SWN Production Company, LLC
P O Box 12359
Spring, Texas 77391-2359
www.swn.com

MICHAEL RATCLIFFE PAD

R-13 CLASS I ADMINISTRATIVE UPDATE

REV	BY	DATE	DESCRIPTION	PERMIT	FACILITIES REVIEWED	DATE
0	CHK	09/2012	-	R13-2995		
1	CHK	03/2013	REM: 1 COMB MOD: route LPT vapors to ENG	R13-2995A		
2	CHK	02/2014	REM: LPT, 1 ENG ADD: 1 ENG	R13-2995C		
3	SWN	01/2018	REM: 1 ENG, 1 LH	R13-2995D	AML	01/09/2018

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INTRODUCTION

SWN Production Company, LLC (SWN), operates the Michael Ratcliffe Pad under Permit No. R13-2995C, issued on March 24, 2014. With this Class I Administrative Update application, SWN requests authorization to remove one 23.6-hp Kubota DG972-E2 engine and one line heater. 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 one sand separator and one fuel gas separator. As a result of these changes, truck loading, vapor combustor, fugitive, and haul road emissions have also been updated. This project qualifies as a Class I Update. Equipment to be authorized includes the following:

- One (1) Sand Separator (not an emissions source other than fugitive components)
- One (1) Fuel Gas Separator (not an emissions source other than fugitive components)
- One (1) 1.0-mmBtu/hr Gas Production Unit
- One (1) 0.5-mmBtu/hr Heater Treater
- Three (3) 400-bbl Condensate Tanks
- Three (3) 400-bbl Produced Water Tanks
- Condensate Truck Loading
- Produced Water Truck Loading
- One (1) 15.0-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 not addressed further in this application.

Proposed Emissions

Emissions calculations for the facility are presented in Attachment N. 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.

Condensate and produced water tank emissions were calculated using ProMax process simulation software. Storage 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.

APPLICATION FOR NSR PERMIT

WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF AIR QUALITY

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

APPLICATION FOR NSR PERMIT

AND

TITLE V PERMIT REVISION
(OPTIONAL)

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

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

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

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

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

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

Section I. General

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

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

3. Name of facility *(if different from above):*
Michael Ratcliffe Pad

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

5A. Applicant's mailing address:
10000 Energy Drive
Spring, TX 77389

5B. Facility's present physical address:
355 Long Run Rd.
Valley Grove, WV 26060

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

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

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

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

- If **YES,** please explain: SWN is leasing the land on which the site is constructed

- If **NO,** you are not eligible for a permit for this source.

9. Type of plant or facility (stationary source) to be **constructed, modified, relocated, administratively updated** or **temporarily permitted** (e.g., coal preparation plant, primary crusher, etc.):
Oil and natural gas production well pad

10. North American Industry Classification System **(NAICS)** code for the facility:
211111

11A. DAQ Plant ID No. (for existing facilities only):
069-00133

11B. List all current 45CSR13 and 45CSR30 (Title V) permit numbers associated with this process (for existing facilities only):
R13-2995C

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

12A.

– For **Modifications, Administrative Updates** or **Temporary permits** at an existing facility, please provide directions to the *present location* of the facility from the nearest state road;

For **Construction** or **Relocation permits,** please provide directions to the *proposed new site location* from the nearest state road. Include a **MAP** as **Attachment B**.

Take exit 11 (CR 41, Dallas Pike) from I-70 east of Wheeling, WV and travel north on CR 41 for 1.93 miles to US 40 (National Road). Turn right (east) on US 40 and travel for 4.02 miles to CR 45 (Atkinson Crossing Road) and turn left. Travel for 1.18 miles to stop sign and turn left to continue on CR 45 (G C & P Road). (After traveling 0.85 miles from stop sign, CR 45 turns to the left. DO NOT follow CR 45 to the left but continue straight on what is now CR 37 but is still G C & P Road). Travel 2.44 miles on CR 45 and CR 37 (G C & P Road) to CR 53/1 (Long Run Road) and turn right. Travel 0.37 miles on CR 53/1 to well pad access road on the left. (Total mileage on G C & P road, which includes CR 45 and 37, after turning off of US 40 is 3.62 (1.18 + 2.44) miles to CR 53/1.

12B. New site address (if applicable):	12C. Nearest city or town:	12D. County:
See above	Valley Grove	Ohio
12.E. UTM Northing (KM): 4,444.30127	12F. UTM Easting (KM): 536.89123	12G. UTM Zone: 17T

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

This application includes one (1) 1.0-mmBtu/hr natural gas-fired gas production unit (GPU) burner (EU-GPU1), one (1) 1.0-mmBtu/hr natural gas-fired heater treater (EU-HT1), three (3) 400-bbl condensate tanks (EU-TANKS-COND), three (3) 400-bbl produced water tanks (EU-TANKS-PW), condensate and produced water truck loading (EU-LOAD-COND and EU-LOAD-PW), one (1) 15.0-mmBtu/hr vapor combustor (APC-COMB) with one (1) 50-SCFH pilot (EU-PILOT), fugitive emissions (EU-FUG), and fugitive haul road emissions (EU-HR).

14A. Provide the date of anticipated installation or change: Immediately upon permit issuance – If this is an **After-The-Fact** permit application, provide the date upon which the proposed change did happen: / /	14B. Date of anticipated Start-Up if a permit is granted: March 2018, but contingent upon permit issuance

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

15. Provide maximum projected **Operating Schedule** of activity/activities outlined in this application:

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

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

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

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

Section II. Additional attachments and supporting documents.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

☐ Other Collectors, specify

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

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

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

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

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

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

☐ **YES** ☒ **NO**

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

Section III. Certification of Information

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

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

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

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

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

Certification of Truth, Accuracy, and Completeness

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

Compliance Certification

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

SIGNATURE _____ DATE: 1/4/2018

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

35B. Printed name of signee: Clay Murral		35C. Title: Regulatory Supervisor
35D. E-mail: Clay_Murral@SWN.com	36E. Phone: 304-884-1715	36F. FAX:
36A. Printed name of contact person (if different from above): Heather Cready		36B. Title: Regulatory Technician
36C. E-mail: Heather_Cready@SWN.com	36D. Phone: 304-884-1651	36E. FAX:

PLEASE CHECK ALL APPLICABLE ATTACHMENTS INCLUDED WITH THIS PERMIT APPLICATION:

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

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

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

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

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

ATTACHMENT A: BUSINESS 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
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
L1160094016

ATTACHMENT C: INSTALLATION/START-UP SCHEDULE

No new equipment is proposed in this project.

ATTACHMENT D: 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:

Potential emissions associated with the proposed project are less than the minor source construction or modification permit thresholds of 6 pounds per hour (pph) AND 10 tons per year (tpy) of any regulated air pollutant OR 144 pounds per day (ppd) of any regulated air pollutant OR 2 pph OR 5 tpy of aggregated hazardous air pollutants (HAP) OR 45 CSR 27 toxic air pollutant (TAP) (10% increase if above BAT triggers or increase to Best Available Technology (BAT) triggers). This project qualifies as a Class I Update.

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^3) 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^3 (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 facility does not contain the affected source (natural gas-fired engine) and is therefore not subject to this Subpart.

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 one (1) existing well at this location was completed before the effective date of this Subpart and is not 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.

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.

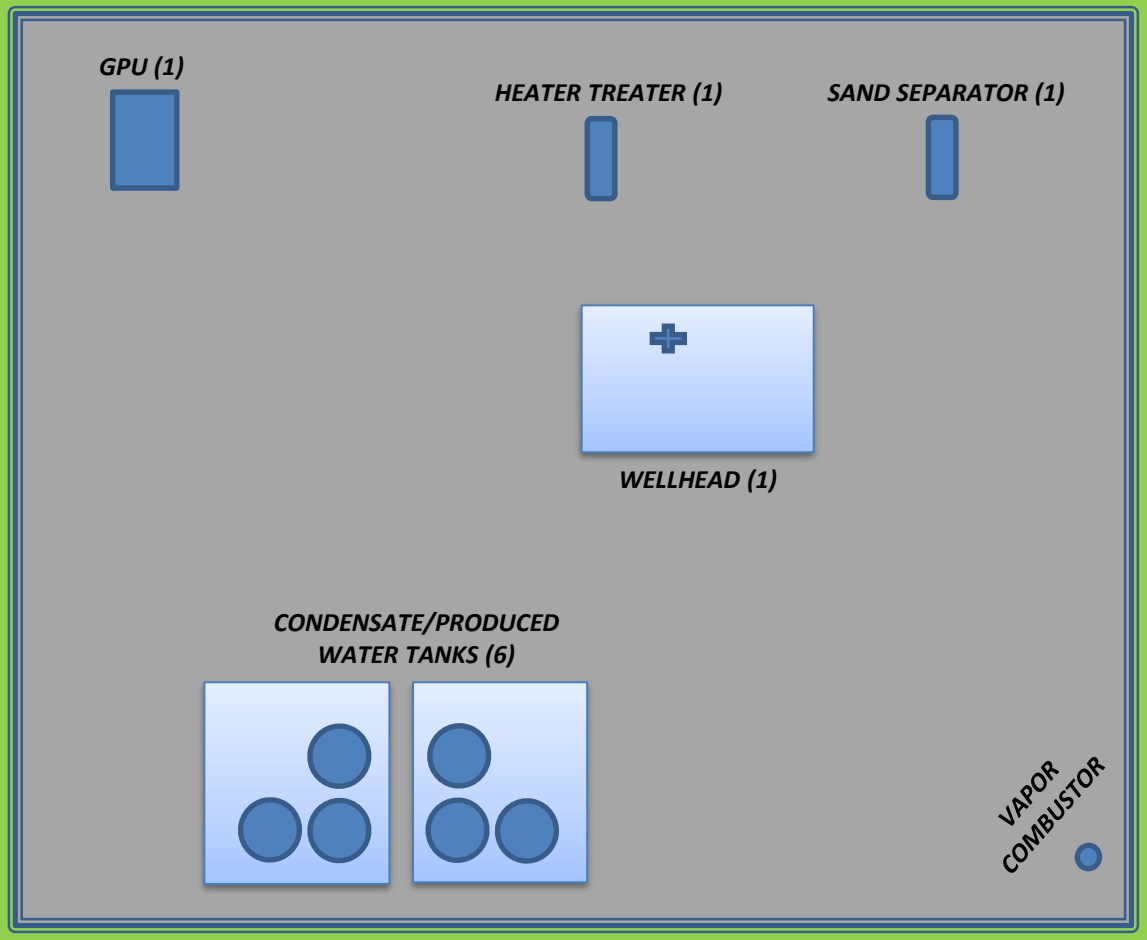
40 CFR PART 63 SUBPART HHH - NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS FOR SOURCE CATEGORIES FROM NATURAL TRANSMISSION AND STORAGE FACILITIES:

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

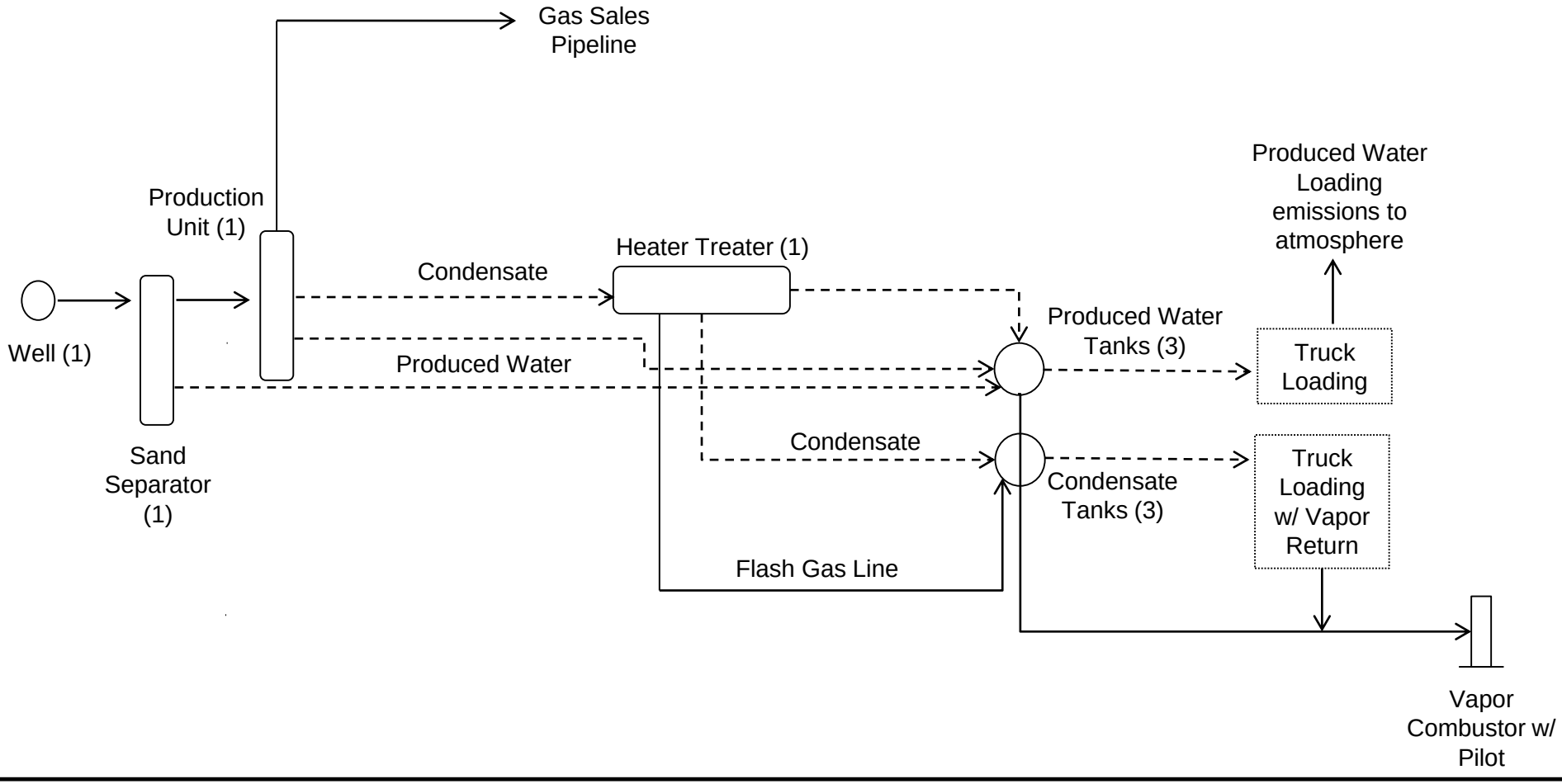
ATTACHMENT E: PLOT PLAN



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

SWN Production Company, LLC
Michael Ratcliffe Pad
Attachment E: Simple Plot Plan
January 2018

ATTACHMENT F: PROCESS FLOW DIAGRAM



Gas/Vapor

Liquids (Condensate and Produced Water)

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

SWN Production Company, LLC
Michael Ratcliffe Pad
Attachment F: Process Flow Diagram
January 2018

ATTACHMENT G: 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 wellhead through the sand separator then to the production unit, where the first stage of separation occurs. Produced water is sent from the production unit to the produced water tanks. Condensate and residual water are sent to the heater treater. Produced water from the heater treater flows into the produced water storage tanks. 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 storage 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 I: EMISSION UNITS TABLE

ATTACHMENT I - EMISSION UNITS TABLE

Include ALL emission units and air pollution control devices that will be part of this permit application review, regardless of permitting

Emission Unit ID[1]	Emission Point ID[2]	Emission Unit Description	Year Installed/Modified	Design Capacity	Type[3] and Date of Change	Control Device(s)[4]
EU-ENG1	EP-ENG1	23.6-hp Kubota DG972-E2 Engine	2014	23.6-hp	Removal	N/A
EU-GPU1	EP-GPU1	1.0-mmBtu/hr GPU Burner	2013	1.0-mmBtu/hr	Existing	N/A
EU-LH1	EP-LH1	1.5-mmBtu/hr Line Heater	2013	1.5-mmBtu/hr	Removal	N/A
EU-HT1	EP-HT1	0.5-mmBtu/hr Heater Treater	2013	0.5-mmBtu/hr	Existing	N/A
EU-TANKS-COND	APC-COMB	Three (3) 400-bbl Condensate Tanks Routed to Vapor Combustor	2013	400-bbl	Modification	APC-COMB
EU-TANKS-PW	APC-COMB	Three (3) 400-bbl Produced Water Tanks Routed to Vapor Combustor	2013	400-bbl	Modification	APC-COMB
EU-LOAD-COND	EU-LOAD-COND and APC-COMB	Condensate Truck Loading w/ Vapor Return Routed to Combustor	2013	308,792 gal/yr	Modification	Vapor Return and APC-COMB
EU-LOAD-PW	EP-LOAD-PW	Produced Water Truck Loading	2013	58,791 gal/yr	Modification	N/A
APC-COMB	APC-COMB	15.0-mmBtu/hr Vapor Combustor	2013	15.0-mmBtu/hr	Modification	N/A
EU-PILOT	APC-COMB	Vapor Combustor Pilots	2013	50-scfh	Modification	N/A
EU-FUG	EP-FUG	Fugitive Emissions	2013	N/A	Modification	N/A
EU-HR	EP-HR	Fugitive Haul Road Emissions	2013	N/A	Modification	N/A

[1] For Emission Units (or Sources) use the following numbering system:1S, 2S, 3S,... or other appropriate designation.

[2] For Emission Points use the following numbering system:1E, 2E, 3E, ... or other appropriate designation.

