA	75 ppm TWA 385 ppm Ceiling 1000 ppm IDLH
n-Pentane	600 ppm TWA	1000 ppm TWA	120 ppm TWA 610 ppm Ceiling 1500 ppm IDLH
n-Propane	2500 ppm TWA	1000 ppm TWA	1000 ppm TWA 2100 ppm IDLH
Toluene	50 ppm TWA Skin	200 ppm TWA 300 ppm Ceiling 500 ppm Peak-10 min	100 ppm TWA 150 ppm STEL 500 ppm IDLH
1,2,4 Trimethyl Benzene	25 ppm TWA	25 ppm TWA	25 ppm TWA
Xylene, all isomers	100 ppm TWA 150 ppm STEL	100 ppm TWA 150 ppm STEL	900 ppm IDLH
Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional for further information.			
ACGIH - American Conference of Government Industrial Hygienists, OSHA - Occupational Safety and Health Administration, NIOSH - National Institute for Industrial Safety and Health, TWA - Time Weighted Average (8 hour average for ACGIH and OSHA, 10 hour average for NIOSH), STEL - 15 Minute Short Term Exposure Level, Skin - indicates potential for cutaneous absorption of liquid or vapor through the eyes or mucous membranes, Ceiling - Ceiling Level, Peak - Acceptable peak over the ceiling concentration for a specified number of minutes, IDLH - Immediately Dangerous to Life and Health			

#### Personal Protective Equipment

**General Considerations** Consider the potential hazards of this material, applicable exposure limits, job activities and other substances in the work place when designing engineering controls and selecting personal protective equipment.

**Engineering Controls** Use process enclosures, local exhaust ventilation or other engineering controls to maintain airborne levels below the recommended exposure limits. An emergency eye wash station and safety shower should be located near the work station.

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### Personal Protective Equipment

**Personal Protective Equipment** If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, personal protective equipment (PPE) is recommended. A hazard assessment of the work should be conducted by a qualified professional to determine what PPE is required.

**Respiratory Protection** A respiratory protection program that meets or exceeds OSHA 29 CFR 1910.134 and ANSI Z.88.2 should be followed whenever workplace conditions warrant the use of a respirator. When airborne concentrations are expected to exceed the established exposure limits given in Section 8, use a NIOSH approved air purifying respirator equipped with organic vapor cartridges/canisters. Use a full-face positive-pressure supplied air respirator in circumstances where air-purifying respirators may not provide adequate protection or where there may be the potential for airborne exposure above the exposure limits. If exposure concentration is unknown, IDLH conditions exist or there is a potential for exposure to hydrogen sulfide above exposure limits, use a NIOSH approved self contained breathing apparatus (SCBA) or equivalent operated in a pressure demand or other positive pressure mode.

**Eye Protection** Eye protection that meets or exceeds ANSI Z.87.1 is recommended if there is a potential for liquid contact to the eyes. Safety glasses equipped with side shields are recommended as minimum protection in industrial settings. Chemical goggles should be worn during transfer operations or when there is a likelihood of misting, splashing or spraying of this material. A face shield may be necessary depending on conditions of use.

**Skin and Body Protection** Avoid skin contact. Wear long-sleeved fire-retardant garments while working with flammable and combustible liquids. Additional chemical-resistant protective gear may be required if splashing or spraying conditions exist. This may include an apron, arm covers, impervious gloves, boots and additional facial protection.

**Hand Protection** Avoid skin contact. Use impervious gloves (e.g., PVC, neoprene, nitrile rubber). Check with glove suppliers to confirm the breakthrough performance of gloves. PVC and neoprene may be suitable for incidental contact. Nitrile rubber should be used for longer term protection when prolonged or frequent contact may occur. Gloves should be worn on clean hands and hands should be washed after removing gloves. Also wash hands with plenty of mild soap and water before eating, drinking, smoking, using toilet facilities or leaving work.

**Special Considerations** Workplace monitoring plans should consider the possibility that heavy metals such as mercury may concentrate in process vessels and equipment presenting the possibility of exposure during sampling and maintenance operations. Mercury and other heavy metals may be present in trace quantities in crude oil, raw natural gas and condensates. Storage and processing of these materials can result in these metals, including elemental mercury, accumulating in enclosed vessels and piping, typically at the low point of the processing equipment. Mercury may also concentrate in sludges, sands, scales, waxes and filter media.

