Dominion Resource Services, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
dom.com

Dominion®

August 19, 2015

BY: U.S. CERTIFIED MAIL, RETURN RECEIPT REQUESTED
7014 3490 0000 0448 4358

William F. Durham
Director, Division of Air Quality
WVDEP
601 57th Street
Charleston, WV 25304

RE: Dominion Transmission, Inc. – R13 Permit Application
Hastings Extraction Plant

Dear Mr. Durham:

In accordance with Condition #2 of the Consent Order (No. CO-R13-E-2015-13) dated June 26, 2015, enclosed are one complete original and two (2) cd copies of the required R13 Permit application for the permitting of the "Frac Efficiency Upgrade" project at Dominion Transmission, Inc.'s Hastings Extraction Plant (HEP) in Wetzel County, WV. This permit application includes changes at Galmish, HEP vent stack and Hastings Electric Compressor Station (HECS) knockout tank stack and sources vented to these emission points.

Included is a check in the amount of $2,000 cover the WVDEP R13 permit application fee.

The public notice affidavit will be submitted to WVDEP once it is received from the newspaper.

If you require any additional information, please contact Rebekah Remick at (804) 273-3536 or via email at Rebekah.J.Remick@dom.com.

Sincerely,

Paula A. Hamel, for

Amanda B. Tornabene
Director, Gas Environmental Services

R-13 PERMIT APPLICATION WITH TITLE V REVISIONS

Dominion Transmission, Inc. – Hastings Extraction Plant

Class II Administrative Update

TRINITY CONSULTANTS
4500 Brooktree Drive
Suite 103
Wexford, PA 15090
(724) 935-2611

August 2015

Project 153901.0057

Trinity Consultants

Environmental solutions delivered uncommonly well

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APPLICATION FEE

1. INTRODUCTION

Dominion Transmission, Inc. (DTI) owns and operates a natural gas processing plant known as the Hastings Extraction Plant ("HEP") near Pine Grove, West Virginia. Dominion also owns and operates the Galmish Loading Area ("Galmish"), which is located approximately 3 miles by road from the HEP within its own separate fence line, and the Hastings Electric Compressor Station ("HECS") which is located approximately 0.1 miles from the HEP. The HEP produces Propane, Isobutane, N-butane, and Natural Gasoline (collectively "NGL"). The NGL are shipped at Galmish. HEP, Galmish, and HECS are included in Title V Permit R30-10300009-2011.

In accordance with Condition #2 of Consent Order (No. CO-R13-E-2015-13) dated June 26, 2015, DTI is submitting this permit application for projects completed during 2010 to 2012 at the HEP and Galmish. HEP and Galmish are currently permitted under Title V Operating Permit number R30 - 10300009, which incorporates the construction and operating permit R13-2468D.

Specifically, this application covers the "Frac Efficiency Upgrade" project, which increased NGL processing capabilities at HEP. This project included additional loading operations at Galmish, a vapor recovery unit (VRU) to control loading emissions at Galmish, and associated fugitive emissions. With this application, DTI is also requesting that the Title V permit be modified to include several changes, including incorporation of HEP Vent Stack and Hastings Electric Compressor Station (HECS) knockout tank stack to the Title V permit, in addition to the modifications requested with this application. These additional Title V modification requests are included in Attachment S.

1.1. FACILITY DESCRIPTION

HEP receives wet natural gas from production wells and extracts and fractionates NGL. Equipment involved in this process includes multiple operations for fractionation (e.g., de-ethanizer, de-propanizer, de-butanizer, C4 splitter, and drip gasoline fractionator). The liquid products are piped to storage tanks for transport via pipeline, truck, and rail, while the residue gas is returned to the transmission pipeline. A process flow diagram is included as Attachment F.

The current Title V permit contains the following equipment:

- Two (2) boilers (one rated at 16.75 and another rated at 25.1 MMBtu/hr);
- One (1) hot oil heater (rated at 70 MMBtu/hr);
- Three (3) emergency generators (rated at 50 kW, 40 kW, and 85 kW);
- Four (4) fire water pumps (rated at 300, 300, 211, and 150 HP);
- One (1) 1,000,000 gallon natural gasoline storage tank with an internal floating roof;
- Four (4) fire water heaters (rated at 0.2, 1.65, 1.65, 3.0 MMBtu/hr); and
- Truck and railcar loading operations; and
- Plant wide fugitive components.

This modification includes:

- Modification of equipment associated with the fractionation area to increase throughput of natural gas liquids that can be processed at the facility;
- Increase of truck and rail throughput and rail car loading capability; and
- Installation of a VRU at Galmish loading operations to control emissions from railcar loading by 95%.

Furthermore, this application seeks to make several modifications to the existing Title V permit. These modifications include:

- Incorporating the modifications from this R13 application into the Title V permit.
- Add the existing "vent stack" at HEP as an emission point in the R13 and Title V permits. The vent stack itself is not an emission unit, but it is the emission point for various operations at the facility. Supporting

information is included in Attachment S. One additional source not included in the supporting documents already supplied is being proposed that will vent to the vent stack – an on-line natural gasoline vapor pressure analyzer.

- Include the Hastings Electric Compressor Station (HECS), slug catcher area, and natural gas liquids (NGL) Unloading area in the existing Title V permit. Emissions from these sources are primarily fugitive in nature, but DTI requests that these operations be specifically listed in the Title V permit.
- Add the existing knockout tank at HECS (V-2195) as an emission point in the R13 and Title V permits. Supporting information is included in Attachment S.
- Incorporate Permit Determination No. PD-15-031 into the Title V permit. This permit determination replaced the existing Cleaver Brooks boiler rated at 16.75 MMBtu/hr (BL02) with a natural gas-fired Superior boiler rated at 25.2 MMBtu/hr.

1.2. SOURCE STATUS

WVDEP must make stationary source determinations on a case-by-case basis using the guidance under the Clean Air Act (CAA) and EPA's and WVDEP's implementing regulations. The definition of stationary source in 40 CFR 51.166(b) includes the following:

> *"(6) Building, structure, facility, or installation means all of the pollutant emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under control of the same person (or persons under common control)."*

Unlike HEP and Galmish, Hastings Compressor Station (HCS), Mockingbird Hill Compressor Station (MHCS), and Lewis Wetzel Compressor Station (LWCS) are natural gas transmission facilities that operate under SIC 4922 (Natural Gas Transmission). All three facilities are under one Title V permit (R30-10300006-2011) and are not included with this project.

DTI is not proposing any modifications in the application that change the existing separate source determinations for these locations.

1.3. R-13 APPLICATION ORGANIZATION

This R-13 permit application is organized as follows:

- Section 2: Sample Emission Source Calculations;
- Section 3: R-13 Application Forms;
- Attachment A: Business Certificate;
- Attachment B: Map;
- Attachment C: Installation and Start Up Schedule;
- Attachment D: Regulatory Discussion;
- Attachment E: Plot Plan;
- Attachment F: Detailed Process Flow Diagram;
- Attachment G: Process Description;
- Attachment H: MSDS;
- Attachment I: Emission Units Table;
- Attachment J: Emission Points Data Summary Sheet;
- Attachment K: Fugitive Emissions Data Summary Sheet;
- Attachment L: Emissions Unit Data Sheets;
- Attachment M: Air Pollution Control Device Sheet;
- Attachment N: Supporting Emission Calculations;
- Attachment O: Monitoring/Recordkeeping/Reporting/Testing Plans;
- Attachment P: Public Notice;

- Attachment S: Title V Revision Information; and
- Application Fee.

2. SAMPLE EMISSION SOURCE CALCULATIONS

Emission increases from the project will result from the increased truck and railcar loading of products (due to the increased natural gas liquids [NGLs] throughput at the de-propanizer) and additional fugitive components at the plant. It is important to note that the increase in NGLs is related to an increase in offsite NGLs being trucked into HEP and not changes in equipment upstream of the de-propanizer (i.e., the wet gas throughput of the facility has not increased as a result of this change). Associated emission increases from combustion units are assumed due to the increased utilization of operations at HEP. The characteristics of air emissions from the project at the HEP, along with the methodology for calculating emissions, are briefly described in this section of the application. Detailed emission calculations are presented in Attachment N of this application.

2.1. LOADING EMISSIONS

Loading emissions occur from vapor displacement during the loading of products (propane, butanes, and natural gasoline) and from de-pressurization of loading arms once loading is completed. Railcar vapor displacement emissions are calculated using emission factors and a projected number of railcars. De-pressurization emissions from railcar loading are calculated separately using the volume of the transfer lines and the pressure when vented to calculate the volume of gas emitted. For truck loading emissions, the loading arm losses and vapor displacement losses are combined into a single factor. It is important to note that propane railcar loading is vapor balanced to the pressurized storage tank, and propane truck loading is completed using condenser fill pipe inherently designed to condense vapors such that vapor displacement emissions from truck and railcar loading are zero.

Similar to propane truck loading, butane trucks are loaded into pressurized truck tankers that previously contained the same butane product, utilize the condenser piping internal to the tanker truck, and have zero emissions. When a product switch is required, such as loading butane into a tank truck that previously held propane or a different isomer of butane, the tank truck is vented to displace the previous product vapors. Tank truck product switching with associated venting is included in the emission calculations to allow operational flexibility. Venting associated with tank truck product switching is not controlled and is routed to the HEP Vent Stack. Venting of rail cars associated with product switching is routed to and controlled by the Galmish VRU. Both tank truck and rail car product switching are included in the emission calculations for Galmish Loading and the baseline and potential actual emissions for HEP.

Baseline emissions are calculated using the actual amount of trucks and railcars loaded during the baseline period. Projected actual emissions are calculated using the projected amount of trucks and railcars loaded. Projected actual emissions for railcar loading include a reduction of 95% due to the operation of the VRU, which condenses vapors to a liquid before routing them back to HEP for processing. DTI has included proposed monitoring to ensure VRU uptime and for monitoring the closed vent system.

2.2. FUGITIVE EMISSIONS

Fugitive emissions occur from various components throughout the process (e.g., valves, pumps, etc.). DTI calculated emissions from fugitive components using published EPA emission factors[1] and the number of components. The baseline emissions are calculated using the existing component count prior to the project and

[1] 1995 Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017).

projected actual emissions are calculated using the current component count. For equipment at HEP subject to leak detection and repair requirements under New Source Performance Standard Subpart KKK, a control efficiency is applied to the average emission factors supplied by EPA.

2.3. ASSOCIATED EMISSIONS

Associated emission increases from the boilers/heater and other associated equipment are calculated based on the increase in processing capacity of NGLs as a result of the project (approximately 10%). Baseline emissions from those units were taken from historical annual emission inventory submissions. Projected actual emissions are calculated using a percent increase in emissions equal to the increase in design capacity of NGL processing.

3. R-13 APPLICATION FORMS

The WVDEP permit application forms contained in this application include all applicable R-13 application forms including the required attachments.

WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION **DIVISION OF AIR QUALITY** 601 57th Street, SE Charleston, WV 25304 (304) 926-0475 www.dep.wv.gov/daq	***APPLICATION FOR NSR PERMIT AND TITLE V PERMIT REVISION (OPTIONAL)***
PLEASE CHECK ALL THAT APPLY TO **NSR (45CSR13)** (IF KNOWN): ☐ **CONSTRUCTION** ☐ **MODIFICATION** ☐ **RELOCATION** ☐ **CLASS I ADMINISTRATIVE UPDATE** ☐ **TEMPORARY** ☒ **CLASS II ADMINISTRATIVE UPDATE** ☒ **AFTER-THE-FACT**	PLEASE CHECK TYPE OF **45CSR30 (TITLE V)** REVISION (IF ANY): ☐ **ADMINISTRATIVE AMENDMENT** ☐ **MINOR MODIFICATION** ☒ **SIGNIFICANT MODIFICATION** IF ANY BOX ABOVE IS CHECKED, INCLUDE TITLE V REVISION INFORMATION AS **ATTACHMENT S** TO THIS APPLICATION

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

Section I. General

1. Name of applicant *(as registered with the WV Secretary of State's Office):* Dominion Transmission, Inc. (DTI)	2. Federal Employer ID No. ***(FEIN):*** 550629203
3. Name of facility *(if different from above):* Hastings Extraction Plant (HEP)	4. The applicant is the: ☐ **OWNER** ☐ **OPERATOR** ☒ **BOTH**
5A. Applicant's mailing address: 445 West Main Street Clarksburg, WV 26301	5B. Facility's present physical address: Route 20, Pine Grove, Wetzel County, WV 26419

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

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

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

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

- If **YES,** please explain: Applicant owns the site
- If **NO,** you are not eligible for a permit for this source.

9. Type of plant or facility (stationary source) to be **constructed, modified, relocated, administratively updated** or **temporarily permitted** (e.g., coal preparation plant, primary crusher, etc.): Natural gas liquids extraction facility	10. North American Industry Classification System **(NAICS)** code for the facility: 211112
11A. DAQ Plant ID No. (for existing facilities only): 10300009	11B. List all current 45CSR13 and 45CSR30 (Title V) permit numbers associated with this process (for existing facilities only): R30-10300009; R13-2468D

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

12A.

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

From Clarksburg, WV take Route 20 North approximately 37 miles to Hastings. Hastings Extraction Plant is on the left side of the road.

12.B. New site address (if applicable):	12C. Nearest city or town: Pine Grove	12D. County: Wetzel
12.E. UTM Northing (KM): 4378.01	12F. UTM Easting (KM): 527.67	12G. UTM Zone: 17

13. Briefly describe the proposed change(s) at the facility:
DTI is permitting the "Frac Efficiency Upgrade" project at HEP and associated vapor recovery installation at Galmish loading operations. DTI is also requesting that the Title V permit be updated to include these emission units as well as other various updates listed in Attachment S.

14A. Provide the date of anticipated installation or change: – If this is an **After-The-Fact** permit application, provide the date upon which the proposed change did happen: 2010-2012	14B. Date of anticipated Start-Up if a permit is granted: N/A

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

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

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

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

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

Section II. Additional attachments and supporting documents.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

☒ Other Collectors, specify Vapor Recovery Unit (VRU)

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

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

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

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

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

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

☐ **YES** ☒ **NO**

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

Section III. Certification of Information

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

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

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

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

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

Certification of Truth, Accuracy, and Completeness

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

Compliance Certification

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

SIGNATURE _____ *(Please use blue ink)* DATE: 08-14-15 *(Please use blue ink)*

35B. Printed name of signee: Brian Sheppard		35C. Title: Vice President, Pipeline Operations
35D. E-mail: Brian.C.Sheppard@dom.com	36E. Phone: 304-627-3733	36F. FAX: 304-627-3323
36A. Printed name of contact person (if different from above): Rebekah Remick		36B. Title: Environmental Specialist III
36C. E-mail: Rebekah.j.remick@dom.com	36D. Phone: 804-273-3536	36E. FAX: 804-273-2964

PLEASE CHECK ALL APPLICABLE ATTACHMENTS INCLUDED WITH THIS PERMIT APPLICATION:

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

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

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

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

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

ATTACHMENT A

Business Certificate

WEST VIRGINIA
STATE TAX DEPARTMENT
BUSINESS REGISTRATION CERTIFICATE

ISSUED TO:
DOMINION TRANSMISSION INC
445 W MAIN ST
CLARKSBURG, WV 26301-2843

BUSINESS REGISTRATION ACCOUNT NUMBER: **1038-3470**

This certificate is issued on: 06/8/2011

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
L0228957312

ATTACHMENT B

Map

ATTACHMENT B – AREA MAP

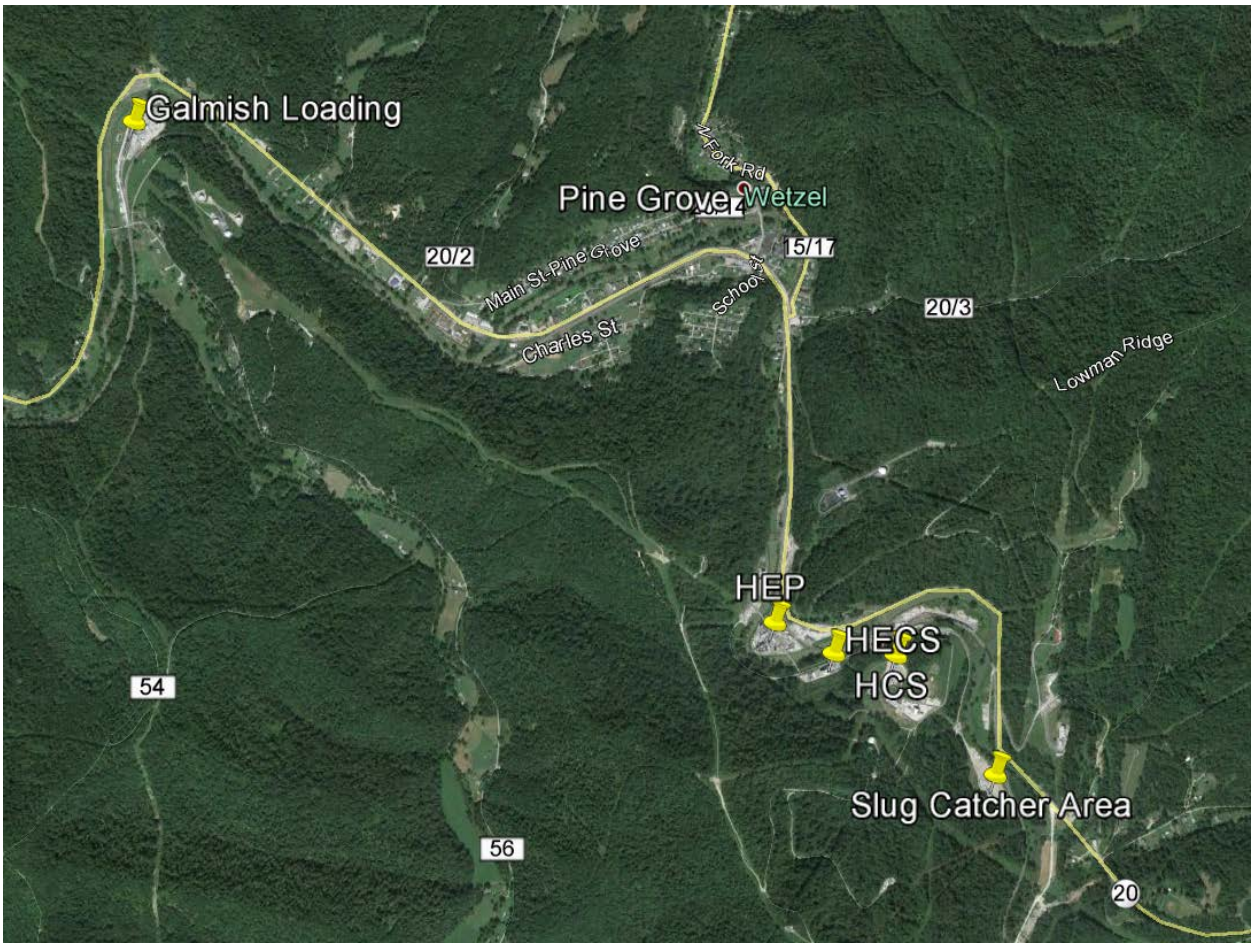


Figure 1 - Map Showing Galmish Loading, Hastings Extraction Plant (HEP), Hastings Electric Compressor Station (HECS), Hastings Compressor Station (HCS), and the Slug Catcher Area

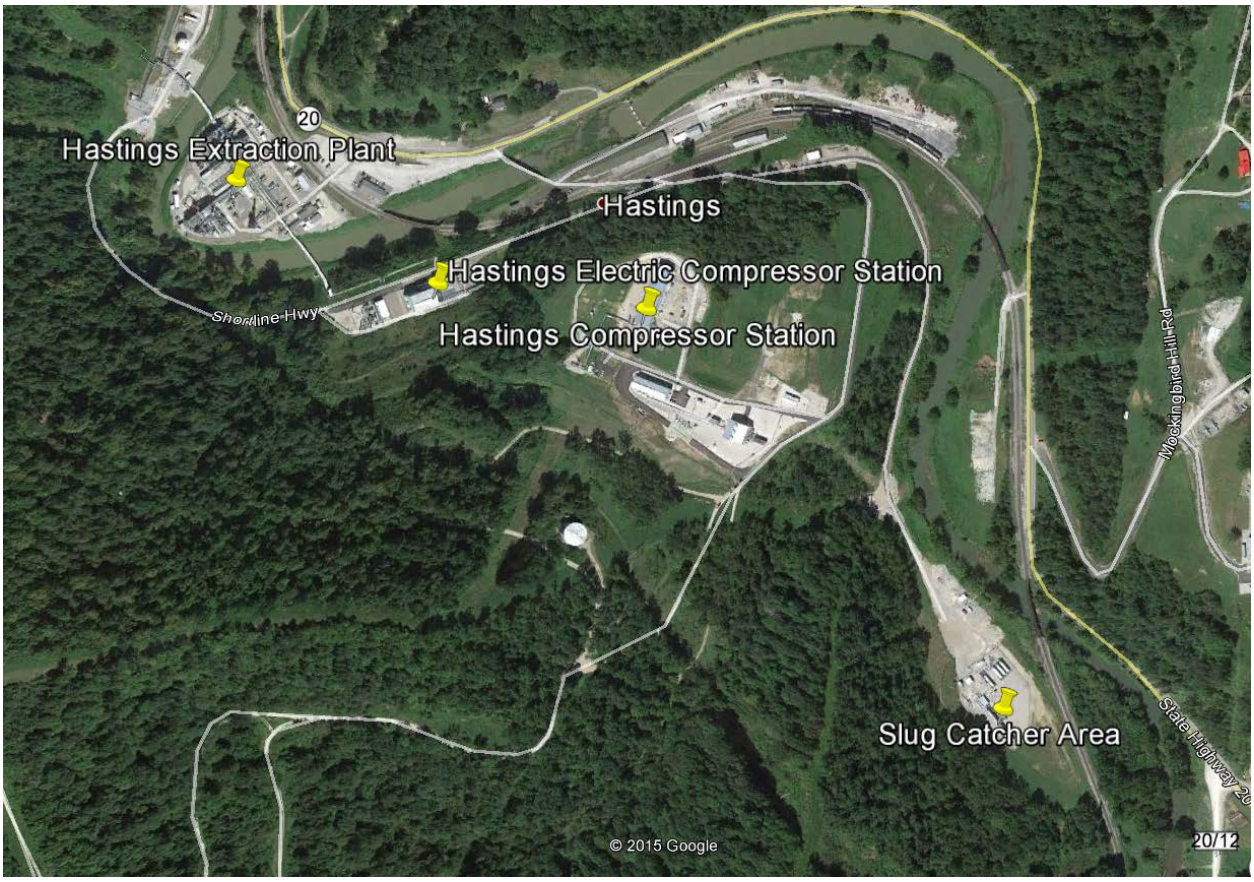


Figure 2 - Map of Hastings Extraction Plant (HEP), Hastings Electric Compressor Station (HECS), Hastings Compressor Station (HCS), and the Slug Catcher Area

Hastings Extraction Plant Information:

UTM Northing (KM):	4,378.01
UTM Easting (KM):	527.67
Elevation:	~720 ft

Figure 3 - Map of Galmish Loading

Galmish Loading Facility Information:

UTM Northing (KM):	4,379.80
UTM Easting (KM):	525.35
Elevation:	~700 ft

Figure 4 - Map of the Slug Catcher Area

Slug Catcher Area Information:

UTM Northing (KM):	4,377.46
UTM Easting (KM):	528.47
Elevation:	~735 ft

ATTACHMENT C

Installation and Start Up Schedule

ATTACHMENT C

Schedule of Installation and Start-Up

Unit	Installation Schedule	Startup Schedule
Frac Efficiency Upgrade Project	2010-2012	2010-2012
Vapor Recovery Unit at Galmish	2011-2012	July 2012

ATTACHMENT D

Regulatory Discussion

ATTACHMENT D – REGULATORY APPLICABILITY

This section documents the applicability determinations made for Federal and State air quality regulations. The monitoring, recordkeeping, reporting, and testing plan is presented in Attachment O. In this section, applicability or non-applicability of the following regulatory programs is addressed:

- Prevention of Significant Deterioration (PSD) permitting;
- Title V of the 1990 Clean Air Act Amendments;
- New Source Performance Standards (NSPS);
- National Emission Standards for Hazardous Air Pollutants (NESHAP); and
- West Virginia State Implementation Plan (SIP) regulations.

In addition to providing a summary of applicable requirements, this section of the application also provides non-applicability determinations for certain regulations, allowing the WVDEP to confirm that identified regulations are not applicable to HEP. Note that explanations of non-applicability are limited to those regulations for which there may be some question of applicability specific to the operations at HEP. Regulations that are categorically non-applicable are not discussed (e.g., NSPS Subpart J, Standards of Performance for Petroleum Refineries).

Prevention of Significant Deterioration (PSD) Source Classification

Federal construction permitting programs regulate new and modified sources of attainment pollutants under Prevention of Significant Deterioration (PSD) and new and modified sources of non-attainment pollutants under Non-Attainment New Source Review (NNSR). HEP is located in Wetzel County, which is classified as attainment with respect to all National Ambient Air Quality Standards. Therefore, NNSR is not applicable. PSD regulations (codified in West Virginia under 45 CSR 14) apply when a major source makes a change and a significant increase in emissions (and significant net increase in emissions) results from the change. HEP is a major source with respect to the PSD program since potential VOC emissions exceed 250 tons per year. As an existing major source, a project that qualifies as major modification as defined in 45 CSR 14 subsection 2.40, triggers PSD requirements.

A project qualifies as a major modification if it results in a significant emission increase of a regulated NSR pollutant and a significant net emission increase of that pollutant. The applicability for a project is determined in accordance with subsection 3.4 of 45 CSR 14. As the project only includes modification to existing emission units (i.e., loading operations and HEP processing equipment), the applicability test for the project is the actual to projected actual test as outlined in subsection 3.4.c of 45 CSR 14.

Baseline actual emissions were calculated within the 10-year period prior to commencing the start of construction on the Frac Efficiency Project (i.e., within the ten years prior to September 2010). Projected actual emissions are based on the maximum projection of liquid production after the project. As the VRU will become a federally-enforceable control device as part of this permitting exercise, projected actual emissions include the emission reductions from the controls installed as part of the project.

A summary of actual to projected actual emissions is included in Table 1 of Attachment N. As displayed in the table, the emission increases of all regulated pollutants as a result of the project are well below the respective significant emission rates.[1] Therefore this permit action will not be a PSD major modification.

[1] On June 23, 2014, the U.S Supreme Court decision in the case of Utility Air Regulatory Group v. EPA effectively changed the permitting procedures for GHGs under the PSD. As the emission increase of all other regulated pollutants are below their respective significant emission rates, greenhouse gases cannot trigger PSD alone.

Title V Operating Permit Program

Title 40 of the Code of Federal Regulations Part 70 (40 CFR 70) establishes the federal Title V operating permit program. West Virginia has incorporated the provisions of this federal program in its Title V operating permit program in West Virginia Code of State Regulations (CSR) 45-30. The major source thresholds with respect to the West Virginia Title V operating permit program regulations are 10 tons per year (tpy) of a single HAP, 25 tpy of any combination of HAP, or 100 tpy of all other regulated pollutants. HEP is currently permitted as a major source under Title V permit number R30-10300009 and will remain a major source after the modifications. DTI is requesting changes to the existing Title V permit as part of this application.

New Source Performance Standards

New Source Performance Standards (NSPS), located in 40 CFR 60, require new, modified, or reconstructed sources to control emissions to the level achievable by the best demonstrated technology as specified in the applicable provisions. Moreover, any source subject to an NSPS is also subject to the general provisions of NSPS Subpart A, except where expressly noted. The following is a summary of applicability and non-applicability determinations for NSPS regulations of relevance to this project at HEP.

NSPS Subpart KKK—Standards of Performance for Equipment Leaks of VOC From Onshore Natural Gas Processing Plants

Subpart KKK – *Standards of Performance for Equipment Leaks of VOC From Onshore Natural Gas Processing Plants*, applies to affected facilities that commenced construction, reconstruction, or modification after January 20, 1984 or before August 23, 2011. These subparts apply to affected facilities in onshore natural gas processing plants constructed, reconstructed, or modified during the time period. Equipment in the HEP Cold Plant, HEP Fractionation Plant, and HEP NGL Storage Area permitted under R13-2468A in March 2003 is already subject to this subpart, which has been incorporated into the current Title V permit. The Frac Efficiency Upgrade project did increase the number of Subpart KKK affected components at HEP.

Subpart KKK incorporates standards, testing, recordkeeping, and reporting requirements under NSPS Subpart VV, Sections §§60.482-1 (a), (b), and (d), §60.482-2 through §60.482-10, and §60.485 – §60.487. The affected facility under Subpart KKK is the group of all equipment (except compressors) within a process unit and compressors in VOC service or wet gas service. Process unit means equipment assembled for the extraction of natural gas liquids from field gas, the fractionation of the liquids into natural gas products, or other operations associated with the processing of natural gas products. As such, Subpart KKK begins at HEP and ends when products are transferred to storage (i.e., it excludes the slug catcher, HECS, and Galmish loading operations).

NSPS Subpart OOOO—Crude Oil and Natural Gas Production, Transmission, and Distribution

Subpart OOOO – *Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution*, applies to affected facilities that commenced construction, reconstruction, or modification after August 23, 2011. This NSPS was published in the Federal Register on August 16, 2012 and subsequently amended. The list of potentially affected facilities includes:

- Gas wells
- Centrifugal compressors
- Reciprocating compressors
- Pneumatic controllers
- Storage vessels
- Equipment (as defined in §60.5430) located at onshore natural gas processing plants
- Sweetening units located onshore that process natural gas produced from either onshore or offshore wells

As part of this project, DTI made changes to the onshore natural gas processing plant at HEP. However, all of the equipment associated with the project commenced construction prior to August 23, 2011. Therefore, equipment installed as part of this project is not subject to this subpart.

Non-Applicability of All Other NSPS

NSPS are developed for particular industrial source categories. Other than NSPS developed for natural gas processing plants (Subparts KKK & OOOO), the applicability of a particular NSPS to HEP can be readily ascertained based on the industrial source category covered. All other NSPS are categorically not applicable to the proposed project.

National Emission Standards for Hazardous Air Pollutants (NESHAP)

Part 63 NESHAP allowable emission limits are established on the basis of a maximum achievable control technology (MACT) determination for a particular major or area (minor) source. A HAP major source is defined as having potential emissions in excess of 25 tpy for total HAP and/or potential emissions in excess of 10 tpy for any individual HAP. HEP is an area source of HAP since its potential emissions of HAP are less than the 10/25 major source thresholds. As an area source of HAP in the upstream oil and gas sector, the only potentially applicable subpart for the proposed project is Subpart HH (National Emission Standards for Hazardous Air Pollutants from Oil and Natural Gas Production Facilities).[2] For area sources, the only affected facilities are dehydration units (63.760(b)(2)). There are no dehydration units being modified as part of the project. Therefore, this subpart is not applicable to the project.

West Virginia SIP Regulations

HEP is potentially subject to regulations contained in the West Virginia Code of State Regulations, Chapter 45 (Code of State Regulations). The Code of State Regulations fall under two main categories: (1) those regulations that are generally applicable (e.g., permitting requirements), and (2) those that have specific applicability (e.g., PM standards for manufacturing equipment).

45 CSR 4: To Prevent and Control the Discharge of Air Pollutants into the Air Which Causes or Contributes to an Objectionable Odor

According to 45 CSR 4-3:

No person shall cause, suffer, allow or permit the discharge of air pollutants which cause or contribute to an objectionable odor at any location occupied by the public.

HEP is generally subject to this requirement. However, due to the nature of the process at HEP, production of objectionable odor from HEP during normal operation is unlikely.

45 CSR 13: Permits For Construction, Modification, Relocation And Operation Of Stationary Sources Of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits And Procedures For Evaluation

45 CSR 13 outlines the procedures for permitting modifications to stationary sources. DTI is submitting this Class II Administrative Update to the existing R13 permit for HEP to incorporate the proposed changes as well as ensure the federal enforceability of the VRU as a control device.

[2] There are other NESHAP subparts applicable to area sources (e.g., Subpart ZZZZ). However, the project does not include any affected facilities under other area source rules.

45 CSR 16: Standards of Performance for New Stationary Sources

45 CSR 16-1 incorporates the federal Clean Air Act (CAA) standards of performance for new stationary sources set forth in 40 CPR Part 60 by reference. As such, by complying with all applicable requirements of 40 CFR Part 60 at HEP, DTI will be complying with 45 CSR 16. NSPS applicability was discussed previously.

45 CSR 17: To Prevent and Control Particulate Matter Air Pollution from Materials Handling, Preparation, Storage and Other Sources of Fugitive Particulate Matter

According to 45 CSR 17-3.1:

No person shall cause, suffer, allow or permit fugitive particulate matter to be discharged beyond the boundary lines of the property lines of the property on which the discharge originates or at any public or residential location, which causes or contributes to statutory air pollution.

Due to the nature of the activities at HEP, it is unlikely that fugitive particulate matter emissions will be emitted under normal operating conditions. However, DTI will take measures to ensure any fugitive particulate matter emissions will not cross the property boundary should any such emissions occur.

45 CSR 27: To Prevent and Control the Emissions of Toxic Air Pollutants

As a result of the application of VRU control, toxic air pollutant emissions are decreasing as a result of the project. Therefore, no additional requirements in the rule are triggered.

45 CSR 34: Emissions Standards for Hazardous Air Pollutants

45 CSR 34-1 incorporates the federal Clean Air Act (CAA) national emissions standards for hazardous air pollutants (NESHAPs) as set forth in 40 CPR Parts 61 and 63 by reference. As such, by complying with all applicable requirements of 40 CFR Parts 61 and 63 at HEP, DTI will be complying with 45 CSR 34. NESHAP applicability was discussed previously.

Non-Applicability of Other SIP Rules

A thorough examination of the West Virginia SIP rules with respect to applicability at HEP reveals many SIP regulations that do not apply or impose additional requirements on operations. Such SIP rules include those specific to a particular type of industrial operation that is categorically not applicable to HEP.

ATTACHMENT E

Plot Plan

GALMISH LOADING AREA

HASTINGS EXTRACTION PLANT

HASTINGS ELECTRIC COMPRESSOR STATION

HASTINGS COMPRESSOR STATION
AND LEWIS WETZEL COMPRESSOR STATION

HASTINGS PIG TRAP AND SLUG CATCHER AREA

QUADRANGLE LOCATION

REFERENCE: USGS 7.5' QUADRANGLE MAP OF: PINE GROVE, WEST VIRGINIA; DATED 1960, PHOTOREVISED 1976.

DRAWN BY	DJF
DATE	7/18/12
CHECKED BY	RAD
SET JOB NO.	212084
SET DWG FILE	HASTINGS SITEm01.dwg
DRAWING SCALE	1"=1200'

SE TECHNOLOGIES
98 Vanadium Road Bridgeville, PA 15017 (412) 221-1100

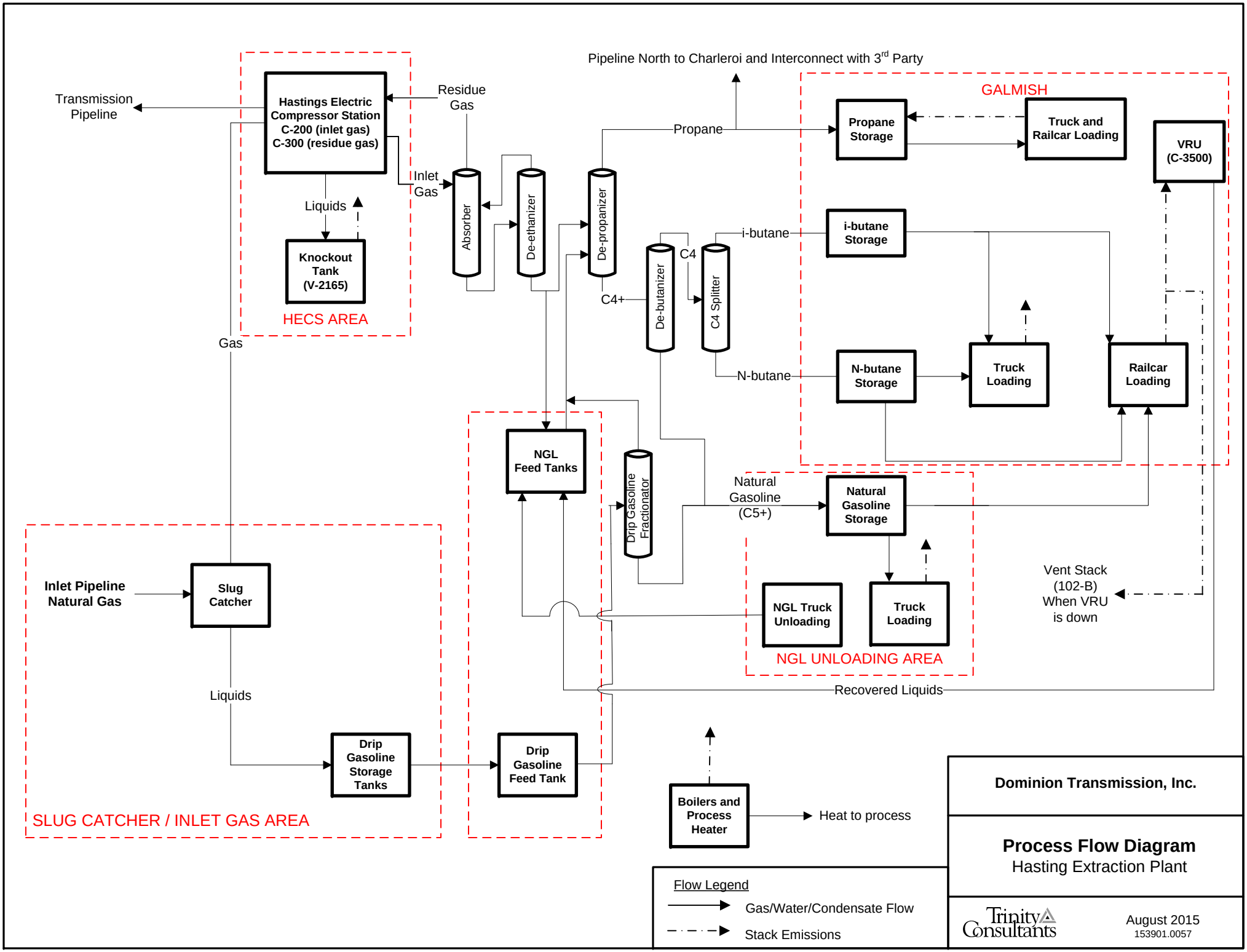
DOMINION TRANSMISSION
HASTINGS COMPLEX
WETSEL COUNTY, WEST VIRGINIA
SITE LOCATION MAP

DRAWING NAME: FIGURES 1-4A & C-10
REV. 1

Plot: env045 08/22/2012 10:45 G:\DOMINION\212084\HASTINGS SITE 1-4Am01.dwg

ATTACHMENT F

Detailed Process Flow Diagram


Pipeline North to Charleroi and Interconnect with 3rd Party
Transmission Pipeline
Hastings Electric Compressor Station C-200 (inlet gas) C-300 (residue gas)
Residue Gas
Inlet Gas
Liquids
Knockout Tank (V-2165)
HECS AREA
Gas
Absorber
De-ethanizer
De-propanizer
Propane
C4+
De-butanizer
C4
C4 Splitter
i-butane
N-butane
GALMISH
Propane Storage
Truck and Railcar Loading
VRU (C-3500)
i-butane Storage
N-butane Storage
Truck Loading
Railcar Loading
NGL Feed Tanks
Drip Gasoline Fractionator
Natural Gasoline (C5+)
Natural Gasoline Storage
NGL Truck Unloading
Truck Loading
NGL UNLOADING AREA
Vent Stack (102-B) When VRU is down
Recovered Liquids
Inlet Pipeline Natural Gas
Slug Catcher
Liquids
Drip Gasoline Storage Tanks
Drip Gasoline Feed Tank
SLUG CATCHER / INLET GAS AREA
Boilers and Process Heater
Heat to process
Flow Legend
Gas/Water/Condensate Flow
Stack Emissions
Dominion Transmission, Inc.
Process Flow Diagram
Hasting Extraction Plant
Trinity Consultants
August 2015
153901.0057

ATTACHMENT G

Process Description

ATTACHMENT G – PROCESS DESCRIPTION

This application covers the "Frac Efficiency Upgrade" project, which increased natural gas liquid (NGL) processing capabilities at HEP. This project included additional loading operations at the Galmish loading area (Galmish), a vapor recovery unit (VRU) to control loading emissions at Galmish, and associated fugitive emissions.

HEP is a natural gas liquid extraction facility currently permitted under R30-10300009. The Frac Efficiency Upgrade project increased the liquid processing capacity at HEP. The increase in liquid throughput was due to additional truck delivery of NGLs. This project added condensers, coolers, fans, and pumps to the butane splitter and drip fractionator areas to increase the ability to process NGLs. DTI also installed a VRU at Galmish to control n-butane, i-butane, and natural gasoline railcar loading emissions, as well as product switchovers.

The following sections detail the wet gas and NGL process steps at HEP. A process flow diagram is included as Attachment F.

Slug Catcher Area

The slug catcher area collects drip fluids from three natural gas pipelines. These pipelines are pigged to remove liquids from the pipelines, and the liquids that collect during this process are captured in the slug catcher. A small amount of liquid is also collected as wet gas is sent through a separator operating at about 130 psi. The drip from the slug catcher and the separator is transferred and stored in three (3) 30,000 gallon tanks, where the water is gravity separated and sent to a waste tank at atmospheric pressure. The flash gas from the drip tanks is captured and compressed at HCS, while the liquids are pumped to HECS to further remove water from the drip fluids by heat and gravity separation before being transferred into a storage tank at HEP. After the drip fluids are removed from the gas in the slug catcher, the wet gas is sent to HECS. The slug catcher area is not specifically listed in any current operating permit but DTI would like to specifically include the Slug Catcher Area in the Title V permit for completeness. The sources of emissions from this area are generally fugitive in nature.