[3] New, modification, removal, existing

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

ATTACHMENT J: EMISSION POINTS DATA SUMMARY SHEET

Attachment J
EMISSION POINTS DATA SUMMARY SHEET

Table 1: Emissions Data

Emission Point ID No. *(Must match Emission Units Table & Plot Plan)*	Emission Point Type[1]	Emission Unit Vented Through This Point *(Must match Emission Units Table & Plot Plan)*		Air Pollution Control Device *(Must match Emission Units Table & Plot Plan)*		Vent Time for Emission Unit *(chemical processes only)*		All Regulated Pollutants - Chemical Name/CAS[3] *(Speciate VOCs & HAPS)*	Maximum Potential Uncontrolled Emissions [4]		Maximum Potential Controlled Emissions [5]		Emission Form or Phase *(At exit conditions, Solid, Liquid or Gas/Vapor)*	Est. Method Used [6]	Emission Concentration [7] (ppmv or mg/m^4)
		ID No.	Source	ID No.	Device Type	Short Term[2]	Max (hr/yr)		lb/hr	ton/yr	lb/hr	ton/yr			
EP-GPU1	Upward vertical stack	EU-GPU1	GPU Burner	N/A	None	N/A	N/A	NOx CO VOC SO_2 PM_{10} PM Total n-Hexane Formaldehyde Benzene Toluene Carbon Dioxide Methane Nitrous Oxide	0.11 0.09 0.01 <0.01 0.01 0.01 <0.01 <0.01 <0.01 <0.01 116.98 <0.01 <0.01	0.48 0.41 0.03 <0.01 0.03 0.04 0.01 <0.01 <0.01 <0.01 512.36 0.01 <0.01	N/A	N/A	Gas/Vapor	O = AP-42	N/A
EP-HT1	Upward vertical stack	EU-HT1	Heater Treater	N/A	None	N/A	N/A	NOx CO VOC SO_2 PM_{10} PM Total n-Hexane Formaldehyde Benzene Toluene Carbon Dioxide Methane Nitrous Oxide	0.06 0.05 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 58.49 <0.01 <0.01	0.24 0.20 0.01 <0.01 0.01 0.02 <0.01 <0.01 <0.01 <0.01 256.18 <0.01 <0.01	N/A	N/A	Gas/Vapor	O = AP-42	N/A
EP-LOAD-COND	Fugitive	EU-LOAD-COND	Condensate Truck Loading	-	Vapor Return and APC-COMB	N/A	N/A	VOC n-Hexane Benzene Toluene Ethylbenzene Xylenes Carbon Dioxide Methane	N/A	0.95 0.05 <0.01 <0.01 <0.01 0.01 <0.01 0.16	N/A	0.29 0.01 <0.01 <0.01 <0.01 <0.01 <0.01 0.05	Gas/Vapor	O = AP-42/Promax	N/A

EP-LOAD-PW	Fugitive	EU-LOAD-PW	Produced Water Truck Loading	-	None	N/A	N/A	VOC n-Hexane Benzene Toluene Ethylbenzene Xylenes Carbon Dioxide Methane	N/A	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 0.03	N/A	N/A	Gas/Vapor	O = AP-42/Promax	N/A
APC-COMB	Upward vertical stack(s)	EU-TANKS-COND, EU-TANKS-PW, EU-COND-LOAD, APC-COMB, EU-PILOT	Vapor Combustor	-	None	N/A	N/A	NOx CO PM VOC n-Hexane Benzene Toluene Ethylbenzene Xylenes Carbon Dioxide Methane Nitrous Oxide	2.08 4.14 0.05 24.18 1.25 0.02 0.08 0.09 0.13 1,759.95 0.03 <0.01	9.09 18.12 0.21 105.92 5.47 0.07 0.33 0.40 0.58 7,708.58 0.15 0.01	2.08 4.14 0.05 0.48 <0.01 <0.01 <0.01 <0.01 <0.01 1,759.95 0.03 <0.01	9.09 18.12 0.21 2.12 0.11 <0.01 0.01 0.01 0.01 7,708.58 0.15 0.01	Gas/Vapor	O = AP-42, Mass Balance, ProMax	N/A
EP-FUG	Fugitive	EU-FUG	Fugitive Components	-	None	N/A	N/A	VOC n-Hexane Benzene Toluene Ethylbenzene Xylenes Carbon Dioxide Methane	N/A	3.02 0.13 <0.01 0.01 0.01 0.01 0.01 1.62	N/A	N/A	Gas/Vapor	O = EPA-453/ R-95-017	N/A
EP-HR	Fugitive	EU-HR	Fugitive Haul Road Emissions	-	None	N/A	N/A	PM Total PM_{10} $PM_{2.5}$	0.02 <0.01 <0.01	0.06 0.02 <0.01	N/A	N/A	Gas/Vapor	O = AP-42	N/A

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

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

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

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

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

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

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

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

Attachment J
EMISSION POINTS DATA SUMMARY SHEET

Table 2: Release Parameter Data								
Emission Point ID No. *(Must match Emission Units Table)*	Inner Diameter (ft.)	Exit Gas			Emission Point Elevation (ft)		UTM Coordinates (km)	
		Temp. (^{o}F)	Volumetric Flow [1] (acfm) *at operating conditions*	Velocity (fps)	Ground Level *(Height above mean sea level)*	Stack Height [2] *(Release height of emissions above ground level)*	Northing	Easting
EP-GPU1	1.0 (est.)	500 (est.)	~992.4	~21.1	~1,275	10.75	4,444.30127	536.89123
EP-HT1	0.7	450 (est.)	~13,067	~277.3	~1,275	10	4,444.30127	536.89123
EP-LOAD-COND	N/A	Ambient	N/A	N/A	~1,275	3 (est.)	4,444.30127	536.89123
EP-LOAD-PW	N/A	Ambient	N/A	N/A	~1,275	3 (est.)	4,444.30127	536.89123
APC-COMB	5.5	1,000 (est.)	Unknown	Unknown	~1,275	30	4,444.30127	536.89123
EP-FUG	N/A	Ambient	N/A	N/A	~1,275	N/A	4,444.30127	536.89123
EP-HR	N/A	Ambient	N/A	N/A	~1,275	N/A	4,444.30127	536.89123
Note: In lieu of equipment UTM coordinates, site UTM coordinates provided.								

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

Note:
*****Stack parameters for GPU and heater treater are estimated based on typical equipment configurations but may vary.***

ATTACHMENT K: FUGITIVE EMISSIONS DATA SUMMARY SHEET

Attachment K

FUGITIVE EMISSIONS DATA SUMMARY SHEET

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

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

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

FUGITIVE EMISSIONS SUMMARY	All Regulated Pollutants - Chemical Name/CAS [1]	Maximum Potential Uncontrolled Emissions [2]		Maximum Potential Controlled Emissions [3]		Est. Method Used [4]
		lb/hr	ton/yr	lb/hr	ton/yr	
Haul Road/Road Dust Emissions Paved Haul Roads						
Unpaved Haul Roads	PM Total PM_{10} $PM_{2.5}$	0.02 <0.01 <0.01	0.06 0.02 <0.01	N/A	N/A	O – AP-42 13.2.2
Storage Pile Emissions						
Loading/Unloading Operations - Condensate	VOC n-Hexane Benzene Toluene Ethylbenzene Xylenes Carbon Dioxide Methane	Does not apply	0.95 0.05 <0.01 <0.01 <0.01 0.01 <0.01 0.16	Does not apply	0.29 0.01 <0.01 <0.01 <0.01 <0.01 <0.01 0.05	O – AP-42 5.2-4 / API 5-12
Loading/Unloading Operations – Produced Water	VOC n-Hexane Benzene Toluene Ethylbenzene Xylenes Carbon Dioxide Methane	Does not apply	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 0.03	Does not apply	N/A	O – AP-42 5.2-4 / API 5-12
Wastewater Treatment Evaporation & Operations						

Equipment Leaks	VOC n-Hexane Benzene Toluene Ethylbenzene Xylenes Carbon Dioxide Methane	Does not apply	3.02 0.13 <0.01 0.01 0.01 0.01 0.01 1.62	Does not apply	N/A	O – EPA-453/R-95-017
General Clean-up VOC Emissions						
Other						

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

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

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

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

Note: Greenhouse Gas (GHG) emissions were calculated using EPA Mandatory Reporting Rule and 2009 API Compendium guidance. With the exception of fugitive emissions (which are calculated by mass balance), emissions calculation methodologies are intended to calculate metric tons (tonnes) for the purposes of emissions reporting to EPA. These values were converted to tons for consistency with other pollutants.

ATTACHMENT L: EMISSION UNIT DATA SHEETS

EUDS - STORAGE TANK(S): CONDENSATE

EUDS - STORAGE TANK(S): PRODUCED WATER

EUDS - BULK LIQUID TRANSFER OPERATIONS – CONDENSATE

EUDS - BULK LIQUID TRANSFER OPERATIONS – PRODUCED WATER

EUDS - CHEMICAL PROCESS (LEAK SOURCES)

EUDS - FUGITIVE EMISSIONS FROM HAUL ROADS

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

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

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

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name Condensate Storage	2. Tank Name Three (3) 400-bbl Condensate Storage Tanks
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) EU-TANKS-COND	4. Emission Point Identification No. (as assigned on *Equipment List Form*) APC-COMB
5. Date of Commencement of Construction (for existing tanks) 2013	
6. Type of change ☐ New Construction ☐ New Stored Material ☒ Other Tank Modification	
7. Description of Tank Modification (if applicable) Update composition and throughput.	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode).	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): Not applicable	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. 400 barrels (per tank)	
9A. Tank Internal Diameter (ft) 12	9B. Tank Internal Height (or Length) (ft) 20
10A. Maximum Liquid Height (ft) 19	10B. Average Liquid Height (ft) 10
11A. Maximum Vapor Space Height (ft) 20	11B. Average Vapor Space Height (ft) 10
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 16,074.56 gallons (per EPA TANKS 4.0.9d – previously submitted)	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
308,792 (Total for all tanks)	846 (Total for all tanks) *Rolling daily throughput total not to exceed maximum annual throughput.

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)
18.38 (Total for all tanks)

15. Maximum tank fill rate (gal/min) Unknown

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

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

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

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

III. TANK CONSTRUCTION & OPERATION INFORMATION (optional if providing TANKS Summary Sheets)
Refer to enclosed Tank Emissions.

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

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

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

22A. Is the tank heated? ☐ YES ☐ NO

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

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

23. Operating Pressure Range (psig):

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

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

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

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

25A. Year Internal Floaters Installed:

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

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

25D. If YES, how is the secondary seal mounted? (check one) ☐ Shoe ☐ Rim ☐ Other (describe):		
25E. Is the Floating Roof equipped with a weather shield? ☐ YES ☐ NO		
25F. Describe deck fittings; indicate the number of each type of fitting:		
ACCESS HATCH		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
AUTOMATIC GAUGE FLOAT WELL		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
COLUMN WELL		
BUILT-UP COLUMN – SLIDING COVER, GASKETED:	BUILT-UP COLUMN – SLIDING COVER, UNGASKETED:	PIPE COLUMN – FLEXIBLE FABRIC SLEEVE SEAL:
LADDER WELL		
PIP COLUMN – SLIDING COVER, GASKETED:	PIPE COLUMN – SLIDING COVER, UNGASKETED:	
GAUGE-HATCH/SAMPLE PORT		
SLIDING COVER, GASKETED:	SLIDING COVER, UNGASKETED:	
ROOF LEG OR HANGER WELL		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	SAMPLE WELL-SLIT FABRIC SEAL (10% OPEN AREA)
VACUUM BREAKER		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
RIM VENT		
WEIGHTED MECHANICAL ACTUATION GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
DECK DRAIN (3-INCH DIAMETER)		
OPEN:	90% CLOSED:	
STUB DRAIN		
1-INCH DIAMETER:		
OTHER (DESCRIBE, ATTACH ADDITIONAL PAGES IF NECESSARY)		

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

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

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

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

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

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

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

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

VI. EMISSIONS AND CONTROL DEVICE DATA (required)

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

- ☐ Carbon Adsorption[1]
- ☐ Condenser[1]
- ☐ Conservation Vent (psig)
  - Vacuum Setting Pressure Setting
- ☐ Emergency Relief Valve (psig)
- ☐ Inert Gas Blanket of
- ☐ Insulation of Tank with
- ☐ Liquid Absorption (scrubber)[1]
- ☐ Refrigeration of Tank
- ☐ Rupture Disc (psig)
- ☐ Vent to Incinerator[1]
- ☒ Other[1] (describe): Vapor Combustor

[1] Complete appropriate Air Pollution Control Device Sheet.

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

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
Refer to Attachment N Emissions Calculations.					

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

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

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

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

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

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name Produced Water Storage	2. Tank Name Three (3) 400-bbl Produced Water Storage Tanks
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) EU-TANKS-PW	4. Emission Point Identification No. (as assigned on *Equipment List Form*) APC-COMB
5. Date of Commencement of Construction (for existing tanks) 2013	
6. Type of change ☐ New Construction ☐ New Stored Material ☒ Other Tank Modification	
7. Description of Tank Modification (if applicable) Update throughput and composition.	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode).	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): Not applicable	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. 400 barrels (per tank)	
9A. Tank Internal Diameter (ft) 12	9B. Tank Internal Height (or Length) (ft) 20
10A. Maximum Liquid Height (ft) 19	10B. Average Liquid Height (ft) 10
11A. Maximum Vapor Space Height (ft) 20	11B. Average Vapor Space Height (ft) 10
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 16,074.56 gallons (per EPA TANKS 4.0.9d – previously submitted)	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
58,791 (Total for all tanks)	161 (Total for all tanks) *Rolling daily throughput total not to exceed maximum annual throughput.

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)
3.50 (Total for all tanks)

15. Maximum tank fill rate (gal/min) Unknown

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

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

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

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

III. TANK CONSTRUCTION & OPERATION INFORMATION (optional if providing TANKS Summary Sheets)
Refer to enclosed Tank Emissions.

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

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

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

22A. Is the tank heated? ☐ YES ☐ NO

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

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

23. Operating Pressure Range (psig):

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

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

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

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

25A. Year Internal Floaters Installed:

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

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

25D. If YES, how is the secondary seal mounted? (check one) ☐ Shoe ☐ Rim ☐ Other (describe):		
25E. Is the Floating Roof equipped with a weather shield? ☐ YES ☐ NO		
25F. Describe deck fittings; indicate the number of each type of fitting:		
ACCESS HATCH		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
AUTOMATIC GAUGE FLOAT WELL		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
COLUMN WELL		
BUILT-UP COLUMN – SLIDING COVER, GASKETED:	BUILT-UP COLUMN – SLIDING COVER, UNGASKETED:	PIPE COLUMN – FLEXIBLE FABRIC SLEEVE SEAL:
LADDER WELL		
PIP COLUMN – SLIDING COVER, GASKETED:	PIPE COLUMN – SLIDING COVER, UNGASKETED:	
GAUGE-HATCH/SAMPLE PORT		
SLIDING COVER, GASKETED:	SLIDING COVER, UNGASKETED:	
ROOF LEG OR HANGER WELL		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	SAMPLE WELL-SLIT FABRIC SEAL (10% OPEN AREA)
VACUUM BREAKER		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
RIM VENT		
WEIGHTED MECHANICAL ACTUATION GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
DECK DRAIN (3-INCH DIAMETER)		
OPEN:	90% CLOSED:	
STUB DRAIN		
1-INCH DIAMETER:		
OTHER (DESCRIBE, ATTACH ADDITIONAL PAGES IF NECESSARY)		

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

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

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

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

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

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

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

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

VI. EMISSIONS AND CONTROL DEVICE DATA (required)

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

- ☐ Carbon Adsorption[1]
- ☐ Condenser[1]
- ☐ Conservation Vent (psig)
  - Vacuum Setting Pressure Setting
- ☐ Emergency Relief Valve (psig)
- ☐ Inert Gas Blanket of
- ☐ Insulation of Tank with
- ☐ Liquid Absorption (scrubber)[1]
- ☐ Refrigeration of Tank
- ☐ Rupture Disc (psig)
- ☐ Vent to Incinerator[1]
- ☒ Other[1] (describe): Vapor Combustor

[1] Complete appropriate Air Pollution Control Device Sheet.

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

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
Refer to Attachment N Emissions Calculations.					

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

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

Attachment L
EMISSIONS UNIT DATA SHEET
BULK LIQUID TRANSFER OPERATIONS

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

Identification Number (as assigned on *Equipment List Form*): EU-LOAD-COND and APC-COMB

1. Loading Area Name: Condensate Truck Loading

2. Type of cargo vessels accommodated at this rack or transfer point (check as many as apply):

☐ Drums ☐ Marine Vessels ☐ Rail Tank Cars ☒ Tank Trucks

3. Loading Rack or Transfer Point Data:

Number of pumps	One (1)
Number of liquids loaded	One (1)
Maximum number of marine vessels, tank trucks, tank cars, and/or drums loading at one time	One (1)

4. Does ballasting of marine vessels occur at this loading area?

☐ Yes ☐ No ☒ Does not apply

5. Describe cleaning location, compounds and procedure for cargo vessels using this transfer point:

Point is kept clear. Scotches are provided. Lines kept in good working order and tested periodically.

6. Are cargo vessels pressure tested for leaks at this or any other location?

☒ Yes ☐ No

If YES, describe:

Vessel pressure tested in accordance with DOT requirements, if applicable.