### 9. PHYSICAL AND CHEMICAL PROPERTIES

<b>Appearance</b>	Clear to dark brown liquid	<b>Physical Form</b>	Liquid
<b>Odor</b>	Strong hydrocarbon, sulfurous odor possible	<b>Odor Threshold</b>	Not established
<b>pH</b>	Neutral	<b>Vapor Pressure</b>	5 - 15 psi (Reid)
<b>Vapor Density</b>	>1 (air = 1)	<b>Boiling Point/Range</b>	-20-1000°F/-17-538°C

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### 9. PHYSICAL AND CHEMICAL PROPERTIES

Percent Volatile	>50%	Partition Coefficient	Not established
Specific Gravity	0.6 - 0.8 @ 60°F	Density	6.3 lb/gal @ 60°F
Molecular Weight	Not determined	Evaporation Rate	Not established
Flash Point	<100°F/<38°C	Test Method	ASTM D-56
Explosive Limits	< 1% LEL, 10% UEL	Autoignition Temperature	450°F/232°C
Solubility in Water	Slightly soluble in water		

### 10. STABILITY AND REACTIVITY

Stability	Stable under normal anticipated storage and handling temperatures and pressures. Extremely flammable liquid and vapor. Vapor can cause flash fire.
Conditions to Avoid	Avoid high temperatures and all possible sources of ignition. Prevent vapor accumulation.
Incompatibility (Materials to Avoid)	Avoid contact with strong oxidizing agents such as strong acids, alkalies, chlorine and other halogens, dichromates or permanganates, which can cause fire or explosion.
Hazardous Decomposition Products	Hazardous decomposition products are not expected to form during normal storage. The use of hydrocarbon fuel in an area without adequate ventilation may result in hazardous levels of combustion products (e.g., oxides of carbon, sulfur and nitrogen, benzene and other hydrocarbons) and/or dangerously low oxygen levels.
Hazardous Polymerization	Not known to occur

### 11. TOXICOLOGICAL INFORMATION

Overview	<p>This product is a clear to dark brown liquid with a strong hydrocarbon odor. It may also have a sulfurous or rotten egg odor. Hydrogen sulfide, an extremely flammable and very toxic gas is expected to be present. This product is a volatile and extremely flammable liquid that may cause flash fires. Keep away from heat, sparks and flames and other sources of ignition. This product contains benzene, which may cause cancer or be toxic to blood forming organs. It contains material that has caused cancer based on animal data. Never siphon this product by mouth. If swallowed, this product may be aspirated into the lungs and cause lung damage or death.</p>
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This material may contain benzene and ethyl benzene at concentrations above 0.1%. Benzene is considered to be a known human carcinogen by OSHA, IARC and NTP. IARC has ethyl benzene, gasoline and gasoline engine exhaust as possibly carcinogenic to humans (Group 2B) based on laboratory animal studies.

#### Toxicological Information of the Material.

Acute Toxicity	<p><b>Dermal:</b> Low Toxicity: LD50 &gt; 2000 mg/kg (rabbit) Causes mild skin irritation. Repeated exposure may cause skin dryness or cracking that can lead to dermatitis.</p> <p><b>Inhalation:</b> Hydrogen Sulfide is Extremely Toxic: LC100 = 600 ppm(v), 30 min (man)</p>
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### 11. TOXICOLOGICAL INFORMATION

Product expected to have low degree of toxicity by inhalation: LC 50 > 5.2 mg/l (vapor)

Effect of overexposure may include irritation of the digestive tract, irritation of the respiratory tract, nausea, vomiting, diarrhea and signs of central nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue). Continued inhalation may result in unconsciousness and/or death.

**Ingestion:** Product expected to have low degree of toxicity by ingestion: Oral LD50 > 5 g/kg (rat), > 10 g/kg (mice)

Aspiration into the lungs when swallowed or vomited may cause chemical pneumonitis which can be fatal.

