

Reviewer HMB  
 cc: \_\_\_\_\_  
 Modeler \_\_\_\_\_  
 D.E. \_\_\_\_\_  
 File A0001127  
 IMP FID 26881

May 7, 2015

NSR Program Manager / Attn: O&G Production Facilities  
 Department of Environmental Quality  
 Air Quality Division  
 Herschler Building, 2-E  
 122 West 25<sup>th</sup> Street  
 Cheyenne, Wyoming 82002



**RE: Linn Operating, Inc.  
 Air Permit Application – Stud Horse Butte 10E  
 Sublette County, Wyoming**

Dear Program Manager:

Linn Operating, Inc. (Linn Energy) is pleased to submit the enclosed air quality permit application for a new multi-well pad facility, the Stud Horse Butte (SHB) 10E PAD. This application adheres to the requirements of Wyoming Air Quality Standards and Regulations (WAQSR) Chapter 6, Section 2 (C6 S2), and follows the Presumptive BACT permitting guidance for JPAD facilities, outlined in the Wyoming Air Quality Division (WAQD) Oil and Gas Production Facilities Permitting Guidance (September 2013).

The SHB 10E PAD is a new multi-well pad equipped with associated equipment typical for oil and gas production in the JPAD area. Table 1 provides a summary of the production rates for each well at the SHB 10E PAD.

**Table 1:**

Well Name	API Number	First Date of Production	Natural Gas Rate <sup>1</sup> (MMSCFD)	Condensate Rate <sup>1</sup> (BPD)
SHB 10e5	49-035-29345	2/20/2015	1.58	18.0
SHB 10d5	49-035-29344	2/21/2015	1.98	18.9

<sup>1</sup>Based on first 30 days production

Since the first date of production, all production and control equipment identified in the enclosed application has been operating on the SHB 10E PAD. In accordance with current Division requirements, IMPACT forms have been completed and are included as part of this application package.

Estimated uncontrolled and controlled emission rates from the SHB 10E PAD are summarized in Table 2.

**Table 2:**

	VOCs	Total HAPs	NOx	CO
Uncontrolled (TPY)	62.5	17.6	0.2	0.2
Controlled (TPY)	2.4	0.2	1.2	0.4

As required under Wyoming Air Quality Standards and Regulations (WAQSR) Chapter 6, Section 2(c)(ii), Linn Energy submits this demonstration that the construction and use of the SHB 10E PAD will not prevent the attainment or maintenance of the Ozone Standard (75 ppb). As described in the Interim Policy (Issued July 21, 2008), Linn Energy will offset annual emissions of VOC at a ratio of 1.5:1 (i.e. 1 tpy VOC increase will be accompanied by a 1.5 tpy VOC reduction) and annual emissions of NOx will be

offset with a ratio of 1.1:1. Table 3 summarizes the ozone precursor offset quantities based on the estimated potential to emit from the SHB 10E PAD.

**Table 3:**

Ozone Precursor	Estimated Potential Emissions (TPY)	Offset Ratio	Offset Values (TPY)
NOx	1.2	1.1 to 1	1.3
VOC	2.4	1.5 to 1	3.6

Sufficient emission offset credits are available in Linn Energy's offset bank managed by the WAQD. Linn Energy requests that these offset credits (generated by voluntary NOx and VOC emissions projects within Sublette County) be used to offset the emissions expected to be generated while operating the SHB 10E PAD.

One paper copy with original signature and one electronic copy of this C6 S2 IMPACT application have been enclosed for your review.

Linn Operating appreciates your time and consideration in this matter. If you have any questions regarding this application submittal, please contact me at (307) 537-9622 or Craig Bock (SLR International) at (970) 817-4211.

Sincerely,



Keith Raney  
Sr. EH&S Representative  
Linn Operating, Inc.

Enclosure: C6, S2 Application Package



Department of Environmental Quality Air Quality Division  
Permit Application Form



Is this a revision to an existing application?

Yes \_\_\_\_\_ No **X**

Previous Application #:

Date of Application: 5/11/2015

**COMPANY INFORMATION:**

Company Name: LINN OPERATING, INC.  
 Address: 81 LUMEN ROAD, BOX 254  
 City: BOULDER State: WY Zip Code: 82923  
 Country: USA Phone Number: (307) 537 - 9622

**FACILITY INFORMATION:**

Facility Name: Stud Horse Butte 10E Pad  
 New Facility or Existing Facility: NEW  
 Facility Description: OIL AND GAS PRODUCTION MULTI-WELL PAD  
 Facility Class: MINOR Operating Status: OPERATING  
 Facility Type: PRODUCTION SITE

*For Oil & Gas Production Sites ONLY:*

First Date of Production (FDOP)/Date of Modification: 2/22/2015  
 Does production at this facility contain H2S? NO

*\*If yes, contact the Division.*

API Number(s):  
 New Wells:  
 Name: SHB 10 D5 API #: 49-035-29344  
 Name: SHB 10 E5 API #: 49-035-29345  
 NAICS Code: 21111 OIL AND GAS EXTRACTION

**FACILITY LOCATION:**

*\*Enter the facility location in either the latitude/longitude area or section/township/range area. Both are not required.*

Physical Address: \_\_\_\_\_  
 City: \_\_\_\_\_ Zip Code: \_\_\_\_\_  
 State: WY County: \_\_\_\_\_

**OR**

Latitude: 42.499851 Longitude: -109.711013 County: SUBLETTE  
 Quarter Quarter: SWNW Quarter: \_\_\_\_\_  
 Section: 10 Township: 29N Range: 108W

*For longitude and latitude, use NAD 83/WGS84 datum and 5 digits after the decimal (i.e. 41.12345, -107.56789)*

**CONTACT INFORMATION:**

*\*Note that an Environmental AND NSR Permitting Contact is required for your application to be deemed complete by the agency.*

Title: MR. First Name: KEITH  
 Last Name: RANEY  
 Company Name: LINN OPERATING, INC.  
 Job Title: SR. EH&S REPRESENTATIVE  
 Address: 81 LUMEN ROAD, BOX 254  
 City: BOULDER State: WY  
 Zip Code: 82923  
 Primary Phone No.: (307) 537 - 9622 E-mail: KRANEY@LINNENERGY.COM  
 Mobile Phone No.: (307) 749 - 0458 Fax No.: \_\_\_\_\_  
 Contact Type: REPRESENTATIVE Start Date: \_\_\_\_\_

Additional Contact Type (if needed):

Title: MR. First Name: CRAIG

Last Name: BOCK

Company Name: SLR INTERNATIONAL CORPORATION

Job Title: SR. PROJECT ENGINEER

Address: 1334 S. 2ND AVE

City: POCATELLO State: ID

Zip Code: 83201

Primary Phone No.: (907) 817-4211 E-mail: CBOCK@SLRCONSULTING.COM

Mobile Phone No.: (907) 817-4211 Fax No.: \_\_\_\_\_

Contact Type: CONSULTANT Start Date: \_\_\_\_\_

**FACILITY APPLICATION INFORMATION:**

**General Info:**

Has the facility changed location or is it a new/ greenfield facility?  YES

Has a Land Use Planning document been included in this application?  NO

Is the facility located in a sage grouse core area? \*  NO

If the facility is in a sage grouse core area, what is the WER number? \_\_\_\_\_

*\* For questions about sage grouse core area, contact WY Game & Fish Department.*

**Federal Rules Applicability - Facility Level:**

Prevention of Significant Deterioration (PSD):  NO

Non-Attainment New Source Review:  NO

**Modeling Section:**

Has the Air Quality Division been contacted to determine if modeling is required?  N/A

Is a modeling analysis part of this application?  N/A

Is the proposed project subject to Prevention of Significant Deterioration (PSD) requirements?  NO

Has the Air Quality Division been notified to schedule a pre-application meeting?  NO

Has a modeling protocol been submitted to and approved by the Air Quality Division?  N/A

Has the Air Quality Division received a Q/D analysis to submit to the respective FLMs to determine the need for an AQRV analysis?  NO

**Required Attachments:**

Facility Map

Process Flow Diagram

Modeling Analysis (if applicable)

Land Use Planning Document

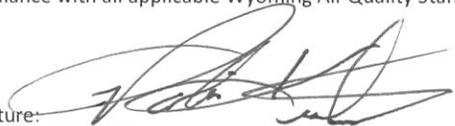
Detailed Project Description

Emissions Calculations

I, ROBIN KISLING PRODUCTION SUPERINTENDENT

Responsible Official (Printed Name) Title

an Official Representative of the Company, state that I have knowledge of the facts herein set forth and that the same are true and correct to the best of my knowledge and belief. I further certify that the operational information provided and emission rates listed on this application reflect the anticipated emissions due to the operation of this facility. The facility will operate in compliance with all applicable Wyoming Air Quality Standards and Regulations.

Signature:  \_\_\_\_\_

(ink)

Date: 5/18/2015

Stud Horse Butte 10E PAD

IMPACT Forms

Specific Emission Unit Attributes:

### Dehydration Unit

Company Equipment ID: DEHY1  
 Company Equipment Description: One (1) 6.0 MMSCFD TEG Dehydration Unit used to dry wellhead gas to meet pipeline specifications

Operating Status: Operating  
 Initial Construction Commencement Date: \_\_\_\_\_  
 Initial Operation Commencement Date: 2/22/2015  
 Most Recent Construction/ Modification Commencement Date: \_\_\_\_\_

Most Recent Operation Commencement Date: \_\_\_\_\_  
**Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):**

Reason: New facility/equipment

If reason is *Reconstruction* or *Temporary Permit* or *Other*, please explain below:

**New facility**

Dehydration Type: TEG Design Capacity (MMscf/day): 6  
 Temperature of Wet Gas (F): 65  
 Water Content of Dry Gas (lbs H2O/MMscf): 2.5  
 Pressure of Wet Gas (psig): 240  
 Manufacturer Name of Glycol Circulation Pump: Kimray  
 Model Name and Number of Glycol Circulation Pump: 2 qty. - 2015 TEG Pump (5.6 MSCFD)  
 Water Content of Wet Gas (lbs H2O/MMscf): Saturated  
 Flow Rate of Dry Gas (MMscfd): 1.07  
 Type of Glycol Circulation Pump: Gas  
 Pump Volume Ratio (acfm/gpm): 0.08  
 Actual LEAN Glycol Circulation Rate (gpm): 0.33  
 Maximum LEAN Glycol Circulation Rate (gpm): 0.33  
 Source of Motive Gas for Pump: Field gas at dehydrator  
 Include Glycol Flash Separator?: No  
 Flash Tank Off Gas Stream (scf/hr): N/A  
 Flash Tank Operating Temperature (F): N/A  
 Flash Tank Operating Pressure (psig): N/A  
 Where are Flash Vapors Routed?: SCC1  
 Is Vessel Heated?: Yes  
 Additional Gas Stripping?: No  
 Stripping Gas Rate (scf/min): N/A  
 Source of Stripping Gas: N/A

**SCC Codes:** List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

**3-10-003-01**

**Potential Operating Schedule:** Provide the operating schedule for this emission unit.  
 Hours/day: 24  
 Hours/year: 8760

Control Equipment: **Yes - Condenser & Enclosed Combustor (SCC1)**

If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.

**Best Available Control Technology (BACT):** Was a BACT Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed BACT: **Presumptive**

\*If yes, attach BACT Analysis with this application.

**Lowest Achievable Emission Rate (LAER):** Was a LAER Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed LAER: \_\_\_\_\_

\*If yes, attach LAER Analysis with this application.

**Federal and State Rule Applicability:**

New Source Performance Standards (NSPS):

**Not Affected**

*New Source Performance Standard are listed under 40 CFR 60- Standards of Performance for New Stationary Sources.*

NSPS Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61):

**Not Affected**

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63):

**Not Affected**

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: \_\_\_\_\_

Prevention of Significant Deterioration (PSD):

**Not Affected**

*These rules are found under WAQSR Chapter 6, Section 4.*

Non-Attainment New Source Review:

**Not Affected**

*These rules are found under WAQSR Chapter 6, Section 13.*

**Specific Emission Unit Attributes:**

## Dehydration Unit

Company Equipment ID: DEHY2  
 Company Equipment Description: One (1) 6.0 MMSCFD TEG Dehydration Unit used to dry wellhead gas to meet pipeline specifications

Operating Status: Operating  
 Initial Construction Commencement Date: \_\_\_\_\_  
 Initial Operation Commencement Date: 2/22/2015  
 Most Recent Construction/ Modification Commencement Date: \_\_\_\_\_

Most Recent Operation Commencement Date: \_\_\_\_\_  
**Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):**

Reason: New facility/equipment

If reason is *Reconstruction* or *Temporary Permit* or *Other*, please explain below:

**New facility**

Dehydration Type: TEG Design Capacity (MMscf/day): 6  
 Temperature of Wet Gas (F): 65  
 Water Content of Dry Gas (lbs H<sub>2</sub>O/MMscf): 2.5  
 Pressure of Wet Gas (psig): 240  
 Manufacturer Name of Glycol Circulation Pump: Kimray  
 Model Name and Number of Glycol Circulation Pump: 2 qty. - 2015 TEG Pump (5.6 MSCFD)  
 Water Content of Wet Gas (lbs H<sub>2</sub>O/MMscf): Saturated  
 Flow Rate of Dry Gas (MMscfd): 1.07  
 Type of Glycol Circulation Pump: Gas  
 Pump Volume Ratio (acfm/gpm): 0.08  
 Actual LEAN Glycol Circulation Rate (gpm): 0.33  
 Maximum LEAN Glycol Circulation Rate (gpm): 0.33  
 Source of Motive Gas for Pump: Field gas at dehydrator  
 Include Glycol Flash Separator?: No  
 Flash Tank Off Gas Stream (scf/hr): N/A  
 Flash Tank Operating Temperature (F): N/A  
 Flash Tank Operating Pressure (psig): N/A  
 Where are Flash Vapors Routed?: SCC1  
 Is Vessel Heated?: Yes  
 Additional Gas Stripping?: No  
 Stripping Gas Rate (scf/min): N/A  
 Source of Stripping Gas: N/A

**SCC Codes:** List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

**3-10-003-01**

**Potential Operating Schedule:** Provide the operating schedule for this emission unit.  
 Hours/day: 24  
 Hours/year: 8760

Control Equipment: **Yes - Condenser & Enclosed Combustor (SCC1)**

If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.