Hastings Electric Compressor Station (HECS)

HECS compresses natural gas entering and exiting HEP. At HECS, there are two (2) centrifugal compressors driven by electric motors (12,000 and 24,000 hp). C-200 compresses wet natural gas and sends it into HEP, and C-300 compresses the residue natural gas exiting HEP and sends it back into Dominion transmission pipeline. Outside HECS, the drip fluids coming from the slug catcher area are phase separated after settling to remove excess water. Then the fluids are sent to a tank at HEP for storage until they are processed in the drip fractionator. HECS is not specifically listed in any current operating permit, but DTI would like to include it in the Title V permit for completeness. The HECS compressors and related equipment are listed sources in the August 2002 R13 application that resulted in permit R13-2468A and associated Title V minor modification issued in March 2003. The sources of emissions from this area are generally fugitive in nature, but also include emissions from the knockout tank (V-2195) which will be included as an emissions point in the Title V permit.

Hasting Extraction Plant (HEP)

HEP takes natural gas from HECS and extracts propane, isobutane, n-butane, and natural gasoline. Various equipment is involved in this process. The general flow of wet gas is through the extraction area of the plant,

which consists of a turbo-expander, cold separator, a de-ethanizer and an absorber. The lighter constituents (i.e., primarily methane and ethane) are removed and routed to HECS as residue gas. The extracted liquid, which is primarily propane, isobutane, n-butane and natural gasoline is pumped from the bottom of the de-ethanizer to the fractionation section of HEP. The first fractionation column is the de-propanizer, where propane is removed overhead and sent to storage spheres at Galmish or into a pipeline which interconnects with a 3rd party pipeline. The liquids from the bottom of the de-propanizer are sent to the de-butanizer where natural gasoline is recovered from the bottom and where butanes (isobutane and n-butane) are removed overhead and sent to the C_4 splitter. The C_4 splitter separates the isobutane overhead, leaving the n-butane as the bottom product. Isobutane and n-butane are sent to storage spheres at Galmish. Natural gasoline is stored nearby, pumped into a pipeline for storage at another location or pumped into pipeline and loaded directly into railcars at Galmish.

HEP also receives drip gasoline that had been received and separated at the slug catcher area. It is pumped into a drip fractionating tower where natural gasoline is recovered from the bottom and the condensed overhead liquids are routed to the de-propanizer for processing. A small amount on non-condensable vapor (primarily methane and ethane) are routed to the fuel gas system for HEP.

Galmish Loading Facility

The Galmish Loading facility includes truck and railcar loadout of isobutane, n-butane, and propane, as well as railcar loadout of natural gasoline. Railcar loading emissions for isobutane, n-butane, and natural gasoline are controlled by a vapor recovery system at 95% control (included in this R13 application). Propane loading is vapor balanced within the tanks. The vapor recovery system is powered by an electric compressor and the recovered product is sent through a separator. The gas and the liquids are sent to HEP for extraction/fractionation. When the VRU is down, emissions from loading are sent to the vent stack. Other air emission sources at the Galmish loadout area include three (3) fire pumps (300 hp, 300 hp, and 211 hp). The Galmish Loading facility is permitted under Title V operating permit number R30-10300009-2011 and R13-2468.

Natural Gas Liquids (NGL) Unloading Area

The NGL unloading area primarily consists of equipment for unloading NGL that is delivered by truck from other Dominion and third-party producers. Received NGL's are unloaded and stored in NGL feed tanks before entering HEP at the depropanizer. Also, truck loading of natural gasoline product occurs at the NGL unloading area.

Vent Stack

The vent stack was installed with the construction of HEP prior to 1974. It receives waste gas from various points in HEP (e.g., blow downs and upset events). It also is used to exhaust waste gas from the loadout operations at Galmish when the vapor recovery system is not operating. The vent stack is not specifically listed in any current operating permit. However, as emissions from the loadout operations and various other points in HEP are routed to the vent stack during upset conditions, the vent stack should be included as an emission point in the Title V permit.

ATTACHMENT H

MSDS

SAFETY DATA SHEET

1. Identification

Product identifier **NATURAL GAS LIQUIDS**

Other means of identification

Product code 1717809
Synonyms NGL's, Raw Product, Petroleum Hydrocarbons

Recommended use Raw material for fuel production.

Recommended restrictions None

Manufacturer / Importer / Supplier / Distributor information

Company name Dominion Transmission, Inc.
Address 445 West Main Street Clarksburg, WV 26302-2450
Telephone 304-627-3761
E-mail www.dom.com
Contact person Safety Department
Emergency phone number 1-888-264-8240

2. Hazard(s) identification

Physical hazards

Flammable liquid	Category 1

Health hazards

Aspiration hazard	Category 1
Reproductive hazard	Category 2
Skin irritant	Category 2
Specific target organ toxicology	Category 3

Label elements

Hazard symbol

Signal word Danger

Hazard statement Extremely flammable liquid and vapor. May be fatal if swallowed and enters airways. Causes skin irritation. Suspected of damaging fertility or the unborn child.

Precautionary statement

Prevention Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not handle until all safety precautions have been read and understood. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Keep container tightly closed. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilating/lighting equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Wear protective gloves/protective clothing/eye protection/face protection. Wash hands and contaminated skin thoroughly after handling. Wear protective gloves. Store locked up.

Response If exposed or concerned: Get medical advice/attention. If on skin (or hair): Wash with plenty of water. Rinse skin with water/shower. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse. If swallowed: Immediately call a poison center/doctor. Do NOT induce vomiting. In case of fire: Use foam, carbon dioxide, dry powder or water fog to extinguish.

Storage Store locked up. Store in a well-ventilated place. Keep cool. Keep container tightly closed.

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

Hazard(s) not otherwise classified (HNOC) None known

Environmental hazards

Aquatic Chronic Category 2

3. Composition/information on ingredients

Substance

Hazardous components Chemical name	Common name and Synonyms	CAS number	%
Ethane		74-84-0	1-4
Propane		74-98-6	1-50
n-Butane		106-97-8	1-20
Isobutane		75-28-5	1-11
Isopentane	2-methyl butane	78-78-4	1-7
Pentanes		109-66-0	1-4
Hexane	n-hexane	110-54-3	1-6
N-Pentane		-	1-6

Composition comments All concentrations are in percent by weight.

4. First-aid measures

Inhalation Move victim to area of fresh air. For respiratory distress give air, oxygen or administer cardiopulmonary resuscitation if needed. Seek medical attention -- call 911 or emergency medical services.

Skin contact Immediately flush skin with water for 15 minutes. Frozen tissue should be gradually warmed using warm water. Clothing frozen to the skin should be thawed before removal. Do not use hot water! Cryogenic burns may occur as evidenced by blistering. Protect affected area with dry gauze and get prompt medical attention.

Eye contact Flush eyes gently with water for at least 15 minutes. If illness or adverse symptoms develop, seek medical attention.

Ingestion Seek immediate medical attention.

Most important symptoms/ effects, acute and delayed Acute: Headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue. Delayed: Dry skin and irritation after repeated or prolonged exposure.

Indication of immediate medical attention and special treatment needed Treat symptomatically.

General information First aid personnel must be aware of own risk during rescue.

5. Fire-fighting measures

Suitable extinguishing media Dry chemical powder, foam, or CO2.

Unsuitable extinguishing media Do not use water jet as an extinguisher, as this will spread the fire. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.

Specific hazards arising from the chemical The product is extremely flammable, and explosive vapor/air mixtures may be formed even at normal room temperatures. Vapors are heavier than air and may travel along the ground to some distant source of ignition and flash back. Liquid propane will vaporize rapidly at well below ambient temperatures and readily forms flammable mixtures with air. Flames impinging on product storage vessels above the liquid level will cause sudden vessel failure, resulting in a BLEVE (Boiling Liquid Expanding Vapor Explosion), unless the vessel surfaces are kept cooled with water. If this cannot be done, evacuate the area. Gasoline portion may continue to pool after propane and butane vaporize.

Special protective equipment and precautions for firefighters Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

Fire-fighting equipment/instructions Evacuate area of all unnecessary personnel. Shut off product source and allow fire to burn itself out. Use water fog or spray to cool exposed containers and equipment to prevent overheating, flashbacks or explosions. Firefighters directly addressing the fire must use proper protective equipment including breathing apparatus to protect against hazardous combustion products and/or oxygen deficiencies.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures All non-essential personnel should be evacuated. Stay upwind. Ventilate enclosed areas to prevent formation of flammable or oxygen-deficient atmospheres. Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Liquid spills will vaporize rapidly and produce vapor cloud. Be alert for latent pooling of gasoline portion. Because vapors are heavier than air they will not readily disperse. Avoid vapor cloud even with proper respiratory equipment.

Avoid contact with skin. Wear suitable protective clothing, gloves and eye/face protection. For personal protection, see section 8 of the SDS.

In the event of a large spill, self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product.

Methods and materials for containment and cleaning up

Stop the flow of material, if this is without risk. Dike far ahead of spill for later disposal. Remove sources of ignition. Beware of the explosion danger.

Small Spills: Absorb spillage with non-combustible, absorbent material.
Large Spills: Remove with vacuum trucks or pump to storage/salvage vessels. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Ensure that waste and contaminated materials are collected and removed from the work area as soon as possible in a suitably labeled container. Wash area with soap and water. If necessary dike the product with dry earth, sand or similar non-combustible materials

Environmental precautions

Prevent spreading over a wide area (e.g. by containment or oil barriers). Do not contaminate water. Contact local authorities in case of spillage to drain/aquatic environment.

7. Handling and storage

Precautions for safe handling

Access to work area should be restricted to people handling the product only. Should be handled in closed systems, if possible. Avoid contact with eyes, skin, and clothing. Avoid breathing vapor. Use self-contained breathing apparatus (SCBA) if appropriate.

Use explosion-proof equipment and non-sparking tools in areas where explosive vapors may form. Electrically ground and bond shipping container, transfer line and receiving container. Material may be at elevated temperatures and/or pressures. Exercise care when opening tank hatches, sampling ports and/or bleeder valves.

Conditions for safe storage, including any incompatibilities

Keep containers tightly closed. Keep away from heat, open flames, or other sources of ignition. No smoking or open lighting. Outside or detached storage is preferred. Keep away from oxidizers, e.g. chlorine, oxygen, bleaches, fertilizers.

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value
Propane	PEL	1000 ppm 1800 mg/m3
Pentanes	PEL	1000 ppm 2950 mg/m3
Hexane	PEL	500 ppm 1800 mg/m3

US. OSHA Table Z-2 (29 CFR 1910.1000)

None

US. ACGIH Threshold Limit Values

Components	Type	Value
Ethane	TLV-TWA	1000 ppm
Propane	TLV-TWA	1000
n-Butane	TLV-TWA	1000
Isobutane	TLV-TWA	1000 ppm
Isopentane	TLV-TWA	600 ppm
Pentanes	TLV-TWA	600
Hexane	TLV-TWA skin	50 ppm

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
Ethane	- -	- -
Propane	REL	1800 mg/m3 1000 ppm
n-Butane	REL	1900 mg/m3 800 ppm
Isobutane	REL	1900 mg/m3 800 ppm
Isopentane	- -	- -
Pentanes	REL TWA	350 mg/m3

		120 ppm
	TWA-C (15 minute)	1800 mg/m3 610 ppm
n-hexane	REL	180 mg/m 350 ppm
	IDLH	1100 ppm [10%LEL]

Biological limit values

US. ACGIH. BEIs. Biological Exposure Indices

Components	Type	Value
Hexane	2,5-Hexanedion, Without hydrolysis	0.4 mg/l

Exposure guidelines

US. ACGIH

Hexane — Can be absorbed through the skin.

US. California Code of Regulations, Title 8, Section 5155. Airborne Contaminants

Hexane — Can be absorbed through the skin

Appropriate engineering controls

Observe occupational exposure limits and minimize the risk of inhalation of vapors. Provide easy access to water supply and eye wash facilities. Use explosion-proof equipment.

Individual protection measures, such as personal protective equipment

Eye/face protection	Wear goggles/face shield.
Skin protection	
Hand protection	Wear protective gloves. Nitrile gloves are recommended, but be aware that the liquid may penetrate the gloves. Frequent change is advisable. If contact with the liquid is possible, insulated gloves suitable for low temperatures should be worn. Suitable gloves can be recommended by the glove supplier.
Other	Protection suit must be worn. Anti-static and flame-retardant protective clothing is recommended.
Respiratory protection	In case of inadequate ventilation, use air-supplied full-mask. Seek advice from local supervisor.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	When using, do not eat, drink or smoke. Wash hands after handling. Launder contaminated clothing before reuse. Private clothes and working clothes should be kept separately. Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Appearance

Physical state	Liquid
Form	Liquid
Color	Colorless to straw colored
Odor	Petroleum
Odor threshold	Not available
pH	Not applicable
Melting point/freezing point	Not available
Initial boiling point and boiling range	Not available
Flash point	-100 °F (-73 °C) estimated
Evaporation rate	Moderately fast
Flammability (solid, gas)	Flammable.

Upper/lower flammability or explosive limits

Explosive limit - lower (%)	2.0
Explosive limit - upper (%)	2.9

Vapor pressure	Not established
Vapor density	> 1 (Air=1)
Relative density	< 1
Solubility(ies)	Negligible
Partition coefficient	
(n-octanol/water)	Not available
Auto-ignition temperature	882°F (472°C) estimated
Decomposition temperature	Not available.
Viscosity	Not available.
Other information	
Bulk density	Not applicable.
Explosive properties	Not explosive.
Oxidizing properties	Not oxidizing.

10. Stability and reactivity

Reactivity	The product is stable and non reactive under normal conditions of use, storage and transport.
Chemical stability	Stable at normal conditions.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	Heat, sparks, flames, elevated temperatures. Contact with incompatible materials.
Incompatible materials	Oxygen. Strong oxidizing agents.
Hazardous decomposition products	Carbon oxides and various hydrocarbons.

11. Toxicological information

Information on likely routes of exposure

Ingestion	Not a likely route of exposure. Aspiration hazard. May be fatal if swallowed and enters airways.
Inhalation	At high concentrations a simple asphyxiant. May produce nausea, diarrhea, loss of appetite, dizziness, disorientation, headache, excitation, rapid respiration, drowsiness, labored breathing, anesthesia and other central nervous system effects. May cause lung paralysis and asphyxiation. Extreme overexposure may cause unconsciousness and respiratory arrest.
Skin contact	May cause slight irritation. Extreme exposure may produce discoloration, muscle weakness, breathing difficulties and other central nervous system effects. Direct contact may cause freeze burns.
Eye contact	May cause irritation including pain, blurred vision, redness, tearing and superficial corneal turbidity.
Symptoms related to the physical, chemical and toxicological characteristics	Headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue. Dry skin and possible irritation with repeated or prolonged exposure.
Acute toxicity	Human evidence indicates that the product has very low acute oral, dermal or inhalation toxicity. However, it can produce severe injury if taken into the lung as a liquid, and there may be profound central nervous system depression following prolonged exposure to high levels of vapor. Suffocation (asphyxiant) hazard - if allowed to accumulate to concentrations that reduce oxygen below safe breathing levels. Breathing of high concentrations may cause dizziness, light-headedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness. Irritant effect on skin. May irritate and cause stomach pain, vomiting, diarrhea and nausea.

Components	Species	Test Results
Pentane Acute inhalation LC50	Rat	364 mg/l, 4 Hours
Propane Acute inhalation LC50	Rat	> 1442.847 mg/l, 15 Minutes
Butane Acute inhalation LC50	Rat	658 mg/l, 4 Hours
n-hexane	Rat	627,000 mg/m3, 3 minute

Skin corrosion/irritation Causes skin irritation. Pre-existing skin conditions including dermatitis might be aggravated by exposure to this product.

Serious eye damage/eye irritation May cause eye irritation on direct contact.

Respiratory sensitization Not classified.

Skin sensitization Not a skin sensitizer.

Germ cell mutagenicity May cause genetic defects.

Carcinogenicity May cause cancer.

IARC Monographs. Overall Evaluation of Carcinogenicity

No ingredients listed.

NTP Report on Carcinogens

No ingredients listed.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

None

Reproductive toxicity

Suspected of damaging fertility or the unborn child.

Specific target organ toxicity - single exposure

May cause drowsiness or dizziness. Aspiration hazard. Droplets of the product aspirated into the lungs through ingestion or vomiting may cause a serious

Specific target organ toxicity - repeated exposure

No information about adverse effects due to exposure.
chemical pneumonia.

Chronic effects Prolonged or repeated contact with skin may cause redness, itching, irritation, eczema/chapping and oil acne. May cause damage to the liver.

Further information Components of the product may be absorbed into the body through the skin.

12. Ecological information

Ecotoxicity Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Components	Species	Test Results
Ethane 96 hour LC50[1]	Fish (unknown species)	27.98 – 147.54 mg/L
Propane 96 hour LC50[1]	Fish (unknown species)	27.98 – 147.54 mg/L
Butane 96 hour LC50[1]	Fish (unknown species)	27.98 – 147.54 mg/L
Isobutane 96 hour LC50[1]	Fish (unknown species)	27.98 – 147.54 mg/L
Isopentane 96 hour LC50	Oncorhynchus mykiss	34.05 mg/L
Pentane 96 hour LC50	Oncorhynchus mykiss	4.26 mg/L
Pentane 96 hour LC50	Oryzias latipes	> 1000 µg/L

[1]The value estimated is greater than the solubility of the substance in water, therefore the value is only of academic interest. Source: US Environmental Protection Agency' (2008) Office of Pollution Prevention and Toxics and Syracuse Research Corporation (SRC).

Persistence and degradability Expected to be inherently biodegradable.

Bioaccumulative potential Has the potential to bioaccumulate.

Partition coefficient n-octanol / water (log Kow)

Propane	2.36
Pentane	3.39
Isobutane	2.76
Hexane	3.90

Mobility in soil The product has a low potential of being absorbed in the soil.

Mobility in general The product is insoluble in water. It will spread on the water surface while some of the components will eventually sediment in water systems. The volatile components of the product will spread in the atmosphere.

Other adverse effects	The product contains volatile organic compounds which have a photochemical ozone creation potential. Oil spills are generally hazardous to the environment.

13. Disposal considerations

Disposal instructions	Dispose in accordance with all applicable regulations. This material and/or its container must be disposed of as hazardous waste.
Local disposal regulations	Dispose of in accordance with local regulations.
Hazardous waste code	D001
Waste from residues / unused products	The transportation, storage, treatment and disposal of RCRA waste material must be conducted in compliance with 40 CFR 262, 263, 264, 268, and 270. Disposal can occur only in properly permitted facilities. Check state regulations. Chemical additions, processing or otherwise altering this material may make the waste management information presented in this SDS incomplete, inaccurate or otherwise inappropriate. Disposal of this material must be conducted in compliance with all federal, state and local regulations.
Contaminated packaging	Non-empty contaminated packaging should be disposed of as hazardous waste.

14. Transport Information

DOT

UN number	UN1075
UN proper shipping name	Petroleum gases, liquefied or Liquefied petroleum gas
Hazard Class	2.1
Transport hazard class(es)	
Subsidary class(es)	
Packing group	None
Special precautions for user	Not available
Labels required	Flammable gas (2.1)
Special provisions	T50
Packaging exceptions	173.306
Packaging non bulk	173.304, 173.305
Packaging bulk	173.315
ERG number	115

IATA

UN number	UN1075
UN proper shipping name	Petroleum gases, liquefied
Transport hazard class(es)	2.1
Subsidary class(es)	
Packaging group	None
Environmental hazards	NA
Labels required	Flammable gas (2.1)
Special Provisions	A1
ERG Code	10L
Special precautions for user	Not available

IMDG

UN number	UN1075
UN proper shipping name	Petroleum gases, liquefied
Transport hazard class(es)	Flammable gas (2.1)
Subsidiary class(es)	
Packaging group	None
Environmental hazards	NA
Marine pollutant labels required	None
EmS	F-D S-U
Special precautions for user	Not available
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	

15. Regulatory information

US federal regulations

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard 29 CFR 1910.1200 (OSHA) and 8 CCR § 5194 (Cal/OSHA).
All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

None

CERCLA Hazardous Substance List (40 CFR 302.4)

n-Hexane 5000 lb

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Immediate Hazard - Yes
Delayed Hazard - Yes
Fire Hazard - Yes
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance No

SARA 311/312 Hazardous chemical Yes

SARA Section 313

This material contains the following chemical subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR 372:

n-Hexane

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Hexane (CAS 110-54-3)

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Propane (CAS) 10,000 lb.
Butane (CAS) 10,000 lb.

Isobutane (CAS) 10,000 lb
Isopentane (CAS 78-28-4) 10,000 lb

Pentane (CAS 109-66-0) 10,000 lb

Safe Drinking Water Act (SDWA)

No constituents on the List of Contaminants.

Drug Enforcement Administration (DEA). List 2, Essential Chemicals (21 CFR 1310.02(b) and 1310.04(f)(2) and Chemical Code Number

None

Drug Enforcement Administration (DEA). List 1 & 2 Exempt Chemical Mixtures (21 CFR 1310.12(c))

None

DEA Exempt Chemical Mixtures Code Number

None

Food and Drug Administration (FDA)

Not regulated.

US state regulations

US. Massachusetts RTK - Substance List

Ethane

US. Pennsylvania RTK - Hazardous Substances

Ethane

Propane

Butane

Massachusetts Substances

Propane
Butane
Ethane
Isobutane
Isopentane

New Jersey Hazardous Substances

Propane
Butane
Ethane
Isobutane
Isopentane

US. California Proposition 65
None

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemical Inventory (KECI)	Yes
New Zealand	New Zealand Inventory (NZIoC)	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s)

16. Other information, including date of preparation or last version

Issue date 12-19-2014

Revision date -

Version # 02

Further information Not available.

References IARC Monographs. Overall Evaluation of Carcinogenicity (Volumes 1-102)
Registry of Toxic Effects of Chemical Substances (RTECS)
National Library of Medicine, Wiser Database
ECHA Registered Substances
NIOSH Pocket Guide to Chemical Hazards
EU Regulation 1272/2008
29 CFR 1910.1200

Disclaimer This information is provided without warranty. The information is believed to be correct. This information should be used to make an independent determination of the methods to safeguard workers and the environment.

SAFETY DATA SHEET

1. Identification

Product identifier **ISOBUTANE**

Other means of identification

Product code 1707032

Recommended use Fuel.

Recommended restrictions None known.

Manufacturer / Importer / Supplier / Distributor information

Company name Dominion Transmission, Inc.

Address 445 West Main Street Clarksburg, WV 26302-2450

Telephone 304-627-3761

E-mail www.dom.com

Contact person Safety Department

Emergency phone number 1-888-264-8240

2. Hazard(s) identification

Physical hazards Flammable gases — Category 1

Gases under pressure — Liquefied gas

Health hazards Not classified.

OSHA hazard(s) Simple asphyxiant

Label elements

Hazard symbol

Signal word Danger

Hazard statement Extremely flammable gas. Contains gas under pressure; may explode if heated. May displace oxygen and cause rapid suffocation.

Precautionary statement

Prevention Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

Response Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

Storage Protect from sunlight. Store in a well-ventilated place.

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

Hazard(s) not otherwise classified (HNOC) Not classified.

3. Composition/information on ingredients

Mixture

Hazardous components

Chemical name	Common name and synonyms	CAS number	%
Isobutane		75-28-5	95
Propane		74-98-6	3
Butane		106-97-8	2

Composition comments All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

Inhalation Move injured person into fresh air and keep person calm under observation. If breathing is difficult, give oxygen. Get medical attention if any discomfort continues.

Skin contact Frostbite: Do not remove clothes, but flush with copious amounts of lukewarm water. Call an ambulance and continue to flush during transportation to hospital.

Eye contact	Immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation develops or persists.
Ingestion	This material is a gas under normal atmospheric conditions and ingestion is unlikely.
Most important symptoms/effects, acute and delayed	Narcosis. Behavioral changes. Decrease in motor functions.
Indication of immediate medical attention and special treatment needed	Treat symptomatically.
General information	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media	Extinguish with foam, carbon dioxide, dry powder or water fog.
Unsuitable extinguishing media	None.
Specific hazards arising from the chemical	Cylinders can burst violently when heated, due to excess pressure build-up. Gas may travel considerable distance to a source of ignition and flash back. Gases may form explosive mixtures with air. Fire or high temperatures create: Carbon monoxide. Carbon oxides.
Special protective equipment and precautions for firefighters	Selection of respiratory protection for firefighting: follow the general fire precautions indicated in the workplace. Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with full face-piece operated in positive pressure mode. Use approved gas detectors in confined spaces.
Fire-fighting equipment/instructions	Evacuate area. Remove pressurized gas cylinders from the immediate vicinity. Cool containers exposed to flames with water until well after the fire is out. Close the valve if no risk is involved. Do not extinguish a leaking gas fire unless leak can be stopped. If leak cannot be stopped and no danger to surrounding area allow the fire to burn out. Fight fire from a protected location. Prevent buildup of vapors or gases to explosive concentrations.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Stay upwind. Keep unnecessary personnel away. No action shall be taken involving any personal risk or without suitable training. Ventilate closed spaces before entering. Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Wear suitable protective clothing, gloves and eye/face protection. For personal protection, see section 8 of the MSDS.
Methods and materials for containment and cleaning up	Ventilate well, stop flow of gas or liquid if possible. Remove ignition sources. Do not allow chemical to enter confined spaces such as sewers due to explosion risk. Sewers designed to preclude formation of explosive concentrations of vapor may be permitted.
Environmental precautions	Stop leak if possible without any risk. Sewers must be covered and basements and workpits evacuated.

7. Handling and storage

Precautions for safe handling	Before entering storage tanks and commencing any operation in a confined area, check the atmosphere for oxygen content, hydrogen sulfide (H2S) and flammability. Provide adequate ventilation. Avoid contact with eyes, skin, and clothing. Material may deplete oxygen from the air to dangerously low levels. Avoid breathing gas. Wear appropriate personal protective equipment. The product is extremely flammable. May form explosive mixtures with air. Avoid heat, sparks, open flames and other ignition sources. Ground container and transfer equipment to eliminate static electric sparks. Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities	Flammable compressed gas storage. Keep away from heat, sparks and open flame. Keep in a cool, well-ventilated place. Store away from incompatible materials.

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value
Propane (CAS 74-98-6)	PEL	1800 mg/m3
		1000 ppm

US. ACGIH Threshold Limit Values

Components	Type	Value
Butane (CAS 106-97-8)	TWA	1000 ppm
Isobutane (CAS 75-28-5)	TWA	1000 ppm
Propane (CAS 74-98-6)	TWA	1000 ppm

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
Butane (CAS 106-97-8)	REL	1900 mg/m3 800 ppm
Isobutane (CAS 75-28-5)	REL	1900 mg/m3 800 ppm
Propane (CAS 74-98-6)	REL	1800 mg/m3 1000 ppm

Biological limit values No biological exposure limits noted for the ingredient(s).

Exposure guidelines No exposure standards allocated.

Appropriate engineering controls Observe Occupational Exposure Limits and minimize the risk of inhalation. Use explosion-proof equipment.

Individual protection measures, such as personal protective equipment

Eye/face protection Risk of contact: Wear goggles/face shield.

Skin protection

Hand protection Risk of contact: Wear cold insulating gloves. Suitable gloves can be recommended by the glove supplier.

Other Wear suitable protective clothing.

Respiratory protection In case of inadequate ventilation, use air-supplied full-mask. Seek advice from local supervisor.

Thermal hazards Not available.

General hygiene considerations Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Appearance Colorless gas

Physical state Gas.

Form Compressed liquefied gas.

Color Colorless.

Odor Slight.

Odor threshold Not available.

pH Not applicable.

Melting point/freezing point Not available.

Initial boiling point and boiling range 11 °F (-11.7 °C)

Flash point -117 °F (-82.8 °C)

Evaporation rate Very fast

Flammability (solid, gas) Extremely flammable gas.

Upper/lower flammability or explosive limits

Flammability limit - lower (%) > 1.8 %

Flammability limit - upper (%) 8.5 %

Explosive limit - lower (%) Not available.

Explosive limit - upper (%) Not available.

Vapor pressure 50 - 60 psi (100°F)

Vapor density 2 (Air=1)

Relative density 0.564 (Water=1)

Solubility(ies) Slightly soluble in water.

Partition coefficient (n-octanol/water) Not available.

Auto-ignition temperature 860 °F (460 °C)

Decomposition temperature Not available.

Viscosity Not available.

Other information

Percent volatile 100

10. Stability and reactivity

Reactivity	The product is stable and non reactive under normal conditions of storage and transport.
Chemical stability	Stable under normal temperature conditions and recommended use.
Possibility of hazardous reactions	Polymerization will not occur.
Conditions to avoid	Heat, sparks, flames, elevated temperatures. Do not pressurize, cut, weld, braze, solder, drill, grind or expose empty containers to heat, flame, sparks, static electricity, or other sources of ignition; they may explode and cause injury or death.
Incompatible materials	Oxidizing agents.
Hazardous decomposition products	Carbon oxides.

11. Toxicological information

Information on likely routes of exposure

Ingestion	This material is a gas under normal atmospheric conditions and ingestion is unlikely.
Inhalation	High concentrations: Suffocation (asphyxiant) hazard - if allowed to accumulate to concentrations that reduce oxygen below safe breathing levels. In high concentrations, vapors are narcotic and may cause headache, fatigue, dizziness and nausea.
Skin contact	Contact with liquefied gas can cause damage (frostbite) due to rapid evaporative cooling.
Eye contact	Contact with liquefied gas can cause damage (frostbite) due to rapid evaporative cooling.
Symptoms related to the physical, chemical and toxicological characteristics	Exposure to rapidly expanding gas or vaporizing liquid may cause frostbite ("cold burn"). Contact with evaporating liquid may cause frostbite or freezing of skin. Narcosis. Behavioral changes. Decrease in motor functions. Eyes. Skin. Central nervous system.

Information on toxicological effects

Acute toxicity	Suffocation (asphyxiant) hazard - if allowed to accumulate to concentrations that reduce oxygen below safe breathing levels. Exposure to rapidly expanding gas or vaporizing liquid may cause frostbite ("cold burn").

Components	Species	Test Results
Butane (CAS 106-97-8)		
Acute		
Inhalation		
LC50	Rat	658 mg/l, 4 Hours
Propane (CAS 74-98-6)		
Acute		
Inhalation		
LC50	Rat	> 1442.847 mg/l, 15 Minutes

Skin corrosion/irritation	Not classified.
Serious eye damage/eye irritation	Not classified.
Respiratory sensitization	Not classified.
Skin sensitization	Not a skin sensitizer.
Germ cell mutagenicity	Not classified.
Carcinogenicity	Not classified.
Reproductive toxicity	Not classified.
Specific target organ toxicity - single exposure	May cause drowsiness or dizziness.
Specific target organ toxicity - repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Chronic effects	Prolonged exposure may cause chronic effects.

12. Ecological information

Ecotoxicity	The product contains substances which are toxic to aquatic organisms and which may cause long-term adverse effects in the aquatic environment.
Persistence and degradability	Not available.
Bioaccumulative potential	Not available.

Partition coefficient n-octanol / water (log Kow)

Propane	2.36

Partition coefficient n-octanol / water (log Kow)

Isobutane	2.76
Butane	2.89

Mobility in soil Not relevant, due to the form of the product.

Mobility in general The product is a volatile substance, which may spread in the atmosphere.

Other adverse effects The product is a volatile organic compound which has a photochemical ozone creation potential.

13. Disposal considerations

Disposal instructions Dispose in accordance with all applicable regulations. Return the empty cylinder to the supplier.

Local disposal regulations Dispose of in accordance with local regulations.

Hazardous waste code Not regulated.

Waste from residues / unused products Dispose of in accordance with local regulations.

Contaminated packaging Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN number	UN1011
UN proper shipping name	Butane see also Petroleum gases, liquefied
Transport hazard class(es)	2.1
Subsidary class(es)	Not available.
Packing group	Not available.
Special precautions for user	Not available.
Labels required	2.1
Special provisions	19, T50
Packaging exceptions	306
Packaging non bulk	304
Packaging bulk	314, 315

IATA

UN number	UN1011
UN proper shipping name	Butane
Transport hazard class(es)	2.1
Subsidary class(es)	-
Packaging group	Not available.
Labels required	2.1
ERG Code	10L
Special precautions for user	Not available.

IMDG

UN number	UN1011
UN proper shipping name	BUTANE
Transport hazard class(es)	2.1
Subsidary class(es)	-
Packaging group	Not available.
Labels required	Not available.
EmS	F-D, S-U
Special precautions for user	Not available.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code No information available.

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not on regulatory list.

CERCLA Hazardous Substance List (40 CFR 302.4)

Butane (CAS 106-97-8)	LISTED
Isobutane (CAS 75-28-5)	LISTED
Propane (CAS 74-98-6)	LISTED

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories	Immediate Hazard - Yes Delayed Hazard - No Fire Hazard - Yes Pressure Hazard - Yes Reactivity Hazard - No
SARA 302 Extremely hazardous substance	No
SARA 311/312 Hazardous chemical	Yes

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Butane (CAS 106-97-8)
Isobutane (CAS 75-28-5)
Propane (CAS 74-98-6)

Safe Drinking Water Act (SDWA) Not regulated.

Drug Enforcement Administration (DEA). List 2, Essential Chemicals (21 CFR 1310.02(b) and 1310.04(f)(2) and Chemical Code Number

Not listed.

Drug Enforcement Administration (DEA). List 1 & 2 Exempt Chemical Mixtures (21 CFR 1310.12(c))

Not regulated.

DEA Exempt Chemical Mixtures Code Number

Not regulated.

Food and Drug Administration (FDA) Not regulated.

US state regulations This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

US. Massachusetts RTK - Substance List

Butane (CAS 106-97-8)
Isobutane (CAS 75-28-5)
Propane (CAS 74-98-6)

US. New Jersey Worker and Community Right-to-Know Act

Butane (CAS 106-97-8)	500 LBS
Isobutane (CAS 75-28-5)	500 LBS
Propane (CAS 74-98-6)	500 LBS

US. Pennsylvania RTK - Hazardous Substances

Butane (CAS 106-97-8)
Isobutane (CAS 75-28-5)
Propane (CAS 74-98-6)

US. Rhode Island RTK

Butane (CAS 106-97-8)
Propane (CAS 74-98-6)

US. California Proposition 65

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

Not listed.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes

Country(s) or region	Inventory name	On inventory (yes/no)*
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s)

16. Other information, including date of preparation or last version

Issue date	10-04-2012
Revision date	-
Version #	01
Further information	Not available.
References	Registry of Toxic Effects of Chemical Substances (RTECS)
Disclaimer	This information is provided without warranty. The information is believed to be correct. This information should be used to make an independent determination of the methods to safeguard workers and the environment.

SAFETY DATA SHEET

1. Identification

Product identifier **NORMAL BUTANE**

Other means of identification

Product code 1707034

Recommended use Fuel.

Recommended restrictions None known.

Manufacturer / Importer / Supplier / Distributor information

Company name Dominion Transmission, Inc.

Address 445 West Main Street Clarksburg, WV 26302-2450

Telephone 304-627-3761

E-mail www.dom.com

Contact person Safety Department

Emergency phone number 1-888-264-8240

2. Hazard(s) identification

Physical hazards Flammable gases — Category 1

Gases under pressure — Liquefied gas

Health hazards Not classified.

OSHA hazard(s) Simple asphyxiant

Label elements

Hazard symbol

Signal word Danger

Hazard statement Extremely flammable gas. Contains gas under pressure; may explode if heated. May displace oxygen and cause rapid suffocation.

Precautionary statement

Prevention Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

Response Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

Storage Protect from sunlight. Store in a well-ventilated place.

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

Hazard(s) not otherwise classified (HNOC) Not classified.

3. Composition/information on ingredients

Mixture

Hazardous components

Chemical name	Common name and synonyms	CAS number	%
Butane		106-97-8	>95
C5 Hydrocarbons		-	<2
Isobutane		75-28-5	<2
Propane		74-98-6	<1

Composition comments All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

Inhalation Move injured person into fresh air and keep person calm under observation. If breathing is difficult, give oxygen. Get medical attention if any discomfort continues.

Skin contact	Frostbite: Do not remove clothes, but flush with copious amounts of lukewarm water. Call an ambulance and continue to flush during transportation to hospital.
Eye contact	Immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation develops or persists.
Ingestion	This material is a gas under normal atmospheric conditions and ingestion is unlikely.
Most important symptoms/effects, acute and delayed	Narcosis. Behavioral changes. Decrease in motor functions.
Indication of immediate medical attention and special treatment needed	Treat symptomatically.
General information	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media	Extinguish with foam, carbon dioxide, dry powder or water fog.
Unsuitable extinguishing media	None.
Specific hazards arising from the chemical	Cylinders can burst violently when heated, due to excess pressure build-up. Gas may travel considerable distance to a source of ignition and flash back. Gases may form explosive mixtures with air. Fire or high temperatures create: Carbon monoxide. Carbon oxides.
Special protective equipment and precautions for firefighters	Selection of respiratory protection for firefighting: follow the general fire precautions indicated in the workplace. Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with full face-piece operated in positive pressure mode. Use approved gas detectors in confined spaces.
Fire-fighting equipment/instructions	Evacuate area. Remove pressurized gas cylinders from the immediate vicinity. Cool containers exposed to flames with water until well after the fire is out. Close the valve if no risk is involved. Do not extinguish a leaking gas fire unless leak can be stopped. If leak cannot be stopped and no danger to surrounding area allow the fire to burn out. Fight fire from a protected location. Prevent buildup of vapors or gases to explosive concentrations.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Stay upwind. Keep unnecessary personnel away. No action shall be taken involving any personal risk or without suitable training. Ventilate closed spaces before entering. Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Wear suitable protective clothing, gloves and eye/face protection. For personal protection, see section 8 of the MSDS.
Methods and materials for containment and cleaning up	Ventilate well, stop flow of gas or liquid if possible. Remove ignition sources. Do not allow chemical to enter confined spaces such as sewers due to explosion risk. Sewers designed to preclude formation of explosive concentrations of vapor may be permitted.
Environmental precautions	Stop leak if possible without any risk. Sewers must be covered and basements and workpits evacuated.

7. Handling and storage

Precautions for safe handling	Before entering storage tanks and commencing any operation in a confined area, check the atmosphere for oxygen content, hydrogen sulfide (H2S) and flammability. Provide adequate ventilation. Avoid contact with eyes, skin, and clothing. Material may deplete oxygen from the air to dangerously low levels. Avoid breathing gas. Wear appropriate personal protective equipment. The product is extremely flammable. May form explosive mixtures with air. Avoid heat, sparks, open flames and other ignition sources. Ground container and transfer equipment to eliminate static electric sparks. Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities	Flammable compressed gas storage. Keep away from heat, sparks and open flame. Keep in a cool, well-ventilated place. Store away from incompatible materials.

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value
Propane (CAS 74-98-6)	PEL	1800 mg/m3
		1000 ppm

US. ACGIH Threshold Limit Values

Components	Type	Value
Butane (CAS 106-97-8)	TWA	1000 ppm
Isobutane (CAS 75-28-5)	TWA	1000 ppm
Propane (CAS 74-98-6)	TWA	1000 ppm

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
Butane (CAS 106-97-8)	REL	1900 mg/m3 800 ppm
Isobutane (CAS 75-28-5)	REL	1900 mg/m3 800 ppm
Propane (CAS 74-98-6)	REL	1800 mg/m3 1000 ppm

Biological limit values No biological exposure limits noted for the ingredient(s).

Exposure guidelines No exposure standards allocated.

Appropriate engineering controls Observe Occupational Exposure Limits and minimize the risk of inhalation. Use explosion-proof equipment.

Individual protection measures, such as personal protective equipment

Eye/face protection Risk of contact: Wear goggles/face shield.

Skin protection

Hand protection Risk of contact: Wear cold insulating gloves. Suitable gloves can be recommended by the glove supplier.

Other Wear suitable protective clothing.

Respiratory protection In case of inadequate ventilation, use air-supplied full-mask. Seek advice from local supervisor.

Thermal hazards Not available.

General hygiene considerations Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Appearance Colorless gas

Physical state Gas.

Form Compressed liquefied gas.

Color Colorless.

Odor Slight.

Odor threshold Not available.

pH Not applicable.

Melting point/freezing point Not available.

Initial boiling point and boiling range 31 °F (-0.6 °C)

Flash point -66 °F (-54.4 °C)

Evaporation rate Not available.

Flammability (solid, gas) Extremely flammable gas.

Upper/lower flammability or explosive limits

Flammability limit - lower (%) 8.4 %

Flammability limit - upper (%) 1.8 %

Explosive limit - lower (%) Not available.

Explosive limit - upper (%) Not available.

Vapor pressure 37 psi (100°F)

Vapor density 2.07 (Air=1)

Relative density 0.584 @31°F (Water=1)

Solubility(ies) Slightly soluble in water.

Partition coefficient (n-octanol/water) Not available.

Auto-ignition temperature Not available.

Decomposition temperature Not available.

Viscosity Not available.

Other information

Percent volatile 100

10. Stability and reactivity

Reactivity	The product is stable and non reactive under normal conditions of storage and transport.
Chemical stability	Stable under normal temperature conditions and recommended use.
Possibility of hazardous reactions	Polymerization will not occur.
Conditions to avoid	Heat, sparks, flames, elevated temperatures. Do not pressurize, cut, weld, braze, solder, drill, grind or expose empty containers to heat, flame, sparks, static electricity, or other sources of ignition; they may explode and cause injury or death.
Incompatible materials	Oxidizing agents.
Hazardous decomposition products	Carbon oxides.

11. Toxicological information

Information on likely routes of exposure

Ingestion	This material is a gas under normal atmospheric conditions and ingestion is unlikely.
Inhalation	High concentrations: Suffocation (asphyxiant) hazard - if allowed to accumulate to concentrations that reduce oxygen below safe breathing levels. In high concentrations, vapors are narcotic and may cause headache, fatigue, dizziness and nausea.
Skin contact	Contact with liquefied gas can cause damage (frostbite) due to rapid evaporative cooling.
Eye contact	Contact with liquefied gas can cause damage (frostbite) due to rapid evaporative cooling.
Symptoms related to the physical, chemical and toxicological characteristics	Exposure to rapidly expanding gas or vaporizing liquid may cause frostbite ("cold burn"). Contact with evaporating liquid may cause frostbite or freezing of skin. Narcosis. Behavioral changes. Decrease in motor functions. Eyes. Skin. Central nervous system.

Information on toxicological effects

Acute toxicity	Suffocation (asphyxiant) hazard - if allowed to accumulate to concentrations that reduce oxygen below safe breathing levels. Exposure to rapidly expanding gas or vaporizing liquid may cause frostbite ("cold burn").