**Eye Damage / Irritation**  
**Sensitization**

Causes serious eye irritation.

**Skin:** Not expected to be a skin sensitizer

**Respiratory:** Not expected to be a respiratory sensitizer

**Specific Target Organ Toxicity**

**Single Exposure:** High concentrations may cause irritation of the skin, eyes, digestive tract, irritation of the respiratory tract, nausea, vomiting, diarrhea and signs of central nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue). Continued inhalation may result in unconsciousness and/or death.

**Repeated Exposure:** Two year inhalation studies of wholly vaporized unleaded gasoline and 90 day studies of various petroleum naphthas did not produce significant target organ toxicity in laboratory animals. Nephropathy in male rats, characterized by the accumulation of alpha-2-uglobulin in epithelial cells of the proximal tubules was observed, however follow up studies suggest that these changes are unique to the male rat.

**Conditions Aggravated by Overexposure**

Disorders of the organs or organ systems that may be aggravated by significant exposure to this material or its components include the skin, respiratory system, liver, kidneys, CNS, cardiovascular system and blood-forming system.

**Carcinogenicity**

May cause cancer based on component information.

Two year inhalation studies of vaporized unleaded gasoline produced an increased incidence of kidney tumors in male rats and liver tumors in female mice. Repeated skin application of various petroleum naphthas in mice for two years resulted in an increased incidence of skin tumors but only in the presence of severe skin irritation. Follow up mechanistic studies suggest that the occurrence of these tumors may be the consequence of promotional process and not relevant to human risk assessment. Epidemiology data collected from a study of more than 18,000 petroleum marketing and distribution workers showed no increased risk of leukemia, multiple myeloma or kidney cancer from gasoline exposure.

Unleaded gasoline has been identified as a possible carcinogen by the International Agency for Research on Cancer.

**Germ Cell Mutagenicity**

Inadequate information available, not expected to be mutagenic.

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### 11. TOXICOLOGICAL INFORMATION

<b>Reproductive and Developmental Toxicity</b>	Not expected to cause reproductive or developmental toxicity. No evidence of developmental toxicity was found in pregnant laboratory animals (rats and mice) exposed to high vapor concentrations of unleaded gasoline and petroleum naphthas via inhalation. A two generation reproductive toxicity study of vapor recovery gasoline did not adversely affect reproductive function or offspring survival and development.
<b>Additional Information</b>	<b>Hydrogen Sulfide (H<sub>2</sub>S).</b> This material may contain or liberate H <sub>2</sub> S, a poisonous gas with the smell of rotten eggs. Odor is not a reliable indicator of exposure because olfactory fatigue causes the smell to disappear. H <sub>2</sub> S has a broad range of effects depending on the airborne concentration and length of exposure: 10 ppm: eye and respiratory tract irritation 100 ppm: coughing, headache, dizziness, nausea, eye irritation, loss of sense of smell in minutes 200 ppm: potential for pulmonary edema after 20 minutes 500 ppm: loss of consciousness after short exposures, potential for respiratory arrest 1000 ppm: Immediate loss of consciousness may lead rapidly to death, prompt cardiopulmonary resuscitation may be required.

#### Toxicological Information of Components

##### Benzene 71-43-2

###### Acute Data:

Dermal LD50 > 9400 mg/kg (Rabbit), (Guinea Pig)

LC50 = 9980 ppm (Mouse); 10000 ppm/7hr (Rat)

Oral LD50 = 4700 mg/kg (Mouse); 930 mg/kg (Rat); 5700 mg/kg (Mammal)

**Carcinogenicity:** Benzene is an animal carcinogen and is known to produce acute myelogenous leukemia (a form of cancer) in humans. Benzene has been identified as a human carcinogen by NTP, IARC and OSHA.

**Target Organs:** Prolonged or repeated exposures to benzene vapors has been linked to bone marrow toxicity which can result in blood disorders such as leukopenia, thrombocytopenia, and aplastic anemia. All of these diseases can be fatal.

**Developmental:** Exposure to benzene during pregnancy demonstrated limited evidence of developmental toxicity in laboratory animals. The effects seen include decreased body weight and increased skeletal variations in rodents. Alterations in hematopoiesis have been observed in the fetuses and offspring of pregnant mice.

