

## ROY RIGGLE PAD

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### G70-D PERMIT MODIFICATION

0	CHK	06/2012	-	R13-2950		
1	CHK	01/2013	Reroute LPT emissions from vapor combustor to flash gas compressor	R13-2950A		
2	CHK	05/2013	Typographical updates	R13-2950B		
3	CHK	07/2013	ADD: 2 ENG	R13-2950D		
4	SWN	04/2017	REM: 2 ENG	R13-2950E		
5	SWN	01/2018	ADD: 3 ENG, 2 GPU, 1 HT, 2 TANKS, 1 COMB REM: 1 HT, 1 COMB	G70-D	AML	01/31/2018
<b>REV</b>	<b>BY</b>	<b>DATE</b>	<b>DESCRIPTION</b>	<b>PERMIT</b>	<b>FACILITIES REVIEWED</b>	<b>DATE</b>

## TABLE OF CONTENTS

TABLE OF CONTENTS.....	i
INTRODUCTION.....	1
Proposed Emissions .....	1
Regulatory Discussion .....	2
APPLICATION FOR GENERAL PERMIT REGISTRATION.....	6
ATTACHMENT A: SINGLE SOURCE DETERMINATION .....	9
ATTACHMENT C: BUSINESS REGISTRATION CERTIFICATE.....	12
ATTACHMENT D: PROCESS FLOW DIAGRAM .....	14
ATTACHMENT E: PROCESS DESCRIPTION .....	16
ATTACHMENT F: PLOT PLAN.....	17
ATTACHMENT G: AREA MAPS .....	19
ATTACHMENT H: G70-D SECTION APPLICABILITY FORM .....	22
ATTACHMENT I: EMISSIONS UNITS/ERD TABLE.....	24
ATTACHMENT J: FUGITIVE EMISSIONS SUMMARY SHEET .....	26
ATTACHMENT K: GAS WELL AFFECTED FACILITY DATA SHEET .....	30
ATTACHMENT L: STORAGE VESSELS DATA SHEET .....	32
ATTACHMENT M: NATURAL GAS FIRED FUEL BURNING UNITS DATA SHEET .....	42
ATTACHMENT N: INTERNAL COMBUSTION ENGINE DATA SHEETS .....	47
ATTACHMENT O: TANKER TRUCK LOADING DATA SHEET.....	59
ATTACHMENT Q: PNEUMATIC CONTROLLERS DATA SHEET .....	65
ATTACHMENT R: PNEUMATIC PUMP DATA SHEET.....	67
ATTACHMENT S: AIR POLLUTION CONTROL DEVICE/EMISSION REDUCTION DEVICES SHEETS.....	69

ATTACHMENT T: EMISSIONS CALCULATIONS.....	80
ATTACHMENT U: FACILITY-WIDE EMISSION SUMMARY SHEETS .....	121
ATTACHMENT V: LEGAL ADVERTISEMENT .....	124

## INTRODUCTION

SWN Production Company, LLC (SWN), operates the Roy Riggle Pad under Permit No. R13-2950E, issued on June 15, 2017. With this application, SWN requests authorization to add two 145-hp Caterpillar G3306 NA compressor engines, one 92-hp GM Vortec 5.7L NA compressor engine, two GPU burners, one heater treater, one 400-bbl condensate tank, one 400-bbl produced water tank, and one 11.7-mmBtu/hr vapor combustor with pilot and to remove one heater treater and one 15-mmBtu/hr vapor combustor with pilot. Combustor controls have also been removed from the produced water loading. Tank throughputs and compositions have been updated and fugitive emissions have been revised to include three sand separators and four fuel gas separators. As a result of these changes, truck loading, vapor combustor, fugitive, and haul road emissions have also been updated. This project qualifies as a Modification. SWN also requests to operate under the General Permit G70-D for Oil and Natural Gas Production Facilities. Equipment to be authorized includes the following:

- Two (2) Caterpillar G3306 NA Compressor Engines
- One (1) 92-hp GM Vortec 5.7L NA Compressor Engine
- Three (3) Sand Separators (not an emissions source other than fugitive components)
- Four (4) Fuel Gas Separators (not an emissions source other than fugitive components)
- Three (3) 1.0-mmBtu/hr Gas Production Units
- One (1) 1.0-mmBtu/hr Heater Treater
- Four (4) 400-bbl Condensate Tanks
- Four (4) 400-bbl Produced Water Tanks
- Condensate Truck Loading
- Produced Water Truck Loading
- One (1) 11.7-mmBtu/hr Vapor Combustor with Pilot
- Fugitive Emissions
- Fugitive Haul Road Emissions

Note that other small storage tanks may be present on site (i.e., methanol, lube oil) but are considered de minimis sources per Table 45-13B and are listed on the application form.

### Proposed Emissions

Emissions calculations for the facility are presented in Attachment T. A fuel heating value of 905 Btu/scf was used to calculate emissions from natural gas-fired equipment. Actual heating value may vary (generally 905 - 1,300) but using a lower heating value in the emissions calculations provides a more conservative (higher) estimate of fuel use.

Emissions from the Caterpillar and GM engines were calculated with manufacturer data when available and AP-42/EPA emissions factors for the remaining pollutants.

Condensate and produced water tank emissions were calculated using ProMax process simulation software. Condensate and produced water tank emissions are routed to a vapor combustor with 100% capture efficiency and 98% destruction efficiency. Loading emissions were calculated using ProMax process simulation software and AP-42 calculations. Condensate loading emissions are routed to a vapor combustor with 70% capture efficiency and 98% destruction efficiency. Produced water loading emissions are vented to the atmosphere.

Fugitive emissions were calculated with a component count by equipment type from a similar facility, and representative extended gas and liquids analyses. Fugitive haul road emissions were calculated using EPA/AP-42 methodologies.

Greenhouse gas emissions were calculated with the latest EPA factors and manufacturer data when available. Documents used as references for the emissions calculations, including AP-42 and EPA emission factor references, gas and liquids analyses, and process simulation results are attached.

## **Regulatory Discussion**

### **STATE**

#### **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:**

The facility requests to operate under the General Permit G70-D. Emissions of carbon monoxide and volatile organic compounds are less than 80 tons per year (TPY). Oxides of nitrogen emissions are less than 50 TPY and particulate matter 10/2.5 and sulfur dioxide emissions are each less than 20 TPY. Also, the facility will have less than 8 TPY for each hazardous air pollutant and less than 20 tons for total hazardous air pollutants. This project qualifies as a Modification.

#### **45 CSR 22 - AIR QUALITY MANAGEMENT FEE PROGRAM:**

The facility will be required to maintain a valid Certificate to Operate on the premises.

#### **45 CSR 30 - REQUIREMENTS FOR OPERATING PERMITS:**

Emissions from the facility do not exceed major source thresholds; therefore, this rule does not apply.

## **FEDERAL**

### **40 CFR PART 60 SUBPART KB—STANDARDS OF PERFORMANCE FOR VOLATILE ORGANIC LIQUID STORAGE VESSELS (INCLUDING PETROLEUM LIQUID STORAGE VESSELS) FOR WHICH CONSTRUCTION, RECONSTRUCTION, OR MODIFICATION COMMENCED AFTER JULY 23, 1984**

The affected facility to which this Subpart applies is each storage vessel with a capacity greater than or equal to 75 cubic meters (m<sup>3</sup>) that is used to store volatile organic liquids (VOL) for which construction, reconstruction, or modification is commenced after July 23, 1984. The tanks at this facility were constructed after the effective date of this Subpart but are less than 75 m<sup>3</sup> (which equals approximately 471 bbl); therefore, this Subpart does not apply.

### **40 CFR PART 60 SUBPART KKK - STANDARDS OF PERFORMANCE FOR STATIONARY FOR EQUIPMENT LEAKS OF VOC FROM ONSHORE NATURAL GAS PROCESSING PLANTS:**

The facility is not considered an affected source (natural gas processing plant) and is therefore not subject to this Subpart.

### **40 CFR PART 60 SUBPART IIII - STANDARDS OF PERFORMANCE FOR STATIONARY COMPRESSION IGNITION INTERNAL COMBUSTION ENGINES:**

The facility does not contain the affected source (diesel-fired engine) and is therefore not subject to this Subpart.

### **40 CFR PART 60 SUBPART JJJJ - STANDARDS OF PERFORMANCE FOR STATIONARY SPARK IGNITION INTERNAL COMBUSTION ENGINES:**

The proposed four-stroke, rich-burn natural gas-fired flash gas compressor engines are assumed to have been constructed after the June 12, 2006 effective date and manufactured after July 1, 2008; therefore, they will be subject to this Subpart. Although final selection of the engines has not yet been made, it is presumed that the 145-hp engines were manufactured after January 1, 2011 and are therefore subject to the Stage 2 emission limitations under this Subpart. SWN will comply with all applicable requirements.

### **40 CFR PART 60 SUBPART OOOO - STANDARDS OF PERFORMANCE FOR CRUDE OIL AND NATURAL GAS PRODUCTION, TRANSMISSION, AND DISTRIBUTION:**

The emission sources affected by this Subpart include well completions, pneumatic controllers, equipment leaks from natural gas processing plants, sweetening units at natural gas processing plants, reciprocating compressors, centrifugal compressors and storage vessels which are constructed, modified or reconstructed after August 23, 2011 and before September 18, 2015.

The one (1) existing well at this location was completed during the effective date of this Subpart and is subject to the compliance requirements. There is no centrifugal compressor using wet gas seals at this facility. The pneumatic controllers utilized at the facility are considered low-bleed and are not subject to this Subpart. The storage vessel venting is controlled to less than six (6) TPY VOC and federally enforceable limits are requested; therefore, the storage vessels are not subject to this Subpart.

**40 CFR PART 60 SUBPART OOOOA - STANDARDS OF PERFORMANCE FOR CRUDE OIL AND NATURAL GAS FACILITIES FOR WHICH CONSTRUCTION, MODIFICATION, OR RECONSTRUCTION COMMENCED AFTER SEPTEMBER 18, 2015:**

The emission sources affected by this Subpart include well completions, centrifugal compressors, reciprocating compressors, pneumatic controllers, storage vessels, fugitive sources at well sites, fugitive sources at compressor stations, pneumatic pumps, equipment leaks from natural gas processing plants and sweetening units at natural gas processing plants which are constructed, modified or reconstructed after September 18, 2015.

The two (2) proposed wells at this location will be completed after the effective date of this Subpart and will be subject to the compliance requirements. There is no centrifugal compressor using wet gas seals at this facility. The pneumatic controllers utilized at the facility are considered low-bleed and are not subject to this Subpart. The storage vessels were constructed before the effective date of this Subpart and are not subject to this Subpart. Reciprocating compressors located at well sites are not subject to this Subpart.

**40 CFR PART 63 SUBPART HH - NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS FOR SOURCE CATEGORIES FROM OIL AND NATURAL GAS PRODUCTION FACILITIES:**

The site is a minor (area) source of hazardous air pollutants. This Subpart applies to affected emission points that are located at facilities that are major and area sources of HAP, and either process, upgrade, or store hydrocarbon liquids prior to custody transfer or that process, upgrade, or store natural gas prior to entering the natural gas transmission and storage source category. For purposes of this Subpart natural gas enters the natural gas transmission and storage source category after the natural gas processing plant, if present. The facility is a minor (area) source of

HAP; however, there is no triethylene glycol (TEG) dehydration unit present at the facility and therefore this Subpart does not apply.

**40 CFR PART 63 SUBPART HHH - NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS FOR SOURCE CATEGORIES FROM NATURAL TRANSMISSION AND STORAGE FACILITIES:**

The facility is not a natural gas transmission and storage facility and is therefore not subject to this Subpart.

**40 CFR PART 63 SUBPART ZZZZ - NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS FOR SOURCE CATEGORIES FROM STATIONARY RECIPROCATING INTERNAL COMBUSTION ENGINES - AREA SOURCE:**

The original rule, published on February 26, 2004, initially affected new (constructed or reconstructed after December 19, 2002) reciprocating internal combustion engines (RICE) with a site-rating greater than 500 brake horsepower (HP) located at a major source of HAP emissions. On January 18, 2008, EPA published an amendment that promulgated standards for RICE constructed or reconstructed after June 12, 2006 with a site rating less than or equal to 500 HP located at major sources, and for engines constructed and reconstructed after June 12, 2006 located at area sources. On August 10, 2010, EPA published another amendment that promulgated standards for existing (constructed or reconstructed before June 12, 2006) RICE at area sources and existing RICE (constructed or reconstructed before June 12, 2006) with a site rating of less than or equal to 500 HP at major sources.

Owners and operators of new or reconstructed engines at area sources must meet the requirements of Subpart ZZZZ by complying with either 40 CFR Part 60 Subpart IIII (for CI engines) or 40 CFR Part 60 Subpart JJJJ (for SI engines). Based on emission calculations, this facility is a minor source of HAP. The proposed four-stroke, rich-burn natural gas-fired flash gas compressor engines are considered new engines and will meet the requirements of this Subpart by complying with requirements under NSPS Subpart JJJJ.



SWN Production Company, LLC  
Roy Riggle Pad  
January 2018

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## **APPLICATION FOR GENERAL PERMIT REGISTRATION**



west virginia department of environmental protection

Division of Air Quality  
601 57<sup>th</sup> Street SE  
Charleston, WV 25 4  
Phone (304) 926-0475  
Fax (304) 926-0479  
www.dep.wv.gov

### G70-D GENERAL PERMIT REGISTRATION APPLICATION

PREVENTION AND CONTROL OF AIR POLLUTION IN REGARD TO THE CONSTRUCTION, MODIFICATION, RELOCATION, ADMINISTRATIVE UPDATE AND OPERATION OF NATURAL GAS PRODUCTION FACILITIES LOCATED AT THE WELL SITE

- CONSTRUCTION
- MODIFICATION
- RELOCATION
- CLASS I ADMINISTRATIVE UPDATE
- CLASS II ADMINISTRATIVE UPDATE

#### SECTION 1. GENERAL INFORMATION

Name of Applicant (as registered with the WV Secretary of State's Office): SWN Production Company, LLC

Federal Employer ID No. (FEIN): 26-4388727

Applicant's Mailing Address: 10000 Energy Drive

City: Spring

State: TX

ZIP Code: 77389

Facility Name: Roy Riggle Pad

Operating Site Physical Address: 205 Crupes Run Rd.  
If none available, list road, city or town and zip of facility.

City: Valley Grove

Zip Code: 26060

County: Ohio

Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits):

Latitude: 40.151121

Longitude: -80.523855

SIC Code: 1311

DAQ Facility ID No. (For existing facilities)

NAICS Code: 211111

069-00121

#### CERTIFICATION OF INFORMATION

This G70-D General Permit Registration Application shall be signed below by a Responsible Official. A Responsible Official is a President, Vice President, Secretary, Treasurer, General Partner, General Manager, a member of the Board of Directors, or Owner, depending on business structure. A business may certify an Authorized Representative who shall have authority to bind the Corporation, Partnership, Limited Liability Company, Association, Joint Venture or Sole Proprietorship. Required records of daily throughput, hours of operation and maintenance, general correspondence, compliance certifications and all required notifications must be signed by a Responsible Official or an Authorized Representative. If a business wishes to certify an Authorized Representative, the official agreement below shall be checked off and the appropriate names and signatures entered. **Any administratively incomplete or improperly signed or unsigned G70-D Registration Application will be returned to the applicant. Furthermore, if the G70-D forms are not utilized, the application will be returned to the applicant. No substitution of forms is allowed.**

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

I hereby certify that all information contained in this G70-D General Permit Registration Application and any supporting documents appended hereto is, to the best of my knowledge, true, accurate and complete, and that all reasonable efforts have been made to provide the most comprehensive information possible.

Responsible Official Signature: \_\_\_\_\_

Name and Title:

Phone:

Fax:

Email:

Date:

If applicable:

Authorized Representative Signature: Clay Murrall

Name and Title: Clay Murrall, Regulatory Supervisor

Phone: 304-884-1715

Fax:

Email: Clay\_Murrall@SWN.com

Date:

02-01-2018

If applicable:

Environmental Contact

Name and Title: Heather Cready, Regulatory Technician

Phone: 304-884-1651

Fax:

Email: Heather\_Cready@SWN.com

Date:

**OPERATING SITE INFORMATION**

Briefly describe the proposed new operation and/or any change(s) to the facility: This application includes two (2) Caterpillar G3306 NA engines (EU-ENG1 – EU-ENG2), one (1) 92-hp GM Vortec 5.7L NA engine (EU-ENG3), three (3) 1.0-mmBtu/hr natural gas-fired gas production unit (GPU) burners (EU-GPU1 – EU-GPU3), one (1) 1.0-mmBtu/hr natural gas-fired heater treater (EU-HT2), four (4) 400-bbl condensate tanks (EU-TANKS-COND), four (4) 400-bbl produced water tanks (EU-TANKS-PW), condensate and produced water truck loading (EU-LOAD-COND and EU-LOAD-PW), one (1) 11.7-mmBtu/hr vapor combustor (APC-COMB) with one (1) 17-SCFH pilot (EU-PILOT), fugitive emissions (EU-FUG), and fugitive haul road emissions (EU-HR).

Directions to the facility: From I-70 exit 5, turn right on US RT. 40 east and travel 4.4 miles to Rt. 40 staging. From Rt.40 staging turn left on US Rt. 40 east and travel 5.3 miles to Pa. SR-3005, (West Liberty Rd), and turn left on SR-3005. Travel SR-3005 for 0.5 miles to intersection and stop sign of SR-3005 and SR-3003, (Dry Run Rd), and turn right on SR-3003. Travel SR-3003 0.8 miles to intersection of SR-3003 and T322, (Main Road), and turn left on Main Road. Travel Main Road 1.9 miles to access road on right. \*\*\*Note road sign for T-322 Main Road is faded and T-322 is not visible. Main Road wording recently painted.

**ATTACHMENTS AND SUPPORTING DOCUMENTS**

**I have enclosed the following required documents:**

Check payable to WVDEP – Division of Air Quality with the appropriate application fee (per 45CSR13 and 45CSR22).

- Check attached to front of application.
- I wish to pay by electronic transfer. Contact for payment (incl. name and email address):
- I wish to pay by credit card. Contact for payment (incl. name and email address):

- \$500 (Construction, Modification, and Relocation)                       \$300 (Class II Administrative Update)
- \$1,000 NSPS fee for 40 CFR60, Subpart IIII, JJJJ, OOOO and/or OOOOa <sup>1</sup>
- \$2,500 NESHAP fee for 40 CFR63, Subpart ZZZZ and/or HH <sup>2</sup>

<sup>1</sup> Only one NSPS fee will apply.  
<sup>2</sup> Only one NESHAP fee will apply. The Subpart ZZZZ NESHAP fee will be waived for new engines that satisfy requirements by complying with NSPS, Subparts IIII and/or JJJJ.  
*NSPS and NESHAP fees apply to new construction or if the source is being modified.*

- Responsible Official or Authorized Representative Signature (if applicable)
- Single Source Determination Form (**must be completed**) – Attachment A
- Siting Criteria Waiver (if applicable) – Attachment B                       Current Business Certificate – Attachment C
- Process Flow Diagram – Attachment D                                       Process Description – Attachment E
- Plot Plan – Attachment F     Area Map – Attachment G
- G70-D Section Applicability Form – Attachment H                       Emission Units/ERD Table – Attachment I
- Fugitive Emissions Summary Sheet – Attachment J
- Gas Well Affected Facility Data Sheet (if applicable) – Attachment K
- Storage Vessel(s) Data Sheet (include gas sample data, USEPA Tanks, simulation software (e.g. ProMax, E&P Tanks, HYSYS, etc.), etc. where applicable) – Attachment L
- Natural Gas Fired Fuel Burning Unit(s) Data Sheet (GPUs, Heater Treaters, In-Line Heaters if applicable) – Attachment M
- Internal Combustion Engine Data Sheet(s) (include manufacturer performance data sheet(s) if applicable) – Attachment N
- Tanker Truck/Rail Car Loading Data Sheet (if applicable) – Attachment O
- Glycol Dehydration Unit Data Sheet(s) (include wet gas analysis, GRI- GLYCalc™ input and output reports and information on reboiler if applicable) – Attachment P
- Pneumatic Controllers Data Sheet – Attachment Q
- Pneumatic Pump Data Sheet – Attachment R
- Air Pollution Control Device/Emission Reduction Device(s) Sheet(s) (include manufacturer performance data sheet(s) if applicable) – Attachment S
- Emission Calculations (please be specific and include all calculation methodologies used) – Attachment T
- Facility-wide Emission Summary Sheet(s) – Attachment U
- Class I Legal Advertisement – Attachment V
- One (1) paper copy and two (2) copies of CD or DVD with pdf copy of application and attachments

**All attachments must be identified by name, divided into sections, and submitted in order.**

**ATTACHMENT A: SINGLE SOURCE DETERMINATION**

**ATTACHMENT A - SINGLE SOURCE DETERMINATION FORM**

Classifying multiple facilities as one “stationary source” under 45CSR13, 45CSR14, and 45CSR19 is based on the definition of Building, structure, facility, or installation as given in §45-14-2.13 and §45-19-2.12. The definition states:

*“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 the control of the same person (or persons under common control). Pollutant-emitting activities are a part of the same industrial grouping if they belong to the same “Major Group” (i.e., which have the same two (2)-digit code) as described in the Standard Industrial Classification Manual, 1987 (United States Government Printing Office stock number GPO 1987 0-185-718:QL 3).*

The Source Determination Rule for the oil and gas industry was published in the Federal Register on June 3, 2016 and will become effective on August 2, 2016. EPA defined the term “adjacent” and stated that equipment and activities in the oil and gas sector that are under common control will be considered part of the same source if they are located on the same site or on sites that share equipment and are within ¼ mile of each other.

Is there equipment and activities in the same industrial grouping (defined by SIC code)?

Yes  No

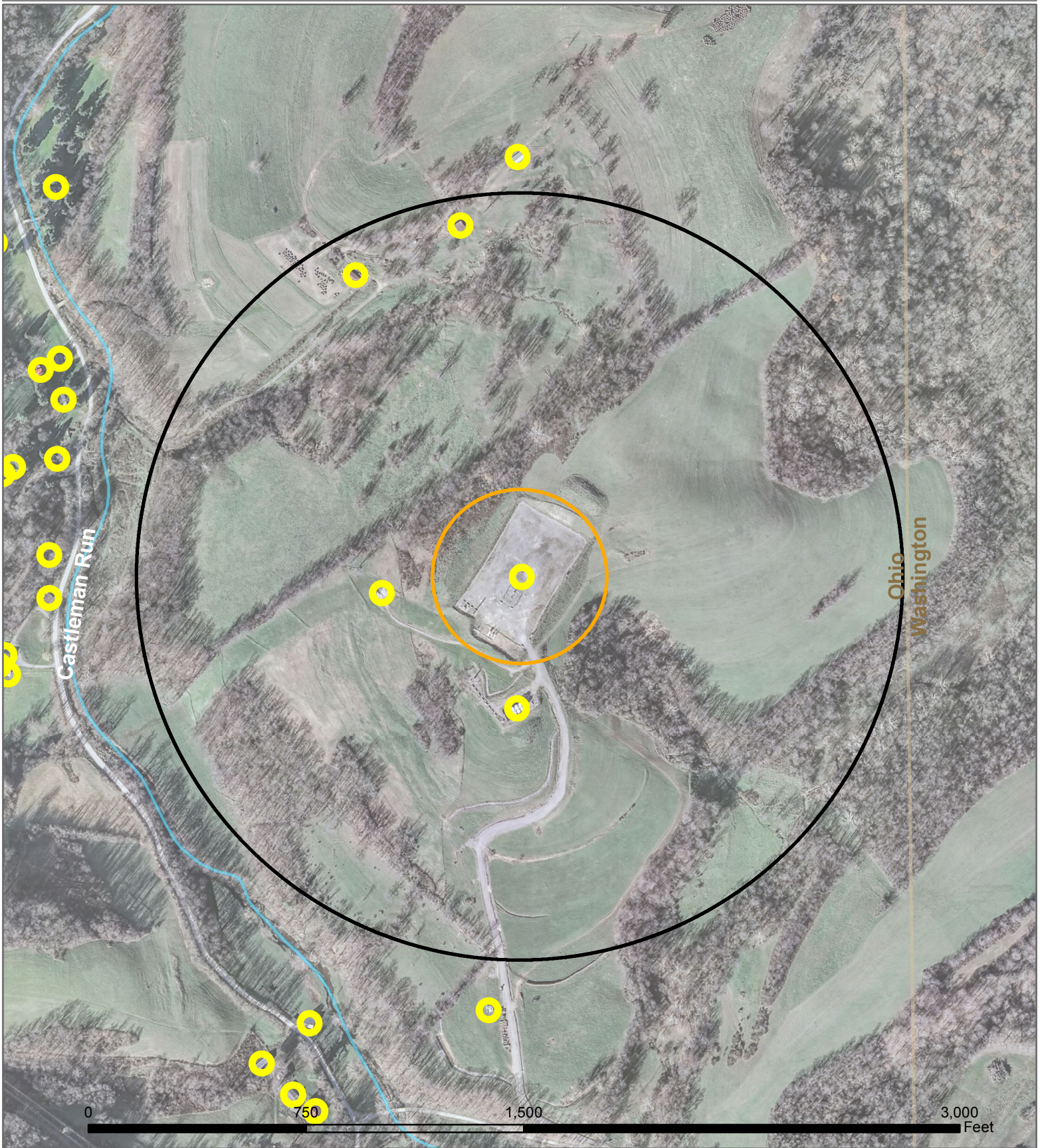
Is there equipment and activities under the control of the same person/people?

Yes  No










Is there equipment and activities located on the same site or on sites that share equipment and are within ¼ mile of each other?

Yes  No

# Proximity Map



**Roy Riggle Pad**  
 Lease Road: 2,127 Feet  
 NAD83 UTM Zone 17N  
 540.557 4,444.699 Kilometers  
 -80.523855 40.151121 Decimal Degrees

- |   |                        |   |                     |
|---|------------------------|---|---------------------|
|  | Schools                |  | Compressor Stations |
|  | Residential Structures |  | Processing Plant    |
|  | Rivers and Lakes       |  | Power Plant         |
|  | Riggle_300FT           |  | Hospital            |
|  | Riggle_Quarter_Mile    |   |                     |

**ATTACHMENT C: BUSINESS REGISTRATION CERTIFICATE**

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

ISSUED TO:  
**SWN PRODUCTION COMPANY, LLC  
5400D BIG TYLER RD  
CHARLESTON, WV 25313-1103**

BUSINESS REGISTRATION ACCOUNT NUMBER: **2307-3731**

This certificate is issued on: **12/8/2014**

This certificate is issued by **[Signature]**  
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.

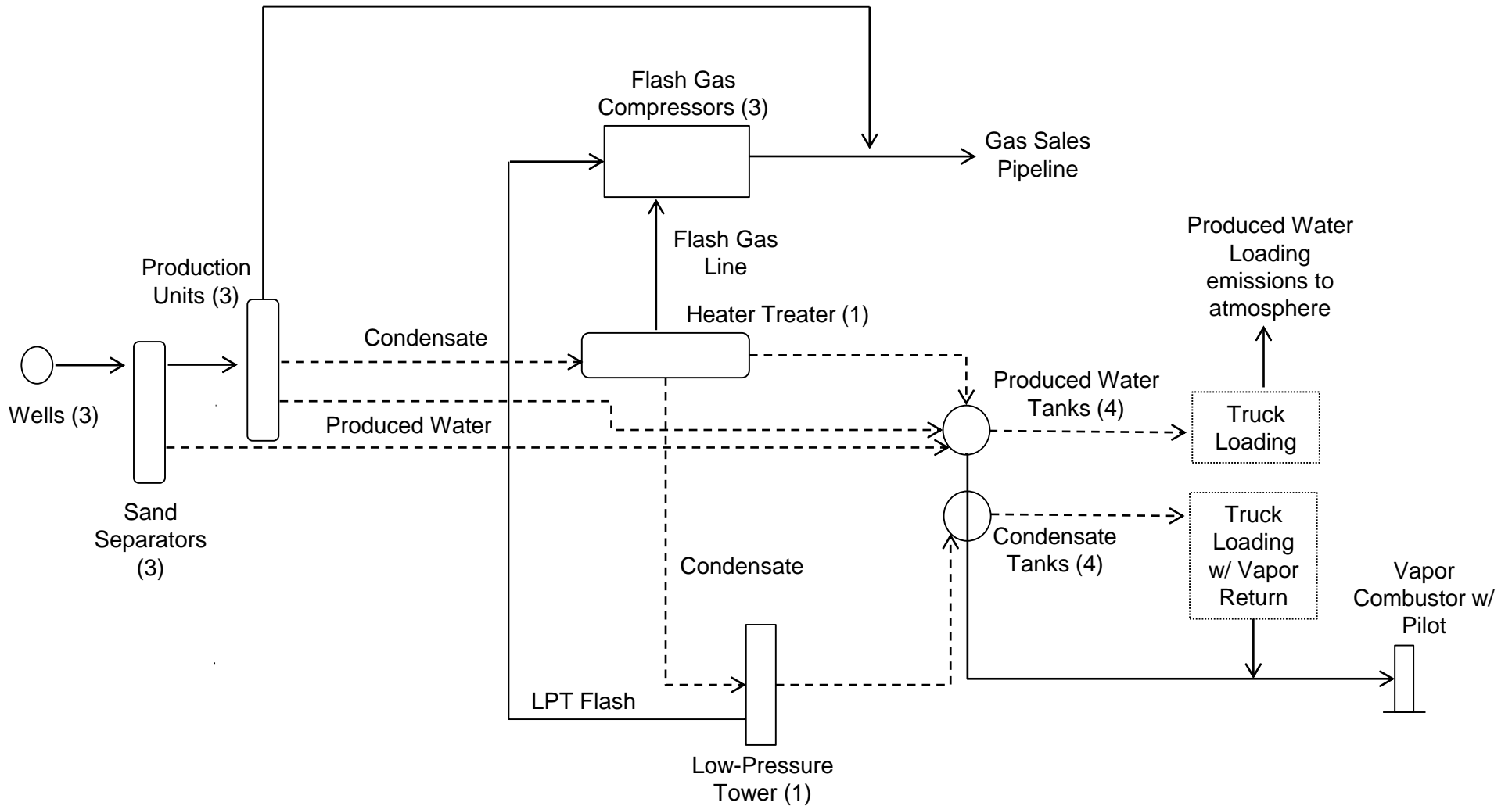
Change in name or change of location shall be considered a cessation of the business and a new  
certificate shall be required.