Components	Species	Test Results
Butane (CAS 106-97-8)		
Acute		
Inhalation		
LC50	Rat	658 mg/l, 4 Hours
Propane (CAS 74-98-6)		
Acute		
Inhalation		
LC50	Rat	> 1442.847 mg/l, 15 Minutes

Skin corrosion/irritation	Not classified.
Serious eye damage/eye irritation	Not classified.
Respiratory sensitization	Not classified.
Skin sensitization	Not a skin sensitizer.
Germ cell mutagenicity	Not classified.
Carcinogenicity	Not classified.
Reproductive toxicity	Not classified.
Specific target organ toxicity - single exposure	May cause drowsiness or dizziness.
Specific target organ toxicity - repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Chronic effects	Prolonged exposure may cause chronic effects.

12. Ecological information

Ecotoxicity	The product contains substances which are toxic to aquatic organisms and which may cause long-term adverse effects in the aquatic environment.

Components		Species	Test Results
C5 Hydrocarbons (CAS -)			
Aquatic			
Crustacea	EC50	Daphnia	2.3 mg/l, 48 Hours
Fish	LC50	Fish	3.1 mg/l, 96 Hours

Persistence and degradability Not available.

Bioaccumulative potential Not available.

Partition coefficient n-octanol / water (log Kow)

Propane	2.36
Isobutane	2.76
Butane	2.89

Mobility in soil Not relevant, due to the form of the product.

Mobility in general The product is a volatile substance, which may spread in the atmosphere.

Other adverse effects The product is a volatile organic compound which has a photochemical ozone creation potential.

13. Disposal considerations

Disposal instructions Dispose in accordance with all applicable regulations. Return the empty cylinder to the supplier.

Local disposal regulations Dispose of in accordance with local regulations.

Hazardous waste code Not regulated.

Waste from residues / unused products Dispose of in accordance with local regulations.

Contaminated packaging Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN number	UN1011
UN proper shipping name	Butane see also Petroleum gases, liquefied
Transport hazard class(es)	2.1
Subsidary class(es)	Not available.
Packing group	Not available.
Special precautions for user	Not available.
Labels required	2.1
Special provisions	19, T50
Packaging exceptions	306
Packaging non bulk	304
Packaging bulk	314, 315

IATA

UN number	UN1011
UN proper shipping name	Butane
Transport hazard class(es)	2.1
Subsidary class(es)	-
Packaging group	Not available.
Labels required	2.1
ERG Code	10L
Special precautions for user	Not available.

IMDG

UN number	UN1011
UN proper shipping name	BUTANE
Transport hazard class(es)	2.1
Subsidary class(es)	-
Packaging group	Not available.
Labels required	Not available.
EmS	F-D, S-U
Special precautions for user	Not available.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code No information available.

15. Regulatory information

US federal regulations

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not on regulatory list.

CERCLA Hazardous Substance List (40 CFR 302.4)

Butane (CAS 106-97-8)	LISTED
Isobutane (CAS 75-28-5)	LISTED
Propane (CAS 74-98-6)	LISTED

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Immediate Hazard - Yes
Delayed Hazard - No
Fire Hazard - Yes
Pressure Hazard - Yes
Reactivity Hazard - No

SARA 302 Extremely hazardous substance No

SARA 311/312 Hazardous chemical Yes

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Butane (CAS 106-97-8)
Isobutane (CAS 75-28-5)
Propane (CAS 74-98-6)

Safe Drinking Water Act (SDWA) Not regulated.

Drug Enforcement Administration (DEA). List 2, Essential Chemicals (21 CFR 1310.02(b) and 1310.04(f)(2) and Chemical Code Number

Not listed.

Drug Enforcement Administration (DEA). List 1 & 2 Exempt Chemical Mixtures (21 CFR 1310.12(c))

Not regulated.

DEA Exempt Chemical Mixtures Code Number

Not regulated.

Food and Drug Administration (FDA) Not regulated.

US state regulations

This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

US. Massachusetts RTK - Substance List

Butane (CAS 106-97-8)
Isobutane (CAS 75-28-5)
Propane (CAS 74-98-6)

US. New Jersey Worker and Community Right-to-Know Act

Butane (CAS 106-97-8)	500 LBS
Isobutane (CAS 75-28-5)	500 LBS
Propane (CAS 74-98-6)	500 LBS

US. Pennsylvania RTK - Hazardous Substances

Butane (CAS 106-97-8)
Isobutane (CAS 75-28-5)
Propane (CAS 74-98-6)

US. Rhode Island RTK

Butane (CAS 106-97-8)
Propane (CAS 74-98-6)

US. California Proposition 65

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

Not listed.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	No
Canada	Domestic Substances List (DSL)	No
Canada	Non-Domestic Substances List (NDSL)	Yes
China	Inventory of Existing Chemical Substances in China (IECSC)	No
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	No
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	No

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s)

16. Other information, including date of preparation or last version

Issue date	10-04-2012
Revision date	-
Version #	01
Further information	Not available.
References	Registry of Toxic Effects of Chemical Substances (RTECS)
Disclaimer	This information is provided without warranty. The information is believed to be correct. This information should be used to make an independent determination of the methods to safeguard workers and the environment.

SAFETY DATA SHEET

1. Identification

Product identifier **PROPANE**

Other means of identification

Product code 1707035

Recommended use Fuel.

Recommended restrictions None known.

Manufacturer / Importer / Supplier / Distributor information

Company name Dominion Transmission, Inc.
Address 445 West Main Street Clarksburg, WV 26302-2450
Telephone 304-627-3761
E-mail www.dom.com
Contact person Safety Department
Emergency phone number 1-888-264-8240

2. Hazard(s) identification

Physical hazards Flammable gases — Category 1
Gases under pressure — Liquefied gas

Health hazards Not classified.

OSHA hazard(s) Simple asphyxiant

Label elements

Hazard symbol

Signal word Danger

Hazard statement Extremely flammable gas. Contains gas under pressure; may explode if heated. May displace oxygen and cause rapid suffocation.

Precautionary statement

Prevention Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

Response Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

Storage Protect from sunlight. Store in a well-ventilated place.

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

Hazard(s) not otherwise classified (HNOC) Not classified.

3. Composition/information on ingredients

Mixture

Hazardous components

Chemical name	Common name and synonyms	CAS number	%
Propane		74-98-6	>90
Ethane		74-84-0	<7
C4 Hydrocarbons		-	<5

Composition comments All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

Inhalation Move injured person into fresh air and keep person calm under observation. If breathing is difficult, give oxygen. Get medical attention if any discomfort continues.

Skin contact Frostbite: Do not remove clothes, but flush with copious amounts of lukewarm water. Call an ambulance and continue to flush during transportation to hospital.

Eye contact	Immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation develops or persists.
Ingestion	This material is a gas under normal atmospheric conditions and ingestion is unlikely.
Most important symptoms/effects, acute and delayed	Narcosis. Behavioral changes. Decrease in motor functions.
Indication of immediate medical attention and special treatment needed	Treat symptomatically.
General information	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media	Extinguish with foam, carbon dioxide, dry powder or water fog.
Unsuitable extinguishing media	None.
Specific hazards arising from the chemical	Cylinders can burst violently when heated, due to excess pressure build-up. Gas may travel considerable distance to a source of ignition and flash back. Gases may form explosive mixtures with air. Fire or high temperatures create: Carbon monoxide. Carbon oxides.
Special protective equipment and precautions for firefighters	Selection of respiratory protection for firefighting: follow the general fire precautions indicated in the workplace. Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with full face-piece operated in positive pressure mode. Use approved gas detectors in confined spaces.
Fire-fighting equipment/instructions	Evacuate area. Remove pressurized gas cylinders from the immediate vicinity. Cool containers exposed to flames with water until well after the fire is out. Close the valve if no risk is involved. Do not extinguish a leaking gas fire unless leak can be stopped. If leak cannot be stopped and no danger to surrounding area allow the fire to burn out. Fight fire from a protected location. Prevent buildup of vapors or gases to explosive concentrations.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Stay upwind. Keep unnecessary personnel away. No action shall be taken involving any personal risk or without suitable training. Ventilate closed spaces before entering. Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Wear suitable protective clothing, gloves and eye/face protection. For personal protection, see section 8 of the MSDS.
Methods and materials for containment and cleaning up	Ventilate well, stop flow of gas or liquid if possible. Remove ignition sources. Do not allow chemical to enter confined spaces such as sewers due to explosion risk. Sewers designed to preclude formation of explosive concentrations of vapor may be permitted.
Environmental precautions	Stop leak if possible without any risk. Sewers must be covered and basements and workpits evacuated.

7. Handling and storage

Precautions for safe handling	Before entering storage tanks and commencing any operation in a confined area, check the atmosphere for oxygen content, hydrogen sulfide (H2S) and flammability. Provide adequate ventilation. Avoid contact with eyes, skin, and clothing. Material may deplete oxygen from the air to dangerously low levels. Avoid breathing gas. Wear appropriate personal protective equipment. The product is extremely flammable. May form explosive mixtures with air. Avoid heat, sparks, open flames and other ignition sources. Ground container and transfer equipment to eliminate static electric sparks. Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities	Flammable compressed gas storage. Keep away from heat, sparks and open flame. Keep in a cool, well-ventilated place. Store away from incompatible materials.

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value
Propane (CAS 74-98-6)	PEL	1800 mg/m3
		1000 ppm

US. ACGIH Threshold Limit Values

Components	Type	Value
C4 Hydrocarbons (CAS -)	TWA	1000 ppm
Ethane (CAS 74-84-0)	TWA	1000 ppm
Propane (CAS 74-98-6)	TWA	1000 ppm

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
C4 Hydrocarbons (CAS -)	REL	1900 mg/m3 800 ppm
Propane (CAS 74-98-6)	REL	1800 mg/m3 1000 ppm

Biological limit values No biological exposure limits noted for the ingredient(s).

Exposure guidelines No exposure standards allocated.

Appropriate engineering controls Observe Occupational Exposure Limits and minimize the risk of inhalation. Use explosion-proof equipment.

Individual protection measures, such as personal protective equipment

Eye/face protection Risk of contact: Wear goggles/face shield.

Skin protection

Hand protection Risk of contact: Wear cold insulating gloves. Suitable gloves can be recommended by the glove supplier.

Other Wear suitable protective clothing.

Respiratory protection In case of inadequate ventilation, use air-supplied full-mask. Seek advice from local supervisor.

Thermal hazards Not available.

General hygiene considerations Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Appearance Colorless gas

Physical state Gas.

Form Compressed liquefied gas.

Color Colorless.

Odor Odorless.

Odor threshold Not available.

pH Not applicable.

Melting point/freezing point Not available.

Initial boiling point and boiling range -47 °F (-43.9 °C) (1 atm)

Flash point -156 °F (-104.4 °C)

Evaporation rate Not available.

Flammability (solid, gas) Extremely flammable gas.

Upper/lower flammability or explosive limits

Flammability limit - lower (%) > 2 %

Flammability limit - upper (%) 10 %

Explosive limit - lower (%) Not available.

Explosive limit - upper (%) Not available.

Vapor pressure 208 psi (100°F)

Vapor density 1.8 (Air=1)

Relative density 0.5 @-42.2°F (Water=1)

Solubility(ies) Slightly soluble in water.

Partition coefficient (n-octanol/water) Not available.

Auto-ignition temperature 874 °F (467.78 °C)

Decomposition temperature Not available.

Viscosity Not available.

Other information

Percent volatile 100 %

VOC (Weight %) 100 %

10. Stability and reactivity

Reactivity	The product is stable and non reactive under normal conditions of storage and transport.
Chemical stability	Stable under normal temperature conditions and recommended use.
Possibility of hazardous reactions	Polymerization will not occur.
Conditions to avoid	Heat, sparks, flames, elevated temperatures. Do not pressurize, cut, weld, braze, solder, drill, grind or expose empty containers to heat, flame, sparks, static electricity, or other sources of ignition; they may explode and cause injury or death.
Incompatible materials	Oxidizing agents.
Hazardous decomposition products	Carbon oxides.

11. Toxicological information

Information on likely routes of exposure

Ingestion	This material is a gas under normal atmospheric conditions and ingestion is unlikely.
Inhalation	High concentrations: Suffocation (asphyxiant) hazard - if allowed to accumulate to concentrations that reduce oxygen below safe breathing levels. In high concentrations, vapors are narcotic and may cause headache, fatigue, dizziness and nausea.
Skin contact	Contact with liquefied gas can cause damage (frostbite) due to rapid evaporative cooling.
Eye contact	Contact with liquefied gas can cause damage (frostbite) due to rapid evaporative cooling.
Symptoms related to the physical, chemical and toxicological characteristics	Exposure to rapidly expanding gas or vaporizing liquid may cause frostbite ("cold burn"). Contact with evaporating liquid may cause frostbite or freezing of skin. Narcosis. Behavioral changes. Decrease in motor functions. Eyes. Skin. Central nervous system.

Information on toxicological effects

Acute toxicity	Suffocation (asphyxiant) hazard - if allowed to accumulate to concentrations that reduce oxygen below safe breathing levels. Exposure to rapidly expanding gas or vaporizing liquid may cause frostbite ("cold burn").

Components	Species	Test Results
C4 Hydrocarbons (CAS -)		
Acute		
Inhalation		
LC50	Rat	658 mg/l, 4 Hours
Propane (CAS 74-98-6)		
Acute		
Inhalation		
LC50	Rat	> 1442.847 mg/l, 15 Minutes

Skin corrosion/irritation	Not classified.
Serious eye damage/eye irritation	Not classified.
Respiratory sensitization	Not classified.
Skin sensitization	Not a skin sensitizer.
Germ cell mutagenicity	Not classified.
Carcinogenicity	Not classified.
Reproductive toxicity	Not classified.
Specific target organ toxicity - single exposure	May cause drowsiness or dizziness.
Specific target organ toxicity - repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Chronic effects	Prolonged exposure may cause chronic effects.

12. Ecological information

Ecotoxicity	The product contains substances which are toxic to aquatic organisms and which may cause long-term adverse effects in the aquatic environment.
Persistence and degradability	Not available.
Bioaccumulative potential	Not available.

Partition coefficient n-octanol / water (log Kow)

Ethane	1.81

Partition coefficient n-octanol / water (log Kow)

Propane	2.36
C4 Hydrocarbons	2.89

Mobility in soil Not relevant, due to the form of the product.

Mobility in general The product is a volatile substance, which may spread in the atmosphere.

Other adverse effects The product is a volatile organic compound which has a photochemical ozone creation potential.

13. Disposal considerations

Disposal instructions Dispose in accordance with all applicable regulations. Return the empty cylinder to the supplier.

Local disposal regulations Dispose of in accordance with local regulations.

Hazardous waste code Not regulated.

Waste from residues / unused products Dispose of in accordance with local regulations.

Contaminated packaging Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN number	UN1978
UN proper shipping name	Propane
Transport hazard class(es)	2.1
Subsidary class(es)	Not available.
Packing group	Not available.
Special precautions for user	Not available.
Labels required	2.1
Special provisions	19, T50
Packaging exceptions	306
Packaging non bulk	304
Packaging bulk	314, 315

IATA

UN number	UN1978
UN proper shipping name	Propane
Transport hazard class(es)	2.1
Subsidary class(es)	-
Packaging group	Not available.
Environmental hazards	No
Labels required	2.1
ERG Code	10L
Special precautions for user	Not available.

IMDG

UN number	UN1978
UN proper shipping name	PROPANE
Transport hazard class(es)	2.1
Subsidary class(es)	-
Packaging group	Not available.
Environmental hazards	
Marine pollutant	No
Labels required	2.1
EmS	F-D, S-U
Special precautions for user	Not available.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code No information available.

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not on regulatory list.

CERCLA Hazardous Substance List (40 CFR 302.4)

C4 Hydrocarbons (CAS -)	LISTED
Ethane (CAS 74-84-0)	LISTED
Propane (CAS 74-98-6)	LISTED

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - Yes
Delayed Hazard - No
Fire Hazard - Yes
Pressure Hazard - Yes
Reactivity Hazard - No

SARA 302 Extremely hazardous substance No

SARA 311/312 Hazardous chemical Yes

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

C4 Hydrocarbons (CAS -)
Ethane (CAS 74-84-0)
Propane (CAS 74-98-6)

Safe Drinking Water Act (SDWA) Not regulated.

Drug Enforcement Administration (DEA). List 2, Essential Chemicals (21 CFR 1310.02(b) and 1310.04(f)(2) and Chemical Code Number

Not listed.

Drug Enforcement Administration (DEA). List 1 & 2 Exempt Chemical Mixtures (21 CFR 1310.12(c))

Not regulated.

DEA Exempt Chemical Mixtures Code Number

Not regulated.

Food and Drug Administration (FDA) Not regulated.

US state regulations This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

US. Massachusetts RTK - Substance List

C4 Hydrocarbons (CAS -)
Ethane (CAS 74-84-0)
Propane (CAS 74-98-6)

US. New Jersey Worker and Community Right-to-Know Act

C4 Hydrocarbons (CAS -)	500 LBS
Ethane (CAS 74-84-0)	500 LBS
Propane (CAS 74-98-6)	500 LBS

US. Pennsylvania RTK - Hazardous Substances

C4 Hydrocarbons (CAS -)
Ethane (CAS 74-84-0)
Propane (CAS 74-98-6)

US. Rhode Island RTK

C4 Hydrocarbons (CAS -)
Ethane (CAS 74-84-0)
Propane (CAS 74-98-6)

US. California Proposition 65

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

Not listed.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes

Country(s) or region	Inventory name	On inventory (yes/no)*
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s)

16. Other information, including date of preparation or last version

Issue date	10-04-2012
Revision date	-
Version #	01
Further information	Not available.
References	Registry of Toxic Effects of Chemical Substances (RTECS)
Disclaimer	This information is provided without warranty. The information is believed to be correct. This information should be used to make an independent determination of the methods to safeguard workers and the environment.

SAFETY DATA SHEET

1. Identification

Product identifier	**NATURAL GASOLINE**
Synonyms	casinghead gasoline, petroleum distillates
Other means of identification	
Product code	1707033
Recommended use	Raw material for fuel production.
Recommended restrictions	-

Manufacturer / Importer / Supplier / Distributor information

Company name	Dominion Transmission, Inc.
Address	445 West Main Street Clarksburg, WV 26302-2450
Telephone	304-627-3761
E-mail	www.dom.com
Contact person	Safety Department
Emergency phone number	1-888-264-8240

2. Hazard(s) identification

Physical hazards	Flammable liquids	Category 1
Health hazards	Skin corrosion/irritation	Category 2
	Germ cell mutagenicity	Category 1B
	Carcinogenicity	Category 1B
	Specific target organ toxicity, single exposure	Category 2 (vascular system)
	Specific target organ toxicity, single exposure	Category 3 narcotic effects
	Aspiration hazard	Category 1
OSHA hazard(s)	Simple asphyxiant	

Label elements

Hazard symbol

Signal word Danger

Hazard statement Extremely flammable liquid and vapor. May be fatal if swallowed and enters airways. Causes skin irritation. May cause drowsiness or dizziness. May cause cancer. May cause genetic defects. May displace oxygen and cause rapid suffocation.

Precautionary statement

Prevention Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Keep container tightly closed. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilating/lighting equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Wear protective gloves/protective clothing/eye protection/face protection. Wash thoroughly after handling. Avoid breathing mist or vapor. Use only outdoors or in a well-ventilated area.

Response If exposed or concerned: Get medical advice/attention. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. If swallowed: Immediately call a poison center/doctor. Do NOT induce vomiting. In case of fire: Use foam, carbon dioxide, dry powder or water fog for extinction.

Storage Store locked up. Store in a well-ventilated place. Keep cool. Keep container tightly closed.

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

Hazard(s) not otherwise classified (HNOC) Not classified.

Environmental hazards	Hazardous to the aquatic environment, long-term hazard	Category 2

3. Composition/information on ingredients

Substance

Hazardous components

Chemical name	Common name and synonyms	CAS number	%
C4 - C12		-	100
Cyclohexane		110-82-7	3.4
Toluene		108-88-3	0.75
Benzene		71-43-2	0.45
Xylene		1330-20-7	0.29

Composition comments All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

Inhalation Move injured person into fresh air and keep person calm under observation. If breathing is difficult, give oxygen. Get medical attention if any discomfort continues.

Skin contact Immediately remove contaminated clothing. Wash with soap and water. In case of rashes, wounds or other skin disorders: Seek medical attention and bring along these instructions.

Eye contact Immediately flush with plenty of water for up to 15 minutes. Remove any contact lenses and open eyelids wide apart. Get medical attention if irritation develops or persists.

Ingestion Immediately rinse mouth and drink plenty of water or milk. Keep person under observation. Do not induce vomiting. If vomiting occurs, keep head low. Transport immediately to hospital and take these instructions. Never give anything by mouth to an unconscious person.

Most important symptoms/effects, acute and delayed Irritation of eyes and mucous membranes. Skin irritation. Dermatitis. Ingestion may cause irritation and malaise. Droplets of the product aspirated into the lungs through ingestion or vomiting may cause a serious chemical pneumonia.

Indication of immediate medical attention and special treatment needed Treat symptomatically.

General information First aid personnel must be aware of own risk during rescue.

5. Fire-fighting measures

Suitable extinguishing media Dry chemical, CO_2, sand, earth, water spray or regular foam.

Unsuitable extinguishing media Do not use water jet as an extinguisher, as this will spread the fire. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.

Specific hazards arising from the chemical The product is extremely flammable, and explosive vapor/air mixtures may be formed even at normal room temperatures. Vapors are heavier than air and may travel along the ground to some distant source of ignition and flash back. Thermal decomposition may produce smoke, oxides of carbon and lower molecular weight organic compounds whose composition have not been characterized.

Special protective equipment and precautions for firefighters Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

Fire-fighting equipment/instructions Move containers from fire area if you can do it without risk. Use water spray to cool unopened containers. Cool containers with flooding quantities of water until well after fire is out.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures Stay upwind. Evacuate area. Provide adequate ventilation. Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Avoid contact with skin. Wear suitable protective clothing, gloves and eye/face protection. For personal protection, see section 8 of the MSDS.

Methods and materials for containment and cleaning up Stop the flow of material, if this is without risk. Dike far ahead of spill for later disposal. Remove sources of ignition. Beware of the explosion danger.

Small Spills: Absorb spillage with non-combustible, absorbent material.

Large Spills: Remove with vacuum trucks or pump to storage/salvage vessels. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Ensure that waste and contaminated materials are collected and removed from the work area as soon as possible in a suitably labeled container. Wash area with soap and water. If necessary dike the product with dry earth, sand or similar non-combustible materials.

Environmental precautions Prevent spreading over a wide area (e.g. by containment or oil barriers). Do not contaminate water. Contact local authorities in case of spillage to drain/aquatic environment.

7. Handling and storage

Precautions for safe handling Access to work area should be restricted to people handling the product only. Should be handled in closed systems, if possible. Avoid contact with eyes, skin, and clothing. Avoid inhalation of vapors. Wear appropriate personal protective equipment. The product is extremely flammable, and explosive vapor/air mixtures may be formed even at normal room temperatures. Ground container and transfer equipment to eliminate static electric sparks. Vapors are heavier than air and may travel along the floor and in the bottom of containers. Immediately change contaminated clothes. Do not eat, drink or smoke when using the product. Observe good industrial hygiene practices.

Conditions for safe storage, including any incompatibilities Follow rules for flammable liquids. Keep away from heat, sparks and open flame. Keep in a cool, well-ventilated place. Keep away from food, drink and animal feeding stuffs. Store away from incompatible materials.

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Components	Type	Value
Benzene (CAS 71-43-2)	STEL	5 ppm
	TWA	1 ppm

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value
Cyclohexane (CAS 110-82-7)	PEL	1050 mg/m3
		300 ppm
Xylene (CAS 1330-20-7)	PEL	435 mg/m3
		100 ppm

US. OSHA Table Z-2 (29 CFR 1910.1000)

Components	Type	Value
Benzene (CAS 71-43-2)	Ceiling	25 ppm
Toluene (CAS 108-88-3)	Ceiling	300 ppm
	TWA	200 ppm

US. ACGIH Threshold Limit Values

Components	Type	Value
Benzene (CAS 71-43-2)	STEL	2.5 ppm
	TWA	0.5 ppm
Cyclohexane (CAS 110-82-7)	TWA	100 ppm
Toluene (CAS 108-88-3)	TWA	20 ppm
Xylene (CAS 1330-20-7)	STEL	150 ppm
	TWA	100 ppm

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
Benzene (CAS 71-43-2)	REL	0.1 ppm
	STEL	1 ppm
Cyclohexane (CAS 110-82-7)	REL	1050 mg/m3
		300 ppm
Toluene (CAS 108-88-3)	REL	375 mg/m3
		100 ppm
	STEL	560 mg/m3
		150 ppm
Xylene (CAS 1330-20-7)	REL	435 mg/m3
		100 ppm
	STEL	655 mg/m3
		150 ppm

Biological limit values

US. ACGIH. BEIs. Biological Exposure Indices

Components	Value	Determinant	Sampling Time
Benzene (CAS 71-43-2)	25 µg/g	S-Phenylmercaruric acid	*
Toluene (CAS 108-88-3)	0.3 mg/g	o-Cresol, with hydrolysis	*
	0.03 mg/l	Toluene	*
	0.02 mg/l	Toluene	*
Xylene (CAS 1330-20-7)	1.5 g/g	Methylhippuric acids	*

* - For sampling details, please see the source document.

Exposure guidelines No exposure standards allocated.

US. ACGIH Threshold Limit Values

Benzene (CAS 71-43-2) Can be absorbed through the skin.

US. California Code of Regulations, Title 8, Section 5155. Airborne Contaminants

BENZENE (CAS 71-43-2) Can be absorbed through the skin.
TOLUENE; TOLUOL (CAS 108-88-3) Can be absorbed through the skin.

US. Minnesota Hazardous Substances List (Minn. Rules 5206.0400).

Toluene (CAS 108-88-3) Skin designation applies.

US. Rhode Island Hazardous Substances Right-to-Know Act (R.I. Gen. Laws Section 28-21-1 et. seq.)

Benzene (CAS 71-43-2) Can be absorbed through the skin.
Toluene (CAS 108-88-3) Can be absorbed through the skin.
Xylene (CAS 1330-20-7) Can be absorbed through the skin.

Appropriate engineering controls Observe Occupational Exposure Limits and minimize the risk of inhalation of vapors. Provide easy access to water supply and eye wash facilities. Use explosion-proof equipment.

Individual protection measures, such as personal protective equipment

Eye/face protection Wear goggles/face shield.

Skin protection

Hand protection Wear protective gloves. Nitrile gloves are recommended, but be aware that the liquid may penetrate the gloves. Frequent change is advisable. Suitable gloves can be recommended by the glove supplier.

Other Protection suit must be worn. Anti-static and flame-retardant protective clothing is recommended.

Respiratory protection In case of inadequate ventilation, use air-supplied full-mask. Seek advice from local supervisor.

Thermal hazards Wear appropriate thermal protective clothing, when necessary.

General hygiene considerations When using, do not eat, drink or smoke. Wash hands after handling. Launder contaminated clothing before reuse. Private clothes and working clothes should be kept separately. Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Appearance Clear, colorless liquid.

Physical state Liquid.

Form Liquid.

Color Colorless.

Odor Hydrocarbon.

Odor threshold Not available.

pH Not applicable.

Melting point/freezing point Not available.

Initial boiling point and boiling range 80 °F (26.7 °C) (1 atm)

Flash point -45 °F (-42.8 °C)

Evaporation rate Moderately fast

Flammability (solid, gas) Not applicable.

Upper/lower flammability or explosive limits

Flammability limit - lower (%) > 1.4

Flammability limit - upper (%) < 7.6

Explosive limit - lower (%) Not available.

Explosive limit - upper (%)	Not available.
Vapor pressure	8 - 14 psi (100°F/38°C)
Vapor density	3 - 4 (Air=1)
Relative density	0.67
Solubility(ies)	Slightly soluble
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	536 °F (280 °C)
Decomposition temperature	Not available.
Viscosity	Not available.
Other information	
Bulk density	Not applicable.
Explosive properties	Not explosive.
Oxidizing properties	Not oxidizing.

10. Stability and reactivity

Reactivity	The product is stable and non reactive under normal conditions of use, storage and transport.
Chemical stability	Stable at normal conditions.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	Heat, sparks, flames, elevated temperatures. Contact with incompatible materials.
Incompatible materials	Strong acids. Strong oxidizing agents.
Hazardous decomposition products	Thermal decomposition or combustion may liberate carbon oxides and other toxic gases or vapors.

11. Toxicological information

Information on likely routes of exposure

Ingestion	Ingestion may cause irritation and malaise.
Inhalation	Breathing of high concentrations may cause dizziness, light-headedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness.
Skin contact	Causes skin irritation. Repeated exposure may cause skin dryness or cracking. May be absorbed through the skin.
Eye contact	May cause eye irritation on direct contact.
Symptoms related to the physical, chemical and toxicological characteristics	Skin irritation. Dermatitis. Irritation of eyes and mucous membranes. Irritation of nose and throat.

Information on toxicological effects

Acute toxicity	Human evidence indicates that the product has very low acute oral, dermal or inhalation toxicity. However, it can produce severe injury if taken into the lung as a liquid, and there may be profound central nervous system depression following prolonged exposure to high levels of vapor. Suffocation (asphyxiant) hazard - if allowed to accumulate to concentrations that reduce oxygen below safe breathing levels. Breathing of high concentrations may cause dizziness, light-headedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness. Irritant effect on skin. May irritate and cause stomach pain, vomiting, diarrhea and nausea.

Components	**Species**	**Test Results**
Benzene (CAS 71-43-2)		
Acute		
Oral		
LD50	Rat	930 mg/kg
Cyclohexane (CAS 110-82-7)		
Acute		
Oral		
LD50	Rat	12705 mg/kg
Toluene (CAS 108-88-3)		
Acute		
Dermal		
LD50	Rabbit	14.1 ml/kg

Components Species		Test Results
Inhalation		49000 mg/m³, 4 Hours
LC50	Rat	
Oral		636 mg/kg
LD50	Rat	
Xylene (CAS 1330-20-7)		
Acute		
Oral		4300 mg/kg
LD50	Rat	

Skin corrosion/irritation Causes skin irritation. Pre-existing skin conditions including dermatitis might be aggravated by exposure to this product.

Serious eye damage/eye irritation May cause eye irritation on direct contact.

Respiratory sensitization Not classified.

Skin sensitization Not a skin sensitizer.

Germ cell mutagenicity May cause genetic defects.

Carcinogenicity May cause cancer.

IARC Monographs. Overall Evaluation of Carcinogenicity

Benzene (CAS 71-43-2)	1 Carcinogenic to humans.
Toluene (CAS 108-88-3)	3 Not classifiable as to carcinogenicity to humans.
Xylene (CAS 1330-20-7)	3 Not classifiable as to carcinogenicity to humans.

NTP Report on Carcinogens

Benzene (CAS 71-43-2)	Known To Be Human Carcinogen.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Benzene (CAS 71-43-2)	Cancer hazard.

Reproductive toxicity Not classified.

Specific target organ toxicity - single exposure May cause drowsiness or dizziness.

Specific target organ toxicity - repeated exposure No information about adverse effects due to exposure.

Aspiration hazard Droplets of the product aspirated into the lungs through ingestion or vomiting may cause a serious chemical pneumonia.

Chronic effects Prolonged or repeated contact with skin may cause redness, itching, irritation, eczema/chapping and oil acne. May cause damage to the liver.

Further information Components of the product may be absorbed into the body through the skin.

12. Ecological information

Ecotoxicity Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Components		Species	Test Results
Benzene (CAS 71-43-2)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	8.76 - 15.6 mg/l, 48 Hours
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)	5 mg/l, 96 Hours
Cyclohexane (CAS 110-82-7)			
Aquatic			
Fish	LC50	Fathead minnow (Pimephales promelas)	3.961 - 5.181 mg/l, 96 hours
Toluene (CAS 108-88-3)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	5.46 - 9.83 mg/l, 48 hours
Fish	LC50	Coho salmon,silver salmon (Oncorhynchus kisutch)	5.5 mg/l, 96 hours
Xylene (CAS 1330-20-7)			
Aquatic			
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)	8 mg/l, 96 Hours

Persistence and degradability Expected to be inherently biodegradable.

Bioaccumulative potential	Has the potential to bioaccumulate.

Partition coefficient n-octanol / water (log Kow)

Benzene	2.13
Toluene	2.73
Xylene	3.2
Cyclohexane	3.44

Mobility in soil	Based on the calculation model the product has a low potential of being absorbed in the soil.
Mobility in general	The product is insoluble in water. It will spread on the water surface while some of the components will eventually sediment in water systems. The volatile components of the product will spread in the atmosphere.
Other adverse effects	The product contains volatile organic compounds which have a photochemical ozone creation potential. Oil spills are generally hazardous to the environment.

13. Disposal considerations

Disposal instructions	Dispose in accordance with all applicable regulations. This material and/or its container must be disposed of as hazardous waste.
Local disposal regulations	Dispose of in accordance with local regulations.
Hazardous waste code	D001
Waste from residues / unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Not available.

14. Transport information

DOT

Shipping Description	UN1268, Petroleum Distillates, n.o.s., 3, I (natural gasoline)
Special precautions for user	Not available.
Labels required	3
Special provisions	144, T11, TP1, TP8
Packaging exceptions	49 CFR 173.150
Packaging non bulk	49 CFR 173.201
Packaging bulk	49 CFR 173.243

IATA

Shipping Description	UN1268, Petroleum Distillates, n.o.s., 3, I (natural gasoline)
Environmental hazards	No
Labels required	3
Special Provision	A3
ERG Code	3H
Special precautions for user	Not available.

IMDG

UN number	UN1268, Petroleum Distillates, n.o.s., 3, I (natural gasoline)
Environmental hazards	
Marine pollutant	No
Labels required	3
EmS	F-E, S-E
Special precautions for user	Not available.
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	No information available.

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard 29 CFR 1910.1200 (OSHA) and 8 CCR § 5194 (Cal/OSHA).
All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Benzene (CAS 71-43-2)	29 CFR 1910.1028

CERCLA Hazardous Substance List (40 CFR 302.4)

Benzene (CAS 71-43-2)	LISTED
Cyclohexane (CAS 110-82-7)	LISTED
Toluene (CAS 108-88-3)	LISTED
Xylene (CAS 1330-20-7)	LISTED

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - Yes
Delayed Hazard - Yes
Fire Hazard - Yes
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance No

SARA 311/312 Hazardous chemical Yes

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Benzene (CAS 71-43-2)
Toluene (CAS 108-88-3)
Xylene (CAS 1330-20-7)

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

Drug Enforcement Administration (DEA). List 2, Essential Chemicals (21 CFR 1310.02(b) and 1310.04(f)(2) and Chemical Code Number

Toluene (CAS 108-88-3)	6594

Drug Enforcement Administration (DEA). List 1 & 2 Exempt Chemical Mixtures (21 CFR 1310.12(c))

Toluene (CAS 108-88-3)	35 %WV

DEA Exempt Chemical Mixtures Code Number

Toluene (CAS 108-88-3)	594

Food and Drug Administration (FDA) Not regulated.

US state regulations WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

US. Massachusetts RTK - Substance List

Benzene (CAS 71-43-2)
Cyclohexane (CAS 110-82-7)
Toluene (CAS 108-88-3)
Xylene (CAS 1330-20-7)

US. New Jersey Worker and Community Right-to-Know Act

Benzene (CAS 71-43-2)	500 LBS
Cyclohexane (CAS 110-82-7)	500 LBS
Toluene (CAS 108-88-3)	500 LBS
Xylene (CAS 1330-20-7)	500 LBS

US. Pennsylvania RTK - Hazardous Substances

Benzene (CAS 71-43-2)
Cyclohexane (CAS 110-82-7)
Toluene (CAS 108-88-3)
Xylene (CAS 1330-20-7)

US. Rhode Island RTK

Benzene (CAS 71-43-2)
Cyclohexane (CAS 110-82-7)
Toluene (CAS 108-88-3)
Xylene (CAS 1330-20-7)

US. California Proposition 65

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

Benzene (CAS 71-43-2)
Toluene (CAS 108-88-3)

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemical Inventory (KECI)	Yes
New Zealand	New Zealand Inventory (NZIoC)	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s)

16. Other information, including date of preparation or last version

Issue date	10-04-2012
Revision date	-
Version #	01
Further information	Not available.
References	IARC Monographs. Overall Evaluation of Carcinogenicity (Volumes 1-102) Registry of Toxic Effects of Chemical Substances (RTECS)
Disclaimer	This information is provided without warranty. The information is believed to be correct. This information should be used to make an independent determination of the methods to safeguard workers and the environment.

ATTACHMENT I

Emission Units Table

Attachment I

Emission Units Table

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

Emission Unit ID[1]	Emission Point ID[2]	Emission Unit Description	Year Installed/ Modified	Design Capacity	Type[3] and Date of Change	Control Device[4]
006-01	LOAD (uncaptured emissions) VS-1 (when VRU is down)	Truck and Rail Car Loading Operations at Galmish and the NGL unloading area. Loading of i-butane, n-butane, natural gasoline and propane at Galmish, Loading of natural gasoline at NGL unloading area.	2010-2012	550 gpm each	Modified	C-1 (n-butane, i-butane, natural gasoline railcar loading only)
007-01	FUG	Plant wide Fugitive Emissions (includes HECS, slug catcher, Galmish loading and NGL unloading)	2012	N/A	Modified	N/A
007-01	VS-1	Plant wide Vented Emissions (includes analyzer bleeds, drains)	1951, 2015	N/A	None	N/A
V-2195	V-2195	HECS Knockout tank	2002	2,936 gallon	None	N/A
C-1	C-1	Vapor Recovery Unit (VRU)	2012		New	N/A

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

ATTACHMENT J

Emission Points Data Summary Sheet

Attachment J
EMISSION POINTS DATA SUMMARY SHEET

Table 1: Emissions Data															
Emission Point ID No. *(Must match Emission Units Table & Plot Plan)*	Emission Point Type[1]	Emission Unit Vented Through This Point *(Must match Emission Units Table & Plot Plan)*		Air Pollution Control Device *(Must match Emission Units Table & Plot Plan)*		Vent Time for Emission Unit *(chemical processes only)*		All Regulated Pollutants - Chemical Name/CAS[3] *(Speciate VOCs & HAPS)*	Maximum Potential Uncontrolled Emissions [4]		Maximum Potential Controlled Emissions [5]		Emission Form or Phase *(At exit conditions, Solid, Liquid or Gas/Vapor)*	Est. Method Used [6]	Emission Concentration [7] (ppmv or mg/m[4])
		ID No.	Source	ID No.	Device Type	Short Term[2]	Max (hr/yr)		lb/hr	ton/yr	lb/hr	ton/yr			
LOAD VS-1 (when VRU down)	vertical upward stack	006-01	Railcar Loading	C-1	VRU	NA	NA	VOC HAPs Toluene Benzene Xylene	371.37 2.02 1.02 0.61 0.39	1626.59 8.85 4.46 2.67 1.72	30.15 0.13 0.06 0.04 0.02	132.07 0.55 0.28 0.17 0.11	Gas/Vapor	O[A]	
LOAD	N/A	006-01	Truck Loading	NA	NA	NA	NA	VOC HAPs Toluene Benzene Xylene	52.35 0.01 <0.01 <0.01 <0.01	229.30 0.03 0.01 0.01 0.01	52.35 0.01 <0.01 <0.01 <0.01	229.30 0.03 0.01 0.01 0.01	Gas/Vapor	O[A]	
FUG	N/A	007-01	Plant wide Fugitive Emissions	NA	NA	NA	NA	VOC HAPs CO2e n-hexane		163.08 2.81 3,323 2.81		163.08 2.81 3,323 2.81	Gas/Vapor	O[B]	
V-2195	vertical upward stack	V-2195	Knockout Tank	NA	NA	NA	NA	VOC HAPs CO2e n-hexane		4.49 0.11 3,547 0.11		4.49 0.11 3,547 0.11	Gas/Vapor	O[C]	
VS-1	vertical upward stack	007-01	Vented emissions from facility	NA	NA	NA	NA	VOC CO2e		19.23 20.30		19.23 20.30	Gas/Vapor	O[C]	

A - DTI emission factor.
B - 1995 Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017)
C – Mass balance

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

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

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

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

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

batch).

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

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

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

Attachment J
EMISSION POINTS DATA SUMMARY SHEET

Table 2: Release Parameter Data								
Emission Point ID No. *(Must match Emission Units Table)*	Inner Diameter (ft.)	Exit Gas			Emission Point Elevation (ft)		UTM Coordinates (km)	
		Temp. (°F)	Volumetric Flow [1] (acfm) *at operating conditions*	Velocity (fps)	Ground Level *(Height above mean sea level)*	Stack Height [2] *(Release height of emissions above ground level)*	Northing	Easting
VS-1		varies	varies	varies				
V-2195		varies	varies	varies				

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

ATTACHMENT K

Fugitive Emissions Data Summary Sheet

Attachment K

FUGITIVE EMISSIONS DATA SUMMARY SHEET

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

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

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

FUGITIVE EMISSIONS SUMMARY	All Regulated Pollutants - Chemical Name/CAS [1]	Maximum Potential Uncontrolled Emissions [2]		Maximum Potential Controlled Emissions [3]		Est. Method Used [4]
		lb/hr	ton/yr	lb/hr	ton/yr	
Haul Road/Road Dust Emissions Paved Haul Roads						
Unpaved Haul Roads						
Storage Pile Emissions						
Loading/Unloading Operations	VOC HAP Toluene Benzene Xylene	N/A	1855.89 8.88 4.47 2.68 1.73	N/A	361.37 0.58 0.29 0.18 0.11	EE
Wastewater Treatment Evaporation & Operations						
Equipment Leaks	VOC HAP n-hexane CO_2e	N/A	163.08 2.81 2.81 3323	N/A	163.08 2.81 2.81 3323	O (EPA Factors)
General Clean-up VOC Emissions						
Other						

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

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

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

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

ATTACHMENT L

Emissions Unit Data Sheet

Attachment L
EMISSIONS UNIT DATA SHEET
BULK LIQUID TRANSFER OPERATIONS

Furnish the following information for each new or modified bulk liquid transfer area or loading rack, as shown on the *Equipment List Form* and other parts of this application. This form is to be used for bulk liquid transfer operations such as to and from drums, marine vessels, rail tank cars, and tank trucks.