**Mutagenicity:** Benzene exposure has resulted in chromosomal aberrations in human lymphocytes and animal bone marrow cells, and DNA damage in mammalian cells in vitro

##### Cyclohexane 110-82-7

###### Acute Toxicity:

Dermal LD50 => 2 g/kg (Rabbit)

LC50 > 4,044 ppm (4-hr, Rat)

Oral LD50 > 2 g/kg (Rat)

**Target Organs:** Cyclohexane can cause eye, skin and mucous membrane irritation, CNS depressant and narcosis at elevated concentrations. In experimental animals exposed to lethal concentrations by inhalation or oral route, generalized vascular damage and degenerative changes in the heart, lungs, liver, kidneys and brain were identified.

**Developmental:** Cyclohexane has been the focus of substantial testing in laboratory animals. Cyclohexane was not found to be genotoxic in several tests including unscheduled DNA synthesis, bacterial and mammalian cell mutation assays, and in vivo chromosomal aberration. An increase in chromosomal aberrations in bone marrow cells of rats exposed to cyclohexane was reported in the 1980's. However, a careful reevaluation of slides from this study by the laboratory which conducted the study indicates these findings were in error, and that no significant chromosomal effects were

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### 11. TOXICOLOGICAL INFORMATION

observed in animals exposed to cyclohexane. Findings indicate long-term exposure to cyclohexane does not promote dermal tumorigenesis.

#### Ethyl Benzene 100-41-4

##### Acute Toxicity:

Dermal LD50 = 17800 mg/kg (Rabbit)

LC50 = 4000 ppm/4 hr; 13367 ppm (Rat)

Oral LD50 = 3500 mg/kg (Rat)

**Carcinogenicity:** Rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study demonstrated limited evidence of kidney, liver, and lung cancer. Ethyl benzene has been listed as a possible human carcinogen by IARC. Ethyl benzene has not been listed as a carcinogen by NTP or OSHA.

**Target Organs:** In rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study there was mild damage to the kidney (tubular hyperplasia), liver (eosinophilic foci, hypertrophy, necrosis), thyroid (hyperplasia) and pituitary (hyperplasia).

#### n-Hexane 110-54-3

##### Acute Toxicity:

Dermal LD50 = >2,000 mg/kg (Rabbit)

LC50 > 3,367 ppm (4 hr, Rat)

Oral LD50 > 5,000 mg/kg (Rat)

**Target Organs:** Excessive exposure to n-hexane can result in peripheral neuropathies. The initial symptoms are symmetrical sensory numbness and paresthesias of distal portions of the extremities. Motor weakness is typically observed in muscles of the toes and fingers but may also involve muscles of the arms, thighs and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. The neurotoxic properties of n-hexane are potentiated by exposure to methyl ethyl ketone and methyl isobutyl ketone. Prolonged exposure to high concentrations of n-hexane (>1,000 ppm) has resulted in decreased sperm count and degenerative changes in the testes of rats but not those of mice.

#### Hydrogen Sulfide 7783-06-4

##### Acute Toxicity:

Dermal - No data

LCLo = 600 ppm, 30 min (Human)

Hydrogen sulfide concentrations will vary significantly depending on the source and sulfur content of the product. Sweet natural gas condensate (<0.5% sulfur) may contain toxicologically significant levels of hydrogen sulfide in the vapor spaces of bulk storage tanks and transport compartments. Concentrations of H<sub>2</sub>S as low as 10 ppm over an 8 hour workshift may cause eye or throat irritation. Prolonged breathing of 50-100 ppm H<sub>2</sub>S vapors can produce significant eye and respiratory irritation. Sour condensates commonly contain extremely high concentrations of H<sub>2</sub>S (500-70,000 ppm) in the vapor spaces of bulk storage vessels. Exposure to 250-600 ppm for 15-30 minutes can produce headache, dizziness, nervousness, staggering gait, nausea and pulmonary edema or bronchial pneumonia. Concentrations >1,000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H<sub>2</sub>S, 6 hrs/day, 5 days/week for 10 weeks, did not produce any toxicity except for irritation of nasal passages. H<sub>2</sub>S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75-80 ppm or 150 ppm H<sub>2</sub>S, respectively. Over the years a number of acute cases of H<sub>2</sub>S poisonings have been reported. Complete and rapid recovery is the general rule. However, if the exposure was sufficiently intense and sustained causing cerebral hypoxia (lack of oxygen to the brain), neurologic effects such as amnesia, intention tremors or brain damage are possible.