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  
L1180094016



**ATTACHMENT D: PROCESS FLOW DIAGRAM**



———— Gas/Vapor  
 - - - - - Liquids (Condensate and Produced Water)

**SWN Production Company, LLC**  
**Roy Riggle Pad**  
 Attachment D: Process Flow Diagram  
 January 2018

*Note: Drawing is a depiction of general facility process and is not intended to represent facility and/or equipment layout.*

## **ATTACHMENT E: PROCESS DESCRIPTION**

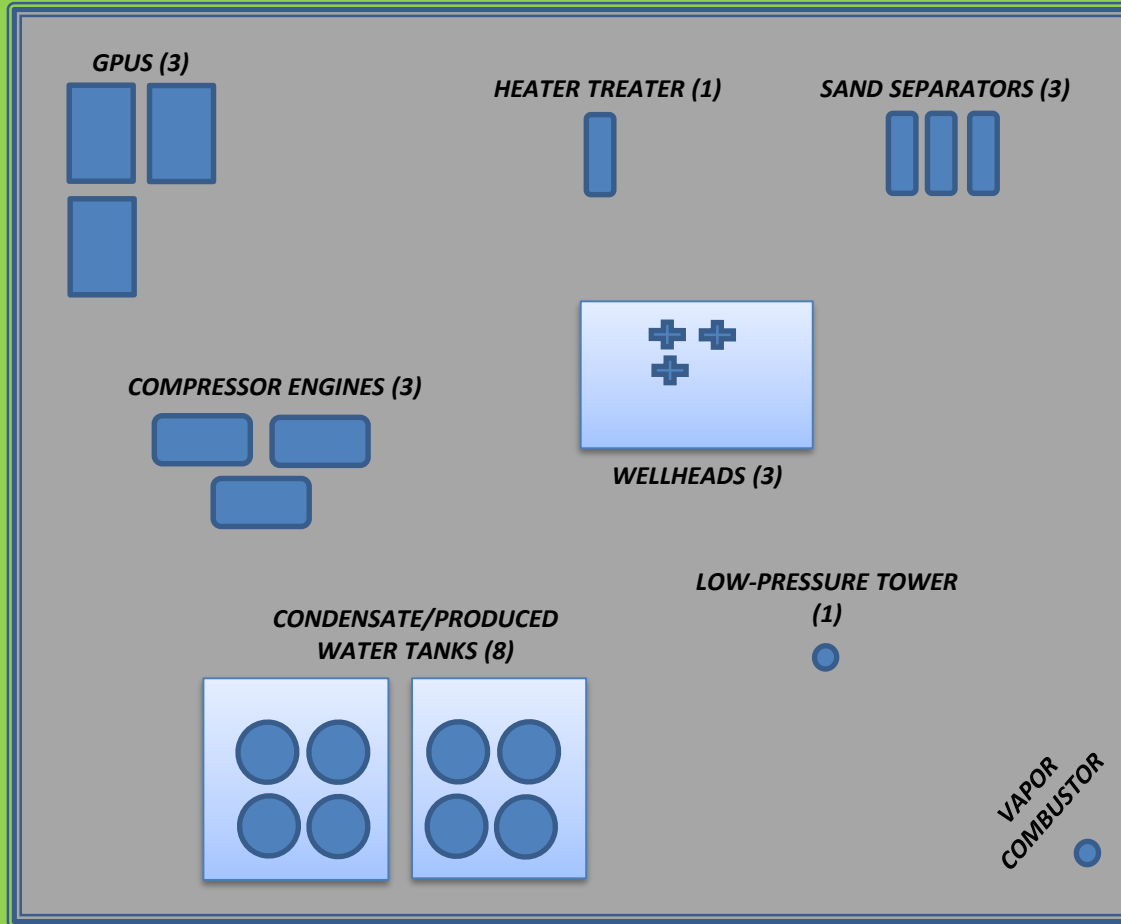
The facility is an oil and natural gas exploration and production facility, responsible for the production of condensate and natural gas. Storage of condensate and produced water also occurs on-site. A description of the facility process is as follows: Condensate, gas and water come from the wellheads through the sand separators then to the production units, where the first stage of separation occurs. Produced water is sent from the production units to the produced water tanks. Condensate and residual water are sent to the heater treater. The flash from the heater treater is captured via natural gas-fired engine-driven flash gas compressors. Produced water from the heater treater flows into the produced water storage tanks. Condensate flows into the low-pressure tower. Flash gas from the low-pressure tower is captured via natural gas-fired engine-driven flash gas compressors. Condensate flows into the condensate storage tanks.

The natural gas stream exits the facility for transmission via pipeline. Condensate and produced water are transported offsite via truck. Working, breathing and flashing vapors from the condensate and produced water tanks are routed to the vapor combustor with 100% capture efficiency to be burned with at least 98% combustion efficiency. Condensate loading emissions are routed to a vapor combustor with 70% capture efficiency and 98% destruction efficiency. Produced water loading emissions are vented to the atmosphere. The vapor combustor has one (1) natural gas-fired pilot to ensure a constant flame for combustion.

A process flow diagram reflecting facility operations is shown in Attachment D.

## **ATTACHMENT F: PLOT PLAN**

Please note that the simple plot plan provided is only a representation of production/emissions equipment to be installed. Actual location specifications and equipment placement are not to scale.



***NOTE: Image is only a representation of production/emissions equipment. Actual location specifications and equipment placement are not to scale.***

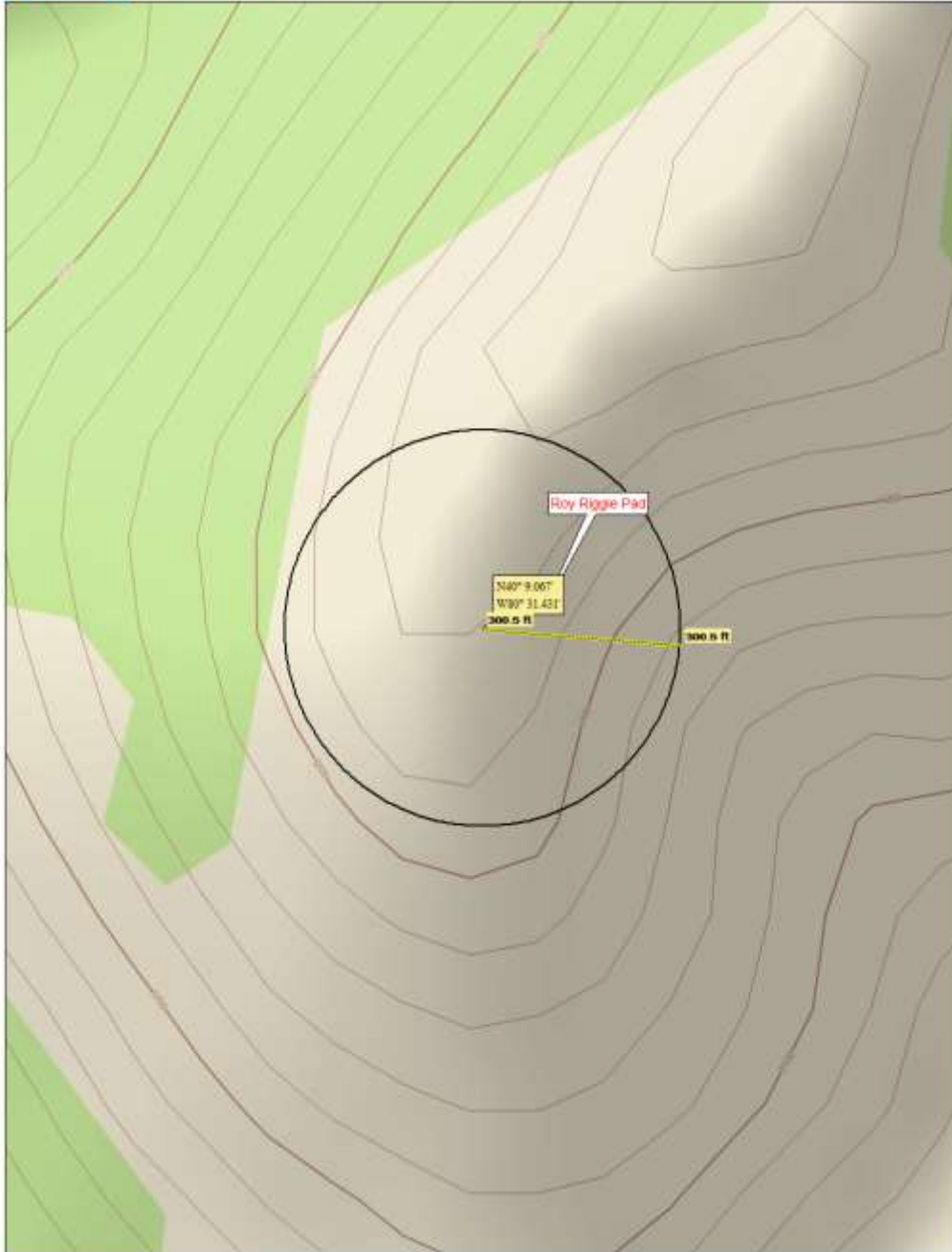
**ATTACHMENT G: AREA MAPS**



Data use subject to license.  
© DeLorme, XMap® 7,  
www.delorme.com



**SWN Production Company, LLC**  
**Roy Riggle Pad**  
Attachment G: Area Map  
January 2018



Data use subject to license.  
© DeLorme, XMap® 7.  
www.delorme.com

MN (8.9° W)

0 60 120 180 240 300 360 ft  
Data Zoom 16-4

**SWN Production Company, LLC**  
**Roy Riggle Pad**  
Attachment G: Area Map with 300' Radius  
January 2018



**ATTACHMENT H: G70-D SECTION APPLICABILITY FORM**

**ATTACHMENT H – G70-D SECTION APPLICABILITY FORM**

**General Permit G70-D Registration  
Section Applicability Form**

General Permit G70-D was developed to allow qualified applicants to seek registration for a variety of sources. These sources include gas well affected facilities, storage vessels, gas production units, in-line heaters, heater treaters, glycol dehydration units and associated reboilers, pneumatic controllers, pneumatic pumps, reciprocating internal combustion engines (RICEs), tank truck/rail car loading, fugitive emissions, completion combustion devices, flares, enclosed combustion devices, and vapor recovery systems. All registered facilities will be subject to Sections 1.0, 2.0, 3.0, and 4.0.

General Permit G70-D allows the registrant to choose which sections of the permit they are seeking registration under. Therefore, please mark which additional sections that you are applying for registration under. If the applicant is seeking registration under multiple sections, please select all that apply. Please keep in mind, that if this registration is approved, the issued registration will state which sections will apply to your affected facility.

<b>GENERAL PERMIT G70-D APPLICABLE SECTIONS</b>	
<input checked="" type="checkbox"/> Section 5.0	Gas and Oil Well Affected Facility (NSPS, Subpart OOOO/OOOOa)
<input checked="" type="checkbox"/> Section 6.0	Storage Vessels Containing Condensate and/or Produced Water <sup>1</sup>
<input type="checkbox"/> Section 7.0	Storage Vessel Affected Facility (NSPS, Subpart OOOO/OOOOa)
<input checked="" type="checkbox"/> Section 8.0	Control Devices and Emission Reduction Devices not subject to NSPS Subpart OOOO/OOOOa and/or NESHAP Subpart HH
<input checked="" type="checkbox"/> Section 9.0	Small Heaters and Reboilers not subject to 40CFR60 Subpart Dc
<input type="checkbox"/> Section 10.0	Pneumatic Controllers Affected Facility (NSPS, Subpart OOOO/OOOOa)
<input type="checkbox"/> Section 11.0	Pneumatic Pump Affected Facility (NSPS, Subpart OOOOa)
<input type="checkbox"/> Section 12.0	Fugitive Emissions GHG and VOC Standards (NSPS, Subpart OOOOa)
<input checked="" type="checkbox"/> Section 13.0	Reciprocating Internal Combustion Engines, Generator Engines
<input checked="" type="checkbox"/> Section 14.0	Tanker Truck/Rail Car Loading <sup>2</sup>
<input type="checkbox"/> Section 15.0	Glycol Dehydration Units <sup>3</sup>

- 1 Applicants that are subject to Section 6 may also be subject to Section 7 if the applicant is subject to the NSPS, Subparts OOOO or OOOOa control requirements or the applicable control device requirements of Section 8.
- 2 Applicants that are subject to Section 14 may also be subject to control device and emission reduction device requirements of Section 8.
- 3 Applicants that are subject to Section 15 may also be subject to the requirements of Section 9 (reboilers). Applicants that are subject to Section 15 may also be subject to control device and emission reduction device requirements of Section 8.

**ATTACHMENT I: EMISSIONS UNITS/ERD TABLE**

**ATTACHMENT I - EMISSION UNITS/EMISSION REDUCTION DEVICES (ERD) TABLE**

Include ALL emission units and air pollution control devices/ERDs that will be part of this permit application review. Do not include fugitive emission sources in this table. Deminimis storage tanks shall be listed in the Attachment L table. This information is required for all sources regardless of whether it is a construction, modification, or administrative update.

Emission Unit ID <sup>1</sup>	Emission Point ID <sup>2</sup>	Emission Unit Description	Year Installed	Manufac. Date <sup>3</sup>	Design Capacity	Type <sup>4</sup> and Date of Change	Control Device(s) <sup>5</sup>	ERD(s) <sup>6</sup>
EU-ENG1	EP-ENG1	145-hp Caterpillar G3306 NA Engine	TBD	after 1/1/2011	145-hp	New	NSCR	NSCR
EU-ENG2	EP-ENG2	145-hp Caterpillar G3306 NA Engine	TBD	after 1/1/2011	145-hp	New	NSCR	NSCR
EU-ENG3	EP-ENG3	92-hp GM Vortec 5.7L NA Engine	TBD	after 7/1/2008	92-hp	New	NSCR	NSCR
EU-GPU1	EP-GPU1	1.0-mmBtu/hr GPU Burner	2011	N/A	1.0-mmBtu/hr	Existing	N/A	N/A
EU-GPU2	EP-GPU2	1.0-mmBtu/hr GPU Burner	TBD	N/A	1.0-mmBtu/hr	New	N/A	N/A
EU-GPU3	EP-GPU3	1.0-mmBtu/hr GPU Burner	TBD	N/A	1.0-mmBtu/hr	New	N/A	N/A
EU-HT1	EP-HT1	0.5-mmBtu/hr Heater Treater	2011	N/A	0.5-mmBtu/hr	Removal	N/A	N/A
EU-HT2	EP-HT2	1.0-mmBtu/hr Heater Treater	TBD	N/A	1.0-mmBtu/hr	New	N/A	N/A
EU-TANKS-COND	APC-COMB	Four (4) 400-bbl Condensate Tanks Routed to Vapor Combustor	3 - 2011; 1 - TBD	N/A	400-bbl	New (1)/ Modification	APC-COMB	APC-COMB
EU-TANKS-PW	APC-COMB	Four (4) 400-bbl Produced Water Tanks Routed to Vapor Combustor	3 - 2011; 1 - TBD	N/A	400-bbl	New (1)/ Modification	APC-COMB	APC-COMB
EU-LOAD-COND	EU-LOAD-COND and APC-COMB	Condensate Truck Loading w/ Vapor Return Routed to Combustor	2011	N/A	14,160,628 gal/yr	Modification	Vapor Return and APC-COMB	Vapor Return and APC-COMB
EU-LOAD-PW	EP-LOAD-PW	Produced Water Truck Loading	2011	N/A	15,282,784 gal/yr	Modification	N/A	N/A
APC-COMB	APC-COMB	11.7-mmBtu/hr Vapor Combustor	TBD	N/A	11.7-mmBtu/hr	New	N/A	N/A
EU-PILOT	APC-COMB	Vapor Combustor Pilot	TBD	N/A	17-scfh	New	N/A	N/A
APC-COMB	APC-COMB	15.0-mmBtu/hr Vapor Combustor	2013	N/A	15-mmBtu/hr	Removal	N/A	N/A
EU-PILOT	APC-COMB	Vapor Combustor Pilot	2013	N/A	50-scfh	Removal	N/A	N/A
EU-FUG	EP-FUG	Fugitive Emissions	2011	N/A	N/A	Modification	N/A	N/A
EU-HR	EP-HR	Fugitive Haul Road Emissions	2011	N/A	N/A	Modification	N/A	N/A

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

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

<sup>3</sup> When required by rule

<sup>4</sup> New, modification, removal, existing

<sup>5</sup> For Control Devices use the following numbering system: 1C, 2C, 3C,... or other appropriate designation.

<sup>6</sup> For ERDs use the following numbering system: 1D, 2D, 3D,... or other appropriate designation.

## **ATTACHMENT J: FUGITIVE EMISSIONS SUMMARY SHEET**

Fugitive emissions at this site consist of haul road emissions, condensate and produced water loading operations, and equipment leaks.

## ATTACHMENT J – FUGITIVE EMISSIONS SUMMARY SHEET

Sources of fugitive emissions may include loading operations, equipment leaks, blowdown emissions, etc.  
Use extra pages for each associated source or equipment if necessary.

Source/Equipment: EU-FUG

Leak Detection Method Used		<input type="checkbox"/> Audible, visual, and olfactory (AVO) inspections		<input type="checkbox"/> Infrared (FLIR) cameras		<input type="checkbox"/> Other (please describe)		<input checked="" type="checkbox"/> None required	
Component Type	Closed Vent System	Count	Source of Leak Factors (EPA, other (specify))	Stream type (gas, liquid, etc.)	Estimated Emissions (tpy)				
					VOC	HAP	GHG (methane, CO <sub>2e</sub> )		
Pumps	<input type="checkbox"/> Yes <input type="checkbox"/> No			<input type="checkbox"/> Gas <input type="checkbox"/> Liquid <input type="checkbox"/> Both					
Valves	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	67 – gas 155 – LL	EPA	<input type="checkbox"/> Gas <input type="checkbox"/> Liquid <input checked="" type="checkbox"/> Both	0.75 – gas 3.56 – LL	0.01 – gas 0.26 – LL	36.95 – gas 1.24 – LL		
Safety Relief Valves	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	42	EPA	<input checked="" type="checkbox"/> Gas <input type="checkbox"/> Liquid <input type="checkbox"/> Both	0.92	0.01	45.30		
Open Ended Lines	<input type="checkbox"/> Yes <input type="checkbox"/> No			<input type="checkbox"/> Gas <input type="checkbox"/> Liquid <input type="checkbox"/> Both					
Sampling Connections	<input type="checkbox"/> Yes <input type="checkbox"/> No			<input type="checkbox"/> Gas <input type="checkbox"/> Liquid <input type="checkbox"/> Both					
Connections (Not sampling)	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	530	EPA	<input type="checkbox"/> Gas <input checked="" type="checkbox"/> Liquid <input type="checkbox"/> Both	1.02	0.08	0.36		
Compressors	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	9	EPA	<input checked="" type="checkbox"/> Gas <input type="checkbox"/> Liquid <input type="checkbox"/> Both	0.20	<0.01	9.71		
Flanges	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	314 – gas 42 – LL	EPA	<input type="checkbox"/> Gas <input type="checkbox"/> Liquid <input checked="" type="checkbox"/> Both	0.30 – gas 0.04 – LL	<0.01 – gas <0.01 – LL	15.01 – gas 0.01 – LL		
Other <sup>1</sup>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	7	EPA	<input type="checkbox"/> Gas <input checked="" type="checkbox"/> Liquid <input type="checkbox"/> Both	<0.01	<0.01	<0.01		

<sup>1</sup> Other equipment types may include compressor seals, relief valves, diaphragms, drains, meters, etc.

Please provide an explanation of the sources of fugitive emissions (e.g. pigging operations, equipment blowdowns, pneumatic controllers, etc.):  
Equipment leaks

Please indicate if there are any closed vent bypasses (include component):

N/A

Specify all equipment used in the closed vent system (e.g. VRU, ERD, thief hatches, tanker truck/rail car loading, etc.)

N/A

TABLE 2-4. OIL AND GAS PRODUCTION OPERATIONS AVERAGE EMISSION FACTORS (kg/hr/source)

Equipment Type	Service <sup>a</sup>	Emission Factor (kg/hr/source) <sup>b</sup>
Valves	Gas	4.5E-03
	Heavy Oil	8.4E-06
	Light Oil	2.5E-03
	Water/Oil	9.8E-05
Pump seals	Gas	2.4E-03
	Heavy Oil	NA
	Light Oil	1.3E-02
	Water/Oil	2.4E-05
Others <sup>c</sup>	Gas	8.8E-03
	Heavy Oil	3.2E-05
	Light Oil	7.5E-03
	Water/Oil	1.4E-02
Connectors	Gas	2.0E-04
	Heavy Oil	7.5E-06
	Light Oil	2.1E-04
	Water/Oil	1.1E-04
Flanges	Gas	3.9E-04
	Heavy Oil	3.9E-07
	Light Oil	1.1E-04
	Water/Oil	2.9E-06
Open-ended lines	Gas	2.0E-03
	Heavy Oil	1.4E-04
	Light Oil	1.4E-03
	Water/Oil	2.5E-04

<sup>a</sup>Water/Oil emission factors apply to water streams in oil service with a water content greater than 50%, from the point of origin to the point where the water content reaches 99%. For water streams with a water content greater than 99%, the emission rate is considered negligible.

<sup>b</sup>These factors are for total organic compound emission rates (including non-VOC's such as methane and ethane) and apply to light crude, heavy crude, gas plant, gas production, and off shore facilities. "NA" indicates that not enough data were available to develop the indicated emission factor.

<sup>c</sup>The "other" equipment type was derived from compressors, diaphragms, drains, dump arms, hatches, instruments, meters, pressure relief valves, polished rods, relief valves, and vents. This "other" equipment type should be applied for any equipment type other than connectors, flanges, open-ended lines, pumps, or valves.



**ATTACHMENT K: GAS WELL AFFECTED FACILITY DATA SHEET**

**ATTACHMENT K – GAS WELL AFFECTED FACILITY DATA SHEET**

Complete this data sheet if you are the owner or operator of a gas well affected facility for which construction, modification or reconstruction commenced after August 23, 2011. This form must be completed for natural gas well affected facilities regardless of when flowback operations occur (or have occurred).

<b>API Number</b>	<b>Date of Flowback</b>	<b>Date of Well Completion</b>	<b>Green Completion and/or Combustion Device</b>	<b>Subject to OOOO or OOOOa?</b>
047-069-00084 (8H)	6/28/2012	5/2/2012	Green Completion	OOOO
PLANNED	TBD	TBD	Green Completion	OOOOa
PLANNED	TBD	TBD	Green Completion	OOOOa

*Note: If future wells are planned and no API number is available please list as PLANNED. If there are existing wells that commenced construction prior to August 23, 2011, please acknowledge as existing.*

*This is the same API (American Petroleum Institute) well number(s) provided in the well completion notification and as provided to the WVDEP, Office of Oil and Gas for the well permit. The API number may be provided on the application without the state code (047).*

*Every oil and gas well permitted in West Virginia since 1929 has been issued an API number. This API is used by agencies to identify and track oil and gas wells.*

*The API number has the following format: 047-001-00001*

*Where,*  
 047 = *State code. The state code for WV is 047.*  
 001 = *County Code. County codes are odd numbers, beginning with 001 (Barbour) and continuing to 109 (Wyoming).*  
 00001 = *Well number. Each well will have a unique well number.*

**ATTACHMENT L: STORAGE VESSELS DATA SHEET**

PROMAX PROCESS SIMULATION RESULTS  
REPRESENTATIVE GAS AND LIQUID ANALYSES

## ATTACHMENT L – STORAGE VESSEL DATA SHEET

Complete this data sheet if you are the owner or operator of a storage vessel that contains condensate and/or produced water. This form must be completed for *each* new or modified bulk liquid storage vessel(s) that contains condensate and/or produced water. (If you have more than one (1) identical tank (i.e. 4-400 bbl condensate tanks), then you can list all on one (1) data sheet). **Include gas sample analysis, flashing emissions, working and breathing losses, USEPA Tanks, simulation software (ProMax, E&P Tanks, HYSYS, etc.), and any other supporting documents where applicable.**

**The following information is REQUIRED:**

- Composition of the representative sample used for the simulation
- For each stream that contributes to flashing emissions:
  - Temperature and pressure (inlet and outlet from separator(s))
  - Simulation-predicted composition
  - Molecular weight
  - Flow rate
- Resulting flash emission factor or flashing emissions from simulation
- Working/breathing loss emissions from tanks and/or loading emissions if simulation is used to quantify those emissions

*Additional information may be requested if necessary.*

**GENERAL INFORMATION (REQUIRED)**

1. Bulk Storage Area Name Condensate Storage	2. Tank Name Four (4) 400-bbl Condensate Storage Tanks
3. Emission Unit ID number EU-TANKS-COND	4. Emission Point ID number APC-COMB
5. Date Installed, Modified or Relocated ( <i>for existing tanks</i> ) 3 – 2011; 1 - TBD Was the tank manufactured after August 23, 2011 and on or before September 18, 2015? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Was the tank manufactured after September 18, 2015? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	6. Type of change: <input type="checkbox"/> New construction <input type="checkbox"/> New stored material <input checked="" type="checkbox"/> Other <input type="checkbox"/> Relocation
7A. Description of Tank Modification ( <i>if applicable</i> ) Update quantity of tanks, composition, and throughput.	
7B. Will more than one material be stored in this tank? <i>If so, a separate form must be completed for each material.</i> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
7C. Was USEPA Tanks simulation software utilized? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
<p><b><i>If Yes, please provide the appropriate documentation and items 8-42 below are not required.</i></b></p>	

1. Bulk Storage Area Name Produced Water Storage	2. Tank Name Four (4) 400-bbl Produced Water Storage Tanks
3. Emission Unit ID number EU-TANKS-PW	4. Emission Point ID number APC-COMB
5. Date Installed, Modified or Relocated ( <i>for existing tanks</i> ) 3 – 2011; 1 - TBD Was the tank manufactured after August 23, 2011 and on or before September 18, 2015? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Was the tank manufactured after September 18, 2015? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	6. Type of change: <input type="checkbox"/> New construction <input type="checkbox"/> New stored material <input checked="" type="checkbox"/> Other <input type="checkbox"/> Relocation
7A. Description of Tank Modification ( <i>if applicable</i> ) Update quantity of tanks, composition, and throughput.	
7B. Will more than one material be stored in this tank? <i>If so, a separate form must be completed for each material.</i> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
7C. Was USEPA Tanks simulation software utilized? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <i>If Yes, please provide the appropriate documentation and items 8-42 below are not required.</i>	

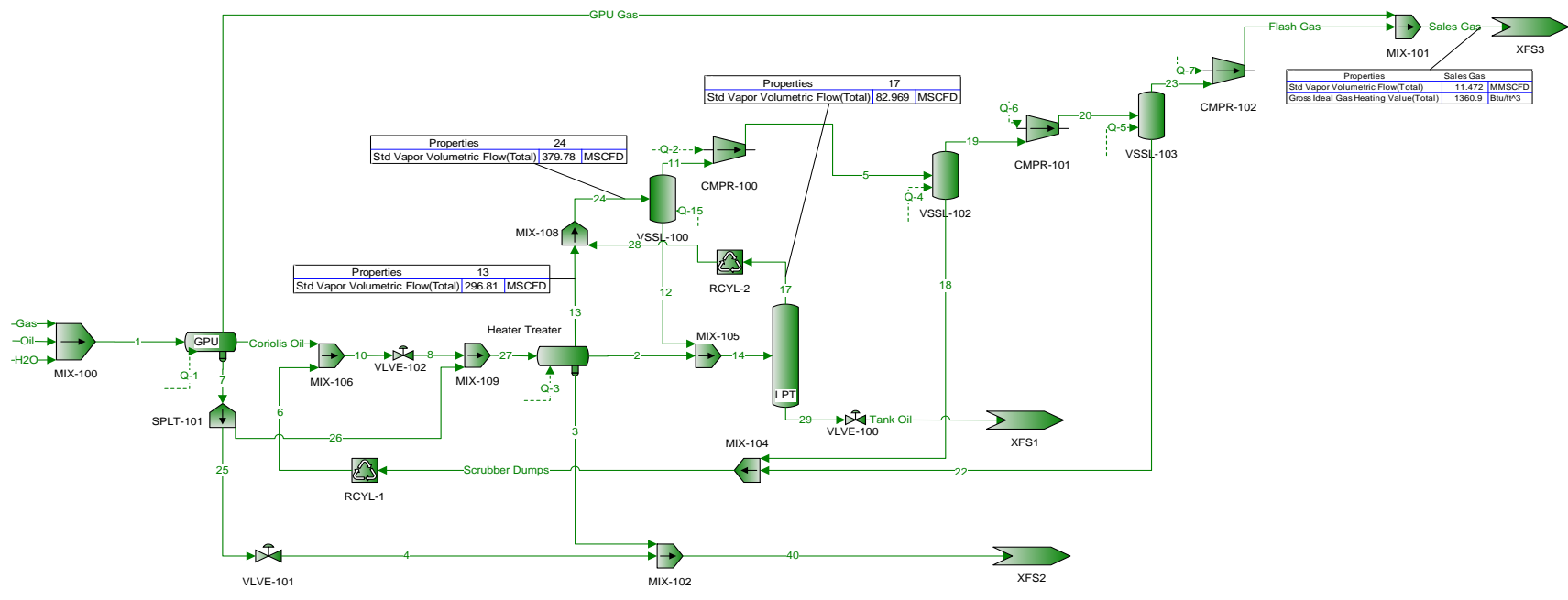
## STORAGE TANK DATA TABLE

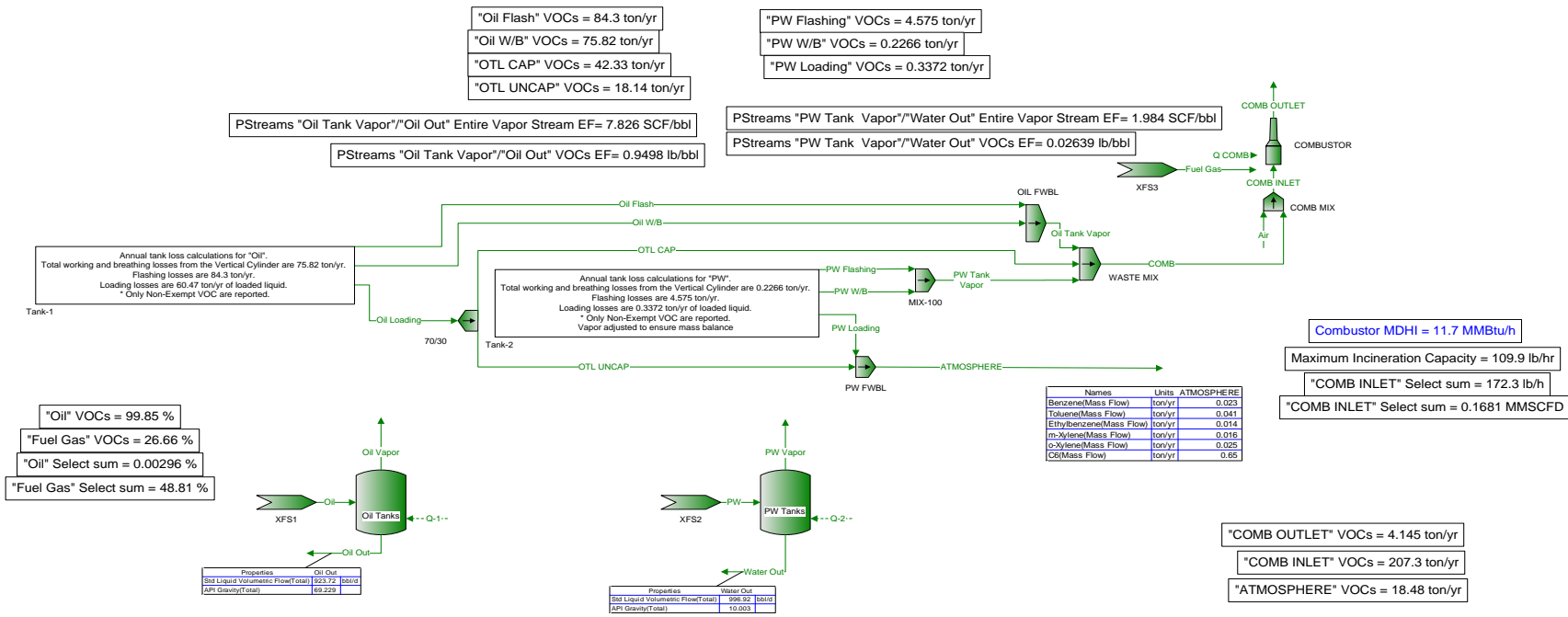
**List all deminimis storage tanks (i.e. lube oil, glycol, diesel etc.)**

Source ID # <sup>1</sup>	Status <sup>2</sup>	Content <sup>3</sup>	Volume <sup>4</sup>
EU-TANKS-LUBEOIL	NEW	Lube Oil	50 gal
EU-TANKS-LUBEOIL	NEW	Lube Oil	50 gal
EU-TANKS-LUBEOIL	NEW	Lube Oil	50 gal
EU-TANKS-METHANOL	NEW	Methanol	50 gal
EU-TANKS-METHANOL	NEW	Methanol	50 gal
EU-TANKS-METHANOL	NEW	Methanol	50 gal
EU-TANKS-METHANOL	NEW	Methanol	50 gal
EU-TANKS-METHANOL	NEW	Methanol	50 gal
EU-TANKS-METHANOL	NEW	Methanol	50 gal

1. Enter the appropriate Source Identification Numbers (Source ID #) for each storage tank located at the well site. Tanks should be designated T01, T02, T03, etc.
2. Enter storage tank Status using the following:  

EXIST	Existing Equipment
NEW	Installation of New Equipment
REM	Equipment Removed
3. Enter storage tank content such as condensate, pipeline liquids, glycol (DEG or TEG), lube oil, diesel, mercaptan etc.
4. Enter the maximum design storage tank volume in gallons.