Identification Number (as assigned on *Equipment List Form*): Emission Unit ID: 006/01, Emission Point ID: LOAD	
1. Loading Area Name: Galmish Loading Facility	
2. Type of cargo vessels accommodated at this rack or transfer point (check as many as apply): Drums Marine Vessels ☒Rail Tank Cars ☒Tank Trucks	
3. Loading Rack or Transfer Point Data: Emission Point ID: LOAD	
Number of pumps	
Number of liquids loaded	4
Maximum number of marine vessels, tank trucks, tank cars, and/or drums loading at one time	
4. Does ballasting of marine vessels occur at this loading area? Yes No ☒ Does not apply	
5. Describe cleaning location, compounds and procedure for cargo vessels using this transfer point: N/A	
6. Are cargo vessels pressure tested for leaks at this or any other location? ☐Yes ☒No If YES, describe:	

7. Projected Maximum Operating Schedule (for rack or transfer point as a whole):

Maximum	Jan. - Mar.	Apr. - June	July - Sept.	Oct. - Dec.
hours/day	24	24	24	24
days/week	7	7	7	7
weeks/quarter	13	13	13	13

8. Bulk Liquid Data *(add pages as necessary): GALMISH RAIL CAR LOADING*							
Pump ID No.							
Liquid Name		i-butane	n-butane	Propane	Natural Gasoline		
Max. daily throughput (1000 gal/day)							
Max. annual throughput (1000 gal/yr)		43,200	21,440	16,320	34,800		
Loading Method [1]		SUB	SUB	SUB	SUB		
Max. Fill Rate (gal/min)		550	550	550	550		
Average Fill Time (min/loading)		Varies	Varies	Varies	Varies		
Max. Bulk Liquid Temperature (ºF)							
True Vapor Pressure [2]							
Cargo Vessel Condition [3]							
Control Equipment or Method [4]		O (VRU)	O (VRU)	VB	O (VRU)		
Minimum control efficiency (%)		95%	95%	100%	95%		
Maximum Emission Rate	Loading (lb/hr)						
	Annual (lb/yr)	58,599	119,383	12,077	74,071		
Estimation Method [5]		O (2011 Title V PTE Emission Factor), includes vapor displacement and loading arm losses					

[1] BF = Bottom Fill SP = Splash Fill SUB = Submerged Fill

[2] At maximum bulk liquid temperature

[3] B = Ballasted Vessel, C = Cleaned, U = Uncleaned (dedicated service), O = other (describe)

[4] List as many as apply (complete and submit appropriate *Air Pollution Control Device Sheets*):CA = Carbon Adsorption LOA = Lean Oil AdsorptionCO = Condensation
SC = Scrubber (Absorption)CRA = Compressor-Refrigeration-Absorption
TO = Thermal Oxidation or Incineration
CRC = Compression-Refrigeration-Condensation VB = Dedicated Vapor Balance (closed system)
O = other (descibe)

[5] EPA = EPA Emission Factor as stated in AP-42
MB = Material Balance
TM = Test Measurement based upon test data submittal
O = other (describe)

8. Bulk Liquid Data *(add pages as necessary): TRUCK LOADING (GALMISH & NGL Unloading Areas)*							
Pump ID No.							
Liquid Name		GALMISH: n-butane	GALMISH: i-butane	GALMISH: Propane	NGL Unloading Area: Natural Gasoline		
Max. daily throughput (1000 gal/day)							
Max. annual throughput (1000 gal/yr)		1,600	800	16,000	435		
Loading Method [1]		SP	SP	SP	BF		
Max. Fill Rate (gal/min)							
Average Fill Time (min/loading)		Varies	Varies	Varies	Varies		
Max. Bulk Liquid Temperature (°F)							
True Vapor Pressure [2]							
Cargo Vessel Condition [3]							
Control Equipment or Method [4]		N/A	N/A	N/A	N/A		
Minimum control efficiency (%)		N/A	N/A	N/A	N/A		
Maximum Emission Rate	Loading (lb/hr)						
	Annual (lb/yr)	284,700	142,350	27,560	3998		
Estimation Method [5]		O (2013 PTE Emission Factor)					

[1] BF = Bottom Fill SP = Splash Fill SUB = Submerged Fill

[2] At maximum bulk liquid temperature

[3] B = Ballasted Vessel, C = Cleaned, U = Uncleaned (dedicated service), O = other (describe)

[4] List as many as apply (complete and submit appropriate *Air Pollution Control Device Sheets*):CA = Carbon Adsorption LOA = Lean Oil AdsorptionCO = Condensation
SC = Scrubber (Absorption)CRA = Compressor-Refrigeration-Absorption
TO = Thermal Oxidation or Incineration
CRC = Compression-Refrigeration-Condensation VB = Dedicated Vapor Balance (closed system)
O = other (descibe)

[5] EPA = EPA Emission Factor as stated in AP-42
MB = Material Balance
TM = Test Measurement based upon test data submittal

O = other (describe)

9. **Proposed Monitoring, Recordkeeping, Reporting, and Testing** Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.	
MONITORING Initial leak detection using Method 21 or alternative (e.g., FLIR camera) and monthly audio, visual, olfactory inspections thereafter of the closed vent system.	RECORDKEEPING Date, duration, cause and corrective action for periods when the VRU is not operating while loading operations are occurring at Galmish or when vapors are released to the atmosphere (e.g., vent stack).. Maintain records of leak detection and repair information.
REPORTING None	TESTING None
MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.	
RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.	
REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.	
TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.	
10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty	

Attachment L
EMISSIONS UNIT DATA SHEET
CHEMICAL PROCESS

For chemical processes please fill out this sheet and all supplementary forms (see below) that apply. Please check all supplementary forms that have been completed.

☐ *Emergency Vent Summary Sheet*
☒ *Leak Sources Data Sheet*
☐ *Toxicology Data Sheet*
☐ *Reactor Data Sheet*
☐ *Distillation Column Data Sheet*

1. Chemical process area name and equipment ID number (as shown in *Equipment List Form*)
   Description: Plant wide Fugitive Emissions-Components in natural gas and light liquid service
   Emission Unit ID: 007-01 Emission Point ID: FUG

2. Standard Industrial Classification Codes (SICs) for process(es)
   1321

3. List raw materials and ☐ attach MSDSs
   Natural gas and natural gas liquids

4. List Products and Maximum Production and ☐ attach MSDSs

Description and CAS Number	Maximum Hourly (lb/hr)	Maximum Annual (ton/year)
VOC		163.08
HAP		2.81
CO_{2e}		3,323

5. Complete the *Emergency Vent Summary Sheet* for all emergency relief devices.

6. Complete the *Leak Source Data Sheet* and describe below or attach to application the leak detection or maintenance program to minimize fugitive emissions. Include detection instruments, calibration gases or methods, planned inspection frequency, and record-keeping, and similar pertinent information. If subject to a rule requirement (e.g. 40CFR60, Subpart VV), please list those here.

   The extraction facility is already subject to requirements under 40CFR60, Subpart KKK which incorporates by reference parts of 40CFR60, Subpart VV.

7. Clearly describe below or attach to application Accident Procedures to be followed in the event of an accidental spill or release.

   In the event of an accidental spill or release, personnel will be protected, emergency response personnel will be notified and immediate steps to stop the spill or release will be implemented. More details are contained in the Emergency Repsonse Manual.

8A. Complete the *Toxicology Data Sheet* or attach to application a toxicology report (an up-to-date material safety data sheets (MSDS) may be used) outlining the currently known acute and chronic health effects of each compound or chemical entity emitted to the air. If these compounds have already been listed in Item 3, then a duplicate MSDS sheet is not required. Include data such as the OSHA time weighted average (TWA) or mutagenicity, teratogenicity, irritation, and other known or suspected effects should be addressed. Indicate where these are unknown, and provide references.

8B. Describe any health effects testing or epidemiological studies on these compounds that are being or may be conducted by the company or required under TSCA, RCRA or other federal regulations. Discuss the persistence in the environment of any emission (e.g. pesticides, etc.).

9. **Waste Products** - Waste products status: (If source is subject to RCRA or 45CSR25, please contact the Hazardous Waste Section of WVDEP, OAQ at (304) 926-3647.)

9A. Types and amounts of wastes to be disposed:

9B. Method of disposal and location of waste disposal facilities:

Carrier: Phone:

9C. Check here if approved USEPA/State Hazardous Waste Landfill will be used ☐

10. Maximum and Projected Typical Operating Schedule for process or project as a whole (circle appropriate units).

circle units:	(hrs/day) (hr/batch)	(days), (batches/day), (batches/week)	(days/yr), (weeks/year)
10A. Maximum	24 hrs/day	7 days/week	365 days/year
10B. Typical			

11. Complete a *Reactor Data Sheet* for each reactor in this chemical process.

12. Complete a *Distillation Column Data Sheet* for each distillation column in this chemical process.

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

MONITORING	RECORDKEEPING
As specified in permit requirements under 40CFR60, Subpart KKK.	As specified in permit requirements under 40CFR60, Subpart KKK.
REPORTING	**TESTING**
As specified in permit requirements under 40CFR60, Subpart KKK.	As specified in permit requirements under 40CFR60, Subpart KKK.

MONITORING. Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment operation or air pollution control

RECORDKEEPING. Please describe the proposed recordkeeping that will accompany the monitoring.

REPORTING. Please describe the proposed frequency of reporting of the recordkeeping.

TESTING. Please describe any proposed emissions testing for this process equipment or air pollution control device

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

INFORMATION REQUIRED FOR CHEMICAL PROCESSES

The notes listed below for chemical processes are intended to help the applicant submit a complete application to the OAQ; these notes are not intended to be all inclusive. The requirements for a complete application for a permit issued under 45CSR13 are designed to provided enough information for a permit reviewer to begin a technical review. Additional information beyond that identified may be required to complete the technical review of any individual application.

Process Description

Please keep these points in mind when completing your process description as part of this permit application.

1. Provide a general process overview. This brief, but complete, process description should include chemical or registered trademark names of chemical products, intermediates, and/or raw materials to be produced or consumed, and the ultimate use(s) of the product(s). A list of the various chemical compounds is helpful.
2. Describe <u>each</u> <u>process</u> <u>step</u>. Include the process chemistry and stoichiometrically balanced reaction equation or material mass balance on all components.
3. Describe the methods and equipment used to receive, store, handle, and charge raw materials.
4. Describe the methods and equipment used to handle, store, or package final products and intermediates.
5. Provide process flow diagrams or equipment layout drawings which clearly show the process flow relationships among all pieces of process and control equipment. Identify all air emission discharge points. Discuss instrumentation and controls for the process.
6. Discuss the possibilities of process upsets, the duration and frequency of upsets, and consequences (including air emissions) of these upsets. Include a description of rupture discs, pressure relief valves, and secondary containment systems.
7. Discuss any fugitive emissions and the methods used to minimize them.
8. Include the following plans for the process if available:
   a. preventative maintenance and malfunction abatement plan (recommended for all control equipment).
   b. continuous emissions (in-stack) monitoring plan
   c. ambient monitoring plan
   d. emergency response plan

Regulatory Discussion

The following state and federal air pollution control regulations may be applicable to your chemical process. You should review these regulations carefully to determine if they apply to your process. Please summarize the results of your review in your permit application along with any other regulations you believe are applicable.

- Title 45 Legislative Rule Division of Environmental Protection, Office of Air Quality contains West Virginia's air pollution control regulations, including the following promulgated rules which may require emissions reductions or control technologies for your chemical process:
  a. 45CSR27 - Best Available Technology (BAT) for Toxic Air Pollutants (TAPs)
  b. 45CSR21 - VOC emissions controls for ozone maintenance in Kanawha, Cabell, Putnam, Wayne, and Wood counties.
  c. 45CSR13 (Table 45-13A) - plantwide emission thresholds for permitting for certain pollutants.
- Federal Guidelines for case-by-case MACT determinations under section 112(g) of the 1990 CAAA for individual and total HAPs greater than 10 and 25 tons per year, respectively.
- There are also subparts of the federal Standards of Performance for New Stationary Sources (NSPS), 40CFR60 60, and the National Emission Standards for Hazardous Air Pollutants (NESHAP) at 40CFR61 and 40CFR63, which apply to various chemical and nonchemical processes. These subparts are too numerous to list here, but these areas of the federal regulations should be consulted carefully to determine applicability to your process.

Emissions Summary and Calculations

Please keep these points in mind when submitting your emissions calculations as part of this permit application.

1. For each pollutant, provide the basis for the emissions estimate and for all emission reduction(s) or control efficiency(ies) claimed.
2. For all <u>batch</u> processes provide the following
   a. Emissions of each pollutant in pound(s) per batch, from each process step
   b. Annual emissions based on number of batches requested per year
   c. The total time for each process step and the duration of the emissions during the process step
   d. Total batch time, total emissions per batch (or per day), and annual emissions based on the number of batches requested per year.

LEAK SOURCE DATA SHEET

Source Category	Pollutant	Number of Source Components[1]	Number of Components Monitored by Frequency[2]	Average Time to Repair (days)[3]	Estimated Annual Emission Rate (lb/yr)[4]
Pumps[5]	light liquid VOC[6,7]	53			11,353 (EPA)
	heavy liquid VOC[8]				
	Non-VOC[9]				
Valves[10]	Gas VOC	1,054			12,652 (EPA)
	Light Liquid VOC	5,175			239,715 (EPA)
	Heavy Liquid VOC				
	Non-VOC				
Safety Relief Valves[11]	Gas VOC	169			60,860 (EPA)
	Non VOC				
Open-ended Lines[12]	VOC				
	Non-VOC				
Sampling Connections[13]	VOC				
	Non-VOC				
Compressors	VOC	2			1,579 (EPA)
	Non-VOC				
Flanges	VOC				
	Non-VOC				
Other	VOC				
	Non-VOC				

[1 - 13] See notes on the following page.

Notes for Leak Source Data Sheet

1. For VOC sources include components on streams and equipment that contain greater than 10% w/w VOC, including feed streams, reaction/separation facilities, and product/by-product delivery lines. Do not include certain leakless equipment as defined below by category.

2. By monitoring frequency, give the number of sources routinely monitored for leaks, using a portable detection device that measures concentration in ppm. Do not include monitoring by visual or soap-bubble leak detection methods. "M/Q(M)/Q/SA/A/O" means the time period between inspections as follows:

   Monthly/Quarterly, with Monthly follow-up of repaired leakers/Quarterly/Semi-annual/Annually/Other (specify time period)

   If source category is not monitored, a single zero in the space will suffice. For example, if 50 gas-service valves are monitored quarterly, with monthly follow-up of those repaired, 75 are monitored semi-annually, and 50 are checked bimonthly (alternate months), with non checked at any other frequency, you would put in the category “valves, gas service:” 0/50/0/75/0/50 (bimonthly).

3. Give the average number of days, after a leak is discovered, that an attempt will be made to repair the leak.

4. Note the method used: MB - material balance; EE - engineering estimate; EPA - emission factors established by EPA (cite document used); O - other method, such as in-house emission factor (specify).

5. Do not include in the equipment count sealless pumps (canned motor or diaphragm) or those with enclosed venting to a control device. (Emissions from vented equipment should be included in the estimates given in the Emission Points Data Sheet.)

6. Volatile organic compounds (VOC) means the term as defined in 40 CFR □51.100 (s).

7. A light liquid is defined as a fluid with vapor pressure equal to or greater than 0.04 psi (0.3 Kpa) at 20°C. For mixtures, if 20% w/w or more of the stream is composed of fluids with vapor pressures greater than 0.04 psi (0.3 Kpa) at 20 °C, then the fluid is defined as a light liquid.

8. A heavy liquid is defined as a fluid with a vapor pressure less than 0.04 psi (0.3 Kpa) at 20°C. For mixtures, if less than 20% w/w of the stream is composed of fluids with vapor pressures greater than 0.04 psi (0.3 Kpa) at 20 °C, then the fluid is defined as a heavy liquid.

9. LIST CO, H_2S, mineral acids, NO, NO_2, SO_3, etc. DO NOT LIST CO_2, H_2, H_2O, N_2, O_2, and Noble Gases.

10. Include all process valves whether in-line or on an open-ended line such as sample, drain and purge valves. Do not include safety-relief valves, or leakless valves such as check, diaphragm, and bellows seal valves.

11. Do not include a safety-relief valve if there is a rupture disk in place upstream of the valve, or if the valve vents to a control device.

12 Open-ended lines include purge, drain and vent lines. Do not include sampling connections, or lines sealed by plugs, caps, blinds or second valves.

13. Do not include closed-purge sampling connections.

ATTACHMENT M

Air Pollution Control Device Sheet

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

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

Equipment Information

1. Manufacturer: ARIEL Model No. JGK/2-1-2	2. Control Device Name: Vapor Recovery Unit (VRU) Type: Vapor Recovery Unit (VRU)
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected: VOC Control Efficiency: 95%	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: 36,000,000 SCF/YR	10. Capacity:
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any. See attached information	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal.	

Gas Stream Characteristics

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

15. Inlet Emission stream parameters:	**Maximum**	**Typical**
Pressure (mmHg):	See attached information	
Heat Content (BTU/scf):		
Oxygen Content (%):		
Moisture Content (%):		
Relative Humidity (%):		

16. Type of pollutant(s) controlled: ☐ SO_x ☐ Odor
☐ Particulate (type): ☒ Other: VOCs

17. Inlet gas velocity: ft/sec

18. Pollutant specific gravity:

19. Gas flow into the collector:
ACF @ °F and PSIA

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

21. Gas flow rate:
Design Maximum: ACFM
Average Expected: ACFM

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

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

Pollutant	IN Pollutant		Emission Capture Efficiency %	OUT Pollutant		Control Efficiency %
	lb/hr	grains/acf		lb/hr	grains/acf	
A: VOC	See Attached		98.7%	See Att. N		95%
B						
C						
D						
E						

24. Dimensions of stack: N/A Height ft. Diameter ft.

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

Particulate Distribution

26. Complete the table:

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

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):

28. Describe the collection material disposal system:

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

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

MONITORING: Initial leak detection using Method 21 or alternative (e.g., FLIR camera) and monthly audio, visual, olfactory inspections thereafter of the closed vent system.	RECORDKEEPING: Date, duration, cause and corrective action for periods when the VRU is not operating while loading operations are occurring at Galmish or when vapors are released to the atmosphere (e.g., vent stack).. Maintain records of leak detection and repair information.
REPORTING: None	TESTING: None

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

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

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

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

Dominion Transmission, Inc.

Galmish Vapor Recovery Project

RECIPROCATING COMPRESSOR

JOB NO. 2008-430 ITEM NO. C-3500

PURCHASE ORDER NO. 70224157

SPECIFICATION NO.

REVISION NO. 0 DATE 25-Jan-11

PAGE 1 OF (17 + 4) BY DAH / FYW

1 APPLICABLE TO: ○ PROPOSALS ● PURCHASE ○ AS BUILT

2 FOR/USER DOMINION TRANS. SITE/LOCATION Galmish/Pine Grove, WV SERVICE Vapor Recovery NO. REQ'D One (1)

3 NOTE: ○ INDICATES INFO. TO BE COMPLETED BY PURCH. ☐ BY MANUFACTURER WITH PROPOSAL ◊ BY MANUFACTURER AFTER ORDER ○ BY MANUFACTURER OR PURCHASER AS APPLICABLE

5 COMPR. MFGR ARIEL TYPE MODEL NO(S) JGK/2-1-2 SERIAL NO(S) *

6 COMPR.THROWS: TOTAL NO. 2 NO. WITH CYLS. 2 NOMINAL FRAME RATING 400 BHP @ RATED RPM OF 900

7 ☐ MAX/MIN ALLOWABLE SPEED 990 / 395 RPM

8 DRIVER MFGR. TOSHIBA; Model 8J4400L148115 DRIVER NAMEPLATE HP/OPERATING RPM 400 / 1200 TO 90

9 DRIVE SYSTEM: ● DIRECT COUPLED ○ GEARED & COUPLED ○ V-BELT

10 TYPE OF DRIVER: ● IND. MOTOR ○ SYN. MOTOR ○ STEAM TURBINE ○ GAS TURBINE ○ ENGINE ● OTHER VFD

11 NO NEGATIVE TOLERANCE APPLIES: ● YES - PURCHASER TO FILL IN "REQUIRED CAPACITY" LINES. CYLINDERS: ● LUBE

12 (NNT) ○ NO - PURCHASER TO FILL IN "MFGR.'S RATED CAP." LINES ○ NON-LUBE

13 ○ MAX ACCEPTABLE AVG PISTON SPEED FT/MIN

14 **OPERATING CONDITIONS (EACH MACHINE)**

15	● SERVICE OR ITEM NO.	Iso-butane	N-butane	Propane Vapor	Propane Vapor	Nat. Gas	
16	● STAGE	Inlet	Inlet	Inlet	Inlet	Inlet	
17	● NORM. OR ALT. CONDITION	Normal	Normal	Normal	Alt.	Alt.	
18	● CERTIFIED PT. (X) MARK ONE			X			
19	● MOLECULAR WEIGHT	58.1	58.1	42.1	42.1	17.9	
20	● Cp/Cv (K) @ 150°F OR °F	See #A	See #B	See #C	See #D	1.34	

21 **INLET CONDITIONS:** AT INLET TO: ● PULSE DEVICES ○ COMPRESSOR CYLINDER FLANGES

22 NOTE: ○ SIDE STREAM TO STAGE(S), THESE INLET PRESS. ARE FIXED

23	● PRESSURE (PSIA) @ PUL. SUPP. INLET	See #A	See #B	See #C	See #D	19.3	
24	○ PRESSURE (PSIA) @ CYL. FLANGE						
25	● TEMPERATURE (°F)	See #A	See #B	See #C	See #D	100	
26	○ REF: SIDE STREAM TEMPS (°F)						
27	☐ COMPRESSIBILITY (Z_s)						

28 **INTERSTAGE:** INTERSTAGE Δ P INCL: ● PULSE DEVICES ● PIPING ● COOLERS ● SEPARATORS ○ OTHER

29 ○ Δ P BETWEEN STAGES, %/psi / / / / /

30 **DISCHARGE CONDITIONS:** AT OUTLET FROM: ● PULSE DEVICE ○ COMP. CYL. FLANGES ○ OTHER

31	○ PRESSURE (PSIA) @ CYL. FLANGE						
32	● PRESS. (PSIA) @ PUL. SUPP. OUTLET	104	104	294	294	294	
33	☐ TEMP., ADIABATIC, °F						
34	☐ TEMP., PREDICTED, °F						
35	☐ COMPRESSIBILITY (Z_2) OR (Z_{AVG})						

36 *** REQUIRED CAPACITY,** RATED FOR PROCESS, AT INLET TO COMPRESSOR, NO NEGATIVE TOLERANCE (-0%)

37	● LBS/HR CAPACITY SPECIFIED						
38	IS ● WET ○ DRY	See #A	See #B	See #C	See #D	Quote in Bid	
39	○ MMSCFD/SCFM (14.7 PSIA & 60°F)						

40 *** MFGR.'S RATED CAPACITY** (AT INLET TO COMPRESSOR) & BHP @ CERTIFIED TOLERANCE OF ±3% FOR CAP. & ±3% FOR BHP

41	○ LBS/HR CAPACITY SPECIFIED						
42	IS ○ WET ○ DRY	Per bid perf. info in Cases 1 to 7.	Per bid perf. info in Cases 8 to 12.	Per bid perf. info in Cases 13 to 31.	Per bid perf. info in Cases 32 to 52.	Provide after APO.	
43	○ ICFM						
44	○ MMSCFD/SCFM (14.7 PSIA & 60°F)						
45	☐ BHP/STAGE						
46	☐ TOTAL BHP @ COMPRESSOR SHAFT						
47	☐ TOTAL HP INCLUDING						
48	V-BELT & GEAR LOSSES						

49 *** CAPACITY FOR NNT**

50 MANUFACTURER'S = REQUIRED ÷ 0.97

51 THEREFORE REQUIRED = MFR'S x 0.97

REMARKS:

1) Performance information cited above is per Dearing's Compr. "H2W_DTI_Galmish_VRU _JGK2 - REVD.run" & "…pdf" for package 2 include in RD: DH email of 201101122.

Dominion Transmission, Inc.

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GAS ANALYSIS AT OPERATING CONDITIONS
MOLE % (BY VOLUME) ONLY

● SERVICE/ITEM NO.			iC4	nC4	C3	C3	NG
● STAGE			Inlet	Inlet	Inlet	Inlet	Inlet
● NORMAL OR ALT			Norm.	Norm.	Norm.	Alt.	Alt.
		M.W.					
AIR		28.966					
OXYGEN	O_2	32.000					
NITROGEN	N_2	28.016					1.153
WATER VAPOR	H_2O	18.016			0.001	0.001	
CARBON MONOX.	CO	28.010					
CARBON DIOX.	CO_2	44.010			0.001	0.001	0.098
HYDRO. SULFIDE	H_2S	34.076					
HYDROGEN	H_2	2.016					
METHANE	CH_4	16.042			0.183	0.196	86.87
ETHYLENE	C_2H_4	28.052					
ETHANE	C_2H_6	30.068			13.86	14.19	11.87
PROPYLENE	C_3H_6	42.078					
PROPANE	C_3H_8	44.094	1.156		85.53	85.18	0.011
I-BUTANE	C_4H_{10}	58.120	97.34	3.158	0.425	0.430	
n-BUTANE	C_4H_{10}	58.120	1.503	96.83	0.008	0.008	
I-PENTANE	C_5H_{12}	72.146		0.016			
n-PENTANE	C_5H_{12}	72.146					
HEXANE PLUS							
AMMONIA	NH_3	17.031					
HYDRO. CHLOR.	HCl	36.461					
CHLORINE	Cl_2	70.914					
CHLORIDES - TRACES							
ETHYL MERCAPTAN - TRACES			N/A	N/A	4 ppmv	4 ppmv	N/A
☐ CALCULATED MOL WT.							
☐ Cp/Cv (K) @ 150° OR _____ °F							

NOTE: IF WATER VAPOR AND/OR CHLORIDES ARE PRESENT, EVEN MINUTE TRACES, IN THE GAS BEING COMPRESS'D, IT MUST BE INCLU'D ABOVE.

REMARKS

APPLICABLE SPECIFICATIONS

○ API-618-RECIPROCATING COMPRESSORS FOR PETROLEUM, CHEMICAL AND GAS INDUSTRY SERVICES

NACE MR-O175 (2.14.1.10)

● Ethyl Mercaptan present in Propane @ nominal 4 ppm vol basis

SITE/LOCATION CONDITIONS

ELEVATION 720 FT. BAROMETER 14.3 PSIA AMBIENT TEMPS: MAX 100 °F MIN -20 °F

● MIN DESIGN METAL TEMP -20 °F (2.14.8) RELATIVE HUMIDITY: MAX 100 % MIN 30 %

COMPRESSOR LOCATION: ○ INDOOR ○ HEATED ○ UNHEATED ● AT GRADE LEVEL ○ ELEVATED: _____ FT.

● OUTDOOR ○ NO ROOF ● UNDER ROOF ○ PARTIAL SIDES ○ PLATFORM: ○ ON-SHORE

○ OFF-SHORE ● WEATHER PROTECTION REQ. ○ TROPICALIZATION REQ.

● WINTERIZATION REQUIRED

UNUSUAL CONDITIONS: ○ CORROSIVES ○ DUST ○ FUMES ● OTHER INTERMITTENT SERVICE

ELECTRICAL CLASSIFICATIONS

	HAZARDOUS						NON-HAZRDOUS
MAIN UNIT	●	CLASS 1	GROUP C & D	DIVISION 2			○
L.O. CONSOLE	●	CLASS 1	GROUP C & D	DIVISION 2			○
CW CONSOLE	○	CLASS N/A	GROUP	DIVISION			○

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PART LOAD OPERATING CONDITIONS

CAPACITY CONTROL BY: ○ MFG'S CAP. CONTROL ● PURCHASERS BY-PASS ● BOTH ● OTHER VARIABLE SPEED - VFD

FOR: ○ PART LOAD COND. ○ START-UP ONLY ● BOTH

WITH: ○ AUTO LOADING DELAY INTERLOCK (3.6.2.2) ○ AUTO IMMEDIATE UNLOADING

USING: ○ FIXED VOLUME POCK. ○ SUCTION VALVE UNLOADERS: ○ FINGER ○ PLUG ○ OTHER

ACTION: ○ DIRECT (AIR-TO-UNLOAD) ○ REVERSE (AIR-TO-LOAD/FAIL SAFE)

NUMBER OF STEPS: ○ ONE ○ THREE ○ FIVE ○ OTHER

○ RAIN COVER REQUIRED OVER UNLOADERS

ALL UNLOADING STEPS BASIS MANUFACTURERS CAPACITY SHOWN ON PAGE 1.

INLET AND DISCHARGE PRESSURE ARE ○ **AT CYLINDER FLANGES** ● **PULSATION SUPPRESSOR FLANGES**

○ SERVICE OR ITEM NO.						
○ STAGE						
○ NORMAL OR ALTERNATE CONDITION						
○ PERCENT CAPACITY						
○ WEIGHT FLOW, LBS/HR						
○ MMSCFD/SCFM (14.7 PSIA & 60°F)						
☐ POCKETS/VALVES OPERATION *						
☐ POCKET CLEARANCE ADDED %						
☐ TYPE UNLOADERS, PLUG/FINGER						
○ INLET TEMPERATURE, °F						
○ INLET PRESSURE, PSIA						
○ DISCHARGE PRESSURE, PSIA						
☐ DISCHARGE TEMP., ADIABATIC °F						
☐ DISCHARGE TEMP., PREDICTED °F						
☐ VOLUMETRIC EFF.,%HE/%CE	/	/	/	/	/	/
☐ CALC. GAS ROD LOAD, LBS, C **						
☐ CALC. GAS ROD LOAD, LBS, T **						
◇ COMB. ROD LOAD, LBS C (GAS & INERTIA)						
◇ COMB. ROD LOAD, LBS T (GAS & INERTIA)						
◇ ROD REV., DEGREES MIN @ X-HD PIN ***						
☐ BHP/STAGE						
☐ TOTAL BHP @ COMPRESSOR SHAFT						
☐ TOTAL HP INCL. V-BELT & GEAR LOSSES						

* SHOW OPERATION WITH THE FOLLOWING SYMBOLS:

HEAD END = HE OR CRANK END = CE PLUS SUCTION VALVE(S) UNLOADED = S OR FIXED POCKET OPEN = F OR VARIABLE POCKET OPEN = V

EXAMPLE: HE-F/CE-S = HEAD END FIXED POCKET OPEN / CRANK END SUCTION VALVE(S) UNLOADED.

* * C = COMPRESSION T = TENSION *** X - HD = CROSSHEAD

☐ MINIMUM PRESSURE REQUIRED TO OPERATE CYLINDER UNLOADING DEVICES, _____ PSIG

CYLINDER UNLOADING MEDIUM: ● AIR ○ NITROGEN ○ OTHER _____

● PRESSURE AVAILABLE FOR CYLINDER UNLOADING DEVICES, MAX/MIN 85 / 60 PSIG

REMARKS, SPECIAL REQUIREMENTS, AND/OR SKETCH

1) COMPRESSOR TRAIN TO BE C/W SKID-MOUNTED SUCTION & DISCHARGE PULSATION SUPPRESSION VESSELS C/W WEDGE SUPPORTS

2) FIXED VOLUME POCKETS & SUCTION VALVE UNLOADERS ARE NOT BE NECESSARY WITH VARIABLE SPEED OPERATION - VFD

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○ **SCOPE OF BASIC SUPPLY**

PURCHASER TO FILL IN (□ ○ ⬡) AFTER COMMODITY TO INDICATE: □ BY COMPR. MFR. ○ BY PURCH. ⬡ BY OTHERS

● DRIVER (■ ○ ⬡): VARIABLE SPEED SPEED RANGE 100% RPM TO 30% RPM
● INDUCTION MOTOR ○ SYNCHRONOUS MOTOR ○ STEAM TURBINE ○ ENGINE ● OTHER VFD
● API-541 ○ API-546 ○ API-611 ○ API-612
○ OUTBOARD BEARING ○ PROVISION FOR DRY AIR PURGE FOR OUTBOARD BEARING.
○ SLIDE BASE FOR DRIVER (□ ○ ⬡) SOLE PLATE FOR DRIVER (□ ○ ⬡)
● MOTOR STARTING EQUIPMENT (■ ● ⬡); DEFINE VFD
○ GEAR (□ ○ ⬡): ○ BASEPLATE FOR GEAR ○ API-613 ○ API-677
● COUPLING(S) (■ ○ ⬡): ● LOW SPD. ○ HI-SPD. ○ QUILL SHAFT ○ KEY-LESS DRV. ○ KEY'D DRV. ● OTHER STD
○ API 671
○ V-BELT DRIVE (□ ○ ⬡): ○ SHEAVES & V-BELTS (□ ○ ⬡) ○ STATIC CONDUCTING V-BELTS ○ BANDED V-BELTS
● DRIVE GUARD(S) (■ ○ ⬡): ● MANUFACTURER'S STD. ● NON-SPARKING ○ CALIF CODE ○ API-671 APPENDIX C
○ OTHER

● PULSATION SUPPRESSORS WITH INTERNALS (■ ○ ⬡): ● INITIAL INLET & FINAL DISCHARGE ● SUPPORTS (■ ○ ⬡)
● INTERSTAGE ● SUPPORTS (■ ○ ⬡)
○ PULSATION SUPPRESSORS WITHOUT INTRNL (□ ○ ⬡): ○ INITIAL INLET & FINAL DISCHARGE ○ SUPPORTS (□ ○ ⬡)
○ INTERSTAGE ○ SUPPORTS (□ ○ ⬡)
○ SUPPRESSOR(S) TO HAVE MOISTURE REMOVAL SECTION: ○ INITIAL INLET ONLY ○ ALL INLET SUPPRESSORS
● ACOUSTICAL SIMUL. STUDY (■ ○ ⬡): DESIGN APPROACH (Check Only One) ● 1, W/SIMPLIFIED ANALYSIS OF PIPING SYSTEM
■ DIGITAL ■ ANALOG ○ 2, SEE 3.9.2.1 AND APPENDIX M
○ 3, SEE 3.9.2.1 AND APPENDIX M
NOTE: SEE APPENDIX N FOR INFORMATION REQUIRED FOR STUDY
STUDY TO CONSIDER: ALL SPECIFIED LOAD COND., INCL. ● SINGLE ACT., PLUS
○ COMP.OPER.IN PARALLEL ● ALTERNATE GASES
○ WITH EXISTING COMP. AND PIPING SYSTEMS
○ STUDY TO BE WITNESSED ○ COMPRESSOR VALVE DYNAMIC RESPONSE
● VENDOR REVIEW OF PURCHASER'S PIPING ARRANGEMENT ○ PULSATION SUPRESS'N DEVICE LOW CYCLE FATIGUE ANALYSIS
○ PIPING SYSTEM FLEXIBILITY

PACKAGED: ○ NO ● YES (■ ○ ⬡) DEFINE BASIC SCOPE OF PACKAGING IN REMARKS SECTION, PAGE 5
● SKID ○ SOLEPLT. ○ BASEPLT. ○ BOLTS OR STUDS FOR SOLEPLT. TO FRAME ○ RAILS ○ CHOCK BLOCKS ○ SHIMS
● SUITABLE FOR COLUMN MOUNTING (UNDER SKID AND/OR BA WITH 4-POINT LIFT OF COMPLETE SKID
● LEVELING SCREWS ● NON-SKID DECKING ○ SUB SOLEPLATES
○ DIRECT GROUTED ○ CEMENTED/MORTAR GROUT ○ EPOXY GROUT; MFG/TYPE _____ / _____
● INTERCLR(S) (□ ● ⬡) ● SEPARATOR(S) (□ ● ⬡) ● AFTERCLR(S) (□ ● ⬡) **INTERCOOLERS:**
● INTERSTAGE PIP. (□ ● ⬡): ○ PIPING MATCHMARKED ○ SHOP FITTED ○ MACHINE MTD.
○ CONDENSATE SEPARATION & COLLECTION FACILITY SYSTEM PER 3.8.12 ● OFF MOUNTED
● INLET STRAINER(S) (■ ○ ⬡): ● INITIAL INLET ○ SIDESTREAM INLET ● SPOOL PIECE FOR INLET STRAINERS
● MANIFOLD PIPING; ● DRAINS ● VENTS ○ RELIEF VALVES ● AIR/GAS SUPPLY **FLANGE FINISH**
● RELIEF VALVE(S) (□ ● ⬡): ● INITIAL INLET ● INTERSTAGE ● FINAL DISCHARGE ● API-618 FLANGE FINISH
○ RUPTURE DISC(S) (□ ○ ⬡) ○ THRU STUDS IN PIPING FLANGES REF 3.9.3.15 > 125 < 250
● CRANKCASE RAPID PRESSURE RELIEF DEVICE(S) (■ ○ ⬡) ○ FLANGE FINISH PER ANSI 16.5
○ SPECIAL PIPING REQUIREMENTS PER 3.7.1.12.24. (DEFINE IN REMARKS SECTION NEXT PAGE) ○ SPECIAL FINISH _____

○ INITIAL INLET, ○ INTERSTAGE SUCTION PIPING ARR'D FOR: ● INSULATION (■ ○ ⬡) ● HEAT TRACING (■ ○ ⬡)
○ FOR ATMOSPHERIC INLET AIR COMPR. ONLY: ○ INLET AIR FILTER (□ ○ ⬡) ○ INLET FILTER -SILENCER (□ ○ ⬡)
● PREFERRED TYPE OF CYLINDER COOLING (■ ○ ⬡): ○ FORCED ○ THERMOSYPHON _____ STAGE CYL'(S)
AIR COOLED CYLINDERS ARE PREFERRED. ○ STATIC (STAND-PIPE) _____ STAGE CYL'(S)
○ CYL. COOLING WATER PIPING (□ ○ ⬡) ○ MATCH M'RKED
○ SINGLE INLET/OUTLET MANIFOLD & VALVES ○ SIGHT GL'SS(ES)
○ INDIVIDUAL INLET/ OUTLET PER CYL. ○ VALVE(S)
○ CLOSED SYS. WITH WATER PUMP, C00LER, SURGE TANK, & PIPING
○ SHOP RUN ○ ARR'D FOR HEATING JACKET AS WELL AS COOLING

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○ **SCOPE OF BASIC SUPPLY (Con't)**

○ SEPARATE COOLING CONSOLE (□ ○ ⬡): ○ ONE FOR EA. UNIT ○ ONE CMMN TO ALL UNITS ○ DUAL PUMPS (AUX .& MAIN)
○ ARRANGED FOR HEATING JACKET WATER AS WELL AS COOLING

FRAME LUBE OIL SYSTEM (■ ○ ⬡): ● AUX. PUMP ● DUAL FILTERS WITH TRANSFER VALVE ● SHOP RUN
● CONTINUOUS FLOW IN SENSING LINE TO PRESSURE SWITCHES

○ SEPARATE LUBE OIL CONSOLE (□ ○ ⬡): ● EXTENDED TO MOTOR OUTBOARD BEARING ● SHOP RUN

API 614 APPLIES (REFER TO NOTE OF 2.12.2) ● NO ○ YES

NOTE: PIPING BETWEEN ALL CONSOLES + COMPRESSOR BY PURCHASER - SEE P&ID #12-HA-209

● CAPACITY CONTROL (■ ● ⬡): ● SEE DATA SHEET PAGE 3 FOR DETAILS ○ IN INSTRUMENT & CONTROL PANEL
○ SEPARATE MACHINE MOUNTED PANEL ● SEPARATE FREE STANDING PANEL
○ PNEUMATIC ○ ELECTRIC ● ELECTRONIC ○ HYDRAULIC
● PROGRAMMABLE CONTROLLER: WILL BE A MODICON QUANTUM PLC LOCATED FREE-STANDING IN A REMOTE NON-CLASSIFIED MCC BUILDING.

● INSTRUMENT & CONTROL PANEL (□ ● ⬡): ● ONE FOR EACH UNIT ○ ONE COMMON TO ALL UNITS
○ MACHINE MOUNTED ● FREE STANDING (OFF UNIT)

SEE INSTRUMENTATION DATA SHEETS FOR DETAILS OF PANEL, ADDITIONAL REMARKS, AND INSTRUMENTATION.

NOTE: ALL TUBING, WIRING, & CONNECTIONS BETWEEN OFF-UNIT FREE STANDING PANELS AND COMPRESSOR UNIT BY PURCHASER.

● HEATERS (■ ○ ⬡): ● FRAME LUBE OIL ● CYL. LUBRICATORS ○ COOLING WATER ● DRIVER(S) ○ GEAR OIL
NOTE (4) ● ELECTRIC ○ STEAM

● BARRING DEVICE (■ ○ ⬡): ● MANUAL ○ PNEUMATIC ○ ELECTRIC ○ FLYWHEEL LOCKING DEVICE (□ ○ ⬡)

○ ROD PRESSURE PACKING COOLING SYSTEM (□ ○ ⬡): ○ SEPARATE CONSOLE ○ FILTERS

○ SPECIAL CORROSION PROTECTION: ○ NO ○ YES ○ MFR'S STANDARD ○ OTHER _____

○ HYDRAULIC TENSIONING TOOLS ○ NO ○ YES

● MECHANICAL RUN TEST: ○ NO ● YES ● MFG'S STANDARD ● OTHER COMPRESSOR & MOTOR
○ COMPLETE SHOP RUN TEST OF ALL MACHINE MOUNTED EQUIPMENT, PIPING & APPURT.'(S)

PAINTING: ● MANUFACTURER'S STANDARD ○ SPECIAL _____

NAMEPLATES: ● U.S. CUSTOMARY UNITS ○ SI UNITS

SHIPMENT: ● DOMESTIC ○ EXPORT ○ EXPORT BOXING REQUIRED (■ ○ ⬡)
● STANDARD 6 MONTH STORAGE PREPARATION (■ ○ ⬡), PER SPEC _____
○ OUTDOOR STORAGE FOR OVER 6 MONTHS (□ ○ ⬡), PER SPEC _____

● INITIAL INSTALLATION AND OPERATING TEMP ALIGNMENT CHECK AT JOBSITE BY VENDOR REPRESENTATIVE

● COMPRESSOR MANUFACTURER'S USER'S LIST FOR SIMILAR SERVICE

● PERFORMANCE DATA REQUIRED PER 5.3.3: ● BHP VS. SUCTION PRESSURE CURVES
○ ROD LOAD/GAS LOAD CHARTS
○ VALVE FAILURE DATA CHARTED
● SPEED/TORQUE CURVE DATA

● BHP VS. CAPACITY PERFORMANCE CURVES OR TABLES REQUIRED FOR UNLOADING STEPS AND/OR VARIABLE SUCTION/DISCHARGE PRESSURES

REMARKS: 1) COMPRESSOR START-UP + LOADING / UN-LOADING + VARIABLE SPEED + CAPACITY CONTROL TO BE AUTOMATED SEQUENCE BY MODICOM QUANTUM PLC MOUNTED IN PURCHASER SUPPIED CONTROL PANEL TO BE INSTALLED IN REMOTE NON-CLASSIFIED MCC BUILDING.