#### Toluene 108-88-3

##### Acute Toxicity:

Dermal LD50 = 14 g/kg (Rabbit)

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### 11. TOXICOLOGICAL INFORMATION

LC50 = 8,000 ppm (4-hr, Rat)

Oral LD50 = 2.5 - 7.9 g/kg (Rat)

**Target Organs:** Epidemiology studies suggest that chronic occupational overexposure to toluene may damage color vision. Subchronic and chronic inhalation studies with toluene produced kidney and liver damage, hearing loss and central nervous system (brain) damage in laboratory animals. Intentional misuse by deliberate inhalation of high concentrations of toluene has been shown to cause liver, kidney, and central nervous system damage, including hearing loss and visual disturbances.

**Developmental:** Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. The effects seen include decreased fetal body weight and increased skeletal variations in both inhalation and oral studies.

#### 1,2,4 Trimethyl Benzene 95-63-6

##### Acute Toxicity:

Dermal LD50 = No data available

LC50 = 18 gm/m<sup>3</sup>/4hr (Rat)

Oral LD50 = 3-6 g/kg (Rat)

#### Xylenes 1330-20-7

##### Acute Toxicity:

Dermal LD50 >3.16 ml/kg (Rabbit)

LC50 = 5000 ppm/4 hr. (Rat)

Oral LD50 = 4300 mg/kg (Rat)

**Target Organs:** A six week inhalation study with xylene produced hearing loss in rats.

**Developmental:** Both mixed xylenes and the individual isomers produced limited evidence of developmental toxicity in laboratory animals. Inhalation and oral administration of xylene resulted in decreased fetal weight, increased incidences of delayed ossification, skeletal variations and resorptions.

### 12. ECOLOGICAL INFORMATION

#### Toxicity

This material is expected to be toxic to aquatic organisms with the potential to cause long term adverse effects in the aquatic environment. Acute aquatic toxicity studies on samples of gasoline and naphtha streams show acute toxicity values greater than 1 mg/l and mostly in the range of 1 to 100 mg/l. These tests were carried out on water accommodated fractions in closed systems to prevent evaporative loss. Results are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon composition.

Classification H411, Chronic Category 2

96 hours LC50: 8.3 mg/l (Cyprinodon variegatus)

96 hours LC50: 1.8 mg/l (Mysidopsis bahia)

48 hours LC50: 3.0 mg/l (Daphnia magna)

96 hours LC50: 2.7 mg/l (Oncorhynchus mykiss)

Coating action of oil can kill birds, plankton, aquatic life, algae and fish.

#### Persistence and Degradability

This material is not readily biodegradable. Most of the nonvolatile constituents are inherently biodegradable. Some of the highest molecular weight components are persistent in water. The individual hydrocarbon components of this material are differentially soluble in water with aromatic hydrocarbons tending to be more water soluble than aliphatic hydrocarbons. If spilled, the lighter components will generally

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### 12. ECOLOGICAL INFORMATION

evaporate but depending on local environmental conditions (temperature, wind, soil type, mixing or wave action in water, etc), photo-oxidation and biodegradation, the remainder may become dispersed in the water column or absorbed to soil or sediment. Because of their differential solubility, the occurrence of hydrocarbons in groundwater will be at different proportions than the parent material. Under anaerobic conditions, such as in anoxic sediments, rates of biodegradation are negligible.

**Persistence per IOPC Fund Definition**

Non-Persistent

**Bioaccumulative Potential**

Contains components with the potential to bioaccumulate. The octanol water coefficient values measured for the hydrocarbon components of this material range from 3 to greater than 6, and therefore would be considered as having the potential to bioaccumulate.