Process Streams		Oil Flash	Oil Loading	Oil W/B	PW Flashing	PW Loading	PW W/B
Composition	Status:	Solved	Solved	Solved	Solved	Solved	Solved
Phase: <b>Total</b>	From Block:	--	--	--	--	--	--
	To Block:	OIL FWBL	70/30	OIL FWBL	MIX-100	PW FWBL	MIX-100
Mass Flow		lb/h	lb/h	lb/h	lb/h	lb/h	lb/h
H2S		0*	0*	0*	0*	0*	0*
N2		9.41284E-05*	3.64720E-06*	4.57318E-06*	0.0132655*	0.000355215*	0.000238660*
CO2		0.00609931*	0.00425112*	0.00533044*	0.0887293*	0.0975767*	0.0655593*
C2		1.88723*	1.84469*	2.31303*	1.35488*	0.110491*	0.0742362*
C3		5.67750*	4.37634*	5.48744*	0.627214*	0.0360621*	0.0242292*
iC4		1.61643*	1.16090*	1.45564*	0.0610646*	0.00242372*	0.00162844*
nC4		5.56987*	4.04821*	5.07601*	0.242533*	0.0127914*	0.00859420*
2,2-Dimethylbutane		0.0296795*	0.0209136*	0.0262233*	0.000256810*	3.75871E-06*	2.52538E-06*
iC5		1.56191*	1.07244*	1.34473*	0.0365110*	0.00135244*	0.000908668*
nC5		2.28798*	1.54625*	1.93882*	0.0249437*	0.000374214*	0.000251425*
2,2-Dimethylpropane		0.0456216*	0.0313542*	0.0393147*	0.000824510*	2.03887E-05*	1.36987E-05*
Cyclopentane		0.00456719*	0.00279527*	0.00350496*	0.000441261*	9.14702E-05*	6.14565E-05*
2,3-Dimethylbutane		0.0698439*	0.0482534*	0.0605050*	0.00142739*	5.41171E-05*	3.63599E-05*
2-Methylpentane		0.433835*	0.291824*	0.365915*	0.00562048*	0.000115121*	7.73465E-05*
3-Methylpentane		0.258617*	0.173774*	0.217894*	0.00761189*	0.000384600*	0.000258403*
Methylcyclopentane		0.0584648*	0.0346944*	0.0435030*	0.00266892*	0.000223853*	0.000150401*
Benzene		0.00831089*	0.00352340*	0.00441796*	0.00272893*	0.00424239*	0.00285035*
Cyclohexane		0.0768375*	0.0436903*	0.0547828*	0.00684274*	0.00133332*	0.000895823*
2-Methylhexane		0.140259*	0.0268685*	0.0336901*	0.00108334*	1.49654E-05*	1.00549E-05*
3-Methylhexane		0.117605*	0.0770043*	0.0965548*	0.00105570*	1.73601E-05*	1.16638E-05*
2,2,4-Trimethylpentane		0*	0*	0*	0*	0*	0*
C7		0.254678*	0.162227*	0.203415*	0.00123746*	9.25738E-06*	6.21979E-06*
Methylcyclohexane		0.0902363*	0.0572547*	0.0717911*	0.00402973*	0.000334665*	0.000224853*
Toluene		0.0147625*	0.00640084*	0.00802594*	0.00476731*	0.00743043*	0.00499232*
C8		0.148025*	0.0923120*	0.115749*	0.000347375*	1.11137E-06*	7.46702E-07*
Ethylbenzene		0.00510991*	0.00240832*	0.00301977*	0.00157192*	0.00240434*	0.00161542*
m-Xylene		0.00561821*	0.00340237*	0.00426620*	0.00173883*	0.00271818*	0.00182627*
o-Xylene		0.00914595*	0.00360837*	0.00452450*	0.00295558*	0.00453652*	0.00304797*
C9		0.0320477*	0.0198270*	0.0248608*	5.96333E-05*	1.91011E-07*	1.28335E-07*
C10		0.0104996*	0.00606266*	0.00760190*	6.50020E-06*	6.13513E-09*	4.12204E-09*
C11		0.00265483*	0.00150586*	0.00188819*	1.37643E-06*	1.28365E-09*	8.62452E-10*
C12		0.000684172*	0.000362055*	0.000453977*	1.21750E-06*	4.20744E-09*	2.82687E-09*
C13		0.000178401*	8.94396E-05*	0.000112147*	7.47116E-07*	6.40199E-09*	4.30133E-09*
C14		3.96576E-05*	1.84422E-05*	2.31244E-05*	3.37592E-07*	5.93529E-09*	3.98777E-09*
C15		9.67024E-06*	4.46881E-06*	5.60340E-06*	1.67205E-07*	6.09502E-09*	4.09509E-09*
C16		2.53890E-06*	9.59274E-07*	1.20282E-06*	1.03395E-07*	1.02812E-08*	6.90765E-09*
C17		7.66536E-07*	2.38090E-07*	2.98539E-07*	6.54947E-08*	1.81531E-08*	1.21966E-08*
C18		2.19291E-07*	5.91852E-08*	7.42117E-08*	3.02859E-08*	2.04644E-08*	1.37495E-08*
C19		4.48100E-08*	9.45421E-09*	1.18545E-08*	8.48990E-09*	1.06796E-08*	7.17533E-09*
C20		9.08091E-09*	2.21991E-09*	2.78353E-09*	2.00042E-09*	2.45131E-09*	1.64697E-09*
C21		3.27597E-09*	7.24818E-10*	9.08841E-10*	7.37879E-10*	8.91406E-10*	5.98913E-10*
C22		1.06849E-09*	1.69661E-10*	2.12737E-10*	2.34528E-10*	2.75719E-10*	1.85248E-10*
C23		2.12786E-10*	3.11950E-11*	3.91150E-11*	4.44644E-11*	5.03175E-11*	3.38071E-11*
C24		5.40893E-11*	1.04285E-11*	1.30762E-11*	1.10105E-11*	1.22197E-11*	8.21009E-12*
C25		1.57462E-11*	2.72557E-12*	3.41756E-12*	3.05560E-12*	3.28322E-12*	2.20591E-12*
C26		2.46454E-12*	5.28929E-13*	6.63219E-13*	4.56100E-13*	4.74285E-13*	3.18660E-13*
C27		6.90376E-13*	1.74842E-13*	2.19233E-13*	1.22501E-13*	1.23050E-13*	8.26741E-14*
C28		9.37238E-14*	6.37702E-15*	7.99608E-15*	1.59866E-14*	1.55866E-14*	1.04723E-14*
C29		4.60095E-14*	2.88087E-15*	3.61229E-15*	7.71138E-15*	7.45205E-15*	5.00684E-15*
C30		7.00483E-14*	1.17303E-15*	1.47085E-15*	1.12806E-14*	1.05196E-14*	7.06787E-15*
H2O		0.0920225*	4.05001E-05*	5.07826E-05*	0.120030*	0.176564*	0.118629*
Oxygen		0*	0*	0*	0*	0*	0*
TEG		0*	0*	0*	0*	0*	0*
C1		0.136450*	0.0238248*	0.0298736*	2.01999*	0.111223*	0.0747282*
C6		0.716055*	0.491056*	0.615730*	0.00490615*	5.00534E-05*	3.36296E-05*
	lb/hr:	19.25	13.81	17.31	1.04	0.08	0.05
	TPY:	84.30	60.47	75.82	4.57	0.34	0.23



**Gas Analytical**

Washington, Pennsylvania  
 954 Manifold Road  
 Washington, PA 15301

Report Date: Apr 19, 2017 2:12p

Client:	SOUTHWESTERN ENERGY	Date Sampled:	Sep 13, 2016
Client Code:	2437	Analysis Date:	Sep 27, 2016 12:00a
Site:	ROY RIGGLE 8H 833123 CTALL	Collected By:	LP
Field:	940-WEST VIRGINIA	Date Effective:	Oct 1, 2016 12:00a
Meter:	1183312301	Sample Pressure (PSI):	185.0
Source Laboratory:	Washington, PA	Sample Temp (°F):	75
<b>Lab File No:</b>	<b>516578106</b>	Field H2O (lb/MMSCFD):	
Cylinder No:	67		
Analysis Status:	good		
Sample Type:	Spot		
Measurement Analyst:	<i>Shelly King</i>		

Component	Mol %	GPM @Contract PSIA
H2S		
Methane	70.6940	0.0000
Ethane	17.5004	4.6991
Propane	7.2099	1.9943
I-Butane	0.7374	0.2423
N-Butane	2.1326	0.6750
I-Pentane	0.3534	0.1298
N-Pentane	0.4760	0.1732
Nitrogen	0.4608	0.0000
Oxygen	0.0004	0.0000
Carbon Dioxide	0.1096	0.0000
Hexanes+	0.3255	0.1418
<b>TOTAL</b>	<b>100.0000</b>	<b>8.0555</b>

Analytical Results at Base Conditions (Real)	
BTU/SCF (Dry):	1,354.3486 BTU/ft <sup>3</sup>
BTU/SCF (Saturated):	1,331.2940 BTU/ft <sup>3</sup>
PSIA:	14.696 PSI
Temperature (°F):	60.0 °F
Z Factor (Dry):	0.99575
Z Factor (Saturated):	0.99532

Analytical Results at Contract Conditions (Real)	
BTU/SCF (Dry):	1,357.4954 BTU/ft <sup>3</sup>
BTU/SCF (Saturated):	1,334.4419 BTU/ft <sup>3</sup>
PSIA:	14.730 PSI
Temperature (°F):	60.0 °F
Z Factor (Dry):	0.99574
Z Factor (Saturated):	0.99532

Calculated Specific Gravities		
Ideal Gravity:	0.7779	Real Gravity: 0.7809
Molecular Wt:	22.5298 lb/lbmol	

Methods, standards, and uncertainties based on  
 GPA 2261-13.  
 Analytical Calculations performed in accordance with  
 GPA 2172-09.

Source	Date	Notes

**FESCO, Ltd.**  
**1100 FESCO Avenue - Alice, Texas 78332**

**For:** Southwestern Energy Production Co.  
 181 W. Tioga Street, Suite 2  
 Tunkannock, Pennsylvania 18657

**Sample:** Gary Kestner  
 Separator Hydrocarbon Liquid  
 Sampled @ 265 psig & 54 °F

Date Sampled: 12/21/16

Job Number: 71011.002

**CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2186-M**

COMPONENT	MOL %	LIQ VOL %	WT %
Nitrogen	0.019	0.005	0.006
Carbon Dioxide	0.017	0.007	0.009
Methane	6.628	2.719	1.231
Ethane	9.468	6.130	3.295
Propane	12.466	8.315	6.363
Isobutane	2.695	2.135	1.813
n-Butane	10.581	8.076	7.119
2,2 Dimethylpropane	0.061	0.057	0.051
Isopentane	3.929	3.479	3.282
n-Pentane	7.293	6.400	6.091
2,2 Dimethylbutane	0.098	0.099	0.098
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.261	0.259	0.261
2 Methylpentane	1.967	1.977	1.963
3 Methylpentane	1.233	1.219	1.230
n-Hexane	4.570	4.550	4.559
Heptanes Plus	<u>38.713</u>	<u>54.574</u>	<u>62.630</u>
Totals:	100.000	100.000	100.000

**Characteristics of Heptanes Plus:**

Specific Gravity ----- 0.7605 (Water=1)  
 °API Gravity ----- 54.55 @ 60°F  
 Molecular Weight ----- 139.8  
 Vapor Volume ----- 17.27 CF/Gal  
 Weight ----- 6.34 Lbs/Gal

**Characteristics of Total Sample:**

Specific Gravity ----- 0.6627 (Water=1)  
 °API Gravity ----- 82.01 @ 60°F  
 Molecular Weight ----- 86.4  
 Vapor Volume ----- 24.35 CF/Gal  
 Weight ----- 5.52 Lbs/Gal

Base Conditions: 14.650 PSI & 60 °F

Certified: FESCO, Ltd. - Alice, Texas

Sampled By: (20) Mayle  
 Analyst: XG  
 Processor: XGdjv  
 Cylinder ID: T-631

David Dannhaus 361-661-7015

**TANKS DATA INPUT REPORT - GPA 2186-M**

COMPONENT	Mol %	LiqVol %	Wt %
Carbon Dioxide	0.017	0.007	0.009
Nitrogen	0.019	0.005	0.006
Methane	6.628	2.719	1.231
Ethane	9.468	6.130	3.295
Propane	12.466	8.315	6.363
Isobutane	2.695	2.135	1.813
n-Butane	10.642	8.133	7.170
Isopentane	3.929	3.479	3.282
n-Pentane	7.293	6.400	6.091
Other C-6's	3.560	3.554	3.551
Heptanes	8.337	8.941	9.423
Octanes	8.385	9.663	10.576
Nonanes	4.164	5.534	6.120
Decanes Plus	16.176	28.954	34.552
Benzene	0.066	0.045	0.060
Toluene	0.303	0.246	0.323
E-Benzene	0.311	0.290	0.382
Xylenes	0.971	0.901	1.194
n-Hexane	4.570	4.550	4.559
2,2,4 Trimethylpentane	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>
Totals:	100.000	100.000	100.000

**Characteristics of Total Sample:**

Specific Gravity -----	0.6627	(Water=1)
°API Gravity -----	82.01	@ 60°F
Molecular Weight-----	86.4	
Vapor Volume -----	24.35	CF/Gal
Weight -----	5.52	Lbs/Gal

**Characteristics of Decanes (C10) Plus:**

Specific Gravity -----	0.7908	(Water=1)
Molecular Weight-----	184.5	

**Characteristics of Atmospheric Sample:**

°API Gravity -----	64.44	@ 60°F
Reid Vapor Pressure Equivalent (D-5191)-----	9.12	psi

QUALITY CONTROL CHECK			
	Sampling Conditions	Test Samples	
Cylinder Number	-----	T-631*	W-1011
Pressure, PSIG	265	254	233
Temperature, °F	54	76	76

\* Sample used for analysis

**TOTAL EXTENDED REPORT - GPA 2186-M**

COMPONENT	Mol %	LiqVol %	Wt %
Nitrogen	0.019	0.005	0.006
Carbon Dioxide	0.017	0.007	0.009
Methane	6.628	2.719	1.231
Ethane	9.468	6.130	3.295
Propane	12.466	8.315	6.363
Isobutane	2.695	2.135	1.813
n-Butane	10.581	8.076	7.119
2,2 Dimethylpropane	0.061	0.057	0.051
Isopentane	3.929	3.479	3.282
n-Pentane	7.293	6.400	6.091
2,2 Dimethylbutane	0.098	0.099	0.098
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.261	0.259	0.261
2 Methylpentane	1.967	1.977	1.963
3 Methylpentane	1.233	1.219	1.230
n-Hexane	4.570	4.550	4.559
Methylcyclopentane	0.584	0.500	0.569
Benzene	0.066	0.045	0.060
Cyclohexane	0.706	0.582	0.688
2-Methylhexane	1.547	1.741	1.794
3-Methylhexane	1.385	1.539	1.606
2,2,4 Trimethylpentane	0.000	0.000	0.000
Other C-7's	0.666	0.726	0.765
n-Heptane	3.449	3.852	4.000
Methylcyclohexane	1.634	1.591	1.858
Toluene	0.303	0.246	0.323
Other C-8's	4.473	5.249	5.707
n-Octane	2.277	2.824	3.011
E-Benzene	0.311	0.290	0.382
M & P Xylenes	0.347	0.326	0.427
O-Xylene	0.624	0.574	0.767
Other C-9's	2.682	3.515	3.919
n-Nonane	1.483	2.020	2.201
Other C-10's	2.821	4.063	4.614
n-decane	0.899	1.335	1.480
Undecanes(11)	2.895	4.277	4.926
Dodecanes(12)	2.160	3.448	4.026
Tridecanes(13)	1.645	2.816	3.333
Tetradecanes(14)	1.297	2.377	2.852
Pentadecanes(15)	1.022	2.006	2.436
Hexadecanes(16)	0.726	1.525	1.867
Heptadecanes(17)	0.539	1.196	1.478
Octadecanes(18)	0.483	1.128	1.402
Nonadecanes(19)	0.393	0.956	1.196
Eicosanes(20)	0.277	0.700	0.881
Heneicosanes(21)	0.225	0.599	0.758
Docosanes(22)	0.181	0.501	0.638
Tricosanes(23)	0.132	0.380	0.486
Tetracosanes(24)	0.109	0.325	0.418
Pentacosanes(25)	0.056	0.173	0.223
Hexacosanes(26)	0.079	0.252	0.327
Heptacosanes(27)	0.036	0.120	0.157
Octacosanes(28)	0.034	0.117	0.153
Nonacosanes(29)	0.025	0.090	0.117
Triacosanes(30)	0.024	0.087	0.115
Hentriacosanes Plus(31+)	<u>0.119</u>	<u>0.482</u>	<u>0.667</u>
Total	100.000	100.000	100.000

**ATTACHMENT M: NATURAL GAS FIRED FUEL BURNING UNITS DATA SHEET**

AP-42 EMISSION FACTORS

**ATTACHMENT M – SMALL HEATERS AND REBOILERS NOT SUBJECT TO  
40CFR60 SUBPART DC  
DATA SHEET**

Complete this data sheet for each small heater and reboiler not subject to 40CFR60 Subpart Dc at the facility. *The Maximum Design Heat Input (MDHI) must be less than 10 MMBTU/hr.*

Emission Unit ID# <sup>1</sup>	Emission Point ID# <sup>2</sup>	Emission Unit Description (manufacturer, model #)	Year Installed/Modified	Type <sup>3</sup> and Date of Change	Maximum Design Heat Input (MMBTU/hr) <sup>4</sup>	Fuel Heating Value (BTU/scf) <sup>5</sup>
EU-GPU1	EP-GPU1	Gas Production Unit Burner	2011	EXIST	1.0	905
EU-GPU2	EP-GPU2	Gas Production Unit Burner	TBD	NEW	1.0	905
EU-GPU3	EP-GPU3	Gas Production Unit Burner	TBD	NEW	1.0	905
EU-HT2	EP-HT2	Heater Treater	TBD	NEW	1.0	905

<sup>1</sup> Enter the appropriate Emission Unit (or Source) identification number for each fuel burning unit located at the production pad. Gas Producing Unit Burners should be designated GPU-1, GPU-2, etc. Heater Treaters should be designated HT-1, HT-2, etc. Heaters or Line Heaters should be designated LH-1, LH-2, etc. For sources, use 1S, 2S, 3S...or other appropriate designation. Enter glycol dehydration unit Reboiler Vent data on the Glycol Dehydration Unit Data Sheet.

<sup>2</sup> Enter the appropriate Emission Point identification numbers for each fuel burning unit located at the production pad. Gas Producing Unit Burners should be designated GPU-1, GPU-2, etc. Heater Treaters should be designated HT-1, HT-2, etc. Heaters or Line Heaters should be designated LH-1, LH-2, etc. For emission points, use 1E, 2E, 3E...or other appropriate designation.

<sup>3</sup> New, modification, removal

<sup>4</sup> Enter design heat input capacity in MMBtu/hr.

<sup>5</sup> Enter the fuel heating value in BTU/standard cubic foot.

Table 1.4-1. EMISSION FACTORS FOR NITROGEN OXIDES (NO<sub>x</sub>) AND CARBON MONOXIDE (CO)  
FROM NATURAL GAS COMBUSTION<sup>a</sup>

Combustor Type (MMBtu/hr Heat Input) [SCC]	NO <sub>x</sub> <sup>b</sup>		CO	
	Emission Factor (lb/10 <sup>6</sup> scf)	Emission Factor Rating	Emission Factor (lb/10 <sup>6</sup> scf)	Emission Factor Rating
Large Wall-Fired Boilers (>100) [1-01-006-01, 1-02-006-01, 1-03-006-01]				
Uncontrolled (Pre-NSPS) <sup>c</sup>	280	A	84	B
Uncontrolled (Post-NSPS) <sup>c</sup>	190	A	84	B
Controlled - Low NO <sub>x</sub> burners	140	A	84	B
Controlled - Flue gas recirculation	100	D	84	B
Small Boilers (<100) [1-01-006-02, 1-02-006-02, 1-03-006-02, 1-03-006-03]				
Uncontrolled	100	B	84	B
Controlled - Low NO <sub>x</sub> burners	50	D	84	B
Controlled - Low NO <sub>x</sub> burners/Flue gas recirculation	32	C	84	B
Tangential-Fired Boilers (All Sizes) [1-01-006-04]				
Uncontrolled	170	A	24	C
Controlled - Flue gas recirculation	76	D	98	D
Residential Furnaces (<0.3) [No SCC]				
Uncontrolled	94	B	40	B

<sup>a</sup> Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. To convert from lb/10<sup>6</sup> scf to kg/10<sup>6</sup> m<sup>3</sup>, multiply by 16. Emission factors are based on an average natural gas higher heating value of 1,020 Btu/scf. To convert from lb/10<sup>6</sup> scf to lb/MMBtu, divide by 1,020. The emission factors in this table may be converted to other natural gas heating values by multiplying the given emission factor by the ratio of the specified heating value to this average heating value. SCC = Source Classification Code. ND = no data. NA = not applicable.

<sup>b</sup> Expressed as NO<sub>2</sub>. For large and small wall fired boilers with SNCR control, apply a 24 percent reduction to the appropriate NO<sub>x</sub> emission factor. For tangential-fired boilers with SNCR control, apply a 13 percent reduction to the appropriate NO<sub>x</sub> emission factor.

<sup>c</sup> NSPS=New Source Performance Standard as defined in 40 CFR 60 Subparts D and Db. Post-NSPS units are boilers with greater than 250 MMBtu/hr of heat input that commenced construction modification, or reconstruction after August 17, 1971, and units with heat input capacities between 100 and 250 MMBtu/hr that commenced construction modification, or reconstruction after June 19, 1984.

TABLE 1.4-3. EMISSION FACTORS FOR SPECIATED ORGANIC COMPOUNDS FROM NATURAL GAS COMBUSTION<sup>a</sup>

CAS No.	Pollutant	Emission Factor (lb/10 <sup>6</sup> scf)	Emission Factor Rating
91-57-6	2-Methylnaphthalene <sup>b,c</sup>	2.4E-05	D
56-49-5	3-Methylchloranthrene <sup>b,c</sup>	<1.8E-06	E
	7,12-Dimethylbenz(a)anthracene <sup>b,c</sup>	<1.6E-05	E
83-32-9	Acenaphthene <sup>b,c</sup>	<1.8E-06	E
203-96-8	Acenaphthylene <sup>b,c</sup>	<1.8E-06	E
120-12-7	Anthracene <sup>b,c</sup>	<2.4E-06	E
56-55-3	Benz(a)anthracene <sup>b,c</sup>	<1.8E-06	E
71-43-2	Benzene <sup>b</sup>	2.1E-03	B
50-32-8	Benzo(a)pyrene <sup>b,c</sup>	<1.2E-06	E
205-99-2	Benzo(b)fluoranthene <sup>b,c</sup>	<1.8E-06	E
191-24-2	Benzo(g,h,i)perylene <sup>b,c</sup>	<1.2E-06	E
205-82-3	Benzo(k)fluoranthene <sup>b,c</sup>	<1.8E-06	E
106-97-8	Butane	2.1E+00	E
218-01-9	Chrysene <sup>b,c</sup>	<1.8E-06	E
53-70-3	Dibenzo(a,h)anthracene <sup>b,c</sup>	<1.2E-06	E
25321-22-6	Dichlorobenzene <sup>b</sup>	1.2E-03	E
74-84-0	Ethane	3.1E+00	E
206-44-0	Fluoranthene <sup>b,c</sup>	3.0E-06	E
86-73-7	Fluorene <sup>b,c</sup>	2.8E-06	E
50-00-0	Formaldehyde <sup>b</sup>	7.5E-02	B
110-54-3	Hexane <sup>b</sup>	1.8E+00	E
193-39-5	Indeno(1,2,3-cd)pyrene <sup>b,c</sup>	<1.8E-06	E
91-20-3	Naphthalene <sup>b</sup>	6.1E-04	E
109-66-0	Pentane	2.6E+00	E
85-01-8	Phenanathrene <sup>b,c</sup>	1.7E-05	D



TABLE 1.4-3. EMISSION FACTORS FOR SPECIATED ORGANIC COMPOUNDS FROM NATURAL GAS COMBUSTION (Continued)

CAS No.	Pollutant	Emission Factor (lb/10 <sup>6</sup> scf)	Emission Factor Rating
74-98-6	Propane	1.6E+00	E
129-00-0	Pyrene <sup>b, c</sup>	5.0E-06	E
108-88-3	Toluene <sup>b</sup>	3.4E-03	C

<sup>a</sup> Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. Data are for all natural gas combustion sources. To convert from lb/10<sup>6</sup> scf to kg/10<sup>6</sup> m<sup>3</sup>, multiply by 16. To convert from lb/10<sup>6</sup> scf to lb/MMBtu, divide by 1,020. Emission Factors preceded with a less-than symbol are based on method detection limits.

<sup>b</sup> Hazardous Air Pollutant (HAP) as defined by Section 112(b) of the Clean Air Act.

<sup>c</sup> HAP because it is Polycyclic Organic Matter (POM). POM is a HAP as defined by Section 112(b) of the Clean Air Act.

<sup>d</sup> The sum of individual organic compounds may exceed the VOC and TOC emission factors due to differences in test methods and the availability of test data for each pollutant.

**ATTACHMENT N: INTERNAL COMBUSTION ENGINE DATA SHEETS**

ENGINE SPECIFICATION SHEETS  
AP-42 AND EPA EMISSION FACTORS

## ATTACHMENT N – INTERNAL COMBUSTION ENGINE DATA SHEET

Complete this data sheet for each internal combustion engine at the facility. Include manufacturer performance data sheet(s) or any other supporting document if applicable. Use extra pages if necessary. *Generator(s) and microturbine generator(s) shall also use this form.*

Emission Unit ID# <sup>1</sup>		EU-ENG1		EU-ENG2		EU-ENG3	
Engine Manufacturer/Model		Caterpillar G3306 NA		Caterpillar G3306 NA		GM Vortec 5.7L NA	
Manufacturers Rated bhp/rpm		145-hp/1,800-rpm		145-hp/1,800-rpm		92-hp/2,200-rpm	
Source Status <sup>2</sup>		NS		NS		NS	
Date Installed/ Modified/Removed/Relocated <sup>3</sup>		TBD		TBD		TBD	
Engine Manufactured /Reconstruction Date <sup>4</sup>		After 1/1/2011		After 1/1/2011		After 7/1/2008	
Check all applicable Federal Rules for the engine (include EPA Certificate of Conformity if applicable) <sup>5</sup>		<input checked="" type="checkbox"/> 40CFR60 Subpart JJJ <input type="checkbox"/> JJJ Certified? <input type="checkbox"/> 40CFR60 Subpart IIII <input type="checkbox"/> IIII Certified? <input checked="" type="checkbox"/> 40CFR63 Subpart ZZZZ <input type="checkbox"/> NESHAP ZZZZ/ NSPS JJJJ Window <input type="checkbox"/> NESHAP ZZZZ Remote Sources		<input checked="" type="checkbox"/> 40CFR60 Subpart JJJ <input type="checkbox"/> JJJ Certified? <input type="checkbox"/> 40CFR60 Subpart IIII <input type="checkbox"/> IIII Certified? <input checked="" type="checkbox"/> 40CFR63 Subpart ZZZZ <input type="checkbox"/> NESHAP ZZZZ/ NSPS JJJJ Window <input type="checkbox"/> NESHAP ZZZZ Remote Sources		<input checked="" type="checkbox"/> 40CFR60 Subpart JJJ <input type="checkbox"/> JJJ Certified? <input type="checkbox"/> 40CFR60 Subpart IIII <input type="checkbox"/> IIII Certified? <input checked="" type="checkbox"/> 40CFR63 Subpart ZZZZ <input type="checkbox"/> NESHAP ZZZZ/ NSPS JJJJ Window <input type="checkbox"/> NESHAP ZZZZ Remote Sources	
Engine Type <sup>6</sup>		4SRB		4SRB		4SRB	
APCD Type <sup>7</sup>		NSCR		NSCR		NSCR	
Fuel Type <sup>8</sup>		PQ		PQ		PQ	
H <sub>2</sub> S (gr/100 scf)		Negligible		Negligible		Negligible	
Operating bhp/rpm		145-hp/1,800-rpm		145-hp/1,800-rpm		92-hp/2,200-rpm	
BSFC (BTU/bhp-hr)		8,625		8,625		8,500	
Hourly Fuel Throughput		1,382	ft <sup>3</sup> /hr gal/hr	1,382	ft <sup>3</sup> /hr gal/hr	864	ft <sup>3</sup> /hr gal/hr
Annual Fuel Throughput (Must use 8,760 hrs/yr unless emergency generator)		12.11	MMft <sup>3</sup> /yr gal/yr	12.11	MMft <sup>3</sup> /yr gal/yr	7.57	MMft <sup>3</sup> /yr gal/yr
Fuel Usage or Hours of Operation Metered		Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>		Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>		Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Calculation Methodology <sup>9</sup>	Pollutant <sup>10</sup>	EU-ENG1		EU-ENG2		EU-ENG3	
		Hourly PTE (lb/hr) <sup>11</sup>	Annual PTE (tons/year) <sub>11</sub>	Hourly PTE (lb/hr) <sup>11</sup>	Annual PTE (tons/year) <sub>11</sub>	Hourly PTE (lb/hr) <sup>11</sup>	Annual PTE (tons/year) <sub>11</sub>
MD	NO <sub>x</sub>	0.32	1.40	0.32	1.40	0.20	0.89
MD	CO	0.64	2.80	0.64	2.80	0.41	1.78
MD	VOC	0.16	0.69	0.16	0.69	0.10	0.43
AP	SO <sub>2</sub>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
AP	PM <sub>10</sub>	0.01	0.05	0.01	0.05	0.01	0.03
MD	Formaldehyde	0.09	0.38	0.09	0.38	0.02	0.07
AP	Total HAPs	0.10	0.44	0.10	0.44	0.02	0.11
MD and EPA	GHG (CO <sub>2</sub> e)	155.19	679.73	155.19	679.73	91.57	401.08

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

2 Enter the Source Status using the following codes:

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

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

- 4 Enter the date that the engine was manufactured, modified or reconstructed.
- 5 Is the engine a certified stationary spark ignition internal combustion engine according to 40CFR60 Subpart IIII/JJJJ? If so, the engine and control device must be operated and maintained in accordance with the manufacturer's emission-related written instructions. You must keep records of conducted maintenance to demonstrate compliance, but no performance testing is required. If the certified engine is not operated and maintained in accordance with the manufacturer's emission-related written instructions, the engine will be considered a non-certified engine and you must demonstrate compliance as appropriate.

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

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

2SLB	Two Stroke Lean Burn	4SRB	Four Stroke Rich Burn
4SLB	Four Stroke Lean Burn		

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

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

- 8 Enter the Fuel Type using the following codes:

PQ	Pipeline Quality Natural Gas	RG	Raw Natural Gas /Production Gas	D	Diesel
----	------------------------------	----	---------------------------------	---	--------

- 9 Enter the Potential Emissions Data Reference designation using the following codes. Attach all reference data used.

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

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

- 11 PTE for engines shall be calculated from manufacturer's data unless unavailable.

**Engine Air Pollution Control Device  
(Emission Unit ID# APC-NSCR-ENG1 – ENG2 use extra pages as necessary)**

Air Pollution Control Device Manufacturer's Data Sheet included?  
Yes  No

NSCR                                       SCR                                       Oxidation Catalyst

Provide details of process control used for proper mixing/control of reducing agent with gas stream:

Manufacturer: N/A	Model #: N/A
-------------------	--------------

Design Operating Temperature: 1,101 °F	Design gas volume: 678 acfm
--	-----------------------------

Service life of catalyst:	Provide manufacturer data? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
---------------------------	--

Volume of gas handled:              acfm at              °F	Operating temperature range for NSCR/Ox Cat: From 600 °F to 1,250 °F
---	---

Reducing agent used, if any:	Ammonia slip (ppm):
------------------------------	---------------------

Pressure drop against catalyst bed (delta P):              inches of H<sub>2</sub>O

Provide description of warning/alarm system that protects unit when operation is not meeting design conditions:

Is temperature and pressure drop of catalyst required to be monitored per 40CFR63 Subpart ZZZZ?  
 Yes  No

How often is catalyst recommended or required to be replaced (hours of operation)?