7. Projected Maximum Operating Schedule (for rack or transfer point as a whole):				
Maximum	Jan. - Mar.	Apr. - June	July - Sept.	Oct. - Dec.
hours/day	24	24	24	24
days/week	5	5	5	5
weeks/quarter	13	13	13	13

8. Bulk Liquid Data *(add pages as necessary):*		
Pump ID No.		N/A
Liquid Name		Condensate
Max. daily throughput (1000 gal/day)		0.85
Max. annual throughput (1000 gal/yr)		308.79
Loading Method [1]		SUB
Max. Fill Rate (gal/min)		125
Average Fill Time (min/loading)		~60
Max. Bulk Liquid Temperature (°F)		120
True Vapor Pressure [2]		13.5987
Cargo Vessel Condition [3]		U
Control Equipment or Method [4]		O = Vapor Return w/ Combustion Controls
Minimum control efficiency (%)		70% Capture / 98% Combustion / 69% Overall
Maximum Emission Rate	Loading (lb/hr)	20.12
	Annual (lb/yr)	570.05 (based on 0.29 tons/year)
Estimation Method [5]		EPA

[1] BF = Bottom Fill SP = Splash Fill SUB = Submerged Fill
[2] At maximum bulk liquid temperature
[3] B = Ballasted Vessel, C = Cleaned, U = Uncleaned (dedicated service), O = other (describe)
[4] List as many as apply (complete and submit appropriate *Air Pollution Control Device Sheets*):CA = Carbon Adsorption LOA = Lean Oil AdsorptionCO = Condensation SC = Scrubber (Absorption)CRA = Compressor-Refrigeration-Absorption TO = Thermal Oxidation or Incineration CRC = Compression-Refrigeration-Condensation VB = Dedicated Vapor Balance (closed system) O = other (descibe)
[5] EPA = EPA Emission Factor as stated in AP-42 MB = Material Balance TM = Test Measurement based upon test data submittal O = other (describe)

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing

Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING Captured loading emissions shall be routed to the vapor combustor. The combustor shall be operated in accordance with the existing permit requirements.	RECORDKEEPING As currently permitted
REPORTING As currently permitted	TESTING As currently permitted

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.
RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.
REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.
TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

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

Not applicable

Attachment L
EMISSIONS UNIT DATA SHEET
BULK LIQUID TRANSFER OPERATIONS

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

Identification Number (as assigned on *Equipment List Form*): EU-LOAD-PW

1. Loading Area Name: Produced Water Truck Loading

2. Type of cargo vessels accommodated at this rack or transfer point (check as many as apply):

☐ Drums ☐ Marine Vessels ☐ Rail Tank Cars ☒ Tank Trucks

3. Loading Rack or Transfer Point Data:

Number of pumps	One (1)
Number of liquids loaded	One (1)
Maximum number of marine vessels, tank trucks, tank cars, and/or drums loading at one time	One (1)

4. Does ballasting of marine vessels occur at this loading area?

☐ Yes ☐ No ☒ Does not apply

5. Describe cleaning location, compounds and procedure for cargo vessels using this transfer point:

Point is kept clear. Scotches are provided. Lines kept in good working order and tested periodically.

6. Are cargo vessels pressure tested for leaks at this or any other location?

☒ Yes ☐ No

If YES, describe:

Vessel pressure tested in accordance with DOT requirements, if applicable.

7. Projected Maximum Operating Schedule (for rack or transfer point as a whole):				
Maximum	Jan. - Mar.	Apr. - June	July - Sept.	Oct. - Dec.
hours/day	24	24	24	24
days/week	5	5	5	5
weeks/quarter	13	13	13	13

8. Bulk Liquid Data *(add pages as necessary):*		
Pump ID No.		N/A
Liquid Name		Produced Water
Max. daily throughput (1000 gal/day)		0.16
Max. annual throughput (1000 gal/yr)		58.79
Loading Method [1]		SUB
Max. Fill Rate (gal/min)		125
Average Fill Time (min/loading)		~60
Max. Bulk Liquid Temperature (°F)		120
True Vapor Pressure [2]		13.4507
Cargo Vessel Condition [3]		U
Control Equipment or Method [4]		None
Minimum control efficiency (%)		N/A
Maximum Emission Rate	Loading (lb/hr)	0.56
	Annual (lb/yr)	<0.01 (based on <0.01 tons/year)
Estimation Method [5]		EPA

[1] BF = Bottom Fill SP = Splash Fill SUB = Submerged Fill
[2] At maximum bulk liquid temperature
[3] B = Ballasted Vessel, C = Cleaned, U = Uncleaned (dedicated service), O = other (describe)
[4] List as many as apply (complete and submit appropriate *Air Pollution Control Device Sheets*):CA = Carbon Adsorption LOA = Lean Oil AdsorptionCO = Condensation SC = Scrubber (Absorption)CRA = Compressor-Refrigeration-Absorption TO = Thermal Oxidation or Incineration CRC = Compression-Refrigeration-Condensation VB = Dedicated Vapor Balance (closed system) O = other (descibe)
[5] EPA = EPA Emission Factor as stated in AP-42 MB = Material Balance TM = Test Measurement based upon test data submittal O = other (describe)

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing

Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING Monitor and record throughput records.	RECORDKEEPING Monitor and record throughput records.
REPORTING As currently permitted	TESTING N/A

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

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

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

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

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

Not applicable

Attachment L
FUGITIVE EMISSIONS FROM UNPAVED HAULROADS

UNPAVED HAULROADS (including all equipment traffic involved in process, haul trucks, endloaders, etc.)

k =	Particle size multiplier	4.90	1.50
s =	Silt content of road surface material (%)	3.9	3.9
p =	Number of days per year with precipitation >0.01 in.	150	150

Item Number	Description	Number of Wheels	Mean Vehicle Weight (tons)	Mean Vehicle Speed (mph)	Miles per Trip	Maximum Trips per Hour	Maximum Trips per Year	Control Device ID Number	Control Efficiency (%)
1	Light Vehicles	4	2	10	0.54	1	23	N/A	N/A
2	Medium Trucks	10	15	10	0.54	1	12	N/A	N/A
3	Heavy Trucks	18	23.5	10	0.54	1	46	N/A	N/A
4									
5									
6									
7									
8									

Source: *AP-42 Fifth Edition – 13.2.2 Unpaved Roads*

$E = k \times 5.9 \times (s \div 12) \times (S \div 30) \times (W \div 3)^{0.7} \times (w \div 4)^{0.5} \times ((365 - p) \div 365) =$ lb/Vehicle Mile Traveled (VMT)

Where:

k =	Particle size multiplier	4.90	1.50
s =	Silt content of road surface material (%)	3.9	3.9
S =	Mean vehicle speed (mph)	10	10
W =	Mean vehicle weight (tons)	16.1	16.1
w =	Mean number of wheels per vehicle	13	13
p =	Number of days per year with precipitation >0.01 in.	150	150

For lb/hr: [lb ÷ VMT] × [VMT ÷ trip] × [Trips ÷ Hour] = lb/hr

For TPY: [lb ÷ VMT] × [VMT ÷ trip] × [Trips ÷ Hour] × [Ton ÷ 2000 lb] = Tons/year

SUMMARY OF UNPAVED HAULROAD EMISSIONS

Item No.	PM				PM-10			
	Uncontrolled		Controlled		Uncontrolled		Controlled	
	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
1	0.01	0.02	-	-	<0.01	<0.01	-	-
2	<0.01	0.01	-	-	<0.01	<0.01	-	-
3	0.01	0.04	-	-	<0.01	0.01	-	-
4								
5								
6								
7								
8								
TOTALS	**0.02**	**0.06**	-	-	<0.01	**0.02**	-	-

Note: Minimum one-per-day average pick-up trucks and service trucks even if tanker truck not required every day. Per EPA BID calculations, all emissions based on average trips. Estimated maximum hourly, daily and yearly trips provided for information only.

FUGITIVE EMISSIONS FROM PAVED HAULROADS – *Not Applicable*

INDUSTRIAL PAVED HAULROADS (including all equipment traffic involved in process, haul trucks, endloaders, etc.)

I =	Industrial augmentation factor (dimensionless)	
n =	Number of traffic lanes	
s =	Surface material silt content (%)	
L =	Surface dust loading (lb/mile)	

Item Number	Description	Mean Vehicle Weight (tons)	Miles per Trip	Maximum Trips per Hour	Maximum Trips per Year	Control Device ID Number	Control Efficiency (%)
1							
2							
3							
4							
5							
6							
7							
8							

Source: *AP-42 Fifth Edition – 11.2.6 Industrial Paved Roads*

$E = 0.077 \times I \times (4 \div n) \times (s \div 10) \times (L \div 1000) \times (W \div 3)^{0.7}$ = lb/Vehicle Mile Traveled (VMT)

Where:

I =	Industrial augmentation factor (dimensionless)	
n =	Number of traffic lanes	
s =	Surface meterial silt content (%)	
L =	Surface dust loading (lb/mile)	
W =	Average vehicle weight (tons)	

For lb/hr: [lb ÷ VMT] × [VMT ÷ trip] × [Trips ÷ Hour] = lb/hr

For TPY: [lb ÷ VMT] × [VMT ÷ trip] × [Trips ÷ Hour] × [Ton ÷ 2000 lb] = Tons/year

SUMMARY OF PAVED HAULROAD EMISSIONS

Item No.	Uncontrolled		Controlled	
	lb/hr	TPY	lb/hr	TPY
1				
2				
3				
4				
5				
6				
7				
8				
TOTALS				

Attachment L
EMISSIONS UNIT DATA SHEET
CHEMICAL PROCESS

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

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

1. Chemical process area name and equipment ID number (as shown in *Equipment List Form*)
   Components in natural gas and light liquid service (EU-FUG)

2. Standard Industrial Classification Codes (SICs) for process(es)
   1311

3. List raw materials and ☐ attach MSDSs – Previously submitted
   Natural gas and condensate

4. List Products and Maximum Production and ☐ attach MSDSs

Description and CAS Number	Maximum Hourly (lb/hr)	Maximum Annual (ton/year)
Not applicable		

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

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

   The facility is not a natural gas processing plant (SIC 1321) and is therefore not subject to New Source Performance Standards (NSPS) Subpart KKK or Subpart OOOO requirements for a leak detection and repair (LDAR) monitoring program.

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

   In the event of an accidental spill or release, personnel will be protected, emergency response personnel will be notified and immediate steps to stop the spill or release will be implemented.

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

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

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

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

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

Carrier: Phone:

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

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

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

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

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

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

MONITORING	RECORDKEEPING
As currently permitted	As currently permitted
REPORTING	**TESTING**
As currently permitted	As currently permitted

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

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

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

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

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

Not applicable

LEAK SOURCE DATA SHEET

Source Category	Pollutant	Number of Source Components[1]	Number of Components Monitored by Frequency[2]	Average Time to Repair (days)[3]	Estimated Annual Emission Rate (lb/yr)[4]
Pumps[5]	light liquid VOC[6,7]	0	N/A	N/A	0
	heavy liquid VOC[8]				
	Non-VOC[9]				
Valves[10]	Gas VOC	17	N/A	N/A	342.03
	Light Liquid VOC	72	N/A	N/A	3,317.87
	Heavy Liquid VOC				
	Non-VOC				
Safety Relief Valves[11]	Gas VOC	24	N/A	N/A	944.27
	Non VOC				
Open-ended Lines[12]	VOC	0	N/A	N/A	0
	Non-VOC				
Sampling Connections[13]	VOC	0	N/A	N/A	0
	Non-VOC				
Compressors	VOC	0	N/A	N/A	0
	Non-VOC				
Flanges	VOC	81 (Gas), 12 (LL)	N/A	N/A	141.24 (Gas), 24.33 (LL)
	Non-VOC				
Other	VOC	260	N/A	N/A	999.35
	Non-VOC				

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

Note: Component counts taken by equipment type at representative facility and made site-specific according to the number of each equipment type at this site.

Notes for Leak Source Data Sheet

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

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

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

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

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

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

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

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

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

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

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

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

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

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

13. Do not include closed-purge sampling connections.

ATTACHMENT M: AIR POLLUTION CONTROL DEVICE SHEET

APCDS – COMBUSTOR

VAPOR COMBUSTOR SPECIFICATION SHEET

Attachment M
Air Pollution Control Device Sheet
(~~FLARE~~ VAPOR COMBUSTOR SYSTEM*)

Control Device ID No. (must match Emission Units Table): APC-COMB

Equipment Information

1. Manufacturer: MRW Technologies, Inc.
   Model No. TBF-5.5-30-147000

2. Method: ☐ Elevated flare ☐ Ground flare ☒ Other
   Describe: Vapor Combustor

3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.

4. Method of system used: Not applicable
   ☐ Steam-assisted ☐ Air-assisted ☐ Pressure-assisted ☐ Non-assisted

5. Maximum capacity of ~~flare~~ vapor combustor:
   ~102 scf/min
   ~6,125 scf/hr
   *Based on 147,000 scfd

6. Dimensions of stack:
   Diameter 5.5 ft.
   Height 30 ft.

7. Estimated combustion efficiency:
   (Waste gas destruction efficiency)
   Estimated: ≥98%
   Minimum guaranteed: 98%

8. Fuel used in burners:
   ☒ Natural Gas
   ☐ Fuel Oil, Number
   ☐ Other, Specify:

9. Number of burners:
   Rating: 15 mmBTU/hr

10. Will preheat be used? ☐ Yes ☐ No

11. Describe method of controlling flame:
    The pilot is monitored via flame rod.

12. ~~Flare~~Vapor Combustor height: 30 ft

13. Flare tip inside diameter: N/A ft

14. Natural gas flow rate to ~~flare~~ pilot flame per pilot light: ~0.83 scf/min
    ≤50 scf/hr

15. Number of pilot lights:
    Total 1 ≤45,250 BTU/hr

16. Will automatic re-ignition be used?
    ☒ Yes ☐ No

17. If automatic re-ignition will be used, 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 and remote alarm signal will be generated to indicate loss of pilot flame.

18. Is pilot flame equipped with a monitor? ☒ Yes ☐ No
    If yes, what type? ☐ Thermocouple ☐ Infra-Red
    ☐ Ultra Violet ☐ Camera with monitoring control room
    ☒ Other, Describe: Flame rod

19. Hours of unit operation per year: 8,760

Steam Injection

20. Will steam injection be used? ☐ Yes ☒ No	21. Steam pressure PSIG Minimum Expected: Design Maximum:
22. Total Steam flow rate: LB/hr	23. Temperature: °F
24. Velocity ft/sec	25. Number of jet streams
26. Diameter of steam jets: in	27. Design basis for steam injected: LB steam/LB hydrocarbon
28. How will steam flow be controlled if steam injection is used?	

Characteristics of the Waste Gas Stream to be Burned

29. Name	Quantity Grains of H_2S/100 ft^3	Quantity (LB/hr, ft^3/hr, etc)	Source of Material
See Vapor Combustor			
Calculations in			
Attachment N			

30. Estimate total combustible to ~~flare~~ vapor combustor: 24.18 lb/hr VOC LB/hr or ACF/hr
(Maximum mass flow rate of waste gas) ~102 scfm

31. Estimated total flow rate to ~~flare~~ vapor combustor including materials to be burned, carrier gases, auxiliary fuel, etc.:
24.18 lb/hr VOC LB/hr or ACF/hr

32. Give composition of carrier gases:

33. Temperature of emission stream: ~1,000 °F Heating value of emission stream: 2,450 BTU/ft^3 Mean molecular weight of emission stream: MW = lb/lb-mole	34. Identify and describe all auxiliary fuels to be burned. BTU/scf Not applicable BTU/scf BTU/scf BTU/scf BTU/scf
35. Temperature of ~~flare~~ vapor combustor gas: ~1,000 °F	36. ~~Flare~~ Vapor combustor gas flow rate: ~102 scf/min
37. ~~Flare~~ Vapor combustor gas heat content: 2,450 BTU/ft^3	38. ~~Flare~~ Vapor combustor gas exit velocity: scf/min

39. Maximum rate during emergency for one major piece of equipment or process unit: scf/min

40. Maximum rate during emergency for one major piece of equipment or process unit: BTU/min

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

42. Describe the collection material disposal system:
N/A

43. Have you included ***~~Flare~~ Vapor Combustor Control Device*** in the Emissions Points Data Summary Sheet?
Yes

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

MONITORING:	RECORDKEEPING:
As currently permitted	As currently permitted
REPORTING:	TESTING:
As currently permitted	As currently permitted

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

45. Manufacturer's Guaranteed Capture Efficiency for each air pollutant.
100%

46. Manufacturer's Guaranteed Control Efficiency for each air pollutant.
≥98%

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

Notes:

****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 controlling emissions. Since there is not APCDS specifically for this device, the APCDS for Flare Systems most accurately reflects the characteristics of this control device.***

*****Assuming <50 SCFH pilot fuel consumption and 905 Btu/scf fuel heating value.***

Tank Battery Flare Specification Sheet
MRW Technologies, Inc.
Flare Model Number: TBF-5.5-30-147000

Expected Destruction Removal Efficiency (DRE):	98% or Greater of Non-Methane Hydrocarbons
Unit Size:	5.5-foot Diameter 30-Foot Overall Height
Design Heat Input:	15 MMBTU/HR
Design Flow Rates:	147,000 SCFD
Design Heat Content:	2450 BTU/SCF
Waste Gas Flame Arrestor:	2" Enardo
Pilot Type:	MRW Electric Ignition
Pilot Operation (Continuous/Intermittent):	Continuous
Pilot Fuel Consumption:	50 SCFH or Less
Pilot Monitoring Device:	Flame Rod
Automatic Re-Ignition:	Included
Remote Alarm Indication:	Included

Description of Control Scheme:

The flare pilot is monitored via flame rod. 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.