**Mobility**

**Air:** Contains volatile components. Lighter components will volatilize in the air. In air, the volatile hydrocarbons undergo photodegradation by reaction with hydroxyl radicals with half lives varying from 0.5 days for n-dodecane to 6.5 days for benzene.

**Water:** Spreads on a film on the surface of water. Significant proportion of spill will remain after one day. Lower molecular weight aromatic hydrocarbons and some polar compounds have low but significant water solubility. Some higher molecular weight compounds are removed by emulsification and these also slowly biodegrade while others adsorb to sediment and sink. Heavier fractions agglomerate to form tars, some of which sink.

**Soil:** Some constituents may be mobile and contaminate groundwater.

**Other Adverse Effects**

Films form on water and may affect oxygen transfer and damage organisms.

### 13. DISPOSAL CONSIDERATIONS

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

This material, if discarded as produced, is not a RCRA "listed" hazardous waste. However, it should be fully characterized for ignitability (D001), reactivity (D003) and benzene (D018) prior to disposal (40 CFR 261). Use which results in chemical or physical change or contamination may subject it to regulation as a hazardous waste. Along with properly characterizing all waste materials, consult state and local regulations regarding the proper disposal of this material.

Do not dispose of tank water bottoms by draining onto the ground. This will result in soil and groundwater contamination. Waste arising from spillage or tank cleaning should be disposed of in accordance with applicable regulations.

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

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### 14. TRANSPORTATION INFORMATION

<b>United States Department of Transportation (US DOT)</b>	<b>Shipping Description:</b> Petroleum Distillates, n.o.s., 3, UN1268, I or II <b>Shipping Name:</b> Petroleum Distillates, n.o.s (contains natural gas condensate) <b>Hazard Class and Division:</b> 3 <b>ID Number:</b> UN1268 <b>Packing Group:</b> I or II <b>Label:</b> Flammable Liquid <b>Placard:</b> Flammable <b>Reportable Quantity:</b> None established for this material <b>Emergency Response Guide:</b> 128
<b>Transportation of Dangerous Goods (TDG) Canada</b>	
<b>International Maritime Dangerous Goods Code (IMDG)</b>	<b>Shipping Description:</b> Petroleum Distillates, n.o.s., 3, UN1268, I or II <b>Shipping Name:</b> Petroleum Distillates, n.o.s (contains natural gas condensate) <b>Hazard Class and Division:</b> 3 <b>UN Number:</b> 1268 <b>Label:</b> Flammable Liquid <b>EMS Guide:</b> F-E, S-E Not a DOT Marine Pollutant per 49 CFR 71.8
<b>European Agreements Concerning the International Carriage by Rail (RID) and by Road (ADR)</b>	<b>Shipping Name:</b> Petroleum Distillates, n.o.s (contains natural gas condensate) <b>Hazard Class:</b> 3 <b>Packing Group:</b> I or II <b>Label:</b> Flammable Liquid <b>Danger Number:</b> 33 <b>UN Number:</b> 1268
<b>International Civil Aviation Organization / International Air Transport Association (ICAO/IATA)</b>	<b>Shipping Name:</b> Petroleum Distillates, n.o.s (contains natural gas condensate) or Natural Gasoline <b>UN/ID Number:</b> UN1268 <b>Hazard Class/Division:</b> 3 <b>Packing Group:</b> I or II <b>Labels:</b> Flammable <b>Emergency Response Guide:</b> 3H

### 15. REGULATORY INFORMATION

#### United States Federal Regulatory Information

<b>EPA TSCA Inventory</b>	This product and/or its components are listed on the Toxic Substances Control Act (TSCA) Inventory
<b>EPA SARA 302/304 Emergency Planning and Notification</b>	This material contains the following chemicals subject to reporting under the Superfund Amendments and Reauthorization Act of 1986 (SARA): Material contains hydrogen sulfide, considered an extremely hazardous substance. TPQ– 500 lb, EPCRA RQ – 100 lb
<b>EPA SARA 311/312 (Title III Hazard Categories)</b>	Acute Health: Yes Chronic Health: Yes Fire Hazard: Yes Pressure Hazard: No Reactive Hazard: No

## Safety Data Sheet

Natural Gas Condensate, Sweet or Sour

J.P. Morgan Ventures Energy Corp.  
JP Morgan Commodities Canada Corp.