**Best Available Control Technology (BACT):** Was a BACT Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed BACT: **Presumptive**

\*If yes, attach BACT Analysis with this application.

**Lowest Achievable Emission Rate (LAER):** Was a LAER Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed LAER: \_\_\_\_\_

\*If yes, attach LAER Analysis with this application.

**Federal and State Rule Applicability:**

New Source Performance Standards (NSPS): **Not Affected**

*New Source Performance Standard are listed under 40 CFR 60- Standards of Performance for New Stationary Sources.*

NSPS Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61): **Not Affected**

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63): **Not Affected**

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: \_\_\_\_\_

Prevention of Significant Deterioration (PSD): **Not Affected**

*These rules are found under WAQSR Chapter 6, Section 4.*

Non-Attainment New Source Review: **Not Affected**

*These rules are found under WAQSR Chapter 6, Section 13.*

Specific Emission Unit Attributes:

### Flare/Combustor - 1

Company Equipment ID: SCC1  
Company Equipment Description: One (1) Enclosed Smokeless Combustion Chamber for Dehy Control

Operating Status: Operating  
Initial Construction Commencement Date: \_\_\_\_\_  
Initial Operation Commencement Date: 2/22/2015  
Most Recent Construction/ Modification Commencement Date: \_\_\_\_\_

Most Recent Operation Commencement Date: \_\_\_\_\_  
**Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):**  
Reason: New facility/equipment

If reason is **Reconstruction** or **Temporary Permit** or **Other**, please explain below:

**New facility**

Maximum Design Capacity (MMSCF/hr): 22 MSCF/D or 0.916 MSCF/hr  
Minimum Design Capacity (MMSCF/hr): \_\_\_\_\_  
Pilot Gas Volume (scf/min): 1.5  
Emergency Flare Only: No Ignition Device Type: Pilot  
Btu Content (Btu/scf): 1113 Smokeless Design: Yes  
Assist Gas Utilized? No Continuously Monitored? Yes - Pilot Only  
Waste Gas Volume: 39 Units: scf/hr  
Installation Date: 2014

**SCC Codes:** List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

**3-10-002-05**

**Potential Operating Schedule:** Provide the operating schedule for this emission unit.  
Hours/day: 24  
Hours/year: 8760

Control Equipment:

If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.

**Best Available Control Technology (BACT):** Was a BACT Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed BACT: Presumptive

\*If yes, attach BACT Analysis with this application.

**Lowest Achievable Emission Rate (LAER):** Was a LAER Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed LAER: \_\_\_\_\_

\*If yes, attach LAER Analysis with this application.

**Federal and State Rule Applicability:**

New Source Performance Standards (NSPS):

*New Source Performance Standards are listed under 40 CFR 60- Standards of Performance for New Stationary Sources.*

NSPS Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61):

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63):

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: \_\_\_\_\_

Prevention of Significant Deterioration (PSD):

*These rules are found under WAQSR Chapter 6, Section 4.*

Non-Attainment New Source Review:

*These rules are found under WAQSR Chapter 6, Section 13.*

Specific Emission Unit Attributes:

## Flare/Combustor - 2

Company Equipment ID: SCC2  
Company Equipment Description: One (1) Enclosed Smokeless Combustion Chamber for Tank , LPS and EG Pneumatic Pump Control

Operating Status: Operating  
Initial Construction Commencement Date: \_\_\_\_\_  
Initial Operation Commencement Date: 2/22/2015  
Most Recent Construction/ Modification Commencement Date: \_\_\_\_\_

Most Recent Operation Commencement Date: \_\_\_\_\_  
**Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):**

Reason: New facility/equipment

If reason is *Reconstruction* or *Temporary Permit* or *Other*, please explain below: •

### New facility

Maximum Design Capacity (MMSCF/hr): 13.54 MSCF/hr or 325,000 SCFD  
Minimum Design Capacity (MMSCF/hr): \_\_\_\_\_  
Pilot Gas Volume (scf/min): 1.5  
Emergency Flare Only: No Ignition Device Type: Pilot  
Btu Content (Btu/scf): 1570 Smokeless Design: Yes  
Assist Gas Utilized? No Continuously Monitored? Yes - Pilot Only  
Waste Gas Volume: 167 Units: scf/hr  
Installation Date: 2014

**SCC Codes:** List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

### 3-10-002-05

**Potential Operating Schedule:** Provide the operating schedule for this emission unit.  
Hours/day: 24  
Hours/year: 8760

Control Equipment:

*If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.*

**Best Available Control Technology (BACT):** Was a BACT Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed BACT: Presumptive

\*If yes, attach BACT Analysis with this application.

**Lowest Achievable Emission Rate (LAER):** Was a LAER Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed LAER: \_\_\_\_\_

\*If yes, attach LAER Analysis with this application.

**Federal and State Rule Applicability:**

New Source Performance Standards (NSPS):

*New Source Performance Standard are listed under 40 CFR 60- Standards of Performance for New Stationary Sources.*

NSPS Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61):

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63):

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: \_\_\_\_\_

Prevention of Significant Deterioration (PSD):

*These rules are found under WAQSR Chapter 6, Section 4.*

Non-Attainment New Source Review:

*These rules are found under WAQSR Chapter 6, Section 13.*

Specific Emission Unit Attributes:

## Separator/Treater

Company Equipment ID: HP Sep1

Company Equipment Description: One (1) Two-Phase Separators associated with the SHB 10e5 Well.

Operating Status: Operating

Initial Construction Commencement Date: \_\_\_\_\_

Initial Operation Commencement Date: 2/22/2015

Most Recent Construction/ Modification Commencement Date: \_\_\_\_\_

Most Recent Operation Commencement Date: \_\_\_\_\_

Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

Reason: New facility/equipment

If reason is *Reconstruction* or *Temporary Permit* or *Other*, please explain below:

**New facility**

Type of Vessel: 2-Phase Separator Is Vessel Heated? Yes

Operating Temperature (F): 70

Operating Pressure (psig): 250

**SCC Codes:** List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

3-10-002-99

**Potential Operating Schedule:** Provide the operating schedule for this emission unit.

Hours/day: 24

Hours/year: 8760

Control Equipment:

If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.

**Best Available Control Technology (BACT):** Was a BACT Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed BACT: \_\_\_\_\_

\*If yes, attach BACT Analysis with this application.

**Lowest Achievable Emission Rate (LAER):** Was a LAER Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed LAER: \_\_\_\_\_

\*If yes, attach LAER Analysis with this application.

**Federal and State Rule Applicability:**

New Source Performance Standards (NSPS):

*New Source Performance Standard are listed under 40 CFR 60-  
Standards of Performance for New Stationary Sources.*

NSPS Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61):

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR  
61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63):

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63)  
standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: \_\_\_\_\_

Prevention of Significant Deterioration (PSD):

*These rules are found under WAQSR Chapter 6, Section 4.*

Non-Attainment New Source Review:

*These rules are found under WAQSR Chapter 6, Section 13.*

Specific Emission Unit Attributes:

## Separator/Treater

Company Equipment ID: HP Sep2

Company Equipment Description: One (1) Two-phase Separator associated with the SHB 10d5 well.

Operating Status: Operating

Initial Construction Commencement Date: \_\_\_\_\_

Initial Operation Commencement Date: 2/22/2015

Most Recent Construction/ Modification Commencement Date: \_\_\_\_\_

Most Recent Operation Commencement Date: \_\_\_\_\_

Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

Reason: Other

If reason is *Reconstruction* or *Temporary Permit* or *Other*, please explain below:

**New facility**

Type of Vessel: 2-Phase Separator Is Vessel Heated? Yes

Operating Temperature (F): 70

Operating Pressure (psig): 250

**SCC Codes:** List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

3-10-001-07

**Potential Operating Schedule:** Provide the operating schedule for this emission unit.

Hours/day: 24

Hours/year: 8760

Control Equipment:

If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.

**Best Available Control Technology (BACT):** Was a BACT Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed BACT: \_\_\_\_\_

\*If yes, attach BACT Analysis with this application.

**Lowest Achievable Emission Rate (LAER):** Was a LAER Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed LAER: \_\_\_\_\_

\*If yes, attach LAER Analysis with this application.

**Federal and State Rule Applicability:**

New Source Performance Standards (NSPS):

*New Source Performance Standard are listed under 40 CFR 60- Standards of Performance for New Stationary Sources.*

NSPS Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61):

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63):

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: \_\_\_\_\_

Prevention of Significant Deterioration (PSD):

*These rules are found under WAQSR Chapter 6, Section 4.*

Non-Attainment New Source Review:

*These rules are found under WAQSR Chapter 6, Section 13.*

Specific Emission Unit Attributes:

## Separator/Treater

Company Equipment ID: LPS1

Company Equipment Description: One (1) Three-Phase Low Pressure Separator

Operating Status: Operating

Initial Construction Commencement Date: \_\_\_\_\_

Initial Operation Commencement Date: 2/22/2015

Most Recent Construction/ Modification Commencement Date: \_\_\_\_\_

Most Recent Operation Commencement Date: \_\_\_\_\_

Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

Reason: New facility/equipment

If reason is *Reconstruction* or *Temporary Permit* or *Other*, please explain below:

**New facility**

Type of Vessel: 3-Phase Separator Is Vessel Heated? Yes

Operating Temperature (F): 70

Operating Pressure (psig): 30

**SCC Codes:** List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

3-10-001-07

**Potential Operating Schedule:** Provide the operating schedule for this emission unit.

Hours/day: 24

Hours/year: 8760

Control Equipment: **Yes - Enclosed Combustor (SCC2)**

*If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.*

**Best Available Control Technology (BACT):** Was a BACT Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed BACT: **Presumptive**

\*If yes, attach BACT Analysis with this application.

**Lowest Achievable Emission Rate (LAER):** Was a LAER Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed LAER: \_\_\_\_\_

\*If yes, attach LAER Analysis with this application.

**Federal and State Rule Applicability:**

New Source Performance Standards (NSPS): **Not Affected**

*New Source Performance Standard are listed under 40 CFR 60- Standards of Performance for New Stationary Sources.*

NSPS Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61): **Not Affected**

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63): **Not Affected**

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: \_\_\_\_\_

Prevention of Significant Deterioration (PSD): **Not Affected**

*These rules are found under WAQSR Chapter 6, Section 4.*

Non-Attainment New Source Review: **Not Affected**

*These rules are found under WAQSR Chapter 6, Section 13.*

Specific Emission Unit Attributes:

## Separator/Treater

Company Equipment ID: LPS2

Company Equipment Description: \_\_\_\_\_

**One (1) Three-Phase Low Pressure Separator**

Operating Status:

Initial Construction Commencement Date: \_\_\_\_\_

Initial Operation Commencement Date: 2/22/2015

Most Recent Construction/ Modification \_\_\_\_\_

Commencement Date: \_\_\_\_\_

Most Recent Operation Commencement \_\_\_\_\_

Date: \_\_\_\_\_

Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

Reason:

If reason is **Reconstruction** or **Temporary Permit** or **Other**, please explain below:

**New facility**

Type of Vessel:  Is Vessel Heated?

Operating Temperature (F): 70

Operating Pressure (psig): 30

**SCC Codes:** List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

**3-10-001-07**

**Potential Operating Schedule:** Provide the operating schedule for this emission unit.

Hours/day: 24

Hours/year: 8760

Control Equipment: **Yes - Enclosed Combustor (SCC2)**

*If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.*

**Best Available Control Technology (BACT):** Was a BACT Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed BACT: **Presumptive**

\*If yes, attach BACT Analysis with this application.

**Lowest Achievable Emission Rate (LAER):** Was a LAER Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed LAER: \_\_\_\_\_

\*If yes, attach LAER Analysis with this application.

**Federal and State Rule Applicability:**

New Source Performance Standards (NSPS): **Not Affected**

*New Source Performance Standard are listed under 40 CFR 60- Standards of Performance for New Stationary Sources.*

NSPS Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61): **Not Affected**

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63): **Not Affected**

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: \_\_\_\_\_

Prevention of Significant Deterioration (PSD): **Not Affected**

*These rules are found under WAQSR Chapter 6, Section 4.*

Non-Attainment New Source Review: **Not Affected**

*These rules are found under WAQSR Chapter 6, Section 13.*

Specific Emission Unit Attributes:

## Heater/Chiller

Company Equipment ID: REB1

Company Equipment Description: One (1) 0.125 MMBtu/hr Dehy Reboiler Heater associated with DEHY1

Operating Status: Operating

Initial Construction Commencement Date: \_\_\_\_\_

Initial Operation Commencement Date: 2/22/2015

Most Recent Construction/ Modification Commencement Date: \_\_\_\_\_

Most Recent Operation Commencement Date: \_\_\_\_\_

Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

Reason: New facility/equipment

If reason is *Reconstruction* or *Temporary Permit* or *Other*, please explain below:

**New facility**

Firing Type: Indirect

Heat Input Rating: 0.125 Units: MMBtu/hr

Primary Fuel Type: Field Gas

Secondary Fuel Type: N/A

Heat Content of Fuel: 1113 Units: BTU/scf

Fuel Sulfur Content: 0 Units: %

**SCC Codes:** List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

3-10-004-05

**Potential Operating Schedule:** Provide the operating schedule for this emission unit.

Hours/day: 24

Hours/year: 8760

Control Equipment:

If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.

**Best Available Control Technology (BACT):** Was a BACT Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed BACT: Presumptive

\*If yes, attach BACT Analysis with this application.

**Lowest Achievable Emission Rate (LAER):** Was a LAER Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed LAER: \_\_\_\_\_

\*If yes, attach LAER Analysis with this application.