2) COMPRESSOR PLC MUST EXECUTE REMOTE SHUTDOWN INPUT SIGNALS FROM NORMAL OPERATION + FROM PLANT ESD SYSTEM

3) COMPRESSOR VENDOR TO FURNISH ALL LOGIC REQUIRED FOR PLC PROGRAMMING BY PURCHASER + WITNESS CONTROLS S.A.T.

4) COMPRESSOR OPERATION WILL BE INTERMITTENT EACH DAY. PRIMARY LUBE OIL ELECTRIC HEATER TO BE EXTERNAL TO ...
... COMPRESSOR FRAME, INSTALLED IN A LUBE OIL CIRCUIT, WITH ELECTRIC LUBE OIL PUMPS, THAT WILL MAINTAIN LUBE OIL ...
... TEMPERATURE WITHIN RANGE FOR COMPRESSOR START 24 / 7 / 365 WITHOUT ANY "WARM-UP" DELAY - SEE P&ID # 12-HA-209

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UTILITY CONDITIONS

ELECTRICAL POWER:	AC VOLTS	PHASE	HERTZ	DC VOLTS		AC VOLTS	PHASE	HERTZ	DC VOLTS
MAIN DRIVER	480	3	60		INSTRUMENT				24
AUXILIARY MOTORS	480	3	60		ALARM & SHTDWN				24
HEATERS	120	1	60						

INSTRUMENT AIR: NORMAL PRESSURE 85 PSIG MAX/MIN 150 / 60 PSIG

STEAM FOR: DRIVERS				HEATERS			
INLET: PRESS	PSIG	MAX/MIN	/ PSIG	INLET: PRESS	PSIG	MAX/MIN	/ PSIG
(NORM.) TEMP	°F	MAX/MIN	/ °F	(NORM.) TEMP	°F	MAX/MIN	/ °F
EXH'ST: PRESS	PSIG	MAX/MIN	/ PSIG	EXH'ST:PRESS	PSIG	MAX/MIN	/ PSIG
(NORM.) TEMP	°F	MAX/MIN	/ °F	(NORM.) TEMP	°F	MAX/MIN	/ °F

COOLING WATER FOR: COMPRESSOR CYLINDERS				COOLERS			
TYPE WATER				TYPE WATER			
SUPP.: PRESS	PSIG	MAX/MIN	/ PSIG	SUPP.: PRESS	PSIG	MAX/MIN	/ PSIG
(NORM.) TEMP	°F	MAX/MIN	/ °F	(NORM.) TEMP	°F	MAX/MIN	/ °F
R'T'RN: PRESS	PSIG	MAX/MIN	/ PSIG	R'T'RN: PRESS	PSIG	MAX/MIN	/ PSIG
(NORM.) TEMP	°F	MAX/MIN	/ °F	(NORM.) TEMP	°F	MAX/MIN	/ °F

COOLING FOR ROD PACKING:

TYPE FLUID _____ SUPPLY PRESS _____ PSIG @ _____ °F RETURN _____ PSIG @ _____ °F

FUEL GAS: NORMAL PRESSURE _____ PSIG MAX/MIN _____ / _____ PSIG LHV _____ BTU/FT ^{3}

COMPOSITION _____

REMARKS/SPECIAL REQUIREMENTS:

1) ELECTRIC MOTOR DRIVER EMD TO BE WP-2 FOR CLASS 1 DIV. 2 GRP. C & D CLASSIFIED AREA, VARIABLE SPEED OPERATION WITH VFD … @ <400BHP MAX. TO COVER ENTIRE OPERATING MAP OF COMPR. …WP-2 ENCLR. WITH CONSTANT-SPEED BLOWER TO AIR-COOL EMD

2) ELECTRIC MOTOR DIRECT DRIVEN COMPRESSOR TRAIN IS BASE CASE + PURCHASER PREFERRED SELECTION. OTHER SELECTION ONLY CONSIDERED AS ALTERNATE BID STRUCTLY IN ADDITION TO THE BASE CASE BID

3) COMPRESSOR + EMD TO BE COMPLETELY SKID MOUNTED + PACKAGED IN VENDOR'S SHOP, COMPLETE WITH SHOP TESTING & READY FOR 1-PIECE SHIPMENT / LIFTING OF COMPLETE COMPRESSOR TRAIN SKID TO JOBSITE

4) COMPRESSOR TRAIN + SKID TO BE STRUCTURALLY DESIGNED FOR 4-POINT LIFT TO OFF-LOAD + SET SKID AT JOBSITE

5) PURCHASER REQUIRES PRESSURE + FLOW INSTRUMENTS TO BE ROSEMOUNT MODEL 3051S, TEMPERATURE INSTRUMENTS TO BE ROSEMOUNT MODEL 3144P, CONTROL VALVES SHALL BE FISHER, PRESSURE RELIEF VALVES SHALL BE MERCER, AND … ACTUATED BLOCK VALVES ROV's SHALL BE CAMERON OR WKM

6) VENDOR TO EXHAUSTIVELY LIST ALL INSTRUMENTATION + VALVES PROVIDED ON-SKID - COMPLETE WITH INSTRUMENT MANUFACTURER & MODEL NUMBERS FOR EACH …SUPPLY ALL INSTRUMENTS + VALVES SHOWN INSIDE SKID LIMITS ON P&ID's # 12-HA-201 + 202 + 209

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1	○ CYLINDER DATA AT FULL LOAD CONDITION						
2	SERVICE/ITEM NO.						
3	STAGE						
4	INLET PRESSURE, PSIA @ CYLINDER						
5	DISCHARGE PRESSURE, PSIA FLANGES						
6	CYLINDERS PER STAGE						
7	SINGLE OR DOUBLE ACTING (SA OR DA)						
8	BORE, INCHES						
9	STROKE, INCHES						
10	RPM: RATED / MAX ALLOW	/					
11	PISTON SPEED, FT/MIN: RATED / MAX ALLOW	/					
12	CYLINDER LINER, YES/NO						
13	LINER NOMINAL THICKNESS, INCHES						
14	PISTON DISPLACEMENT, CFM						
15	CYLINDER DESIGN CLEARANCE, % AVERAGE						
16	VOLUMETRIC EFFICIENCY, % AVERAGE						
17	VALVES, INLET/DISCHARGE, QTY PER CYL.	/	/	/	/	/	/
18	TYPE OF VALVES						
19	VALVE LIFT, INLET/DISCHARGE, INCHES	/	/	/	/	/	/
20	VALVE VELOCITY, API 4TH EDITION, FT/MIN						
21	SUCTION VALVE(S)						
22	DISCHARGE VALVE(S)						
23	ROD DIAMETER, INCHES						
24	MAX ALLOW. COMBINED ROD LOADING, LBS, C *						
25	MAX ALLOW. COMBINED ROD LOADING, LBS, T *						
26	CALCULATED GAS ROD LOAD, LBS, C *						
27	CALCULATED GAS ROD LOAD, LBS, T *						
28	COMBINED ROD LOAD (GAS + INERTIA), LBS, C *						
29	COMBINED ROD LOAD (GAS + INERTIA), LBS, T *						
30	ROD REV., DEGREES MIN @ X-HD PIN**						
31	RECIP WT. (PISTON, ROD, X-HD & NUTS), LBS**						
32	MAX ALLOW. WORKING PRESSURE, PSIG						
33	MAX ALLOW. WORKING TEMPERATURE, °F						
34	HYDROSTATIC TEST PRESSURE, PSIG						
35	HELIUM TEST PRESSURE, PSIG						
36	INLET FLANGE SIZE/RATING	/	/	/	/	/	/
37	FACING						
38	DISCHARGE FLANGE SIZE/RATING	/	/	/	/	/	/
39	FACING						
40	DISCHARGE RELIEF VALVE SETTING DATA AT INLET PRESSURES GIVEN ABOVE:						
41	RECOMMENDED SETTING, PSIG						
42	GAS ROD LOAD, LBS, C *						
43	GAS ROD LOAD, LBS, T *						
44	COMBINED ROD LOAD, LBS, C *						
45	COMBINED ROD LOAD, LBS, T *						
46	ROD REVERSAL, °MIN @ X-HD PIN**						
47	NOTE: CALCULATED AT INLET PRESSURES						
48	GIVEN ABOVE & RECOMMENDED SETTING.						
49	⊗ SETTLE-OUT GAS PRESSURE						
50	(DATA REQUIRED FOR STARTING)						
51	* C = COMPRESSION * T = TENSION	**X-HD = CROSSHEAD					
52	**NOTES/REMARKS:**						

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1	○ **CONSTRUCTION FEATURES**						
2	SERVICE ITEM NO.						
3	STAGE						
4	CYLINDER SIZE (BORE DIA), INCHES						
5	ROD RUN-OUT: NORMAL COLD VERTICAL						
6	(per appendix C)						
7	**MATERIALS OF CONSTRUCTION**						
8	CYLINDER(S)						
9	CYLINDER LINER(S)						
10	PISTON(S)						
11	PISTON RINGS						
12	WEAR BANDS ○ REQUIRED						
13	PISTON ROD(S): MATERIAL/YIELD, PSI	/	/	/	/	/	/
14	THREAD ROOT STRESS @ MACRL * @ X-HD END						
15	PISTON ROD HARDNESS, BASE MATERIAL, Rc						
16	PISTON ROD COATING ⊗ REQUIRED						
17	COATING HARDNESS, Rc						
18	VALVE SEATS / SEAT PLATE						
19	VALVE SEAT MIN HARDNESS, Rc						
20	VALVE GUARDS (STOPS)						
21	VALVE DISCS						
22	VALVE SPRINGS						
23	ROD PRESSURE PACKING RINGS						
24	ROD PRESSURE PACKING CASE						
25	ROD PRESSURE PACKING SPRINGS						
26	SEAL / BUFFER PACKING, DISTANCE PIECE						
27	SEAL / BUFFER PACKING, INTERMEDIATE						
28	WIPER PACKING RINGS						
29	MAIN JOURNAL BEARINGS, CRANKSHAFT						
30	CONNECTING ROD BEARING, CRANKPIN						
31	CONNECTING ROD BUSHING, X-HD END						
32	CROSSHEAD (X-HD) PIN BUSHING						
33	CROSSHEAD PIN						
34	CROSSHEAD						
35	CROSSHEAD SHOES						
36	CYLINDER INDICATOR VALVES (X)						
37	INDICATOR CONNECTIONS ABOVE 5000 PSI						
38	FLUOROCARBON SPRAYED CYLINDER (X)						
39	INSTRUMENTATION IN (X) COLD SIDE						
40	CONTACT W/PROCESS GAS (X) HOT SIDE						
41	* MAXIMUM ALLOWABLE COMBINED ROD LOAD	USE (X) IN APPROPRIATE COLUMN WHERE APPLICABLE					

42 ○ COMPRESSOR CYLINDER ROD PACKING
43 ○ FULL FLOATING PACKING
44 ○ VENTED TO: ○ FLARE @ _____ PSIG ○ ATMOS.
45 ○ SUCTION PRESSURE @ _____ PSIG
46 ○ FORCED LUBRICATED ○ NON-LUBE ○ TFE
47 ○ WATER COOLED, _____ STAGE(S), _____ GPM REQ'D
48 ○ OIL COOLED, _____ STAGE(S), _____ GPM REQ'D
49 ○ WATER FILTER PROV.FUTURE WATER/OIL COOLING
50 ○ VENT/BUFFER GAS SEAL PACKING ARR. (Ref: Appndx I FIG I-1)
51 ○ CONSTANT OR ○ VARIABLE DISPOSAL SYSTEM
52 ○ BUFFER GAS PRESSURE, _____ PSIG
53 ○ SPLASH GUARDS FOR WIPER PACKING

DISTANCE PIECE(S): ○ TYPE A ○ TYPE B ○ TYPE C ○ TYPE D
Ref: Appendix G, Fig. G-3

COVERS: ○ SOLID METAL ○ SCREEN ○ LOUVERED

CYLINDER COMPARTMENT: (Outboard Distance Piece)
○ VENTED TO _____ PSIG
○ PURGED AT _____ PSIG
○ PRESSURIZED TO _____ PSIG
○ WITH RELIEF VALVE

FRAME COMPARTMENT: (Inboard Distance Piece)
○ VENTED TO _____ PSIG
○ PURGED AT _____ PSIG
○ PRESSURIZED TO _____ PSIG
○ WITH RELIEF VALVE

☐ DISTANCE PIECE MAWP _____ PSIG

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○ **CONSTRUCTION FEATURES (CONTINUED)**

○ FABRICATED CYLINDER, HEADS, & CONNECTION SKETCHES FOR DESIGN REVIEW BY PURCHASER. (2.14.5.2.8)

○ BUFFER GAS PACKING ARR. — Ref: Appendix I
- ○ OIL WIPER PACKING PURGE — Figures I-1, I-2 &I-3
- ○ INTERMEDIATE PARTITION PURGE

INERT BUFFER PURGE GAS: ○ N_2 ○ OTHER _____

⊗ VENT, DRAIN, PURGE PIPING BY MFG'R ○ NO ⊗ YES

○ **COUPLING(S)** ⊗ LOW-SPEED (Between Compressor & Driver or Gear) ○ HI-SPEED (Between Driver & Gear)

	LOW-SPEED	HI-SPEED
◇ BY MANUFACTURER		
◇ MODEL		
◇ TYPE		

API-671 APPLIES ○ YES ○ NO

⊗ **INSPECTION AND SHOP TESTS (REF. 4.1.3)**

	REQ'D	WITN.	OBSER.
*SHOP INSPECTION	⊗	○	○
ACTUAL RUNNING CLEARANCES AND RECORDS	⊗	○	○
MFG STANDARD SHOP TESTS	⊗	○	○
CYLINDER HYDROSTATIC TEST	⊗	○	○
CYLINDER PNEUMATIC TEST	⊗	○	○
CYLINDER HELIUM LEAK TEST	○	○	○
CYL. JACKET WATER HYDRO TEST	○	○	○
*MECHANICAL RUN TEST (4 HR)	⊗	○	○
BAR-OVER TO CHECK ROD RUNOUT	⊗	○	○
*LUBE OIL CONSOLE RUN/TEST (4 HR)	○	○	○
*COOLING H_2O CONSOLE RUN/TEST	○	○	○
RADIOGRAPHY BUTT WELDS	⊗	○	○
⊗ GAS ○ OIL ⊗ FAB CYLS.			
MAG PARTICLE/LIQUID PENETRANT OF WELDS SPECIFY ADDITIONAL REQUIREMENTS (4.2.1.3)	⊗	○	○
_____	○	○	○
QC OF INACCESSIBLE WELDS (2.14.5.2.4)	○		
SHOP FIT-UP OF PULSATION SUPPL. DEVICES & ALL ASSOCIATED GAS PIPING	⊗	○	○
*CLEANLINESS OF EQUIP., PIPING, & APPURTENANCES	⊗	○	○
*HARDNESS OF PARTS, WELDS & HEAT AFFECTED ZONES	○	○	○
*NOTIFICATION TO PURCHASER OF ANY REPAIRS TO MAJOR COMPONENTS	⊗		
_____	○	○	○
_____	○	○	○

*SPECIFIC REQUIREMENTS TO BE DEFINED, FOR EXAMPLE, DISMANTLING, AUX EQUIPMENT OPERATIONAL & RUN TESTS.

APPENDIX K COMPLIANCE: ○ VENDOR ○ PURCHASER

□ **V-BELT DRIVE**

	DRIVEN SHEAVE (Compressor Shaft)	DRIVE SHEAVE (Driver Shaft)
RPM (EXPECTED)		
PITCH DIA. (Inches)		
◇ QTY & GROOVE X-SEC.		
POWER TRANSMITT'D		Incl. Belt Losses

DRIVER NAMEPLATE HP RATING _____

◇ CENTER DISTANCE (INCHES) _____

◇ QTY, TYPE, X-SEC., & LENGTH BELTS _____

◇ BELT SERVICE FACTOR (RELATIVE TO DRIVER NAMEPLATE HP RATING) _____

○ **CYLINDER LUBRICATION**

○ NON-LUBE _____ STAGE(S)/SERVICE

⊗ LUBRICATED _____ STAGE(S)/SERVICE

TYPE OF LUBE OIL: ○ SYNTHETIC _____ ○ HYDROCARBON _____

LUBRICATOR DRIVE BY: □ COMP. CRANKSHAFT, DIRECT □ CHAIN, FROM CRANKSHAFT ○ ELECTRIC MOTOR ○ OTHER _____

◇ LUBRICATOR MFR _____ ◇ MODEL _____

TYPE LUBRICATOR: (2.13) ○ SINGLE PLUNGER PER POINT ○ DIVIDER BLOCKS _____

◇ COMPARTM'T, TOTAL QTY. _____

◇ PLUNGERS (PUMPS), TOTAL QTY. _____

◇ SPARE PLUNGERS, QTY. _____

◇ SPARE COMPARTM'T W/OUT PLUNGERS _____

○ HEATERS: ○ ELECTRIC W/THERM.(S) ○ STEAM

☒ **ESTIMATED WEIGHTS AND NOMINAL DIMENSIONS**

□ TOTAL COMPR. WT, LESS DRIVER & GEAR			LBS
◇ WT, OF COMPLETE UNIT, (LESS CONSOLES)			LBS
◇ MAXIMUM ERECTION WEIGHT			LBS
◇ MAXIMUM MAINTENANCE WEIGHT			LBS
◇ DRIVER WEIGHT/GEAR WEIGHT	/		LBS
◇ LUBE OIL/COOLING H_2O CONS.	/		LBS
◇ FREE STANDING PANEL			

SPACE REQUIREMENTS-FEET:	LENGTH	WIDTH	HEIGHT
◇ COMPLETE UNIT			
◇ LUBE OIL CONSOLE			
◇ COOLING H_2O CONSOLE			
◇ FREE STANDING PANEL			
□ PISTON ROD REMOVAL DIST.			

OTHER EQUIPMENT SHIPPED LOOSE (DEFINE)

◇ PULSATION SUPP., WEIGHT		LBS
◇ PIPING		LBS
◇ INTERSTAGE EQUIPMENT		LBS

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☐ **UTILITY CONSUMPTION**

ELECTRIC MOTORS

	For Induction Motors See Note of 3.1.2.5 and Motor Data Sheet	NAMEPLATE HP	LOCKED ROTOR AMPS	FULL LOAD STEADY STATE AMPS	MAIN DRIVER NON-STEADY STATE AMPS AT COMPRESSOR RATED HORSEPOWER (Induction Motors Only)
◇ MAIN DRIVER					_____ AMPS
◇ MAIN LUBE OIL PUMP					@ COMPRESSOR RATED
◇ AUX LUBE OIL PUMP					HP OF _____
◇ MAIN COOLING WATER PUMP					@ CURRENT PULSATIONS
◇ AUX COOLING WATER PUMP					OF _____ %
◇ ROD PACKING COOLING PUMP					
◇ CYLINDER LUBRICATOR					

ELECTRIC HEATERS

	WATTS	VOLTS	HERTZ
◇ FRAME OIL HEATER(S)			
◇ COOLING WATER HEATER(S)			
◇ CYL. LUBRICATOR HEATER(S)			

STEAM

	FLOW		PRESSURE		TEMPERATURE		BACK PRESSURE	
◇ MAIN DRIVER		LBS/HR @		PSIG		°FTT TO		PSIG
◇ FRAME OIL HEATER(S)		LBS/HR @		PSIG		°FTT TO		PSIG
◇ CYL. LUB. HEATER(S)		LBS/HR @		PSIG		°FTT TO		PSIG
		LBS/HR @		PSIG		°FTT TO		PSIG
		LBS/HR @		PSIG		°FTT TO		PSIG

COOLING WATER REQUIREMENTS

	FLOW GPM	INLET TEMP °F	OUTLET TEMP °F	INLET PRESS PSIG	OUTLET PRESS PSIG	MAX PRESS PSIG
☐ CYLINDER JACKETS						
◇ INTERCOOLER(S)						
◇ AFTERCOOLER						
◇ FRAME LUBE OIL COOLER						
◇ ROD PRESSURE PACKING*						
◇ TOTAL QUANTITY, GPM						

REMARKS/SPECIAL REQUIREMENTS:

*ROD PACKING COOLANT MAY BE OTHER THAN WATER

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○ **FRAME LUBE OIL SYSTEM**

○ **BASIC LUBE OIL SYSTEM FOR FRAME:** ○ SPLASH ○ PRESSURE (FORCED) ⊗ HEATERS REQUIRED:
☐ REF: TYPE MAIN BEARINGS: ○ TAP'RD ROLL'R ○ PRECISION SL'VE ⊗ ELEC. W/THERMOSTAT(S) ○ STEAM

○ **PRESSURE SYSTEM:** ○ MAIN OIL PUMP DRIVEN BY: ○ COMP. CRANKSHAFT ⊗ ELEC. MOTOR ○ OTHER _____
☐ PSV FOR MAIN PUMP EXTERNAL TO CRANKCASE _____
○ AUX OIL PUMP DRIVEN BY: ⊗ ELEC. MOTOR ○ OTHER _____
☐ HAND OPERATED PRE-LUBE PUMP FOR STARTING ⊗ OPERATIONAL TEST & 4 HOUR MECH RUN TEST
○ API-614 LUBE SYSTEM: ⊗ NO ○ YES (See Note of 2.12.2) ○ CHECK VALVE ON MAIN PUMP (FIG G-5)
⊗ CONTINUOUS FLOW THROUGH OIL (3.7.2.7)

○ **SEP. CONSOLE FOR PRESS. LUBE SYS:** ○ ONE CONSOLE FOR EA. COMP. ○ ONE CONSOLE FOR _____ COMPRESSORS
Note: Instrumentation to be listed on Instrumentation Data Sheets. ○ CONSOLE TO BE OF DECK PLATE TYPE CONSTRUCTION SUITABLE FOR MULTI-POINT SUPPORT AND GROUTING WITH GROUT & VENT HOLES.

⊗ ELECTRICAL CLASSIFICATION : CLASS 1 , GROUP C&D , DIV 2 ○ NON-HAZARDOUS

☐ **BASIC SYS. REQ'MTS (NORM. OIL FLOWS & VOLUMES)**

☐ LUBE OIL	FLOW GPM	PRESSURE PSIG	VISCOSITY SSU @ 100°F	VISCOSITY SSU @ 210°F	SUMP VOLUME GALLONS
☐ COMPRESSOR FRAME					
◇ DRIVER					
◇ GEAR					

☐ SYSTEM PRESSURES: ☐ DESIGN _____ PSIG ☐ HYDROTEST _____ PSIG
☐ PRESSURE CONTROL VALVE SETTING _____ PSIG ☐ PUMP REL'F VALVE(S) SET _____ PSIG

⊗ **PIPING MATERIALS:**

	CARBON STEEL	STAINLESS STEEL WITH SS FLANGES	STAINLESS STEEL WITH CARBON STEEL FLANGES
⊗ UPSTREAM OF PUMPS & FILTERS	⊗	○	○
⊗ DOWNSTREAM OF FILTERS	○	⊗	○
○ _____	○	○	○
○ _____	○	○	○

☐ **PUMPS** (Gear or Screw Type Only)

	◇ RAT'D FL'W GPM	◇ PRESSURE PSIG	◇ COLD START REQ'D BHP	◇ DRIVER HP	◇ SPEED RPM	COUPLING REQ'D	MECH. SEAL REQ'D
MAIN						○	○
AUXILIARY						○	○

☐ PUMP CASING MATERIAL (Ref. 2.12.3.1): MAIN PUMP _____ AUX PUMP _____
○ GUARD(S) REQ. FOR COUPLING(S): ○ MAIN PUMP ○ AUX PUMP ○ GUARD TYPE OR CODE _____
○ AUXILIARY PUMP CONTROL: ○ MANUAL ○ AUTOMATIC ○ ON-OFF-AUTO SEL. SWITCH: ○ BY PURCH. ○ BY MFR.
○ WIRING TO TERMINAL BOX: ○ BY PURCH. ○ BY MFR.
○ SWITCHES ○ RTD'S/THERMOCOUPLES

⊗ **COOLERS:** ○ SHELL & TUBE ○ SINGLE ○ DUAL W/TRANSFER VALVE ○ MFG'S STD. ○ TEMA C ○ TEMA R (API-660 Data Shts Attached)
○ REMOVABLE BUNDLE ○ WATER COOLED ⊗ AIR COOLED W/AUTO TEMP CONTROL (API-661 Data Shts - Attached)
⊗ W/BYPASS & TEMP CONTROL VALVE: ○ MANUAL ⊗ AUTO ○ SEE SEPARATE HEAT EXCHANGER DATA SHT FOR DETAILS SPECIFY % GLYCOL ON COOLING WATER SIDE
SEE P&ID # 12-HA-209

⊗ **FILTER(S)** ○ SINGLE ⊗ DUAL W/TRANSFER VALVE ○ ASME CODE DESIGN ○ ASME CODE STAMPED
☐ DESIGN PRESSURE, _____ PSIG ☐ Δ P CLEAN, _____ PSI ☐ Δ P COLLAPSE, _____ PSI
☐ MICRON RATING, _____ ☐ CARTRIDGE MATERIAL, _____ ◇ CARTRIDGE P/N _____
☐ BONNET MATERIAL, _____ ☐ CASING MATERIAL, _____ ⊗ FURN.SPARE CARTR.,QTY 10

☐ **SYS. COMPONENT SUPP.**

	MANUFACTURER	MODEL		MANUFACTURER	MODEL
◇ MAIN PUMP			◇ OIL COOLER(S)		
◇ AUXILIARY PUMP			◇ TRANSFER VALVE(S)		
◇ MECHANICAL SEALS			◇ PUMP COUPLING(S)		
◇ ELECTRIC MOTORS			◇ SUCTION STRAINER(S)		
◇ STEAM TURBINES			◇ CHECK VALVE(S)		
◇ OIL FILTER(S)			◇ _____		

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○ **COOLING WATER SYSTEM**

○ **BASIC COOLING SYS. FOR:** ○ COMPRESSOR CYL.(S) ○ INTERCOOLER(S) ○ AFTERCOOLER ○ OIL COOLER(S)
○ HEATERS REQ.'D FOR PRE-HEATING: ○ ELEC.,W/ THERMOSTAT(S) ○ STEAM

○ **PRESSURE FORCED CIRCULATING SYS:** ○ OPEN, PIPING BY: ○ PURCH. ○ MFR ○ CLOSED, PIPING BY MFR.
MAIN WATER PUMP DRIVEN BY: ○ ELEC. MOTOR ○ STEAM TURBINE ○ OTHER _____
AUX WATER PUMP DRIVEN BY: ○ ELEC. MOTOR ○ STEAM TURBINE ○ OTHER _____

○ **SEP. CONSOLE FOR COOLING WATER SYS.:** ○ ONE CONSOLE FOR EA. COMP. ○ ONE CONSOLE FOR ____ COMP'RS
NOTE: Instrumentation to be Listed on Instrumentation Data Sheets
○ CONSOLE TO BE OF DECK PLATE TYPE CONSTRUCTION SUITABLE FOR MULTI-POINT SUPPORT AND GROUTING WITH GROUT & VENT HOLES.

○ ELECTRICAL CLASSIFICATION : CLASS ____, GROUP ____, DIV ____ ○ NON-HAZARDOUS

○ **BASIC SYS. REQ'MTS (NORM. COOLING WATER FLOW DATA)** ○ COOL'G WATER TO BE ____ % ETHYL'NE GLYC'L

	FORCED COOL'G	THERMO SYPHON	STAND PIPE	FLOW GPM	PRESSURE PSIG	INLET TEMP °F	OUTLET TEMP °F	SITE FLOW IND'TR
CYLINDER(S), ___ STAGE	○	○	○					○
CYLINDER(S), ___ STAGE	○	○	○					○
CYLINDER(S), ___ STAGE	○	○	○					○
CYLINDER(S), ___ STAGE	○	○	○					○
CYLINDER(S), ___ STAGE	○	○	○					○
CYLINDER(S), ___ STAGE	○	○	○					○
PISTON ROD PACK'G TOTAL	○							○
INTERCOOLER(S) TOTAL	○							○
AFTERCOOLER	○							○
OIL COOLER(S)	○							○
_____	○							○
TOTAL FLOW								

☐ **SYS. PRESSURES:** ☐ DESIGN, ____ PSIG ☐ HYDROTEST, ____ PSIG ○ RELIEF VALVE(S), SETTING ____ PSIG

○ **WATER RESERVOIR:** ◇ SIZE, ____ FT IN DIA X ____ FT IN HT. ◇ CAPACITY ____ GALLONS @ Normal Operating Level
◇ RESERVOIR MATERIAL ◇ INTERNAL COATING, TYPE _____
○ LEVEL GAUGE ○ LEVEL SWITCH ○ DRAIN VALVE ○ INSPECTION & CLEAN-OUT OPENINGS

☐ **PUMPS: (Centrifugal Only)**

	◇ RAT'D FL'W GPM	◇ PRESS. PSIG.	◇ REQ'D BHP	◇ DRIVER HP	◇ SPEED RPM	COUPLING REQ'D	MECH.SEAL REQ'D
MAIN						○	○
AUXILIARY						○	○

☐ PUMP CASING MATERIAL (Ref 2.12.3.1): MAIN PUMP _____ AUX PUMP _____
○ GUARD(S) REQ.'D FOR COUP'G(S) ○ MAIN PUMP ○ AUX PUMP ○ GUARD TYPE OR CODE _____
○ AUX.PUMP CONTROL: ○ MANUAL ○ AUTO ○ ON-OFF-AUTO SEL. SWITCH: ○ BY PURCH. ○ BY MANUFACTURER
○ WIRING TO TERMINAL BOX: ○ BY PURCH. ○ BY MANUFACTURER

○ **COOLING WATER HEAT EXCH.:** ○ SHELL & TUBE ○ SINGLE ○ DUAL W/TRANSFER VALVE ○ TEMA C ○ TEMA R(API-660 Data Shts Attached)
○ AIR COOLED EXCHANGER W/AUTO TEMP CONTROL (API-661 Data Sheets Attached)
○ W/BYPASS & TEM. CONTROL VALVE ○ MANUAL ○ AUTO ○ LOUVERS FOR AIR EXCH.
○ SEE SEPARATE COOLER DATA SHEET FOR DETAILS; SPECIFY % GLYCOL ON BOTH SIDES OF SHELL & TUBE

SYS. COMPONENT SUPP.	MANUFACTURER	MODEL		MANUFACTURER	MODEL
◇ MAIN PUMP			◇ TEMP CONTROL VALVE(S)		
◇ AUXILIARY PUMP			◇ TRANSFER VALVE(S)		
◇ MECHANICAL SEALS			◇ PUMP COUPLING(S)		
◇ ELECTRIC MOTORS			◇		
◇ STEAM TURBINES			◇		
◇			◇		
◇			◇		

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PULSATION SUPPRESSION DEVICES FOR RECIPROCATING COMPRESSORS

THESE SHEETS TO BE FILLED OUT FOR EACH SERVICE AND/OR STAGE OF COMPRESSION

APPLICABLE TO: ○ PROPOSALS ○ PURCHASE ○ AS BUILT

FOR/USER _____

SITE/LOCATION _____ AMBIENT TEMPERATURE MIN/MAX ____ / ____ °F

COMPRESSOR SERVICE _____ NUMBER OF COMPRESSORS _____

COMPRESSOR MFG. _____ MODEL/TYPE _____

SUPPRESSOR MFG. _____

NOTE: ○ Ind.Data Comp.'d Purch. ☐ By Compr/Supp.Mfg.w/Proposal ◇ By Mfg(s) after order ◯ By Mfg(s)/Purchaser as Applicable

GENERAL INFORMATION APPLICABLE TO ALL SUPPRESSORS

TOTAL NUMBER OF SERVICES AND/OR STAGES _____

TOTAL NUMBER OF COMPRESSOR CYL. ____ TOTAL NUMBER OF CRANKTHROWS ____ STROKE ____ IN. RPM ____

⊗ ASME CODE STAMP ○ GOVERNMENTAL CODES OF _____ CODE REGULATIONS APPLY

○ OTHER APPLICABLE PRESSURE VESSEL SPEC. OR CODE _____

○ LUBE SERVICE ○ NON-LUBE SERV. ○ NO OIL ALLOWED INTERNALLY DRY TYPE INTER.CORR.COATING ○ YES ○ NO

RADIOGRAPHY (X-RAY OF WELDS): ○ NONE ○ SPOT ⊗ 100% ○ IMPACT TEST ○ SPECIAL WELDING REQUIREMENTS

⊗ SHOP INSPECTION ○ WITNESS HYDROTEST ○ OUTDOOR STORAGE OVER 6 MONTHS ○ SPECIAL PAINT SPEC _____

○ WITNESSED ○ OBSERVED

CYLINDER, GAS, OPERATING, AND SUPPRESSOR DESIGN DATA

SERVICE _____ STAGE NO. _____

☐ COMPRESSOR MANUFACTURER'S RATED CAPACITY	LBS/HR ____ SCFM ____ MMSCFD ____	
◯ LINE SIDE OPERATING PRESSURE	INLET, ____ PSIA	DISCHARGE, ____ PSIA
◯ OPERATING TEMP. WITHIN SUPPRESSORS	INLET, ____ °F	DISCHARGE, ____ °F
○ ALLOWABLE PRESSURE DROP THROUGH SUPPRESSORS	Δ P ____ PSI / ____ %	Δ P ____ PSI / ____ %
	INLET SUPPRESSOR	DISCHARGE SUPPRESSOR
○ SUPRESSOR TAG NUMBER		
○ COMBINATION INLET SUPP SEPARATOR / INTERNALS	○ YES ○ NO / ○ YES ○ NO	/ ○ YES ○ NO
◯ NO. (QTY) OF INLET & DISCH. SUPP. PER STAGE		
○ ALLOWABLE PEAK-PEAK PULSE @ LINE SIDE NOZZLE	PSI / %	PSI / %
○ ALLOWABLE PEAK-PEAK PULSE @ CYL FLANGE NOZZLE	PSI / %	PSI / %
○ DESIGN FOR FULL VACUUM CAPABILITY	○ YES ○ NO	○ YES ○ NO
○ MIN. REQ'D WORKING PRESSURE & TEMPERATURE NOTE: After design, the actual Mawp & temp are to be determined based on the weakest component and stamped on the vessel. The actual Mawp is to be shown on pg.14 line 12 and on the U1A Forms.	PSIG, ____ @ ____ °F	PSIG, ____ @ ____ °F
○ INITIAL SIZING VOL. PER FORMULA OF 3.9.2.2.2 NOTE: This is a Reference	____ FT³	____ FT³
◇ AS BUILT VOLUME (FT³)	____ FT³	____ FT³

Dominion Transmission, Inc.
Galmish Vapor Recovery Project

RECIPROCATING COMPRESSOR (API 618-4TH) DATA SHEET U.S. CUSTOMARY UNITS

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PULSATION SUPPRESSION DEVICES FOR RECIPROCATING COMPRESSORS (CONT'D) SERVICE
THESE SHEETS TO BE FILLED OUT FOR EACH SERVICE AND/OR STAGE OF COMPRESSION STAGE NO.

		INLET SUPPRESSOR	DISCHARGE SUPPRESSOR
	CONSTRUCTION REQUIREMENTS & DATA		
○	SUPRESSOR TAG NUMBER		
⊗	BASIC MATERIAL REQUIRED, CS, SS, ETC.	SA-106-B	SA-106-B
◇	ACTUAL MATERIAL DESIGNATION SHELL/HEAD	/	/
○	SPECIAL HARDNESS LIMITATIONS, Rc ○ YES ○ NO	SHELL & HEADS WELDS	SHELL & HEADS WELDS
⊗	CORROSION ALLOWANCE., IN. ⊗ REQUIRED	0.0625 IN.	0.0625 IN.
◇	WALL THICKNESS, IN. SHELL/HEAD	IN./ IN.	IN./ IN.
☐	NOM. SHELL DIA X OVERALL LGTH. (INCH/VOL.FT³)	x IN./ FT³	x IN./ FT³
☒	PIPE OR ROLLED PLATE CONSTRUCTION	☒ PIPE ☐ ROLLED PLATE	☒ PIPE ☐ ROLLED PLATE
◇	ACT. MAX ALLOW. WORKING PRESS. AND TEMPERATURE	PSI @ °F	PSI @ °F
⊗	MINIMUM DESIGN METAL TEMP (2.14.8)	MINUS 20 °F	MINUS 20 °F
⊗	INLET SUPRESS. TO BE SAME MAWP AS DISCH'RGE SUPPRESS.	⊗ YES ○ NO	
◇	MAX EXPECTED PRESSURE DROP(Δ P, PSI / %) LINE PRESS	Δ P PSI/ %	Δ P PSI/ %
◇	WEIGHT (LBS EACH)	LBS	LBS
○	INSUL NUTS & ALLOW. FOR INSULATION REQUIRED (X)		
◇	EXPECTED P-P PULSE @ LINE SIDE/CYL FLG, % LINE PRESS BASED ON FINAL SUPPRESSOR DESIGN	%/ %	%/ %
⊗	SUPPORTS, TYPE/QUANTITY	ADJUSTABLE WEDGE	
	CONNECTION REQUIREMENTS & DATA		
⊗	LINE SIDE FLANGE. SIZE/RATING/FACING/TYPE	RFWN	RFWN
⊗	COMP CYL FLANGE(S), QTY/SIZE/RATING/FACING/TYPE	RFWN	RFWN
⊗	FLANGE FINISH, ⊗ PER 3.9.3.15 ○ SPECIAL (SPECIFY) >125 <250 ○ PER ANSI 16.5		
⊗	INSPECTION OPENINGS REQUIRED	⊗ YES ___ ○ NO ___ ⊗ BLINDED	⊗ YES ___ ○ NO ___ ⊗ BLINDED
⊗	SPEC. QTY. SIZE, 6000 LB NPT CPLG./FLG TYPE & RATING	MIN. 1-1/2" NPS RFWN	MIN. 1-1/2" NPS RFWN
◇	* QTY. SIZE, 6000 LB NPT CPLG./FLG TYPE & RATING		
⊗	VENT CONNECTIONS REQUIRED	⊗ YES ○ NO	⊗ YES ○ NO
⊗	SPEC. QTY. SIZE, 6000 LB NPT CPLG./FLG TYPE & RATING	MIN. 1-1/2" NPS RFWN	MIN. 1-1/2" NPS RFWN
◇	* QTY. SIZE, 6000 LB NPT CPLG./FLG TYPE & RATING		
⊗	DRAIN CONNECTIONS REQUIRED	⊗ YES ○ NO	⊗ YES ○ NO
⊗	SPEC. QTY. SIZE, 6000 LB NPT CPLG./FLG TYPE & RATING	MIN. 1-1/2" NPS RFWN	MIN. 1-1/2" NPS RFWN
◇	* QTY. SIZE, 6000 LB NPT CPLG./FLG TYPE & RATING		
⊗	PRESSURE CONNECTIONS REQUIRED	⊗ YES ○ NO	⊗ YES ○ NO
⊗	SPEC. QTY. SIZE, 6000 LB NPT CPLG./FLG TYPE & RATING	MIN. 1-1/2" NPS RFWN	MIN. 1-1/2" NPS RFWN
◇	* QTY. SIZE, 6000 LB NPT CPLG./FLG TYPE & RATING		
⊗	TEMPERATURE CONNECTIONS REQUIRED	⊗ YES ○ NO	⊗ YES ○ NO
⊗	SPEC. QTY. SIZE, 6000 LB NPT CPLG./FLG TYPE & RATING ○ CYL NOZZLE ⊗ MAIN BODY	MIN. 1-1/2" NPS RFWN	MIN. 1-1/2" NPS RFWN
◇	* QTY. SIZE, 6000 LB NPT CPLG./FLG TYPE & RATING		
	OTHER DATA AND NOTES		
◇	COMPRESSOR MFG'S SUPP. OUTLINE OR DRAWING NO.		
◇	SUPP. MFG'S OUTLINE OR DRAWING NO.		