### 15. REGULATORY INFORMATION

EPA SARA Toxic Chemical Notification and Release Reporting (40 CFR 372) and CERCLA Reportable Quantities (40 CFR 302.4)	Component	CAS Number	Concentration	RQ
	Benzene	71-43-2	< 5 %	10 lb
	Cyclohexane	110-82-7	< 5 %	1000 lb
	Ethyl Benzene	100-41-4	< 3 %	1000 lb
	n-Hexane	110-54-3	< 50 %	5000 lb
	Toluene	108-88-3	< 15 %	1000 lb
	1,2,4 Trimethyl Benzene	95-63-6	< 4 %	not listed
	Xylene, all isomers	1330-20-7	< 12 %	100 lb

CERCLA Section 101(14) excludes crude oil and crude oil fractions, including hazardous constituents of petroleum, from the definition of hazardous substances. The petroleum exclusion applies to this product.

**EPA CWA and OPA** This product is classified as an oil under Section 311 of the Clean Water Act (CWA) and Oil Pollution Act of 1990 (OPA), subject to spill reporting requirements.

#### Canadian Regulatory Information

**DSL/NDSL Inventory** This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the SDS contains all the information required by the Regulations..

**Workplace Hazardous Materials Information System (WHMIS) Hazard Class**  
B2 - Flammable Liquid  
D1A – Material Causing Immediate and Serious Toxic Effects - Very Toxic Material  
D2A: Material Causing Other Toxic Effects Very Toxic  
D2B - Material Causing Other Toxic Effects - Toxic Material

#### European Union Regulatory Information

**Labeling** Product is dangerous as defined by the European Union Dangerous Substances / Preparations Directives  
Contains: Low Boiling Point Naphtha

**Symbol**  
**F+** Extremely Flammable  
**T** Toxic  
**N** Dangerous for the Environment

**Risk Phrases**  
R12-45-38-65-67-51/53  
Extremely flammable. May cause cancer. Irritating to skin. Harmful: may cause lung damage if swallowed. Vapors may cause drowsiness and dizziness. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

**Safety Phrases**  
S16-53-45-2-23-24-29-43-62  
Keep away from sources of ignition – No smoking. Avoid exposure – obtain special instructions before use. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Keep out of reach of children. Do not breathe vapor. Avoid contact with skin. Do not empty into drains. In case of fire use foam/dry powder/CO<sub>2</sub>. If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.

## Safety Data Sheet

Natural Gas Condensate, Sweet or Sour

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### 15. REGULATORY INFORMATION

#### California Proposition 65

This product may contain detectable quantities of the following chemicals, known to the State of California to cause cancer, birth defects, or other reproductive harm and which may be subject to the warning requirements of California Proposition 65. Chemicals known to the State of California to cause cancer, birth defects or other reproductive harm are created by the combustion of this product.

**Carcinogens:** Benzene, Ethyl Benzene

**Developmental Toxicity:** Benzene, Toluene

**Male Reproductive Toxicity:** Benzene

#### Carcinogen Identification by International Agency for Research on Cancer

Group 1	Carcinogenic to Humans	Benzene
Group 2A	Probably Carcinogenic to Humans	
Group 2B	Possibly Carcinogenic to Humans	Ethyl Benzene, Gasoline, Gasoline Engine Exhaust
Group 3	Not Classifiable	Toluene, Xylenes

### 16. OTHER INFORMATION

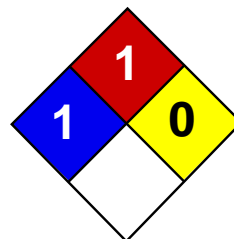
#### Prepared By

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New York, NY 10017

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Suite 600, Vintage Towers II, 326 11<sup>th</sup>  
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T2R 0C5

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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-Ethanediy]bis(oxy)]bisethanol

**Chemical Formula:** C<sub>6</sub>H<sub>14</sub>O<sub>4</sub>

**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](http://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, CO<sub>2</sub>).

**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

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