**Federal and State Rule Applicability:**

New Source Performance Standards (NSPS):

*New Source Performance Standard are listed under 40 CFR 60- Standards of Performance for New Stationary Sources.*

NSPS Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61):

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63):

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: \_\_\_\_\_

Prevention of Significant Deterioration (PSD):

*These rules are found under WAQSR Chapter 6, Section 4.*

Non-Attainment New Source Review:

*These rules are found under WAQSR Chapter 6, Section 13.*

Specific Emission Unit Attributes:

### Heater/Chiller

Company Equipment ID: REB2

Company Equipment Description: One (1) 0.125 MMBtu/hr Dehy Reboiler Heater associated with DEHY2

Operating Status: Operating

Initial Construction Commencement Date: \_\_\_\_\_

Initial Operation Commencement Date: 2/22/2015

Most Recent Construction/ Modification \_\_\_\_\_

Commencement Date: \_\_\_\_\_

Most Recent Operation Commencement \_\_\_\_\_

Date: \_\_\_\_\_

Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

Reason: New facility/equipment

If reason is *Reconstruction* or *Temporary Permit* or *Other*, please explain below:

#### New facility

Firing Type: Indirect

Heat Input Rating: 0.125 Units: MMBtu/hr

Primary Fuel Type: Field Gas

Secondary Fuel Type: N/A

Heat Content of Fuel: 1113 Units: BTU/scf

Fuel Sulfur Content: 0 Units: %

SCC Codes: List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

#### 3-10-004-05

Potential Operating Schedule: Provide the operating schedule for this emission unit.

Hours/day: 24

Hours/year: 8760

Control Equipment:

If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.

**Best Available Control Technology (BACT):** Was a BACT Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed BACT: Presumptive

\*If yes, attach BACT Analysis with this application.

**Lowest Achievable Emission Rate (LAER):** Was a LAER Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed LAER: \_\_\_\_\_

\*If yes, attach LAER Analysis with this application.

**Federal and State Rule Applicability:**

New Source Performance Standards (NSPS):

*New Source Performance Standard are listed under 40 CFR 60- Standards of Performance for New Stationary Sources.*

NSPS Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61):

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63):

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: \_\_\_\_\_

Prevention of Significant Deterioration (PSD):

*These rules are found under WAQSR Chapter 6, Section 4.*

Non-Attainment New Source Review:

*These rules are found under WAQSR Chapter 6, Section 13.*

Specific Emission Unit Attributes:

### Heater/Chiller

Company Equipment ID: EG1

Company Equipment Description: One (1) 0.25 MMBtu/hr Ethylene Glycol Bath Heater

Operating Status: Operating

Initial Construction Commencement Date: \_\_\_\_\_

Initial Operation Commencement Date: 2/22/2015

Most Recent Construction/ Modification Commencement Date: \_\_\_\_\_

Most Recent Operation Commencement Date: \_\_\_\_\_

Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

Reason: New facility/equipment

If reason is *Reconstruction* or *Temporary Permit* or *Other*, please explain below:

**New facility**

Firing Type: Indirect

Heat Input Rating: 0.250 Units: MMBtu/hr

Primary Fuel Type: Field Gas

Secondary Fuel Type: N/A

Heat Content of Fuel: 1113 Units: BTU/scf

Fuel Sulfur Content: 0 Units: %

SCC Codes: List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

3-10-004-05

Potential Operating Schedule: Provide the operating schedule for this emission unit.

Hours/day: 24

Hours/year: 4380

Control Equipment:

If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.

**Best Available Control Technology (BACT):** Was a BACT Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed BACT: Presumptive

\*If yes, attach BACT Analysis with this application.

**Lowest Achievable Emission Rate (LAER):** Was a LAER Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed LAER: \_\_\_\_\_

\*If yes, attach LAER Analysis with this application.

**Federal and State Rule Applicability:**

New Source Performance Standards (NSPS):

*New Source Performance Standards are listed under 40 CFR 60- Standards of Performance for New Stationary Sources.*

NSPS Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61):

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63):

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: \_\_\_\_\_

Prevention of Significant Deterioration (PSD):

*These rules are found under WAQSR Chapter 6, Section 4.*

Non-Attainment New Source Review:

*These rules are found under WAQSR Chapter 6, Section 13.*

Specific Emission Unit Attributes:

## Heater/Chiller

Company Equipment ID: EG2

Company Equipment Description: One (1) 0.25 MMBtu/hr Ethylene Glycol Bath Heater

Operating Status: Operating

Initial Construction Commencement Date: \_\_\_\_\_

Initial Operation Commencement Date: 2/22/2015

Most Recent Construction/ Modification Commencement Date: \_\_\_\_\_

Most Recent Operation Commencement Date: \_\_\_\_\_

Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

Reason: New facility/equipment

If reason is *Reconstruction* or *Temporary Permit* or *Other*, please explain below:

**New facility**

Firing Type: Indirect

Heat Input Rating: 0.250 Units: MMBtu/hr

Primary Fuel Type: Field Gas

Secondary Fuel Type: N/A

Heat Content of Fuel: 1113 Units: BTU/scf

Fuel Sulfur Content: 0 Units: %

SCC Codes: List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

3-10-004-05

Potential Operating Schedule: Provide the operating schedule for this emission unit.

Hours/day: 24

Hours/year: 4380

Control Equipment:

If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.

**Best Available Control Technology (BACT):** Was a BACT Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed BACT: Presumptive

\*If yes, attach BACT Analysis with this application.

**Lowest Achievable Emission Rate (LAER):** Was a LAER Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed LAER: \_\_\_\_\_

\*If yes, attach LAER Analysis with this application.

**Federal and State Rule Applicability:**

New Source Performance Standards (NSPS):

*New Source Performance Standard are listed under 40 CFR 60- Standards of Performance for New Stationary Sources.*

NSPS Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61):

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63):

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: \_\_\_\_\_

Prevention of Significant Deterioration (PSD):

*These rules are found under WAQSR Chapter 6, Section 4.*

Non-Attainment New Source Review:

*These rules are found under WAQSR Chapter 6, Section 13.*

Specific Emission Unit Attributes:

### Pneumatic Equipment (Pumps and Controllers)

Company Equipment ID: P1-P4

Company Equipment Description: Four(4) 321 scfh Natural Gas Pneumatic Heat Trace EG Pumps

Operating Status: Operating

Initial Construction Commencement Date: \_\_\_\_\_

Initial Operation Commencement Date: 2/22/2015

Most Recent Construction/ Modification Commencement Date: \_\_\_\_\_

Most Recent Operation Commencement Date: \_\_\_\_\_

Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

Reason: New facility/equipment

If reason is *Reconstruction* or *Temporary Permit* or *Other*, please explain below:

**New facility**

Type of Equipment: Pump

Motive Force: Field Gas

VOC Content (%): 9.61%

HAP Content (%): 0.76%

SCC Codes: List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

3-10-002-99

Potential Operating Schedule: Provide the operating schedule for this emission unit.

Hours/day: 24

Hours/year: 4380

Control Equipment: **Yes - Enclosed Combustor (SCC2)**

If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.

Best Available Control Technology (BACT): Was a BACT Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed BACT: **Presumptive**

\*If yes, attach BACT Analysis with this application.

Lowest Achievable Emission Rate (LAER): Was a LAER Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed LAER: \_\_\_\_\_

\*If yes, attach LAER Analysis with this application.

**Federal and State Rule Applicability:**

New Source Performance Standards (NSPS): **Not Affected**

*New Source Performance Standard are listed under 40 CFR 60- Standards of Performance for New Stationary Sources.*

NSPS Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61): **Not Affected**

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63): **Not Affected**

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: \_\_\_\_\_

Prevention of Significant Deterioration (PSD): **Not Affected**

*These rules are found under WAQSR Chapter 6, Section 4.*

Non-Attainment New Source Review: **Not Affected**

*These rules are found under WAQSR Chapter 6, Section 13.*

Specific Emission Unit Attributes:

### Loading/Unloading/Dump

Company Equipment ID: TCK  
Company Equipment Description: Condensate Truck Loading from Storage Tanks

Operating Status: Operating  
Initial Construction Commencement Date: \_\_\_\_\_  
Initial Operation Commencement Date: 2/22/2015  
Most Recent Construction/ Modification Commencement Date: \_\_\_\_\_

Most Recent Operation Commencement Date: \_\_\_\_\_  
**Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):**

Reason: New facility/equipment

If reason is *Reconstruction* or *Temporary Permit* or *Other*, please explain below: \*

**New facility**

Type of Material: Liquid  
Material Description: Natural Gas Condensate

Maximum Annual Throughput:	<u>8,076</u>	Units:	<u>barrels/yr</u>
Maximum Hourly Throughput:	<u>0.92</u>	Units:	<u>barrels/hr</u>

Detailed Description of Loading/Unloading/Dump Source: \_\_\_\_\_

**SCC Codes:** List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

3-10-002-99

**Potential Operating Schedule:** Provide the operating schedule for this emission unit.  
Hours/day: 24  
Hours/year: 8760

Control Equipment:

If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.

**Best Available Control Technology (BACT):** Was a BACT Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed BACT: Presumptive

\*If yes, attach BACT Analysis with this application.

**Lowest Achievable Emission Rate (LAER):** Was a LAER Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed LAER: \_\_\_\_\_

\*If yes, attach LAER Analysis with this application.

**Federal and State Rule Applicability:**

New Source Performance Standards (NSPS):

*New Source Performance Standard are listed under 40 CFR 60-*

- Standards of Performance for New Stationary Sources.*

NSPS Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61):

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63):

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: \_\_\_\_\_

Prevention of Significant Deterioration (PSD):

*These rules are found under WAQSR Chapter 6, Section 4.*

Non-Attainment New Source Review:

*These rules are found under WAQSR Chapter 6, Section 13.*

Specific Emission Unit Attributes:

## Fugitives

Company Equipment ID: FUG

Company Equipment Description: Equipment Fugitive Leaks - All Equipment (Valves, Flanges, Connections, Seals, Drains)

Operating Status: Operating

Initial Construction Commencement Date: \_\_\_\_\_

Initial Operation Commencement Date: 2/22/2015

Most Recent Construction/ Modification Commencement Date: \_\_\_\_\_

Most Recent Operation Commencement Date: \_\_\_\_\_

Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

Reason: New facility/equipment

If reason is **Reconstruction** or **Temporary Permit** or **Other**, please explain below:

**New facility**

Type of Fugitive Emission: Fugitive Leaks at O&G

SCC Codes: List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

**3-10-002-20**

Potential Operating Schedule: Provide the operating schedule for this emission unit.

Hours/day: 24

Hours/year: 8760

Control Equipment:

If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.

**Best Available Control Technology (BACT):** Was a BACT Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed BACT: Presumptive

\*If yes, attach BACT Analysis with this application.

**Lowest Achievable Emission Rate (LAER):** Was a LAER Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed LAER: \_\_\_\_\_

\*If yes, attach LAER Analysis with this application.

**Federal and State Rule Applicability:**

New Source Performance Standards (NSPS):

*New Source Performance Standard are listed under 40 CFR 60- Standards of Performance for New Stationary Sources.*

NSPS Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61):

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63):

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: \_\_\_\_\_

Prevention of Significant Deterioration (PSD):

*These rules are found under WAQSR Chapter 6, Section 4.*

Non-Attainment New Source Review:

*These rules are found under WAQSR Chapter 6, Section 13.*

Specific Emission Unit Attributes:

### Pneumatic Equipment (Pumps and Controllers)

Company Equipment ID: Liquid Level Controllers (LLCs)  
Company Equipment Description: Six (6) Low or No-bleed Pneumatic Controllers

Operating Status: Operating  
Initial Construction Commencement Date: \_\_\_\_\_  
Initial Operation Commencement Date: 2/22/2015  
Most Recent Construction/ Modification Commencement Date: \_\_\_\_\_  
Most Recent Operation Commencement Date: \_\_\_\_\_

Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

Reason: New facility/equipment

If reason is *Reconstruction* or *Temporary Permit* or *Other*, please explain below:

**New facility**

Type of Equipment: Controller  
Motive Force: Field Gas VOC Content (%): 9.61%  
HAP Content (%): 0.76%

SCC Codes: List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

**3-10-003-24**

Potential Operating Schedule: Provide the operating schedule for this emission unit.

Hours/day: 24  
Hours/year: 8760

Control Equipment:

If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.

**Best Available Control Technology (BACT):** Was a BACT Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed BACT: Presumptive

\*If yes, attach BACT Analysis with this application.

**Lowest Achievable Emission Rate (LAER):** Was a LAER Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed LAER: \_\_\_\_\_

\*If yes, attach LAER Analysis with this application.

**Federal and State Rule Applicability:**

New Source Performance Standards (NSPS):

*New Source Performance Standard are listed under 40 CFR 60- Standards of Performance for New Stationary Sources.*

NSPS Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61):

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63):

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: \_\_\_\_\_

Prevention of Significant Deterioration (PSD):

*These rules are found under WAQSR Chapter 6, Section 4.*

Non-Attainment New Source Review:

*These rules are found under WAQSR Chapter 6, Section 13.*

Specific Emission Unit Attributes:

### Storage Tank/Silo

Company Equipment ID: T1  
Company Equipment Description: One (1) 400-bbl Condensate Storage Tank

Operating Status: Operating  
Initial Construction Commencement Date: \_\_\_\_\_  
Initial Operation Commencement Date: 2/22/2015  
Most Recent Construction/ Modification Commencement Date: \_\_\_\_\_  
Most Recent Operation Commencement Date: \_\_\_\_\_

Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

Reason: New facility/equipment

If reason is *Reconstruction* or *Temporary Permit* or *Other*, please explain below:

**New facility**

Material Type: Liquid  
Description of Material Stored:

**Condensate from Natural Gas Production**

Capacity: 400 Units: barrels  
Maximum Throughput: 22.13 Units: barrels/day  
Maximum Hourly Throughput: 0.92 Units: barrels/hr  
Operating Pressure (psig): Atmospheric  
Vapor Pressure of Material Stored (psig): N/A  
Is Tank Heated?: No

SCC Codes: List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

3-10-002-99

Potential Operating Schedule: Provide the operating schedule for this emission unit.

Hours/day: 24  
Hours/year: 8760

Control Equipment: **Yes - Enclosed Combustor (SCC2)**

If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.

Best Available Control Technology (BACT): Was a BACT Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed BACT: **Presumptive**

\*If yes, attach BACT Analysis with this application.

Lowest Achievable Emission Rate (LAER): Was a LAER Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed LAER: \_\_\_\_\_

\*If yes, attach LAER Analysis with this application.