How often is performance test required?  
 Initial  
 Annual  
 Every 8,760 hours of operation  
 Field Testing Required  
 No performance test required. If so, why (please list any maintenance required and the applicable sections in NSPS/GACT,

**Engine Air Pollution Control Device  
(Emission Unit ID# APC-NSCR-ENG3 use extra pages as necessary)**

Air Pollution Control Device Manufacturer's Data Sheet included?  
Yes  No

NSCR                                       SCR                                       Oxidation Catalyst

Provide details of process control used for proper mixing/control of reducing agent with gas stream:

Manufacturer: Miratech	Model #: VXCI-1005-3.5-XC1
Design Operating Temperature: 1,200 °F	Design gas volume: 650 acfm
Service life of catalyst:	Provide manufacturer data? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Volume of gas handled:            acfm at            °F	Operating temperature range for NSCR/Ox Cat: From 600 °F to 1,350 °F
Reducing agent used, if any:	Ammonia slip (ppm):

Pressure drop against catalyst bed (delta P):                      inches of H<sub>2</sub>O

Provide description of warning/alarm system that protects unit when operation is not meeting design conditions:

Is temperature and pressure drop of catalyst required to be monitored per 40CFR63 Subpart ZZZZ?

Yes  No

How often is catalyst recommended or required to be replaced (hours of operation)?

How often is performance test required?

- Initial
- Annual
- Every 8,760 hours of operation
- Field Testing Required
- No performance test required. If so, why (please list any maintenance required and the applicable sections in NSPS/GACT,

# G3306 NA

GAS COMPRESSION APPLICATION

## GAS ENGINE SITE SPECIFIC TECHNICAL DATA



ENGINE SPEED (rpm):	1800	FUEL SYSTEM:	LPG IMPCO
COMPRESSION RATIO:	10.5:1	WITH CUSTOMER SUPPLIED AIR FUEL RATIO CONTROL	
JACKET WATER OUTLET (°F):	210	<b>SITE CONDITIONS:</b>	
COOLING SYSTEM:	JW+OC	FUEL:	Nat Gas
IGNITION SYSTEM:	MAG	FUEL PRESSURE RANGE (psig):	1.5-10.0
EXHAUST MANIFOLD:	WC	FUEL METHANE NUMBER:	84.8
COMBUSTION:	Catalyst	FUEL LHV (Btu/scf):	905
EXHAUST O2 EMISSION LEVEL %:	0.5	ALTITUDE (ft):	500
SET POINT TIMING:	30.0	MAXIMUM INLET AIR TEMPERATURE (°F):	77
		NAMEPLATE RATING:	145 bhp@1800rpm

RATING	NOTES	LOAD	MAXIMUM RATING	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE		
			100%	100%	75%	50%
ENGINE POWER	(1)	bhp	145	145	109	72
INLET AIR TEMPERATURE		°F	77	77	77	77

ENGINE DATA						
FUEL CONSUMPTION (LHV)	(2)	Btu/bhp-hr	7775	7775	8318	9509
FUEL CONSUMPTION (HHV)	(2)	Btu/bhp-hr	8625	8625	9227	10548
AIR FLOW	(3)(4)	lb/hr	922	922	739	556
AIR FLOW WET (77°F, 14.7 psia)	(3)(4)	scfm	208	208	167	125
INLET MANIFOLD PRESSURE	(5)	in Hg(abs)	26.2	26.2	21.8	17.6
EXHAUST STACK TEMPERATURE	(6)	°F	1101	1101	1067	1037
EXHAUST GAS FLOW (@ stack temp, 14.5 psia)	(7)(4)	ft3/min	678	678	532	393
EXHAUST GAS MASS FLOW	(7)(4)	lb/hr	978	978	784	590

EMISSIONS DATA						
NOx (as NO2)	(8)	g/bhp-hr	13.47	13.47	12.15	9.76
CO	(8)	g/bhp-hr	13.47	13.47	11.44	9.56
THC (mol. wt. of 15.84)	(8)	g/bhp-hr	2.20	2.20	2.49	3.22
NMHC (mol. wt. of 15.84)	(8)	g/bhp-hr	0.33	0.33	0.37	0.48
NMNEHC (VOCs) (mol. wt. of 15.84)	(8)(9)	g/bhp-hr	0.22	0.22	0.25	0.32
HCHO (Formaldehyde)	(8)	g/bhp-hr	0.27	0.27	0.31	0.33
CO2	(8)	g/bhp-hr	485	485	525	601
EXHAUST OXYGEN	(10)	% DRY	0.5	0.5	0.5	0.5

HEAT REJECTION						
HEAT REJ. TO JACKET WATER (JW)	(11)	Btu/min	6049	6049	5237	4455
HEAT REJ. TO ATMOSPHERE	(11)	Btu/min	751	751	602	459
HEAT REJ. TO LUBE OIL (OC)	(11)	Btu/min	990	990	857	729

HEAT EXCHANGER SIZING CRITERIA			
TOTAL JACKET WATER CIRCUIT (JW+OC)	(12)	Btu/min	7842

**CONDITIONS AND DEFINITIONS**

Engine rating obtained and presented in accordance with ISO 3046/1, adjusted for fuel, site altitude and site inlet air temperature.  
 100% rating at maximum inlet air temperature is the maximum engine capability for the specified fuel at site altitude and maximum site inlet air temperature.  
 Max. rating is the maximum capability for the specified fuel at site altitude and reduced inlet air temperature.  
 Lowest load point is the lowest continuous duty operating load allowed. No overload permitted at rating shown.

For notes information consult page three.



**Prepared For:**

Jason Stinson  
MIDCON COMPRESSION, LP

**MANUFACTURED ON OR AFTER 1/1/2011**

**INFORMATION PROVIDED BY CATERPILLAR**

Engine: G3306 NA  
Horsepower: 145  
RPM: 1800  
Compression Ratio: 10.5:1  
Exhaust Flow Rate: 678 CFM  
Exhaust Temperature: 1101 °F  
Reference: DM5053-07  
Fuel: Natural Gas  
Annual Operating Hours: 8760

**Uncontrolled Emissions**

NOx: 13.47 g/bhp-hr  
CO: 13.47 g/bhp-hr  
THC: 2.20 g/bhp-hr  
NMHC: 0.33 g/bhp-hr  
NMNEHC: 0.22 g/bhp-hr  
HCHO: 0.27 g/bhp-hr  
Oxygen: 0.50 %

**POST CATALYST EMISSIONS**

NOx: <1.0 g/bhp-hr  
CO: <2.0 g/bhp-hr  
VOC: <0.7 g/bhp-hr

**CONTROL EQUIPMENT**

**Catalytic Converter**

Model: **EAH-1200T-0404F-21CEE**  
Catalyst Type: NSCR, Precious group metals  
Manufacturer: EMIT Technologies, Inc.  
Element Size: Round 12 x 3.5  
Catalyst Elements: 1  
Housing Type: 2 Element Capacity  
Catalyst Installation: Accessible Housing  
Construction: 10 gauge Carbon Steel  
Sample Ports: 6 (0.5" NPT)  
Inlet Connections: 4" Flat Face Flange  
Outlet Connections: 4" Flat Face Flange  
Configuration: End In / End Out  
Silencer: Integrated  
Silencer Grade: Hospital  
Insertion Loss: 35-40 dBA

**Air Fuel Ratio Controller**

Model: **ENG-S-075-T**  
Manufacturer: EMIT Technologies, Inc.  
Description: EDGE NG Air Fuel Ratio Controller  
4-Wire Narrowband O2 Sensor  
Digital Power Valve  
O2 Sensor Weldment  
Wiring Harness  
(2) 25' Type K Thermocouple  
Digital Power Valve Size: 0.75" NPT



**MIRATECH Emissions Control Equipment Specification Summary**

Proposal Number: TJ-12-2475

**Engine Data**

Number of Engines: 1  
 Application: Gas Compression  
 Engine Manufacturer: General Motors  
 Model Number: Vortec 5.7L NA  
 Power Output: 92 bhp  
 Lubrication Oil: 0.6 wt% sulfated ash or less  
 Type of Fuel: Natural Gas  
 Exhaust Flow Rate: 650 acfm (cfm)  
 Exhaust Temperature: 1,200°F

**System Details**

Housing Model Number: VXCI-1005-3.5-HSG  
 Element Model Number: VX-RE-05XC  
 Number of Catalyst Layers: 1  
 Number of Spare Catalyst Layers: 1  
 System Pressure Loss: 4.0 inches of WC (Fresh)  
 Sound Attenuation: 28-32 dBA insertion loss  
 Exhaust Temperature Limits: 750 – 1250°F (catalyst inlet); 1350°F (catalyst outlet)

**NSCR Housing & Catalyst Details**

Model Number: VXCI-1005-3.5-XC1  
 Material: Carbon Steel  
 Inlet Pipe Size & Connection: 3.5 inch FF Flange, 150# ANSI standard bolt pattern  
 Outlet Pipe Size & Connection: 3.5 inch FF Flange, 150# ANSI standard bolt pattern  
 Overall Length: 43 inches  
 Weight Without Catalyst: 98 lbs  
 Weight Including Catalyst: 104 lbs  
 Instrumentation Ports: 1 inlet/1 outlet (1/2" NPT)

**Emission Requirements**

Exhaust Gases	Engine Outputs (g/ bhp-hr)	Reduction (%)	Warranted Converter Outputs (g/ bhp-hr)	Requested Emissions Targets
NOx	14.00	93%	1.00	1 g/bhp-hr
CO	11.00	82%	2.00	2 g/bhp-hr
NMNEHC	0.40	0%	0.70	.7 g/bhp-hr
Oxygen	0.5%			

MIRATECH warrants the performance of the converter, as stated above, per the MIRATECH General Terms and Conditions of Sale.



# Buck's Engines

## GM Vortec 5.7L Engine

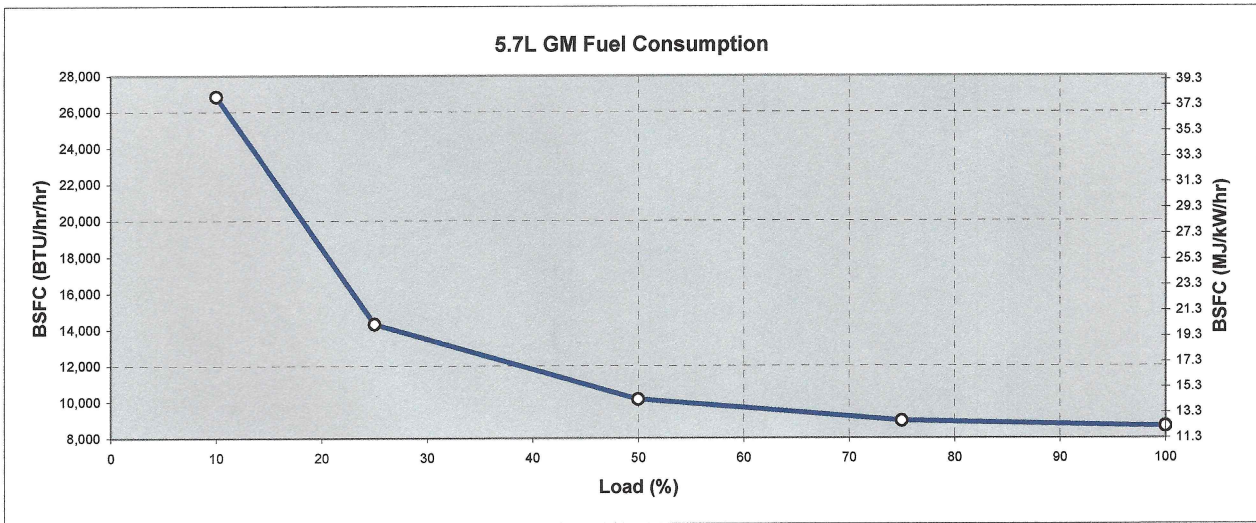
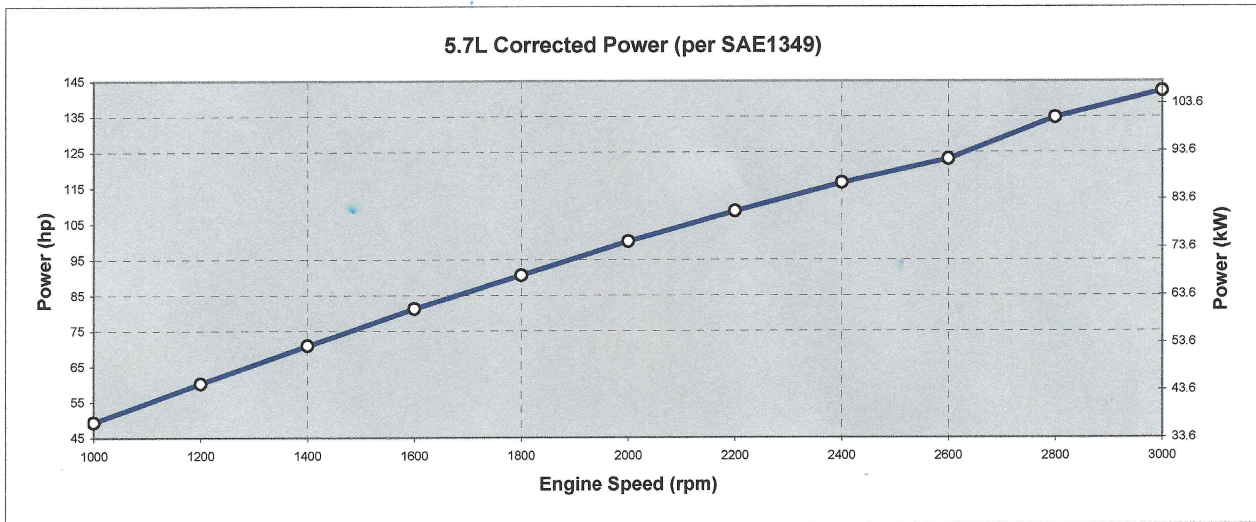
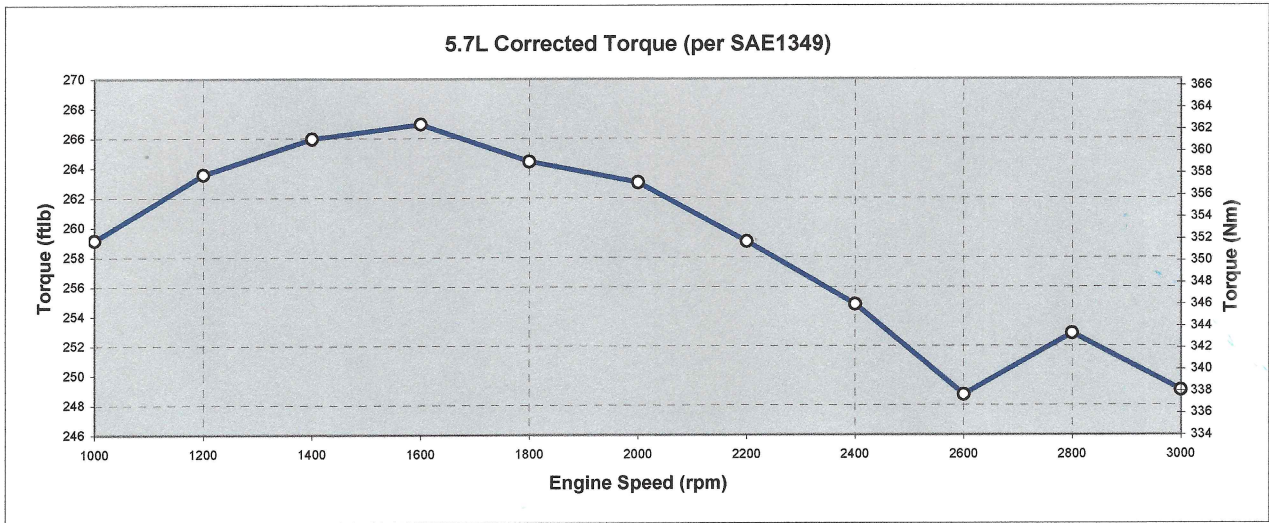


Table 3.2-3. UNCONTROLLED EMISSION FACTORS FOR 4-STROKE RICH-BURN  
 ENGINES<sup>a</sup>  
 (SCC 2-02-002-53)

Pollutant	Emission Factor (lb/MMBtu) <sup>b</sup> (fuel input)	Emission Factor Rating
Criteria Pollutants and Greenhouse Gases		
NO <sub>x</sub> <sup>c</sup> 90 - 105% Load	2.21 E+00	A
NO <sub>x</sub> <sup>c</sup> <90% Load	2.27 E+00	C
CO <sup>c</sup> 90 - 105% Load	3.72 E+00	A
CO <sup>c</sup> <90% Load	3.51 E+00	C
CO <sub>2</sub> <sup>d</sup>	1.10 E+02	A
SO <sub>2</sub> <sup>e</sup>	5.88 E-04	A
TOC <sup>f</sup>	3.58 E-01	C
Methane <sup>g</sup>	2.30 E-01	C
VOC <sup>h</sup>	2.96 E-02	C
PM10 (filterable) <sup>i,j</sup>	9.50 E-03	E
PM2.5 (filterable) <sup>j</sup>	9.50 E-03	E
PM Condensable <sup>k</sup>	9.91 E-03	E
Trace Organic Compounds		
1,1,2,2-Tetrachloroethane <sup>l</sup>	2.53 E-05	C
1,1,2-Trichloroethane <sup>l</sup>	<1.53 E-05	E
1,1-Dichloroethane	<1.13 E-05	E
1,2-Dichloroethane	<1.13 E-05	E
1,2-Dichloropropane	<1.30 E-05	E
1,3-Butadiene <sup>l</sup>	6.63 E-04	D
1,3-Dichloropropene <sup>l</sup>	<1.27 E-05	E
Acetaldehyde <sup>l,m</sup>	2.79 E-03	C
Acrolein <sup>l,m</sup>	2.63 E-03	C
Benzene <sup>l</sup>	1.58 E-03	B
Butyr/isobutyraldehyde	4.86 E-05	D
Carbon Tetrachloride <sup>l</sup>	<1.77 E-05	E

Table 3.2-3. UNCONTROLLED EMISSION FACTORS FOR 4-STROKE RICH-BURN ENGINES  
(Concluded)

Pollutant	Emission Factor (lb/MMBtu) <sup>b</sup> (fuel input)	Emission Factor Rating
Chlorobenzene <sup>1</sup>	<1.29 E-05	E
Chloroform <sup>1</sup>	<1.37 E-05	E
Ethane <sup>n</sup>	7.04 E-02	C
Ethylbenzene <sup>1</sup>	<2.48 E-05	E
Ethylene Dibromide <sup>1</sup>	<2.13 E-05	E
Formaldehyde <sup>1,m</sup>	2.05 E-02	A
Methanol <sup>1</sup>	3.06 E-03	D
Methylene Chloride <sup>1</sup>	4.12 E-05	C
Naphthalene <sup>1</sup>	<9.71 E-05	E
PAH <sup>1</sup>	1.41 E-04	D
Styrene <sup>1</sup>	<1.19 E-05	E
Toluene <sup>1</sup>	5.58 E-04	A
Vinyl Chloride <sup>1</sup>	<7.18 E-06	E
Xylene <sup>1</sup>	1.95 E-04	A

<sup>a</sup> Reference 7. Factors represent uncontrolled levels. For NO<sub>x</sub>, CO, and PM-10, “uncontrolled” means no combustion or add-on controls; however, the factor may include turbocharged units. For all other pollutants, “uncontrolled” means no oxidation control; the data set may include units with control techniques used for NO<sub>x</sub> control, such as PCC and SCR for lean burn engines, and PSC for rich burn engines. Factors are based on large population of engines. Factors are for engines at all loads, except as indicated. SCC = Source Classification Code. TOC = Total Organic Compounds. PM10 = Particulate Matter ≤ 10 microns (μm) aerodynamic diameter. A “<” sign in front of a factor means that the corresponding emission factor is based on one-half of the method detection limit.

<sup>b</sup> Emission factors were calculated in units of (lb/MMBtu) based on procedures in EPA Method 19. To convert from (lb/MMBtu) to (lb/10<sup>6</sup> scf), multiply by the heat content of the fuel. If the heat content is not available, use 1020 Btu/scf. To convert from (lb/MMBtu) to (lb/hp-hr) use the following equation:

$$\text{lb/hp-hr} = (\text{lb/MMBtu}) (\text{heat input, MMBtu/hr}) (1/\text{operating HP, 1/hp})$$

<sup>c</sup> Emission tests with unreported load conditions were not included in the data set.

<sup>d</sup> Based on 99.5% conversion of the fuel carbon to CO<sub>2</sub>. CO<sub>2</sub> [lb/MMBtu] = (3.67)(%CON)(C)(D)(1/h), where %CON = percent conversion of fuel carbon to CO<sub>2</sub>,

C = carbon content of fuel by weight (0.75), D = density of fuel,  $4.1 \text{ E}+04 \text{ lb}/10^6 \text{ scf}$ , and h = heating value of natural gas (assume 1020 Btu/scf at 60°F).

<sup>e</sup> Based on 100% conversion of fuel sulfur to SO<sub>2</sub>. Assumes sulfur content in natural gas of  $2,000 \text{ gr}/10^6 \text{ scf}$ .

<sup>f</sup> Emission factor for TOC is based on measured emission levels from 6 source tests.

<sup>g</sup> Emission factor for methane is determined by subtracting the VOC and ethane emission factors from the TOC emission factor.

<sup>h</sup> VOC emission factor is based on the sum of the emission factors for all speciated organic compounds. Methane and ethane emissions were not measured for this engine category.

<sup>i</sup> No data were available for uncontrolled engines. PM10 emissions are for engines equipped with a PCC.

<sup>j</sup> Considered  $\leq 1 \mu\text{m}$  in aerodynamic diameter. Therefore, for filterable PM emissions,  $\text{PM}_{10}(\text{filterable}) = \text{PM}_{2.5}(\text{filterable})$ .

<sup>k</sup> No data were available for condensable emissions. The presented emission factor reflects emissions from 4SLB engines.

<sup>l</sup> Hazardous Air Pollutant as defined by Section 112(b) of the Clean Air Act.

<sup>m</sup> For rich-burn engines, no interference is suspected in quantifying aldehyde emissions. The presented emission factors are based on FTIR and CARB 430 emissions data measurements.

<sup>n</sup> Ethane emission factor is determined by subtracting the VOC emission factor from the NMHC emission factor.

**ATTACHMENT O: TANKER TRUCK LOADING DATA SHEET**

AP-42 EMISSION FACTORS

**ATTACHMENT O – TANKER TRUCK/RAIL CAR LOADING DATA SHEET**

Complete this data sheet for each new or modified bulk liquid transfer area or loading rack at the facility. This is to be used for bulk liquid transfer operations to tanker trucks/rail cars. Use extra pages if necessary.

***Truck/Rail Car Loadout Collection Efficiencies***

The following applicable capture efficiencies of a truck/rail car loadout are allowed:

- For tanker trucks/rail cars passing the MACT level annual leak test – 99.2%
- For tanker trucks/rail cars passing the NSPS level annual leak test – 98.7%
- For tanker trucks/rail cars not passing one of the annual leak tests listed above – 70%

Compliance with this requirement shall be demonstrated by keeping records of the applicable MACT or NSPS Annual Leak Test certification for *every* truck and railcar loaded/unloaded. This requirement can be satisfied if the trucking/rail car company provided certification that its entire fleet was compliant. This certification must be submitted in writing to the Director of the DAQ. These additional requirements must be noted in the Registration Application.

Emission Unit ID#: EU-LOAD-COND	Emission Point ID#: EP-LOAD-COND/APC-COMB	Year Installed/Modified: 2011/2018
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Emission Unit Description: Condensate Truck Loading Emissions

**Loading Area Data**

Number of Pumps: 1	Number of Liquids Loaded: 1	Max number of trucks/rail cars loading at one (1) time: 1
--------------------	-----------------------------	---

Are tanker trucks/rail cars pressure tested for leaks at this or any other location?  Yes  No  Not Required  
If Yes, Please describe:

Provide description of closed vent system and any bypasses. Vapors are collected and routed to a vapor combustor.

Are any of the following truck/rail car loadout systems utilized?  
 Closed System to tanker truck/rail car passing a MACT level annual leak test?  
 Closed System to tanker truck/rail car passing a NSPS level annual leak test?  
 Closed System to tanker truck/rail car not passing an annual leak test and has vapor return?

**Projected Maximum Operating Schedule (for rack or transfer point as a whole)**

Time	Jan – Mar	Apr - Jun	Jul – Sept	Oct - Dec
Hours/day	24	24	24	24
Days/week	5	5	5	5

**Bulk Liquid Data (use extra pages as necessary)**

Liquid Name	Condensate		
Max. Daily Throughput (1000 gal/day)	38.8		
Max. Annual Throughput (1000 gal/yr)	14,160.63		
Loading Method <sup>1</sup>	SUB		
Max. Fill Rate (gal/min)	125		
Average Fill Time (min/loading)	Approx. 60		
Max. Bulk Liquid Temperature (°F)	102.06		
True Vapor Pressure <sup>2</sup>	13.6448		
Cargo Vessel Condition <sup>3</sup>	U		
Control Equipment or Method <sup>4</sup>	O = Vapor Return/ Combustion Controls		
Max. Collection Efficiency (%)	70%		

Max. Control Efficiency (%)		98%		
Max.VOC Emission Rate	Loading (lb/hr)	19.22		
	Annual (ton/yr)	18.14		
Max.HAP Emission Rate	Loading (lb/hr)	1.35		
	Annual (ton/yr)	1.27		
Estimation Method <sup>5</sup>		EPA/O = ProMax process simulation		



Emission Unit ID#: EU-LOAD-PW		Emission Point ID#: EP-LOAD-PW		Year Installed/Modified: 2011/2018	
Emission Unit Description: Produced Water Truck Loading Emissions					
<b>Loading Area Data</b>					
Number of Pumps: 1		Number of Liquids Loaded: 1		Max number of trucks/rail cars loading at one (1) time: 1	
Are tanker trucks/rail cars pressure tested for leaks at this or any other location? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Not Required If Yes, Please describe:					
Provide description of closed vent system and any bypasses. Vapors are collected and routed to a vapor combustor.					
Are any of the following truck/rail car loadout systems utilized? <input type="checkbox"/> Closed System to tanker truck/rail car passing a MACT level annual leak test? <input type="checkbox"/> Closed System to tanker truck/rail car passing a NSPS level annual leak test? <input type="checkbox"/> Closed System to tanker truck/rail car not passing an annual leak test and has vapor return?					
<b>Projected Maximum Operating Schedule (for rack or transfer point as a whole)</b>					
Time	Jan – Mar		Apr - Jun		Jul – Sept
Hours/day	24		24		24
Days/week	5		5		5
<b>Bulk Liquid Data (use extra pages as necessary)</b>					
Liquid Name	Produced Water				
Max. Daily Throughput (1000 gal/day)	41.87				
Max. Annual Throughput (1000 gal/yr)	15,282.78				
Loading Method <sup>1</sup>	SUB				
Max. Fill Rate (gal/min)	125				
Average Fill Time (min/loading)	Approx. 60				
Max. Bulk Liquid Temperature (°F)	87.69				
True Vapor Pressure <sup>2</sup>	13.5148				
Cargo Vessel Condition <sup>3</sup>	U				
Control Equipment or Method <sup>4</sup>	N/A				
Max. Collection Efficiency (%)	0%				
Max. Control Efficiency (%)	0%				
Max.VOC Emission Rate	Loading (lb/hr)	0.33			
	Annual (ton/yr)	0.34			
Max.HAP Emission Rate	Loading (lb/hr)	0.02			
	Annual (ton/yr)	0.02			
Estimation Method <sup>5</sup>	EPA/O = ProMax process simulation				

- |   |     |   |    |   |     |                               |
|---|-----|---|----|---|-----|-------------------------------|
| 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   | VB | Dedicated Vapor Balance (closed system) |     |                               |
|   | ECD | Enclosed Combustion Device  | F  | Flare                                   |     |                               |
|   | TO  | Thermal Oxidization or Incineration   |    |   |     |                               |
| 5 | EPA | EPA Emission Factor in AP-42  | MB | Material Balance                        |     |                               |
|   | TM  | Test Measurement based upon test data submittal   | O  | Other (describe)                        |     |                               |

loading operation, resulting in high levels of vapor generation and loss. If the turbulence is great enough, liquid droplets will be entrained in the vented vapors.

A second method of loading is submerged loading. Two types are the submerged fill pipe method and the bottom loading method. In the submerged fill pipe method, the fill pipe extends almost to the bottom of the cargo tank. In the bottom loading method, a permanent fill pipe is attached to the cargo tank bottom. During most of submerged loading by both methods, the fill pipe opening is below the liquid surface level. Liquid turbulence is controlled significantly during submerged loading, resulting in much lower vapor generation than encountered during splash loading.

The recent loading history of a cargo carrier is just as important a factor in loading losses as the method of loading. If the carrier has carried a nonvolatile liquid such as fuel oil, or has just been cleaned, it will contain vapor-free air. If it has just carried gasoline and has not been vented, the air in the carrier tank will contain volatile organic vapors, which will be expelled during the loading operation along with newly generated vapors.

Cargo carriers are sometimes designated to transport only one product, and in such cases are practicing "dedicated service". Dedicated gasoline cargo tanks return to a loading terminal containing air fully or partially saturated with vapor from the previous load. Cargo tanks may also be "switch loaded" with various products, so that a nonvolatile product being loaded may expel the vapors remaining from a previous load of a volatile product such as gasoline. These circumstances vary with the type of cargo tank and with the ownership of the carrier, the petroleum liquids being transported, geographic location, and season of the year.

One control measure for vapors displaced during liquid loading is called "vapor balance service", in which the cargo tank retrieves the vapors displaced during product unloading at bulk plants or service stations and transports the vapors back to the loading terminal. Figure 5.2-5 shows a tank truck in vapor balance service filling a service station underground tank and taking on displaced gasoline vapors for return to the terminal. A cargo tank returning to a bulk terminal in vapor balance service normally is saturated with organic vapors, and the presence of these vapors at the start of submerged loading of the tanker truck results in greater loading losses than encountered during nonvapor balance, or "normal", service. Vapor balance service is usually not practiced with marine vessels, although some vessels practice emission control by means of vapor transfer within their own cargo tanks during ballasting operations, discussed below.

Emissions from loading petroleum liquid can be estimated (with a probable error of  $\pm 30$  percent)<sup>4</sup> using the following expression:

$$L_L = 12.46 \frac{SPM}{T} \quad (1)$$

where:

$L_L$  = loading loss, pounds per 1000 gallons (lb/10<sup>3</sup> gal) of liquid loaded

$S$  = a saturation factor (see Table 5.2-1)

$P$  = true vapor pressure of liquid loaded, pounds per square inch absolute (psia)  
(see Figure 7.1-5, Figure 7.1-6, and Table 7.1-2)

$M$  = molecular weight of vapors, pounds per pound-mole (lb/lb-mole) (see Table 7.1-2)

$T$  = temperature of bulk liquid loaded, °R (°F + 460)

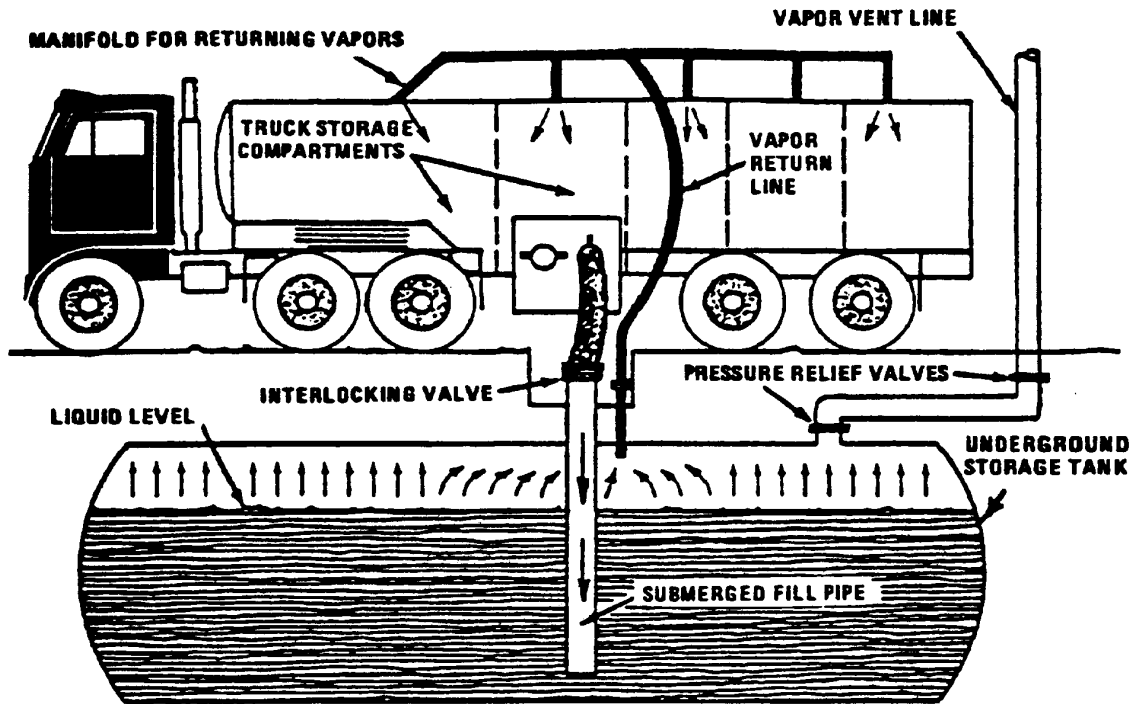


Figure 5.2-5. Tank truck unloading into a service station underground storage tank and practicing "vapor balance" form of emission control.