ATTACHMENT N: SUPPORTING EMISSIONS CALCULATIONS

EXAMPLE CALCULATIONS

g/hp-hr Emission Factors:

Emission Factor (g/hp-hr) * Engine Rating (hp) * 1 lb/453.6 g = lb/hr

lb/mmBtu Emission Factors:

Emission Factor (lb/mmBtu) * Engine Rating (hp) * Fuel Use (Btu/hp-hr) * 1 mmBtu/1000000 Btu = lb/hr

Emission Factor (lb/mmBtu) * Combustor Rating (mmBtu/hr) = lb/hr

lb/mmscf Emission Factors:

Emission Factor (lb/mmscf) * Heater Rating (mmBtu/hr) * 1/Fuel Heating Value (Btu/scf) = lb/hr

kg/mmBtu Emission Factors:

Emission Factor (kg/mmBtu) * Engine Rating (hp) * Fuel Use (Btu/hp-hr) * 2.20462 lb/kg * 1 mmBtu/1000000 Btu = lb/hr

Emission Factor (kg/mmBtu) * Heater Rating (mmBtu/hr) * 2.20462 lb/kg = lb/hr

Emissions with Capture and Control Systems:

Uncontrolled Emissions = Potential to Emit without Capture and/or Control

Uncaptured Emissions = Uncontrolled Emissions * (1 – Capture Efficiency %)

Controlled Emissions = Captured Emissions * (1 – Control Efficiency %)

Fugitives:

TOC Emission Factor (lb/hr/source) * Number of Sources * VOC wt% = lb/hr VOC

Tons per Year (TPY) Conversion:

lb/hr * Hours/Year * 1 ton/2000 lb = TPY

Tonnes/Year * 1.10231131 = TPY

SWN Production Company, LLC
Michael Ratcliffe Pad
Summary of Criteria Air Pollutant Emissions

Equipment	Unit ID	Emission Point ID	NOx		CO		Total VOC[1]		SO_2		PM Total	
			lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
1.0-mmBtu/hr GPU Burner	EU-GPU1	EP-GPU1	0.11	0.48	0.09	0.41	0.01	0.03	<0.01	<0.01	0.01	0.04
0.5-mmBtu/hr Heater Treater	EU-HT1	EP-HT1	0.06	0.24	0.05	0.20	<0.01	0.01	<0.01	<0.01	<0.01	0.02
Three (3) 400-bbl Condensate Tanks Routed to Vapor Combustor	EU-TANKS-COND	APC-COMB	-	-	-	-	-	-	-	-	-	-
Three (3) 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	-	-	-	-	0.07	0.29	-	-	-	-
Produced Water Truck Loading	EU-LOAD-PW	EP-LOAD-PW	-	-	-	-	<0.01	<0.01	-	-	-	-
15.0-mmBtu/hr Vapor Combustor	APC-COMB	APC-COMB	2.07	9.07	4.13	18.10	0.48	2.12	-	-	0.05	0.20
Vapor Combustor Pilot	EU-PILOT	APC-COMB	<0.01	0.02	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fugitive Emissions	EU-FUG	EP-FUG	-	-	-	-	0.69	3.02	-	-	-	-
Fugitive Haul Road Emissions	EU-HR	EP-HR	-	-	-	-	-	-	-	-	0.02	0.06
Total =			**2.24**	**9.81**	**4.28**	**18.73**	**1.25**	**5.47**	**<0.01**	**<0.01**	**0.08**	**0.32**
Total minus fugitives =			**2.24**	**9.81**	**4.28**	**18.73**	**0.56**	**2.44**	**<0.01**	**<0.01**	**0.06**	**0.26**
Current Permit Allowable Emissions =			**2.73**	**11.95**	**9.96**	**43.64**	**3.05**	**13.35**	**0.00**	**0.01**	**0.34**	**1.20**
Change in Emissions =			**(0.49)**	**(2.13)**	**(5.69)**	**(24.91)**	**(1.80)**	**(7.89)**	**(0.00)**	**(0.00)**	**(0.26)**	**(0.88)**

Notes:
[1] Total VOC includes all constituents heavier than Propane (C3+), including hazardous air pollutants (HAP). Speciated HAP presented in following table.

SWN Production Company, LLC
Michael Ratcliffe Pad
Summary of Hazardous Air Pollutants

Equipment	Unit ID	Estimated Emissions (lb/hr)									
		Acetaldehyde	Acrolein	Benzene	Ethylbenzene	Formalde-hyde	Methanol	n-Hexane	Toluene	Xylenes	Total HAP
1.0-mmBtu/hr GPU Burner	EU-GPU1	-	-	<0.01	-	<0.01	-	<0.01	<0.01	-	<0.01
0.5-mmBtu/hr Heater Treater	EU-HT1	-	-	<0.01	-	<0.01	-	<0.01	<0.01	-	<0.01
Three (3) 400-bbl Condensate Tanks Routed to Vapor Combustor	EU-TANKS-COND	-	-	-	-	-	-	-	-	-	-
Three (3) 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	-	-	<0.01	<0.01	<0.01	<0.01
Produced Water Truck Loading	EU-LOAD-PW	-	-	<0.01	<0.01	-	-	<0.01	<0.01	<0.01	<0.01
15.0-mmBtu/hr Vapor Combustor	APC-COMB	-	-	<0.01	<0.01	-	-	0.02	<0.01	<0.01	0.03
Vapor Combustor Pilot	EU-PILOT	-	-	<0.01	-	<0.01	-	<0.01	<0.01	-	<0.01
Fugitive Emissions	EU-FUG	-	-	<0.01	<0.01	-	-	0.03	<0.01	<0.01	0.04
Fugitive Haul Road Emissions	EU-HR	-	-	-	-	-	-	-	-	-	-
Total =		**0.00**	**0.00**	**<0.01**	**<0.01**	**<0.01**	**0.00**	**0.06**	**<0.01**	**0.01**	**0.08**
Current Permit Allowable Emissions =		**<0.01**	**<0.01**	**<0.01**	**0.01**	**<0.01**	**<0.01**	**0.16**	**0.01**	**0.03**	**0.22**
Change in Emissions =		**(0.00)**	**(0.00)**	**(0.00)**	**(0.01)**	**(0.00)**	**(0.00)**	**(0.10)**	**(0.01)**	**(0.02)**	**(0.14)**

Continued on Next Page

SWN Production Company, LLC
Michael Ratcliffe Pad
Summary of Hazardous Air Pollutants (Continued)

Equipment	Unit ID	Estimated Emissions (TPY)									
		Acetaldehyde	Acrolein	Benzene	Ethylbenzene	Formalde-hyde	Methanol	n-Hexane	Toluene	Xylenes	Total HAP
1.0-mmBtu/hr GPU Burner	EU-GPU1	-	-	<0.01	-	<0.01	-	0.01	<0.01	-	0.01
0.5-mmBtu/hr Heater Treater	EU-HT1	-	-	<0.01	-	<0.01	-	<0.01	<0.01	-	<0.01
Three (3) 400-bbl Condensate Tanks Routed to Vapor Combustor	EU-TANKS-COND	-	-	-	-	-	-	-	-	-	-
Three (3) 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	-	-	0.01	<0.01	<0.01	0.02
Produced Water Truck Loading	EU-LOAD-PW	-	-	<0.01	<0.01	-	-	<0.01	<0.01	<0.01	<0.01
15.0-mmBtu/hr Vapor Combustor	APC-COMB	-	-	<0.01	0.01	-	-	0.11	0.01	0.01	0.14
Vapor Combustor Pilot	EU-PILOT	-	-	<0.01	-	<0.01	-	<0.01	<0.01	-	<0.01
Fugitive Emissions	EU-FUG	-	-	<0.01	0.01	-	-	0.13	0.01	0.01	0.16
Fugitive Haul Road Emissions	EU-HR	-	-	-	-	-	-	-	-	-	-
Total =		**0.00**	**0.00**	**<0.01**	**0.02**	**<0.01**	**0.00**	**0.27**	**0.02**	**0.03**	**0.33**
Current Permit Allowable Emissions =		**<0.01**	**<0.01**	**0.01**	**0.05**	**0.02**	**<0.01**	**0.68**	**0.05**	**0.15**	**0.96**
Change in Emissions =		**(0.00)**	**(0.00)**	**(0.01)**	**(0.03)**	**(0.02)**	**(0.00)**	**(0.41)**	**(0.03)**	**(0.12)**	**(0.63)**

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

Equipment	Unit ID	Carbon Dioxide (CO_2)		Methane (CH_4)		Methane (CH_4) as $CO_{2\ Eq.}$		Nitrous Oxide (N_2O)		Nitrous Oxide (N_2O) as $CO_{2\ Eq.}$		Total CO_2 + $CO_{2\ Eq.}$ [1]	
		lb/hr	tonnes/yr	lb/hr	tonnes/yr	lb/hr	tonnes/yr	lb/hr	tonnes/yr	lb/hr	tonnes/yr	lb/hr	tonnes/yr
1.0-mmBtu/hr GPU Burner	EU-GPU1	116.98	464.80	<0.01	0.01	0.06	0.22	<0.01	<0.01	0.07	0.26	117.10	465.28
0.5-mmBtu/hr Heater Treater	EU-HT1	58.49	232.40	<0.01	<0.01	0.03	0.11	<0.01	<0.01	0.03	0.13	58.55	232.64
Three (3) 400-bbl Condensate Tanks Routed to Vapor Combustor	EU-TANKS-COND	-	-	-	-	-	-	-	-	-	-	-	-
Three (3) 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	0.01	0.04	0.27	1.08	-	-	-	-	0.27	1.08
Produced Water Truck Loading	EU-LOAD-PW	<0.01	<0.01	0.01	0.03	0.17	0.69	-	-	-	-	0.17	0.69
15.0-mmBtu/hr Vapor Combustor	APC-COMB	1,754.66	6,972.07	0.03	0.13	0.83	3.28	<0.01	0.01	0.99	3.92	1,756.47	6,979.27
Vapor Combustor Pilot	EU-PILOT	5.29	21.03	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.01	5.30	21.05
Fugitive Emissions	EU-FUG	<0.01	0.01	0.37	1.47	9.24	36.70	-	-	-	-	9.24	36.70
Fugitive Haul Road Emissions	EU-HR	-	-	-	-	-	-	-	-	-	-	-	-
	Total =	**1,935.42**	**7,690.32**	**0.42**	**1.68**	**10.59**	**42.09**	**<0.01**	**0.01**	**1.09**	**4.32**	**1,947.10**	**7,736.72**

Notes:
[1] CO_2 Equivalent = Pollutant times GWP multiplier. 40 CFR 98 Table A-1, Global Warming Potential (GWP) multiplier (100-Year Time Horizon): CO_2 = 1, CH_4 = 25, N_2O = 298

[2] Per API Compendium (2009) Chapter 5: Because most of the CH_4 and CO_2 emissions from storage tanks occur as a result of flashing (which 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. Therefore, GHG emissions from the condensate tanks are assumed to be negligible.

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

Equipment	Unit ID	Carbon Dioxide (CO_2)		Methane (CH_4)		Methane (CH_4) as $CO_{2\ Eq.}$		Nitrous Oxide (N_2O)		Nitrous Oxide (N_2O) as $CO_{2\ Eq.}$		Total CO_2 + $CO_{2\ Eq.}$[1]	
		lb/hr	tons/yr[2]	lb/hr	tons/yr[2]	lb/hr	tons/yr	lb/hr	tons/yr[2]	lb/hr	tons/yr	lb/hr	tons/yr
1.0-mmBtu/hr GPU Burner	EU-GPU1	116.98	512.36	<0.01	0.01	0.06	0.24	<0.01	<0.01	0.07	0.29	117.10	512.89
0.5-mmBtu/hr Heater Treater	EU-HT1	58.49	256.18	<0.01	<0.01	0.03	0.12	<0.01	<0.01	0.03	0.14	58.55	256.44
Three (3) 400-bbl Condensate Tanks Routed to Vapor Combustor	EU-TANKS-COND	-	-	-	-	-	-	-	-	-	-	-	-
Three (3) 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	0.01	0.05	0.27	1.19	-	-	-	-	0.27	1.19
Produced Water Truck Loading	EU-LOAD-PW	<0.01	<0.01	0.01	0.03	0.17	0.76	-	-	-	-	0.17	0.76
15.0-mmBtu/hr Vapor Combustor	APC-COMB	1,754.66	7,685.39	0.03	0.14	0.83	3.62	<0.01	0.01	0.99	4.32	1,756.47	7,693.33
Vapor Combustor Pilot	EU-PILOT	5.29	23.18	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.01	5.30	23.21
Fugitive Emissions	EU-FUG	<0.01	0.01	0.37	1.62	9.24	40.45	-	-	-	-	9.24	40.46
Fugitive Haul Road Emissions	EU-HR	-	-	-	-	-	-	-	-	-	-	-	-
Total =		**1,935.42**	**8,477.12**	**0.42**	**1.86**	**10.59**	**46.39**	**<0.01**	**0.02**	**1.09**	**4.76**	**1,947.10**	**8,528.28**

Notes:
[1] CO_2 Equivalent = Pollutant times GWP multiplier. 40 CFR 98 Table A-1, Global Warming Potential (GWP) multiplier (100-Year Time Horizon): CO_2 = 1, CH_4 = 25, N_2O = 298
[2] 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.
[3] Per API Compendium (2009) Chapter 5: Because most of the CH_4 and CO_2 emissions from storage tanks occur as a result of flashing (which 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. Therefore, GHG emissions from the condensate tanks are assumed to be negligible.

SWN Production Company, LLC
Michael Ratcliffe Pad
Gas Production Unit Burner Emissions Calculations - Criteria Air Pollutants

Equipment Information

Unit ID:	**EU-GPU1**
Emission Point ID:	EP-GPU1
Description:	Gas Production Unit Burner
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-GPU1**

Pollutant	lb/hr	TPY
NOx	0.11	0.48
CO	0.09	0.41
VOC	0.01	0.03
SO_2	<0.01	<0.01
$PM_{10/2.5}$	0.01	0.03
PM_{COND}	<0.01	0.01
PM_{TOT}	0.01	0.04

AP-42 Emission Factors for Units <100 mmBtu/hr (lb/mmscf)[1]

Pollutant	1.4-1, -2 (7/98)
NOx	100.0
CO	84.0
VOC	5.5
SO_2	0.6
$PM_{10/2.5}$	5.7
PM_{COND}	1.9
PM_{TOT}	7.6

Notes:
[1] 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
Michael Ratcliffe Pad
Gas Production Unit Burner Emissions Calculations - Hazardous Air Pollutants

Equipment Information

Unit ID:	**EU-GPU1**
Emission Point ID:	EP-GPU1
Description:	Gas Production Unit Burner
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-GPU1**

Pollutant	lb/hr	TPY
n-Hexane	<0.01	0.01
Formaldehyde	<0.01	<0.01
Benzene	<0.01	<0.01
Toluene	<0.01	<0.01
Total HAP =	**<0.01**	**0.01**

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
Michael Ratcliffe Pad
Gas Production Unit Burner Emissions Calculations - Greenhouse Gases

Equipment Information

Unit ID:	**EU-GPU1**
Emission Point ID:	EP-GPU1
Description:	Gas Production Unit Burner
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[1]

Unit ID: **EU-GPU1**

Pollutant	lb/hr	tonnes/yr
CO_2	116.98	464.80
CH_4	<0.01	0.01
N_2O	<0.01	<0.01
CH_4 as CO_2e	0.06	0.22
N_2O as CO_2e	0.07	0.26
Total CO_2 + CO_2e =	**117.10**	**465.28**

40 CFR 98 Tables C-1 and C-2 Emission Factors (kg/mmBtu)[2]

Carbon Dioxide (CO_2)	53.06
Methane (CH_4)	1.00E-03
Nitrous Oxide (N_2O)	1.00E-04

Notes:
[1] Conversion to short tons (tons) found in site-wide Summary of Greenhouse Gases - Short Tons per Year (tons) table.
[2] CO_2e = CO_2 equivalent (Pollutant times GWP multiplier):
40 CFR 98 Table A-1, Global Warming Potential (GWP) multiplier: CO_2 = 1, CH_4 = 25, N_2O = 298

SWN Production Company, LLC
Michael Ratcliffe Pad
Heater Treater Emissions Calculations - Criteria Air Pollutants

Equipment Information

Unit ID:	**EU-HT1**
Emission Point ID:	EP-HT1
Description:	Heater Treater
Number of Units:	1
Burner Design (mmBtu/hr):	0.5
Fuel HHV (Btu/scf):	905
Annual Fuel Use (mmscf):	4.84
Annual Operating Hours:	8,760

Criteria Air Pollutant Emissions

Unit ID: **EU-HT1**

Pollutant	lb/hr	TPY
NOx	0.06	0.24
CO	0.05	0.20
VOC	<0.01	0.01
SO_2	<0.01	<0.01
$PM_{10/2.5}$	<0.01	0.01
PM_{COND}	<0.01	<0.01
PM_{TOT}	<0.01	0.02

AP-42 Emission Factors for Units <100 mmBtu/hr (lb/mmscf)[1]

Pollutant	1.4-1, -2 (7/98)
NOx	100.0
CO	84.0
VOC	5.5
SO_2	0.6
$PM_{10/2.5}$	5.7
PM_{COND}	1.9
PM_{TOT}	7.6

Notes:
[1] 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
Michael Ratcliffe Pad
Heater Treater Emissions Calculations - Hazardous Air Pollutants

Equipment Information

Unit ID:	**EU-HT1**
Emission Point ID:	EP-HT1
Description:	Heater Treater
Number of Units:	1
Burner Design (mmBtu/hr):	0.5
Fuel HHV (Btu/scf):	905
Annual Fuel Use (mmscf):	4.84
Annual Operating Hours:	8,760

Hazardous Air Pollutant Emissions

Unit ID: **EU-HT1**

Pollutant	lb/hr	TPY
n-Hexane	<0.01	<0.01
Formaldehyde	<0.01	<0.01
Benzene	<0.01	<0.01
Toluene	<0.01	<0.01
Total HAP =	**<0.01**	**<0.01**

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
Michael Ratcliffe Pad
Heater Treater Emissions Calculations - Greenhouse Gases

Equipment Information

Unit ID:	**EU-HT1**
Emission Point ID:	EP-HT1
Description:	Heater Treater
Number of Units:	1
Burner Design (mmBtu/hr):	0.5
Fuel HHV (Btu/scf):	905
Annual Fuel Use (mmscf):	4.84
Annual Operating Hours:	8,760

Greenhouse Gas (GHG) Emissions[1]

Unit ID: **EU-HT1**

Pollutant	lb/hr	tonnes/yr
CO_2	58.49	232.40
CH_4	<0.01	<0.01
N_2O	<0.01	<0.01
CH_4 as CO_2e	0.03	0.11
N_2O as CO_2e	0.03	0.13
Total CO_2 + CO_2e =	**58.55**	**232.64**

40 CFR 98 Tables C-1 and C-2 Emission Factors (kg/mmBtu)[2]

Carbon Dioxide (CO_2)	53.06
Methane (CH_4)	1.00E-03
Nitrous Oxide (N_2O)	1.00E-04

Notes:
[1] Conversion to short tons (tons) found in site-wide Summary of Greenhouse Gases - Short Tons per Year (tons) table.
[2] CO_2e = CO_2 equivalent (Pollutant times GWP multiplier):
40 CFR 98 Table A-1, Global Warming Potential (GWP) multiplier: CO_2 = 1, CH_4 = 25, N_2O = 298

SWN Production Company, LLC
Michael Ratcliffe Pad
Storage Tank Emissions - Criteria Air Pollutants

Tank Information

Unit ID:	EU-TANKS-COND	EU-TANKS-PW
Emission Point ID:	APC-COMB	APC-COMB
Contents: [1,3]	Condensate	Produced Water
Number of Tanks:	3	3
Capacity (bbl) - Per Tank:	400	400
Capacity (gal) - Per Tank:	16,800	16,800
Total:		
Total Throughput (bbl/yr):	7,352	1,400
Total Throughput (gal/yr):	308,792	58,791
Total Throughput (bbl/d):	20	4
Per Tank:		
Throughput (bbl/yr):	2,451	467
Throughput (gal/yr):	102,931	19,597
Throughput (bbl/d):	7	1
Turnovers:	18.38	3.50
Tank Vapor Capture Efficiency:	100%	100%
Captured Vapors Routed to:	Vapor Combustor	Vapor Combustor

Uncontrolled Storage Tank Emissions[2]

Unit ID:	EU-TANKS-COND		EU-TANKS-PW	
Emissions	**lb/hr**	**TPY**	**lb/hr**	**TPY**
Working and Breathing Losses	9.60	42.06	<0.01	0.01
Flashing Losses	14.42	63.17	<0.01	0.01
Total VOC =	**24.03**	**105.23**	**<0.01**	**0.02**

Controlled Storage Tank Emissions[3]

Unit ID:	EU-TANKS-COND		EU-TANKS-PW	
Emissions	**lb/hr**	**TPY**	**lb/hr**	**TPY**
Working and Breathing Losses	0.19	0.84	<0.01	<0.01
Flashing Losses	0.29	1.26	<0.01	<0.01
Total VOC =	**0.48**	**2.10**	**<0.01**	**<0.01**
Per Tank =	**0.16**	**0.70**	**<0.01**	**<0.01**

Notes:

[1] Produced water tanks assumed to contain 99% produced water and 1% condensate.