**Federal and State Rule Applicability:**

New Source Performance Standards (NSPS): **Not Affected**

*New Source Performance Standard are listed under 40 CFR 60- Standards of Performance for New Stationary Sources.*

NSPS Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61): **Not Affected**

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63): **Not Affected**

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: \_\_\_\_\_

Prevention of Significant Deterioration (PSD): **Not Affected**

*These rules are found under WAQSR Chapter 6, Section 4.*

Non-Attainment New Source Review: **Not Affected**

*These rules are found under WAQSR Chapter 6, Section 13.*

Specific Emission Unit Attributes:

### Storage Tank/Silo

Company Equipment ID: T2  
Company Equipment Description: One (1) 400-bbl Produced Water Storage Tank

Operating Status: Operating  
Initial Construction Commencement Date: \_\_\_\_\_  
Initial Operation Commencement Date: 2/22/2015  
Most Recent Construction/ Modification Commencement Date: \_\_\_\_\_  
Most Recent Operation Commencement Date: \_\_\_\_\_

Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

Reason: New facility/equipment

If reason is *Reconstruction* or *Temporary Permit* or *Other*, please explain below:

**New facility**

Material Type: Liquid  
Description of Material Stored:

**Produced Water from Natural Gas Production**

Capacity: 400 Units: barrels  
Maximum Throughput: 150 Units: barrels/day  
Maximum Hourly Throughput: 6 Units: barrels/hr  
Operating Pressure (psig): Atmospheric  
Vapor Pressure of Material Stored (psig): N/A  
Is Tank Heated?: No

SCC Codes: List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

**3-10-002-99**

Potential Operating Schedule: Provide the operating schedule for this emission unit.

Hours/day: 24  
Hours/year: 8760

Control Equipment: **Yes - Enclosed Combustor (SCC2)**

If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.

Best Available Control Technology (BACT): Was a BACT Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed BACT: **Presumptive**

\*If yes, attach BACT Analysis with this application.

Lowest Achievable Emission Rate (LAER): Was a LAER Analysis completed for this emission unit?

Yes  No

Pollutant: \_\_\_\_\_

Proposed LAER: \_\_\_\_\_

\*If yes, attach LAER Analysis with this application.

**Federal and State Rule Applicability:**

New Source Performance Standards (NSPS): **Not Affected**

*New Source Performance Standard are listed under 40 CFR 60- Standards of Performance for New Stationary Sources.*

NSPS Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61): **Not Affected**

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: \_\_\_\_\_

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63): **Not Affected**

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: \_\_\_\_\_

Prevention of Significant Deterioration (PSD): **Not Affected**

*These rules are found under WAQSR Chapter 6, Section 4.*

Non-Attainment New Source Review: **Not Affected**

*These rules are found under WAQSR Chapter 6, Section 13.*

Control Equipment:

### Condenser

Manufacturer: Various Fabricators Date Installed: 2014  
 Model Name and Number: N/A Company Control Equipment ID: DEHY1 Cond.  
 Company Control Equipment Description: Still vent condenser for DEHY1 (Vents to SCC1)

Pollutant(s) Controlled:						
<input type="checkbox"/> CO	<input type="checkbox"/> NOx	<input type="checkbox"/> Pb	<input type="checkbox"/> SO2	<input checked="" type="checkbox"/> VOC	<input type="checkbox"/> PM	
<input type="checkbox"/> PM (FIL)	<input type="checkbox"/> PM Condensible	<input type="checkbox"/> PM 10 (FIL)	<input type="checkbox"/> PM 2.5 (FIL)	<input type="checkbox"/> PM 10	<input type="checkbox"/> PM 2.5	
<input checked="" type="checkbox"/> Other: HAPs						

**NOTE: The following fields require numeric values unless otherwise denoted with an asterisk\***

Design Control Efficiency (%): 98 Capture Efficiency (%): 100  
 Operating Control Efficiency (%): 98  
 Condenser Type:\* Indirect Contact  
 Coolant Type:\* Atmospheric air  
 Design Coolant Temp. Range (F): N/A  
 Design Coolant Flow Rate (gpm): N/A  
 Max. Exhaust Gas Temp (F): \_\_\_\_\_ Inlet Gas Flow Rate (acfm): 22.89  
 Outlet Gas Flow Rate (acfm): 7.07 Inlet Gas Temp (F): 212  
 Operating Pressure (psia): 13.20 Outlet Gas Temp (F): 78

This is the only control equipment on this air contaminant source

If not, this control equipment is:  Primary  Secondary  Parallel

List all other emission units that are also vented to this control equipment:\* None

List all release point IDs associated with this control equipment:\* TBD - associated with release point SCC1

**Control Equipment:**

**Condenser**

Manufacturer: Various Fabricators Date Installed: 2014  
 Model Name and Number: N/A Company Control Equipment ID: DEHY2 Cond.  
 Company Control Equipment Description: Still vent condenser for DEHY2 (Vents to SCC1)

Pollutant(s) Controlled:						
<input type="checkbox"/> CO	<input type="checkbox"/> NOx	<input type="checkbox"/> Pb	<input type="checkbox"/> SO2	<input checked="" type="checkbox"/> VOC	<input type="checkbox"/> PM	
<input type="checkbox"/> PM (FIL)	<input type="checkbox"/> PM Condensible	<input type="checkbox"/> PM 10 (FIL)	<input type="checkbox"/> PM 2.5 (FIL)	<input type="checkbox"/> PM 10	<input type="checkbox"/> PM 2.5	
<input checked="" type="checkbox"/> Other: HAPs						

**NOTE: The following fields require numeric values unless otherwise denoted with an asterisk\***

Design Control Efficiency (%): 98 Capture Efficiency (%): 100  
 Operating Control Efficiency (%): 98  
 Condenser Type:\* Indirect Contact  
 Coolant Type:\* Atmospheric air  
 Design Coolant Temp. Range (F): N/A  
 Design Coolant Flow Rate (gpm): N/A  
 Max. Exhaust Gas Temp (F): \_\_\_\_\_ Inlet Gas Flow Rate (acfm): 22.89  
 Outlet Gas Flow Rate (acfm): 7.07 Inlet Gas Temp (F): 212  
 Operating Pressure (psia): 13.20 Outlet Gas Temp (F): 78

This is the only control equipment on this air contaminant source

If not, this control equipment is:  Primary  Secondary  Parallel

List all other emission units that are also vented to this control equipment:\* None

List all release point IDs associated with this control equipment:\* TBD - associated with release point SCC1

Control Equipment:

Flare/Combustor

Manufacturer: Various Fabricators
Model Name and Number:
Company Control Equipment Description:

Date Installed: 2014
Company Control Equipment ID: SCC1 Control

Enclosed Smokeless Combustion Chamber - DEHY1 Condenser Control

Pollutant(s) Controlled: CO, NOx, Pb, SO2, VOC, PM, PM (FIL), PM Condensable, PM 10 (FIL), PM 2.5 (FIL), PM 10, PM 2.5, Other: HAPs

NOTE: The following fields require numeric values unless otherwise denoted with an asterisk

Maximum Design Capacity (MMSCF/hr): 22 MSCF/D or 0.916 MSCF/hr
Minimum Design Capacity (MMSCF/hr):
Design Control Efficiency (%): 98 Capture Efficiency (%): 100
Operating Control Efficiency (%): 98

Flare Type: Enclosed Elevated Flare Type: Non-Assisted
Ignition Device: Yes Flame Presence Sensor: Yes
Inlet Gas Temp (F): 78 Flame Presence Type: Thermocouple
Gas Flow Rate (acfm): 802.6 Outlet Gas Temp (F): 1200

This is the only control equipment on this air contaminant source
If not, this control equipment is: Primary Secondary Parallel

List all other emission units that are also vented to this control equipment: DEHY1 and DEHY 2 (secondary control)

List all release point IDs associated with this control equipment: None

Control Equipment:

### Flare/Combustor

Manufacturer: Various Fabricators  
Model Name and Number: \_\_\_\_\_  
Company Control Equipment Description: \_\_\_\_\_

Date Installed: 2014  
Company Control Equipment ID: SCC2 Control

Description: **Enclosed Smokeless Combustion Chamber - Tank Vent, LPS, and Pneumatic Pump P1-P4 Vent Control**

Pollutant(s) Controlled:		<input type="checkbox"/> CO	<input type="checkbox"/> NOx	<input type="checkbox"/> Pb	<input type="checkbox"/> SO2	<input checked="" type="checkbox"/> VOC	<input type="checkbox"/> PM
<input type="checkbox"/> PM (FIL)	<input type="checkbox"/> PM Condensible	<input type="checkbox"/> PM 10 (FIL)	<input type="checkbox"/> PM 2.5 (FIL)	<input type="checkbox"/> PM 10	<input type="checkbox"/> PM 2.5		
<input checked="" type="checkbox"/> Other: HAPs							

**NOTE: The following fields require numeric values unless otherwise denoted with an asterisk\***

Maximum Design Capacity (MMSCF/hr): 13.54 MSCF/hr or 325,000 SCFD  
Minimum Design Capacity (MMSCF/hr): \_\_\_\_\_  
Design Control Efficiency (%): 98 Capture Efficiency (%): 100  
Operating Control Efficiency (%): 98

Flare Type:\* Enclosed Elevated Flare Type:\* Non-Assisted  
Ignition Device:\* Yes Flame Presence Sensor:\* Yes  
Inlet Gas Temp (F): 70 Flame Presence Type:\* Thermocouple  
Gas Flow Rate (acfm): 2665.7 Outlet Gas Temp (F): 1200

This is the only control equipment on this air contaminant source

If not, this control equipment is:  Primary  Secondary  Parallel

List all other emission units that are also vented to this control equipment:\* T1-T2, LPS, P1-P4

List all release point IDs associated with this control equipment:\* None

**Release Point Information:**

Complete the table below for *each* release point. Please include release point information for each emission unit. Multiple attachments may be necessary. A release point is a point at which emissions from an emission unit are released into the ambient (outside) air. List each individual release point on a separate pair of lines (release point ID and description). *For longitude and latitude, use NAD 83/WGS84 datum and 5 digits after the decimal (i.e. 41.12345, -107.56789)*

Stack Release Point Information	
Company Release Point ID:	Release Point Type: <b>Vertical</b>
TBD	Release Point Latitude: <b>42.499851</b>
	Release Point Longitude: <b>-109.711013</b>
Company Release Point Description:	Base Elevation (ft): <b>7271</b>
<b>SCC1: Enclosed smokeless combustion chamber to control dehydrator condenser vents from DEHY1 and DEHY2.</b>	Stack Height (ft): <b>23</b>
	Stack Diameter (ft): <b>2</b>
	Exit Gas Velocity (ft/s): <b>6.1</b>
	Exit Gas Temp (F): <b>1,200</b>
	Exit Gas Flow Rate (acfm): <b>802.6</b>
Company Release Point ID:	Release Point Type: <b>Vertical</b>
TBD	Release Point Latitude: <b>42.499851</b>
	Release Point Longitude: <b>-109.711013</b>
Company Release Point Description:	Base Elevation (ft): <b>7271</b>
<b>SCC2: Enclosed smokeless combustion chamber to control tank vents (T1-T2), LPS Vent and pneumatic pump vents from P1-P4.</b>	Stack Height (ft): <b>20</b>
	Stack Diameter (ft): <b>4</b>
	Exit Gas Velocity (ft/s): <b>3.5</b>
	Exit Gas Temp (F): <b>1,200</b>
	Exit Gas Flow Rate (acfm): <b>2665.70</b>
Company Release Point ID:	Release Point Type: <b>Vertical</b>
TBD	Release Point Latitude: <b>42.499851</b>
	Release Point Longitude: <b>-109.711013</b>
Company Release Point Description:	Base Elevation (ft): <b>7271</b>
<b>REB1-REB2: Reboiler Heater (0.125 MMBtu/hr) associated with DEHY1 and DEHY2.</b>	Stack Height (ft): <b>12</b>
	Stack Diameter (ft): <b>0.50</b>
	Exit Gas Velocity (ft/s): <b>2.12</b>
	Exit Gas Temp (F): <b>500</b>
	Exit Gas Flow Rate (acfm): <b>24.94</b>

Company Release Point ID:	Release Point Type: <b>Vertical</b>
<b>TBD</b>	Release Point Latitude: <b>42.499851</b>
	Release Point Longitude: <b>-109.711013</b>
Company Release Point Description:	Base Elevation (ft): <b>7271</b>
<b>EG1-EG2: Ethylene Glycol Bath Heaters (0.10 MMBtu/hr) for equipment and line heat tracing.</b>	Stack Height (ft): <b>12</b>
	Stack Diameter (ft): <b>0.50</b>
	Exit Gas Velocity (ft/s): <b>1.69</b>
	Exit Gas Temp (F): <b>500.00</b>
	Exit Gas Flow Rate (acfm): <b>19.95</b>
Company Release Point ID:	Release Point Type: <b>Vertical</b>
<b>TBD</b>	Release Point Latitude: <b>42.499851</b>
	Release Point Longitude: <b>-109.711013</b>
Company Release Point Description:	Base Elevation (ft): <b>7271</b>
<b>LPS H1 and LPS H2: LPS Heater (0.250 MMBtu/hr) for equipment heat tracing.</b>	Stack Height (ft): <b>12</b>
	Stack Diameter (ft): <b>0.5</b>
	Exit Gas Velocity (ft/s): <b>4.24</b>
	Exit Gas Temp (F): <b>500.00</b>
	Exit Gas Flow Rate (acfm): <b>49.89</b>
Company Release Point ID:	Release Point Type: <b>Vertical</b>
<b>TBD</b>	Release Point Latitude: <b>42.499851</b>
	Release Point Longitude: <b>-109.711013</b>
Company Release Point Description:	Base Elevation (ft): <b>7271</b>
<b>Liquid Level Controllers (6 Total)</b>	Stack Height (ft): _____
	Stack Diameter (ft): _____
	Exit Gas Velocity (ft/s): _____
	Exit Gas Temp (F): _____
	Exit Gas Flow Rate (acfm): _____

Complete the table below for each fugitive (area, volume, line) release point. List each individual release point on a separate line.