Table 5.2-1. SATURATION (S) FACTORS FOR CALCULATING PETROLEUM LIQUID LOADING LOSSES

Cargo Carrier	Mode Of Operation	S Factor
Tank trucks and rail tank cars	Submerged loading of a clean cargo tank	0.50
	Submerged loading: dedicated normal service	0.60
	Submerged loading: dedicated vapor balance service	1.00
	Splash loading of a clean cargo tank	1.45
	Splash loading: dedicated normal service	1.45
	Splash loading: dedicated vapor balance service	1.00
Marine vessels <sup>a</sup>	Submerged loading: ships	0.2
	Submerged loading: barges	0.5

<sup>a</sup> For products other than gasoline and crude oil. For marine loading of gasoline, use factors from Table 5.2-2. For marine loading of crude oil, use Equations 2 and 3 and Table 5.2-3.

**ATTACHMENT Q: PNEUMATIC CONTROLLERS DATA SHEET**

**ATTACHMENT Q – PNEUMATIC CONTROLLERS  
DATA SHEET**

**Are there any continuous bleed natural gas driven pneumatic controllers at this facility that commenced construction, modification or reconstruction after August 23, 2011, and on or before September 18, 2015?**

Yes     No

Please list approximate number.

**Are there any continuous bleed natural gas driven pneumatic controllers at this facility that commenced construction, modification or reconstruction after September 18, 2015?**

Yes     No

Please list approximate number.

**Are there any continuous bleed natural gas driven pneumatic controllers at this facility with a bleed rate greater than 6 standard cubic feet per hour that are required based on functional needs, including but not limited to response time, safety and positive actuation that commenced construction, modification or reconstruction after August 23, 2011, and on or before September 18, 2015?**

Yes     No

Please list approximate number.

**Are there any continuous bleed natural gas driven pneumatic controllers at this facility with a bleed rate greater than 6 standard cubic feet per hour that are required based on functional needs, including but not limited to response time, safety and positive actuation that commenced construction, modification or reconstruction after September 18, 2015?**

Yes     No

Please list approximate number.

**ATTACHMENT R: PNEUMATIC PUMP DATA SHEET**

**ATTACHMENT R – PNEUMATIC PUMP  
DATA SHEET**

**Are there any natural gas-driven diaphragm pumps located at a well site that commenced construction, modification or reconstruction after September 18, 2015?**

Yes     No

Please list.

Source ID #	Date	Pump Make/Model	Pump Size

**ATTACHMENT S: AIR POLLUTION CONTROL DEVICE/EMISSION REDUCTION  
DEVICES SHEETS**

VAPOR COMBUSTION

AP-42 EMISSION FACTORS



**ATTACHMENT S – AIR POLLUTION CONTROL DEVICE /  
EMISSION REDUCTION DEVICE SHEETS**

Complete the applicable air pollution control device sheets for each flare, vapor combustor, thermal oxidizer, condenser, adsorption system, vapor recovery unit, BTEX Eliminator, Reboiler with and without Glow Plug, etc. at the facility. Use extra pages if necessary.

Emissions calculations must be performed using the most conservative control device efficiency.

*The following five (5) rows are only to be completed if registering an alternative air pollution control device.*

Emission Unit ID:	Make/Model:
Primary Control Device ID:	Make/Model:
Control Efficiency (%):	APCD/ERD Data Sheet Completed: <input type="checkbox"/> Yes <input type="checkbox"/> No
Secondary Control Device ID:	Make/Model:
Control Efficiency (%):	APCD/ERD Data Sheet Completed: <input type="checkbox"/> Yes <input type="checkbox"/> No

## VAPOR COMBUSTION (Including Enclosed Combustors)

### General Information

Control Device ID#: APC-COMB	Installation Date: TBD <input checked="" type="checkbox"/> New <input type="checkbox"/> Modified <input type="checkbox"/> Relocated	
Maximum Rated Total Flow Capacity 4,541.67 scfh                      109,000 scfd	Maximum Design Heat Input (from mfg. spec sheet) 11.7 MMBTU/hr	Design Heat Content 2,300 BTU/scf

### Control Device Information

Type of Vapor Combustion Control?		
<input checked="" type="checkbox"/> Enclosed Combustion Device <input type="checkbox"/> Thermal Oxidizer	<input type="checkbox"/> Elevated Flare	<input type="checkbox"/> Ground Flare
Manufacturer: Cimarron Model: ECD-3-48HV-90-OOOO	Hours of operation per year? 8,760	

List the emission units whose emissions are controlled by this vapor control device (Emission Point ID# APC-COMB)

Emission Unit ID#	Emission Source Description	Emission Unit ID#	Emission Source Description
EU-TANKS-COND	Condensate Tanks	EU-LOAD-COND	Condensate Truck Loading
EU-TANKS-PW	Produced Water Tanks		

*If this vapor combustor controls emissions from more than six (6) emission units, please attach additional pages.*

Assist Type (Flares only)	Flare Height	Tip Diameter	Was the design per §60.18?
<input type="checkbox"/> Steam <input type="checkbox"/> Air <input type="checkbox"/> Pressure <input checked="" type="checkbox"/> Non	25.25 feet	N/A feet	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Provide determination.

### Waste Gas Information

Maximum Waste Gas Flow Rate 74.69 (scfm)	Heat Value of Waste Gas Stream 2,300 BTU/ft <sup>3</sup>	Exit Velocity of the Emissions Stream (ft/s)
---	---	---

*Provide an attachment with the characteristics of the waste gas stream to be burned.*

### Pilot Gas Information

Number of Pilot Lights 1	Fuel Flow Rate to Pilot Flame per Pilot 17 scfh	Heat Input per Pilot 15,385 BTU/hr	Will automatic re-ignition be used? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
-----------------------------	--	---------------------------------------	--

If automatic re-ignition is used, please describe the method. If the pilot flame is lost, the control system will automatically attempt to relight the pilot. If the re-ignition attempt fails, the pilot solenoid valve will automatically close and a local remote alarm signal will be generated to indicate loss of pilot flame.

Is pilot flame equipped with a monitor to detect the presence of the flame? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	If Yes, what type? <input type="checkbox"/> Thermocouple <input type="checkbox"/> Infrared <input type="checkbox"/> Ultraviolet <input type="checkbox"/> Camera <input checked="" type="checkbox"/> Other: flame rod
---	---

Describe all operating ranges and maintenance procedures required by the manufacturer to maintain the warranty. *(If unavailable, please indicate).*

Additional information attached?     Yes     No

Please attach copies of manufacturer's data sheets, drawings, flame demonstration per §60.18 or §63.11(b) and performance testing.



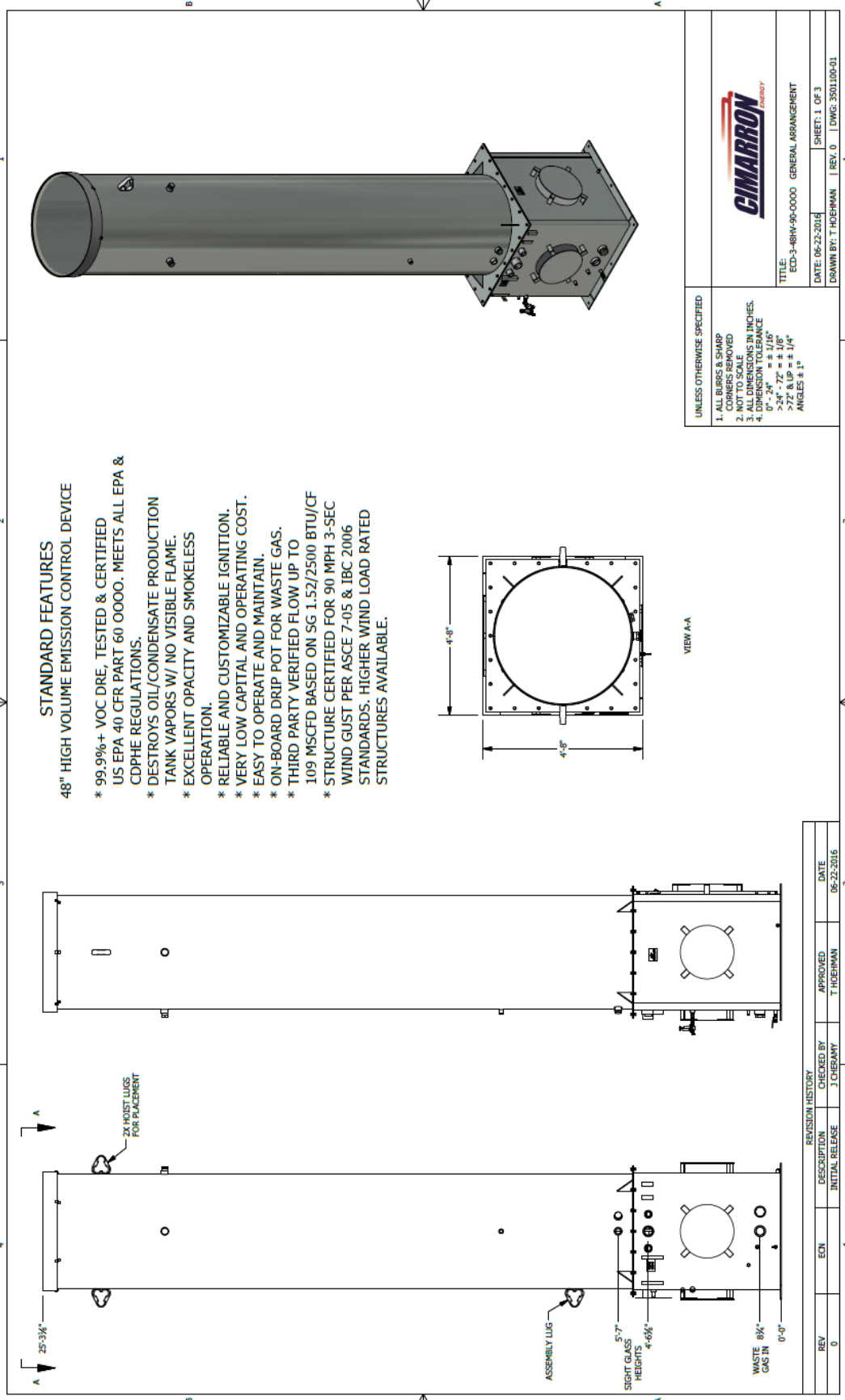
## SPECIFICATIONS FOR 48" HIGH VOLUME ENCLOSED COMBUSTOR

<b>GENERAL PROPERTIES</b>	
Description	Enclosed Combustor
Typical vapor heat content	2,300 Btu/ft <sup>3</sup>
Ambient Temperature	-20 to 120° F
Flow Rate	Up to 109,000 SCFD
Pilot Fuel Required	At 5 to 7 PSIG pilot regulator setting, consumption of 14 to 17 SCFH
Heat Release	Up to 11.7 MMBtu/hr
Insulated Stack Temperature	800 to 2100° F
Inlet Pressure Required	1 to 16 oz/in <sup>2</sup>
Turndown Ratio	8:1
VOC Destruction Efficiency	Per EPA Manufacturer's Test: >99%

<b>MECHANICAL PROPERTIES</b>	
Design Wind Speed	90 mph 3 second Wind Gust per ASCE 7-05
Electrical Classification	General Area Classification
Elevation	Up to 5,000 ft ASL
Weight	Approx. 4,380 lbs (excludes concrete base)
Dimensions	56" square base by 303" height

<b>UTILITIES</b>	
Pilot Gas	Process Gas or propane
Solar	Solar panel with battery backup available
Operating Voltage – Cimarron ARC	10 to 30 VDC, typically 12 or 24 VDC
Solar Voltage – Cimarron ARC	40 VDC
Current Consumption – Cimarron ARC	Typically 15 mA
Solar Charging Current – Cimarron ARC	1 to 2 Amp

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**STANDARD FEATURES**

**48" HIGH VOLUME EMISSION CONTROL DEVICE**

- \* 99.9%+ VOC DRE, TESTED & CERTIFIED US EPA 40 CFR PART 60 0000. MEETS ALL EPA & CDPHE REGULATIONS.
- \* DESTROYS OIL/CONDENSATE PRODUCTION TANK VAPORS W/ NO VISIBLE FLAME.
- \* EXCELLENT OPACITY AND SMOKELESS OPERATION.
- \* RELIABLE AND CUSTOMIZABLE IGNITION.
- \* VERY LOW CAPITAL AND OPERATING COST.
- \* EASY TO OPERATE AND MAINTAIN.
- \* ON-BOARD DRIP POT FOR WASTE GAS.
- \* THIRD PARTY VERIFIED FLOW UP TO 109 MSCFD BASED ON SG 1.52/2500 BTU/CF
- \* STRUCTURE CERTIFIED FOR 90 MPH 3-SEC WIND GUST PER ASCE 7-05 & IBC 2006 STANDARDS. HIGHER WIND LOAD RATED STRUCTURES AVAILABLE.

UNLESS OTHERWISE SPECIFIED  
 1. ALL BURRS & SHARP CORNERS REMOVED  
 2. KERNEL SCALE  
 3. ALL DIMENSIONS IN INCHES  
 4. DIMENSION TOLERANCE  
 0" - .24" ± ± ± 1/16"  
 .25" - .72" ± ± ± 1/32"  
 >.72" & UP ± ± 1/8"  
 ANGLES ± 1°



TITLE: ECD-3-48H4-90-0000 GENERAL ARRANGEMENT  
 DATE: 06-22-2016  
 DRAWN BY: T. PUCHMAN | REV. 0 | DWG: 501.100-01

REV	EN	DESCRIPTION	INITIAL RELEASE	CHECKED BY	APPROVED	DATE
0				J. CHEANNEY	T. PUCHMAN	06-22-2016

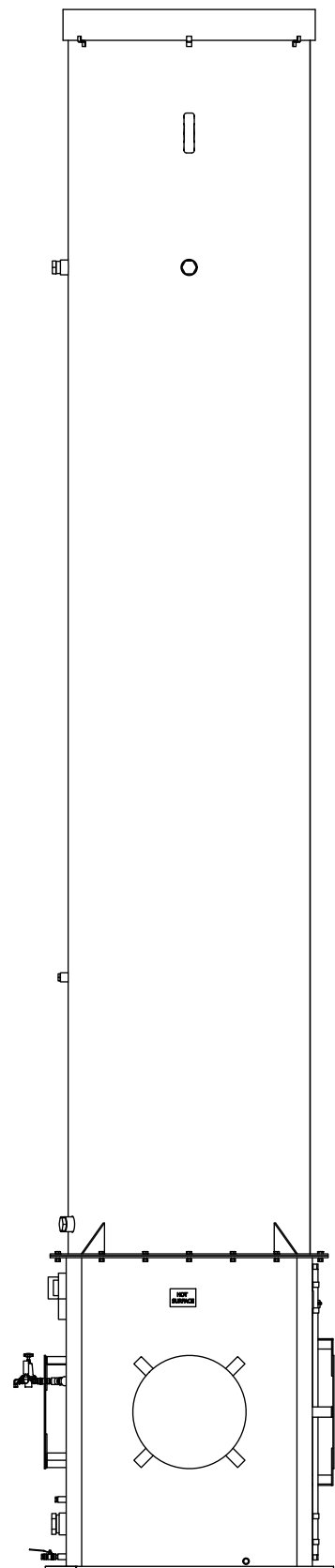
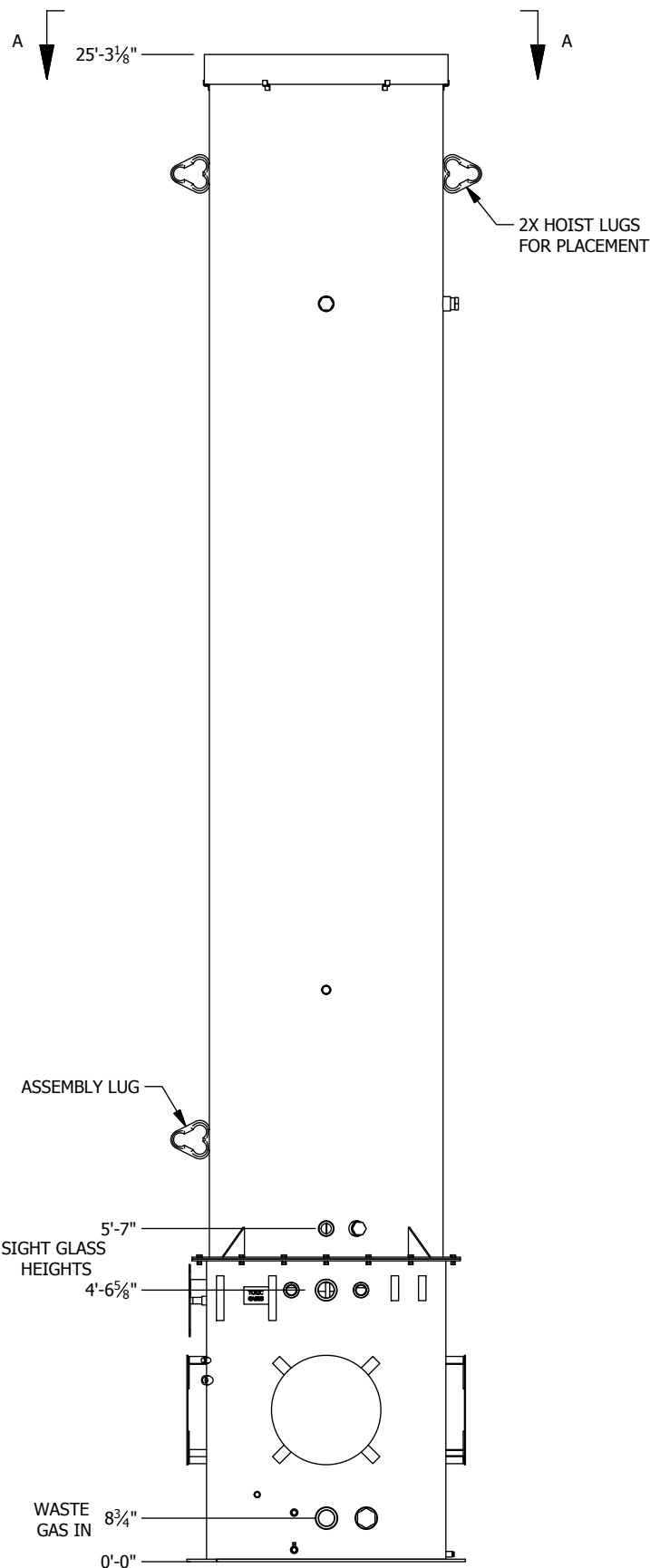
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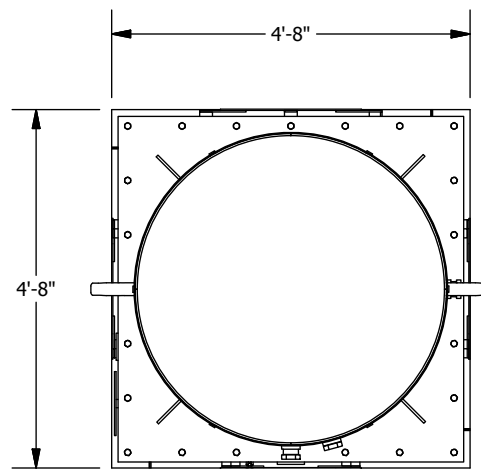
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### STANDARD FEATURES

#### 48" HIGH VOLUME EMISSION CONTROL DEVICE

- \* 99.9%+ VOC DRE, TESTED & CERTIFIED US EPA 40 CFR PART 60 OOOO. MEETS ALL EPA & CDPHE REGULATIONS.
- \* DESTROYS OIL/CONDENSATE PRODUCTION TANK VAPORS W/ NO VISIBLE FLAME.
- \* EXCELLENT OPACITY AND SMOKELESS OPERATION.
- \* RELIABLE AND CUSTOMIZABLE IGNITION.
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- \* STRUCTURE CERTIFIED FOR 90 MPH 3-SEC WIND GUST PER ASCE 7-05 & IBC 2006 STANDARDS. HIGHER WIND LOAD RATED STRUCTURES AVAILABLE.

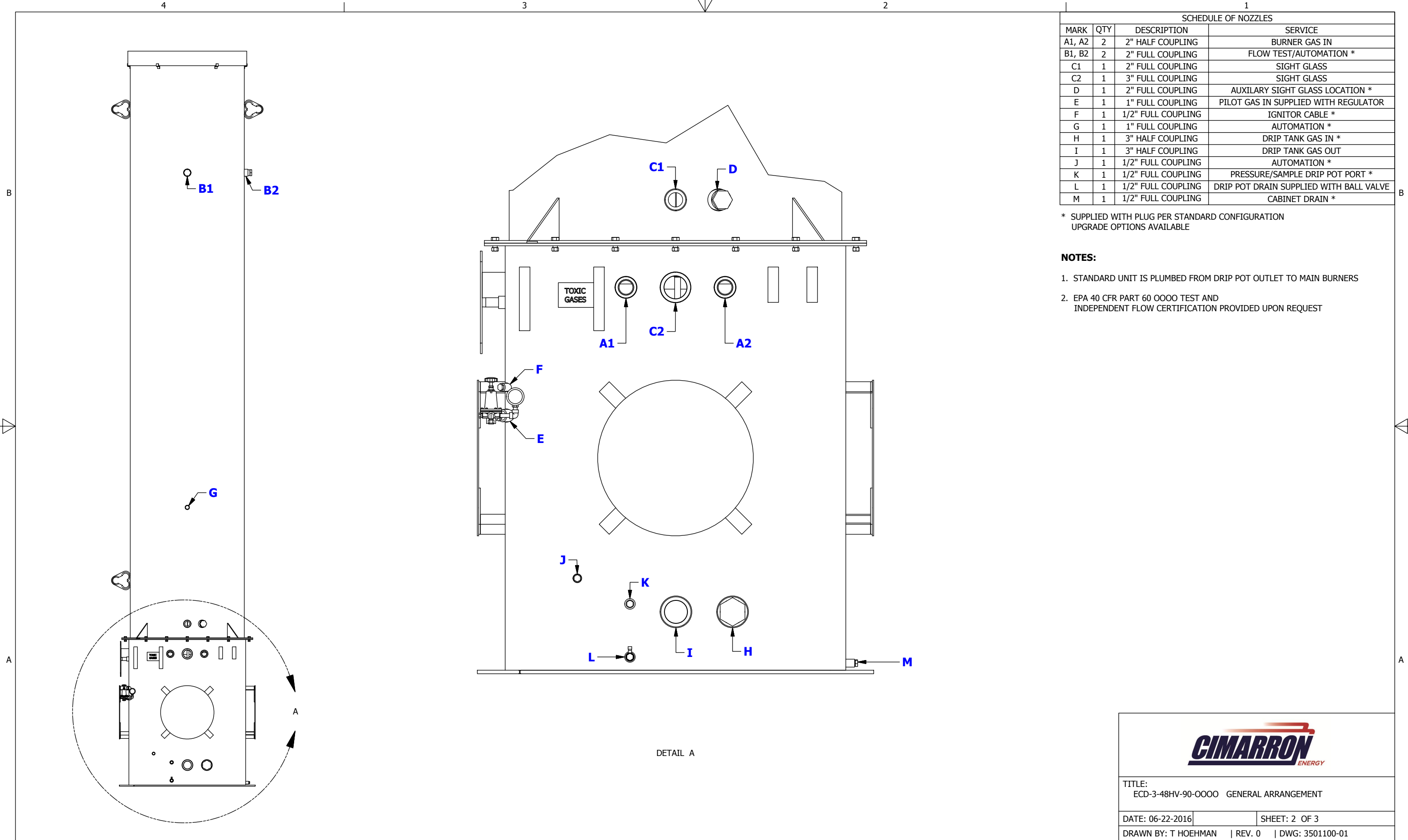


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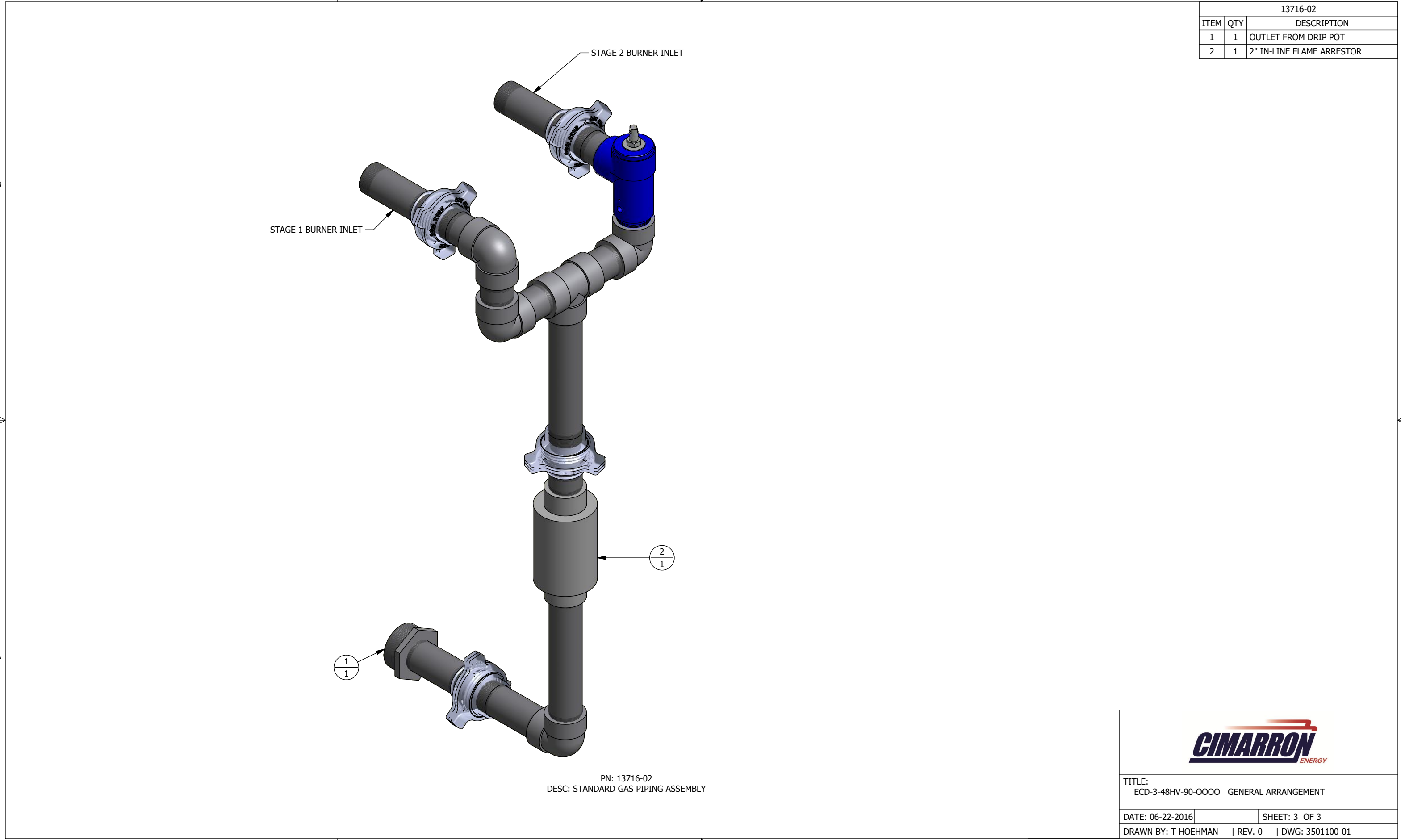
REVISION HISTORY					
REV	ECN	DESCRIPTION	CHECKED BY	APPROVED	DATE
0		INITIAL RELEASE	J CHERAMY	T HOEHMAN	06-22-2016

UNLESS OTHERWISE SPECIFIED	
1. ALL BURRS & SHARP CORNERS REMOVED 2. NOT TO SCALE 3. ALL DIMENSIONS IN INCHES. 4. DIMENSION TOLERANCE 0" - 24" = ± 1/16" >24" - 72" = ± 1/8" >72" & UP = ± 1/4" ANGLES ± 1°	
TITLE: ECD-3-48HV-90-0000 GENERAL ARRANGEMENT	
DATE: 06-22-2016	SHEET: 1 OF 3
DRAWN BY: T HOEHMAN	REV. 0   DWG: 3501100-01



TITLE: ECD-3-48HV-90-0000 GENERAL ARRANGEMENT	
DATE: 06-22-2016	SHEET: 2 OF 3
DRAWN BY: T HOEHMAN	REV. 0   DWG: 3501100-01

13716-02		
ITEM	QTY	DESCRIPTION
1	1	OUTLET FROM DRIP POT
2	1	2" IN-LINE FLAME ARRESTOR



PN: 13716-02  
DESC: STANDARD GAS PIPING ASSEMBLY

**CIMARRON**  
ENERGY

TITLE:  
ECD-3-48HV-90-0000 GENERAL ARRANGEMENT

DATE: 06-22-2016 | SHEET: 3 OF 3

DRAWN BY: T HOEHMAN | REV. 0 | DWG: 3501100-01

hydrogen, unsaturated hydrocarbons, and carbon. The carbon particles may escape further combustion and cool down to form soot or smoke. Olefins and other unsaturated hydrocarbons may polymerize to form larger molecules which crack, in turn forming more carbon.

The fuel characteristics influencing soot formation include the carbon-to-hydrogen (C-to-H) ratio and the molecular structure of the gases to be burned. All hydrocarbons above methane, i. e., those with a C-to-H ratio of greater than 0.33, tend to soot. Branched chain paraffins smoke more readily than corresponding normal isomers. The more highly branched the paraffin, the greater the tendency to smoke. Unsaturated hydrocarbons tend more toward soot formation than do saturated ones. Soot is eliminated by adding steam or air; hence, most industrial flares are steam-assisted and some are air-assisted. Flare gas composition is a critical factor in determining the amount of steam necessary.

Since flares do not lend themselves to conventional emission testing techniques, until recently only a few attempts have been made to characterize flare emissions. Early EPA tests using propylene as flare gas indicated that efficiencies of 98 percent can be achieved when burning an offgas with at least 11,200 kJ/m<sup>3</sup> (300 Btu/ft<sup>3</sup>).<sup>1</sup> However, recent studies on flare performance using passive Fourier Transform Infrared (pFTIR) spectroscopy have been performed on a number of different flares.<sup>4-8</sup> The studies cover a number of flares at refineries, chemical plants and flare test facilities with varying waste gas compositions. The pFTIR studies support the conclusion that the combustion zone properties of the steam-waste gas mixture are predictive of proper flare combustion.<sup>10</sup> There have also been recent studies on sources, including flares, using differential infrared absorption LIDAR [light detection and ranging] (DIAL). To date, many of these studies do not provide the data necessary to isolate the emissions from a particular flare. But enough data existed in one study that the emissions measured by DIAL could be attributed to the flare.<sup>9</sup> For flares operated at petroleum refineries, EPA has determined that the net heating value of the gas in the combustion zone of the flare should be greater than or equal to 270 Btu/ft<sup>3</sup> to obtain a destruction efficiency of at least 98%.<sup>a</sup>

Table 13.5-1 presents flare emissions factors from the EPA tests<sup>1</sup>; Table 13.5-2 presents flare emissions factors from pFTIR and DIAL studies.<sup>4-9</sup> Crude propylene was used as flare gas during the early EPA tests. Methane was a major fraction of hydrocarbons in the flare emissions, and acetylene was the dominant intermediate hydrocarbon species. Many other reports on flares indicate that acetylene is always formed as a stable intermediate product. The acetylene formed in the combustion reactions may react further with hydrocarbon radicals to form polyacetylenes followed by polycyclic hydrocarbons.<sup>2</sup> Typical refinery waste gas feeds were used as flare gas during the pFTIR and DIAL studies.