[2] Tank working, breathing, and flashing emissions were calculated using Promax process simulation. Reports located in Appendix A. Uncontrolled tank working/breathing/flashing emissions will be routed to a vapor combustor with 100% capture efficiency.

[3] Controlled tank emissions are shown for reference only.

SWN Production Company, LLC
Michael Ratcliffe 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**
Total VOC = [1,2]	**24.03**	**105.23**	**<0.01**	**0.02**
n-Hexane	1.24	5.43	<0.01	<0.01
Benzene	0.02	0.07	<0.01	<0.01
Toluene	0.07	0.33	<0.01	<0.01
Ethylbenzene	0.09	0.39	<0.01	<0.01
Xylenes	0.13	0.57	<0.01	<0.01
Total HAP =	**1.55**	**6.80**	**<0.01**	**<0.01**

Controlled Storage Tank Emissions [3]

Unit ID:	EU-TANKS-COND		EU-TANKS-PW	
Pollutant	**lb/hr**	**TPY**	**lb/hr**	**TPY**
Total VOC = [1]	**0.48**	**2.10**	**<0.01**	**<0.01**
n-Hexane	0.02	0.11	<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	0.01	<0.01	<0.01
Total HAP =	**0.03**	**0.14**	**<0.01**	**<0.01**

Estimated HAP Composition (% by Weight)[4]

Pollutant	Wt%
n-Hexane	5.163%
Benzene	0.065%
Toluene	0.312%
Ethylbenzene	0.375%
Xylenes	0.545%
Total HAP =	**6.460%**

Notes:

[1] VOC emissions calculated in Criteria Air Pollutant calculations.

[2] Uncontrolled tank working/breathing/flashing emissions are controlled by a vapor combustor with 100% capture efficiency.

[3] Controlled tank emissions are shown for reference only.

[4] 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
Michael Ratcliffe Pad
Tank Emissions Calculations - Greenhouse Gases

Equipment Information

Unit ID:	**EU-TANKS-COND**	**EU-TANKS-PW**
Emission Point ID:	APC-COMB	APC-COMB
Contents:	Condensate	Produced Water
Number of Tanks:	3	3
Capacity (bbl) - Per Tank:	400	400
Capacity (gal) - Per Tank:	16,800	16,800
Total:		
Total Throughput (bbl/yr):	7,352	1,400
Total Throughput (gal/yr):	308,792	58,791
Total Throughput (bbl/d):	20	4
Per Tank:		
Throughput (bbl/yr):	2,451	467
Throughput (gal/yr):	102,931	19,597
Throughput (bbl/d):	7	1
Turnovers:	18.38	3.50
Tank Vapor Capture Efficiency:	100%	100%
Captured Vapors Routed to:	Vapor Combustor	Vapor Combustor

Uncontrolled Greenhouse Gas Emissions[1,2]

Unit ID:	**EU-TANKS-COND**		**EU-TANKS-PW**	
Greenhouse Gas	**Avg. lb/hr**[3]	**tonnes/yr**	**Avg. lb/hr**[3]	**tonnes/yr**
CH_4	0.70	2.80	7.11	28.25
CH_4 as CO_2e	17.61	69.97	177.76	706.34
CO_2	0.02	0.10	0.38	1.50
Total CO_2 + CO_2e =	**17.63**	**70.06**	**178.14**	**707.83**
Per Tank =	**5.88**	**23.35**	**59.38**	**235.94**

Greenhouse Gas	**Avg. lb/hr**[3]	**tons/yr**	**Avg. lb/hr**[3]	**tons/yr**
CH_4	0.70	3.08	7.11	31.14
CH_4 as CO_2e	17.61	77.12	177.76	778.60
CO_2	0.02	0.10	0.38	1.65
Total CO_2 + CO_2e =	**17.63**	**77.23**	**178.14**	**780.25**
Per Tank =	**5.88**	**25.74**	**59.38**	**260.08**

SWN Production Company, LLC
Michael Ratcliffe Pad
Tank Emissions Calculations - Greenhouse Gases

Notes:

1) Per API Chapter 5: CH_4 and CO_2 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_4 or CO_2.

2) CO_2e = CO_2 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_4)	25

SWN Production Company, LLC
Michael Ratcliffe 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
Em. Factor (lb/1000 gal):	9.11
Throughput (1000 gal):	308.79
Control Type:	Vapor Return/Combustion
Vapor Capture Efficiency: [1]	70%
Average Fill Rate (gal/hr):	7,500
Captured Vapors Routed to:	Vapor Combustor
VOC Weight %:	98.16%

13.5987	= P, True vapor pressure of liquid loaded (max. psia)
51.98	= M, Molecular weight of vapor (lb/lb-mol)
120.00	= T, Temperature of bulk liquid loaded (average °F)
580.00	= T, Temperature of bulk liquid loaded (°F + 460 = °R)

Uncontrolled Loading Emissions[2]

Pollutant	Max. lb/hr	Avg. lb/hr	TPY
VOC =	**67.08**	**0.22**	**0.95**
n-Hexane	3.46	0.01	0.05
Benzene	0.04	<0.01	<0.01
Toluene	0.21	<0.01	<0.01
Ethylbenzene	0.25	<0.01	<0.01
Xylenes	0.37	<0.01	0.01
Total HAP =	**4.33**	**0.01**	**0.06**

Uncaptured Loading Emissions[2]

Pollutant	Max. lb/hr	Avg. lb/hr	TPY
VOC =	**20.12**	**0.07**	**0.29**
n-Hexane	1.04	<0.01	0.01
Benzene	0.01	<0.01	<0.01
Toluene	0.06	<0.01	<0.01
Ethylbenzene	0.08	<0.01	<0.01
Xylenes	0.11	<0.01	<0.01
Total HAP =	**1.30**	**<0.01**	**0.02**

SWN Production Company, LLC
Michael Ratcliffe Pad
Condensate Truck Loading Emissions - Criteria and Hazardous Air Pollutants (Continued)

Estimated HAP Composition (% by Weight)[3]

Pollutant	Wt%
n-Hexane	5.163%
Benzene	0.065%
Toluene	0.312%
Ethylbenzene	0.375%
Xylenes	0.545%
Total HAP =	**6.460%**

Notes:

[1] 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.

[2] Maximum lb/hr based on average hourly truck loading rate. Average lb/hr based on TPY conversion assuming continuous operation.

[3] 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
Michael Ratcliffe Pad
Condensate Truck Loading Emissions - Greenhouse Gases

Loading Information

Unit ID:	**EU-LOAD-COND**
Emission Point ID:	APC-COMB
Fill Method:	Submerged
Type of Service:	Dedicated
Mode of Operation:	Normal
TOC Em. Factor (tonne/10^6 gal): [1]	0.91
Throughput (10^6 gal):	0.309
Control Type:	Vapor Return/Combustion
Vapor Capture Efficiency: [2]	70.00%
Average Fill Rate (gal/hr):	7,500
Captured Vapors Routed to:	Vapor Combustor

Analysis CH_4 wt% =	51.22273%
Analysis CO_2 wt% =	0.26415%

Uncontrolled Loading Emissions[3, 4]

Pollutant	Max. lb/hr	Avg. lb/hr	tonnes/yr	tons/yr
CH_4	7.71	0.04	0.14	0.16
CH_4 as CO_2e	192.68	0.91	3.60	3.97
CO_2	0.04	<0.01	<0.01	<0.01
Total CO_2 + CO_2e =	**192.72**	**0.91**	**3.60**	**3.97**

Uncaptured Loading Emissions[3, 4]

Pollutant	Max. lb/hr	Avg. lb/hr	tonnes/yr	tons/yr
CH_4	2.31	0.01	0.04	0.05
CH_4 as CO_2e	57.80	0.27	1.08	1.19
CO_2	0.01	<0.01	<0.01	<0.01
Total CO_2 + CO_2e =	**57.82**	**0.27**	**1.08**	**1.19**

SWN Production Company, LLC
Michael Ratcliffe Pad
Condensate Truck Loading Emissions - Greenhouse Gases (Continued)

API Compendium Table 5-12

Loading Type	Emission Factor (tonne TOC/10^6 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:

[1] API Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Gas Industry, Table 5-12.

[2] 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.

[3] Maximum lb/hr based on average hourly truck loading rate. Average lb/hr based on TPY conversion assuming continuous operation.

[4] CO_2e = CO_2 equivalent (Pollutant times GWP multiplier):
40 CFR 98 Table A-1, Global Warming Potential (GWP) multiplier: CO_2 = 1, CH_4 = 25

SWN Production Company, LLC
Michael Ratcliffe 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
Em. Factor (lb/1000 gal):	5.94
Throughput (1000 gal):	58.79
Control Type:	None
Average Fill Rate (gal/hr):	7,500
VOC Weight %:	1.27%

13.4507	= P, True vapor pressure of liquid loaded (max. psia)
34.26	= M, Molecular weight of vapor (lb/lb-mol)
120.00	= T, Temperature of bulk liquid loaded (average °F)
580.00	= T, Temperature of bulk liquid loaded (°F + 460 = °R)

Uncontrolled Loading Emissions[1]

Pollutant	Max. lb/hr	Avg. lb/hr	TPY
VOC =	**0.56**	**<0.01**	**<0.01**
n-Hexane	0.03	<0.01	<0.01
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
Total HAP =	**0.04**	**<0.01**	**<0.01**

Estimated HAP Composition (% by Weight)[2]

Pollutant	Wt%
n-Hexane	5.163%
Benzene	0.065%
Toluene	0.312%
Ethylbenzene	0.375%
Xylenes	0.545%
Total HAP =	**6.460%**

Notes:

[1] Maximum lb/hr based on average hourly truck loading rate. Average lb/hr based on TPY conversion assuming continuous operation.

[2] 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
Michael Ratcliffe 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/10^6 gal): [1]	0.91
Throughput (10^6 gal):	0.0588
Control Type:	None
Average Fill Rate (gal/hr):	7,500

Analysis CH_4 wt% =	51.22273%
Analysis CO_2 wt% =	0.26415%

Uncontrolled Loading Emissions[2, 3]

Pollutant	Max. lb/hr	Avg. lb/hr	tonnes/yr	tons/yr
CH_4	7.71	0.01	0.03	0.03
CH_4 as CO_2e	192.68	0.17	0.69	0.76
CO_2	0.04	<0.01	<0.01	<0.01
Total CO_2 + CO_2e =	**192.72**	**0.17**	**0.69**	**0.76**

API Compendium Table 5-12

Loading Type	Emission Factor (tonne TOC/10^6 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:

[1] API Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Gas Industry, Table 5-12.

[2] Maximum lb/hr based on average hourly truck loading rate. Average lb/hr based on TPY conversion assuming continuous operation.

[3] CO_2e = CO_2 equivalent (Pollutant times GWP multiplier):
40 CFR 98 Table A-1, Global Warming Potential (GWP) multiplier: CO_2 = 1, CH_4 = 25

SWN Production Company, LLC
Michael Ratcliffe Pad
Vapor Combustor Emissions Calculations - Criteria and Hazardous Air Pollutants

Criteria and Hazardous Air Pollutant Emissions

Unit ID	Pollutant	Emission Factors[1]	Total Captured Emissions[2]		Combustor Destruction Efficiency	Total Controlled Emissions (Post-Capture and Combustion)	
			lb/hr	TPY	%	lb/hr	TPY
APC-COMB	NOx	0.138	-	-	-	2.07	9.07
	CO	0.2755	-		-	4.13	18.10
	PM	7.6	-		-	0.05	0.20
	VOC	Mass Balance	24.18	105.92	98.00%	0.48	2.12
	n-Hexane	Mass Balance	1.25	5.47	98.00%	0.02	0.11
	Benzene	Mass Balance	0.02	0.07	98.00%	<0.01	<0.01
	Toluene	Mass Balance	0.08	0.33	98.00%	<0.01	0.01
	Ethylbenzene	Mass Balance	0.09	0.40	98.00%	<0.01	0.01
	Xylenes	Mass Balance	0.13	0.58	98.00%	<0.01	0.01

Notes:

[1] 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:	147.10	lb/hr
	15.0	mmBtu/hr per Combustor
	15.0	mmBtu/hr Total Heat Input

NOx and CO emission factors (lb/mmBtu): *TCEQ Air Permit Technical Guidance for Chemical Sources: Flares and Vapor Oxidizers:* High Btu waste streams (>1,000 Btu/scf) based on heat input to each combustor =

[2] 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
Michael Ratcliffe Pad
Vapor Combustor Emissions Calculations - Criteria and Hazardous Air Pollutants (Continued)

Source	Captured VOC Emissions	
	lb/hr	TPY
Condensate Storage Tanks	24.03	105.23
Produced Water Storage Tanks	<0.01	0.02
Condensate Truck Loading	0.15	0.67
Total VOC =	**24.18**	**105.92**

Source	Captured HAP Emissions (lb/hr)				
	n-Hexane	Benzene	Toluene	Ethylbenzene	Xylenes
Condensate Storage Tanks	1.24	0.02	0.07	0.09	0.13
Produced Water Storage Tanks	<0.01	<0.01	<0.01	<0.01	<0.01
Condensate Truck Loading	0.01	<0.01	<0.01	<0.01	<0.01
Total HAP =	**1.25**	**0.02**	**0.08**	**0.09**	**0.13**

Source	Captured HAP Emissions (TPY)				
	n-Hexane	Benzene	Toluene	Ethylbenzene	Xylenes
Condensate Storage Tanks	5.43	0.07	0.33	0.39	0.57
Produced Water Storage Tanks	<0.01	<0.01	<0.01	<0.01	<0.01
Condensate Truck Loading	0.03	<0.01	<0.01	<0.01	<0.01
Total HAP =	**5.47**	**0.07**	**0.33**	**0.40**	**0.58**

SWN Production Company, LLC
Michael Ratcliffe Pad
Vapor Combustor Emissions Calculations - Greenhouse Gases

Equipment Information

Unit ID:	**APC-COMB**
Description:	Vapor Combustor
Number of Combustors:	1
Burner Design Capacity (mmBtu/hr):	15.0
Stream HHV (Btu/scf):	2,450
Annual Throughput (mmscf):	53.63
Annual Operating Hours:	8,760

Greenhouse Gas (GHG) Emissions

Pollutant	lb/hr	tonnes/yr	tons/yr
CO_2	1,754.66	6,972.07	7,685.39
CH_4	0.03	0.13	0.14
N_2O	<0.01	0.01	0.01
CH_4 as CO_2e	0.83	3.28	3.62
N_2O as CO_2e	0.99	3.92	4.32
Total CO_2 + CO_2e =	**1,756.47**	**6,979.27**	**7,693.33**

40 CFR 98 Tables C-1 and C-2 Emission Factors (kg/mmBtu)[1]

Carbon Dioxide (CO_2)	53.06
Methane (CH_4)	1.00E-03
Nitrous Oxide (N_2O)	1.00E-04

Notes:
[1] CO_2e = CO_2 equivalent (Pollutant times GWP multiplier):
40 CFR 98 Table A-1, Global Warming Potential (GWP) multiplier: CO_2 = 1, CH_4 = 25, N_2O = 298

SWN Production Company, LLC
Michael Ratcliffe Pad
Vapor Combustor Pilot Emissions Calculations - Criteria Air Pollutants

Criteria Air Pollutant Emissions

Unit ID	Pollutant	Emission Factors [1] (lb/mmscf)	Emissions lb/hr	Emissions TPY
EU-PILOT APC-COMB	NOx	100	<0.01	0.02
	CO	84	<0.01	0.02
	VOC	5.5	<0.01	<0.01
	SO_2	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
50	Total Pilot Gas Flow Rate (SCFH)
45,250	Total Pilot Gas Fuel Use (Btu/hr)
0.44	Total Annual Fuel Use (MMSCF)

Notes:
[1] AP-42 Table 1.4-1, -2 (7/98)

SWN Production Company, LLC
Michael Ratcliffe Pad
Vapor Combustor Pilot Emissions Calculations - Hazardous Air Pollutants

Hazardous Air Pollutant Emissions

Unit ID	Pollutant	Emission Factors [1] (lb/mmscf)	Emissions lb/hr	Emissions 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
		Total HAP =	**<0.01**	**<0.01**

905	Pilot Stream Heat Content (Btu/SCF)
8,760	Pilot Hours/Yr
50	Total Pilot Gas Flow Rate (SCFH)
45,250	Total Pilot Gas Fuel Use (Btu/hr)
0.44	Total Annual Fuel Use (MMSCF)

Notes:

[1] AP-42 Table 1.4-3 (7/98)

SWN Production Company, LLC
Michael Ratcliffe Pad
Vapor Combustor Pilot Emissions Calculations - Greenhouse Gases

Greenhouse Gas (GHG) Emissions

Unit ID	Pollutant	Emissions		
		lb/hr	tonnes/yr	tons/yr
EU-PILOT	CO_2	5.29	21.03	23.18
APC-COMB	CH_4	<0.01	<0.01	<0.01
	N_2O	<0.01	<0.01	<0.01
	CH_4 as CO_2e	<0.01	0.01	0.01
	N_2O as CO_2e	<0.01	0.01	0.01
	Total CO_2 + CO_2e =	**5.30**	**21.05**	**23.21**