Fugitive Release Point Information	
Company Release Point ID:	Release Point Latitude: <b>42.499851</b>
<b>TBD</b>	Release Point Longitude: <b>-109.711013</b>
	Release Height (ft): <b>7271</b>
Company Release Point Description:	
<b>Fugitive leaks from valves, flanges, and other connectors located on entire site.</b>	

# Stud Horse Butte 10E PAD

## Facility Map, Process Description, & Process Flow Diagram

# Stud Horse Butte 10E Facility Map

SW/NW Sec. 10, T29N, R108W

Legend

Sand Draw Reservoir Number 4

Stud Horse Butte 10E PAD



1 mi

Google earth



## PROCESS DESCRIPTION

The Stud Horse Butte (SHB) 10E PAD facility is a new multi-well PAD located in the Jonah and Pinedale Anticline (JPAD) that currently receives production from two wells, SHB 10D5, and SHB 10E5. The SHB 10E PAD process and equipment is visually depicted in the process flow diagram that follows this description of the process.

The SHB 10E PAD consists of one (1) dual pack production train. The dual pack production train is equipped with two (2) high pressure separators and two (2) EG bath coil heaters. The production train is designed to produce two (2) production wells in parallel. The well stream from each individual well is first routed through a high-pressure 3-phase separator, separating the stream into wet gas, condensate, and water.

The liquids from the high-pressure separator are then combined and routed to a 3-phase low pressure separator (commonly shared by all wells) where the stream is further separated into gas, condensate and water. The gas from the low pressure separator is sent to the LPS combustor on site. The condensate and produced water exit the low pressure separator as follows:

The condensate (hydrocarbon liquid) flows to condensate storage tanks. As the pressurized hydrocarbon liquids are transferred from the separators to the storage tanks, the flash gas that is generated is vented to an enclosed smokeless combustor; as are all standing, working, and breathing losses (S/W/B) from the condensate tanks. After an adequate volume of condensate is accumulated in the tanks, the condensate is loaded into a tank truck and transported to a processing facility.

The produced water is transferred from the separators to the produced water storage tank. Any potential standing, working, and breathing (S/W/B) losses that may occur from the produced water tank are also vented to the same enclosed combustor as the condensate tanks. After an adequate volume of produced water is accumulated in the tank, the produced water is loaded into a tank truck and transported to an appropriate treatment or disposal facility.

Wet gas from the high-pressure 3-phase separator is routed to the TEG dehydration units onsite (DEHY1, DEHY2), which dry the gas to sales pipeline specifications.

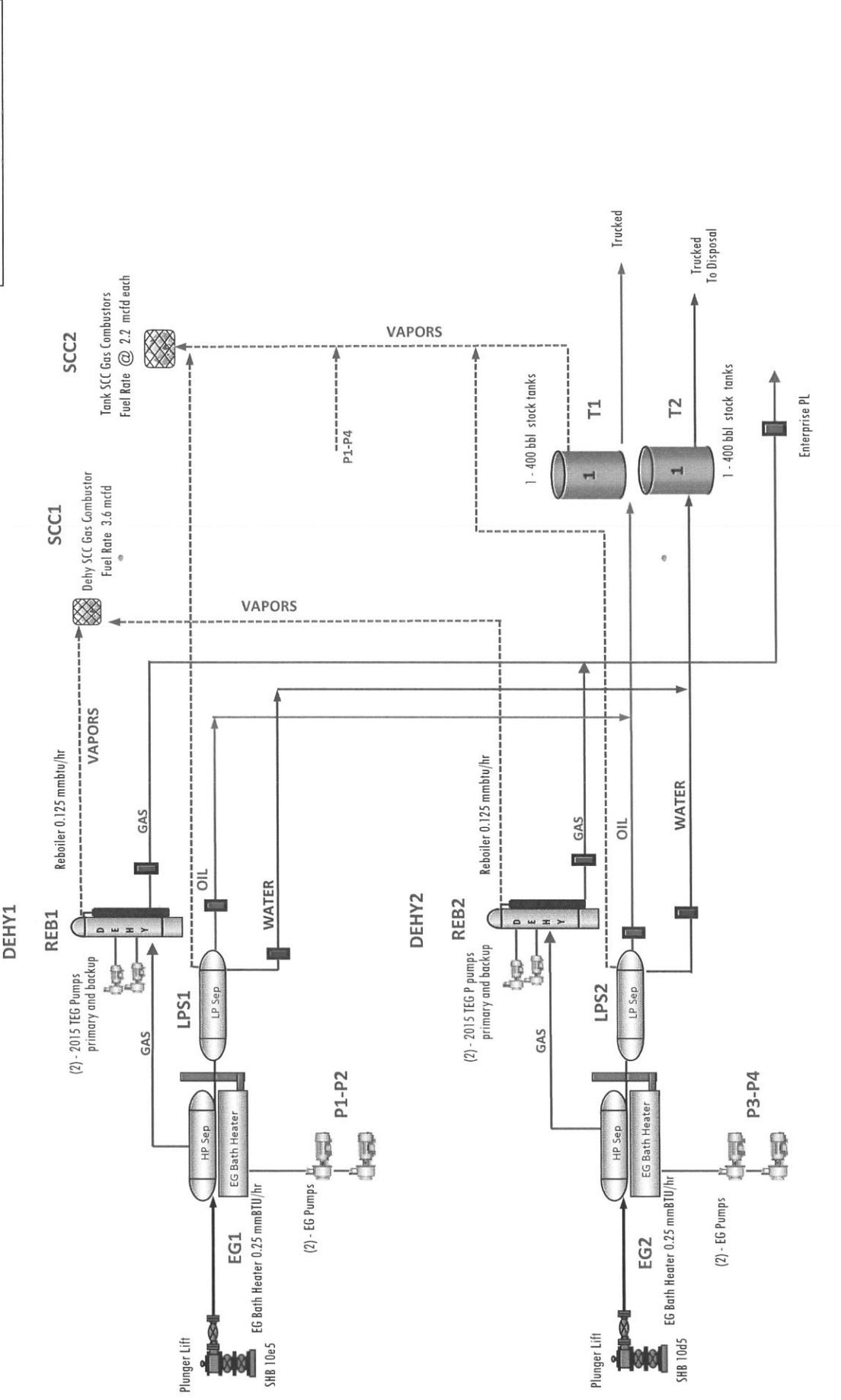
For the dehydration units:

Wet gas enters a two phase separator, to remove any liquids which have condensed in the transfer system. The separated gas stream then enters the absorber where it contacts lean glycol to remove the water vapor from the gas stream to a concentration determined by the sales contract, the resultant dry gas is measured and routed to the natural gas sales pipeline. From the absorber tower, the rich glycol (glycol saturated with water) is regenerated in a glycol reboiler, which distills the water from the rich glycol, the resultant lean glycol is suitable for reuse, and is subsequently re-circulated back into the absorber tower.

During the absorption process, hazardous air pollutants (HAPs) including benzene, toluene, ethyl benzene, and xylene (BTEX), hexanes and volatile organic compounds (VOCs) are absorbed in the lean glycol stream along with the water vapors, and subsequently purged from solution during the reboiler regeneration process. The reboiler still vent vapors from the TEG dehydration unit are routed through a condenser and then piped to an enclosed smokeless combustor for destruction of vapors.

**Stud Horse Butte 10e PAD  
- Facility Equipment Drawing -**

Effective January 2015



	GAS METER		GAS LINE
	OIL METER		OIL LINE
	WATER METER		WATER LINE
	WET GAS METER		PNEUMATIC CHEMICAL PUMP (GAS)

**UPDATE SUMMARY:**  
New location  
(DC)

# Stud Horse Butte 10E PAD

## Emission Calculations



**LINN OPERATING, INC.**  
**Total Well Production**

<b>Facility Name</b>	Stud Horse Butte 10E Pad
----------------------	--------------------------

Production Timeframe <sup>[1]</sup>	Well Name	Oil Bbls <sup>[1]</sup>	Gas Mcf <sup>[1]</sup>	Produced Water <sup>[1]</sup>	Days	Gas (MMSCF/day)	Oil (BPD)
2/22/2015 - 3/23/2015	SHB 10 D5	567	59,287	2,544	30	1.98	18.9
2/22/2015 - 3/23/2015	SHB 10 E5	539	47,518	1,967	30	1.58	18.0
<b>Totals</b>		<b>1,106</b>	<b>106,805</b>	<b>4,511</b>		<b>3.6</b>	<b>36.9</b>

Estimated Production/Dehy Unit	
Dehys	MMSCFD
6.0	1.07
6.0	1.07

Pad Production Rates - New Wells; ~30 day production * 0.6 decline factor	
Gas MMSCFD	Oil (BPD)
2.14	22.13

* Totals	
Gas (MMSCFD)	Oil (BPD)
2.14	22.13

**References**

[1] Actual first 30-day production data obtained from Linn database.



## GRI-GLYCalc VERSION 4.0 - AGGREGATE CALCULATIONS REPORT

Case Name: SHB 10e Pad Dehy

File Name: N:\Fort Collins\Linn Energy Official\Permitting\SHB 10e PAD\calcs\SHB 10E.ddf

Date: May 11, 2015

## DESCRIPTION:

Description: Linn Operating, Inc.  
 SHB 10e Pad  
 One (1) Dehys - 6 MMSCFD with two (2) 2015  
 SC glycol pumps

Annual Hours of Operation: 8760.0 hours/yr

## EMISSIONS REPORTS:

## CONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	0.0250	0.600	0.1095
Ethane	0.0039	0.094	0.0172
Propane	0.0029	0.069	0.0125
Isobutane	0.0012	0.029	0.0054
n-Butane	0.0015	0.036	0.0066
Isopentane	0.0008	0.018	0.0033
n-Pentane	0.0007	0.017	0.0032
n-Hexane	0.0012	0.029	0.0053
Cyclohexane	0.0009	0.023	0.0041
Heptanes	0.0008	0.020	0.0037
Methylcyclohexane	0.0012	0.030	0.0054
2,2,4-Trimethylpentane	<0.0001	0.001	0.0001
Benzene	0.0031	0.074	0.0136
Toluene	0.0028	0.068	0.0125
Ethylbenzene	<0.0001	0.001	0.0002
Xylenes	0.0004	0.010	0.0018
C8+ Heavies	<0.0001	<0.001	0.0001
Total Emissions	0.0467	1.121	0.2046
Total Hydrocarbon Emissions	0.0467	1.121	0.2046
Total VOC Emissions	0.0178	0.427	0.0778
Total HAP Emissions	0.0077	0.184	0.0335
Total BTEX Emissions	0.0064	0.154	0.0281

## UNCONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	1.2511	30.026	5.4797
Ethane	0.1973	4.736	0.8643
Propane	0.1464	3.513	0.6411
Isobutane	0.0643	1.544	0.2818
n-Butane	0.0810	1.945	0.3550
Isopentane	0.0473	1.134	0.2070
n-Pentane	0.0432	1.037	0.1893
n-Hexane	0.1046	2.509	0.4579
Cyclohexane	0.0965	2.315	0.4225

Heptanes	0.1328	3.187	0.5816
Methylcyclohexane	0.2052	4.926	0.8989
2,2,4-Trimethylpentane	0.0047	0.113	0.0207
Benzene	0.3602	8.646	1.5778
Toluene	0.7682	18.436	3.3646
Ethylbenzene	0.0398	0.956	0.1744
Xylenes	0.4242	10.180	1.8579
C8+ Heavies	0.3873	9.295	1.6964
-----			
Total Emissions	4.3541	104.499	19.0711
Total Hydrocarbon Emissions	4.3541	104.499	19.0711
Total VOC Emissions	2.9057	69.738	12.7271
Total HAP Emissions	1.7017	40.841	7.4534
Total BTEX Emissions	1.5924	38.218	6.9748

## EQUIPMENT REPORTS:

## CONDENSER AND COMBUSTION DEVICE

Condenser Outlet Temperature: 78.00 deg. F  
 Condenser Pressure: 13.20 psia  
 Condenser Duty: 1.04e-002 MM BTU/hr  
 Hydrocarbon Recovery: 0.16 bbls/day  
 Produced Water: 0.18 bbls/day  
 Ambient Temperature: 36.50 deg. F  
 Excess Oxygen: 0.00 %  
 Combustion Efficiency: 98.00 %  
 Supplemental Fuel Requirement: 1.04e-002 MM BTU/hr

Component	Emitted	Destroyed
Methane	2.00%	98.00%
Ethane	1.99%	98.01%
Propane	1.96%	98.04%
Isobutane	1.91%	98.09%
n-Butane	1.86%	98.14%
Isopentane	1.62%	98.38%
n-Pentane	1.67%	98.33%
n-Hexane	1.16%	98.84%
Cyclohexane	0.98%	99.02%
Heptanes	0.63%	99.37%
Methylcyclohexane	0.60%	99.40%
2,2,4-Trimethylpentane	0.62%	99.38%
Benzene	0.86%	99.14%
Toluene	0.37%	99.63%
Ethylbenzene	0.11%	99.89%
Xylenes	0.10%	99.90%
C8+ Heavies	0.00%	100.00%

## ABSORBER

Calculated Absorber Stages: 1.28  
 Specified Dry Gas Dew Point: 2.50 lbs. H2O/MMSCF  
 Temperature: 65.0 deg. F

Pressure: 240.0 psig  
 Dry Gas Flow Rate: 1.0700 MMSCF/day  
 Glycol Losses with Dry Gas: 0.0008 lb/hr  
 Wet Gas Water Content: Saturated  
 Calculated Wet Gas Water Content: 61.65 lbs. H2O/MMSCF  
 Calculated Lean Glycol Recirc. Ratio: 7.57 gal/lb H2O

Component	Remaining in Dry Gas	Absorbed in Glycol
Water	4.05%	95.95%
Carbon Dioxide	99.82%	0.18%
Nitrogen	99.99%	0.01%
Methane	99.99%	0.01%
Ethane	99.96%	0.04%
Propane	99.91%	0.09%
Isobutane	99.84%	0.16%
n-Butane	99.77%	0.23%
Isopentane	99.71%	0.29%
n-Pentane	99.62%	0.38%
n-Hexane	99.21%	0.79%
Cyclohexane	96.61%	3.39%
Heptanes	98.13%	1.87%
Methylcyclohexane	95.34%	4.66%
2,2,4-Trimethylpentane	99.17%	0.83%
Benzene	72.25%	27.75%
Toluene	57.54%	42.46%
Ethylbenzene	39.85%	60.15%
Xylenes	29.39%	70.61%
C8+ Heavies	92.33%	7.67%

REGENERATOR

No Stripping Gas used in regenerator.