NOTES * = AS BUILT

Dominion Transmission, Inc.
Galmish Vapor Recovery Project

RECIPROCATING COMPRESSOR (API 618-4TH) DATA SHEET U.S. CUSTOMARY UNITS

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INSTRUMENTATION

PURCHASER TO FILL IN (☐ ○ ⬡) AFTER COMMODITY TO INDICATE: ☐ BY COMP. MFR. ○ BY PURCH. ⬡ BY OTHERS

INSTRUMENT & CONTROL PANEL (☐ ⊗ ⬡):
- ⊗ ONE FOR EA. UNIT ○ ONE COMMON TO ALL UNITS
- ○ MACHINE MT'ED ⊗ FREE STANDING (OFF UNIT) ○ LOCAL ⊗ REMOTE ○ OUTDOORS
- ○ PNEUMATIC ○ ELEC. ⊗ ELECTRONIC ○ HYDRAULIC ⊗ MODICON QUANTUM PLC
- ○ NEMA 7, CLASS _____, GROUP _____, DIVISION _____ ○ INTRINSICALLY SAFE
- ○ I/S BARRIERS (☐ ○ ⬡)
- ○ NEMA 4, WATERTIGHT & DUSTTIGHT ○ PURGED TO NFPA 496 TYPE ○ X ○ Y ○ Z
- ○ OTHER NEMA _____ LOW PURGE PRESS. ○ ALARM ○ SHUTDOWN
- ○ VIB, ISOLATORS ○ STRIP HEATERS ○ PURGE CONN. ○ EXTRA CUTOUTS
- ○ ANNUNCIATOR W/FIRST-OUT INDICATION LOCATED ON CONTROL PANEL
- ⊗ PURCHASER'S CONN. BROUGHT OUT TO TERMINAL BOXES MOUNTED ON-SKID BY VENDOR

ADDITIONAL PANEL REMARKS:

1) SEE NOTES ON PAGE 5

2) SEE P&ID's # 12-HA-201 + 202 + 209 FOR SCOPE OF VENDOR SUPPLIED + VENDOR INSTALLED INSTRUMENTS + VALVES

⊗ INSTRUMENTATION SUITABLE FOR: ○ INDOORS ⊗ OUTDOORS ○ OTHER _____

○ PREFERRED INSTRUMENT SUPPLIERS, (TO BE COMPLETED BY PURCHASER), OTHERWISE MFR'S STANDARD APPLIES

PRESSURE GAUGES	MFR		SIZE & TYPE		MTL	
TEMPERATURE GAUGES	MFR		SIZE & TYPE		MTL	
LIQUID LEVEL GAUGES	MFR		TYPE		MTL	
DIFF. PRESSURE GAUGES	MFR		SIZE & TYPE		MTL	
PRESS. TRANSMITTERS	MFR		TYPE		MTL	
LIQUID LEV. TRANSMITTER	MFR		TYPE		MTL	
PRESSURE SWITCHES	MFR		TYPE		MTL	
TEMPERATURE SWITCHES	MFR		TYPE		MTL	
LIQUID LEVEL SWITCHES	MFR		TYPE		MTL	
DIFF. PRESSURE SWITCHES	MFR		TYPE		MTL	
CONTROL VALVES	MFR		TYPE		MTL	
PRESSURE SAFETY VALVES	MFR		TYPE		MTL	
SIGHT FLOW INDICATORS	MFR		TYPE		MTL	
VIBRATION MONITORS & EQUIP.	MFR		TYPE		MTL	
THERMOCOUPLES	MFR		TYPE		MTL	
RTD'S	MFR		TYPE		MTL	
SOLENOID VALVES	MFR		TYPE		MTL	
ANNUNCIATOR	MFR		MODEL & (QTY SPARE POINTS)		( )	
PROGRAMMABLE CONTROLLER	MFR		TYPE		MTL	
	MFR		TYPE		MTL	
	MFR		TYPE		MTL	

○ PRESSURE GAUGE REQUIREMENTS ○ LIQUID FILLED PRESSURE GAUGES: ○ YES ○ NO

FUNCTION	LOCALLY MOUNTED	PANEL MOUNTED		LOCALLY MOUNTED	PANEL MOUNTED
LUBE OIL MAIN PUMP DISCHAR.	(☐ ○ ⬡)	(☐ ○ ⬡)	PROCESS GAS: INLET PRESS.	(☐ ○ ⬡)	(☐ ○ ⬡)
LUBE OIL AUX. PUMP DISCHARG.	(☐ ○ ⬡)	(☐ ○ ⬡)	@ EA. STAGE	(☐ ○ ⬡)	(☐ ○ ⬡)
LUBE OIL PRESS. AT FRAME HEADER	(☐ ○ ⬡)	(☐ ○ ⬡)	DISCH. PRESS.	(☐ ○ ⬡)	(☐ ○ ⬡)
LUBE OIL FILTER Δ P	(☐ ○ ⬡)	(☐ ○ ⬡)	@ EA. STAGE	(☐ ○ ⬡)	(☐ ○ ⬡)
COOLING H_2O INLET HEADER	(☐ ○ ⬡)	(☐ ○ ⬡)		(☐ ○ ⬡)	(☐ ○ ⬡)
	(☐ ○ ⬡)	(☐ ○ ⬡)		(☐ ○ ⬡)	(☐ ○ ⬡)
	(☐ ○ ⬡)	(☐ ○ ⬡)		(☐ ○ ⬡)	(☐ ○ ⬡)

REMARKS: GAUGES TO BE PANEL MOUNTED ON-SKID BY VENDOR

Dominion Transmission, Inc.
Galmish Vapor Recovery Project

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INSTRUMENTATION (CONT'D)

TEMPERATURE MEASUREMENT REQUIREMENTS

FUNCTION	LOCALLY MOUNTED	PANEL MOUNTED	GAUGE W/ CAPIL'RY	THERMO CPL SYS	RTD SYS	I/S SYS
LUBE OIL ○ INLET TO ○ OUT OF FRAME	(□ ○ ⬡)	(□ ○ ⬡)	○	○	⊗	○
LUBE OIL ○ INLET TO ○ OUT OF COOLER	(□ ○ ⬡)	(□ ○ ⬡)	○	○	⊗	○
MAIN JRNL BEARINGS (THERMOCOUPLES OR RTD'S ONLY)	(□ ○ ⬡)	(□ ○ ⬡)	○	○	⊗	○
MOTOR BEARING(S) (THERMOCOUPLES OR RTD'S ONLY)	(□ ○ ⬡)	(□ ○ ⬡)	○	○	⊗	○
COOLING WATER HEADER: ○ INLET ○ OUTLET	(□ ○ ⬡)	(□ ○ ⬡)	○	○	○	○
CYL. COOLING WATER: ○ INLET ○ OUTLET ○ EA. CYL	(□ ○ ⬡)	(□ ○ ⬡)	○	○	○	○
PROCESS GAS: ○ INLET ⊗ DISCH. ⊗ EACH CYL	(□ ○ ⬡)	(□ ○ ⬡)	○	○	⊗	○
INTERCOOLER(S) ○ INLET ○ GAS ○ WATER	(□ ○ ⬡)	(□ ○ ⬡)	○	○	○	○
○ INLET ○ GAS ○ WATER	(□ ○ ⬡)	(□ ○ ⬡)	○	○	○	○
AFTERCOOLER: ○ INLET ○ GAS ○ WATER	(□ ○ ⬡)	(□ ○ ⬡)	○	○	○	○
○ INLET ○ GAS ○ WATER	(□ ○ ⬡)	(□ ○ ⬡)	○	○	○	○
COOLING WATER ○ INLET ○ OUTLET/COOLED PKG CASE(S)	(□ ○ ⬡)	(□ ○ ⬡)	○	○	○	○
PRESS. PGK CASE, CYL PIST ROD (THRM'CPLS OR RTD'S ONLY)	(□ ○ ⬡)	(□ ○ ⬡)		○	○	○
COMPRESSOR VALVES ○ SUCT. ○ DISCH. TC'S OR RTD'S ONLY	(□ ○ ⬡)	(□ ○ ⬡)	○	○	○	○
	(□ ○ ⬡)	(□ ○ ⬡)	○	○	○	○
	(□ ○ ⬡)	(□ ○ ⬡)	○	○	○	○

ALARM & SHUTDOWN SWITCH REQ'MTS

NOTE: ALARM & SHUTDOWN SWITCHES SHALL BE INDIVIDUALLY SEPARATE

FUNCTION	ALARM	SHUT DOWN	ANNUNCIATION POINTS: ALARM IN PNL BY MFR	ALARM IN CTL ROOM PANEL OTH'RS	SHUTDOWN IN PNL BY MFR	SHUTDOWN IN CTL ROOM PANEL OTH'RS	TOTAL NO. OF POINTS
LOW LUBE OIL PRESS. @ BEARING HEADER	(□ ○ ⬡)	(□ ○ ⬡)	○	⊗	○	⊗	
HIGH LUBE OIL ΔP ACROSS FILTER	(□ ○ ⬡)	(□ ○ ⬡)	○	⊗	○	○	
LOW LUBE OIL LEVEL, FRAME	(□ ○ ⬡)	(□ ○ ⬡)	○	⊗	○	⊗	
AUX LUBE OIL PUMP, FAIL TO START	(□ ○ ⬡)	(□ ○ ⬡)	○	⊗	○	○	
CYL LUBE SYSTEM PROTECTION	(□ ○ ⬡)	(□ ○ ⬡)	○	⊗	○	○	
COMPR. VIBRATION, SHUTDOWN ONLY		(□ ○ ⬡)	○	○	○	⊗	
VIBRATION, W/ CONTINUOUS MONITORING	(□ ○ ⬡)	(□ ○ ⬡)	○	○	○	⊗	
ROD DROP DETECTOR, CONTACT TYPE(1/CYL)	(□ ○ ⬡)	(□ ○ ⬡)	○	○	○	○	
ROD DROP PROXIMITY PROBE (1/CYL)	(□ ○ ⬡)	(□ ○ ⬡)	○	○	○	○	
OIL TEMP OUT OF FRAME	(□ ○ ⬡)	(□ ○ ⬡)	○	⊗	○	○	
HIGH GAS DISCH. TEMP EACH CYLINDER	(□ ○ ⬡)	(□ ○ ⬡)	○	⊗	○	⊗	
HIGH JACKET WATER TEMP., EA. CYL	(□ ○ ⬡)	(□ ○ ⬡)	○	○	○	○	
LOW SUCTION PRESS., FIRST STG INLET	(□ ○ ⬡)	(□ ○ ⬡)	○	⊗	○	⊗	
HI DISCH. PRESS. ○ FINAL ○ EA STG	(□ ○ ⬡)	(□ ○ ⬡)	○	○	○	○	
HI CYL. GAS ΔP, EACH STAGE	(□ ○ ⬡)	(□ ○ ⬡)	○	○	○	○	
HI LIQ. LEV., EA. MOISTURE SEPARATOR	(□ ○ ⬡)	(□ ○ ⬡)	○	○	○	○	
LOW PURGE GAS PRESS, DISTANCE PIECE(S)	(□ ○ ⬡)	(□ ○ ⬡)	○	○	○	○	
HI X-HD PIN TEMP	(□ ○ ⬡)	(□ ○ ⬡)	○	○	○	○	
PRESS PKG CASE (PISTON ROD TEMP)	(□ ○ ⬡)	(□ ○ ⬡)	○	○	○	○	
	(□ ○ ⬡)	(□ ○ ⬡)	○	○	○	○	
					TOTAL NUMBER OF ANNUNCIATION POINTS		

SWITCH CONTACT OPERATION

NOTE: EACH SWITCH SHALL BE MINIMUM SPDT ARRANGEMENT

ALARM CONTACTS SHALL:
- ⊗ OPEN (DE-ENER.) TO SOUND ALARM & BE ENERGIZED WHEN COMPR. IS IN OPERATION
- ○ CLOSE (ENERGIZE) TO SOUND ALARM & BE DE-ENERGIZED WHEN COMPR. IS IN OPERATION

SHUTDOWN CONTACTS SHALL:
- ⊗ OPEN (DE-ENERGIZED) TO SHUTDOWN & BE ENERGIZE WHEN COMPR. IS IN OPERATION
- ○ CLOSE (ENERGIZE) TO SHUTDOWN & BE DE-ENERGIZE WHEN COMPR. IS IN OPERATION

REF: 3.6.5.1 FOR MINIMUM RECOMMENDED PROTECTION REQUIREMENTS

Dominion Transmission, Inc.
Galmish Vapor Recovery Project

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1 ○ **INSTRUMENTATION (CONT'D)**

2 ○ MISCELLANEOUS INSTRUMENTATION ○ INTERCLR(S) ○ AFTERCLR ○ OIL CLR ○ H_2O CLR

3 SIGHT FLOW IND. (COOLING H_2O ONLY) (□ ○ ⬡) FOR: ○ CYL JACKET WATER ○ ROD PRESS. PKG CASES

4 PNEUMATIC PRESSURE TRANSMITTERS (□ ○ ⬡) FOR:

5 PRESSURE TRANSMITTERS (ELEC. OUTP.) (□ ○ ⬡) FOR:

6 PNEUMATIC LEVEL TRANSMITTERS (□ ○ ⬡)

7 ALARM HORN & ACKN'LMT TEST BUTTON (□ ○ ⬡)

8 CONDUIT & WIRING W/JUNCT. BOXES (CON-SOLES) (□ ○ ⬡)

9 TEST VALVES (□ ○ ⬡) FOR:

10 DRAIN VALVES (□ ○ ⬡) FOR:

11 GAUGE GLASS(ES) (□ ○ ⬡) FOR:

12 TACHOMETER (□ ○ ⬡) _____ SPEED RANGE _____ TO _____ RPM

13 CRANKSHAFT KEY PHASER (□ ○ ⬡) FOR:

14 AND TRANSDUCER

15 _____ (□ ○ ⬡)

16 _____ (□ ○ ⬡)

17 ○ SEPARATE LUBE OIL CONSOLE INSTRUMENTATION: PURCH. TO LIST REQ'MTS IN ADDITION TO ANY ABOVE REQ'MTS

18 _____ (□ ○ ⬡)

19 _____ (□ ○ ⬡)

20 _____ (□ ○ ⬡)

21 _____ (□ ○ ⬡)

22 _____ (□ ○ ⬡)

23 _____ (□ ○ ⬡)

24 ○ SEPARATE COOLING WATER CONSOLE INSTRUMENT: PURCH. TO LIST REQ'MTS IN ADDITION TO ANY ABOVE REQ'MTS

25 _____ (□ ○ ⬡)

26 _____ (□ ○ ⬡)

27 _____ (□ ○ ⬡)

28 _____ (□ ○ ⬡)

29 _____ (□ ○ ⬡)

30 _____ (□ ○ ⬡)

31 ○ RELIEF VALVES

32	LOCATION	BY	MANUFACTURER	TYPE	◇ SIZE	◇ SETTING
33		(□ ○ ⬡)				
34		(□ ○ ⬡)				
35		(□ ○ ⬡)				
36		(□ ○ ⬡)				
37		(□ ○ ⬡)				
38		(□ ○ ⬡)				
39		(□ ○ ⬡)				
40		(□ ○ ⬡)				
41		(□ ○ ⬡)				
42		(□ ○ ⬡)				

43 **NOTES:** SEE MOTOR DATA SHEET FOR ADDITIONAL MOTOR INSTRUMENTATION REQUIREMENTS

44 FOR TURBINE DRIVERS USE APPLICABLE API DATA SHEETS

45 FOR GEAR REDUCERS USE APPLICABLE API DATA SHEETS

46 ALL ELECTRICAL & INSTRUMENTATION CONNECTIONS SHALL BE SHOP-WIRED TO ON-SKID JUNCTION BOXES BY VENDOR

47

48 **ADDITIONAL INSTRUMENTATION REMARKS/SPECIAL REQUIREMENTS:** _____

49 _____

50 _____

ATTACHMENT N

Supporting Emission Calculations

Draft – Work Product – Privileged and Confidential – Prepared at the Request of Counsel and in Anticipation of Litigation – Subject to Attorney-Client Privilege

Company Name: **Dominion Transmission Inc.**

Project Description: **R13 Permit Application**

TABLE 1. Actual to Projected Actual NSR Emissions Analysis

Pollutant	Projected Actual Emissions (tpy)	Baseline Emissions (tpy)	Emission Increase[1] (tpy)	Significant Emission Rate (tpy)	Trigger Major NSR (Yes/No)	Percent of SER %
CO	18.63	16.87	1.76	100	No	2%
PM	3.62	3.28	0.34	25	No	1%
PM_{10}	3.62	3.28	0.34	15	No	2%
$PM_{2.5}$	2.05	1.86	0.19	10	No	2%
NO_X	22.90	20.74	2.16	40	No	5%
VOC	553.03	1195.66	0.00	40	No	0%
SO_2	0.17	0.15	0.02	40	No	0%
CO_2e	3,342.99	3,163.94	179.05	N/A	No	N/A

1. Emission decreases are reported as zero.
2. Since emissions of other criteria pollutants are less than the significant emission rate, greenhouse gases are not subject to regulation with respect to major NSR permitting.

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Company Name: **Dominion Transmission Inc.**

Project Description: **R13 Permit Application**

TABLE 2. Baseline Emissions Summary

CO (TPY)														
Source	**Projected**	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**	**2003**	**Baseline**
Boiler 1		1.00	0.65	0.94	3.88	4.33	3.54	4.88	1.42	3.75	1.27	0.16	0.40	
Boiler 2		0.31	0.20	0.08	1.43	0.07	0.85	0.05	0.95	0.46	2.14	2.36	2.05	
Heater 1		---	---	---	---	---	---	---	---	---	---	---	0.00	
Heater 2		---	---	---	---	---	---	---	---	---	---	---	0.00	
Heater 3		12.16	12.26	12.21	12.24	12.08	12.26	12.15	12.22	12.01	12.23	12.26	3.76	
Heater 4		---	---	---	---	---	---	---	---	---	---	---	0.65	
Total	**18.63**	**13.47**	**13.10**	**13.24**	**17.55**	**16.47**	**16.66**	**17.08**	**14.59**	**16.22**	**15.64**	**14.79**	**6.86**	**16.87**

1. Annual emissions from corresponding emission inventory.
2. Emissions from fire water heaters, auxiliary engines, and fire water pumps are not associated with the project in question.
3. Projected actual emissions assume an increase from baseline emissions proportional to the increase in NGL processing (approximately 10%). Example Calculation: Projected Actual Emissions = Baseline + [Baseline X 10.42%].

PM (TPY)														
Source	**Projected**	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**	**2003**	
Boiler 1		0.14	0.09	0.13	0.55	0.62	0.51	0.70	0.20	0.54	0.18	0.05	0.14	
Boiler 2		0.11	0.07	0.03	0.49	0.02	0.29	0.02	0.33	0.16	0.73	0.81	0.70	
Heater 1		---	---	---	---	---	---	---	---	---	---	---	0.00	
Heater 2		---	---	---	---	---	---	---	---	---	---	---	0.00	
Heater 3		2.30	2.32	2.60	2.60	2.36	2.43	2.34	2.24	2.22	2.32	2.45	1.32	
Heater 4		---	---	---	---	---	---	---	---	---	---	---	0.71	
Total	**3.62**	**2.55**	**2.48**	**2.77**	**3.65**	**3.00**	**3.23**	**3.06**	**2.77**	**2.91**	**3.24**	**3.32**	**2.87**	**3.28**

1. Annual emissions from corresponding emission inventory. Assumes all PM is PM_{10}.
2. Emissions from fire water heaters, auxiliary engines, and fire water pumps are not associated with the project in question.
3. Projected actual emissions assume an increase from baseline emissions proportional to the increase in NGL processing (approximately 10%). Example Calculation: Projected Actual Emissions = Baseline + [Baseline X 10.42%].

$PM_{2.5}$ (TPY)														
Source	**Projected**	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**	**2003**	
Boiler 1		0.09	0.06	0.09	0.35	0.39	0.32	0.44	0.13	0.34	0.12	0.03	0.09	
Boiler 2		0.07	0.04	0.02	0.31	0.01	0.19	0.01	0.21	0.10	0.46	0.51	0.44	
Heater 1		---	---	---	---	---	---	---	---	---	---	---	0.00	
Heater 2		---	---	---	---	---	---	---	---	---	---	---	0.00	
Heater 3		1.30	1.42	1.41	1.41	1.28	1.32	1.27	1.21	1.21	1.26	1.33	0.72	
Heater 4		---	---	---	---	---	---	---	---	---	---	---	0.06	
Total	**2.05**	**1.46**	**1.52**	**1.52**	**2.07**	**1.68**	**1.82**	**1.72**	**1.55**	**1.64**	**1.84**	**1.88**	**1.31**	**1.86**

1. Annual emissions from corresponding emission inventory.
2. Emissions from fire water heaters, auxiliary engines, and fire water pumps are not associated with the project in question.
3. Projected actual emissions assume an increase from baseline emissions proportional to the increase in NGL processing (approximately 10%). Example Calculation: Projected Actual Emissions = Baseline + [Baseline X 10.42%].

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Company Name: **Dominion Transmission Inc.**

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TABLE 2. Baseline Emissions Summary

NO_X (TPY)														
Source	**Projected**	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**	**2003**	
Boiler 1		1.19	0.77	1.12	4.62	5.15	4.22	5.81	1.69	4.46	1.52	0.63	1.60	
Boiler 2		0.32	0.20	0.08	1.49	0.07	0.89	0.05	0.99	0.48	2.23	2.47	2.13	
Heater 1		---	---	---	---	---	---	---	---	---	---	---	0.00	
Heater 2		---	---	---	---	---	---	---	---	---	---	---	0.00	
Heater 3		15.20	15.32	15.27	15.30	15.09	15.33	15.18	15.28	15.02	15.29	15.33	4.70	
Heater 4		---	---	---	---	---	---	---	---	---	---	---	0.77	
Total	**22.90**	**16.72**	**16.30**	**16.47**	**21.41**	**20.31**	**20.44**	**21.05**	**17.96**	**19.95**	**19.04**	**18.43**	**9.21**	**20.74**

1. Annual emissions from corresponding emission inventory.
2. Emissions from fire water heaters, auxiliary engines, and fire water pumps are not associated with the project in question.
3. Projected actual emissions assume an increase from baseline emissions proportional to the increase in NGL processing (approximately 10%). Example Calculation: Projected Actual Emissions = Baseline + [Baseline X 10.42%].

VOC (TPY)														
Source	**Projected**	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**	**2003**	
Boiler 1	0.30	0.07	0.04	0.06	0.25	0.28	0.23	0.32	0.09	0.25	0.08	0.01	0.03	
Boiler 2	0.23	0.14	0.09	0.04	0.65	0.03	0.39	0.02	0.43	0.21	0.98	1.08	0.94	
Heater 1	---	---	---	---	---	---	---	---	---	---	---	---	0.00	
Heater 2	---	---	---	---	---	---	---	---	---	---	---	---	0.00	
Heater 3	3.37	3.04	3.06	3.05	3.06	3.02	3.07	3.04	3.06	3.00	3.06	3.07	0.94	
Heater 4	---	---	---	---	---	---	---	---	---	---	---	---	0.04	
Galmish Rail Car Loading	132.07	85.89	109.35	544.24	849.99	944.86	937.41	991.07	900.57	636.39	566.06	510.89	349.59	
Galmish Truck Loading	229.30	60.38	66.22	83.05	209.88	66.09	57.55	56.97	103.78	111.96	143.93	15.23	9.54	
Vent Stack (Excluding Galmish Loading)	19.23	18.81	18.86	9.82	0.78	0.78	0.82	0.79	0.80	0.77	0.78	0.78	0.50	
HEP Tank 10	0.96	0.93	0.93	0.93	0.92	0.93	0.93	0.92	0.92	0.93	0.92	0.93	0.91	
HECS Knockout Tank	4.49	4.49	4.49	4.49	4.49	4.49	4.49	4.49	4.49	4.49	4.49	4.49	4.49	
Fugitives	163.08	159.77	159.77	159.77	159.77	159.77	159.77	159.77	159.77	159.77	159.77	159.77	159.77	
Total	**553.03**	**333.52**	**362.81**	**805.45**	**1229.80**	**1180.25**	**1164.65**	**1217.39**	**1173.92**	**917.77**	**880.08**	**696.25**	**526.76**	**1195.66**

1. Annual emissions from combustion units and Tank 10 are from corresponding emission inventory. Supporting calculations are included for other sources.
2. Emissions from fire water heaters, auxiliary engines, and fire water pumps are not associated with the project in question.
3. Projected actual emissions for combustion sources assume an increase from baseline emissions proportional to the increase in NGL processing (approximately 10%). Example Calculation: Projected Actual Emissions = Baseline + [Baseline X 10.4
4. Tank 10 projected actual emissions equal to permit limit.
5. HECS knockout tank emissions are not expected to change as a result of the project.

SO_2 (TPY)														
Source	**Projected**	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**	**2003**	
Boiler 1		0.01	0.00	0.01	0.03	0.03	0.03	0.03	0.01	0.03	0.01	0.00	0.01	
Boiler 2		0.01	0.00	0.00	0.02	0.00	0.01	0.00	0.02	0.01	0.04	0.04	0.04	
Heater 1		---	---	---	---	---	---	---	---	---	---	---	0.00	
Heater 2		---	---	---	---	---	---	---	---	---	---	---	0.00	
Heater 3		0.10	0.11	0.11	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.11	0.06	
Heater 4		---	---	---	---	---	---	---	---	---	---	---	0.05	
Total	**0.17**	**0.11**	**0.12**	**0.12**	**0.16**	**0.13**	**0.14**	**0.14**	**0.12**	**0.13**	**0.15**	**0.15**	**0.15**	**0.15**

1. Annual emissions from corresponding emission inventory.
2. Emissions from fire water heaters, auxiliary engines, and fire water pumps are not associated with the project in question.
3. Projected actual emissions assume an increase from baseline emissions proportional to the increase in NGL processing (approximately 10%). Example Calculation: Projected Actual Emissions = Baseline + [Baseline X 10.42%].

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TABLE 3. Emission Calculation Inputs

Location	Input Parameter	Input Value	Units
Railcar Loading Emissions	VRU Uptime	95%	Percent
Galmish Rail Car Loading Projected Actual Emissions	I-butane (# of rail cars)	670	Rail Cars
	N-butane (# of rail cars)	1350	Rail Cars
	Propane (# of rail cars)	510	Rail Cars
	Natural Gasoline (# of rail cars)	1200	Rail Cars
Galmish Rail Car Loading Baseline & Projected Actual Emissions	I-butane (Emission Factor)	990	lb VOC per rail car
	N-butane (Emission Factor)	990	lb VOC per rail car
	Propane (Emission Factor)	0	lb VOC per rail car
	Natural Gasoline (Emission Factor)	990	lb VOC per rail car
Galmish & NGL Unloading Area: Truck Loading Projected Actual Emissions	n-Butane (# of trucks)	200	Trucks
	I-butane (# of trucks)	100	Trucks
	Propane (# of trucks)	2000	Trucks
	Natural Gasoline (MGal)	435	MGal
Galmish & NGL Unloading Area: Truck Loading Baseline & Projected Actual E,ossopmss	N-butane (Emission Factor)	1423.5	lbs VOC per truck (loading arm and truck displacement)
	I-butane (Emission Factor)	1423.5	lbs VOC per truck (loading arm and truck displacement)
	Propane (Emission Factor)	13.78	lbs VOC per truck (loading arm)
	Natural Gasoline Emission Factor	9.19	lb/ Mgal
Vent Stack Projected Actual Fugitives	Nominal HEP Inlet Natural Gas Volume	69,350	MMscf/yr
	Component Count	See "Fugitives" Tables	

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TABLE 4. Galmish Rail Car Loading Emissions

VRU Uptime	95%	Percent
2012 VRU Uptime	53%	Effective Percent
VRU Capture effieincy	98.7%	Percent
Natural Gasoline Toluene Concentration	0.75%	wt%
Natural Gasoline Benzene Concentration	0.45%	wt%
Natural Gasoline Xylene Concentration	0.29%	wt%

1. VRU became operational in June 2012.
2. Capture efficiency assumes NSPS level test per AP-42 Section 5.2 (6/08)
3. Concentration of HAPs from MSDS for natural gasoline.

Product Loading	Value	Units	Value	Units	Value	Units
i-butane	990	lbs VOC per rail car	168.03	scf per blowdown	25.74	lb VOC per blowdown
n-butane	990	lbs VOC per rail car	174.37	scf per blowdown	26.71	lb VOC per blowdown
Propane	0	lbs VOC per rail car	203.78	scf per blowdown	23.68	lb VOC per blowdown
Natural Gasoline	990	lbs VOC per rail car		scf per blowdown	0.00	lb VOC per blowdown

Galmish Rail Car Loading Throughput (# of cars)

Inputs	Projected Actual	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
I-butane	670	450	556	516	485	465	467	448	448	423	387	367	252
N-butane	1350	860	1118	1037	919	844	829	801	803	764	724	634	432
Propane	510	246	426	209	408	458	387	205	252	43	124	186	169
Natural Gasoline	1200	819	990	636	266	554	554	715	529	66	0	0	0

1. Projected actual number of cars, conservatively assumes a 20% factor of safety due to potential variability in natural gas production.

VOC Emissions (TPY)

Product Loaded	Projected Actual	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
I-butane	29.30	19.68	24.31	129.52	246.32	236.16	237.17	227.52	227.52	214.83	196.54	186.39	127.98
N-butane	59.69	38.03	49.43	260.79	467.18	429.05	421.42	407.19	408.21	388.38	368.05	322.30	219.61
Propane	6.04	2.91	5.04	2.47	4.83	5.42	4.58	2.43	2.98	0.51	1.47	2.20	2.00
Natural Gasoline	37.04	25.28	30.55	151.45	131.67	274.23	274.23	353.93	261.86	32.67	0.00	0.00	0.00
Total	**132.07**	**85.89**	**109.35**	**544.24**	**849.99**	**944.86**	**937.41**	**991.07**	**900.57**	**636.39**	**566.06**	**510.89**	**349.59**

1. Sample emission calculation:

   {(VOC emission factor [lb/railcar] x no. of rail cars) x (1 - VRU Efficiency x VRU Capture Efficiency) + (VOC Blowdown Emission Factor [lb/railcar] x no. of rail cars)} / 2000
2. Blowdown volumes calculated from piping length. VOC conversion assumes 379.5 scf/lbmol of gas at STP.

HAP Emissions (TPY)

Pollutant	Projected Actual	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
Toluene	0.28	0.19	0.23	1.14	0.99	2.06	2.06	2.65	1.96	0.25	0.00	0.00	0.00
Benzene	0.17	0.11	0.14	0.68	0.59	1.23	1.23	1.59	1.18	0.15	0.00	0.00	0.00
Xylene	0.11	0.07	0.09	0.44	0.38	0.80	0.80	1.03	0.76	0.09	0.00	0.00	0.00
Total	**0.55**	**0.38**	**0.46**	**2.26**	**1.96**	**4.09**	**4.09**	**5.27**	**3.90**	**0.49**	**0.00**	**0.00**	**0.00**

1. HAP emissions are calculated as a percentage of VOC emissions based on weight percent of HAP in natural gasoline.
2. Sample emission calculation: Toluene emissions [tpy] = VOC emissions [tpy] x wt% of toluene in natural gasoline [0.75%]

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TABLE 5. Galmish & NGL Unloading Area: Truck Loading Emissions

	Emission Factor	
Parameter	**Value**	**Units**
n-butane loading	1423.5	lbs VOC per truck
i-butane loading	1423.5	lbs VOC per truck
Propane loading	13.78	lbs VOC per truck
Natural Gasoline loading	9.19	lbs VOC per 1000 gal
Natural Gasoline Toluene Concentration	0.75%	wt%
Natural Gasoline Benzene Concentration	0.45%	wt%
Natural Gasoline Xylene Concentration	0.29%	wt%

1. Concentration of HAPs from MSDS for natural gasoline.

Galmish Truck Loading Inputs														
Inputs	**Units**	**Projected Actual**	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**	**2003**
n-butane	# of trucks	200	0	0	30	181	0	3	6	45	48	91	0	0
i-butane	# of trucks	100	75	75	72	90	69	56	52	78	87	80	0	0
Propane	# of trucks	2000	1016	1863	1216	2137	2310	2200	2180	2205	2152	2636	2211	1385
Natural Gasoline	MGal	435	0	0	450.549	494.412	231.222	87.314	146.214	227.789	227.243	883.625	0	0

VOC Emissions (TPY)													
Product Loaded	**Projected Actual**	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**	**2003**
n-butane	142.35	0.00	0.00	21.35	128.83	0.00	2.14	4.27	32.03	34.16	64.77	0.00	0.00
i-butane	71.18	53.38	53.38	51.25	64.06	49.11	39.86	37.01	55.52	61.92	56.94	0.00	0.00
Propane	13.78	7.00	12.84	8.38	14.72	15.92	15.16	15.02	15.19	14.83	18.16	15.23	9.54
Natural Gasoline	2.00	0.00	0.00	2.07	2.27	1.06	0.40	0.67	1.05	1.04	4.06	0.00	0.00
Total	**229.30**	**60.38**	**66.22**	**83.05**	**209.88**	**66.09**	**57.55**	**56.97**	**103.78**	**111.96**	**143.93**	**15.23**	**9.54**

1. Sample emission calculation:

(VOC emission factor [lb/truck] x no. of trucks) / 2000

HAP Emissions (TPY)													
Pollutant	**Projected Actual**	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**	**2003**
Toluene	0.01	0.00	0.00	0.02	0.02	0.01	0.00	0.01	0.01	0.01	0.03	0.00	0.00
Benzene	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
Xylene	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
Total	**0.03**	**0.00**	**0.00**	**0.03**	**0.03**	**0.02**	**0.01**	**0.01**	**0.02**	**0.02**	**0.06**	**0.00**	**0.00**

1. HAP emissions are calculated as a percentage of VOC emissions based on weight percent of HAP in natural gasoline.
2. Sample emission calculation: Toluene emissions [tpy] = VOC emissions [tpy] x wt% of toluene in natural gas [0.75%]

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TABLE 6. VOC Vent Stack Emissions

Input	Value	Units
Gas Analyzer Bleeds PTE	0.2	tpy VOC
Gas Analyzer Bleeds PTE	20.3	tpy CO_2e
O2 Analyzer Bleeds PTE	18	tpy VOC
Manual Drains PTE	0.73	tpy VOC

1. Values based on a memo Dominon provided to EPA on March 7, 2014. PFD titled "Hastings Vent Stack Emissions to EPA 7 Mar 2014 sec"

Vent Stack Calculations														
Inputs	**Units**	**Projected Actual**	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**	**2003**
Natural Gas Volume	MMscf/yr	69,350	60,115	64,113	61,055	58,396	58,069	60,836	58,641	59,500	57,686	58,531	58,448	37,579
Gas Analyzer Bleeds	tpy VOC	0.20	0.17	0.18	0.18	0.17	0.17	0.18	0.17	0.17	0.17	0.17	0.17	0.11
Gas Analyzer Bleeds	tpy CO_2e	20.30	17.60	18.77	17.87	17.09	17.00	17.81	17.17	17.42	16.89	17.13	17.11	11.00
O2 Analyzer Bleeds	tpy	18.00	18.00	18.00	9.00									
Manual Drains	tpy	0.73	0.63	0.67	0.64	0.61	0.61	0.64	0.62	0.63	0.61	0.62	0.62	0.40
Natural Gasoline Analyzer	tpy	0.30												
VOC Total	**tpy**	**19.23**	**18.81**	**18.86**	**9.82**	**0.78**	**0.78**	**0.82**	**0.79**	**0.80**	**0.77**	**0.78**	**0.78**	**0.50**

1. Calculation methodology and PTE are based on a memo Dominon provided to EPA on March 7, 2014. PTE for natural gasoline analyzer based on mass balance:
   Example Natural Gasoline Analyzer Calculation: Emissions (tpy) = Sample Volume (L/day) x Specific Gravity (kg/L) x 365 (day/yr) x 10% evaporation x (lb / 2.2 kg) x (ton / 2,000 lb)
   Example Natural Gasoline Analyzer Calculation: Emissions (tpy) = 11 (L/day) x 0.67 (kg/L) x 365 (day/yr) x 10% evaporation x (2.2 lb / kg) x (ton / 2,000 lb)
2. Emissions from loading at Galmish are already accounted for on the Galmish rail/truck loading tabs.
3. Baseline emissions are calculated using a ratio of baseline inlet gas vs the nominal design inlet gas. The O_2 analyzer bleed began once the VRU become operational.
   Example Calculation: Baseline Emissions (tpy) = PTE (tpy) x (Actual Natural Gas Volume [MMscf/yr] / Nominal Potential Natural Gas Volume [MMscf/yr])
4. Projected actual emissions are conservatively assumed to be equal to PTE values.

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Table 7. VOC Fugitive Component Information

HEP Fugitive Emissions:

Component Type	Service	Projected Actual Component Count	Baseline Component Count	Gas Leak Emission Factor (lb/hr/component)	LDAR Control Efficiency	VOC Mass Fraction	Projected Actual			Baseline Actual		
							Average Gas Leak Rate (lb/hr)	Average Gas Leak Rate (tpy)	VOC Emissions (tpy)	Average Gas Leak Rate (lb/hr)	Average Gas Leak Rate (tpy)	VOC Emissions (tpy)
Compressor Seals	Gas Vapor	2	2	5.03E-01	0%	0.1793	1.01	4.40	0.79	1.01	4.40	0.79
Pump Seals	Light Liquid	34	33	4.39E-02	69%	1.00	1.49	2.03	2.03	1.45	1.97	1.97
Valves	Gas Vapor	508	500	1.32E-02	87%	0.1793	6.69	3.81	0.68	6.58	3.75	0.67
Valves	Light Liquid	2,494	2,292	8.88E-03	84%	1.00	22.16	15.53	15.53	20.36	14.27	14.27
PRVs	Any	67	56	2.29E-01	0%	0.1793	15.36	67.28	12.06	12.84	56.24	10.08
Total							**46.70**	**93.05**	**31.09**	**42.24**	**80.62**	**27.78**

Notes:

1. The projected actual component count is the current component count at HEP from July 2014. Baseline component count excludes those components that began monitoring in April 2011 & October 2010.
2. Emission Factors from: 1995 Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017), Table 2-1 SOCMI Average Emission Factors.
3. Control efficiency from: 1995 Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017), Table 5-2. Assumes monthly leak detection. If no efficiency was published, none was assumed
4. VOC mass fraction for components is gas service is taken from the February 13, 2014 Vent Stack letter to EPA. Light liquid components assumed to be 100% VOC.

Non-HEP Fugitive Emissions:

Component Type	Service	Projected Actual Component Count	Baseline Component Count	Gas Leak Emission Factor (lb/hr/component)	LDAR Control Efficiency	VOC Mass Fraction	Projected Actual			Baseline Actual		
							Average Gas Leak Rate (lb/hr)	Average Gas Leak Rate (tpy)	VOC Emissions (tpy)	Average Gas Leak Rate (lb/hr)	Average Gas Leak Rate (tpy)	VOC Emissions (tpy)
Compressor Seals	Gas Vapor	0	0	5.03E-01	0%	0.1793	0.00	0.00	0.00	0.00	0.00	0.00
Pump Seals	Light Liquid	19	19	4.39E-02	0%	1.00	0.83	3.65	3.65	0.83	3.65	3.65
Valves	Gas Vapor	546	546	1.32E-02	0%	0.1793	7.19	31.48	5.64	7.19	31.48	5.64
Valves	Light Liquid	2,681	2,681	8.88E-03	0%	1.00	23.82	104.33	104.33	23.82	104.33	104.33
PRVs	Any	102	102	2.29E-01	0%	0.1793	23.39	102.43	18.37	23.39	102.43	18.37
Total							**55.23**	**241.89**	**131.99**	**55.23**	**241.89**	**131.99**

Notes:

1. The projected actual component count is the current component count at non-HEP locations (slug catcher, HECS, Galmish loading, Tank 10, HCS, and NGL unloading)
2. Emission Factors from: 1995 Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017), Table 2-1 SOCMI Average Emission Factors.
3. VOC mass fraction for components is gas service is taken from the February 13, 2014 Vent Stack letter to EPA. Light liquid components assumed to be 100% VOC.
4. No control efficiency of an LDAR program is assumed.
5. Component service assumed to be same ratio as HEP.

Draft – Work Product – Privileged and Confidential – Prepared at the Request of Counsel and in Anticipation of Litigation – Subject to Attorney-Client Privilege

Company Name: **Dominion Transmission Inc.**

Project Description: **R13 Permit Application**

Table 8. GHG & HAP Fugitive Component Information

HEP Fugitive Emissions:

								Projected Actual				Baseline Actual			
Component Type	**Service**	**Projected Actual Component Count**	**Baseline Component Count**	**Gas Leak Emission Factor**	**LDAR Control Efficiency**	**CH_4 Mass Fraction**	**HAP Mass Fraction**	**Average Gas Leak Rate**	**Average Gas Leak Rate**	**CH_4 Emissions (as CO_2e)**	**HAP Emissions**	**Average Gas Leak Rate**	**Average Gas Leak Rate**	**CH_4 Emissions (as CO_2e)**	**HAP Emissions**
				(lb/hr/component)				**(lb/hr)**	**(tpy)**	**(tpy)**	**(tpy)**	**(lb/hr)**	**(tpy)**	**(tpy)**	**(tpy)**
Compressor Seals	Gas Vapor	2	2	5.03E-01	0%	0.6347	0.0045	1.01	4.40	69.87	0.02	1.01	4.40	69.87	0.02
Pump Seals	Light Liquid	34	33	4.39E-02	69%	0.00	0.0149	1.49	2.03	0.00	0.03	1.45	1.97	0.00	0.03
Valves	Gas Vapor	508	500	1.32E-02	87%	0.6347	0.0045	6.69	3.81	60.41	0.02	6.58	3.75	59.46	0.02
Valves	Light Liquid	2,494	2,292	8.88E-03	84%	0.00	0.0149	22.16	15.53	0.00	0.23	20.36	14.27	0.00	0.21
PRVs	Any	67	56	2.29E-01	0%	0.6347	0.0045	15.36	67.28	1067.63	0.30	12.84	56.24	892.35	0.25
Total								**46.70**	**93.05**	**1197.91**	**0.60**	**42.24**	**80.62**	**1021.67**	**0.53**

Notes:

1. The projected actual component count is the current component count at HEP from July 2014. Baseline component count excludes those components that began monitoring in April 2011 & October 2010.
2. Emission Factors from: 1995 Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017), Table 2-1 SOCMI Average Emission Factors.
3. Control efficiency from: 1995 Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017), Table 5-2. Assumes monthly leak detection. If no efficiency was published, none was assumed
4. CH_4 and HAP mass fraction for components in gas service is taken from the February 13, 2014 Vent Stack letter to EPA. Light liquid components assumed to be 0% methane. HAP concentration assumed to be same as that in natural gasoline.