905	Pilot Stream Heat Content (Btu/SCF)
8,760	Pilot Hours/Yr
50	Total Pilot Gas Flow Rate (SCFH)
45,250	Total Pilot Gas Fuel Use (Btu/hr)
0.44	Total Annual Fuel Use (MMSCF)

40 CFR 98 Tables C-1 and C-2 Emission Factors (kg/mmBtu)[1]

Carbon Dioxide (CO_2)	53.06
Methane (CH_4)	1.00E-03
Nitrous Oxide (N_2O)	1.00E-04

Notes:
[1] CO_2e = CO_2 equivalent (Pollutant times GWP multiplier):
40 CFR 98 Table A-1, Global Warming Potential (GWP) multiplier: CO_2 = 1, CH_4 = 25, N_2O = 298

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

Equipment Information

Source Type/Service	Number of Sources[1]	Em. Factor (lb/hr/source)[2]	Control Efficiency	TOC lb/hr	TOC TPY	VOC Wt %
Valves - Gas	17	9.92E-03	0.00%	0.17	0.74	23.15%
Flanges - Gas	81	8.60E-04	0.00%	0.07	0.31	23.15%
Relief Valves - Gas	24	1.94E-02	0.00%	0.47	2.04	23.15%
Total TOC (Gas Components) =				**0.70**	**3.08**	-
Valves - Light Oil	72	5.51E-03	0.00%	0.40	1.74	95.45%
Flanges - Light Oil	12	2.43E-04	0.00%	0.00	0.01	95.45%
Connectors - Light Oil	258	4.63E-04	0.00%	0.12	0.52	95.45%
Other - Light Oil	2	1.65E-02	0.00%	0.03	0.14	95.45%
Total TOC (Liquid Components) =				**0.55**	**2.42**	-

VOC and Greenhouse Gas Emissions

Source Type/Service	VOC		CH_4		CO_2	
	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
Valves - Gas	0.04	0.17	0.09	0.38	<0.01	<0.01
Flanges - Gas	0.02	0.07	0.04	0.16	<0.01	<0.01
Relief Valves - Gas	0.11	0.47	0.24	1.05	<0.01	0.01
Components in Gas Service =	**0.16**	**0.71**	**0.36**	**1.59**	**<0.01**	**0.01**
Valves - Light Oil	0.38	1.66	<0.01	0.02	<0.01	<0.01
Flanges - Light Oil	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
Connectors - Light Oil	0.11	0.50	<0.01	0.01	<0.01	<0.01
Other - Light Oil	0.03	0.14	<0.01	<0.01	<0.01	<0.01
Components in Liquid Service =	**0.53**	**2.31**	**0.01**	**0.02**	**<0.01**	**<0.01**
Total (Gas + Liquid Components) =	**0.69**	**3.02**	**0.37**	**1.62**	**<0.01**	**0.01**

SWN Production Company, LLC
Michael Ratcliffe 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	0.00	<0.01	0.00	<0.01
Flanges - Gas	<0.01	<0.01	<0.01	0.00	<0.01	0.00	<0.01
Relief Valves - Gas	<0.01	<0.01	<0.01	0.00	<0.01	0.00	<0.01
Components in Gas Service =	**<0.01**	**<0.01**	**<0.01**	**0.00**	**<0.01**	**0.00**	**<0.01**
Valves - Light Oil	0.02	<0.01	<0.01	<0.01	<0.01	0.00	0.03
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	0.01
Other - Light Oil	<0.01	<0.01	<0.01	<0.01	<0.01	0.00	<0.01
Components in Liquid Service =	**0.03**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**0.00**	**0.04**
Total (Gas + Liquid Components) =	**0.03**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**0.00**	**0.04**

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	0.00	<0.01	0.00	<0.01
Flanges - Gas	<0.01	<0.01	<0.01	0.00	<0.01	0.00	<0.01
Relief Valves - Gas	0.01	<0.01	<0.01	0.00	<0.01	0.00	0.01
Components in Gas Service =	**0.01**	**<0.01**	**<0.01**	**0.00**	**<0.01**	**0.00**	**0.01**
Valves - Light Oil	0.09	<0.01	0.01	0.01	0.01	0.00	0.11
Flanges - Light Oil	<0.01	<0.01	<0.01	<0.01	<0.01	0.00	<0.01
Connectors - Light Oil	0.03	<0.01	<0.01	<0.01	<0.01	0.00	0.03
Other - Light Oil	0.01	<0.01	<0.01	<0.01	<0.01	0.00	0.01
Components in Liquid Service =	**0.12**	**<0.01**	**0.01**	**0.01**	**0.01**	**0.00**	**0.16**
Total (Gas + Liquid Components) =	**0.13**	**<0.01**	**0.01**	**0.01**	**0.01**	**0.00**	**0.16**

SWN Production Company, LLC
Michael Ratcliffe Pad
Fugitive Emissions Calculations (Continued)

Typical Component Count per Equipment Type based on Representative Facility[3]

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

Equipment Type	WH	GPU	HT	LPT	FGC	TK	TT-O	SP
Number of Each Type On Pad =	1	1	1	0	0	6	1	2

SWN Production Company, LLC
Michael Ratcliffe Pad
Fugitive Emissions Calculations (Continued)

Speciated Gas Analysis[4]

Component	Molecular Weight	Mole %	Equiv. Wt. Basis	Weight %	HC Weight %	lb/hr	TPY
Hydrogen Sulfide	34.082	0.000%	0.000	0.000%	-	0.00	0.00
Carbon Dioxide	44.010	0.133%	0.059	0.264%	-	<0.01	0.01
Nitrogen	28.013	0.496%	0.139	0.627%	-	<0.01	0.02
Methane	16.042	70.754%	11.350	51.223%	51.683%	0.36	1.59
Ethane	30.069	18.380%	5.527	24.941%	25.165%	0.18	0.78
Propane	44.096	7.198%	3.174	14.324%	14.453%	0.10	0.45
i-Butane	58.122	0.590%	0.343	1.548%	1.561%	0.01	0.05
n-Butane	58.122	1.711%	0.994	4.488%	4.528%	0.03	0.14
i-Pentane	72.149	0.214%	0.154	0.697%	0.703%	<0.01	0.02
n-Pentane	72.149	0.317%	0.229	1.032%	1.041%	0.01	0.03
n-Hexane	86.175	0.067%	0.058	0.261%	0.263%	<0.01	0.01
Other Hexanes	86.175	0.080%	0.069	0.311%	0.314%	<0.01	0.01
Heptanes (as n-Heptane)	100.202	0.041%	0.041	0.185%	0.187%	<0.01	0.01
Benzene	78.114	0.001%	0.001	0.004%	0.004%	<0.01	<0.01
Toluene	92.141	0.001%	0.001	0.004%	0.004%	<0.01	<0.01
Ethylbenzene	106.167	0.000%	0.000	0.000%	0.000%	0.00	0.00
Xylenes	106.167	0.001%	0.001	0.005%	0.005%	<0.01	<0.01
2,2,4-Trimethylpentane	114.230	0.000%	0.000	0.000%	0.000%	0.00	0.00
Octanes (as n-Octane)	114.229	0.011%	0.013	0.057%	0.057%	<0.01	<0.01
Nonanes (as n-Nonane)	128.255	0.003%	0.004	0.017%	0.018%	<0.01	<0.01
Decanes (as n-Decane)	142.282	0.002%	0.003	0.013%	0.013%	<0.01	<0.01
TOTAL =		**100.00%**	**22.16**	**100.00%**	**100.00%**	**0.71**	**3.11**
		TOTAL HC =	**21.96**	**TOTAL VOC =**	**23.15%**	**0.16**	**0.71**
				TOTAL HAP =	**0.28%**	**<0.01**	**0.01**

SWN Production Company, LLC
Michael Ratcliffe Pad
Fugitive Emissions Calculations (Continued)

Speciated Liquids Analysis[4]

Component	Molecular Weight	Mole %	Equiv. Wt. Basis	Weight %	HC Weight %	lb/hr	TPY
Hydrogen Sulfide	34.082	0.000%	0.000	0.000%	-	0.00	0.00
Carbon Dioxide	44.010	0.010%	0.004	0.005%	-	<0.01	<0.01
Nitrogen	28.013	0.015%	0.004	0.005%	-	<0.01	<0.01
Methane	16.042	5.084%	0.816	1.018%	1.018%	0.01	0.02
Ethane	30.069	9.419%	2.832	3.536%	3.536%	0.02	0.09
Propane	44.096	13.438%	5.926	7.398%	7.398%	0.04	0.18
i-Butane	58.122	2.701%	1.570	1.960%	1.960%	0.01	0.05
n-Butane	58.122	11.641%	6.766	8.447%	8.448%	0.05	0.20
i-Pentane	72.149	3.950%	2.850	3.558%	3.558%	0.02	0.09
n-Pentane	72.149	7.673%	5.536	6.911%	6.912%	0.04	0.17
n-Hexane	86.175	4.799%	4.136	5.163%	5.163%	0.03	0.12
Other Hexanes	86.175	4.886%	4.211	5.256%	5.257%	0.03	0.13
Heptanes (as n-Heptane)	100.202	8.310%	8.327	10.395%	10.396%	0.06	0.25
Benzene	78.114	0.067%	0.052	0.065%	0.065%	<0.01	<0.01
Toluene	92.141	0.271%	0.250	0.312%	0.312%	<0.01	0.01
Ethylbenzene	106.167	0.283%	0.300	0.375%	0.375%	<0.01	0.01
Xylenes	106.167	0.411%	0.436	0.545%	0.545%	<0.01	0.01
2,2,4-Trimethylpentane	114.230	0.000%	0.000	0.000%	0.000%	0.00	0.00
Octanes (as n-Octane)	114.229	6.334%	7.235	9.033%	9.034%	0.05	0.22
Nonanes (as n-Nonane)	128.255	4.366%	5.600	6.991%	6.991%	0.04	0.17
Decanes (as n-Decane)	142.282	16.342%	23.252	29.028%	29.031%	0.16	0.70
	TOTAL =	**100.00%**	**80.10**	**100.00%**	**100.00%**	**0.55**	**2.42**
		TOTAL HC =	**80.09**	**TOTAL VOC =**	**95.45%**	**0.53**	**2.31**
				TOTAL HAP =	**6.46%**	**0.04**	**0.16**

Notes:

[1] Component counts taken by equipment type at representative facility and made site-specific according to the number of each equipment type at this site.

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

[3] 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

[4] Gas and liquids analyses located in Appendix A.

SWN Production Company, LLC
Michael Ratcliffe Pad
Fugitive Haul Road Emissions

Facility Data [1]

Vehicle Type	Light Vehicles (Pick-ups and Cars)	Medium Trucks (Service Trucks)	Heavy Trucks (Tanker Trucks)[2]
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	0	0	0
Distance per round trip (miles/trip)	0.54	0.54	0.54
Vehicle miles travelled (miles/day)	0.03	0.02	0.07
Number of days operational (days/yr)	365	365	365
Vehicle miles travelled VMT (miles/yr)	13	6	25
Average vehicle speed S (mph)	10	10	10
Average number of round trips/hour/vehicle type	0.00	0.00	0.01
Average number of round trips/year/vehicle type	23	12	46
Estimated maximum number of round trips/hour/vehicle type	2	1	1
Estimated maximum number of round trips/day/vehicle type	5	2	2
Estimated maximum number of round trips/year/vehicle type	1,789	767	815

190	Average Tanker Volume (bbl)
7,980	Gallons Tanker Volume
4	bwpd
20	bopd
0.13	Tanker Trucks per Day
1,098	Length Leased Access Road (ft)
338	Longest Pad Side (ft)
2,872	Total Round Trip Feet

Formula & Calculation Inputs

$E=k(s/12)^a * (W/3)^b * ((365-P) / 365)$ *Reference : AP-42, Section 13.2.2 (11/06), Equation 1a and 2*

where:	Rate	Units	Comment
Days per year	365		
Annual average hours per day of road operations	18		
k = PM Particle Size Multiplier	4.90	lb/VMT	AP-42 Section 13.2.2 (11/06), Table 13.2.2-2 (PM)
k = PM10 Particle Size Multiplier	1.50	lb/VMT	AP-42 Section 13.2.2 (11/06), Table 13.2.2-2 (PM_{10})
k = PM2.5 Particle Size Multiplier	0.15	lb/VMT	AP-42 Section 13.2.2 (11/06), Table 13.2.2-2 ($PM_{2.5}$)
s = Surface Material Silt Content	3.9	%	State Default Data from AP-42 Data (1999 NEI Data)
P = Number of days > 0.01 inch of rain	150	days/year	AP-42 Section 13.2.2 (11/06), Figure 13.2.2-1
a = PM Constant	0.70	unitless	AP-42 Section 13.2.2 (11/06), Table 13.2.2-2 (PM)
a = PM10 & PM2.5 Constant	0.90	unitless	AP-42 Section 13.2.2 (11/06), Table 13.2.2-2 (PM_{10} & $PM_{2.5}$)
b = PM, PM10, & PM2.5 Constant	0.45	unitless	AP-42 Section 13.2.2 (11/06), Table 13.2.2-2
Total hourly fleet vehicle miles travelled (miles/hr)	0.01	VMT/hr	
Total annual fleet vehicle miles travelled (miles/yr)[3]	43.85	VMT/yr	
Average wheels[4]	13		
Average vehicle weight of the fleet (W)[5]	16.1	tons	
Moisture Ratio	1.00		Estimated based on 0.2% uncontrolled surface water content assuming no watering
Control Efficiency (CF)	0.00	%	Based on Moisture Ratio and Figure 13.2.2-2 Control

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SWN Production Company, LLC
Michael Ratcliffe Pad
Fugitive Haul Road Emissions (Continued)

Vehicle Type	Emission Factors			Control Efficiency	Total Vehicle Miles Travelled		Emission Rates			Emission Rates		
	PM	PM_{10}	$PM_{2.5}$				Total PM	Total PM_{10}	$PM_{2.5}$	Total PM	Total PM_{10}	$PM_{2.5}$
	(lbs/VMT)	(lbs/VMT)	(lbs/VMT)	(%)	(VMT/hr)	(VMT/yr)	(lb/hr)	(lb/hr)	(lb/hr)	(tons/yr)	(tons/yr)	(tons/yr)
Light Vehicles	2.80	0.69	0.07	0.00	<0.01	12.53	0.01	<0.01	<0.01	0.02	<0.01	<0.01
Medium Trucks	2.80	0.69	0.07	0.00	<0.01	6.26	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
Heavy Trucks	2.80	0.69	0.07	0.00	<0.01	25.06	0.01	<0.01	<0.01	0.04	0.01	<0.01
			Total =	**0.00**	**0.01**	**43.85**	**0.02**	**<0.01**	**<0.01**	**0.06**	**0.02**	**<0.01**

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_{ext} *= 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

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

APPENDIX A: SUPPORT DOCUMENTS

AP-42 AND EPA EMISSION FACTORS

REPRESENTATIVE GAS AND LIQUIDS ANALYSES

PROMAX PROCESS SIMULATION RESULTS

Table 1.4-1. EMISSION FACTORS FOR NITROGEN OXIDES (NO_x) AND CARBON MONOXIDE (CO) FROM NATURAL GAS COMBUSTION[a]

Combustor Type (MMBtu/hr Heat Input) [SCC]	NO_x[b]		CO	
	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
Large Wall-Fired Boilers (>100) [1-01-006-01, 1-02-006-01, 1-03-006-01]				
Uncontrolled (Pre-NSPS)[c]	280	A	84	B
Uncontrolled (Post-NSPS)[c]	190	A	84	B
Controlled - Low NO_x 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_x burners	50	D	84	B
Controlled - Low NO_x 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

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. To convert from $lb/10^6$ scf to $kg/10^6$ m^3, multiply by 16. Emission factors are based on an average natural gas higher heating value of 1,020 Btu/scf. To convert from $1b/10^6$ 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.

[b] Expressed as NO_2. For large and small wall fired boilers with SNCR control, apply a 24 percent reduction to the appropriate NO_X emission factor. For tangential-fired boilers with SNCR control, apply a 13 percent reduction to the appropriate NO_X emission factor.

[c] 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[a]

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

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

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

[a] 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 $lb/10^6$ scf to $kg/10^6$ m^3, multiply by 16. To convert from $1b/10^6$ scf to lb/MMBtu, divide by 1,020. Emission Factors preceeded with a less-than symbol are based on method detection limits.

[b] Hazardous Air Pollutant (HAP) as defined by Section 112(b) of the Clean Air Act.

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

[d] 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.

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 ±30 percent)[4] using the following expression:

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

where:

L_L = loading loss, pounds per 1000 gallons ($lb/10^3$ 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)

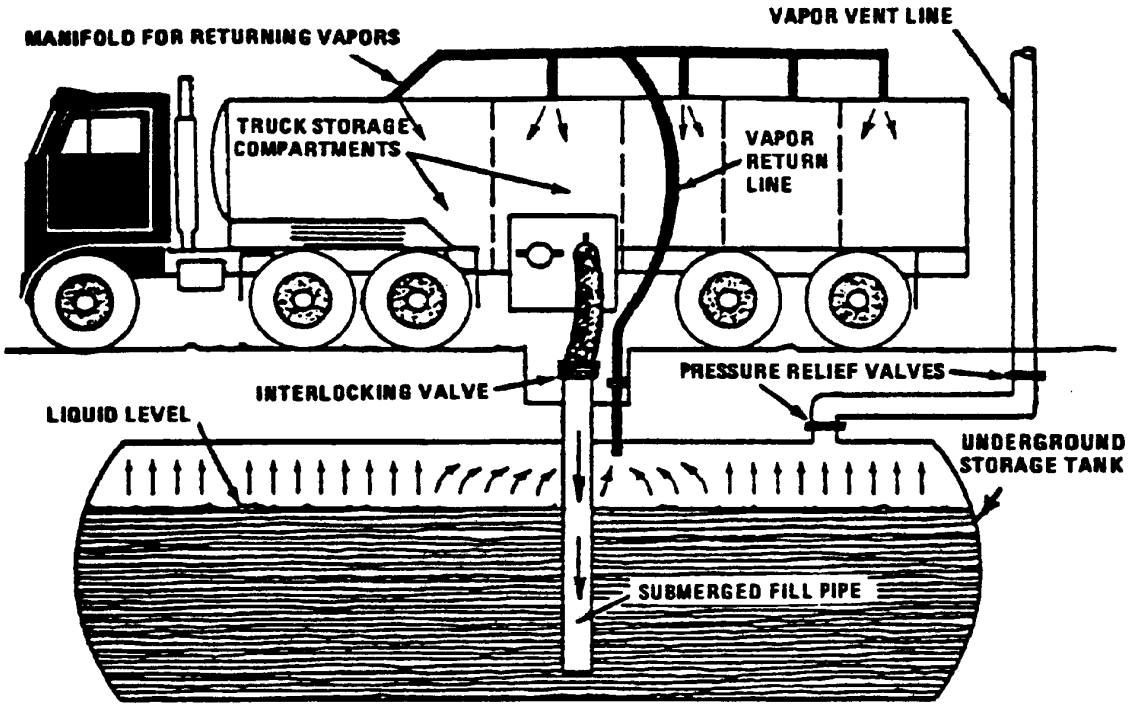


Figure 5.2-5. Tank truck unloading into a service station underground storage tank and practicing "vapor balance" form of emission control.