Component	Remaining in Glycol	Distilled Overhead
Water	51.53%	48.47%
Carbon Dioxide	0.00%	100.00%
Nitrogen	0.00%	100.00%
Methane	0.00%	100.00%
Ethane	0.00%	100.00%
Propane	0.00%	100.00%
Isobutane	0.00%	100.00%
n-Butane	0.00%	100.00%
Isopentane	0.41%	99.59%
n-Pentane	0.43%	99.57%
n-Hexane	0.46%	99.54%
Cyclohexane	3.14%	96.86%
Heptanes	0.48%	99.52%
Methylcyclohexane	3.95%	96.05%
2,2,4-Trimethylpentane	1.39%	98.61%
Benzene	4.99%	95.01%
Toluene	7.89%	92.11%
Ethylbenzene	10.39%	89.61%
Xylenes	12.89%	87.11%
C8+ Heavies	11.92%	88.08%

## STREAM REPORTS:

## WET GAS STREAM

Temperature: 65.00 deg. F  
 Pressure: 254.70 psia  
 Flow Rate: 4.47e+004 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	1.30e-001	2.75e+000
Carbon Dioxide	5.21e-001	2.70e+001
Nitrogen	4.66e-001	1.54e+001
Methane	9.04e+001	1.71e+003
Ethane	5.30e+000	1.87e+002
Propane	1.79e+000	9.27e+001
Isobutane	4.16e-001	2.84e+001
n-Butane	4.05e-001	2.77e+001
Isopentane	1.60e-001	1.35e+001
n-Pentane	1.15e-001	9.79e+000
n-Hexane	1.21e-001	1.22e+001
Cyclohexane	2.82e-002	2.80e+000
Heptanes	5.83e-002	6.88e+000
Methylcyclohexane	3.76e-002	4.34e+000
2,2,4-Trimethylpentane	3.94e-003	5.30e-001
Benzene	1.41e-002	1.30e+000
Toluene	1.67e-002	1.81e+000
Ethylbenzene	5.29e-004	6.61e-002
Xylenes	4.80e-003	6.00e-001
C8+ Heavies	2.50e-002	5.01e+000
Total Components	100.00	2.15e+003

## DRY GAS STREAM

Temperature: 65.00 deg. F  
 Pressure: 254.70 psia  
 Flow Rate: 4.46e+004 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	5.27e-003	1.11e-001
Carbon Dioxide	5.21e-001	2.70e+001
Nitrogen	4.67e-001	1.54e+001
Methane	9.05e+001	1.71e+003
Ethane	5.30e+000	1.87e+002
Propane	1.79e+000	9.26e+001
Isobutane	4.16e-001	2.84e+001
n-Butane	4.05e-001	2.77e+001
Isopentane	1.59e-001	1.35e+001
n-Pentane	1.15e-001	9.75e+000
n-Hexane	1.20e-001	1.22e+001
Cyclohexane	2.73e-002	2.70e+000
Heptanes	5.73e-002	6.75e+000
Methylcyclohexane	3.59e-002	4.14e+000
2,2,4-Trimethylpentane	3.92e-003	5.26e-001

Benzene	1.02e-002	9.36e-001
Toluene	9.60e-003	1.04e+000
Ethylbenzene	2.11e-004	2.64e-002
Xylenes	1.41e-003	1.76e-001
C8+ Heavies	2.31e-002	4.63e+000
-----		
Total Components	100.00	2.14e+003

## LEAN GLYCOL STREAM

-----  
 Temperature: 65.00 deg. F  
 Flow Rate: 3.33e-001 gpm

Component	Conc. (wt%)	Loading (lb/hr)
-----		
TEG	9.84e+001	1.84e+002
Water	1.50e+000	2.81e+000
Carbon Dioxide	2.63e-012	4.92e-012
Nitrogen	8.17e-014	1.53e-013
Methane	3.01e-018	5.64e-018
Ethane	1.98e-008	3.70e-008
Propane	1.90e-009	3.56e-009
Isobutane	7.41e-010	1.39e-009
n-Butane	8.40e-010	1.57e-009
Isopentane	1.04e-004	1.94e-004
n-Pentane	9.93e-005	1.86e-004
n-Hexane	2.60e-004	4.86e-004
Cyclohexane	1.67e-003	3.13e-003
Heptanes	3.45e-004	6.45e-004
Methylcyclohexane	4.51e-003	8.44e-003
2,2,4-Trimethylpentane	3.57e-005	6.69e-005
Benzene	1.01e-002	1.89e-002
Toluene	3.51e-002	6.58e-002
Ethylbenzene	2.47e-003	4.62e-003
Xylenes	3.35e-002	6.28e-002
C8+ Heavies	2.80e-002	5.24e-002
-----		
Total Components	100.00	1.87e+002

## RICH GLYCOL AND PUMP GAS STREAM

-----  
 Temperature: 65.00 deg. F  
 Pressure: 254.70 psia  
 Flow Rate: 3.48e-001 gpm  
 NOTE: Stream has more than one phase.

Component	Conc. (wt%)	Loading (lb/hr)
-----		
TEG	9.48e+001	1.84e+002
Water	2.81e+000	5.45e+000
Carbon Dioxide	3.41e-002	6.63e-002
Nitrogen	5.81e-003	1.13e-002
Methane	6.44e-001	1.25e+000
Ethane	1.02e-001	1.97e-001
Propane	7.53e-002	1.46e-001
Isobutane	3.31e-002	6.43e-002
n-Butane	4.17e-002	8.10e-002
Isopentane	2.44e-002	4.75e-002

n-Pentane	2.23e-002	4.34e-002
n-Hexane	5.41e-002	1.05e-001
Cyclohexane	5.13e-002	9.96e-002
Heptanes	6.87e-002	1.33e-001
Methylcyclohexane	1.10e-001	2.14e-001
2,2,4-Trimethylpentane	2.47e-003	4.80e-003
Benzene	1.95e-001	3.79e-001
Toluene	4.29e-001	8.34e-001
Ethylbenzene	2.29e-002	4.44e-002
Xylenes	2.51e-001	4.87e-001
C8+ Heavies	2.26e-001	4.40e-001
-----		
Total Components	100.00	1.94e+002

REGENERATOR OVERHEADS STREAM

Temperature: 212.00 deg. F  
 Pressure: 14.70 psia  
 Flow Rate: 1.01e+002 scfh

Component	Conc. (vol%)	Loading (lb/hr)
-----		
Water	5.52e+001	2.64e+000
Carbon Dioxide	5.67e-001	6.63e-002
Nitrogen	1.52e-001	1.13e-002
Methane	2.94e+001	1.25e+000
Ethane	2.47e+000	1.97e-001
Propane	1.25e+000	1.46e-001
Isobutane	4.17e-001	6.43e-002
n-Butane	5.25e-001	8.10e-002
Isopentane	2.46e-001	4.73e-002
n-Pentane	2.25e-001	4.32e-002
n-Hexane	4.57e-001	1.05e-001
Cyclohexane	4.31e-001	9.65e-002
Heptanes	4.99e-001	1.33e-001
Methylcyclohexane	7.87e-001	2.05e-001
2,2,4-Trimethylpentane	1.56e-002	4.73e-003
Benzene	1.74e+000	3.60e-001
Toluene	3.14e+000	7.68e-001
Ethylbenzene	1.41e-001	3.98e-002
Xylenes	1.50e+000	4.24e-001
C8+ Heavies	8.56e-001	3.87e-001
-----		
Total Components	100.00	7.08e+000

CONDENSER PRODUCED WATER STREAM

Temperature: 78.00 deg. F  
 Flow Rate: 5.15e-003 gpm

Component	Conc. (wt%)	Loading (lb/hr)	(ppm)
-----			
Water	9.99e+001	2.58e+000	999482.
Carbon Dioxide	1.92e-003	4.95e-005	19.
Nitrogen	6.39e-006	1.65e-007	0.
Methane	1.52e-003	3.90e-005	15.
Ethane	3.13e-004	8.06e-006	3.
Propane	1.56e-004	4.01e-006	2.

Isobutane	3.84e-005	9.89e-007	0.
n-Butane	6.61e-005	1.70e-006	1.
Isopentane	2.52e-005	6.49e-007	0.
n-Pentane	2.64e-005	6.81e-007	0.
n-Hexane	4.03e-005	1.04e-006	0.
Cyclohexane	2.06e-004	5.30e-006	2.
Heptanes	1.64e-005	4.24e-007	0.
Methylcyclohexane	1.34e-004	3.46e-006	1.
2,2,4-Trimethylpentane	3.69e-007	9.51e-009	0.
Benzene	2.40e-002	6.19e-004	240.
Toluene	1.97e-002	5.06e-004	197.
Ethylbenzene	2.53e-004	6.52e-006	3.
Xylenes	3.47e-003	8.93e-005	35.
C8+ Heavies	9.49e-008	2.45e-009	0.
-----			
Total Components	100.00	2.58e+000	1000000.

CONDENSER RECOVERED OIL STREAM

Temperature: 78.00 deg. F  
 Flow Rate: 4.74e-003 gpm

Component	Conc. (wt%)	Loading (lb/hr)
-----		
Water	3.10e-002	6.25e-004
Carbon Dioxide	6.06e-003	1.22e-004
Nitrogen	5.33e-004	1.08e-005
Methane	3.64e-002	7.34e-004
Ethane	3.52e-002	7.09e-004
Propane	1.55e-001	3.12e-003
Isobutane	1.48e-001	2.98e-003
n-Butane	2.71e-001	5.47e-003
Isopentane	4.49e-001	9.06e-003
n-Pentane	3.51e-001	7.09e-003
n-Hexane	2.18e+000	4.40e-002
Cyclohexane	2.44e+000	4.93e-002
Heptanes	4.51e+000	9.10e-002
Methylcyclohexane	7.10e+000	1.43e-001
2,2,4-Trimethylpentane	1.62e-001	3.27e-003
Benzene	1.01e+001	2.05e-001
Toluene	3.10e+001	6.26e-001
Ethylbenzene	1.86e+000	3.76e-002
Xylenes	2.00e+001	4.03e-001
C8+ Heavies	1.92e+001	3.87e-001
-----		
Total Components	100.00	2.02e+000

CONDENSER VENT STREAM

Temperature: 78.00 deg. F  
 Pressure: 13.20 psia  
 Flow Rate: 3.90e+001 scfh

Component	Conc. (vol%)	Loading (lb/hr)
-----		
Water	3.66e+000	6.77e-002
Carbon Dioxide	1.46e+000	6.62e-002
Nitrogen	3.91e-001	1.13e-002
Methane	7.58e+001	1.25e+000

Ethane	6.36e+000	1.97e-001
Propane	3.16e+000	1.43e-001
Isobutane	1.03e+000	6.13e-002
n-Butane	1.26e+000	7.56e-002
Isopentane	5.15e-001	3.82e-002
n-Pentane	4.87e-001	3.61e-002
n-Hexane	6.83e-001	6.05e-002
Cyclohexane	5.45e-001	4.72e-002
Heptanes	4.06e-001	4.18e-002
Methylcyclohexane	6.13e-001	6.19e-002
2,2,4-Trimethylpentane	1.24e-002	1.46e-003
Benzene	1.93e+000	1.55e-001
Toluene	1.50e+000	1.42e-001
Ethylbenzene	2.07e-002	2.26e-003
Xylenes	1.93e-001	2.11e-002
C8+ Heavies	3.73e-003	6.54e-004
-----		
Total Components	100.00	2.48e+000

## COMBUSTION DEVICE OFF GAS STREAM

-----  
Temperature: 1000.00 deg. F  
Pressure: 14.70 psia  
Flow Rate: 7.38e-001 scfh

Component	Conc. (vol%)	Loading (lb/hr)
-----		
Methane	8.02e+001	2.50e-002
Ethane	6.73e+000	3.93e-003
Propane	3.34e+000	2.87e-003
Isobutane	1.09e+000	1.23e-003
n-Butane	1.34e+000	1.51e-003
Isopentane	5.45e-001	7.64e-004
n-Pentane	5.15e-001	7.23e-004
n-Hexane	7.23e-001	1.21e-003
Cyclohexane	5.76e-001	9.43e-004
Heptanes	4.29e-001	8.36e-004
Methylcyclohexane	6.49e-001	1.24e-003
2,2,4-Trimethylpentane	1.31e-002	2.91e-005
Benzene	2.04e+000	3.10e-003
Toluene	1.59e+000	2.84e-003
Ethylbenzene	2.19e-002	4.51e-005
Xylenes	2.04e-001	4.22e-004
C8+ Heavies	3.95e-003	1.31e-005
-----		
Total Components	100.00	4.67e-002

**LINN OPERATING, INC.**  
**SCC2 - Tank, LPS and EG Pump P2-P3 Combustor Emission Calculations**

Emission Assumptions

				NOx Emission Factor =	0.14 lb/MMBtu	WDEQ O&G Guidance
				CO Emission Factor =	0.035 lb/MMBtu	WDEQ O&G Guidance
SCC2	T1	Gas Throughput to Combustor =	27 scf/hr			[Gas Throughput from ProMax]
SCC2	T2	Gas Throughput to Combustor =	3 scf/hr			[Gas Throughput from ProMax]
SCC2	LPS	Gas Throughput to Combustor =	138 scf/hr			[Gas Throughput from ProMax]
SCC2	P1-P4	Gas Throughput to Combustor =	321 scf/hr Pump			[Pump Specifications]
		Combustor Pilot Gas =	92 scf/hr			[Conservative Estimate]
		Natural Gas Heating Value =	1570 Btu/scf			[From ProMax Calculated Weighted]

		NOx (tpy)	CO (tpy)	Number of Units	Hours/Year
SCC2	T1	Combustor Emissions =	0.03	1	8760
SCC2	T2	Combustor Emissions =	0.00	1	8760
SCC2	LPS	Combustor Emissions =	0.13	1	8760
SCC2	P1-P4	Combustor Emissions =	0.62	4	4360
		Pilot Gas Emissions =	0.09	1	
		<b>Total Combustor Emissions =</b>	<b>0.86</b>		
					<b>0.22</b>