Non-HEP Fugitive Emissions:

								Projected Actual				Baseline Actual			
Component Type	**Service**	**Projected Actual Component Count**	**Baseline Component Count**	**Gas Leak Emission Factor**	**LDAR Control Efficiency**	**CH_4 Mass Fraction**	**HAP Mass Fraction**	**Average Gas Leak Rate**	**Average Gas Leak Rate**	**CH_4 Emissions (as CO_2e)**	**HAP Emissions**	**Average Gas Leak Rate**	**Average Gas Leak Rate**	**CH_4 Emissions (as CO_2e)**	**HAP Emissions**
				(lb/hr/component)				**(lb/hr)**	**(tpy)**	**(tpy)**		**(lb/hr)**	**(tpy)**	**(tpy)**	**(tpy)**
Compressor Seals	Gas Vapor	0	0	5.03E-01	0%	0.6347	0.0045	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pump Seals	Light Liquid	19	19	4.39E-02	0%	0.00	0.0149	0.83	3.65	0.00	0.05	0.83	3.65	0.00	0.05
Valves	Gas Vapor	546	546	1.32E-02	0%	0.6347	0.0045	7.19	31.48	499.44	0.14	7.19	31.48	499.44	0.14
Valves	Light Liquid	2,681	2,681	8.88E-03	0%	0.00	0.0149	23.82	104.33	0.00	1.55	23.82	104.33	0.00	1.55
PRVs	Any	102	102	2.29E-01	0%	0.6347	0.0045	23.39	102.43	1625.35	0.46	23.39	102.43	1625.35	0.46
Total								**55.23**	**241.89**	**2124.78**	**2.21**	**55.23**	**241.89**	**2124.78**	**2.21**

Notes:

1. The projected actual component count is the current component count at non-HEP locations (slug catcher, HECS, Galmish loading, Tank 10, HCS, and NGL unloading).
2. Emission Factors from: 1995 Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017), Table 2-1 SOCMI Average Emission Factors.
4. CH_4 and HAP mass fraction for components in gas service is taken from the February 13, 2014 Vent Stack letter to EPA. Light liquid components assumed to be 0% methane. HAP concentration assumed to be same as that in natural gasoline.
4. No control efficiency of an LDAR program is assumed.
5. Component service assumed to be same ratio as HEP.

ATTACHMENT O

Monitoring/Recordkeeping/Reporting/Testing Plans

ATTACHMENT O

Monitoring, Recording, Reporting, and Testing Plans

Plan Type	Emission unit	Pollutant	Requirements	Frequency	Method of Measurement	Regulatory Reference
Monitoring, Reporting	006-01 (C-1)	VOC	Implementation of a leak detection and repair program on the Galmish VRU and associated closed vent system If leak is detected, first attempt of repair within 5 days and final repair within 15 days	Initial monitoring within 60 days and monthly thereafter	Initial: Method 21 or approved alternative (e.g., FLIR camera). Leak definition is 500 ppm for Method 21 and visible leak using FLIR camera Monthly: Audio, visual, olfactory	Consent Order CO-R13-E-2015-13 dated June 26, 2015
Monitoring, Reporting	006-01 (C-1)	VOC	Document date, duration, cause, and corrective action for periods when the VRU is not operating while loading operations are occurring or during periods when vapors are vented to atmosphere	Per occurrence	Records	Consent Order CO-R13-E-2015-13 dated June 26, 2015
Monitoring, Recordkeeping, Reporting	HEP Fugitives	VOC	Implementation of a leak detection and repair program. Applies to the HEP Cold Plant, the HEP Fractionation Plant, and to new and reconstructed portions of the HEP NGL Storage Area since the 2002 modernization project authorized under R13-2468A issued in March 2003 [includes alcohol seal pots in the HEP Cold Plant and relief valves on the VRU liquid return line in the NGL storage area]	40 CFR 60 Subpart KKK as referenced in Section 8 of the Title V permit	40 CFR 60 Subpart KKK as referenced in Section 8 of the Title V permit	40 CFR 60 Subpart KKK as referenced in Section 8 of the Title V permit

ATTACHMENT P

Public Notice

AIR QUALITY PERMIT NOTICE
Notice of Application

Notice is given that Dominion Transmission, Inc. (DTI) has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a Class II Administrative Update to Permit No. R13-2468D for the Hastings Extraction Plant located on Route 20 near Pine Grove, in Wetzel County, West Virginia (39.552121, -80.675052).

The applicant estimates the potential increase to discharge the following Regulated Air Pollutants as a result of the change will be:

Particulate Matter (PM) = 0.00 tpy
Sulfur Dioxide (SO2) = 0.00 tpy
Volatile Organic Compounds (VOC) = 0.00 tpy
Carbon Monoxide (CO) = 0. 00 tpy
Nitrogen Oxides (NOx) = 0.00 tpy
Hazardous Air Pollutants (HAPs) = 0.00 tpy
Greenhouse Gases (CO2e) = 180 tpy

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

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

Dated this the (Day) of (Month), 2015.

By: Dominion Transmission, Inc.
Brian Sheppard
Vice President, Pipeline Operations
445 West Main Street
Clarksburg, WV 26301

ATTACHMENT S

Title V Revision Information

Attachment S

Title V Permit Revision Information

1. New Applicable Requirements Summary	
Mark all applicable requirements associated with the changes involved with this permit revision:	
☐ SIP	☐ FIP
☒ Minor source NSR (45CSR13)	☐ PSD (45CSR14)
☐ NESHAP (45CSR15)	☐ Nonattainment NSR (45CSR19)
☒ Section 111 NSPS (Subpart(s)_KKK_____)	☐ Section 112(d) MACT standards (Subpart(s)_____)
☐ Section 112(g) Case-by-case MACT	☐ 112(r) RMP
☐ Section 112(i) Early reduction of HAP	☐ Consumer/commercial prod. reqts., section 183(e)
☐ Section 129 Standards/Reqts.	☐ Stratospheric ozone (Title VI)
☐ Tank vessel reqt., section 183(f)	☐ Emissions cap 45CSR§30-2.6.1
☐ NAAQS, increments or visibility (temp. sources)	☐ 45CSR27 State enforceable only rule
☐ 45CSR4 State enforceable only rule	☐ Acid Rain (Title IV, 45CSR33)
☐ Emissions Trading and Banking (45CSR28)	☐ Compliance Assurance Monitoring (40CFR64) [1]
☐ NO_x Budget Trading Program Non-EGUs (45CSR1)	☐ NO_x Budget Trading Program EGUs (45CSR26)

[1] If this box is checked, please include **Compliance Assurance Monitoring (CAM) Form(s)** for each Pollutants Specific Emission Unit (PSEU) (See Attachment H to Title V Application). If this box is not checked, please explain why **Compliance Assurance Monitoring** is not applicable:

The VRU is considered "inherent process equipment" as defined at 40 CFR 64.1, and therefore, the emission unit does not have a control device for purposes of CAM applicability.

2. Non Applicability Determinations

List all requirements, which the source has determined not applicable to this permit revision and for which a permit shield is requested. The listing shall also include the rule citation and a rationale for the determination.

☒ **Permit Shield Requested** *(not applicable to Minor Modifications)*

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

3. Suggested Title V Draft Permit Language

Are there any changes involved with this Title V Permit revision outside of the scope of the NSR Permit revision? ☒ Yes ☐ No If Yes, describe the changes below.

Also, please provide **Suggested Title V Draft Permit language** for the proposed Title V Permit revision (including all applicable requirements associated with the permit revision and any associated monitoring /recordkeeping/ reporting requirements), OR attach a marked up pages of current Title V Permit. Please include appropriate citations (Permit or Consent Order number, condition number and/or rule citation (e.g. 45CSR§7-4.1)) for those requirements being added / revised.

DTI requests the following updates be made to the existing Title V permit No.: R30-10300009

1. **Incorporating the modifications from this R13 application into the Title V permit.**

2. **Add the existing "vent stack" at HEP and knockout tank at HECS (V-2195) as emission points in the Title V permit. The vent stack and knockout tank themselves are not an emission unit, but it is the emission point for various operations at the facility. The emission points are included on Attachment I and J forms.**

3. **Include the Hastings Electric Compressor Station (HECS), slug catcher area, and the NGL Unloading area in the existing Title V permit. Emissions from these sources are primarily fugitive in nature, but DTI requests that these operations be specifically listed in the Title V permit. Supporting calculations for equipment at these locations are included in Attachment S.**

4. **Incorporate Permit Determination No. PD-15-031 into the Title V permit. This permit determination replaced the existing Cleaver Brooks boiler rated at 16.75MMBtu/hr (BL02) with a natural gas-fired Superior boiler rated at 25.2 MMBtu/hr.**

4. Active NSR Permits/Permit Determinations/Consent Orders Associated With This Permit Revision

Permit or Consent Order Number	Date of Issuance	Permit/Consent Order Condition Number
R13-2468D	11/5/2014	
R30-10300009-2011	12/6/2011	
PD-15-031	4/3/2015	
CO-R13-E-2015-13	6/26/2015	

5. Inactive NSR Permits/Obsolete Permit or Consent Orders Conditions Associated With This Revision

Permit or Consent Order Number	Date of Issuance	Permit/Consent Order Condition Number
	MM/DD/YYYY	
	/ /	
	/ /	

6. Change in Potential Emissions	
Pollutant	Change in Potential Emissions (+ or -), TPY
Please see detailed emission calculations in Attachment N.	
All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.	

7. Certification For Use Of Minor Modification Procedures *(Required Only for Minor Modification Requests)*

Note:	*This certification must be signed by a responsible official. Applications without a signed certification will be returned as incomplete. The criteria for allowing the use of Minor Modification Procedures are as follows:*

i. Proposed changes do not violate any applicable requirement;

ii. Proposed changes do not involve significant changes to existing monitoring, reporting, or recordkeeping requirements in the permit;

iii. Proposed changes do not require or change a case-by-case determination of an emission limitation or other standard, or a source-specific determination for temporary sources of ambient air quality impacts, or a visibility increment analysis;

iv. Proposed changes do not seek to establish or change a permit term or condition for which there is no underlying applicable requirement and which permit or condition has been used to avoid an applicable requirement to which the source would otherwise be subject (synthetic minor). Such terms and conditions include, but are not limited to a federally enforceable emissions cap used to avoid classification as a modification under any provision of Title I or any alternative emissions limit approved pursuant to regulations promulgated under § 112(j)(5) of the Clean Air Act;

v. Proposed changes do not involve preconstruction review under Title I of the Clean Air Act or 45CSR14 and 45CSR19;

vi. Proposed changes are not required under any rule of the Director to be processed as a significant modification;

Notwithstanding subparagraph 45CSR§30-6.5.a.1.A. (items i through vi above), minor permit modification procedures may be used for permit modifications involving the use of economic incentives, marketable permits, emissions trading, and other similar approaches, to the extent that such minor permit modification procedures are explicitly provided for in rules of the Director which are approved by the U.S. EPA as a part of the State Implementation Plan under the Clean Air Act, or which may be otherwise provided for in the Title V operating permit issued under 45CSR30.

Pursuant to 45CSR§30-6.5.a.2.C., the proposed modification contained herein meets the criteria for use of Minor permit modification procedures as set forth in Section 45CSR§30-6.5.a.1.A. The use of Minor permit modification procedures are hereby requested for processing of this application.

(Signed):	Brian T. Sheppard *(Please use blue ink)*	Date:	08 / 14 / 15 *(Please use blue ink)*
Named (typed):	Brian Sheppard	Title:	Vice President, Pipeline Operations

Note: Please check if the following included (if applicable):

☐	Compliance Assurance Monitoring Form(s)
☐	Suggested Title V Draft Permit Language

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

Pamela F. Faggert
Chief Environmental Officer and
Vice President-Corporate Compliance

Dominion Resources Services, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
Phone: 804-273-3467

dom.com

March 7, 2014

Via Electronic Delivery

Bruce Augustine
Office of Air Enforcement & Compliance Assistance
USEPA Region III
1650 Arch Street (3AP00)
Philadelphia, PA 19103-2029

Bowen Hosford
Office of Air Enforcement & Compliance Assistance
USEPA Region III
1650 Arch Street (3AP00)
Philadelphia, PA 19103-2029

RE: Dominion Transmission, Inc.
Hastings Complex
Vent Stack 102-B VOC Content and Annual Emissions

Dear Messrs. Augustine and Hosford:

In response to our January 16, 2014 meeting, we prepared an analysis of the sources and emissions associated with the Vent Stack on the hill above the Hastings Extraction Plant ("Vent Stack") at the Hastings Complex. For sources vented to the Vent Stack and its header system, we determined whether those sources contain or may contain gases or flash vapors with greater than 10 percent volatile organic compound (VOC) content by weight. We also estimated potential annual emissions from the Vent Stack associated with normal operations. The format for this information follows our February 13, 2014 submittal of similar information for the separate Knockout Tank and vent system at the Hastings Electric Compressor Station. The Vent Stack system is much more complex and has taken time to review and verify to the same level of detail.

Sources Vented to the Vent Stack

The Vent Stack (Equipment ID 102-B) located on top of the hill is a 175-foot tall from ground-level stack with a diameter of 24-inches installed in 1968 that receives vented gases directly through a 24-inch diameter vent header/plenum that runs from the Hastings Extraction Plant ("HEP") to the Vent Stack. In general, the vent gas sources are the Galmish Loading Area ("Galmish"), the Natural Gas Liquid (NGL) Storage Area and the HEP Vent Stack Knockout Drum (Equipment ID 126-F). The first two sources tie into the Vent Stack vent header/plenum downstream of the Knockout Drum.

Process and instrumentation diagrams for the Vent Stack system were included in the May 6, 2013 information submittal to your office. The purpose of the Vent Stack is to safely convey relief and other potentially flammable gases and vapors away from process and production areas at the Hastings Complex. A continuous nitrogen purge and sweep is maintained throughout the entire vent header/plenum system and exits through the Vent Stack. The purpose of the nitrogen purge and

sweep is to exclude oxygen and eliminate the potential for accumulating explosive gas/vapor mixtures in the Vent Stack vent header/plenum. The emergency backup to nitrogen for the safety purge is residue gas (dry natural gas). However, residue gas would only be used to purge the Vent Stack plenum in the unlikely event that the HEP nitrogen system fails.

The HEP Vent Stack Knockout Drum ("VS Knockout Drum") is an approximately 7000-gallon vessel installed in 1969. The inlet to the drum is a 20-inch vent header/plenum within the HEP. The VS Knockout Drum receives vapor-liquid flows from relief valves and other sources within the HEP. The VS Knockout Drum separates hydrocarbon liquids and also separates flash gases from the hydrocarbon liquids. The hydrocarbon liquids are pumped from the VS Knockout Drum and sold as product. The flash gases are carried through the Vent Stack via the nitrogen purge and air sweep. The VOC content of liquids, gases and vapors processed in the VS Knockout Drum varies and is often 100 percent.

The sources directly venting to the Vent Stack downstream of the VS Knockout Drum are listed in Table 1. Sources associated with the Vent Stack header from Galmish identified in Table 1 are listed in Table 2. The sources routed through the VS Knockout Drum prior to the Vent Stack are listed in Table 3. Each source is characterized by vent type, emission scenario, location and VOC content. Vent type and emission scenario information separate the sources into categories:

- normal operation including continuous and intermittent sources
- backup / emergency
- malfunction (safety and equipment protection)
- maintenance activities including outages

Source location refers to the origin of gases, vapors or liquids that are ultimately routed to the Vent Stack. The VOC content of these sources is based on sampling and analysis of the gas streams or from product specifications for the NGL products produced at HEP (propane, butane, and natural gasoline).

Table 1 – Sources Vented Directly to the Vent Stack (Equipment ID102-B)

Source (Equip ID) [Ref drawing]	Type	Emission Scenario	Source Location*	VOC Content by Weight
Recovered Liquid Pig Receiver Blowdown [12-HA-090]	Manual liquid drain / vent	Maintenance	NGL Storage Area	100%
Drip Gasoline Drains from P-1350, 1355 [12-HA-090]	Manual liquid drain / vent	Maintenance	NGL Storage Area	100%
NGL Vents from P-1340, P-1345, & P-1530 [12-HA-090]	Manual liquid drain / vent	Maintenance / Malfunction	NGL Storage Area	100%
Vents from PCV-1360 [12-HA-090]	Vents on Malfunction	Equipment Protection / Malfunction	NGL Storage Area	100%
Recovered Liquids (PSV-3675) [12-HA-090]	Relief Valve on Malfunction	Equipment Protection / Malfunction	NGL Storage Area	100%
Drip Gasoline Seal Pot Vents from P-1350, 1355 [12-HA-090]	Vents on Malfunction	Maintenance / Malfunction	NGL Storage Area	100%
NGL Seal Vent from P-1340, 1345 [12-HA-090]	Vents on Malfunction	Maintenance / Malfunction	NGL Storage Area	100%
Propane (F-1500 Vent) [12-HA-090]	Manual liquid drain / vent	Maintenance	NGL Storage Area	> 97%
PSV-1754 Gasoline [12-HA-090]	Relief Valve on Malfunction	Equipment Protection / Malfunction	NGL Storage Area	100%

Source (Equip ID) [Ref drawing]	Type	Emission Scenario	Source Location*	VOC Content by Weight
Gasoline vapor from Tank Car loading if vapor recovery not in service [12-HA-090]	Process Vent	Backup Operation	Galmish	100%
Vent from Galmish Area [12-HA-090]	**See Table 2**	**See Table 2**	**Galmish**	**100 %**
Purge Nitrogen from N2 Supply Header [12-HA-090]	Nitrogen Purge,	Backup Operation	HEP	Zero, inert gas
Vent from Vent Stack KO Drum 126-F [12-HA-090]	**See Table 3**	**See Table 3**	**HEP**	**Varies**

* Source location refers to the origin of gases, vapors or liquid in sources connected to Vent Stack 102-B.

Table 2 – Sources Vented Directly to Vent Stack from Galmish

Source (Equip ID) [Ref drawing]	Type	Emission Scenario	Source Location	VOC Content by Weight
Pump Area PSVs to Vent Header [12-HA-205]	Relief Valve Malfunction	Equipment Protection / Malfunction	Galmish	100%
Pump 930 vents to Vent Header [12-HA-205]	**Blowdown of pump**	**Intermittent Operations**	**Galmish**	**100%**
Pump 920 Drain and RV-133 Outlet which vents to Vent Header [12-HA-205]	Manual liquid drain / vent Relief Valve on Malfunction	Maintenance Equipment Protection / Malfunction	Galmish	100%
Mercaptan Vessel PSV-117 Outlet which vents to Vent Header) [12-HA-205]	Relief Valve Malfunction	Equipment Protection / Malfunction	Galmish	0%
Sample Return for Vapor Recovery from Analyzer AT-3521 [12-HA-205]	**O2 Analyzer of NGL and vent**	**Normal Operations**	**Galmish**	**100%**
Vent from V-3650) [12-HA-205]	Vent for Maintenance	Maintenance	Galmish	100%
Vent from C-3500 1st Stage [12-HA-205]	Vent for Maintenance	Maintenance	Galmish	100%
Vent from C-3500 2nd Stage)[12-HA-205]	Vent for Maintenance	Maintenance	Galmish	100%
Non-Condensable [12-HA-205]	Vent on Malfunction	Equipment Protection / Malfunction	Galmish	0%
Drains from Pumps and Vessels [12-HA-205]	Manual liquid drain / vent	Maintenance	Galmish	100%
Vent from P-3660 Seal[12-HA-205]	Vent on Malfunction	Maintenance / Malfunction	Galmish	100%

Source (Equip ID) [Ref drawing]	Type	Emission Scenario	Source Location	VOC Content by Weight
Vent from P-3665 Seal [12-HA-205]	Vent on Malfunction	Maintenance / Malfunction	Galmish	100%
Vent from V-3630 [12-HA-205]	Vent for Maintenance	Maintenance	Galmish	100%
Vent from AC-3620/3640 [12-HA-205]	Vent for Maintenance	Maintenance	Galmish	100%
Vent from V-3610 [12-HA-205]	Vent for Maintenance	Maintenance	Galmish	100%
ESD Blowdown from PV-3540 [12-HA-205]	Open during ESD	Emergency / Malfunction	Galmish	100%
Pig Vent from propane pipeline [12-HA-211]	Vent for Maintenance	Maintenance	Galmish	> 97%
Pig Vent from Isobutane pipeline [12-HA-211]	Vent for Maintenance	Maintenance	Galmish	100%
Pig Vent from n-Butane pipeline [12-HA-211]	Vent for Maintenance	Maintenance	Galmish	100%
LPG Vapor from truck loading [12-HA-211]	**Loading Operations**	**Intermittent Operations**	**Galmish**	**> 97%**
LPG Vapor from truck/rail loading [12-HA-211]	Vent on Malfunction	Equipment Protection/ Malfunction	Galmish	100%
LPG Vapor from rail loading when Vapor Recovery not in service [12-HA-211]	Vent Operation	Backup Operation	Galmish	100%
LPG Vapor from rail loading [12-HA-211]	**Vent for Intermittent Operations**	**Intermittent Operations**	**Galmish**	**> 97%**

Table 3 – Sources Routed to Vent Stack Through VS Knockout Drum

Source (Equip ID) [Ref drawing]	Type	Emission Scenario	Source Location	VOC Content by Weight
Waste Water from Open Drain System) [12-HA-090]	Manual liquid drain / vent	Backup Operation	HEP	100%
Butane PSV-1318) [12-HA-090]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	100%
Drip Gasoline PSV-1361, 1364) [12-HA-090]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	Varies may be > 10%

Source (Equip ID) [Ref drawing]	Type	Emission Scenario	Source Location	VOC Content by Weight
Drip Gasoline PSV-1365) [12-HA-090]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	Varies may be > 10%
Iso-Butane PSV-1485) [12-HA-090]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	100%
Iso-Butane (Rerun) PSV-1418) [12-HA-090]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	100%
PSV-1140 Propane [12-HA-087]	Relief Valve on Malfunction	Equipment Protection / Malfunction	Galmish	> 97%
Vent from PV-1142 Propane [12-HA-087]	Vent on Malfunction	Equipment Protection / Malfunction	HEP	> 97%
Vent from E-1230 Butane Mix [12-HA-087]	Vent for Maintenance	Maintenance / Malfunction	HEP	100%
PSV-1230 Butane Mix [12-HA-087]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	100%
Drain from P-1240, P1245 Butane Mix [12-HA-087]	Manual liquid drain / vent	Maintenance	HEP	100%
Drain from V-1230 Butane Mix [12-HA-087]	Manual liquid drain / vent	Maintenance	HEP	100%
Iso-Butane PSV-1290) [12-HA-087]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	100%
Iso-Butane (Drain from P-1290, P-1295) [12-HA-087]	Manual liquid drain / vent	Maintenance	HEP	100%
Iso-Butane (Drain from V-1280) [12-HA-087]	Manual liquid drain / vent	Maintenance	HEP	100%
Propane (Drain from P-1160, P-1161) [12-HA-087]	Manual liquid drain / vent	Maintenance	HEP	> 97%
Propane (Drain from V-1140) [12-HA-087]	Manual liquid drain / vent	Maintenance	HEP	> 97%
Propane, Butane, Iso-Butane (Seal Pot vents from P-1160/1161, P-1240/1245, P-1290/1295) [12-HA-087]	Vent on Malfunction	Maintenance / Malfunction	HEP	100%
Propane (PSV-1114) [12-HA-087]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	> 97%
Iso-Butane (PSV-1276 on-106-E) [12-HA-087]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	100%
Iso-Butane (PSV-1274) [12-HA-087]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	100%
NGL (PSV-1720) [12-HA-087]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	100%
Seal Pot Vents (from P-1165, P1166) [12-HA-087]	Vent on Malfunction	Maintenance / Malfunction	HEP	100%
Butane (PSV-1200) [12-HA-087]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	100%
Iso-Butane (from PV-1274) [12-HA-087]	Vent on Malfunction	Maintenance / Malfunction	HEP	100%
Propane (Drains from P-1166/1165) [12-HA-087]	Manual liquid drain / vent	Maintenance	HEP	> 97%

Source (Equip ID) [Ref drawing]	Type	Emission Scenario	Source Location	VOC Content by Weight
Propane Vents from 120-CN & 122-CN) [12-HA-087]	Manual liquid drain / vent	Maintenance	HEP	> 97%
Drip Gasoline (Vents from A-1770-1) [12-HA-087]	Manual liquid drain / vent	Maintenance	HEP	100%
Drip Gasoline (PSV-1710 on 107-E) [12-HA-087]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	100%
Nitrogen Purge from Supply [12-HA-088]	Nitrogen Purge -	Backup Operation	HEP	Zero, inert gas
Purge Fuel Gas (from 121-F) [12-HA-088]	Back-up Purge	Backup Operation	HEP	Varies
Fuel Gas KO (Drain from V-947) [12-HA-088]	Manual liquid drain / vent	Maintenance	HEP	Varies
Fuel Gas KO (Drain from 121-F) [12-HA-088]	Manual liquid drain / vent	Maintenance	HEP	Varies
Fuel Gas (PSV-943) [12-HA-088]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	Varies
Fuel Gas KO (Drain from V-840; 0) [12-HA-088]	Manual liquid drain / vent	Maintenance	HEP	Varies
Fuel Gas (PSV-947) [12-HA-088]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	Varies
Fuel Gas (PSV-840) [12-HA-088]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	Varies
Fuel Gas (PSV-69) [12-HA-088]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	Varies
Hot Oil (RV-167 Blanket/purge from 113-F) [12-HA-088]	**Nitrogen Purge -**	**Normal Operation**	**HEP**	**Zero, inert gas**
Drain from 106 J/JA Gasoline [12-HA-089]	Manual liquid drain / vent	Maintenance	HEP	100%
Drain from P-1420/1425 Iso-Butane [12-HA-089]	Manual liquid drain / vent	Maintenance	HEP	100%
Seal Pot Vents from P-1420/1425 Iso-Butane [12-HA-089]	Vent on Malfunction	Maintenance / Malfunction	HEP	100%
Vent from PV-1390 Drip Gasoline [12-HA-089]	Vent on Malfunction	Maintenance / Malfunction	HEP	100%
Drain from 114J & JA Butane [12-HA-089]	Manual liquid drain / vent	Maintenance	HEP	100%
Drip Gasoline (Drains from 127-J/JA) [12-HA-089]	Manual liquid drain / vent	Maintenance	HEP	100%
Drip Gasoline (Water Drains from 118-F) [12-HA-089]	**Manual liquid drain / vent**	**Intermittent Operations**	**HEP**	**Varies**
Drip Gasoline (Drain from E-1345) [12-HA-089]	Manual liquid drain / vent	Maintenance	HEP	100%
Iso-Butane (Vent from PV-1248) [12-HA-089]	Vent on Malfunction	Maintenance / Malfunction	HEP	100%
Propane (PSV-1115 104-E) [12-HA-089]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	> 97%
NGL/Gasoline (PSV-1775/1776) [12-HA-089]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	100%
Gasoline (Vent/Drain from P-1750/1755) [12-HA-089]	Manual liquid drain/vent	Maintenance / Malfunction	HEP	100%
Gasoline (Vent from P-1750 Seal Pot) [12-HA-089]	Vent on Malfunction	Maintenance / Malfunction	HEP	100%
Gasoline (Vent from P-1755 Seal Pot) [12-HA-089]	Vent on Malfunction	Maintenance / Malfunction	HEP	100%
Gasoline (PSV-1752) [12-HA-089]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	100%
Fuel Gas (PSV-3656) [12-HA-089]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	100%

Source (Equip ID) [Ref drawing]	Type	Emission Scenario	Source Location	VOC Content by Weight
Gasoline (PSV-1120) [12-HA-089]	Relief Valve on Malfunction	Equipment / Malfunction	HEP	100%
Depropanizer Reboiler E1170 Drain [12-HA-089]	Manual liquid drain / vent	Maintenance	HEP	> 97%
Gasoline Vent from high point on gasoline line [12-HA-089]	Manual liquid drain/vent	Maintenance	HEP	100%
Iso-Butane and n-Butane (Tubing Vent from Analyzer House) [12-HA-089]	**Continuous Analyzer**	**Continuous Purge of Analyzer**	**HEP**	**100%**
GC#1 – Danalyzer 570 model analyzer, Danalyzer Controller 2350 Controllers - 2 streams DeEthanizer overhead and DeEthanizer bottoms [12-HA-089]	**Continuous Analyzer**	**Continuous Purge of Analyzer**	**HEP**	**100%**
Gasoline (PSV-1325) [12-HA-089]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	100%
Gasoline (PSV-1429, 1430) Relief from Gasoline Treating) [12-HA-089]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	100%
Gasoline (PSV-1320, 1324) [12-HA-089]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	100%
Gasoline (PSV-1730, 1735) [12-HA-089]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	100%
Iso-Butane (Vent from PV-1278) [12-HA-089]	Vent on Malfunction	Equipment Protection / Malfunction	HEP	100%
Propane (Relief from Pig Launcher) [12-HA-089]	Vent for Maintenance	Maintenance	HEP	> 97%
Seal Gas (PSV-710) Normally residue gas (GHG) with inlet gas as backup (VOC)	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	17.9%
Seal Gas (PSV-775) Normally residue gas (GHG) with inlet gas as backup (VOC)	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	17.9%
Seal Gas (PSV-770) Normally residue gas (GHG) with inlet gas as backup (VOC)	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	17.9%
Vent XK-700 (residue gas GHG)	Manual liquid drain / vent	Maintenance	HEP	0%
N2 Purge (HP Flare) [Sheet 18]	**Nitrogen Purge -**	**Normal Operation**	**HEP**	**Zero, inert gas**
Fuel Gas (Flare Purge)[Sheet 18]	Back-up Purge	Back-up Operations	HEP	17.9%
Inlet gas/regen gas (PSV570/560/597/580/530/540) [Sheet 18]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	17.9%
Hot Oil (PSV-583 Hot Oil E-580)[Sheet 18]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	0%
Natural Gas (PSV-555 Natural Gas F-555)[Sheet 18]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	17.9%
Natural Gas (PSV-550 Natural Gas F-550)[Sheet 18]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	17.9%
Natural Gas (PSV-520 Natural Gas V-520)[Sheet 18]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	17.9%
Natural Gas (PSV-525 Natural Gas F-525)[Sheet 18]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	17.9%
Natural Gas (Drain F-550/555) [Sheet 18]	Manual liquid drain / vent	Maintenance	HEP	17.9%
Iso-Butane (PSV-1490 Hot Oil)[Sheet 18]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	100%

Source (Equip ID) [Ref drawing]	Type	Emission Scenario	Source Location	VOC Content by Weight
(PSV-1491 Residue Gas supply for iso-butane regeneration) [Sheet 18]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	0%
Iso-Butane (PSV-1460/1471/1480) [Sheet 18]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	100%
Iso-Butane (P-1450 Seal vent)[Sheet 18]	Vent on Malfunction	Maintenance / Malfunction	HEP	100%
Isobutane (treater filling monitoring lines)[Sheet 18]	Manual liquid fill/vent	Backup Operation	HEP	100%
Natural Gas (PSV-701 Natural Gas and PCV-612) [Sheet 18]	Vent on Malfunction	Equipment Protection / Malfunction	HEP	0%
NGL (PSV-875)[Sheet 18]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	100%
N2 Purge (Cryo Flare) [Sheet 17]	**Nitrogen Purge -**	**Normal Operations**	**HEP**	**Zero, inert gas**
FG Vent (Cryo Flare) [Sheet 17]	Back-up Purge	Back-up Operation	HEP	**17.9%**
NGL (Drain XT-700) [Sheet 17]	Manual liquid drain / vent	Maintenance	HEP	100%
NGL (Vent XT-700) [Sheet 17]	Manual liquid drain / vent	Maintenance	HEP	100%
NGL (PSV-700) [Sheet 17]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	100%
Inlet Gas (PSV-620) [Sheet 17]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	17.9%
Cold residue gas (PSV-685A/B) [Sheet 17]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	0%
Cold residue Gas (PSV-680) [Sheet 17]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	0%
Residue Gas (PSV-660)[Sheet 17]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	0%
NGL (PSV-640A) [Sheet 17]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	100%
NGL (PSV-640B) [Sheet 17]	Relief Valve on Malfunction	Equipment Protection / Malfunction	HEP	100%
NGL (P-640A/B Drains) [Sheet 17]	Manual liquid drain / vent	Maintenance	HEP	100%
Cold Residue gas (P-685A/B V-680) [Sheet 17]	Manual liquid drain / vent	Maintenance	HEP	Varies
Cold residue gas (V-680) [Sheet 17]	Manual liquid drain / vent	Maintenance	HEP	Varies
cold residue gas (Drain E-650 "F" pass) [Sheet 17]	Manual liquid drain / vent	Maintenance	HEP	Varies
NGL (Drain V-620) [Sheet 17]	Manual liquid drain / vent	Maintenance	HEP	100%

Estimated Annual Potential Emissions from Vent Stack

Of the sources connected to the Vent Stack, only a few have a continuous or intermittent emission of gas or vapor aside from the nitrogen used to purge the Vent Stack header / plenum system. These sources are highlighted in bold in Tables 1, 2 and 3. The majority of sources in Tables 1, 2 and 3 are relief valves or are related to maintenance. The annual potential emissions to the Vent Stack associated with normal operation are summarized in Table 4. The largest intermittent source connected to the Vent Stack – the rail car loading at Galmish – was previously quantified in the May 6, 2013 information submittal. There is a closed vapor recovery system for rail car loading at Galmish ("Galmish Vapor Recovery System"). When the Galmish Vapor Recovery System is

operating, there are no rail car loading VOC emissions to the Vent Stack header with the exception of the O2 Analyzer of NGL identified in Table 2. If the Galmish Vapor Recovery System is down, rail cars can be loaded, and vapors are rerouted to the Vent Stack. For purposes of Table 4, we have conservatively assumed 95 percent availability for the Galmish Vapor Recovery System. That is, the system operates at least 95 percent of the time that rail cars are loaded.

Other sources in Table 4 include Liquid Petroleum Gas ("LPG") truck loading at Galmish and process gas analyzers that have a continuous bleed of wet gas or product gas. There is no green house gas ("GHG") in the normal operation continuous or intermittent sources connected to the Vent Stack with the exception of methane in wet gas and residue gas analyzer bleeds. Hazardous air pollutant ("HAP") compounds are removed from product gases during the NGL extraction process at HEP and are not present in product propane and butane in detectable amounts. The natural gasoline product from the NGL extraction process contains some aromatic hydrocarbons. The HAP emission estimate in Table 4 is based on the Dominion product safety data sheet for natural gasoline which indicates a benzene, toluene and xylene ("BTX") concentration of 1.49% by weight.

Since malfunctions are not part of potential-to-emit ("PTE"), emissions from safety / equipment overpressure relief vents and from process malfunction / emergency vents and drains are not included in the annual emission estimate associated with normal operations. The practice for equipment maintenance and outages at the HEP and at Galmish is to de-inventory and isolate equipment prior to opening the equipment to vent or to drain. The liquids or gases removed from process equipment prior to maintenance are recovered as products. Potential emissions to the Vent Stack from maintenance activities are difficult to quantity and are not included in Table 4.

Table 4 – Continuous and Intermittent Sources connected to the Vent Stack with Annual Potential Emission Estimates

Operation	Source Area	PTE (US Tons per Year)	Notes
Rail car loading operations with vapor recovery	Galmish	64.7 as VOC 0.32 as HAP	Vapor recovery system operating at 95% availability
LPG truck loading	Galmish	66.6 as VOC	LPG vapor from truck loading related to loading line depressurization, and product swap, assumes 2000 propane trucks per year and 75 butane trucks per year
Gas Analyzer Bleeds	HEP	0.20 as VOC 0.001 as HAP 20.3 as GHG CO2e	5 gas chromatograph analyzers and 2 moisture analyzers within the HEP
O2 Analyzer Bleed	Galmish	18.0 as VOC	Analyzer on the Galmish vapor recovery system
Manual drains to remove water	HEP	0.73 as VOC 0.011 as HAP	Estimate to account for potential VOCs in water periodically drained from natural gasoline processing

Table 5 is the PTE summary for the Vent Stack using information from Table 4.

Table 5 – Summary of Potential to Emit from the Vent Stack 102-B

Constituent	PTE (US tons per year)	Notes
VOCs	150.2	
HAPs	0.33	HAPs are hexane and BTX from wet gas and natural gasoline
GHGs (in CO2e)	20.3	GHG is methane from wet gas and residue gas analyzer bleeds

If you have any questions regarding this submittal, please contact Lisa Moerner at (804) 273-2998 or via email at lisa.c.moerner@dom.com.

Sincerely,

Pamela Faggert

Pamela F. Faggert
Chief Environmental Officer and Vice President - Corporate Compliance

PFF/psd

cc: Lisa Moerner
Robert Keatley, WVDEP

Dominion Resources Services, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060

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February 13, 2014

Via Electronic Delivery

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Office of Air Enforcement & Compliance Assistance
USEPA Region III
1650 Arch Street (3AP00)
Philadelphia, PA 19103-2029

Bowen Hosford
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RE: Dominion Transmission, Inc.
Hastings Electric Compressor Station
Knockout Tank V-2195 VOC Content and Annual Emissions

Dear Messrs. Augustine and Hosford:

In response to our January 16, 2014 meeting, we prepared an analysis of the sources and emissions associated with the Knockout Tank at the Hastings Electric Compressor Station (HECS). For sources vented to this tank, we determined whether those sources contain or may contain gases or flash vapors with greater than 10 percent volatile organic compound (VOC) content by weight. We also estimated potential annual emissions from the Knockout Tank associated with normal operations including electric compressor startup and shutdown.

Sources Vented to the Knockout Tank

The Knockout Tank (Equipment ID V-2195) (Knockout Tank) is a 2936 gallon tank installed in 2002 that receives vented gases and entrained liquids from equipment associated with the electric gas compressors, along with flash gases and liquids from equipment associated with the Hastings Liquid Collection System, portions of which are located at HECS. The Hastings Liquid Collection System (HLCS) processes drip gasoline, condensed water and oily wastewater from separators, scrubbers, pump pads, drains and tanks located within the Hastings Slug Catcher Area (HSCA), the HECS and the Hastings Extraction Plant (HEP). The HLCS separates water from hydrocarbons and also separates flash gases from the hydrocarbon liquids. The separated water is collected for off-site disposal. The flash gases are routed to compressors at the Hastings Compressor Station, which is separate from the HECS. Hydrocarbon liquids are directed to the HEP for further processing. The VOC content of liquids, gases and vapors processed in the HLCS varies and may at times be greater than 10 percent. All of the equipment sources vented to the Knockout Tank from the HLCS are related to malfunction. In normal operation, these HLCS vents and drains are closed.

The sources venting to the Knockout Tank are listed in Table 1 below. Each source is characterized by vent type, emission scenario, location and VOC content. Vent type and emission scenario information separate the sources into categories of normal operation, startup/shutdown and

malfunction. Source location refers to the origin of gases, vapors or liquids that ultimately vent to the Knockout Tank. The VOC content of these sources is based on sampling and analysis of the inlet (wet) and residue (product) natural gas streams. These samples were collected on November 5, 2013. The gas analyses are presented in Attachment A. The calculation of VOC content from the gas analyses is presented in Attachment B.

Table 1 –Sources Vented to the HECS Knockout Tank (V-2195)

Source (Equip ID) [Ref drawing]	Type	Emission Scenario	Source Location*	VOC Content by Weight
Inlet Gas (from PV 426) [12-HA-002]	Emergency Shutdown Valve	Equipment Protection / Malfunction	HECS	17.9%
Inlet Gas (PSV-425: From F-425) [12-HA-002]	Relief Valve on Malfunction	Safety / Malfunction	HECS	17.9%
Inlet Gas (PSV-420: From V-420) [12-HA-002]	Relief Valve on Malfunction	Safety / Malfunction	HECS	17.9%
Inlet Gas (PSV-220, 221, 240, 241: From C-200) [12-HA-003]	Relief Valve on Malfunction	Safety / Malfunction	HECS	17.9%
Blow down valve (XV-493: C-200) [12-HA-003]	Emergency Shutdown Valve	Equipment Protection / Malfunction	HECS	17.9%
Inlet Gas Compressor (HV-244: C-200) [12-HA-003]	**Open During Startup/Shutdown**	**Startup / Shutdown**	**HECS**	17.9%
Inlet Gas 2nd Stage Scrubber (PSV-440: V-440) [12-HA-004]	Relief Valve on Malfunction	Safety / Malfunction	HECS	17.9%
Residue Gas Scrubber (PSV-480: V-480) [12-HA-005]	Relief Valve on Malfunction	Safety / Malfunction	HECS	0.05%
Residue Gas Line Blowdown Valve (XV-494) [12-HA-005]	Emergency Shutdown Valve	Equipment Protection / Malfunction	HECS	0.05%
Residue Gas Compressor (PSV-320, 321: C-300) [12-HA-006]	Relief Valve on Malfunction	Safety / Malfunction	HECS	0.05%
Residue Gas Compressor (HV 334:C-300) [12-HA-006]	**Open During Startup/Shutdown**	**Startup / Shutdown**	**HECS**	0.05%
Collected Liquids Surge Drum (PSV-2133: V-2130) [12-HA-010]	Relief Valve on Malfunction	Safety / Malfunction	HECS, HEP	Varies, may be > 10%
Gasoline/Water Heater (PSV-2155: E-2155) [12-HA-011]	Relief Valve on Malfunction	Safety / Malfunction	HSCA, HECS, HEP	Varies, may be > 10%
Collected Liquids Cross Exchanger (PSV-2140: E-2140) [12-HA-011]	Relief Valve on Malfunction	Safety / Malfunction	HECS, HEP	Varies, may be > 10%
Drip Gasoline Cross Exchanger (PSV-2150: E-2150) [12-HA-011]	Relief Valve on Malfunction	Safety / Malfunction	HSCA	Varies, may be > 10%
Separated Water Coalescer (PSV-2176: F-2176) [12-HA-011]	Relief Valve on Malfunction	Safety / Malfunction	HSCA, HECS, HEP	Varies, may be > 10%
Gasoline Coalescer (PSV-2175: F-2175) [12-HA-011]	Relief Valve on Malfunction	Safety / Malfunction	HSCA, HECS, HEP	Varies, may be > 10%
Guard Filter (PSV-2174: F-2174) [12-HA-012]	Relief Valve on Malfunction	Safety / Malfunction	HSCA, HECS, HEP	Varies, may be > 10%
Flash Gas KO Drum (PSV-2163: V-2163) [12-HA-012]	Relief Valve on Malfunction	Safety / Malfunction	HSCA, HECS, HEP	Varies, may be > 10%
Gasoline Flash Drum (PSV-2170: V-2170) [12-HA-012]	Relief Valve on Malfunction	Safety / Malfunction	HSCA, HECS, HEP	Varies, may be > 10%
Oil/Water Separation Drum (PSV-2165: V-2165) [12-HA-012]	Relief Valve on Malfunction	Safety / Malfunction	HSCA, HECS, HEP	Varies, may be > 10%
Collected Liquids Flash Drum (PSV-2160: V-2160) [12-HA-012]	Relief Valve on Malfunction	Safety / Malfunction	HSCA, HECS, HEP	Varies, may be > 10%
Flash Gas (PV-2163) [12-HA-012]	Pressure Valve on Malfunction	Equipment Protection / Malfunction	HSCA, HECS, HEP	Varies, may be > 10%
Liquids from Flash Gas Knock out drum (V-2163) [12-HA-012]	Manual Liquid Drain	Malfunction	HECS, HSCA	Varies, may be > 10%
Nitrogen Purge Supply [12-HA-020]	Nitrogen Purge – Normal Operations	Normal Operation	HEP	Zero, inert gas

Source (Equip ID) [Ref drawing]	Type	Emission Scenario	Source Location*	VOC Content by Weight
Nitrogen Purge Supply [12-HA-021]	Nitrogen Purge – Normal Operations	Normal Operation	HEP	Zero, inert gas
Drive End Seal Gas Vent (C-200) [12-HA-153]	**Vent During Normal Operations**	**Normal Operation**	**HECS**	0.05%
Non-Drive End Seal Gas Vent (C-200) [12-HA-153]	**Vent During Normal Operations**	**Normal Operation**	**HECS**	0.05%
Drive End Seal Gas Vent (C-300) [12-HA-153]	**Vent During Normal Operations**	**Normal Operation**	**HECS**	0.05%
Non-Drive End Seal Gas Vent (C-300) [12-HA-158]	**Vent During Normal Operations**	**Normal Operation**	**HECS**	0.05%
Casing Drains (C-200) [12-HA-158]	Oil Drain	Equipment Protection / Malfunction	HECS	17.9%
Casing Drains (C-300) [12-HA-158]	Oil Drain	Equipment Protection / Malfunction	HECS	0.05%

* Source location refers to the origin of gases, vapors or liquid in sources venting to Knockout Tank V-2195 in the HECS. Source Location abbreviations are: HECS – Hastings Electric Compressor Station; HEP – Hastings Extraction Plant; HSCA – Hastings Slug Catcher Area

Estimated Annual Emissions from Knockout Tank

There are six equipment sources in bold type in Table 1 that have non-malfunction emissions of VOCs, hazardous air pollutants (HAPs) or greenhouse gas (GHG) to the Knockout Tank. The VOCs consist of C3 and greater hydrocarbons present in the inlet and residue gas. The HAPs are hexane and other C6 and greater hydrocarbons including trace aromatics, which are present in the inlet gas. The GHG is methane present in the inlet and residue gas.