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[a]	Submerged loading: ships	0.2
	Submerged loading: barges	0.5

[a] 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.

Since flares do not lend themselves to conventional emission testing techniques, only a few attempts have been made to characterize flare emissions. Recent 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^3 (300 Btu/ft^3). The tests conducted on steam-assisted flares at velocities as low as 39.6 meters per minute (m/min) (130 ft/min) to 1140 m/min (3750 ft/min), and on air-assisted flares at velocities of 180 m/min (617 ft/min) to 3960 m/min (13,087 ft/min) indicated that variations in incoming gas flow rates have no effect on the combustion efficiency. Flare gases with less than 16,770 kJ/m^3 (450 Btu/ft^3) do not smoke.

Table 13.5-1 presents flare emission factors, and Table 13.5-2 presents emission composition data obtained from the EPA tests.[1] Crude propylene was used as flare gas during the 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.[2]

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.[2] Sulfur compounds contained in a flare gas stream are converted to SO_2 when burned. The amount of SO_2 emitted depends directly on the quantity of sulfur in the flared gases.

Table 13.5-1 (English Units). EMISSION FACTORS FOR FLARE OPERATIONS[a]

EMISSION FACTOR RATING: B

Component	Emission Factor (lb/10^6 Btu)
Total hydrocarbons[b]	0.14
Carbon monoxide	0.37
Nitrogen oxides	0.068
Soot[c]	0 - 274

[a] Reference 1. Based on tests using crude propylene containing 80% propylene and 20% propane.
[b] Measured as methane equivalent.
[c] 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.

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

Equipment Type	Service[a]	Emission Factor (kg/hr/source)[b]
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[c]	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

[a]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.

[b]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.

[c]The "other" equipment type was derived from compressors, diaphrams, 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.

TABLE 1-B

COMPOSITIONAL ANALYSIS OF THE SEPARATOR GAS, OIL AND MATHEMATICALLY RECOMBINED WELLSTREAM THROUGH C_{11+}

SEPARATOR GOR.....: 4381 Scf/Sep Bbl
SEPARATOR PRESSURE.....: 215 psig
SEPARATOR TEMPERATURE.....: 55 °F

	SEPARATOR GAS		SEPARATOR OIL		WELLSTREAM	
Component	Mole%	* GPM	Mole %	Liquid Volume %	Mole %	* GPM
Hydrogen Sulfide	0.000	0.000	0.000	0.000	0.000	0.000
Nitrogen	0.496	0.000	0.015	0.004	0.405	0.000
Carbon Dioxide	0.133	0.000	0.010	0.011	0.110	0.000
Methane	70.754	0.000	5.084	0.773	58.285	0.000
Ethane	18.380	4.955	9.419	6.156	16.678	4.496
Propane	7.198	1.999	13.438	9.048	8.383	2.328
Iso-butane	0.590	0.195	2.701	2.160	0.991	0.327
N-butane	1.711	0.544	11.641	8.969	3.596	1.143
2-2 Dimethylpropane	0.000	0.000	0.173	0.162	0.033	0.013
Iso-pentane	0.211	0.078	3.777	3.376	0.888	0.327
N-pentane	0.317	0.116	7.673	6.798	1.714	0.626
2-2 Dimethylbutane	0.003	0.001	0.087	0.088	0.019	0.008
Cyclopentane	0.003	0.001	0.000	0.000	0.002	0.001
2-3 Dimethylbutane	0.005	0.002	0.246	0.246	0.051	0.021
2 Methylpentane	0.039	0.016	2.037	2.067	0.418	0.175
3 Methylpentane	0.022	0.009	1.250	1.248	0.255	0.105
Other Hexanes	0.000	0.000	0.000	0.000	0.000	0.000
n-Hexane	0.067	0.028	4.799	4.823	0.965	0.400
Methylcyclopentane	0.005	0.002	0.578	0.500	0.114	0.041
Benzene	0.001	0.000	0.067	0.046	0.014	0.004
Cyclohexane	0.006	0.002	0.688	0.573	0.136	0.047
2-Methylhexane	0.007	0.003	1.483	1.685	0.287	0.135
3-Methylhexane	0.007	0.003	1.361	1.527	0.264	0.122
2,2,4 Trimethylpentane	0.000	0.000	0.000	0.000	0.000	0.000
Other Heptanes	0.007	0.003	0.628	0.680	0.125	0.056
n-Heptane	0.014	0.007	3.405	3.839	0.658	0.306
Methylcyclohexane	0.006	0.002	1.433	1.408	0.277	0.112
Toluene	0.001	0.000	0.271	0.222	0.052	0.018
Other C-8's	0.008	0.004	4.169	4.862	0.798	0.384
n-Octane	0.003	0.002	2.165	2.710	0.413	0.214
Ethylbenzene	0.000	0.000	0.283	0.267	0.054	0.021
M&P-Xylene	0.001	0.000	0.288	0.273	0.055	0.022
O-Xylene	0.000	0.000	0.123	0.114	0.023	0.009
Other C-9's	0.002	0.001	2.999	3.907	0.571	0.307
n-Nonane	0.001	0.001	1.367	1.880	0.260	0.148
Other C10's	0.000	0.000	2.719	3.893	0.516	0.305
n-Decane	0.000	0.000	0.845	1.268	0.160	0.099
Undecanes Plus	0.002	0.001	12.778	24.418	2.428	1.913
TOTAL	100.000	7.974	100.000	100.000	100.000	14.229

TABLE 1-B

COMPOSITIONAL ANALYSIS OF THE SEPARATOR GAS, OIL AND MATHEMATICALLY RECOMBINED WELLSTREAM THROUGH C_{11+}

SEPARATOR GOR.....: 4381 Scf/Sep Bbl
SEPARATOR PRESSURE.....: 215 psig
SEPARATOR TEMPERATURE.....: 55 °F

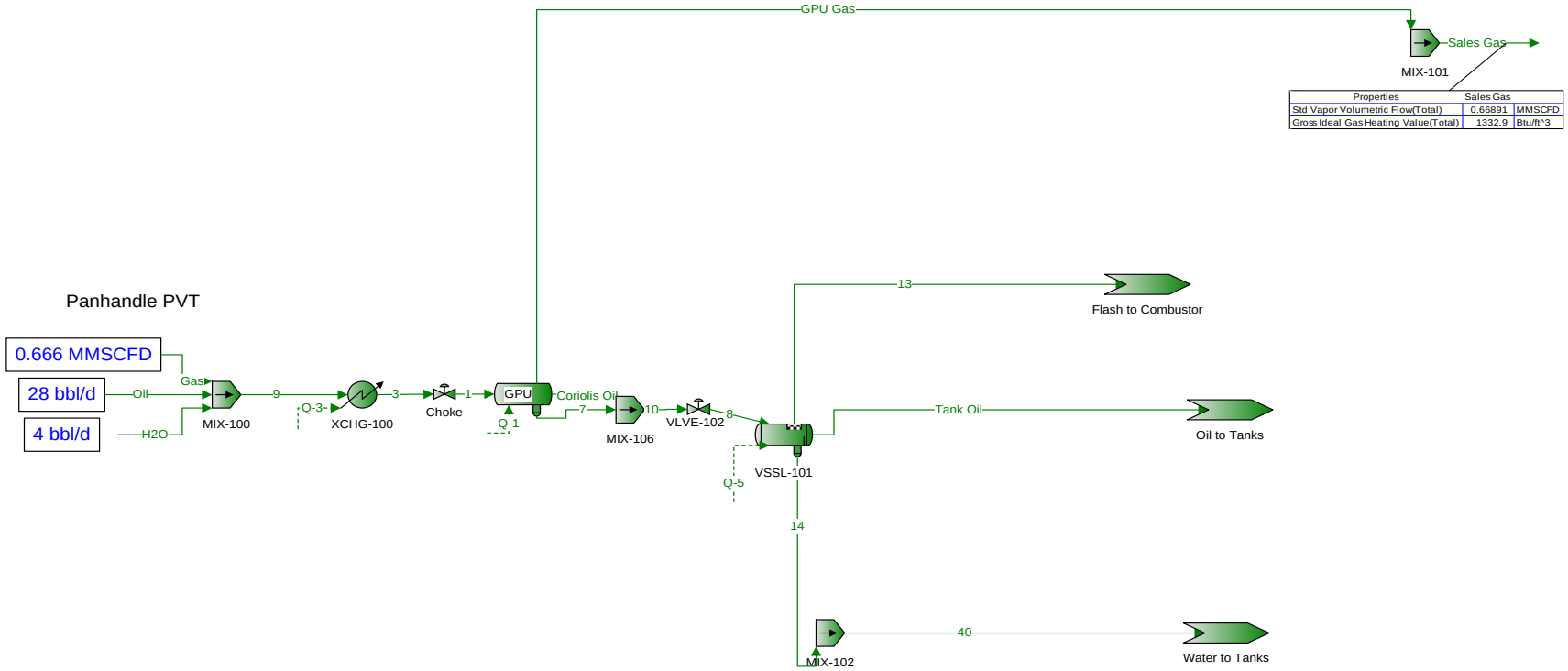
UNDECANES PLUS (C_{11+}) FRACTION CHARACTERISTICS					
	Specific Gravity		Molecular Weight	Vapor Volume	Gross Heating Value
COMPONENT	°API	**	lb/lb-mole	Scf/Gal	***
Gas	N/A	0.8250	156.000	16.558	8,400
Oil	41.949	0.8158	201.300	12.689	130,622
Wellstream	N/A	0.8158	201.270	12.691	N/A

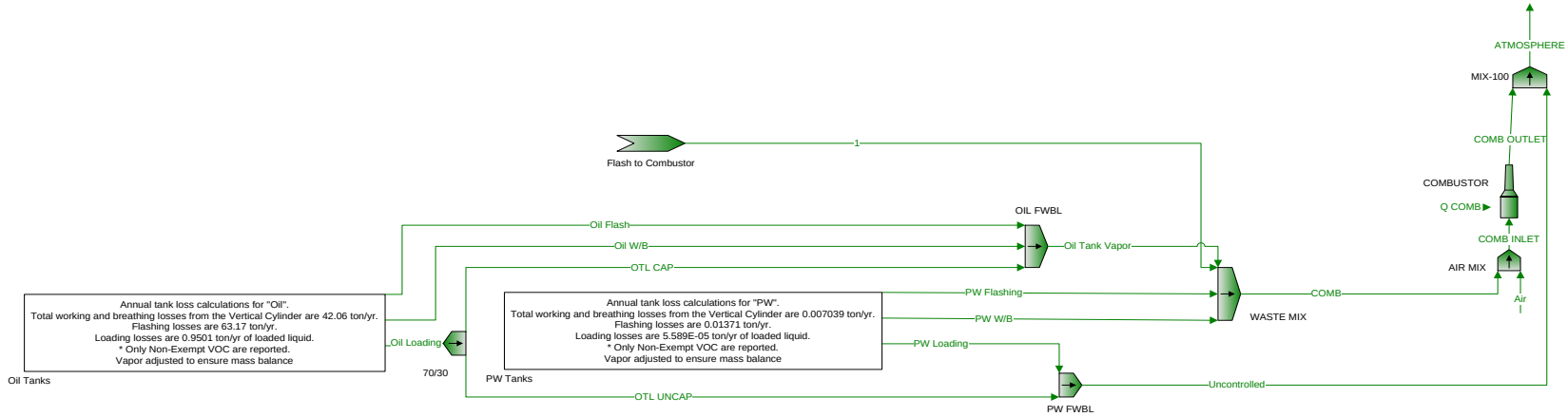
TOTAL SAMPLE CHARACTERISTICS						
	Specific Gravity		Molecular Weight	Vapor Volume	Gross Heating Value	
					Dry	Saturated
COMPONENT	°API	**	lb/lb-mole	Scf/Gal	***	***
Gas	N/A	0.7683	22.159	125.402	1,348	1,325
Oil	77.724	0.6763	87.330	24.247	N/A	114,325
Wellstream	N/A	1.1924	34.534	55.616	N/A	N/A

* GPM (gallons per Mscf) determined at 14.85 psia and 60 °F

** Gas specific gravity and wellstream specific gravity determined relative to air (SG=1.000).
Oil specific gravity determined relative to water (SG=1.000).

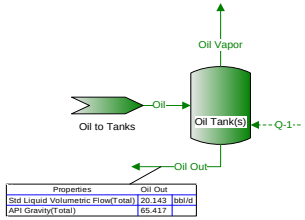
*** Gross Heating Value units for gas (real basis) and oil are BTU/Scf and BTU/Gal, respectively.


GPU Gas
Sales Gas
MIX-101
Properties
Sales Gas
Std Vapor Volumetric Flow(Total)
0.66891
MMSCFD
Gross Ideal Gas Heating Value(Total)
1332.9
Btu/ft^3
Panhandle PVT
0.666 MMSCFD
28 bbl/d
4 bbl/d
Gas
Oil
H2O
MIX-100
9
Q-3
XCHG-100
3
Choke
1
GPU
Q-1
Coriolis Oil
7
MIX-106
10
VLVE-102
8
VSSL-101
Q-5
13
Flash to Combustor
Tank Oil
Oil to Tanks
14
MIX-102
40
Water to Tanks



PStreams "Oil Vapor"/"Oil" Entire Vapor Stream EF= 103.2 SCF/bbl

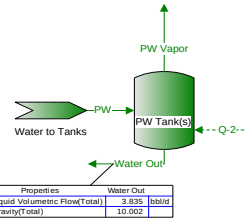
PStreams "Oil Vapor"/"Oil" VOCs EF= 12.34 lb/bbl



Properties	Oil Out	
Std Liquid Volumetric Flow(Total)	20.143	bbl/d
API Gravity(Total)	65.417	

PStreams "PW Vapor"/"PW" Entire Vapor Stream EF= 0.3476 SCF/bbl

PStreams "PW Vapor"/"PW" VOCs EF= 0.01848 lb/bbl



Properties	Water Out	
Std Liquid Volumetric Flow(Total)	3.835	bbl/d
API Gravity(Total)	10.002	