Notes:

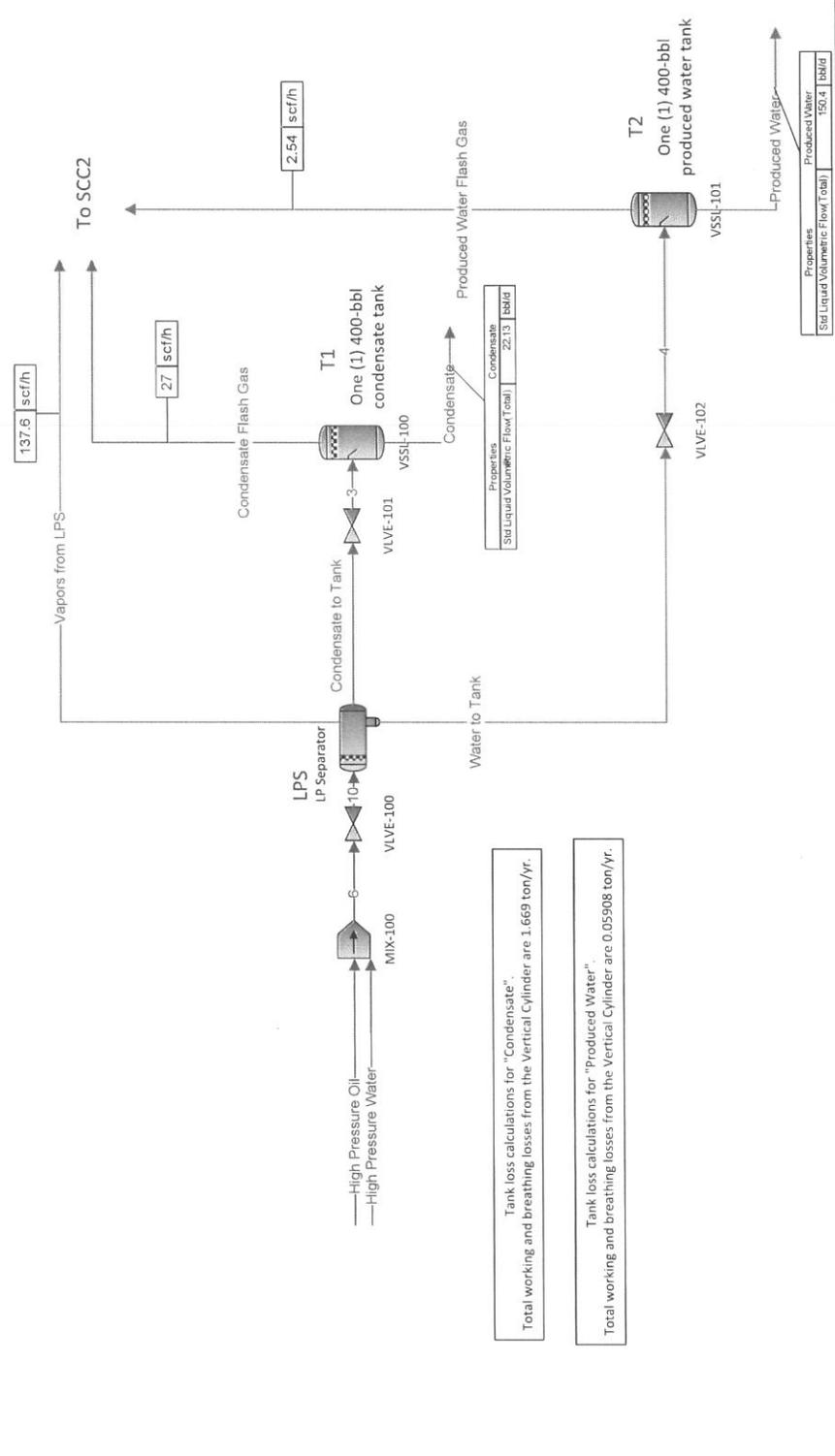
Emission factors for NOx and CO from combustors from WDEQ O&G Guidance, March 2010

# Flowsheet1 Plant Schematic

Client Name: Linn Operating, Inc.  
 Location: Stud Horse Butte 10e Pad  
 Flowsheet: Flowsheet1  
 Job: LPS Model: LPS, T1-T2, SCC2 Emissions

Stream Vapors from LPS C3+ Mass Flow =14.45 ton/yr  
 Stream Condensate Flash Gas C3+ Mass Flow =8.064 ton/yr  
 Stream Produced Water Flash Gas C3+ Mass Flow =0.2405 ton/yr

Linn Operating, Inc.  
 Stud Horse Butte 10e Pad  
 Two (2) Total Wells: SHB 10e5, SHB 10d5  
 January 2015 -February 2015 Production



Tank loss calculations for "Condensate".  
 Total working and breathing losses from the Vertical Cylinder are 1.669 ton/yr.

Tank loss calculations for "Produced Water".  
 Total working and breathing losses from the Vertical Cylinder are 0.05908 ton/yr.

Properties	Produced Water
Std Liquid Volumetric Flow Total	150.4 [bbl/d]

Process Streams Report All Streams Tabulated by Total Phase					
Client Name:	Linn Operating, Inc.			Job: LPS Model: LPS, T1-T2, SCC2 Emissions	
Location:	Stud Horse Butte 10e Pad				
Flowsheet:	Flowsheet1				
Connections					
	Condensate	Condensate Flash Gas	Condensate to Tank	High Pressure Oil	High Pressure Water
From Block	VSSL-100	VSSL-100	LP Separator	--	--
To Block	--	--	VLVE-101	MIX-100	MIX-100
Stream Composition					
	Condensate	Condensate Flash Gas	Condensate to Tank	High Pressure Oil	High Pressure Water
Mole Fraction	%	%	%	%	%
Carbon Dioxide	0.00825059	0.674975	0.0293183	0.169981	0 *
Nitrogen	1.1057E-05	0.00927375	0.000303747	0.0102989	0 *
Methane	0.110277	26.6644	0.949356	10.1404	0 *
Ethane	0.690855	25.2094	1.46561	3.51191	0 *
Propane	2.35954	23.4603	3.0263	3.90217	0 *
i-Butane	1.87724	6.88597	2.03551	2.07087	0 *
n-Butane	2.86071	7.26777	2.99997	2.91198	0 *
i-Pentane	2.92693	2.77703	2.9222	2.63301	0 *
n-Pentane	2.94881	2.05327	2.92051	2.59901	0 *
Cyclopentane	0	0	0	0	0 *
n-Hexane	7.88026	1.51672	7.67918	6.66087	0 *
Cyclohexane	0	0	0	0	0 *
Isohexane	0	0	0	0	0 *
Heptane	25.6076	1.57823	24.8483	21.407	0 *
Methylcyclohexane	0	0	0	0	0 *
2,2,4-Trimethylpentane	0.841756	0.0570124	0.816959	0.704023	0 *
Benzene	1.3872	0.253709	1.35138	1.20687	0 *
Toluene	5.73525	0.300962	5.56354	4.82537	0 *
Ethylbenzene	0.554277	0.00859686	0.537034	0.462449	0 *
m-Xylene	5.7843	0.0744799	5.60388	4.82347	0 *
n-Octane	10.0126	0.185127	9.70211	8.33908	0 *
Nonane	7.24055	0.0420748	7.01308	6.02364	0 *
Helium	0	0	0	0	0 *
Ethyl Alcohol	0	0	0	0	0 *
Water	0.0133486	0.942057	0.0426947	0	100 *
Decane	21.1602	0.038685	20.4927	17.5976	0 *
C11	0	0	0	0	0 *
C12	0	0	0	0	0 *
C13	0	0	0	0	0 *
C14	0	0	0	0	0 *
C15	0	0	0	0	0 *
C16	0	0	0	0	0 *
C17	0	0	0	0	0 *
	Condensate	Condensate Flash Gas	Condensate to Tank	High Pressure Oil	High Pressure Water
Mass Flow	lb/h	lb/h	lb/h	lb/h	lb/h
Carbon Dioxide	0.00791161	0.0211195	0.0290311	0.196029	0 *
Nitrogen	6.74896E-06	0.000184701	0.00019145	0.00756009	0 *
Methane	0.0385467	0.304125	0.342672	4.26282	0 *
Ethane	0.452627	0.538928	0.991555	2.76717	0 *
Propane	2.26703	0.735491	3.00252	4.50893	0 *
i-Butane	2.37736	0.284548	2.66191	3.15404	0 *
n-Butane	3.62285	0.300326	3.92317	4.43509	0 *
i-Pentane	4.60124	0.142448	4.74369	4.97798	0 *
n-Pentane	4.63564	0.105323	4.74096	4.91371	0 *
Cyclopentane	0	0	0	0	0 *
n-Hexane	14.7964	0.0929261	14.8894	15.0413	0 *
Cyclohexane	0	0	0	0	0 *
Isohexane	0	0	0	0	0 *
Heptane	55.9086	0.112433	56.0211	56.2089	0 *
Methylcyclohexane	0	0	0	0	0 *

\* User Specified Values  
? Extrapolated or Approximate Values

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Process Streams Report All Streams Tabulated by Total Phase						
Client Name:		Linn Operating, Inc.			Job: LPS Model: LPS, T1-T2, SCC2 Emissions	
Location:		Stud Horse Butte 10e Pad				
Flowsheet:		Flowsheet1				
Mass Flow	Condensate lb/h	Condensate Flash Gas lb/h	Condensate to Tank lb/h	High Pressure Oil lb/h	High Pressure Water lb/h	
2,2,4-Trimethylpentane	2.09505	0.00463012	2.09968	2.10733 *	0	*
Benzene	2.36096	0.0140897	2.37505	2.47029 *	0	*
Toluene	11.514	0.0197152	11.5337	11.6505 *	0	*
Ethylbenzene	1.28216	0.000648889	1.28281	1.28652 *	0	*
m-Xylene	13.3803	0.00562173	13.3859	13.4188 *	0	*
n-Octane	24.9205	0.0150347	24.9355	24.9612 *	0	*
Nonane	20.2339	0.00383659	20.2377	20.2444 *	0	*
Helium	0	0	0	0	0	*
Ethyl Alcohol	0	0	0	0	0	*
Water	0.00523976	0.0120661	0.0173059	0	2194.01	*
Decane	65.5996	0.00391328	65.6035	65.6105 *	0	*
C11	0	0	0	0	0	*
C12	0	0	0	0	0	*
C13	0	0	0	0	0	*
C14	0	0	0	0	0	*
C15	0	0	0	0	0	*
C16	0	0	0	0	0	*
C17	0	0	0	0	0	*
Stream Properties						
Property	Units	Condensate	Condensate Flash Gas	Condensate to Tank	High Pressure Oil	High Pressure Water
Temperature	°F	66.5816	66.5816	70.1495	70	70
Pressure	psia	11.76	11.76 *	41.76	261.76 *	261.76 *
Std Vapor Volumetric Flow	MMSCFD	0.0198444	0.000647522	0.020492	0.0238659	1.10918
Std Liquid Volumetric Flow	sgpm	0.64546	0.0116291	0.657089	0.706014 *	4.38598 *
Gross Ideal Gas Heating Value	Btu/ft <sup>3</sup>	5708.11	2167.96	5596.25	5014.76	50.31
Remarks						

\* User Specified Values

? Extrapolated or Approximate Values

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Process Streams Report All Streams Tabulated by Total Phase					
Client Name:	Linn Operating, Inc.			Job: LPS Model: LPS, T1-T2, SCC2 Emissions	
Location:	Stud Horse Butte 10e Pad				
Flowsheet:	Flowsheet1				
Connections					
	Produced Water	Produced Water Flash Gas	Vapors from LPS	Water to Tank	3
From Block	VSSL-101	VSSL-101	LP Separator	LP Separator	VLVE-101
To Block	--	--	--	VLVE-102	VSSL-100
Stream Composition					
	Produced Water	Produced Water Flash Gas	Vapors from LPS	Water to Tank	3
Mole Fraction	%	%	%	%	%
Carbon Dioxide	0.000904825	2.18119	0.70244	0.00102455	0.0293183
Nitrogen	3.75326E-07	0.038514	0.071715	2.49026E-06	0.000303747
Methane	0.00124598	62.2005	65.8335	0.00466159	0.949356
Ethane	0.000394477	16.6422	15.8479	0.00130834	1.46561
Propane	0.000284282	10.4286	9.1348	0.000856944	3.0263
i-Butane	1.07276E-05	1.14569	2.31065	7.36413E-05	2.03551*
n-Butane	4.4466E-05	2.18243	2.3741	0.000164309	2.99997
i-Pentane	8.73984E-06	0.611236	0.881471	4.23048E-05	2.9222
n-Pentane	6.11793E-06	0.440368	0.650223	3.03E-05	2.92051
Cyclopentane	0	0	0	0	0
n-Hexane	7.35364E-07	0.139903	0.48352	8.41797E-06	7.67918
Cyclohexane	0	0	0	0	0
Isohexane	0	0	0	0	0
Heptane	1.18446E-06	0.179917	0.513171	1.10644E-05	24.8483
Methylcyclohexane	0	0	0	0	0
2,2,4-Trimethylpentane	5.68697E-10	0.000784975	0.0184659	4.36748E-08	0.816959
Benzene	0.000746758	0.264953	0.0805811	0.000761266	1.35138
Toluene	0.00073313	0.314691	0.0973614	0.000750371	5.56354
Ethylbenzene	1.97586E-05	0.00907305	0.0028478	2.02558E-05	0.537034
m-Xylene	0.00017605	0.0788438	0.0247774	0.00018037	5.60388
n-Octane	5.37687E-08	0.0134777	0.0615789	7.93882E-07	9.70211
Nonane	3.10131E-08	0.00479575	0.014282	2.94365E-07	7.01308
Helium	0	0	0	0	0
Ethyl Alcohol	0	0	0	0	0
Water	99.9954	3.12002	0.883034	99.9901	0.0426947
Decane	1.10869E-08	0.002825	0.0134842	1.66218E-07	20.4927
C11	0	0	0	0	0
C12	0	0	0	0	0
C13	0	0	0	0	0
C14	0	0	0	0	0
C15	0	0	0	0	0
C16	0	0	0	0	0
C17	0	0	0	0	0
	Produced Water	Produced Water Flash Gas	Vapors from LPS	Water to Tank	3
Mass Flow	lb/h	lb/h	lb/h	lb/h	lb/h
Carbon Dioxide	0.0484967	0.00642019	0.112081	0.0549169	0.0290311
Nitrogen	1.28049E-05	7.21593E-05	0.00728368	8.49642E-05	0.00019145
Methane	0.0243434	0.066738	3.82907	0.0910814	0.342672
Ethane	0.0144458	0.0334686	1.7277	0.0479144	0.991555
Propane	0.0152667	0.0307561	1.46039	0.0460228	3.00252
i-Butane	0.000759354	0.00445366	0.486914	0.00521301	2.66191
n-Butane	0.00314754	0.0084838	0.500284	0.0116313	3.92317
i-Pentane	0.000767951	0.00294948	0.230575	0.00371743	4.74369
n-Pentane	0.000537569	0.00212497	0.170085	0.00266254	4.74096
Cyclopentane	0	0	0	0	0
n-Hexane	7.71767E-05	0.000806342	0.151068	0.000883518	14.8894
Cyclohexane	0	0	0	0	0