In flaring waste gases containing no nitrogen compounds, NO is formed either by the fixation of atmospheric nitrogen (N) with oxygen (O) or by the reaction between the hydrocarbon radicals present in the combustion products and atmospheric nitrogen, by way of the intermediate stages, HCN, CN, and OCN.<sup>2</sup> Sulfur compounds contained in a flare gas stream are converted to SO<sub>2</sub> when burned. The amount of SO<sub>2</sub> emitted depends directly on the quantity of sulfur in the flared gases.

---

<sup>a</sup> See Petroleum Refinery Sector Risk and Technology Review and New Source Performance Standards Final Rule, December 1, 2015 (80 FR 75183). Net heating value of the combustion zone is determined on a 15-minute average, and refinery owners and operators may use a corrected heat content for hydrogen when determining the combustion zone heat value.



Table 13.5-1 (English Units). THC, NO<sub>x</sub> AND SOOT EMISSIONS FACTORS FOR FLARE OPERATIONS<sup>a</sup>

EMISSIONS FACTOR RATING: B

Pollutant	SCC <sup>d</sup>	Emissions Factor Value	Emissions Factor Units
Total hydrocarbons <sup>b</sup>	30190099; 30119701; 30119705; 30119709; 30119741	0.14	lb/10 <sup>6</sup> Btu
Nitrogen oxides <sup>c</sup>		0.068	lb/10 <sup>6</sup> Btu
Soot <sup>c</sup>		0 - 274	μg/L

<sup>a</sup> Reference 1. Based on tests using crude propylene containing 80% propylene and 20% propane.

<sup>b</sup> Measured as methane equivalent. The THC emissions factor may not be appropriate for reporting VOC emissions when a VOC emissions factor exists.

<sup>c</sup> Soot in concentration values: nonsmoking flares, 0 micrograms per liter (μg/L); lightly smoking flares, 40 μg/L; average smoking flares, 177 μg/L; and heavily smoking flares, 274 μg/L.

<sup>d</sup> See Table 13.5-3 for a description of these SCCs.

Table 13.5-2 (English Units). VOC and CO EMISSIONS FACTORS FOR FLARE OPERATIONS<sup>a</sup>

Pollutant	SCC <sup>d</sup>	Emissions Factor (lb/10 <sup>6</sup> Btu)	Representativeness
Volatile organic compounds <sup>b</sup>	30190099; 30600904; 30119701; 30119705; 30119709; 30119741; 30119799; 30130115;	0.66	Poorly
Carbon monoxide <sup>c</sup>	30600201; 30600401; 30600508; 30600903; 30600999; 30601701; 30601801; 30688801; 40600240	0.31	Poorly

<sup>a</sup> These factors apply to well operated flares achieving at least 98% destruction efficiency and operating in compliance with the current General Provisions requirements of 40 CFR Part 60, i.e. >300 btu/scf net heating value in the vent gas and less than the specified maximum flare tip velocity. The VOC emissions factor data set had an average destruction efficiency of 98.9%, and the CO emissions factor data set had an average destruction efficiency of 99.1% (based on test reports where destruction efficiency was provided). These factors are based on steam-assisted and air-assisted flares burning a variety of vent gases.

<sup>b</sup> References 4-9 and 11.

<sup>c</sup> References 1, 4-8 and 11.

<sup>d</sup> See Table 13.5-3 for a description of these SCCs.

**ATTACHMENT T: EMISSIONS CALCULATIONS**

SWN Production Company, LLC  
 Roy Riggle Pad  
 Summary of Criteria Air Pollutant Emissions

Equipment	Unit ID	Emission Point ID	NOx		CO		Total VOC <sup>1</sup>		SO <sub>2</sub>		PM Total	
			lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
145-hp Caterpillar G3306 NA Engine	EU-ENG1	EP-ENG1	0.32	1.40	0.64	2.80	0.16	0.69	<0.01	<0.01	0.02	0.11
145-hp Caterpillar G3306 NA Engine	EU-ENG2	EP-ENG2	0.32	1.40	0.64	2.80	0.16	0.69	<0.01	<0.01	0.02	0.11
92-hp GM Vortec 5.7L NA Engine	EU-ENG3	EP-ENG3	0.20	0.89	0.41	1.78	0.10	0.43	<0.01	<0.01	0.02	0.07
Three (3) 1.0-mmBtu/hr GPU Burners	EU-GPU1 - EU-GPU3	EP-GPU1 - EP-GPU3	0.33	1.45	0.28	1.22	0.02	0.08	<0.01	0.01	0.03	0.11
1.0-mmBtu/hr Heater Treater	EU-HT2	EP-HT2	0.11	0.48	0.09	0.41	0.01	0.03	<0.01	<0.01	0.01	0.04
Four (4) 400-bbl Condensate Tanks Routed to Vapor Combustor	EU-TANKS-COND	APC-COMB	-	-	-	-	-	-	-	-	-	-
Four (4) 400-bbl Produced Water Tanks Routed to Vapor Combustor	EU-TANKS-PW	APC-COMB	-	-	-	-	-	-	-	-	-	-
Condensate Truck Loading w/ Vapor Return Routed to Combustor	EU-LOAD-COND	APC-COMB	-	-	-	-	4.14	18.14	-	-	-	-
Produced Water Truck Loading	EU-LOAD-PW	EP-LOAD-PW	-	-	-	-	0.08	0.34	-	-	-	-
11.7-mmBtu/hr Vapor Combustor	APC-COMB	APC-COMB	0.80	3.48	3.63	15.89	0.95	4.15	-	-	0.04	0.17
Vapor Combustor Pilot	EU-PILOT	APC-COMB	<0.01	0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fugitive Emissions	EU-FUG	EP-FUG	-	-	-	-	1.66	7.27	-	-	-	-
Fugitive Haul Road Emissions	EU-HR	EP-HR	-	-	-	-	-	-	-	-	2.71	8.91
<b>Total =</b>			<b>2.08</b>	<b>9.12</b>	<b>5.68</b>	<b>24.90</b>	<b>7.26</b>	<b>31.80</b>	<b>&lt;0.01</b>	<b>0.02</b>	<b>2.85</b>	<b>9.51</b>
<b>Total Minus Fugitives =</b>			<b>2.08</b>	<b>9.12</b>	<b>5.68</b>	<b>24.90</b>	<b>5.60</b>	<b>24.53</b>	<b>&lt;0.01</b>	<b>0.02</b>	<b>0.14</b>	<b>0.60</b>

Notes:

<sup>1</sup>Total VOC includes all constituents heavier than Propane (C3+), including hazardous air pollutants (HAP). Speciated HAP presented in following table.

SWN Production Company, LLC  
 Roy Riggle Pad  
 Summary of Hazardous Air Pollutants

Equipment	Unit ID	Estimated Emissions (lb/hr)									
		Acetaldehyde	Acrolein	Benzene	Ethylbenzene	Formaldehyde	Methanol	n-Hexane	Toluene	Xylenes	Total HAP
145-hp Caterpillar G3306 NA Engine	EU-ENG1	<0.01	<0.01	<0.01	<0.01	0.09	<0.01	-	<0.01	<0.01	0.10
145-hp Caterpillar G3306 NA Engine	EU-ENG2	<0.01	<0.01	<0.01	<0.01	0.09	<0.01	-	<0.01	<0.01	0.10
92-hp GM Vortec 5.7L NA Engine	EU-ENG3	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	-	<0.01	<0.01	0.02
Three (3) 1.0-mmBtu/hr GPU Burners	EU-GPU1 - EU-GPU3	-	-	<0.01	-	<0.01	-	0.01	<0.01	-	0.01
1.0-mmBtu/hr Heater Treater	EU-HT2	-	-	<0.01	-	<0.01	-	<0.01	<0.01	-	<0.01
Four (4) 400-bbl Condensate Tanks Routed to Vapor Combustor	EU-TANKS-COND	-	-	-	-	-	-	-	-	-	-
Four (4) 400-bbl Produced Water Tanks Routed to Vapor Combustor	EU-TANKS-PW	-	-	-	-	-	-	-	-	-	-
Condensate Truck Loading w/ Vapor Return Routed to Combustor	EU-LOAD-COND	-	-	<0.01	0.02	-	-	0.20	0.01	0.05	0.29
Produced Water Truck Loading	EU-LOAD-PW	-	-	<0.01	<0.01	-	-	<0.01	<0.01	<0.01	0.01
11.7-mmBtu/hr Vapor Combustor	APC-COMB	-	-	<0.01	<0.01	-	-	0.05	<0.01	0.01	0.07
Vapor Combustor Pilot	EU-PILOT	-	-	<0.01	-	<0.01	-	<0.01	<0.01	-	<0.01
Fugitive Emissions	EU-FUG	-	-	<0.01	0.01	-	-	0.06	0.01	0.02	0.09
Fugitive Haul Road Emissions	EU-HR	-	-	-	-	-	-	-	-	-	-
<b>Total =</b>		<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.03</b>	<b>0.19</b>	<b>0.01</b>	<b>0.33</b>	<b>0.02</b>	<b>0.08</b>	<b>0.69</b>

Continued on Next Page

SWN Production Company, LLC  
 Roy Riggle Pad  
 Summary of Hazardous Air Pollutants (Continued)

Equipment	Unit ID	Estimated Emissions (TPY)									
		Acetaldehyde	Acrolein	Benzene	Ethylbenzene	Formaldehyde	Methanol	n-Hexane	Toluene	Xylenes	Total HAP
145-hp Caterpillar G3306 NA Engine	EU-ENG1	0.02	0.01	0.01	<0.01	0.38	0.02	-	<0.01	<0.01	0.44
145-hp Caterpillar G3306 NA Engine	EU-ENG2	0.02	0.01	0.01	<0.01	0.38	0.02	-	<0.01	<0.01	0.44
92-hp GM Vortec 5.7L NA Engine	EU-ENG3	0.01	0.01	0.01	<0.01	0.07	0.01	-	<0.01	<0.01	0.11
Three (3) 1.0-mmBtu/hr GPU Burners	EU-GPU1 - EU-GPU3	-	-	<0.01	-	<0.01	-	0.03	<0.01	-	0.03
1.0-mmBtu/hr Heater Treater	EU-HT2	-	-	<0.01	-	<0.01	-	0.01	<0.01	-	0.01
Four (4) 400-bbl Condensate Tanks Routed to Vapor Combustor	EU-TANKS-COND	-	-	-	-	-	-	-	-	-	-
Four (4) 400-bbl Produced Water Tanks Routed to Vapor Combustor	EU-TANKS-PW	-	-	-	-	-	-	-	-	-	-
Condensate Truck Loading w/ Vapor Return Routed to Combustor	EU-LOAD-COND	-	-	0.01	0.07	-	-	0.89	0.06	0.23	1.27
Produced Water Truck Loading	EU-LOAD-PW	-	-	<0.01	<0.01	-	-	0.02	<0.01	<0.01	0.02
11.7-mmBtu/hr Vapor Combustor	APC-COMB	-	-	<0.01	0.02	-	-	0.20	0.01	0.05	0.29
Vapor Combustor Pilot	EU-PILOT	-	-	<0.01	-	<0.01	-	<0.01	<0.01	-	<0.01
Fugitive Emissions	EU-FUG	-	-	0.01	0.02	-	-	0.28	0.02	0.07	0.40
Fugitive Haul Road Emissions	EU-HR	-	-	-	-	-	-	-	-	-	-
<b>Total =</b>		<b>0.04</b>	<b>0.04</b>	<b>0.04</b>	<b>0.12</b>	<b>0.83</b>	<b>0.04</b>	<b>1.42</b>	<b>0.11</b>	<b>0.36</b>	<b>3.01</b>

SWN Production Company, LLC  
 Roy Riggle Pad  
 Summary of Greenhouse Gas Emissions - Metric Tons per Year (Tonnes)

Equipment	Unit ID	Carbon Dioxide (CO <sub>2</sub> )		Methane (CH <sub>4</sub> )		Methane (CH <sub>4</sub> ) as CO <sub>2</sub> Eq.		Nitrous Oxide (N <sub>2</sub> O)		Nitrous Oxide (N <sub>2</sub> O) as CO <sub>2</sub> Eq.		Total CO <sub>2</sub> + CO <sub>2</sub> Eq. <sup>1</sup>	
		lb/hr	tonnes/yr	lb/hr	tonnes/yr	lb/hr	tonnes/yr	lb/hr	tonnes/yr	lb/hr	tonnes/yr	lb/hr	tonnes/yr
145-hp Caterpillar G3306 NA Engine	EU-ENG1	155.04	616.04	<0.01	0.01	0.07	0.27	<0.01	<0.01	0.08	0.33	155.19	616.64
145-hp Caterpillar G3306 NA Engine	EU-ENG2	155.04	616.04	<0.01	0.01	0.07	0.27	<0.01	<0.01	0.08	0.33	155.19	616.64
92-hp GM Vortec 5.7L NA Engine	EU-ENG3	91.48	363.48	<0.01	0.01	0.04	0.17	<0.01	<0.01	0.05	0.20	91.57	363.85
Three (3) 1.0-mmBtu/hr GPU Burners	EU-GPU1 - EU-GPU3	350.93	1,394.41	0.01	0.03	0.17	0.66	<0.01	<0.01	0.20	0.78	351.29	1,395.85
1.0-mmBtu/hr Heater Treater	EU-HT2	116.98	464.80	<0.01	0.01	0.06	0.22	<0.01	<0.01	0.07	0.26	117.10	465.28
Four (4) 400-bbl Condensate Tanks Routed to Vapor Combustor	EU-TANKS-COND	-	-	-	-	-	-	-	-	-	-	-	-
Four (4) 400-bbl Produced Water Tanks Routed to Vapor Combustor	EU-TANKS-PW	-	-	-	-	-	-	-	-	-	-	-	-
Condensate Truck Loading w/ Vapor Return Routed to Combustor	EU-LOAD-COND	<0.01	0.01	0.49	1.95	12.25	48.68	-	-	-	-	12.25	48.68
Produced Water Truck Loading	EU-LOAD-PW	0.01	0.03	1.76	7.00	44.07	175.11	-	-	-	-	44.08	175.14
11.7-mmBtu/hr Vapor Combustor	APC-COMB	1,368.63	5,438.21	0.03	0.10	0.64	2.56	<0.01	0.01	0.77	3.05	1,370.05	5,443.83
Vapor Combustor Pilot	EU-PILOT	1.80	7.15	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.80	7.16
Fugitive Emissions	EU-FUG	<0.01	0.02	0.99	3.95	24.83	98.64	-	-	-	-	24.83	98.66
Fugitive Haul Road Emissions	EU-HR	-	-	-	-	-	-	-	-	-	-	-	-
<b>Total =</b>		<b>2,239.91</b>	<b>8,900.19</b>	<b>3.29</b>	<b>13.06</b>	<b>82.19</b>	<b>326.59</b>	<b>&lt;0.01</b>	<b>0.02</b>	<b>1.25</b>	<b>4.96</b>	<b>2,323.35</b>	<b>9,231.74</b>

Notes:  
<sup>1</sup> CO<sub>2</sub> Equivalent = Pollutant times GWP multiplier. 40 CFR 98 Table A-1, Global Warming Potential (GWP) multiplier (100-Year Time Horizon): CO<sub>2</sub> = 1, CH<sub>4</sub> = 25, N<sub>2</sub>O = 298  
<sup>2</sup> Per API Compendium (2009) Chapter 5: Because most of the CH<sub>4</sub> and CO<sub>2</sub> emissions from storage tanks occur as a result of flashing (flashing is controlled by the vapor combustor in this case), working and breathing loss emissions of these gases are very small in production and virtually non-existent in the downstream segments. Vapors from the tanks are routed to the vapor combustor at this site. Therefore, GHG emissions from the tanks are assumed to be negligible.

SWN Production Company, LLC  
 Roy Riggle Pad  
 Summary of Greenhouse Gas Emissions - Short Tons per Year (Tons)

Equipment	Unit ID	Carbon Dioxide (CO <sub>2</sub> )		Methane (CH <sub>4</sub> )		Methane (CH <sub>4</sub> ) as CO <sub>2</sub> Eq.		Nitrous Oxide (N <sub>2</sub> O)		Nitrous Oxide (N <sub>2</sub> O) as CO <sub>2</sub> Eq.		Total CO <sub>2</sub> + CO <sub>2</sub> Eq. <sup>1</sup>	
		lb/hr	tons/yr <sup>2</sup>	lb/hr	tons/yr <sup>2</sup>	lb/hr	tons/yr	lb/hr	tons/yr <sup>2</sup>	lb/hr	tons/yr	lb/hr	tons/yr
145-hp Caterpillar G3306 NA Engine	EU-ENG1	155.04	679.06	<0.01	0.01	0.07	0.30	<0.01	<0.01	0.08	0.36	155.19	679.73
145-hp Caterpillar G3306 NA Engine	EU-ENG2	155.04	679.06	<0.01	0.01	0.07	0.30	<0.01	<0.01	0.08	0.36	155.19	679.73
92-hp GM Vortec 5.7L NA Engine	EU-ENG3	91.48	400.67	<0.01	0.01	0.04	0.19	<0.01	<0.01	0.05	0.23	91.57	401.08
Three (3) 1.0-mmBtu/hr GPU Burners	EU-GPU1 - EU-GPU3	350.93	1,537.08	0.01	0.03	0.17	0.72	<0.01	<0.01	0.20	0.86	351.29	1,538.67
1.0-mmBtu/hr Heater Treater	EU-HT2	116.98	512.36	<0.01	0.01	0.06	0.24	<0.01	<0.01	0.07	0.29	117.10	512.89
Four (4) 400-bbl Condensate Tanks Routed to Vapor Combustor	EU-TANKS-COND	-	-	-	-	-	-	-	-	-	-	-	-
Four (4) 400-bbl Produced Water Tanks Routed to Vapor Combustor	EU-TANKS-PW	-	-	-	-	-	-	-	-	-	-	-	-
Condensate Truck Loading w/ Vapor Return Routed to Combustor	EU-LOAD-COND	<0.01	0.01	0.49	2.15	12.25	53.66	-	-	-	-	12.25	53.67
Produced Water Truck Loading	EU-LOAD-PW	0.01	0.03	1.76	7.72	44.07	193.03	-	-	-	-	44.08	193.06
11.7-mmBtu/hr Vapor Combustor	APC-COMB	1,368.63	5,994.61	0.03	0.11	0.64	2.82	<0.01	0.01	0.77	3.37	1,370.05	6,000.80
Vapor Combustor Pilot	EU-PILOT	1.80	7.88	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.80	7.89
Fugitive Emissions	EU-FUG	<0.01	0.02	0.99	4.35	24.83	108.73	-	-	-	-	24.83	108.75
Fugitive Haul Road Emissions	EU-HR	-	-	-	-	-	-	-	-	-	-	-	-
<b>Total =</b>		<b>2,239.91</b>	<b>9,810.78</b>	<b>3.29</b>	<b>14.40</b>	<b>82.19</b>	<b>360.01</b>	<b>&lt;0.01</b>	<b>0.02</b>	<b>1.25</b>	<b>5.47</b>	<b>2,323.35</b>	<b>10,176.25</b>

Notes:  
<sup>1</sup> CO<sub>2</sub> Equivalent = Pollutant times GWP multiplier. 40 CFR 98 Table A-1, Global Warming Potential (GWP) multiplier (100-Year Time Horizon): CO<sub>2</sub> = 1, CH<sub>4</sub> = 25, N<sub>2</sub>O = 298  
<sup>2</sup> EPA and API GHG calculation methodologies calculate emissions in metric tons (tonnes). These values have been converted to short tons for consistency with permitting threshold units.  
<sup>3</sup> Per API Compendium (2009) Chapter 5: Because most of the CH<sub>4</sub> and CO<sub>2</sub> emissions from storage tanks occur as a result of flashing (flashing is controlled by the vapor combustor in this case), working and breathing loss emissions of these gases are very small in production and virtually non-existent in the downstream segments. Vapors from the tanks are routed to the vapor combustor at this site. Therefore, GHG emissions from the tanks are assumed to be negligible.



**SWN Production Company, LLC  
 Roy Riggle Pad  
 Engine Emissions Calculations - Criteria Air Pollutants**

**Equipment Information**

	<b><u>EU-ENG1</u></b>	<b><u>EU-ENG2</u></b>	<b><u>EU-ENG3</u></b>
Unit ID:	EP-ENG1	EP-ENG2	EP-ENG3
Emission Point ID:	Caterpillar	Caterpillar	GM
Make:	G3306 NA	G3306 NA	Vortec 5.7L NA
Model:	4S-RB	4S-RB	4S-RB
Design Class:	NSCR	NSCR	NSCR
Controls:	145	145	92
Horsepower (hp):	8,625	8,625	8,500
Fuel Use (Btu/hp-hr):	1,382	1,382	864
Fuel Use (scfh):	12.11	12.11	7.57
Annual Fuel Use (mmscf):	1.25	1.25	0.78
Fuel Use (mmBtu/hr):	678	678	650
Exhaust Flow (acfm):	1,101	1,101	1,200
Exhaust Temp (°F):	after 1/1/2011	after 1/1/2011	after 7/1/2008
Manufacture Date:	8,760	8,760	8,760
Operating Hours:	905	905	905
Fuel Heating Value (Btu/scf):			

**Uncontrolled Manufacturer Emission Factors <sup>1</sup>**

NOx (g/hp-hr):	13.47	13.47	14.00
CO (g/hp-hr):	13.47	13.47	11.00
NMNEHC/VOC (g/hp-hr):	0.22	0.22	0.40
Total VOC = NMNEHC + HCHO (g/hp-hr):	0.49	0.49	NA

**Post-Catalyst Emission Factors**

NOx Control Eff. %	92.58%	92.58%	92.86%
CO Control Eff. %	85.15%	85.15%	81.82%
NOx (g/hp-hr):	1.00	1.00	1.00
CO (g/hp-hr):	2.00	2.00	2.00
NMNEHC/VOC (g/hp-hr):	0.22	0.22	0.40
Total VOC = NMNEHC + HCHO (g/hp-hr):	0.49	0.49	NA

**Uncontrolled Criteria Air Pollutant Emissions**

	Unit ID:	<b><u>EU-ENG1</u></b>	<b><u>EU-ENG2</u></b>	<b><u>EU-ENG3</u></b>			
<b>Pollutant</b>		<b>lb/hr</b>	<b>TPY</b>	<b>lb/hr</b>	<b>TPY</b>	<b>lb/hr</b>	<b>TPY</b>
NOx		4.31	18.86	4.31	18.86	2.84	12.44
CO		4.31	18.86	4.31	18.86	2.23	9.77
NMNEHC/VOC (does not include HCHO)		0.07	0.31	0.07	0.31	0.08	0.36
Total VOC (includes HCHO)		0.16	0.69	0.16	0.69	0.10	0.43
SO <sub>2</sub>		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
PM <sub>10/2.5</sub>		0.01	0.05	0.01	0.05	0.01	0.03
PM <sub>COND</sub>		0.01	0.05	0.01	0.05	0.01	0.03
PM <sub>TOT</sub>		0.02	0.11	0.02	0.11	0.02	0.07

**SWN Production Company, LLC  
 Roy Riggle Pad  
 Engine Emissions Calculations - Criteria Air Pollutants (Continued)**

**Proposed Criteria Air Pollutant Emissions<sup>2</sup>**

<b>Pollutant</b>	<b>lb/hr</b>	<b>TPY</b>	<b>lb/hr</b>	<b>TPY</b>	<b>lb/hr</b>	<b>TPY</b>
NO <sub>x</sub>	0.32	1.40	0.32	1.40	0.20	0.89
CO	0.64	2.80	0.64	2.80	0.41	1.78
NMNEHC/VOC (does not include HCHO)	0.07	0.31	0.07	0.31	0.08	0.36
Total VOC (includes HCHO)	0.16	0.69	0.16	0.69	0.10	0.43
SO <sub>2</sub>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
PM <sub>10/2.5</sub>	0.01	0.05	0.01	0.05	0.01	0.03
PM <sub>COND</sub>	0.01	0.05	0.01	0.05	0.01	0.03
PM <sub>TOT</sub>	0.02	0.11	0.02	0.11	0.02	0.07

**AP-42 Emission Factors (lb/mmBtu)<sup>3</sup>**

**4S-RB**

<b>Pollutant</b>	<b>3.2-3 (7/00)</b>
SO <sub>2</sub>	5.88E-04
PM <sub>10/2.5</sub>	9.50E-03
PM <sub>COND</sub>	9.91E-03
PM <sub>TOT</sub>	1.94E-02

Notes:

<sup>1</sup> Uncontrolled emission factors based on engine manufacturer data. Per Caterpillar, NMNEHC emission factor does not include formaldehyde (HCHO); therefore, NMNEHC and HCHO factors have been added to demonstrate total uncontrolled VOC. All

<sup>2</sup> Post-catalyst emission factors for the Caterpillar engines are based on catalyst manufacturer data and/or NSPS Subpart JJJJ limits, if applicable. Per NSPS Subpart JJJJ, VOC limit does not include HCHO; therefore, HCHO emissions have been added to the NSPS JJJJ VOC emission rates for demonstration purposes only.

<sup>3</sup> Per AP-42, all particulate matter (PM) from combustion of natural gas (total, condensable and filterable PM) is presumed <1 micrometer in diameter.

**SWN Production Company, LLC  
 Roy Riggle Pad  
 Engine Emissions Calculations - Hazardous Air Pollutants**

**Equipment Information**

Unit ID:	<b><u>EU-ENG1</u></b>	<b><u>EU-ENG2</u></b>	<b><u>EU-ENG3</u></b>
Emission Point ID:	EP-ENG1	EP-ENG2	EP-ENG3
Make:	Caterpillar	Caterpillar	GM
Model:	G3306 NA	G3306 NA	Vortec 5.7L NA
Design Class:	4S-RB	4S-RB	4S-RB
Controls:	NSCR	NSCR	NSCR
Horsepower (hp):	145	145.0	92
Fuel Use (Btu/hp-hr):	8,625	8,625	8,500
Fuel Use (scfh):	1,382	1,382	864
Annual Fuel Use (mmscf):	12.11	12.11	7.57
Fuel Use (mmBtu/hr):	1.25	1.25	0.78
Exhaust Flow (acfm):	678	678	650
Exhaust Temp (°F):	1,101	1,101	1,200
Operating Hours:	8,760	8,760	8,760

**Proposed HAP Emissions<sup>1,2</sup>**

Unit ID:                   **EU-ENG1**                                   **EU-ENG2**                                   **EU-ENG3**

<b>Pollutant</b>	<b>lb/hr</b>	<b>TPY</b>	<b>lb/hr</b>	<b>TPY</b>	<b>lb/hr</b>	<b>TPY</b>
Acetaldehyde	<0.01	0.02	<0.01	0.02	<0.01	0.01
Acrolein	<0.01	0.01	<0.01	0.01	<0.01	0.01
Benzene	<0.01	0.01	<0.01	0.01	<0.01	0.01
Ethylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Formaldehyde	0.09	0.38	0.09	0.38	0.02	0.07
Methanol	<0.01	0.02	<0.01	0.02	<0.01	0.01
Toluene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Xylenes	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
<b>Total HAP =</b>	<b>0.10</b>	<b>0.44</b>	<b>0.10</b>	<b>0.44</b>	<b>0.02</b>	<b>0.11</b>

**SWN Production Company, LLC  
Roy Riggle Pad**

**AP-42 Emission Factors (lb/mmBtu)**

**4S-RB**

<b>Pollutant</b>	<b>3.2-3 (7/00)</b>
Acetaldehyde	2.79E-03
Acrolein	2.63E-03
Benzene	1.58E-03
Ethylbenzene	2.18E-05
Formaldehyde	2.05E-02
Methanol	3.06E-03
Toluene	5.58E-04
Xylenes	1.95E-04

Notes:

<sup>1</sup> Manuf. data for uncontrolled Caterpillar G3306 NA HCHO emissions (g/hp-hr): 0.27

Manuf. Data for uncontrolled GM Vortec 5.7L NA HCHO emissions (g/kW-hr): NA

<sup>2</sup> For conservative estimate, no reduction taken for any HAP .

**SWN Production Company, LLC  
 Roy Riggle Pad  
 Engine Emissions Calculations - Greenhouse Gases**

**Equipment Information**

	<b><u>EU-ENG1</u></b>	<b><u>EU-ENG2</u></b>	<b><u>EU-ENG3</u></b>
Unit ID:	EP-ENG1	EP-ENG2	EP-ENG3
Emission Point ID:	Caterpillar	Caterpillar	GM
Make:	G3306 NA	G3306 NA	Vortec 5.7L NA
Model:	4S-RB	4S-RB	4S-RB
Design Class:	NSCR	NSCR	NSCR
Controls:	145	145.0	92
Horsepower (hp):	8,625	8,625	8,500
Fuel Use (Btu/hp-hr):	1,382	1,382	864
Fuel Use (scfh):	1.25	1.25	0.78
Fuel Use (mmBtu/hr):	678	678	650
Exhaust Flow (acfm):	1,101	1,101	1,200
Exhaust Temp (°F):	8,760	8,760	8,760
Operating Hours:			

**Manufacturer Emission Factors (g/hp-hr)<sup>1</sup>**

CO <sub>2</sub> =	485	485	NA
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**Greenhouse Gas (GHG) Emissions<sup>1</sup>**

	<b><u>EU-ENG1</u></b>	<b><u>EU-ENG2</u></b>	<b><u>EU-ENG3</u></b>
Unit ID:			
<b>Pollutant</b>	<b>lb/hr</b>	<b>tonnes/yr</b>	<b>lb/hr</b>
			<b>tonnes/yr</b>
			<b>lb/hr</b>
			<b>tonnes/yr</b>
CO <sub>2</sub>	155.04	616.04	155.04
			616.04
CH <sub>4</sub>	<0.01	0.01	<0.01
			0.01
N <sub>2</sub> O	<0.01	<0.01	<0.01
			<0.01
CH <sub>4</sub> as CO <sub>2</sub> e	0.07	0.27	0.07
			0.27
N <sub>2</sub> O as CO <sub>2</sub> e	0.08	0.33	0.08
			0.33
<b>Total CO<sub>2</sub> + CO<sub>2</sub>e =</b>	<b>155.19</b>	<b>616.64</b>	<b>155.19</b>
			<b>616.64</b>
			<b>91.57</b>
			<b>363.85</b>

**40 CFR 98 Tables ENG-1 Emission Factors (kg/mmBtu)<sup>2</sup>**

Carbon Dioxide (CO <sub>2</sub> )	53.06
Methane (CH <sub>4</sub> )	1.00E-03
Nitrous Oxide (N <sub>2</sub> O)	1.00E-04

Notes:

<sup>1</sup> Caterpillar manufacturer data used to estimate CO<sub>2</sub> emissions for the Caterpillar engines. All other emissions estimated using EPA data. Conversion to short tons (tons) found in site-wide Summary of

<sup>2</sup> CO<sub>2</sub>e = CO<sub>2</sub> equivalent (Pollutant times GWP multiplier):

40 CFR 98 Table A-1, Global Warming Potential (GWP) multiplier: CO<sub>2</sub> = 1, CH<sub>4</sub> = 25, N<sub>2</sub>O = 298

**SWN Production Company, LLC  
 Roy Riggle Pad  
 Gas Production Unit Burner Emissions Calculations - Criteria Air Pollutants**

**Equipment Information**

Unit ID:	<b><u>EU-GPU1 - EU-GPU3 (EACH)</u></b>
Emission Point ID:	EP-GPU1 - EP-GPU3
Description:	Gas Production Unit Burner
Number of Units:	3
Burner Design (mmBtu/hr):	1.0
Fuel HHV (Btu/scf):	905
Annual Fuel Use (mmscf):	9.68
Annual Operating Hours:	8,760

**Criteria Air Pollutant Emissions**

Unit ID: **EU-GPU1 - EU-GPU3 (EACH)** **EU-GPU1 - EU-GPU5 (TOTAL)**

Pollutant	lb/hr	TPY	lb/hr	TPY
NOx	0.11	0.48	0.33	1.45
CO	0.09	0.41	0.28	1.22
VOC	0.01	0.03	0.02	0.08
SO <sub>2</sub>	<0.01	<0.01	<0.01	0.01
PM <sub>10/2.5</sub>	0.01	0.03	0.02	0.08
PM <sub>COND</sub>	<0.01	0.01	0.01	0.03
PM <sub>TOT</sub>	0.01	0.04	0.03	0.11

**AP-42 Emission Factors for Units <100 mmBtu/hr (lb/mmscf)<sup>1</sup>**

Pollutant	1.4-1, -2 (7/98)
NOx	100.0
CO	84.0
VOC	5.5
SO <sub>2</sub>	0.6
PM <sub>10/2.5</sub>	5.7
PM <sub>COND</sub>	1.9
PM <sub>TOT</sub>	7.6

Notes:

<sup>1</sup> All PM (total, condensable and filterable) is assumed to be <1 micrometer in diameter. Total PM is the sum of filterable PM and cc

**SWN Production Company, LLC  
 Roy Riggle Pad  
 Gas Production Unit Burner Emissions Calculations - Hazardous Air Pollutants**

**Equipment Information**

Unit ID: **EU-GPU1 - EU-GPU3 (EACH)**  
 Emission Point ID: EP-GPU1 - EP-GPU3  
 Description: Gas Production Unit Burner  
 Number of Units: 3  
 Burner Design (mmBtu/hr): 1.0  
 Fuel HHV (Btu/scf): 905  
 Annual Fuel Use (mmscf): 9.68  
 Annual Operating Hours: 8,760

**Hazardous Air Pollutant Emissions**

Unit ID: **EU-GPU1 - EU-GPU3 (EACH)** **EU-GPU1 - EU-GPU5 (TOTAL)**

Pollutant	lb/hr	TPY	lb/hr	TPY
n-Hexane	<0.01	0.01	<0.01	0.03
Formaldehyde	<0.01	<0.01	<0.01	<0.01
Benzene	<0.01	<0.01	<0.01	<0.01
Toluene	<0.01	<0.01	<0.01	<0.01
<b>Total HAP =</b>	<b>&lt;0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.03</b>

**AP-42 Emission Factors (lb/mmscf)**

Pollutant	1.4-3 (7/98)
n-Hexane	1.80E+00
Formaldehyde	7.50E-02
Benzene	2.10E-03
Toluene	3.40E-03

**SWN Production Company, LLC  
 Roy Riggle Pad  
 Gas Production Unit Burner Emissions Calculations - Greenhouse Gases**

**Equipment Information**

Unit ID:	<b><u>EU-GPU1 - EU-GPU3 (EACH)</u></b>
Emission Point ID:	EP-GPU1 - EP-GPU3
Description:	Gas Production Unit Burner
Number of Units:	3
Burner Design (mmBtu/hr):	1.0
Fuel HHV (Btu/scf):	905
Annual Fuel Use (mmscf):	9.68
Annual Operating Hours:	8,760

**Greenhouse Gas (GHG) Emissions<sup>1</sup>**

Unit ID: **EU-GPU1 - EU-GPU3 (EACH)** **EU-GPU1 - EU-GPU5 (TOTAL)**

Pollutant	lb/hr	tonnes/yr	lb/hr	tonnes/yr
CO <sub>2</sub>	116.98	464.80	350.93	1,394.41
CH <sub>4</sub>	<0.01	0.01	0.01	0.03
N <sub>2</sub> O	<0.01	<0.01	<0.01	<0.01
CH <sub>4</sub> as CO <sub>2</sub> e	0.06	0.22	0.17	0.66
N <sub>2</sub> O as CO <sub>2</sub> e	0.07	0.26	0.20	0.78
<b>Total CO<sub>2</sub> + CO<sub>2</sub>e =</b>	<b>117.10</b>	<b>465.28</b>	<b>351.29</b>	<b>1,395.85</b>

**40 CFR 98 Tables C-1 and C-2 Emission Factors (kg/mmBtu)<sup>2</sup>**

Carbon Dioxide (CO <sub>2</sub> )	53.06
Methane (CH <sub>4</sub> )	1.00E-03
Nitrous Oxide (N <sub>2</sub> O)	1.00E-04

Notes:

<sup>1</sup> Conversion to short tons (tons) found in site-wide Summary of Greenhouse Gases - Short Tons per Year (tons) table.