During startup of HECS, the inlet and residue gas compressors are purged, which results in brief venting of inlet and residue natural gas to the Knockout Tank. During normal shutdown, the inlet and residue gas compressors remain loaded, and there is no loss of gas. However, during a process upset or emergency shutdown, the compressors are unloaded which results in brief venting. The startup inlet gas loss associated with purge of the inlet gas compressor (C-200) is 23,075 standard cubic feet (scf). If the inlet compressor is blown down, or fully unloaded, at shutdown, the inlet gas loss is 92,300 scf. The startup and shutdown residue gas losses from the residue gas compressor (C-300) with purge and blow down are 16,000 and 64,000 scf, respectively. In a typical year, the HECS has two to four startup and shutdown events. In 2013, there were two startup and shutdown events, both unplanned. For calculation of potential annual emissions, we conservatively assumed eight startup and shutdown events per year and full blow down of the compressors for each shutdown event.

Residue gas is the seal gas for end seals on the inlet gas and residue gas electric compressors. The end seals are pressurized so that any seal leakage flows into the compressor. For the inlet gas compressor, the end seal design prevents seal loss of inlet gas with VOCs. The end seals bleed residue gas to the Knockout Tank at a continuous rate of 1.5 to 3 standard cubic feet per minute (scfm). For calculation of potential annual emissions, we assumed a 3 scfm residue gas bleed rate for each seal, or 12 scfm total for the four compressor end seals.

Table 2 presents the estimated annual potential to emit (PTE) for the Knockout Tank at HECS. For VOC calculations, we used a VOC content of 17.9% by weight for inlet gas and 0.05% by weight for residue gas. These VOC contents are calculated from the gas analyses presented in Attachment A. All estimated annual emissions are in US tons per year. In calculating PTE for GHG, the most recent

global warming potential CO2 equivalent factor of 25 for methane was used. The detailed calculations are in Attachment B. Since malfunctions are not part of PTE, emissions from safety / equipment overpressure relief vents and process malfunction / emergency vents and drains are not included in the annual emission estimate associated with normal operations including startup and shutdown.

Table 2 – Summary of Potential to Emit from HECS Knockout Tank V-2195

Constituent	PTE (US tons per year)
VOCs	4.49
HAPs (hexane)	0.11
GHGs (in CO2e)	3,547

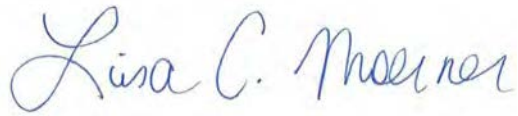
To determine the annual average emission VOC content, we used a weighted average of the quantity of inlet gas and residue gas emitted from the Knockout Tank. Each gas has a different VOC content and density. Table 3 illustrates the percent VOC content calculation.

Table 3 – Summary of Annual Average Gas VOC Content in Potential to Emit from HECS Knockout Tank V-2195 Potential to Emit

Gas Type	Annual Volume of Natural Gas Emissions (scf)	Gas Density (lbs/mmcf)	Annual Mass of Natural Gas Emissions (lbs)	VOC Content by Weight	Average VOC Content of Gas Emitted by Weight
Inlet	923,000	53,272	49,170	17.93%	2.38%
Residue	6,947,000	47,273	328,415	0.05 %	

If you have any questions regarding this submittal, please contact me at (804) 273-2998 or via email at lisa.c.moerner@dom.com.

Sincerely,



Lisa C. Moerner
Director, Environmental Sustainability & Gas Environmental Services

Enclosures: Attachment A – Gas Sampling Analyses Summaries
Attachment B – Emission Calculations and VOC Gas Content by Weight

LCM/psd/jrz

cc: Robert Keatley, WVDEP

Attachment A

Gas Sampling Analyses Summaries

- Inlet Gas
- Residue Gas

Gas Sample Report with Analysis

Hastings Extraction Plant

State	WV	**Gas Temp (in deg. F)**	107
Sample Site	Inlet Gas	**Pressure (in psig)**	880
Site ID	4318	**Water(in lbs./mmcf)**	0
Sample No.	24815	**Calc Water Saturation at T and P**	
Vendor Sample No.		**Calc Water Dewpoint**	
Active	Y	**CO2 Partial Pressure (in psia)**	0.993117
Promoted	Y	**Dew Point**	
Sample Date	Nov 5, 2013	**Field Oxygen**	
Sample Taken By	chris96	**Field Carbon Dioxide**	
Sample Comments		**Field Hydrogen Sulfide**	
		Sulfur	Y
		Chromatograph	Y
Empty Canister	N	**Received Date**	Nov 5, 2013
Internal Corrosion	N	**Analysis Date**	Nov 5, 2013
Title V	N	**Analyzed By**	karen65
Other	N	**Analysis Comments**	
Source			
Methane(in mol%)	80.186	**Hydrogen Sulfide (in grs/100cf)**	0.000
Ethane(in mol%)	11.764	**Methyl Mercaptan (in grs/100cf)**	0.000
Propane(in mol%)	4.985	**Ethyl Mercaptan (in grs/100cf)**	0.000
Isobutane(in mol%)	0.666	**DiMethyl sulfide (in grs/100cf)**	0.005
n-Butane(in mol%)	1.081	**Isopropyl Mercaptan (in grs/100cf)**	0.000
Neopentane (in mol%)		**Tbutyl Mercaptan (in grs/100cf)**	0.000
Isopentane (in mol%)	0.264	**Npropyl Mercaptan (in grs/100cf)**	0.011
n-Pentane (in mol%)	0.192	**Methyl Ethyl sulfide (in grs/100cf)**	0.000
Hexane (in mol%)	0.105	**Secbutly Mercaptan (in grs/100cf)**	0.000
Oxygen (in mol%)	0.000	**Tetrahydrothiophane (in grs/100cf)**	0.000
Nitrogen (in mol%)	0.646	**Sulfur Components Total (in grs/100cf)**	0.016
Carbon Dioxide (in mol%)	0.111	**Total Sulfur Analysis (in ppm)**	
Helium (in mol%)		**Compressibility**	0.9967
Hydrogen (in mol%)		**Specific Gravity**	0.7021
Ammonia (in ppm)		**Dry BTU**	1233.40
Gas Components Total	100	**Saturated BTU**	1211.94

Gas Sample Report with Analysis

Hastings Extraction Plant

State	WV	**Gas Temp (in deg. F)**	162
Sample Site	HEP Tail & Fuel gas	**Pressure (in psig)**	318
Site ID	317	**Water(in lbs./mmcf)**	0
Sample No.	24765	**Calc Water Saturation at T and P**	0
Vendor Sample No.		**Calc Water Dewpoint**	
Active	Y	**CO2 Partial Pressure (in psia)**	0.392586
Promoted	Y	**Dew Point**	
Sample Date	Nov 5, 2013	**Field Oxygen**	
Sample Taken By	chris96	**Field Carbon Dioxide**	
Sample Comments	calc water dewpoint 162	**Field Hydrogen Sulfide**	
		Sulfur	Y
		Chromatograph	Y
Empty Canister	N	**Received Date**	Nov 5, 2013
Internal Corrosion	Y	**Analysis Date**	Nov 5, 2013
Title V	N	**Analyzed By**	karen65
Other	N	**Analysis Comments**	
Source			
Methane(in mol%)	86.199	**Hydrogen Sulfide (in grs/100cf)**	0.000
Ethane(in mol%)	12.957	**Methyl Mercaptan (in grs/100cf)**	0.000
Propane(in mol%)	0.021	**Ethyl Mercaptan (in grs/100cf)**	0.000
Isobutane(in mol%)	0.000	**DiMethyl sulfide (in grs/100cf)**	0.000
n-Butane(in mol%)	0.000	**Isopropyl Mercaptan (in grs/100cf)**	0.000
Neopentane (in mol%)		**Tbutyl Mercaptan (in grs/100cf)**	0.000
Isopentane (in mol%)	0.000	**Npropyl Mercaptan (in grs/100cf)**	0.000
n-Pentane (in mol%)	0.000	**Methyl Ethyl sulfide (in grs/100cf)**	0.000
Hexane (in mol%)	0.000	**Secbutly Mercaptan (in grs/100cf)**	0.000
Oxygen (in mol%)	0.000	**Tetrahydrothiophane (in grs/100cf)**	0.000
Nitrogen (in mol%)	0.705	**Sulfur Components Total (in grs/100cf)**	0.000
Carbon Dioxide (in mol%)	0.118	**Total Sulfur Analysis (in ppm)**	
Helium (in mol%)		**Compressibility**	0.9975
Hydrogen (in mol%)		**Specific Gravity**	0.6225
Ammonia (in ppm)		**Dry BTU**	1108.30
Gas Components Total	100	**Saturated BTU**	1089.01

Attachment B

VOC Gas Content by Weight

Potential Annual Emissions

Hastings INLET Gas Analysis

Constituent	MW	Compsition[1]	Density of Constituent Gases	Contribution to Overall Sample Density by Species	Composition
	(g/g mole)	(mole %)	(g/l)	(g/l)	(weight %)
Methane	16	80.186%	0.675	0.542	63.47%
Ethane	30	11.764%	1.266	0.149	17.46%
Propane	44	4.985%	1.857	0.093	10.85%
Isobutane	58	0.666%	2.448	0.016	1.91%
n-Butane	58	1.081%	2.448	0.026	3.10%
Isopentane	72	0.264%	3.039	0.008	0.94%
n-Pentane	72	0.192%	3.039	0.006	0.68%
Hexanes+	86	0.105%	3.630	0.004	0.45%
Oxygen	16	0.000%	0.675	0.000	0.00%
Nitrogen	28	0.646%	1.182	0.008	0.89%
CO2	44	0.111%	1.857	0.002	0.24%
TOTAL		100.000%		0.853	100.000%

1. From gas analysis 24658, 11/26/13, Hastings Station Inlet to Contactor

Gas density	53,272	lb/MMcf		
VOC content	7.293%	volume %	17.93%	weight %
Methane Content	80.186%	volume %	63.47%	weight %
Hexane Content*	0.105%	volume %	0.45%	weight %

**this constituent represents C6+ which may also include benzene, toluene, ethylbenzene, and/or xylene.*

Hastings RESIDUE Gas Analysis

Constituent	MW	Compsition[1]	Density of Constituent Gases	Contribution to Overall Sample Density by Species	Composition
	(g/g mole)	(mole %)	(g/l)	(g/l)	(weight %)
Methane	16	86.199%	0.675	0.582	76.89%
Ethane	30	12.957%	1.266	0.164	21.67%
Propane	44	0.021%	1.857	0.000	0.05%
Isobutane	58	0.000%	2.448	0.000	0.00%
n-Butane	58	0.000%	2.448	0.000	0.00%
Isopentane	72	0.000%	3.039	0.000	0.00%
n-Pentane	72	0.000%	3.039	0.000	0.00%
Hexanes+	86	0.000%	3.630	0.000	0.00%
Oxygen	16	0.000%	0.675	0.000	0.00%
Nitrogen	28	0.705%	1.182	0.008	1.10%
CO2	44	0.118%	1.857	0.002	0.29%
TOTAL		100.000%		0.757	100.000%

1. From gas analysis 24641, 11/07/13, Hastings Station Fuel

Gas density	47,273	lb/MMcf		
VOC content	0.021%	volume %	0.05%	weight %
Methane Content	86.199%	volume %	76.89%	weight %
Hexane Content*	0.00%	volume %	0.00%	weight %

**this constituent represents C6+ which may also include benzene, toluene, ethylbenzene, and/or xylene.*

Hastings Knockout Drum
Potential Emissions Calculation

Four (4) Sources of Emissions that vent to the Knockout Drum under Non Startup Operating Conditions

Emission Description, 8760 max hrs per year	**Natural Gas Type**	**Maximum Natural Gas Flow (scfm)**	**Potential Annual Natural Gas Flow (scf)**
Drive End Seal Gas Vent C-200	Residue	3	1,576,800
Non-Drive End Seal Gas Vent C-200	Residue	3	1,576,800
TOTAL			**3,153,600**
Non-Drive End Seal Gas Vent C-300	Residue	3	1,576,800
Drive End Seal Gas Vent C-300	Residue	3	1,576,800
TOTAL			**3,153,600**

Maximum Annual Facility Startups/Shutdowns:		8		
Emission Description	**Natural Gas Flow (scf)**	**Potential Annual Natural Gas Flow (scf)**		
Gas Released During Facility Startup*				
Inlet Gas	23,075	184,600		
Residue Gas	16,000	128,000		
Gas Released During Facility Vented Shutdown (worse case)				
Inlet Gas	92,300	738,400		
Residue Gas	64,000	512,000		
TOTAL Gas Released During Startup & Shutdown		**1,563,000**		

* estimated to be 25% of gas released during vented shutdown

POTENTIAL GAS EMITTED ANNUALLY	Residue	**6,947,200**	**scf**
	Inlet	**923,000**	**scf**
	TOTAL	**7,870,200**	**scf**

	lb/mmscf
Residue Gas Density	47,273
Inlet Gas Density	53,272

Emissions Calculations

	Content By Weight	Annual Potential Emissions (US tpy)
Residue Gas		
VOC	0.05%	0.08
HAPs* (Hexane)	0.00%	0.00
Methane (GHG)	*76.89%*	*126.26*
CO_2	*0.29%*	*0.48*
GHG Total (in CO2e)**	77.18%	3,156.89
Non VOC/Non GHG Components	22.77%	
TOTAL (VOC + GHG + Non VOC / Non GHG)***	100.00%	
Inlet Gas		
VOC	17.93%	4.41
HAPs* (Hexane)	0.45%	0.11
Methane (GHG)	*63.47%*	*15.60*
CO_2	*0.24%*	*0.06*
GHG Total (in CO2e)**	63.71%	390.16
Non VOC/Non GHG Components	18.35%	
TOTAL (VOC + GHG + Non VOC / Non GHG)***	100.00%	

*this constituent represents C6+ which may also include benzene, toluene, ethylbenzene, and/or xylene.

**Assumes a Global Warming Potential of 25 for methane and 1 for CO_2

*** Hexane is a VOC and is therefore included in the VOC component

VOC Content of Gas Emitted from Tank	Content by Weight	Gas Emitted Annually (lbs)	Average VOC Content of Gas Emitted
Residue Gas	0.05%	328,415	2.38%
Inlet Gas	17.93%	49,170	

Knockout Tank PTE	**(tpy)**
VOC	**4.49**
HAPs (Hexane)	**0.11**
GHG (in CO2e)	**3,547.05**

Dominion Resource Services, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
dom.com

March 31, 2015

BY: U.S. CERTIFIED MAIL, RETURN RECEIPT REQUESTED
7014 3490 0000 0448 3818

William F. Durham
Director, Division of Air Quality
WVDEP
601 57th Street
Charleston, WV 25304

RE: **Dominion Transmission, Inc.**
Hastings Extraction Plant
Permit Determination Request

Dear Mr. Durham:

Dominion Transmission, Inc. (Dominion) is submitting this request for permit determination for the replacement of a boiler at our Hastings Extraction Plant, a natural gas extraction facility, located near Pine Grove, Wetzel County, West Virginia. The Cleaver Brooks 16.75 MMBtu/hr natural gas fired boiler (BL02) will be replaced with a Superior 25.2 MMBtu/hr natural gas fired boiler (BL03). The Cleaver Brooks boiler will be demolished and removed from site.

Based on potential emissions being below "stationary source" thresholds and the replacement boiler having "no substantive requirements of an emission control rule" as stated under West Virginia's R13 Regulations (§45-13-2), Dominion believes a permit is not necessary for the installation and operation of the replacement boiler (BL03).

If you require any additional information, please contact Rebekah Remick at 804-273-3536 or via email at Rebekah.J.Remick@dom.com.

Sincerely,

Amanda Tornabene

Amanda B. Tornabene
Director, Gas Environmental Services

DEP – The original

Please scan signed original/attachments and name file as:
Hastings EP - Permit Determination for Replacement Boiler – March 2015

Please upload to Documentum

Facility:	Hastings Extraction Plant
Title:	Hastings EP - Permit Determination for Replacement Boiler – March 2015
Document Type:	Permit Applications
Environmental Program:	Air –State Permits

Send document link electronically to:

Pam Faggert
Amanda Tornabene
Brian Sheppard
Paul Dickens
Becky Remick
Abby Credicott
Ray Seech
Ryan Anderson
Ed Lancaster
Joseph “Keith” Stigall
Christina Lemasters
George Martin

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

PERMIT DETERMINATION FORM (PDF)

FOR AGENCY USE ONLY: PLANT I.D. # _____

PDF # _____ PERMIT WRITER: _____

1. NAME OF APPLICANT (AS REGISTERED WITH THE WV SECRETARY OF STATE'S OFFICE):
Dominion Transmissions, Inc.

2. NAME OF FACILITY (IF DIFFERENT FROM ABOVE):
Hastings Extraction Plant

3. NORTH AMERICAN INDUSTRY CLASSIFICATION SYSTEM (**NAICS**) CODE:
211112

4A. MAILING ADDRESS:
445 West Main Street, Clarksburg, WV 26301

4B. PHYSICAL ADDRESS:
Route 20, Pine Grove, WV 26419

5A. DIRECTIONS TO FACILITY (PLEASE PROVIDE **MAP** AS **ATTACHMENT A**):
From Clarksburg, take Route 20 North approximately 37 miles to Hastings. The Extraction Plant is on the left side of the road.

5B. NEAREST ROAD:
Route 20

5C. NEAREST CITY OR TOWN:
Pine Grove, WV

5D. COUNTY:
Wetzel

5E. UTM NORTHING (KM):
4377.66

5F. UTM EASTING (KM):
528.64

5G. UTM ZONE:
17

6A. INDIVIDUAL TO CONTACT IF MORE INFORMATION IS REQUIRED:
Rebekah (Becky) Remick

6B. TITLE:
Environmental Specialist III

6C. TELEPHONE:
804-273-3536

6D. FAX:
804-273-2964

6E. E-MAIL:
Rebekah.J.Remick@dom.com

7A. DAQ PLANT I.D. NO. (FOR AN EXISTING FACILITY ONLY):
03-54-103-00009

7B. PLEASE LIST ALL CURRENT 45CSR13, 45CSR14, 45CSR19 AND/OR TITLE V (45CSR30) PERMIT NUMBERS ASSOCIATED WITH **THIS** PROCESS (FOR AN EXISTING FACILITY ONLY):
R13-2468D, R30-10300009-2011

7C. IS THIS PDF BEING SUBMITTED AS THE RESULT OF AN ENFORCEMENT ACTION? IF YES, PLEASE LIST: No

8A. TYPE OF EMISSION SOURCE (CHECK ONE):
☐ **NEW SOURCE** ☐ **ADMINISTRATIVE UPDATE**
☒ **MODIFICATION** ☐ **OTHER** (PLEASE EXPLAIN IN 11B)

8B. IF ADMINISTRATIVE UPDATE, DOES DAQ HAVE THE APPLICANT'S CONSENT TO UPDATE THE EXISTING PERMIT WITH THE INFORMATION CONTAINED HEREIN?
☐ **YES** ☐ **NO**

9. IS *DEMOLITION* OR PHYSICAL *RENOVATION* AT AN EXISTING FACILITY INVOLVED? ☒ **YES** ☐ **NO**

10A. DATE OF ANTICIPATED INSTALLATION OR CHANGE:
5/1/15

10B. DATE OF ANTICIPATED START-UP:
7/1/15

11A. PLEASE PROVIDE A **DETAILED PROCESS FLOW DIAGRAM** SHOWING EACH PROPOSED OR MODIFIED PROCESS EMISSION POINT AS **ATTACHMENT B**.

11B. PLEASE PROVIDE A **DETAILED PROCESS DESCRIPTION** AS **ATTACHMENT C**.

12. PLEASE PROVIDE **MATERIAL SAFETY DATA SHEETS (MSDS)** FOR ALL MATERIALS PROCESSED, USED OR PRODUCED AS **ATTACHMENT D**. FOR CHEMICAL PROCESSE, PLEASE PROVIDE A MSDS FOR EACH COMPOUND EMITTED TO AIR.

13A. **REGULATED AIR POLLUTANT EMISSIONS:**

⇒ **FOR A NEW FACILITY,** PLEASE PROVIDE PLANT WIDE EMISSIONS BASED ON THE POTENTIAL TO EMIT (PTE) FOR THE FOLLOWING AIR POLLUTANTS INCLUDING ALL PROCESSES.

⇒ **FOR AN EXISTING FACILITY,** PLEASE PROVIDE THE PROPOSED CHANGE IN EMISSIONS BASED ON THE PTE OF ALL PROCESS CHANGES FOR THE FOLLOWING AIR POLLUTANTS.

PTE FOR A GIVEN POLLUTANT IS TYPICALLY BEFORE AIR POLLUTION CONTROL DEVICES AND IS COLLECTED BASED ON THE MAXIMUM DESIGN CAPACITY OF PROCESS EQUIPMENT.

POLLUTANT	HOURLY PTE (LB/HR)	YEARLY PTE (TON/YR) (HOURLY PTE MULTIPLIED BY 8760 HR/YR) DIVIDED BY 2000 LB/TON
PM	0.12	0.53
PM_{10}	0.12	0.53
VOCs	0.63	2.76
CO	0.93	4.08
NO_x	0.73	3.20
SO_2	0.02	0.07
Pb	0.01	0.06
HAPs (AGGREGATE AMOUNT)	0.13	0.55
TAPs (INDIVIDUALLY)*		
OTHER (INDIVIDUALLY)*		

* ATTACH ADDITIONAL PAGES AS NEEDED

13B. PLEASE PROVIDE ALL **SUPPORTING CALCULATIONS** AS **ATTACHMENT E.**

CALCULATE AN HOURLY AND YEARLY PTE OF EACH PROCESS EMISSION POINT (SHOWN IN YOUR DETAILED PROCESS FLOW DIAGRAM) FOR ALL AIR POLLUTANTS LISTED ABOVE INCLUDING INDIVIDUAL HAP'S (LISTED IN SECTION 112[b] OF THE 1990 CAAA), TAP'S (LISTED IN 45CSR27), AND OTHER AIR POLLUTANTS (E.G. POLLUTANTS LISTED IN TABLE 45-13A OF 45CSR13, MINERAL ACIDS PER 45CSR7, ETC.).

14. **CERTIFICATION OF DATA**

I, BRIAN SHEPPARD (*TYPE NAME*) ATTEST THAT ALL THE REPRESENTATIONS CONTAINED IN THIS APPLICATION, OR APPENDED HERETO, ARE TRUE, ACCURATE, AND COMPLETE TO THE BEST OF MY KNOWLEDGE BASED ON INFORMATION AND BELIEF AFTER REASONABLE INQUIRY, AND THAT I AM A ***RESPONSIBLE OFFICIAL*** (*PRESIDENT, VICE PRESIDENT, SECRETARY OR TREASURER, GENERAL PARTNER OR SOLE PROPRIETOR*) OF THE APPLICANT.

SIGNATURE OF RESPONSIBLE OFFICIAL: _____

TITLE: VICE PRESIDENT, PIPELINE OPERATIONS DATE: 03 / 24 / 2015.

** THE DEFINITION OF THE PHRASE '***RESPONSIBLE OFFICIAL***' CAN BE FOUND AT 45CSR13, SECTION 2.23.

NOTE: PLEASE CHECK ENCLOSED ATTACHMENTS:

☒ **ATTACHMENT A** ☒ **ATTACHMENT B** ☒ **ATTACHMENT C** ☐ **ATTACHMENT D** ☒ **ATTACHMENT E**

RECORDS ON ALL CHANGES ARE REQUIRED TO BE KEPT AND MAINTAINED ON-SITE FOR TWO (2) YEARS.

THE PERMIT DETERMINATION FORM WITH THE INSTRUCTIONS CAN BE FOUND ON DAQ'S PERMITTING SECTION WEB SITE:

www.dep.wv.gov/daq

Attachment A

Facility Location

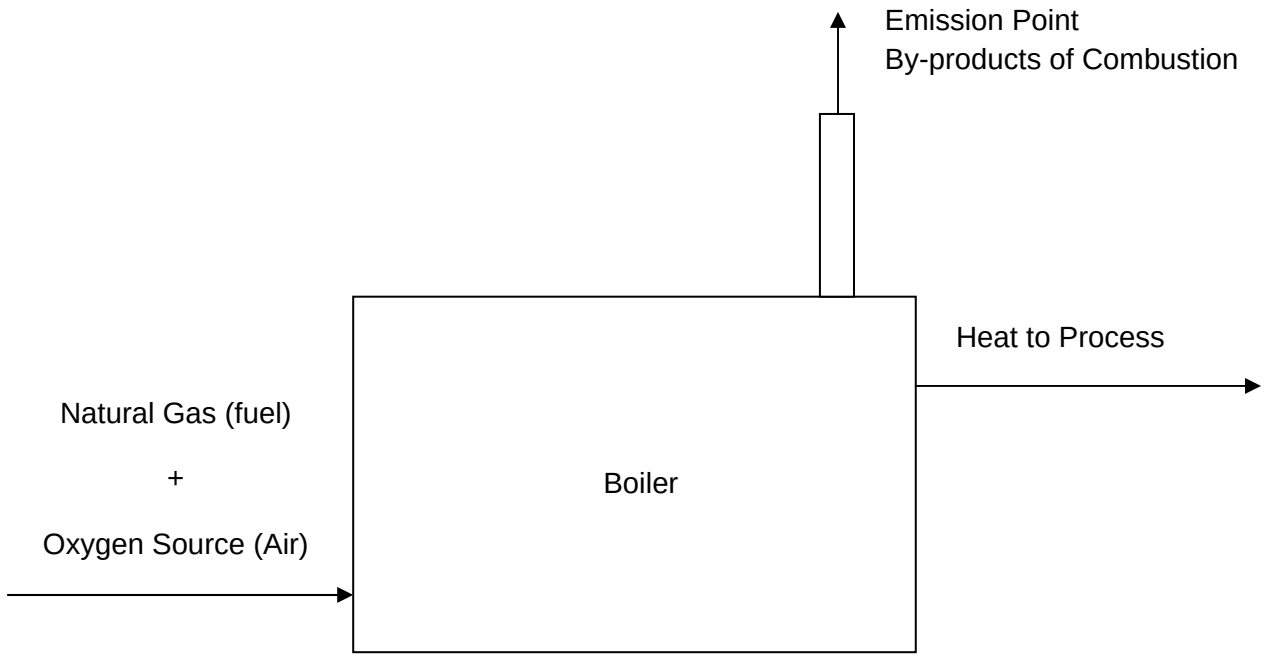
Piney Fork
56
Piney Fork Rd
Piney Fork
Shortline Hwy
g Creek
A
State Hwy 20
South Fork Fishing Creek
Mockingbird Hill Rd
Mockingbird Hill Rd
Lower Run
500 ft
200 m

Attachment B

Process Flow Diagram

Process Flow Diagram for the Boiler (BL03)

Hastings Extraction Plant



Attachment C

Process Description

Process Description

Hastings Extraction Plant is a natural gas extraction facility that services a natural gas pipeline system. The facility takes natural gas from Hastings Electric Compressor Station and extracts propane, isobutane, n-butane, and natural gasoline. Various equipment is involved in this process including a de-ethanizer, de-propanizer, de-butanizer, C4 splitter, and drip gasoline fractionators. The products are piped to storage tanks at the Galmish loadout area for transport via truck and rail. Products can also be sent to Ben's Run (natural gasoline barge loading) and to Charleroi and Hutchinson (propane). The air emission sources at the extraction plant include two (2) boilers (16.75 MMBtu/hr and 25.1 MMBtu/hr), one (1) heater (70 MMBtu/hr), three (3) emergency generators (50 kW, 40 kW, and 85 kW), one (1) 150 hp fire pump, and one (1) 1,000,000 gallon natural gasoline storage tank with a floating roof, along with fugitive emissions from the process.

The purpose of this permit determination is for the replacement of the natural gas fired Cleaver Brooks 16.75 MMBtu/hr boiler (BL02) with a natural gas fired Superior 25.2 MMBtu/hr boiler (BL03). The Cleaver Brooks boiler will be demolished and removed from site.

New Source Performance Standards (NSPS) Subpart Dc

The natural gas fired Superior 25.2 MMBtu/hr boiler is subject to this Subpart. The only requirement that the boiler needs to comply with is to keep records of monthly fuel usage. No stack testing is required.

National Emission Standards for Hazardous Air Pollutants (NESHAP):

Subpart DDDDD

The natural gas fired Superior 25.2 MMBtu/hr boiler is not subject to this Subpart as Hastings Extraction Plant is not a major source of HAPs.

**Dominion submitted an application for Hastings Compressor Station on 3/23/15 to make the control device federally enforceable; therefore clarifying that the Hastings Compressor Station is an area source of HAPs. This permit will be issued prior to the NESHAP Subpart HH applicability date of October 15, 2015.

Subpart JJJJJJ

The natural gas fired Superior 25.2 MMBtu boiler is not subject to this Subpart as gas-fired boilers are not subject to this Subpart and to any requirements in this Subpart (§63.11195).

West Virginia Minor Source Regulations (R13)

The addition of the Superior 25.5 MMBtu/hr boiler does not trigger permitting as potential to emit calculations are below exemption thresholds of:

- 6 lbs/hr and 10 tons/yr, or
- 144 lbs/day, or
- 2 lbs/hr or 5 tons/yr of HAPs

In addition, the boiler is not "subject to any substantive requirement of an emission control rule" (i.e. no stack testing is required) as stated above. Therefore, the boiler is not deemed to be a "stationary source" and does not require permitting.

Attachment E

Supporting Calculations

Company Name: Dominion Transmission, Inc.
Facility/Division: Hastings Extraction Plant
Prepared By: Becky Remick

Replacement Boiler (BL03)

Btu Rating =	25.2	MMBtu/hr
Fuel Rating =	0.03	MMcf/hr
Process Throughput =	220.8	MMcf/yr
Heat Content =	1,000	Btu/cf
Hours of Operation =	8,760	hrs/yr

Emission Calculations

Pollutant	Emission Factor			Emissions (8760 hrs/yr) (lb/hr)	(lb/day)	(tons/yr)
Criteria Pollutants						
PM	0.0048	lb/MMBtu	(1)	0.12	2.90	0.53
PM-10	0.0048	lb/MMBtu	(1)	0.12	2.90	0.53
PM-2.5	0.0048	lb/MMBtu	(1)	0.12	2.90	0.53
SO2	0.6	lb/MMcf	(2)	0.02	0.36	0.07
CO	0.037	lb/MMBtu	(1)	0.93	22.38	4.08
NO_X	0.029	lb/MMBtu	(1)	0.73	17.54	3.20
VOC	0.025	lb/MMBtu	(1)	0.63	15.12	2.76
Lead	0.0005	lb/MMBtu	(1)	0.01	0.30	0.06
Greenhouse Gases						
CO_2	117.0	lb/MMBtu	(5)	2,947.83	70,747.91	12,911.49
CH_4	2.20E-03	lb/MMBtu	(5)	0.06	1.33	0.24
N_2O	2.20E-04	lb/MMBtu	(5)	0.01	0.13	0.02
CO_2e	117.1	lb/MMBtu	(5, 6)	2,950.87	70,820.98	12,924.83
Hazardous Air Pollutants						
Arsenic	2.00E-04	lb/MMcf	(4)	5.04E-06	1.21E-04	2.21E-05
Benzene	2.10E-03	lb/MMcf	(3)	5.29E-05	1.27E-03	2.32E-04
Beryllium	1.20E-05	lb/MMcf	(4)	3.02E-07	7.26E-06	1.32E-06
Cadmium	1.10E-03	lb/MMcf	(4)	2.77E-05	6.65E-04	1.21E-04
Chromium	1.40E-03	lb/MMcf	(4)	3.53E-05	8.47E-04	1.55E-04
Cobalt	8.40E-05	lb/MMcf	(4)	2.12E-06	5.08E-05	9.27E-06
Ethane	3.10E+00	lb/MMcf	(3)	7.81E-02	1.87E+00	3.42E-01
Formaldehyde	7.50E-02	lb/MMcf	(3)	1.89E-03	4.54E-02	8.28E-03
Hexane	1.80E+00	lb/MMcf	(3)	4.54E-02	1.09E+00	1.99E-01
Manganese	3.80E-04	lb/MMcf	(4)	9.58E-06	2.30E-04	4.19E-05
Mercury	2.60E-04	lb/MMcf	(4)	6.55E-06	1.57E-04	2.87E-05
Naphthalene	6.10E-04	lb/MMcf	(3)	1.54E-05	3.69E-04	6.73E-05
Nickel	2.10E-03	lb/MMcf	(4)	5.29E-05	1.27E-03	2.32E-04
Selenium	2.40E-05	lb/MMcf	(4)	6.05E-07	1.45E-05	2.65E-06
Toluene	3.40E-03	lb/MMcf	(3)	8.57E-05	2.06E-03	3.75E-04
TOTAL HAP:				0.13		0.55

(1) Emission factors from manufacture specification sheets
(2) Emission factors from AP-42 Section 1.4, Table 1.4-2 (7/98)
(3) Emission factors from AP-42 Section 1.4, Table 1.4-3 (7/98)
(4) Emission factors from AP-42 Section 1.4, Table 1.4-4 (7/98)
(5) Lb/MMBtu numbers based on 40 CFR Part 98 Tables C-1 and C-2 for natural gas

For example: CO_2 = (53.06 kg CO_2/MMBtu) / (0.453592 kg/lb) = 117.0 lb/MMBtu

(6) Global Warming Potentials = 25 for CH_4 and 298 for N_2O (per 40 CFR Part 98 Table A-1 to Subpart A)

For example: CO_2e = (117.0 lb/MMBtu) + (0.0022 lb/MMBtu * 25) + (0.00022 lb/MMBtu * 298) = 117.1 lb/MMBtu

Contact JOE/GB Date 01/21/2015

"As Built" Burner Specification Sheet

Job Number J086377-0 Qty 1 Order Number B062562 Line Number 1
Customer COMBUSTION SERVICE& EQUIP Purchase Order 23018
Job Name DOMINION HASTINGS

Burner Model	LNICM10C-G-30				
Burner Mode of Operation	MOD	Serial Number	121456238		
Code	CSD-1, NFPA, FM				
UL Label	NONE				
Heat Exchanger Make	SUPERIOR			Heat Exchanger Model	SUPER
Heat Exchanger Type	Scotch				
Combustion Chamber Pressure	3.0"				
Job Site Altitude	2000FT		Clearance Checked By	JOE	
Clipped Circuit Board PN					
Gas High Fire Rate	25200	MBH			
Oil High Fire Rate		GPH		PSIG Pump	
Fuel Oil Grade					
UL Group - Gas	4D		UL Group - Oil		
Gas Type	NATURAL				
High Fire Manifold Pressure**	11.6	IN. WC	Side Orifice Drill Size		
Gas Regulator Outlet Pressure		IN. WC	RPTD Job Pressure	280.0	IN. WC
Minimum Supply Pressure		IN. WC	Max Design Pressure*	280.0***	IN. WC
Wiring Diagram	G-J086377				
Gas Piping Diagram	PDG-J086377				
Oil Piping Diagram					
General Arrangement Drawing	LNICM10C-G-30_J086377		Addl Dwg.		
Remote Panel Diagram			Addl Dwg.		
Additional Drawings					

Control Voltage	115V	Single Phase	60	HZ	Full Load Amps	6.0
Blower Motor Voltage	460V	3 PH	60	HZ	Full Load Amps	23.0
Oil Pump Motor Voltage		PH		HZ	Full Load Amps	
Compressor Motor Voltage		PH		HZ	Full Load Amps	
Minimum Circuit Ampacity	12.0				Gas Inlet Location	
Ignition System	GAS PILOT SCANNER					
Diffuser Blade Setting		Blast Tube Flange Set				

Comments:
VERTICAL FGR INLET

NON-UL BUILT TO UL STANDARDS
LESS MAIN GAS PRESSURE REGULATOR, MAIN GAS VALVE, AND AUX GAS VALVE
***BASED ON PFI SUPPLIED COMPONENTS

**Approximate operating pressure at the Manifold Inlet for initial start-up. Final Pressure should be determined after checking actual flow with gas meter. Stack temperature, CO, CO2, O2, and Furnace Pressure will help in determining actual input when gas meter is not available for this unit.

*All components are rated for the Max Design Pressure specified, that pressure must not be exceeded.

Power Flame Incorporated

9/28/2006
Rev. 06/11/2010

Typical Flue Product Emissions Data for Power Flame Burners

	Natural Gas	L.P. Gas	# 2 Fuel Oil [1]
Carbon Monoxide - CO	.037 lb CO 10^6 BTU input (50 PPM)	.037 lb CO 10^6 BTU input (50 PPM)	.037 lb per 10^6 BTU INPUT (50 PPM)
Sulfur Dioxide - SO_2	(1.05) x (% Sulfur by weight in fuel) = lb SO_2 per 10^6 BTU Input		
Particulate Matter	.0048 lb PM per 10^6 BTU input	.0048 lb PM per 10^6 BTU input	.0143 lb PM per 10^6 BTU input
Hydrocarbons	.025 lb HC's per 10^6 BTU input	.025 lb HC's per 10^6 BTU input	.038 lb HC's per 10^6 BTU input
CO_2	9 % to 10%	10% to 12%	10% to 13%
Nitrogen Oxides - NO_x			
Standard J, FDM & X4 Gas Burners	.088 lb NO_x per 10^6 BTU input (75 PPM)	.092 lb NO_x per 10^6 BTU input (75 PPM)	N/A N/A
Standard C(R) Burners	.088 lb NO_x per 10^6 BTU input (75 PPM)	.092 lb NO_x per 10^6 BTU input (75 PPM)	.159 lb NO_x per 10^6 BTU Input (90) PPM[2]
LNIC(R) Burners Fire box/Cast Iron boilers	.029 lb NO_x per 10^6 BTU input (25 PPM)	.031 lb NO_x per 10^6 BTU input (25 PPM)	.159 lb NO_x per 10^6 BTU Input (90) PPM[2]
LNIC(R) Burners Water tube boilers	.024 lb NO_x per 10^6 BTU input (20 PPM)	.031 lb NO_x per 10^6 BTU input (25 PPM)	.159 lb NO_x per 10^6 BTU Input (90) PPM[2]
LNIAC Burners	.029 lb NO_x per 10^6 BTU input (25 PPM)	.031 lb NO_x per 10^6 BTU input (25 PPM)	.12 lb NO_x per 10^6 BTU Input (90) PPM
CM Burners	.070 lb NO_x per 10^6 BTU input (60 PPM)[4]	.074 lb NO_x per 10^6 BTU input (60 PPM)[4]	.146 lb NO_x per 10^6 BTU Input (110) PPM
LNICM Burners Fire box/Cast Iron boilers	.029 lb NO_x per 10^6 BTU input (25) PPM	.031 lb NO_x per 10^6 BTU input (25) PPM	.12 lb NO_x per 10^6 BTU Input (90) PPM
LNICM Burners Water tube boilers	.029 lb NO_x per 10^6 BTU input (20) PPM	.031 lb NO_x per 10^6 BTU input (20) PPM	.12 lb NO_x per 10^6 BTU Input (90) PPM
NPM Premix Burners	.029 lb NO_x per 10^6 BTU input (25) PPM	.031 lb NO_x per 10^6 BTU input (25) PPM	N/A N/A
Nova Plus Burners NVC AND NP2	.010 lb NO_x per 10^6 BTU input (9) PPM	.015 lb NO_x per 10^6 BTU input (12) PPM	N/A N/A

(1) NOx emissions at 3 % 02 will vary based on the percent of fuel bound nitrogen (these are based on .02%) and boiler or heat exchanger configurations

(2) 90 PPM NOx on cast iron sectional, fire box and water tube boiler, 120 PPM on fire tube boilers.

(3) Burning natural gas the VOC are estimated at 0.003 # per million BTU and SO_x are 0.0005 # per million BTU.

(4) In some applications the CMAX will achieve less than 60 PPM without flue gas recirculation - consult factory.

These emission rates are general estimates and do not constitute guarantees by Power Flame Inc.
In instances where guarantees are required, please consult the factory with the specific application information.
All NOx numbers stated are corrected to 3% O_2

APPLICATION FEE