Combustor MDHI = 15 MMBtu/h

Max. Incineration Capacity = 147.1 lb/hr

"COMB INLET" Select sum = 175.2 lb/h

"COMB INLET" Select sum = 0.1716 MMSCFD

"COMB OUTLET" VOCs = 4.062 ton/yr

"COMB INLET" VOCs = 203.1 ton/yr

"ATMOSPHERE" VOCs = 4.347 ton/yr

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: **Total**	**From Block:**	--	--	--	--	--	--
	To Block:	OIL FWBL	70/30	OIL FWBL	WASTE MIX	PW FWBL	WASTE MIX
Mass Flow		lb/h	lb/h	lb/h	lb/h	lb/h	lb/h
H2S		0*	0*	0*	0*	0*	0*
N2		0.000205243*	4.13605E-08*	1.83118E-06*	1.52950E-06*	2.38861E-09*	3.00853E-07*
CO2		0.00396108*	6.28590E-06*	0.000278300*	2.18614E-05*	1.28213E-06*	0.000161488*
C1		0.126308*	7.38792E-05*	0.00327090*	0.000603295*	1.92795E-06*	0.000242832*
C2		1.23685*	0.00397735*	0.176092*	0.00150321*	6.56632E-06*	0.000827049*
C3		4.10550*	0.0445415*	1.97201*	0.00161959*	4.91756E-06*	0.000619383*
iC4		1.10289*	0.0191752*	0.848956*	0.000173461*	3.27643E-07*	4.12677E-05*
nC4		4.25999*	0.0741388*	3.28239*	0.000910013*	2.54397E-06*	0.000320421*
2,2-Dimethylbutane		0.0103918*	0.000171940*	0.00761241*	4.63780E-07*	3.04670E-10*	3.83741E-08*
iC5		1.07877*	0.0179543*	0.794900*	0.000125782*	2.29039E-07*	2.88483E-05*
nC5		1.84383*	0.0301367*	1.33426*	0.000132672*	1.13934E-07*	1.43504E-05*
2,2-Dimethylpropane		0.0191052*	0.000322309*	0.0142698*	1.67615E-06*	1.99951E-09*	2.51845E-07*
Cyclopentane		0.00787432*	0.000116422*	0.00515443*	2.45611E-06*	2.40307E-08*	3.02674E-06*
2,3-Dimethylbutane		0.0421944*	0.000689638*	0.0305328*	3.38734E-06*	4.70512E-09*	5.92625E-07*
2-Methylpentane		0.328941*	0.00535091*	0.236904*	2.50893E-05*	2.70448E-08*	3.40638E-06*
3-Methylpentane		0.187047*	0.00303331*	0.134296*	2.77321E-05*	7.11775E-08*	8.96503E-06*
C6		0.594874*	0.00980223*	0.433980*	2.65764E-05*	1.48296E-08*	1.86784E-06*
Methylcyclopentane		0.0649311*	0.000931951*	0.0412608*	1.30484E-05*	5.41550E-08*	6.82100E-06*
Benzene		0.00769763*	8.02486E-05*	0.00355290*	3.90391E-06*	1.27168E-06*	0.000160173*
Cyclohexane		0.0642691*	0.000882849*	0.0390869*	1.94283E-05*	1.78902E-07*	2.25332E-05*
2-Methylhexane		0.106122*	0.000511870*	0.0226623*	4.11296E-06*	2.52412E-09*	3.17921E-07*
3-Methylhexane		0.0918636*	0.00145269*	0.0643159*	3.93994E-06*	2.78495E-09*	3.50774E-07*
2,2,4-Trimethylpentane		0*	0*	0*	0*	0*	0*
C7		0.219579*	0.00339407*	0.150268*	6.62229E-06*	2.52837E-09*	3.18456E-07*
Methylcyclohexane		0.0767165*	0.00115828*	0.0512814*	1.48990E-05*	5.85573E-08*	7.37549E-06*
Toluene		0.0123165*	0.000130354*	0.00577127*	6.58281E-06*	1.63016E-06*	0.000205324*
C8		0.134543*	0.00204472*	0.0905273*	2.20491E-06*	3.84176E-10*	4.83882E-08*
Ethylbenzene		0.00508823*	5.84218E-05*	0.00258654*	2.67846E-06*	5.51633E-07*	6.94799E-05*
m-Xylene		0.00516046*	7.61113E-05*	0.00336972*	2.93972E-06*	4.25178E-07*	5.35525E-05*
o-Xylene		0.00180424*	1.73433E-05*	0.000767852*	9.82625E-07*	3.04757E-07*	3.83851E-05*
C9		0.0348887*	0.000525372*	0.0232601*	3.65707E-07*	5.02872E-11*	6.33384E-09*
C10		0.0108621*	0.000155143*	0.00686873*	4.23192E-08*	1.82283E-12*	2.29592E-10*
C11		0.00314797*	4.42698E-05*	0.00195998*	8.67061E-09*	3.03708E-13*	3.82530E-11*
C12		0.000914748*	1.22430E-05*	0.000542042*	7.31462E-09*	8.26607E-13*	1.04114E-10*
C13		0.000279841*	3.56958E-06*	0.000158038*	5.12775E-09*	1.34595E-12*	1.69527E-10*
C14		8.90132E-05*	1.07036E-06*	4.73888E-05*	3.32874E-09*	1.75279E-12*	2.20769E-10*
C15		2.56420E-05*	3.09394E-07*	1.36980E-05*	1.90339E-09*	2.04419E-12*	2.57472E-10*
C16		7.83740E-06*	7.97944E-08*	3.53279E-06*	1.19205E-09*	3.20222E-12*	4.03330E-10*
C17		2.45889E-06*	2.12355E-08*	9.40173E-07*	6.55880E-10*	4.50487E-12*	5.67403E-10*
C18		1.00746E-06*	7.61834E-09*	3.37291E-07*	3.74553E-10*	5.80208E-12*	7.30790E-10*
C19		2.95022E-07*	1.80776E-09*	8.00362E-08*	1.34717E-10*	5.33318E-12*	6.71731E-10*
C20		7.72875E-08*	5.52998E-10*	2.44832E-08*	3.98683E-11*	4.74384E-12*	5.97502E-10*
C21		2.15463E-08*	1.40995E-10*	6.24236E-09*	1.13517E-11*	2.72775E-12*	3.43568E-10*
C22		9.38050E-09*	4.59232E-11*	2.03319E-09*	4.76133E-12*	2.94980E-12*	3.71537E-10*
C23		2.67312E-09*	1.24793E-11*	5.52505E-10*	1.28237E-12*	3.01658E-12*	3.79947E-10*
C24		5.02840E-10*	3.08958E-12*	1.36787E-10*	2.41682E-13*	1.12125E-12*	1.41225E-10*
C25		1.86982E-10*	1.04060E-12*	4.60711E-11*	8.41068E-14*	3.79081E-13*	4.77464E-11*
C26		7.96373E-11*	5.54128E-13*	2.45333E-11*	3.40164E-14*	1.48912E-13*	1.87560E-11*
C27		7.56418E-12*	6.22625E-14*	2.75659E-12*	3.10913E-15*	1.31940E-14*	1.66183E-12*
C28		5.79622E-12*	1.47958E-14*	6.55062E-13*	2.20170E-15*	9.09959E-15*	1.14612E-12*
C29		2.48513E-12*	5.85658E-15*	2.59292E-13*	9.64001E-16*	3.95363E-15*	4.97973E-13*
C30		7.42081E-12*	5.43747E-15*	2.40736E-13*	2.68162E-15*	1.06538E-14*	1.34188E-12*
H2O		0.0492976*	6.88382E-07*	3.04772E-05*	0.000167757*	0.000985606*	0.124140*
Oxygen		0*	0*	0*	0*	0*	0*
	lb/hr:	**14.42**	**0.22**	**9.60**	**<0.01**	**<0.01**	**<0.01**
	TPY:	**63.17**	**0.95**	**42.06**	**0.01**	**<0.01**	**0.01**

User Value Sets Report

Client Name:	Air Permit	**Job:**	C:\Users\creadyh\AppData\Lo
Location:	0		
Flowsheet:	Main		

Oil Tanks

User Value [ShellLength]

Parameter	20*	ft	Upper Bounc		ft
Lower Bound	0*	ft	Enforce Boui	FALSE	

User Value [ShellDiam]

Parameter	12*	ft	Upper Bounc		ft
Lower Bound	0*	ft	Enforce Boui	FALSE	

User Value [BreatherVP]

Parameter	0.0300000*	psig	Upper Bounc		psig
Lower Bound		psig	Enforce Boui	FALSE	

User Value [BreatherVacP]

Parameter	-0.0300000*	psig	Upper Bounc		psig
Lower Bound		psig	Enforce Boui	FALSE	

User Value [DomeRadius]

Parameter		ft	Upper Bounc		ft
Lower Bound		ft	Enforce Boui	FALSE	

User Value [OpPress]

Parameter	0*	psig	Upper Bounc		psig
Lower Bound		psig	Enforce Boui	FALSE	

User Value [AvgPercentLiq]

Parameter	50*	%	Upper Bounc		%
Lower Bound		%	Enforce Boui	FALSE	

User Value [MaxPercentLiq]

Parameter	90*	%	Upper Bounc		%
Lower Bound		%	Enforce Boui	FALSE	

User Value [AnnNetTP]

Parameter	20.0197*	bbl/day	Upper Bounc		bbl/day
Lower Bound	0*	bbl/day	Enforce Boui	FALSE	

User Value [OREff]

Parameter	0*	%	Upper Bounc		%
Lower Bound		%	Enforce Boui	FALSE	

User Value [MaxAvgT]

Parameter	59.9*	°F	Upper Bounc		°F
Lower Bound		°F	Enforce Boui	FALSE	

User Value [MinAvgT]

Parameter	40.7*	°F	Upper Bounc		°F
Lower Bound		°F	Enforce Boui	FALSE	

User Value [BulkLiqT]

Parameter	120*	°F	Upper Bounc		°F
Lower Bound		°F	Enforce Boui	FALSE	

User Value [AvgP]					
Parameter	14.1085*	psia	Upper Bounc		psia
Lower Bound		psia	Enforce Bou	FALSE	

User Value [ThermI]					
Parameter	1069*	Btu/ft^2/day	Upper Bounc		Btu/ft^2/day
Lower Bound		Btu/ft^2/day	Enforce Bou	FALSE	

User Value [AvgWindSpeed]					
Parameter	9.1*	mi/h	Upper Bounc		mi/h
Lower Bound		mi/h	Enforce Bou	FALSE	

User Value [MaxHourlyLoadingRate]					
Parameter	175*	bbl/hr	Upper Bounc		bbl/hr
Lower Bound	0*	bbl/hr	Enforce Bou	FALSE	

User Value [EntrainedOilFrac]					
Parameter	1*	%	Upper Bounc		%
Lower Bound		%	Enforce Bou	FALSE	

User Value [TurnoverRate]					
Parameter	4.03021*		Upper Bounc		
Lower Bound			Enforce Bou	FALSE	

User Value [LLossSatFactor]					
Parameter	0.5*		Upper Bounc		
Lower Bound			Enforce Bou	FALSE	

User Value [AtmPressure]					
Parameter	14.1085*	psia	Upper Bounc		psia
Lower Bound		psia	Enforce Bou	FALSE	

User Value [TVP]					
Parameter	13.5987*	psia	Upper Bounc		psia
Lower Bound		psia	Enforce Bou	FALSE	

User Value [AvgLiqSurfaceT]					
Parameter	90.7677*	°F	Upper Bounc		°F
Lower Bound		°F	Enforce Bou	FALSE	

User Value [MaxLiqSurfaceT]					
Parameter	95.4958*	°F	Upper Bounc		°F
Lower Bound		°F	Enforce Bou	FALSE	

User Value [TotalLosses]					
Parameter	42.8506*	ton/yr	Upper Bounc		ton/yr
Lower Bound		ton/yr	Enforce Bou	FALSE	

User Value [WorkingLosses]					
Parameter	0.407205*	ton/yr	Upper Bounc		ton/yr
Lower Bound		ton/yr	Enforce Bou	FALSE	

User Value [StandingLosses]					
Parameter	8.16292*	ton/yr	Upper Bounc		ton/yr
Lower Bound		ton/yr	Enforce Bou	FALSE	

User Value [RimSealLosses]					
Parameter	0*	ton/yr	Upper Bounc		ton/yr
Lower Bound		ton/yr	Enforce Bou	FALSE	

User Value [WithdrawalLoss]					
Parameter	0*	ton/yr	Upper Bounc		ton/yr
Lower Bound		ton/yr	Enforce Bou	FALSE	

User Value [LoadingLosses]				
Parameter	0.967859*	ton/yr	Upper Bounc	ton/yr
Lower Bound		ton/yr	Enforce Bou	FALSE

User Value [MaxHourlyLoadingLoss]				
Parameter	58.8024*	lb/hr	Upper Bounc	lb/hr
Lower Bound		lb/hr	Enforce Bou	FALSE

User Value [PStar]				
Parameter			Upper Bounc	
Lower Bound			Enforce Bou	FALSE

User Value [DeckFittingLosses]				
Parameter	0*	ton/yr	Upper Bounc	ton/yr
Lower Bound		ton/yr	Enforce Bou	FALSE

User Value [DeckSeamLosses]				
Parameter	0*	ton/yr	Upper Bounc	ton/yr
Lower Bound		ton/yr	Enforce Bou	FALSE

User Value [FlashingLosses]				
Parameter	69.3720*	ton/yr	Upper Bounc	ton/yr
Lower Bound		ton/yr	Enforce Bou	FALSE

User Value [TotalResidual]				
Parameter	860.481*	ton/yr	Upper Bounc	ton/yr
Lower Bound		ton/yr	Enforce Bou	FALSE

User Value [GasMoleWeight]				
Parameter	0.0519792*	kg/mol	Upper Bounc	kg/mol
Lower Bound		kg/mol	Enforce Bou	FALSE

User Value [VapReportableFrac]				
Parameter	98.1635*	%	Upper Bounc	%
Lower Bound		%	Enforce Bou	FALSE

User Value [LiqReportableFrac]				
Parameter	99.9089*	%	Upper Bounc	%
Lower Bound		%	Enforce Bou	FALSE

User Value [FlashReportableFrac]				
Parameter	91.0557*	%	Upper Bounc	%
Lower Bound		%	Enforce Bou	FALSE

User Value [BlockReady]				
Parameter	1*		Upper Bounc	
Lower Bound			Enforce Bou	FALSE

Notes:
This User Value Set was programmatically generated. GUID={2B5C6D0D-40DB-404F-AC15-16FC81688D28}

PW Tanks

User Value [BlockReady]				
Parameter	1*		Upper Bounc	
Lower Bound			Enforce Bou	FALSE

User Value [ShellLength]				
Parameter	20*	ft	Upper Bounc	ft
Lower Bound	0*	ft	Enforce Bou	FALSE

User Value [ShellDiam]				
Parameter	12*	ft	Upper Bounc	ft
Lower Bound	0*	ft	Enforce Bou	FALSE

User Value [BreatherVP]				
Parameter	0.0300000*	psig	Upper Bounc	psig
Lower Bound		psig	Enforce Bou	FALSE

User Value [BreatherVacP]				
Parameter	-0.0300000*	psig	Upper Bounc	psig
Lower Bound		psig	Enforce Bou	FALSE

User Value [DomeRadius]				
Parameter		ft	Upper Bounc	ft
Lower Bound		ft	Enforce Bou	FALSE

User Value [OpPress]				
Parameter	0*	psig	Upper Bounc	psig
Lower Bound		psig	Enforce Bou	FALSE

User Value [AvgPercentLiq]				
Parameter	50*	%	Upper Bounc	%
Lower Bound		%	Enforce Bou	FALSE

User Value [MaxPercentLiq]				
Parameter	90*	%	Upper Bounc	%
Lower Bound		%	Enforce Bou	FALSE

User Value [AnnNetTP]				
Parameter	3.85355*	bbl/day	Upper Bounc	bbl/day
Lower Bound	0*	bbl/day	Enforce Bou	FALSE

User Value [OREff]				
Parameter	0*	%	Upper Bounc	%
Lower Bound		%	Enforce Bou	FALSE

User Value [MaxAvgT]				
Parameter	59.9*	°F	Upper Bounc	°F
Lower Bound		°F	Enforce Bou	FALSE

User Value [MinAvgT]				
Parameter	40.7*	°F	Upper Bounc	°F
Lower Bound		°F	Enforce Bou	FALSE

User Value [BulkLiqT]				
Parameter	120*	°F	Upper Bounc	°F
Lower Bound		°F	Enforce Bou	FALSE

User Value [AvgP]				
Parameter	14.1085*	psia	Upper Bounc	psia
Lower Bound		psia	Enforce Bou	FALSE

User Value [Therml]				
Parameter	1069*	Btu/ft^2/day	Upper Bounc	Btu/ft^2/day
Lower Bound		Btu/ft^2/day	Enforce Bou	FALSE

User Value [AvgWindSpeed]				
Parameter	9.1*	mi/h	Upper Bounc	mi/h
Lower Bound		mi/h	Enforce Bou	FALSE

User Value [MaxHourlyLoadingRate]				
Parameter	175*	bbl/hr	Upper Bounc	bbl/hr
Lower Bound	0*	bbl/hr	Enforce Bou	FALSE

User Value [EntrainedOilFrac]				
Parameter	1*	%	Upper Bounc	%
Lower Bound		%	Enforce Bou	FALSE

User Value [TurnoverRate]				
Parameter	0.775766*		Upper Bounc	
Lower Bound			Enforce Bou	FALSE

User Value [LLossSatFactor]				
Parameter	0.5*		Upper Bounc	
Lower Bound			Enforce Bou	FALSE

User Value [AtmPressure]				
Parameter	14.1085*	psia	Upper Bounc	psia
Lower Bound		psia	Enforce Bou	FALSE

User Value [TVP]				
Parameter	13.4507*	psia	Upper Bounc	psia
Lower Bound		psia	Enforce Bou	FALSE

User Value [AvgLiqSurfaceT]				
Parameter	90.7677*	°F	Upper Bounc	°F
Lower Bound		°F	Enforce Bou	FALSE

User Value [MaxLiqSurfaceT]				
Parameter	95.4958*	°F	Upper Bounc	°F
Lower Bound		°F	Enforce Bou	FALSE

User Value [TotalLosses]				
Parameter	0.556168*	ton/yr	Upper Bounc	ton/yr
Lower Bound		ton/yr	Enforce Bou	FALSE

User Value [WorkingLosses]				
Parameter	0.00185779*	ton/yr	Upper Bounc	ton/yr
Lower Bound		ton/yr	Enforce Bou	FALSE

User Value [StandingLosses]				
Parameter	0.109376*	ton/yr	Upper Bounc	ton/yr
Lower Bound		ton/yr	Enforce Bou	FALSE

User Value [RimSealLosses]				
Parameter	0*	ton/yr	Upper Bounc	ton/yr
Lower Bound		ton/yr	Enforce Bou	FALSE

User Value [WithdrawalLoss]				
Parameter	0*	ton/yr	Upper Bounc	ton/yr
Lower Bound		ton/yr	Enforce Bou	FALSE

User Value [LoadingLosses]				
Parameter	0.00441567*	ton/yr	Upper Bounc	ton/yr
Lower Bound		ton/yr	Enforce Bou	FALSE

User Value [MaxHourlyLoadingLoss]				
Parameter	38.3313*	lb/hr	Upper Bounc	lb/hr
Lower Bound		lb/hr	Enforce Bou	FALSE

User Value [PStar]				
Parameter			Upper Bounc	
Lower Bound			Enforce Bou	FALSE

User Value [DeckFittingLosses]				
Parameter	0*	ton/yr	Upper Bounc	ton/yr
Lower Bound		ton/yr	Enforce Bou	FALSE

User Value [DeckSeamLosses]				
Parameter	0*	ton/yr	Upper Bounc	ton/yr
Lower Bound		ton/yr	Enforce Bou	FALSE

User Value [FlashingLosses]				
Parameter	0.0237761*	ton/yr	Upper Bounc	ton/yr
Lower Bound		ton/yr	Enforce Boui	FALSE

User Value [TotalResidual]				
Parameter	244.500*	ton/yr	Upper Bounc	ton/yr
Lower Bound		ton/yr	Enforce Boui	FALSE

User Value [GasMoleWeight]				
Parameter	0.0342564*	kg/mol	Upper Bounc	kg/mol
Lower Bound		kg/mol	Enforce Boui	FALSE

User Value [VapReportableFrac]				
Parameter	1.26565*	%	Upper Bounc	%
Lower Bound		%	Enforce Boui	FALSE

User Value [LiqReportableFrac]				
Parameter	0.00289527*	%	Upper Bounc	%
Lower Bound		%	Enforce Boui	FALSE

User Value [FlashReportableFrac]				
Parameter	57.6730*	%	Upper Bounc	%
Lower Bound		%	Enforce Boui	FALSE

Notes:
This User Value Set was programmatically generated. GUID={31605A22-C5CB-4512-A14D-A28BEF78A0BE}