<sup>2</sup> CO<sub>2</sub>e = CO<sub>2</sub> equivalent (Pollutant times GWP multiplier):

40 CFR 98 Table A-1, Global Warming Potential (GWP) multiplier: CO<sub>2</sub> = 1, CH<sub>4</sub> = 25, N<sub>2</sub>O = 298



**SWN Production Company, LLC  
 Roy Riggle Pad  
 Heater Treater Emissions Calculations - Criteria Air Pollutants**

**Equipment Information**

Unit ID:	<b><u>EU-HT2</u></b>
Emission Point ID:	EP-HT2
Description:	Heater Treater
Number of Units:	1
Burner Design (mmBtu/hr):	1.0
Fuel HHV (Btu/scf):	905
Annual Fuel Use (mmscf):	9.68
Annual Operating Hours:	8,760

**Criteria Air Pollutant Emissions**

Unit ID: **EU-HT2**

<b>Pollutant</b>	<b>lb/hr</b>	<b>TPY</b>
NO <sub>x</sub>	0.11	0.48
CO	0.09	0.41
VOC	0.01	0.03
SO <sub>2</sub>	<0.01	<0.01
PM <sub>10/2.5</sub>	0.01	0.03
PM <sub>COND</sub>	<0.01	0.01
PM <sub>TOT</sub>	0.01	0.04

**AP-42 Emission Factors for Units <100 mmBtu/hr (lb/mmscf)<sup>1</sup>**

<b>Pollutant</b>	<b>1.4-1, -2 (7/98)</b>
NO <sub>x</sub>	100.0
CO	84.0
VOC	5.5
SO <sub>2</sub>	0.6
PM <sub>10/2.5</sub>	5.7
PM <sub>COND</sub>	1.9
PM <sub>TOT</sub>	7.6

Notes:

<sup>1</sup> All PM (total, condensable and filterable) is assumed to be <1 micrometer in diameter. Total PM is the sum of filterable PM and condensable PM.

**SWN Production Company, LLC  
 Roy Riggle Pad  
 Heater Treater Emissions Calculations - Hazardous Air Pollutants**

**Equipment Information**

Unit ID:	<b><u>EU-HT2</u></b>
Emission Point ID:	EP-HT2
Description:	Heater Treater
Number of Units:	1
Burner Design (mmBtu/hr):	1.0
Fuel HHV (Btu/scf):	905
Annual Fuel Use (mmscf):	9.68
Annual Operating Hours:	8,760

**Hazardous Air Pollutant Emissions**

Unit ID: **EU-HT2**

<b>Pollutant</b>	<b>lb/hr</b>	<b>TPY</b>
n-Hexane	<0.01	0.01
Formaldehyde	<0.01	<0.01
Benzene	<0.01	<0.01
Toluene	<0.01	<0.01
<b>Total HAP =</b>	<b>&lt;0.01</b>	<b>0.01</b>

**AP-42 Emission Factors (lb/mmscf)**

<b>Pollutant</b>	<b>1.4-3 (7/98)</b>
n-Hexane	1.80E+00
Formaldehyde	7.50E-02
Benzene	2.10E-03
Toluene	3.40E-03

**SWN Production Company, LLC  
 Roy Riggle Pad  
 Heater Treater Emissions Calculations - Greenhouse Gases**

**Equipment Information**

Unit ID:	<b><u>EU-HT2</u></b>
Emission Point ID:	EP-HT2
Description:	Heater Treater
Number of Units:	1
Burner Design (mmBtu/hr):	1.0
Fuel HHV (Btu/scf):	905
Annual Fuel Use (mmscf):	9.68
Annual Operating Hours:	8,760

**Greenhouse Gas (GHG) Emissions<sup>1</sup>**

Unit ID: **EU-HT2**

Pollutant	lb/hr	tonnes/yr
CO <sub>2</sub>	116.98	464.80
CH <sub>4</sub>	<0.01	0.01
N <sub>2</sub> O	<0.01	<0.01
CH <sub>4</sub> as CO <sub>2</sub> e	0.06	0.22
N <sub>2</sub> O as CO <sub>2</sub> e	0.07	0.26
<b>Total CO<sub>2</sub> + CO<sub>2</sub>e =</b>	<b>117.10</b>	<b>465.28</b>

**40 CFR 98 Tables C-1 and C-2 Emission Factors (kg/mmBtu)<sup>2</sup>**

Carbon Dioxide (CO <sub>2</sub> )	53.06
Methane (CH <sub>4</sub> )	1.00E-03
Nitrous Oxide (N <sub>2</sub> O)	1.00E-04

Notes:

<sup>1</sup> Conversion to short tons (tons) found in site-wide Summary of Greenhouse Gases - Short Tons per Year (tons) table.

<sup>2</sup> CO<sub>2</sub>e = CO<sub>2</sub> equivalent (Pollutant times GWP multiplier):

40 CFR 98 Table A-1, Global Warming Potential (GWP) multiplier: CO<sub>2</sub> = 1, CH<sub>4</sub> = 25, N<sub>2</sub>O = 298

**SWN Production Company, LLC  
 Roy Riggle Pad  
 Storage Tank Emissions - Criteria Air Pollutants**

**Tank Information**

Unit ID:	<b><u>EU-TANKS-COND</u></b>	<b><u>EU-TANKS-PW</u></b>
Emission Point ID:	APC-COMB	APC-COMB
Contents: <sup>1</sup>	Condensate	Produced Water
Number of Tanks:	4	4
Capacity (bbl) - Per Tank:	400	400
Capacity (gal) - Per Tank:	16,800	16,800
<b>Total:</b>		
Total Throughput (bbl/yr):	337,158	363,876
Total Throughput (gal/yr):	14,160,628	15,282,784
Total Throughput (bbl/d):	924	997
<b>Per Tank:</b>		
Throughput (bbl/yr):	84,289	90,969
Throughput (gal/yr):	3,540,157	3,820,696
Throughput (bbl/d):	1,254	1,996
Turnovers:	842.89	909.69
Tank Vapor Capture Efficiency:	100%	100%
Captured Vapors Routed to:	Vapor Combustor	Vapor Combustor

**Uncontrolled Storage Tank Emissions<sup>2</sup>**

Unit ID: **EU-TANKS-COND** **EU-TANKS-PW**

Emissions	lb/hr	TPY	lb/hr	TPY
Working and Breathing Losses	17.31	75.82	0.05	0.23
Flashing Losses	19.25	84.30	1.04	4.57
<b>Total VOC =</b>	<b>36.56</b>	<b>160.12</b>	<b>1.10</b>	<b>4.80</b>

**Controlled Storage Tank Emissions<sup>3</sup>**

Unit ID: **EU-TANKS-COND** **EU-TANKS-PW**

Emissions	lb/hr	TPY	lb/hr	TPY
Working and Breathing Losses	0.35	1.52	<0.01	<0.01
Flashing Losses	0.38	1.69	0.02	0.09
<b>Total VOC =</b>	<b>0.73</b>	<b>3.20</b>	<b>0.02</b>	<b>0.10</b>
<b>Per Tank =</b>	<b>0.18</b>	<b>0.80</b>	<b>0.01</b>	<b>0.02</b>

Notes:

<sup>1</sup> Produced water tanks assumed to contain 99% produced water and 1% condensate.

<sup>2</sup> Tank working, breathing, and flashing emissions were calculated using Promax process simulation. Reports located in Attachment L. Uncontrolled tank working/breathing/flashing emissions will be routed to a vapor combustor with 100% capture efficiency.

<sup>3</sup> Controlled tank emissions are shown for reference only.

**SWN Production Company, LLC  
 Roy Riggle Pad  
 Storage Tank Emissions - Hazardous Air Pollutants**

**Uncontrolled Storage Tank Emissions**

Unit ID: **EU-TANKS-COND** **EU-TANKS-PW**

Pollutant	lb/hr	TPY	lb/hr	TPY
<b>Total VOC = <sup>1,2</sup></b>	<b>36.56</b>	<b>160.12</b>	<b>1.10</b>	<b>4.80</b>
n-Hexane	1.79	7.86	0.05	0.24
Benzene	0.02	0.10	<0.01	<0.01
Toluene	0.13	0.56	<0.01	0.02
Ethylbenzene	0.15	0.66	<0.01	0.02
Xylenes	0.47	2.06	0.01	0.06
<b>Total HAP =</b>	<b>2.56</b>	<b>11.23</b>	<b>0.08</b>	<b>0.34</b>

**Controlled Storage Tank Emissions**<sup>3</sup>

Unit ID: **EU-TANKS-COND** **EU-TANKS-PW**

Pollutant	lb/hr	TPY	lb/hr	TPY
<b>Total VOC = <sup>1</sup></b>	<b>0.73</b>	<b>3.20</b>	<b>0.02</b>	<b>0.10</b>
n-Hexane	0.04	0.16	<0.01	<0.01
Benzene	<0.01	<0.01	<0.01	<0.01
Toluene	<0.01	0.01	<0.01	<0.01
Ethylbenzene	<0.01	0.01	<0.01	<0.01
Xylenes	0.01	0.04	<0.01	<0.01
<b>Total HAP =</b>	<b>0.05</b>	<b>0.22</b>	<b>&lt;0.01</b>	<b>0.01</b>

**Estimated HAP Composition (% by Weight)**<sup>4</sup>

Pollutant	Wt%
n-Hexane	4.908%
Benzene	0.064%
Toluene	0.348%
Ethylbenzene	0.411%
Xylenes	1.285%
<b>Total HAP =</b>	<b>7.016%</b>

Notes:

<sup>1</sup> VOC emissions calculated in Criteria Air Pollutant calculations.

<sup>2</sup> Uncontrolled condensate tank working/breathing/flashing emissions are controlled by a vapor combustor with 100% capture efficiency.

<sup>3</sup> Controlled tank emissions are shown for reference only.

<sup>4</sup> Speciated liquids analysis located in Fugitive Emissions Calculations. HAP weight % calculated as % of total hydrocarbons in the sample. All HAP assumed to volatilize from liquids for most conservative emissions estimate.

**SWN Production Company, LLC  
 Roy Riggle Pad  
 Tank Emissions Calculations - Greenhouse Gases**

**Equipment Information**

Unit ID:	<b><u>EU-TANKS-COND</u></b>	<b><u>EU-TANKS-PW</u></b>
Emission Point ID:	APC-COMB	APC-COMB
Contents:	Condensate	Produced Water
Number of Tanks:	4	4
Capacity (bbl) - Per Tank:	400	400
Capacity (gal) - Per Tank:	16,800	16,800
<b>Total:</b>		
Total Throughput (bbl/yr):	337,158	363,876
Total Throughput (gal/yr):	14,160,628	15,282,784
Total Throughput (bbl/d):	924	997
<b>Per Tank:</b>		
Throughput (bbl/yr):	84,289	90,969
Throughput (gal/yr):	3,540,157	3,820,696
Throughput (bbl/d):	1254	1996
Turnovers:	842.89	909.69
Tank Vapor Capture Efficiency:	100%	100%
Captured Vapors Routed to:	Vapor Combustor	Vapor Combustor

**Uncontrolled Greenhouse Gas Emissions**<sup>1,2</sup>

Unit ID: **EU-TANKS-COND** **EU-TANKS-PW**

Greenhouse Gas	Avg. lb/hr <sup>3</sup>	tonnes/yr	Avg. lb/hr <sup>3</sup>	tonnes/yr
CH <sub>4</sub>	1.86	7.39	3.61	14.33
CH <sub>4</sub> as CO <sub>2</sub> e	46.53	184.87	90.14	358.16
CO <sub>2</sub>	0.09	0.36	0.15	0.60
<b>Total CO<sub>2</sub> + CO<sub>2</sub>e =</b>	<b>46.62</b>	<b>185.23</b>	<b>90.29</b>	<b>358.76</b>
<b>Per Tank =</b>	<b>11.65</b>	<b>46.31</b>	<b>22.57</b>	<b>89.69</b>

Greenhouse Gas	Avg. lb/hr <sup>3</sup>	tons/yr	Avg. lb/hr <sup>3</sup>	tons/yr
CH <sub>4</sub>	1.86	8.15	3.61	15.79
CH <sub>4</sub> as CO <sub>2</sub> e	46.53	203.78	90.14	394.81
CO <sub>2</sub>	0.09	0.40	0.15	0.66
<b>Total CO<sub>2</sub> + CO<sub>2</sub>e =</b>	<b>46.62</b>	<b>204.18</b>	<b>90.29</b>	<b>395.47</b>
<b>Per Tank =</b>	<b>11.65</b>	<b>51.05</b>	<b>22.57</b>	<b>98.87</b>

**SWN Production Company, LLC  
Roy Riggle Pad  
Tank Emissions Calculations - Greenhouse Gases**

Notes:

1) Per API Chapter 5: CH<sub>4</sub> and CO<sub>2</sub> emissions from crude storage tanks occur mainly as a result of flashing; working and breathing loss emissions of these gases are very small in production and virtually non-existent in downstream segments. Unless site-specific data indicate otherwise, working and breathing losses are presumed to contain no CH<sub>4</sub> or CO<sub>2</sub>.

2) CO<sub>2</sub>e = CO<sub>2</sub> equivalent (Pollutant times GWP multiplier)

3) Due to variable short-term emission rates, average lb/hr based on annual emissions shown for reference only.

**40 CFR 98 Table A-1, Global Warning Potential (GWP) Multiplier**

Methane (CH <sub>4</sub> )	25
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**SWN Production Company, LLC  
 Roy Riggle Pad  
 Condensate Truck Loading Emissions - Criteria and Hazardous Air Pollutants**

**Loading Information**

Unit ID: **EU-LOAD-COND**  
 Emission Point ID: APC-COMB  
 Fill Method: Submerged  
 Type of Service: Dedicated  
 Mode of Operation: Normal  
 Saturation Factor: 0.6  
 Throughput (1000 gal): 14,160.63  
 Control Type: Vapor Return/Combustion  
 Vapor Capture Efficiency: <sup>1</sup> 70%  
 Average Fill Rate (gal/hr): 7,500  
 Captured Vapors Routed to: Vapor Combustor  
 VOC Weight %: 88.05%

13.6448	= P, True vapor pressure of liquid loaded (max. psia)
51.26	= M, Molecular weight of vapor (lb/lb-mol)
102.06	= T, Temperature of bulk liquid loaded (average °F)
562.06	= T, Temperature of bulk liquid loaded (°F + 460 = °R)

**Uncontrolled Loading Emissions<sup>2</sup>**

Pollutant	Max. lb/hr	Avg. lb/hr	TPY
<b>VOC =</b>	<b>64.05</b>	<b>13.81</b>	<b>60.47</b>
n-Hexane	3.14	0.68	2.97
Benzene	0.04	0.01	0.04
Toluene	0.22	0.05	0.21
Ethylbenzene	0.26	0.06	0.25
Xylenes	0.82	0.18	0.78
<b>Total HAP =</b>	<b>4.49</b>	<b>0.97</b>	<b>4.24</b>

**Uncaptured Loading Emissions<sup>2</sup>**

Pollutant	Max. lb/hr	Avg. lb/hr	TPY
<b>VOC =</b>	<b>19.22</b>	<b>4.14</b>	<b>18.14</b>
n-Hexane	0.94	0.20	0.89
Benzene	0.01	<0.01	0.01
Toluene	0.07	0.01	0.06
Ethylbenzene	0.08	0.02	0.07
Xylenes	0.25	0.05	0.23
<b>Total HAP =</b>	<b>1.35</b>	<b>0.29</b>	<b>1.27</b>



**SWN Production Company, LLC  
 Roy Riggle Pad  
 Condensate Truck Loading Emissions - Criteria and Hazardous Air Pollutants (Continued)**

**Estimated HAP Composition (% by Weight)<sup>3</sup>**

<b>Pollutant</b>	<b>Wt%</b>
n-Hexane	4.908%
Benzene	0.064%
Toluene	0.348%
Ethylbenzene	0.411%
Xylenes	1.285%
<b>Total HAP =</b>	<b>7.016%</b>

Notes:

<sup>1</sup> Uncontrolled emissions that are captured by the collection system are routed to a vapor combustor. Per AP-42 5.2-6, 70% capture efficiency can be assumed for trucks not subject to NSPS. Uncaptured emissions shown represent those not captured by the collection system or controlled by the vapor combustor.

<sup>2</sup> Maximum lb/hr based on average hourly truck loading rate. Average lb/hr based on TPY conversion assuming continuous operation.

<sup>3</sup> Speciated liquids analysis located in Fugitive Emissions Calculations. HAP weight % calculated as % of total hydrocarbons in the sample. All HAP assumed to volatilize from liquids for most conservative emissions estimate.

**SWN Production Company, LLC  
 Roy Riggle Pad  
 Condensate Truck Loading Emissions - Greenhouse Gases**

**Loading Information**

Unit ID:	<b><u>EU-LOAD-COND</u></b>
Emission Point ID:	APC-COMB
Fill Method:	Submerged
Type of Service:	Dedicated
Mode of Operation:	Normal
TOC Em. Factor (tonne/10 <sup>6</sup> gal): <sup>1</sup>	0.91
Throughput (10 <sup>6</sup> gal):	14.161
Control Type:	Vapor Return/Combustion
Vapor Capture Efficiency: <sup>2</sup>	70.00%
Average Fill Rate (gal/hr):	7,500
Captured Vapors Routed to:	Vapor Combustor

Analysis CH <sub>4</sub> wt% =	50.36580%
Analysis CO <sub>2</sub> wt% =	0.21422%

**Uncontrolled Loading Emissions<sup>3,4</sup>**

Pollutant	Max. lb/hr	Avg. lb/hr	tonnes/yr	tons/yr
CH <sub>4</sub>	7.58	1.63	6.49	7.15
CH <sub>4</sub> as CO <sub>2</sub> e	189.46	40.83	162.26	178.86
CO <sub>2</sub>	0.03	0.01	0.03	0.03
<b>Total CO<sub>2</sub> + CO<sub>2</sub>e =</b>	<b>189.49</b>	<b>40.84</b>	<b>162.28</b>	<b>178.89</b>

**Uncaptured Loading Emissions<sup>3,4</sup>**

Pollutant	Max. lb/hr	Avg. lb/hr	tonnes/yr	tons/yr
CH <sub>4</sub>	2.27	0.49	1.95	2.15
CH <sub>4</sub> as CO <sub>2</sub> e	56.84	12.25	48.68	53.66
CO <sub>2</sub>	0.01	<0.01	0.01	0.01
<b>Total CO<sub>2</sub> + CO<sub>2</sub>e =</b>	<b>56.85</b>	<b>12.25</b>	<b>48.68</b>	<b>53.67</b>

**SWN Production Company, LLC  
 Roy Riggle Pad  
 Condensate Truck Loading Emissions - Greenhouse Gases (Continued)**

**API Compendium Table 5-12**

<b>Loading Type</b>	<b>Emission Factor (tonne TOC/10<sup>6</sup> gal)</b>
Rail/Truck - Submerged Loading - Dedicated Normal Service	0.91
Rail/Truck - Submerged Loading - Vapor Balance Service	1.51
Rail/Truck - Splash Loading - Dedicated Normal Service	2.20
Rail/Truck - Splash Loading - Vapor Balance Service	1.51
Marine Loading - Ships/Ocean Barges	0.28
Marine Loading - Barges	0.45

Notes:

<sup>1</sup> API Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Gas Industry, Table 5-12.

<sup>2</sup> Uncontrolled emissions that are captured by the collection system are routed to a vapor combustor. Per AP-42 5.2-6, 70% capture efficiency can be assumed for trucks not subject to NSPS. Uncaptured emissions shown represent those not captured by the collection system or controlled by the vapor combustor.

<sup>3</sup> Maximum lb/hr based on average hourly truck loading rate. Average lb/hr based on TPY conversion assuming continuous operation.

<sup>4</sup> CO<sub>2</sub>e = CO<sub>2</sub> equivalent (Pollutant times GWP multiplier):

40 CFR 98 Table A-1, Global Warming Potential (GWP) multiplier: CO<sub>2</sub> = 1, CH<sub>4</sub> = 25

**SWN Production Company, LLC  
 Roy Riggle Pad  
 Produced Water Truck Loading Emissions - Criteria and Hazardous Air Pollutants**

**Loading Information**

Unit ID: **EU-LOAD-PW**  
 Emission Point ID: EP-LOAD-PW  
 Fill Method: Submerged  
 Type of Service: Dedicated  
 Mode of Operation: Normal  
 Saturation Factor: 0.6  
 Throughput (1000 gal): 15,282.78  
 Control Type: None  
 Average Fill Rate (gal/hr): 7,500  
 VOC Weight %: 13.43%

13.5148	= P, True vapor pressure of liquid loaded (max. psia)
22.99	= M, Molecular weight of vapor (lb/lb-mol)
87.69	= T, Temperature of bulk liquid loaded (average °F)
547.69	= T, Temperature of bulk liquid loaded (°F + 460 = °R)

**Uncontrolled Loading Emissions<sup>1</sup>**

Pollutant	Max. lb/hr	Avg. lb/hr	TPY
<b>VOC =</b>	<b>0.33</b>	<b>0.08</b>	<b>0.34</b>
n-Hexane	0.02	<0.01	0.02
Benzene	<0.01	<0.01	<0.01
Toluene	<0.01	<0.01	<0.01
Ethylbenzene	<0.01	<0.01	<0.01
Xylenes	<0.01	<0.01	<0.01
<b>Total HAP =</b>	<b>0.02</b>	<b>0.01</b>	<b>0.02</b>

**Estimated HAP Composition (% by Weight)<sup>2</sup>**

Pollutant	Wt%
n-Hexane	4.908%
Benzene	0.064%
Toluene	0.348%
Ethylbenzene	0.411%
Xylenes	1.285%
<b>Total HAP =</b>	<b>7.016%</b>

Notes:

<sup>1</sup> Maximum lb/hr based on average hourly truck loading rate. Average lb/hr based on TPY conversion assuming continuous operation.

<sup>2</sup> Speciated liquids analysis located in Fugitive Emissions Calculations. HAP weight % calculated as % of total hydrocarbons in the sample. All HAP assumed to volatilize from liquids for most conservative emissions estimate.

**SWN Production Company, LLC  
 Roy Riggle Pad  
 Produced Water Truck Loading Emissions - Greenhouse Gases**

**Loading Information**

Unit ID: **EU-LOAD-PW**  
 Emission Point ID: APC-COMB  
 Fill Method: Submerged  
 Type of Service: Dedicated  
 Mode of Operation: Normal  
 TOC Em. Factor (tonne/10<sup>6</sup> gal): <sup>1</sup> 0.91  
 Throughput (10<sup>6</sup> gal): 15.2828  
 Control Type: None  
 Average Fill Rate (gal/hr): 7,500

Analysis CH <sub>4</sub> wt% =	50.36580%
Analysis CO <sub>2</sub> wt% =	0.21422%

**Uncontrolled Loading Emissions<sup>2,3</sup>**

Pollutant	Max. lb/hr	Avg. lb/hr	tonnes/yr	tons/yr
CH <sub>4</sub>	7.58	1.76	7.00	7.72
CH <sub>4</sub> as CO <sub>2</sub> e	189.46	44.07	175.11	193.03
CO <sub>2</sub>	0.03	0.01	0.03	0.03
<b>Total CO<sub>2</sub> + CO<sub>2</sub>e =</b>	<b>189.49</b>	<b>44.08</b>	<b>175.14</b>	<b>193.06</b>

**API Compendium Table 5-12**

Loading Type	Emission Factor (tonne TOC/10 <sup>6</sup> gal)
Rail/Truck - Submerged Loading - Dedicated Normal Service	0.91
Rail/Truck - Submerged Loading - Vapor Balance Service	1.51
Rail/Truck - Splash Loading - Dedicated Normal Service	2.20
Rail/Truck - Splash Loading - Vapor Balance Service	1.51
Marine Loading - Ships/Ocean Barges	0.28
Marine Loading - Barges	0.45

Notes:

<sup>1</sup> API Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Gas Industry, Table 5-12.

<sup>2</sup> Maximum lb/hr based on average hourly truck loading rate. Average lb/hr based on TPY conversion assuming continuous operation.

<sup>3</sup> CO<sub>2</sub>e = CO<sub>2</sub> equivalent (Pollutant times GWP multiplier):

40 CFR 98 Table A-1, Global Warming Potential (GWP) multiplier: CO<sub>2</sub> = 1, CH<sub>4</sub> = 25

**SWN Production Company, LLC  
 Roy Riggle Pad  
 Vapor Combustor Emissions Calculations - Criteria and Hazardous Air Pollutants**

**Criteria and Hazardous Air Pollutant Emissions**

Unit ID	Pollutant	Emission Factors <sup>1</sup>	Total Captured Emissions <sup>2</sup>		Combustor Destruction Efficiency %	Total Controlled Emissions (Post-Capture and Combustion)	
			lb/hr	TPY		lb/hr	TPY
APC-COMB	NOx	0.068	-	-	-	0.80	3.48
	CO	0.31	-	-	-	3.63	15.89
	PM	7.6	-	-	-	0.04	0.17
	VOC	Mass Balance	47.32	207.25	98.00%	0.95	4.15
	n-Hexane	Mass Balance	2.32	10.17	98.00%	0.05	0.20
	Benzene	Mass Balance	0.03	0.13	98.00%	<0.01	<0.01
	Toluene	Mass Balance	0.16	0.72	98.00%	<0.01	0.01
	Ethylbenzene	Mass Balance	0.19	0.85	98.00%	<0.01	0.02
	Xylenes	Mass Balance	0.61	2.66	98.00%	0.01	0.05

Notes:

<sup>1</sup> Although a vapor combustor is not considered a flare by design, the function is consistent in that it combusts a waste stream for the purpose of reducing emissions; therefore, flare emission factors for NOx and CO were used to provide the most accurate emissions estimates. Although the combustor is designed to be smokeless, PM emissions have been estimated using AP-42 Table 1.4-1 factor (lb/mmscf) for a conservative estimate.

Hours per Year: 8,760  
 Number of Combustors: 1  
 Max. Incinerator Capacity: 109.90 lb/hr  
 11.7 mmBtu/hr per Combustor

NOx and CO emission factors (lb/mmBtu): AP-42 Table 13.5-1, -2 (12/16), based on heat input to each combustor =

11.7 mmBtu/hr Total Heat Input

<sup>2</sup> Total captured emissions are based on 100% capture efficiency from storage tanks and 70% capture efficiency from condensate truck loading with 98% destruction efficiency from the vapor combustor based on 8,760 hours of operation per year. Captured emissions from sources controlled by VOC combustor shown in following tables.

**SWN Production Company, LLC**  
**Roy Riggle Pad**  
**Vapor Combustor Emissions Calculations - Criteria and Hazardous Air Pollutants (Continued)**

Source	Captured VOC Emissions	
	lb/hr	TPY
Condensate Storage Tanks	36.56	160.12
Produced Water Storage Tanks	1.10	4.80
Condensate Truck Loading	9.66	42.33
<b>Total VOC =</b>	<b>47.32</b>	<b>207.25</b>

Source	Captured HAP Emissions (lb/hr)				
	n-Hexane	Benzene	Toluene	Ethylbenzene	Xylenes
Condensate Storage Tanks	1.79	0.02	0.13	0.15	0.47
Produced Water Storage Tanks	0.05	<0.01	<0.01	<0.01	0.01
Condensate Truck Loading	0.47	0.01	0.03	0.04	0.12
<b>Total HAP =</b>	<b>2.32</b>	<b>0.03</b>	<b>0.16</b>	<b>0.19</b>	<b>0.61</b>

Source	Captured HAP Emissions (TPY)				
	n-Hexane	Benzene	Toluene	Ethylbenzene	Xylenes
Condensate Storage Tanks	7.86	0.10	0.56	0.66	2.06
Produced Water Storage Tanks	0.24	<0.01	0.02	0.02	0.06
Condensate Truck Loading	2.08	0.03	0.15	0.17	0.54
<b>Total HAP =</b>	<b>10.17</b>	<b>0.13</b>	<b>0.72</b>	<b>0.85</b>	<b>2.66</b>

**SWN Production Company, LLC  
 Roy Riggle Pad  
 Vapor Combustor Emissions Calculations - Greenhouse Gases**

**Equipment Information**

Unit ID:	<b><u>APC-COMB</u></b>
Description:	Vapor Combustor
Number of Combustors:	1
Burner Design Capacity (mmBtu/hr):	11.7
Stream HHV (Btu/scf):	2,300
Annual Throughput (mmscf):	44.56
Annual Operating Hours:	8,760

**Greenhouse Gas (GHG) Emissions**

Pollutant	lb/hr	tonnes/yr	tons/yr
CO <sub>2</sub>	1,368.63	5,438.21	5,994.61
CH <sub>4</sub>	0.03	0.10	0.11
N <sub>2</sub> O	<0.01	0.01	0.01
CH <sub>4</sub> as CO <sub>2</sub> e	0.64	2.56	2.82
N <sub>2</sub> O as CO <sub>2</sub> e	0.77	3.05	3.37
<b>Total CO<sub>2</sub> + CO<sub>2</sub>e =</b>	<b>1,370.05</b>	<b>5,443.83</b>	<b>6,000.80</b>

**40 CFR 98 Tables C-1 and C-2 Emission Factors (kg/mmBtu)<sup>1</sup>**

Carbon Dioxide (CO <sub>2</sub> )	53.06
Methane (CH <sub>4</sub> )	1.00E-03
Nitrous Oxide (N <sub>2</sub> O)	1.00E-04

Notes:

<sup>1</sup> CO<sub>2</sub>e = CO<sub>2</sub> equivalent (Pollutant times GWP multiplier):

40 CFR 98 Table A-1, Global Warming Potential (GWP) multiplier: CO<sub>2</sub> = 1, CH<sub>4</sub> = 25, N<sub>2</sub>O = 298



SWN Production Company, LLC  
 Roy Riggle Pad  
 Vapor Combustor Pilot Emissions Calculations - Criteria Air Pollutants

Criteria Air Pollutant Emissions

Unit ID	Pollutant	Emission Factors <sup>1</sup>	Emissions	
		(lb/mmscf)	lb/hr	TPY
EU-PILOT APC-COMB	NOx	100	<0.01	0.01
	CO	84	<0.01	0.01
	VOC	5.5	<0.01	<0.01
	SO <sub>2</sub>	0.6	<0.01	<0.01
	PM	7.6	<0.01	<0.01

905 Pilot Stream Heat Content (Btu/SCF)  
 8,760 Pilot Hours/Yr  
 17 Total Pilot Gas Flow Rate (SCFH)  
 15,385 Total Pilot Gas Fuel Use (Btu/hr)  
 0.15 Total Annual Fuel Use (MMSCF)

Notes:

<sup>1</sup> AP-42 Table 1.4-1, -2 (7/98)

**SWN Production Company, LLC  
 Roy Riggle Pad  
 Vapor Combustor Pilot Emissions Calculations - Hazardous Air Pollutants**

**Hazardous Air Pollutant Emissions**

Unit ID	Pollutant	Emission Factors <sup>1</sup>	Emissions	
		(lb/mmscf)	lb/hr	TPY
EU-PILOT APC-COMB	n-Hexane	1.8	<0.01	<0.01
	Formaldehyde	0.075	<0.01	<0.01
	Benzene	0.0021	<0.01	<0.01
	Toluene	0.0034	<0.01	<0.01
<b>Total HAP =</b>			<b>&lt;0.01</b>	<b>&lt;0.01</b>

905 Pilot Stream Heat Content (Btu/SCF)  
 8,760 Pilot Hours/Yr  
 17 Total Pilot Gas Flow Rate (SCFH)  
 15,385 Total Pilot Gas Fuel Use (Btu/hr)  
 0.15 Total Annual Fuel Use (MMSCF)

Notes:

<sup>1</sup> AP-42 Table 1.4-3 (7/98)

**SWN Production Company, LLC  
 Roy Riggle Pad  
 Vapor Combustor Pilot Emissions Calculations - Greenhouse Gases**

**Greenhouse Gas (GHG) Emissions**

Unit ID	Pollutant	Emissions		
		lb/hr	tonnes/yr	tons/yr
EU-PILOT APC-COMB	CO <sub>2</sub>	1.80	7.15	7.88
	CH <sub>4</sub>	<0.01	<0.01	<0.01
	N <sub>2</sub> O	<0.01	<0.01	<0.01
	CH <sub>4</sub> as CO <sub>2</sub> e	<0.01	<0.01	<0.01
	N <sub>2</sub> O as CO <sub>2</sub> e	<0.01	<0.01	<0.01
<b>Total CO<sub>2</sub> + CO<sub>2</sub>e =</b>		<b>1.80</b>	<b>7.16</b>	<b>7.89</b>

905 Pilot Stream Heat Content (Btu/SCF)  
 8,760 Pilot Hours/Yr  
 17 Total Pilot Gas Flow Rate (SCFH)  
 15,385 Total Pilot Gas Fuel Use (Btu/hr)  
 0.15 Total Annual Fuel Use (MMSCF)

**40 CFR 98 Tables C-1 and C-2 Emission Factors (kg/mmBtu)<sup>1</sup>**

Carbon Dioxide (CO <sub>2</sub> )	53.06
Methane (CH <sub>4</sub> )	1.00E-03
Nitrous Oxide (N <sub>2</sub> O)	1.00E-04

Notes:

<sup>1</sup> CO<sub>2</sub>e = CO<sub>2</sub> equivalent (Pollutant times GWP multiplier):

40 CFR 98 Table A-1, Global Warming Potential (GWP) multiplier: CO<sub>2</sub> = 1, CH<sub>4</sub> = 25, N<sub>2</sub>O = 298

SWN Production Company, LLC  
 Roy Riggle Pad  
 Fugitive Emissions Calculations - Criteria and Hazardous Air Pollutants and Greenhouse Gases

Equipment Information

Source Type/Service	Number of Sources <sup>1</sup>	Em. Factor (lb/hr/source) <sup>2</sup>	Control Efficiency	TOC lb/hr	TOC TPY	VOC Wt %
Valves - Gas	67	9.92E-03	0.00%	0.66	2.91	25.68%
Flanges - Gas	314	8.60E-04	0.00%	0.27	1.18	25.68%
Compressor Seals - Gas	9	1.94E-02	0.00%	0.17	0.76	25.68%
Relief Valves - Gas	42	1.94E-02	0.00%	0.81	3.57	25.68%
<b>Total TOC (Gas Components) =</b>				<b>1.92</b>	<b>8.43</b>	-
Valves - Light Oil	155	5.51E-03	0.00%	0.85	3.74	95.13%
Flanges - Light Oil	42	2.43E-04	0.00%	0.01	0.04	95.13%
Connectors - Light Oil	530	4.63E-04	0.00%	0.25	1.07	95.13%
Other - Light Oil	7	1.65E-02	0.00%	0.12	0.51	95.13%
<b>Total TOC (Liquid Components) =</b>				<b>1.23</b>	<b>5.37</b>	-

VOC and Greenhouse Gas Emissions

Source Type/Service	VOC		CH <sub>4</sub>		CO <sub>2</sub>	
	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
Valves - Gas	0.17	0.75	0.34	1.48	<0.01	0.01
Flanges - Gas	0.07	0.30	0.14	0.60	<0.01	<0.01
Compressor Seals - Gas	0.04	0.20	0.09	0.39	<0.01	<0.01
Relief Valves - Gas	0.21	0.92	0.41	1.81	<0.01	0.01
<b>Components in Gas Service =</b>	<b>0.49</b>	<b>2.16</b>	<b>0.98</b>	<b>4.28</b>	<b>&lt;0.01</b>	<b>0.02</b>
Valves - Light Oil	0.81	3.56	0.01	0.05	<0.01	<0.01
Flanges - Light Oil	0.01	0.04	<0.01	<0.01	<0.01	<0.01
Connectors - Light Oil	0.23	1.02	<0.01	0.01	<0.01	<0.01
Other - Light Oil	0.11	0.48	<0.01	0.01	<0.01	<0.01
<b>Components in Liquid Service =</b>	<b>1.17</b>	<b>5.11</b>	<b>0.02</b>	<b>0.07</b>	<b>&lt;0.01</b>	<b>&lt;0.01</b>
<b>Total (Gas + Liquid Components) =</b>	<b>1.66</b>	<b>7.27</b>	<b>0.99</b>	<b>4.35</b>	<b>&lt;0.01</b>	<b>0.02</b>

SWN Production Company, LLC  
 Roy Riggle Pad  
 Fugitive Emissions Calculations (Continued)

**Hazardous Air Pollutant (HAP) Emissions (lb/hr)**

Source Type/Service	n-Hexane	Benzene	Toluene	Ethylbenzene	Xylenes	2,2,4-Tri.	Total
Valves - Gas	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Flanges - Gas	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Compressor Seals - Gas	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Relief Valves - Gas	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
<b>Components in Gas Service =</b>	<b>&lt;0.01</b>	<b>&lt;0.01</b>	<b>&lt;0.01</b>	<b>&lt;0.01</b>	<b>&lt;0.01</b>	<b>&lt;0.01</b>	<b>0.01</b>
Valves - Light Oil	0.04	<0.01	<0.01	<0.01	0.01	0.00	0.06
Flanges - Light Oil	<0.01	<0.01	<0.01	<0.01	<0.01	0.00	<0.01
Connectors - Light Oil	0.01	<0.01	<0.01	<0.01	<0.01	0.00	0.02
Other - Light Oil	0.01	<0.01	<0.01	<0.01	<0.01	0.00	0.01
<b>Components in Liquid Service =</b>	<b>0.06</b>	<b>&lt;0.01</b>	<b>&lt;0.01</b>	<b>0.01</b>	<b>0.02</b>	<b>0.00</b>	<b>0.09</b>
<b>Total (Gas + Liquid Components) =</b>	<b>0.06</b>	<b>&lt;0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.02</b>	<b>&lt;0.01</b>	<b>0.09</b>

**Hazardous Air Pollutant (HAP) Emissions (TPY)**

Source Type/Service	n-Hexane	Benzene	Toluene	Ethylbenzene	Xylenes	2,2,4-Tri.	Total
Valves - Gas	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Flanges - Gas	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Compressor Seals - Gas	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Relief Valves - Gas	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
<b>Components in Gas Service =</b>	<b>0.02</b>	<b>&lt;0.01</b>	<b>&lt;0.01</b>	<b>&lt;0.01</b>	<b>&lt;0.01</b>	<b>&lt;0.01</b>	<b>0.03</b>
Valves - Light Oil	0.18	<0.01	0.01	0.02	0.05	0.00	0.26
Flanges - Light Oil	<0.01	<0.01	<0.01	<0.01	<0.01	0.00	<0.01
Connectors - Light Oil	0.05	<0.01	<0.01	<0.01	0.01	0.00	0.08
Other - Light Oil	0.02	<0.01	<0.01	<0.01	0.01	0.00	0.04
<b>Components in Liquid Service =</b>	<b>0.26</b>	<b>&lt;0.01</b>	<b>0.02</b>	<b>0.02</b>	<b>0.07</b>	<b>0.00</b>	<b>0.38</b>
<b>Total (Gas + Liquid Components) =</b>	<b>0.28</b>	<b>0.01</b>	<b>0.02</b>	<b>0.02</b>	<b>0.07</b>	<b>&lt;0.01</b>	<b>0.40</b>

SWN Production Company, LLC  
 Roy Riggle Pad  
 Fugitive Emissions Calculations (Continued)

Typical Component Count per Equipment Type based on Representative Facility<sup>3</sup>

Source Type/Service	WH	GPU	HT	LPT	FGC	TK	TT-O	SP
Valves - Gas	12	3	2	5	5	0	0	0
Flanges - Gas	37	15	9	24	33	3	2	0
Compressor Seals - Gas	0	0	0	0	3	0	0	0
Relief Valves - Gas	1	3	1	1	1	3	1	0
Open-Ended Lines - Gas	0	0	0	0	0	0	0	0
Valves - Light Oil	0	5	6	12	3	6	9	8
Flanges - Light Oil	0	0	0	0	0	0	0	6
Connectors - Light Oil	0	20	24	48	12	24	30	20
Pump Seals - Light Oil	0	0	0	0	0	0	0	0
Other - Light Oil	0	0	0	0	0	0	0	1
<b>Equipment Type</b>	<b>WH</b>	<b>GPU</b>	<b>HT</b>	<b>LPT</b>	<b>FGC</b>	<b>TK</b>	<b>TT-O</b>	<b>SP</b>
Number of Each Type On Pad =	3	3	1	1	3	8	1	7

SWN Production Company, LLC  
 Roy Riggle Pad  
 Fugitive Emissions Calculations (Continued)

Speciated Gas Analysis<sup>4</sup>

Component	Molecular Weight	Mole %	Equiv. Wt. Basis	Weight %	HC Weight %	Ib/hr	TPY
Hydrogen Sulfide	34.082	0.000%	0.000	0.000%	-	0.00	0.00
Carbon Dioxide	44.010	0.110%	0.048	0.214%	-	<0.01	0.02
Nitrogen	28.013	0.461%	0.129	0.573%	-	0.01	0.05
Methane	16.042	70.694%	11.341	50.366%	50.766%	0.98	4.28
Ethane	30.069	17.500%	5.262	23.370%	23.556%	0.45	1.99
Propane	44.096	7.210%	3.179	14.120%	14.232%	0.27	1.20
i-Butane	58.122	0.737%	0.429	1.903%	1.919%	0.04	0.16
n-Butane	58.122	2.133%	1.240	5.505%	5.549%	0.11	0.47
i-Pentane	72.149	0.353%	0.255	1.132%	1.141%	0.02	0.10
n-Pentane	72.149	0.476%	0.343	1.525%	1.537%	0.03	0.13
n-Hexane	86.175	0.048%	0.041	0.184%	0.186%	<0.01	0.02
Other Hexanes	86.175	0.208%	0.179	0.795%	0.802%	0.02	0.07
Heptanes (as n-Heptane)	100.202	0.022%	0.022	0.100%	0.100%	<0.01	0.01
Benzene	78.114	0.011%	0.008	0.037%	0.038%	<0.01	<0.01
Toluene	92.141	0.009%	0.009	0.038%	0.038%	<0.01	<0.01
Ethylbenzene	106.167	0.000%	0.000	0.002%	0.002%	<0.01	<0.01
Xylenes	106.167	0.002%	0.002	0.011%	0.011%	<0.01	<0.01
2,2,4-Trimethylpentane	114.230	0.009%	0.010	0.044%	0.044%	<0.01	<0.01
Octanes (as n-Octane)	114.229	0.016%	0.018	0.079%	0.080%	<0.01	0.01
Nonanes (as n-Nonane)	128.255	0.000%	0.000	0.000%	0.000%	0.00	0.00
Decanes (as n-Decane)	142.282	0.000%	0.000	0.000%	0.000%	0.00	0.00
<b>TOTAL =</b>		<b>100.00%</b>	<b>22.52</b>	<b>100.00%</b>	<b>100.00%</b>	<b>1.94</b>	<b>8.49</b>
		<b>TOTAL HC =</b>	<b>22.34</b>	<b>TOTAL VOC =</b>	<b>25.68%</b>	<b>0.49</b>	<b>2.16</b>
				<b>TOTAL HAP =</b>	<b>0.32%</b>	<b>0.01</b>	<b>0.03</b>

SWN Production Company, LLC  
 Roy Riggle Pad  
 Fugitive Emissions Calculations (Continued)

Speciated Liquids Analysis<sup>4</sup>

Component	Molecular Weight	Mole %	Equiv. Wt. Basis	Weight %	HC Weight %	Ib/hr	TPY
Hydrogen Sulfide	34.082	0.000%	0.000	0.000%	-	0.00	0.00
Carbon Dioxide	44.010	0.017%	0.007	0.009%	-	<0.01	<0.01
Nitrogen	28.013	0.019%	0.005	0.007%	-	<0.01	<0.01
Methane	16.042	6.628%	1.063	1.325%	1.325%	0.02	0.07
Ethane	30.069	9.468%	2.847	3.547%	3.548%	0.04	0.19
Propane	44.096	12.466%	5.497	6.849%	6.851%	0.08	0.37
i-Butane	58.122	2.695%	1.566	1.952%	1.952%	0.02	0.10
n-Butane	58.122	10.642%	6.185	7.707%	7.708%	0.09	0.41
i-Pentane	72.149	3.929%	2.835	3.532%	3.533%	0.04	0.19
n-Pentane	72.149	7.293%	5.262	6.556%	6.558%	0.08	0.35
n-Hexane	86.175	4.570%	3.938	4.907%	4.908%	0.06	0.26
Other Hexanes	86.175	3.560%	3.068	3.823%	3.823%	0.05	0.21
Heptanes (as n-Heptane)	100.202	8.337%	8.354	10.409%	10.411%	0.13	0.56
Benzene	78.114	0.066%	0.052	0.064%	0.064%	<0.01	<0.01
Toluene	92.141	0.303%	0.279	0.348%	0.348%	<0.01	0.02
Ethylbenzene	106.167	0.311%	0.330	0.411%	0.411%	0.01	0.02
Xylenes	106.167	0.971%	1.031	1.285%	1.285%	0.02	0.07
2,2,4-Trimethylpentane	114.230	0.000%	0.000	0.000%	0.000%	0.00	0.00
Octanes (as n-Octane)	114.229	8.385%	9.578	11.935%	11.937%	0.15	0.64
Nonanes (as n-Nonane)	128.255	4.164%	5.341	6.655%	6.656%	0.08	0.36
Decanes (as n-Decane)	142.282	16.176%	23.016	28.678%	28.683%	0.35	1.54
<b>TOTAL =</b>		<b>100.00%</b>	<b>80.25</b>	<b>100.00%</b>	<b>100.00%</b>	<b>1.23</b>	<b>5.37</b>
		<b>TOTAL HC =</b>	<b>80.24</b>	<b>TOTAL VOC =</b>	<b>95.13%</b>	<b>1.17</b>	<b>5.11</b>
				<b>TOTAL HAP =</b>	<b>7.02%</b>	<b>0.09</b>	<b>0.38</b>

Notes:

<sup>1</sup> Component counts taken by equipment type at representative facility and made site-specific according to the number of each equipment type at this site.

<sup>2</sup> Emission Factor Source: EPA-453/R-95-017. TOC multiplied by pollutant content of streams (weight %) to obtain pollutant emissions.

<sup>3</sup> Equipment Type Key: WH = Well Head, GPU = Gas Production Unit, HT = Heater, LPT = Low-Pressure Tower, FGC = Flash Gas Compressor, TK = Storage Tank, TT-O = Tank Truck - Oil SP = Separator

<sup>4</sup> Gas and liquids analyses located in Attachment L.



**SWN Production Company, LLC  
Roy Riggle Pad  
Estimated Extended Gas Analysis**

Enter C6+ Value from Gas Analysis =  mole%

Component	Production	
	GRI Fraction	Estimate Mole%
Other Hexanes	0.6385	0.2078%
n-Hexane	0.1479	0.0481%
Heptane	0.0687	0.0224%
2,2,4-Trimethylpentane	0.0267	0.0087%
Octanes+	0.0480	0.0156%
Benzene	0.0331	0.0108%
Toluene	0.0285	0.0093%
Ethylbenzene	0.0014	0.0005%
Xylenes	0.0072	0.0023%
<b>Total =</b>		0.3255%

Notes:

1) GRI-GLYCalc Version 4.0 Technical Reference Manual: When an extended gas analysis is not available, the C6+ composition may be estimated. To convert a C6+ analysis for use in GRI-GLYCalc, multiply the total C6+ concentration by the fraction of each component from the appropriate industry segment.

**SWN Production Company, LLC  
Roy Riggle Pad  
Fugitive Haul Road Emissions**

**Facility Data <sup>1</sup>**

Vehicle Type	Light Vehicles (Pick-ups and Cars)	Medium Trucks (Service Trucks)	Heavy Trucks (Tanker Trucks) <sup>2</sup>
Average vehicle weight ((empty + full)/2) (tons)	2	15	23.5
Number of wheels per vehicle type (w)	4	10	18
Average number of round trips/day/vehicle type	5	3	10
Distance per round trip (miles/trip)	0.98	0.98	0.98
Vehicle miles travelled (miles/day)	4.98	2.49	9.96
Number of days operational (days/yr)	365	365	365
Vehicle miles travelled VMT (miles/yr)	1,817	908	3,634
Average vehicle speed S (mph)	10	10	10
Average number of round trips/hour/vehicle type	0.28	0.14	0.56
Average number of round trips/year/vehicle type	1,845	922	3,690
Estimated maximum number of round trips/hour/vehicle type	3	3	2
Estimated maximum number of round trips/day/vehicle type	6	4	12
Estimated maximum number of round trips/year/vehicle type	2,300	1,533	4,641

190 Average Tanker Volume (bbl)  
7,980 Gallons Tanker Volume  
997 bwpd  
924 bopd  
10.11 Tanker Trucks per Day  
2,100 Length Leased Access Road (ft)  
500 Longest Pad Side (ft)  
5,200 Total Round Trip Feet

**Formula & Calculation Inputs**

$$E = k(s/12)^a * (W/3)^b * ((365-P) / 365)$$

where:

Days per year  
Annual average hours per day of road operations  
k = PM Particle Size Multiplier  
k = PM10 Particle Size Multiplier  
k = PM2.5 Particle Size Multiplier  
s = Surface Material Silt Content  
P = Number of days > 0.01 inch of rain  
a = PM Constant  
a = PM10 & PM2.5 Constant  
b = PM, PM10, & PM2.5 Constant  
Total hourly fleet vehicle miles travelled (miles/hr)  
Total annual fleet vehicle miles travelled (miles/yr)<sup>3</sup>  
Average wheels<sup>4</sup>  
Average vehicle weight of the fleet (W)<sup>5</sup>  
Moisture Ratio  
Control Efficiency (CF)

Reference : AP-42, Section 13.2.2 (11/06), Equation 1a and 2

Rate	Units	Comment
365		
18		
4.90	lb/VMT	AP-42 Section 13.2.2 (11/06), Table 13.2.2-2 (PM)
1.50	lb/VMT	AP-42 Section 13.2.2 (11/06), Table 13.2.2-2 (PM <sub>10</sub> )
0.15	lb/VMT	AP-42 Section 13.2.2 (11/06), Table 13.2.2-2 (PM <sub>2.5</sub> )
3.9	%	State Default Data from AP-42 Data (1999 NEI Data)
150	days/year	AP-42 Section 13.2.2 (11/06), Figure 13.2.2-1
0.70	unitless	AP-42 Section 13.2.2 (11/06), Table 13.2.2-2 (PM)
0.90	unitless	AP-42 Section 13.2.2 (11/06), Table 13.2.2-2 (PM <sub>10</sub> & PM <sub>2.5</sub> )
0.45	unitless	AP-42 Section 13.2.2 (11/06), Table 13.2.2-2
0.97	VMT/hr	
6,359.06	VMT/yr	
13		
16.1	tons	
1.00		Estimated based on 0.2% uncontrolled surface water content assuming no watering
0.00	%	Based on Moisture Ratio and Figure 13.2.2-2 Control

EPA - BID Document 13.2.2 - 1998

SWN Production Company, LLC  
 Roy Riggle Pad  
 Fugitive Haul Road Emissions (Continued)

Vehicle Type	Emission Factors			Control Efficiency (%)	Total Vehicle Miles Travelled		Emission Rates			Emission Rates		
	PM	PM <sub>10</sub>	PM <sub>2.5</sub>		(VMT/hr)	(VMT/yr)	Total PM	Total PM <sub>10</sub>	PM <sub>2.5</sub>	Total PM	Total PM <sub>10</sub>	PM <sub>2.5</sub>
	(lbs/VMT)	(lbs/VMT)	(lbs/VMT)				(lb/hr)	(lb/hr)	(lb/hr)	(tons/yr)	(tons/yr)	(tons/yr)
Light Vehicles	2.80	0.69	0.07	0.00	0.28	1,816.87	0.78	0.19	0.02	2.55	0.62	0.06
Medium Trucks	2.80	0.69	0.07	0.00	0.14	908.44	0.39	0.09	0.01	1.27	0.31	0.03
Heavy Trucks	2.80	0.69	0.07	0.00	0.55	3,633.75	1.55	0.38	0.04	5.09	1.24	0.12
<b>Total =</b>				<b>0.00</b>	<b>0.97</b>	<b>6,359.06</b>	<b>2.71</b>	<b>0.66</b>	<b>0.07</b>	<b>8.91</b>	<b>2.18</b>	<b>0.22</b>

Notes:

- 1) Facility vehicle data based on estimates, GP5.1 and AP-42 13.2.2-2 defaults for industrial unpaved roads
- 2) Tank trucker average vehicle weight as  $(W_{(empty)} + W_{(full)})/2 = (7 + 40)/2 = 23.7$  tons
- 3) Average vehicle miles travelled (VMT/yr) as (No. of round trip/vehicle \* No. of vehicles/type \* Roundtrip miles/trip) \* 365 days/yr \* No. of vehicle type)
- 4) Average wheels calculated as average of (No. of wheels per vehicle type \* No. of vehicle/type)
- 5) Average vehicle fleet calculated as (Average weight of vehicle type \* Percentage of each vehicle type on unpaved surface). Percentage of each vehicle type =  $VMT_{vehicle\ type}/VMT$
- 6) Minimum one-per-day average pick-up trucks and service trucks even if tanker not required every day.
- 7) Per EPA BID calculations, all emissions based on average trips. Estimated maximum hourly, daily and yearly trips provided for information only.

Calculation of Emission Factors (AP-42, 13.2.2)

Equation 1a:  $EF = k(s/12)^a (W/3)^b$  where *k*, *a*, and *b* are empirical constants and  
*EF* = size-specific emission factor (lb/VMT)  
*s* = surface material silt content %  
*W* = mean vehicle weight (tons)

Equation 2:  $EF_{ext} = EF * ((365 - P) / 365)$  where:  
*EF<sub>ext</sub>* = annual size-specific emission factor extrapolated for natural mitigation, lb/VMT  
*EF* = emission factor from Equation 1a  
*P* = number of days in a year with at least 0.01 inches of precipitation

Calculation of Emissions

$E = EF_{ext} * VMT/yr * ((1 - CF) / 100) * 1 \text{ ton} / 2000 \text{ lbs}$  where:  
*E* = annual emissions (tons/yr)  
*EF<sub>ext</sub>* = annual size-specific emission factor extrapolated for natural mitigation, lb/VMT  
*CF* = control efficiency (%)

**ATTACHMENT U: FACILITY-WIDE EMISSION SUMMARY SHEETS**

**ATTACHMENT U – FACILITY-WIDE CONTROLLED EMISSIONS SUMMARY SHEET**

List all sources of emissions in this table. Use extra pages if necessary.

Emission Point ID #	NO <sub>x</sub>		CO		VOC		SO <sub>2</sub>		PM <sub>10</sub>		PM <sub>2.5</sub>		CH <sub>4</sub>		GHG (CO <sub>2</sub> e)	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
EP-ENG1	0.32	1.40	0.64	2.80	0.16	0.69	<0.01	<0.01	0.02	0.11	0.02	0.11	<0.01	0.01	155.19	679.73
EP-ENG2	0.32	1.40	0.64	2.80	0.16	0.69	<0.01	<0.01	0.02	0.11	0.02	0.11	<0.01	0.01	155.19	679.73
EP-ENG3	0.20	0.89	0.41	1.78	0.10	0.43	<0.01	<0.01	0.02	0.07	0.02	0.07	<0.01	0.01	91.57	401.08
EP-GPU1 - EP-GPU3	0.33	1.45	0.28	1.22	0.02	0.08	<0.01	0.01	0.03	0.11	0.03	0.11	<0.01	0.01	351.29	1,538.67
EP-HT2	0.11	0.48	0.09	0.41	0.01	0.03	<0.01	<0.01	0.01	0.04	0.01	0.04	<0.01	0.01	117.10	512.89
EP-LOAD-COND	-	-	-	-	4.14	18.14	-	-	-	-	-	-	0.49	2.15	12.25	53.67
EP-LOAD-PW	-	-	-	-	0.08	0.34	-	-	-	-	-	-	1.76	7.72	44.08	193.06
APC-COMB	0.80	3.49	3.63	15.89	0.95	4.15	<0.01	<0.01	0.04	0.17	0.04	0.17	0.03	0.11	1,371.85	6,008.69
<b>TOTAL</b>	2.08	9.12	5.68	24.90	5.60	24.53	<0.01	0.02	0.14	0.60	0.14	0.60	2.29	10.03	2,298.52	10,067.50

Annual emissions shall be based on 8,760 hours per year of operation for all emission units except emergency generators.

According to 45CSR14 Section 2.43.e, fugitive emissions are not included in the major source determination because it is not listed as one of the source categories in Table 1. Therefore, fugitive emissions shall not be included in the PTE above.

*Note that the emissions from the APC-COMB includes uncombusted emissions from the storage tanks and condensate loading operations, as well as combustor pilot emissions.*

**ATTACHMENT U – FACILITY-WIDE HAP CONTROLLED EMISSIONS SUMMARY SHEET**

List all sources of emissions in this table. Use extra pages if necessary.

Emission Point ID #	Formaldehyde		Benzene		Toluene		Ethylbenzene		Xylenes		Hexane		Total HAPs		
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	
EP-ENG1	0.09	0.38	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	0.10	0.44
EP-ENG2	0.09	0.38	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	0.10	0.44
EP-ENG3	0.02	0.07	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	0.02	0.11
EP-GPU1 - EP-GPU3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	0.01	0.03	0.01	0.03
EP-HT2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	<0.01	0.01	<0.01	0.01
EP-LOAD-COND	-	-	<0.01	0.01	0.01	0.06	0.02	0.07	0.05	0.23	0.20	0.89	0.29	1.27	
EP-LOAD-PW	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.01	0.02	
APC-COMB	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.02	0.01	0.05	0.05	0.20	0.07	0.29	
<b>TOTAL</b>	0.19	0.83	0.01	0.04	0.02	0.09	0.02	0.09	0.07	0.29	0.26	1.15	0.59	2.61	

Annual emissions shall be based on 8,760 hours per year of operation for all emission units except emergency generators.

According to 45CSR14 Section 2.43.e, fugitive emissions are not included in the major source determination because it is not listed as one of the source categories in Table 1. Therefore, fugitive emissions shall not be included in the PTE above.

*Note that the emissions from the APC-COMB includes uncombusted emissions from the storage tanks and condensate loading operations, as well as combustor pilot emissions.*

## ATTACHMENT V: LEGAL ADVERTISEMENT

Note: Affidavit of Publication will be submitted upon receipt by SWN from the publisher.

### AIR QUALITY PERMIT NOTICE Notice of Application

Notice is given that SWN Production Company, LLC has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a G70-D General Permit Registration for a natural gas production facility (Roy Riggle Pad) located on Crupes Run Road in Valley Grove, in Ohio County, West Virginia. From I-70 exit 5, turn right on US RT. 40 east and travel 4.4 miles to Rt. 40 staging. From Rt.40 staging turn left on US Rt. 40 east and travel 5.3 miles to Pa. SR-3005, (West Liberty Rd), and turn left on SR-3005. Travel SR-3005 for 0.5 miles to intersection and stop sign of SR-3005 and SR-3003, (Dry Run Rd), and turn right on SR-3003. Travel SR-3003 0.8 miles to intersection of SR-3003 and T322, (Main Road), and turn left on Main Road. Travel Main Road 1.9 miles to access road on right. \*\*\*Note road sign for T-322 Main Road is faded and T-322 is not visible. Main Road wording recently painted. Latitude and longitude coordinates are: 40.151121, -80.523855.

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

Nitrogen Oxides (NO <sub>x</sub> )	9.12 tons/yr
Carbon Monoxide (CO)	24.90 tons/yr
Volatile Organic Compounds (VOC)	24.53 tons/yr
Sulfur Dioxide (SO <sub>2</sub> )	0.02 tons/yr
Particulate Matter (PM)	0.60 tons/yr
Acetaldehyde	0.04 tons/yr
Acrolein	0.04 tons/yr
Benzene	0.04 tons/yr
Ethylbenzene	0.12 tons/yr
Formaldehyde	0.83 tons/yr
Methanol	0.04 tons/yr
n-Hexane	1.42 tons/yr
Toluene	0.11 tons/yr
Xylenes	0.36 tons/yr
Carbon Dioxide	9,810.78 tons/yr
Methane	14.40 tons/yr
Nitrous Oxide	0.02 tons/yr
CO <sub>2</sub> Equivalent	10,176.25 tons/yr

Operations is planned to begin on or about May 1, 2018. Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57<sup>th</sup> Street, SE, Charleston, WV 25304, for at least 30 calendar days from the date of publication of this notice. Any questions regarding this permit application should be directed to the DAQ at (304) 926-0499, extension 1250, during normal business hours.

SWN Production Company, LLC  
Roy Riggle Pad  
January 2018

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Dated this the XX<sup>th</sup> of January 2018

By: SWN Production Company, LLC  
Clay Murrall  
Regulatory Supervisor  
179 Innovation Drive  
Jane Lew, WV 26378