\* User Specified Values

? Extrapolated or Approximate Values

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Process Streams Report All Streams Tabulated by Total Phase						
Client Name:		Linn Operating, Inc.			Job: LPS Model: LPS, T1-T2, SCC2 Emissions	
Location:		Stud Horse Butte 10e Pad				
Flowsheet:		Flowsheet1				
Mass Flow	Produced Water lb/h	Produced Water Flash Gas lb/h	Vapors from LPS lb/h	Water to Tank lb/h	3 lb/h	
Isohexane	0	0	0	0	0	
Heptane	0.000144543	0.00120575	0.186429	0.00135029	56.0211	
Methylcyclohexane	0	0	0	0	0	
2,2,4-Trimethylpentane	7.91145E-08	5.99706E-06	0.0076475	6.07618E-06	2.09968	
Benzene	0.0710391	0.00138418	0.0228205	0.0724233	2.37505	
Toluene	0.0822665	0.00193925	0.0325239	0.0842057	11.5337	
Ethylbenzene	0.0025547	6.44233E-05	0.00109614	0.00261912	1.28281	
m-Xylene	0.0227624	0.000559831	0.00953701	0.0233223	13.3859	
n-Octane	7.48006E-06	0.000102967	0.0255024	0.000110447	24.9355	
Nonane	4.84419E-06	4.11376E-05	0.0066411	4.59818E-05	20.2377	
Helium	0	0	0	0	0	
Ethyl Alcohol	0	0	0	0	0	
Water	2193.93	0.00375929	0.0576758	2193.93	0.0173059	
Decane	1.92115E-06	2.68829E-05	0.00695583	2.8804E-05	65.6035	
C11	0	0	0	0	0	
C12	0	0	0	0	0	
C13	0	0	0	0	0	
C14	0	0	0	0	0	
C15	0	0	0	0	0	
C16	0	0	0	0	0	
C17	0	0	0	0	0	
Stream Properties						
Property	Units	Produced Water	Produced Water Flash Gas	Vapors from LPS	Water to Tank	3
Temperature	°F	70.2183	70.2183	70.1495	70.1495	66.5816
Pressure	psia	11.76	11.76 *	41.76	41.76	11.76
Std Vapor Volumetric Flow	MMSCFD	1.10919	6.09135E-05	0.00330202	1.10925	0.020492
Std Liquid Volumetric Flow	sgpm	4.38667	0.000853786	0.0473808	4.38752	0.657089
Gross Ideal Gas Heating Value	Btu/ft <sup>3</sup>	50.4079	1383.84	1456.67	50.4811	5596.25
Remarks						

Process Streams Report				
All Streams				
Tabulated by Total Phase				
Client Name:	Linn Operating, Inc.		Job: LPS Model: LPS, T1-T2, SCC2 Emissions	
Location:	Stud Horse Butte 10e Pad			
Flowsheet:	Flowsheet1			
Connections				
	4	6	10	
From Block	VLVE-102	MIX-100	VLVE-100	
To Block	VSSL-101	VLVE-100	LP Separator	
Stream Composition				
Mole Fraction	4 %	6 %	10 %	
Carbon Dioxide	0.00102455	0.00358039	0.00358039	
Nitrogen	2.49026E-06	0.00021693	0.00021693	
Methane	0.00466159	0.213592	0.213592	
Ethane	0.00130834	0.0739731	0.0739731	
Propane	0.000856944	0.0821932	0.0821932	
i-Butane	7.36413E-05	0.0436197	0.0436197	
n-Butane	0.000164309	0.0613364	0.0613364	
i-Pentane	4.23048E-05	0.0554603	0.0554603	
n-Pentane	3.03E-05	0.0547442	0.0547442	
Cyclopentane	0	0	0	
n-Hexane	8.41797E-06	0.140301	0.140301	
Cyclohexane	0	0	0	
Isohexane	0	0	0	
Heptane	1.10644E-05	0.450906	0.450906	
Methylcyclohexane	0	0	0	
2,2,4-Trimethylpentane	4.36748E-08	0.0148292	0.0148292	
Benzene	0.000761266	0.0254208	0.0254208	
Toluene	0.000750371	0.101639	0.101639	
Ethylbenzene	2.02558E-05	0.00974078	0.00974078	
m-Xylene	0.00018037	0.101599	0.101599	
n-Octane	7.93882E-07	0.17565	0.17565	
Nonane	2.94365E-07	0.126879	0.126879	
Helium	0	0	0	
Ethyl Alcohol	0	0	0	
Water	99.9901	97.8937	97.8937	
Decane	1.66218E-07	0.370666	0.370666	
C11	0	0	0	
C12	0	0	0	
C13	0	0	0	
C14	0	0	0	
C15	0	0	0	
C16	0	0	0	
C17	0	0	0	
Mass Flow	4 lb/h	6 lb/h	10 lb/h	
Carbon Dioxide	0.0549169	0.196029	0.196029	
Nitrogen	8.49642E-05	0.00756009	0.00756009	
Methane	0.0910814	4.26282	4.26282	
Ethane	0.0479144	2.76717	2.76717	
Propane	0.0460228	4.50893	4.50893	
i-Butane	0.00521301	3.15404	3.15404	
n-Butane	0.0116313	4.43509	4.43509	
i-Pentane	0.00371743	4.97798	4.97798	
n-Pentane	0.00266254	4.91371	4.91371	
Cyclopentane	0	0	0	
n-Hexane	0.000883518	15.0413	15.0413	
Cyclohexane	0	0	0	
Isohexane	0	0	0	
Heptane	0.00135029	56.2089	56.2089	
Methylcyclohexane	0	0	0	
2,2,4-Trimethylpentane	6.07618E-06	2.10733	2.10733	
Benzene	0.0724233	2.47029	2.47029	
Toluene	0.0842057	11.6505	11.6505	

\* User Specified Values  
 ? Extrapolated or Approximate Values

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Process Streams Report All Streams Tabulated by Total Phase					
Client Name:	Linn Operating, Inc.			Job: LPS Model: LPS, T1-T2, SCC2 Emissions	
Location:	Stud Horse Butte 10e Pad				
Flowsheet:	Flowsheet1				
Mass Flow	4 lb/h	6 lb/h	10 lb/h		
Ethylbenzene	0.00261912	1.28652	1.28652		
m-Xylene	0.0233223	13.4188	13.4188		
n-Octane	0.000110447	24.9612	24.9612		
Nonane	4.59818E-05	20.2444	20.2444		
Helium	0	0	0		
Ethyl Alcohol	0	0	0		
Water	2193.93	2194.01	2194.01		
Decane	2.8804E-05	65.6105	65.6105		
C11	0	0	0		
C12	0	0	0		
C13	0	0	0		
C14	0	0	0		
C15	0	0	0		
C16	0	0	0		
C17	0	0	0		
Stream Properties					
Property	Units	4	6	10	
Temperature	°F	70.2183	70.0819	70.1495	
Pressure	psia	11.76 *	261.76	41.76 *	
Std Vapor Volumetric Flow	MMSCFD	1.10925	1.13305	1.13305	
Std Liquid Volumetric Flow	sgpm	4.38752	5.09199	5.09199	
Gross Ideal Gas Heating Value	Btu/ft <sup>3</sup>	50.4811	154.878	154.878	
Remarks					

**LINN OPERATING, INC.**  
**Process Heater Emission Calculations**

Emission Assumptions

NOx Emission Factor, adjusted for heating value = 109 lb/MMscf [AP-42, Chapter 1.4]  
 CO Emission Factor, adjusted for heating value = 92 lb/MMscf [AP-42, Chapter 1.4]  
 VOC Emission Factor, adjusted for heating value = 6 lb/MMscf [AP-42, Chapter 1, Table 1.4-2]

Natural Gas Heating Value = 1113 Btu/scf [Field Average]  
 Natural Gas Heating Value = 1020 Btu/scf AP-42 default value

Number of Units

REB1, REB2 Dehy Reboiler = 0.125 MMBtu/hr 2  
 EG1-EG2 EG Bath Heater = 0.250 MMBtu/hr 2

Reboiler Separator Hours Operated Per Year = 8760.00  
 EG Bath Heater Hours Operated Per Year = 4380.00

	NOx (tpy)	VOC (tpy)	CO (tpy)
0.125 MMBtu/hr Dehy Reboiler =	<b>0.11</b>	<b>0.006</b>	<b>0.09</b>
0.250 MMBtu/hr EG Bath Heater =	<b>0.11</b>	<b>0.006</b>	<b>0.09</b>

**Total Process Heater Emissions = 0.21 0.01 0.18**

**LINN OPERATING, INC.**  
**Pneumatics Emissions Estimation**  
**Calculation Details - Ethylene Glycol Pumps P1-P4**

Sandpiper pump (scfh)	321
Hours/year	4380
Motive Gas Density (lb/ft <sup>3</sup> )	0.047
Number of pumps	4
<b>Gas Vented (tpy)</b>	<b>133.06</b>
<b>% VOC</b>	<b>9.61%</b>
<b>% HAPs</b>	<b>0.76%</b>

7700 SCFD (Process Flow Diagram)  
 321 SCFH per pump  
 1283 SCFH total

<b>Uncontrolled VOCs (tpy)</b>	<b>12.79</b>
<b>Uncontrolled HAPs (tpy)</b>	<b>1.01</b>
<b>Control Efficiency (%)</b>	<b>98.0%</b>
<b>Controlled VOCs (tpy)<sup>1</sup></b>	<b>0.256</b>
<b>Controlled HAPs (tpy)<sup>1</sup></b>	<b>0.020</b>

**Calculations:**

Pump Rate (scf/hour) \* Number of Pumps / 23.8 ft<sup>3</sup>/lb \* 8760 hrs/yr / 2000 lbs-ton = Amount of gas vented (tons/yr)  
 %VOC was calculated from the mol % wet gas average of four wells, converted to weight percent, VOC = All C3+ components  
 % VOC of gas x pneumatic gas vented (tons/yr) = ton/yr of VOC emitted

**Notes:**

<sup>1</sup>All pneumatic heat trace, heat medium, or glycol circulation pumps are routed through combustor or an equivalent device to achieve 98% destruction efficiency

**LINN OPERATING, INC.**  
**Condensate Truck Loading**

**From AP-42, Chapter 5.2 - Transportation and Marketing of Petroleum Liquids**

$$L_L = 12.46 \text{ SPM} / T$$

Where,

- $L_L$  = Loading Loss, lb/1000 gals of liquid loaded (Total Hydrocarbons)
- S = Saturation Factor
- P = True Vapor Pressure of Liquid Loaded, psia
- M = Molecular Weight of Vapors, lb/lb-mol
- T = Temperature of Bulk Liquid Loaded, °R

**Condensate Truck Loading Assumptions**

- $L_L$  = 3.83 Loading Losses, lb/1000 gal liquid loaded
- S = 0.6 submerged loading, dedicated normal service
- P = 13.2 Reid Vapor Pressure, psia
- M = 5.74 True Vapor Pressure, psia
- T = 44.7 Mol Wt of Vapors, lb/lbmol
- T = 500 Temp of liquid loaded, °R, (50 + 460) = 510 °R

- Calculated VOC Wt. % of THC Vapors = 83.83 wt. %
- Calculated HAP WT. % of THC Vapors = 2.60 wt. %

- Average Daily Loadout = 22.13 bbls/day
- Annual Production = 8,076 bbls/year
- Annual Production = 339,192 gals/year
- Annual Production = 339 1,000 gals/year

- Tank Truck Capacity = 8000 gallons
- Annual Unloading = 42.4 trucks/yr
- For 8000 gal Truck = 30.67 lbs/truck

- E = 0.54 TPY VOC
- E = 0.02 TPY HAPS

LINN OPERATING, INC.  
Truck Loading Vapor Pressure and Speciation

Component	Molecular Weight	Higher Heating Value	Stable Oil Composition <sup>(a)</sup>	Truck Loading Vapor Composition <sup>(b)</sup>	
	(lb/lb-mole)			(Btu/scf)	(Mole %)
Carbon Dioxide <sup>(c)</sup>	44.01	0	0.0049	0.0000	0.0000
Nitrogen <sup>(c)</sup>	28.01	0	0.0074	0.0000	0.0000
Methane	16.04	1013	0.0195	15.8993	5.7090
Ethane	30.07	1792	0.3393	15.5472	10.4655
Propane	44.10	2590	2.6714	34.3820	33.9425
Isobutane	58.12	3363	2.2905	10.6497	13.8560
n-Butane	58.12	3370	3.9215	12.0761	15.7118
Isopentane	72.15	4008	4.1894	4.3333	6.9989
n-Pentane	72.15	4016	4.0726	3.0324	4.8978
n-Hexane	84.18	4762	5.1258	0.9706	1.8290
Hexanes	86.18	4482	6.5694	1.2439	2.3998
Heptanes	100.21	5503	25.4448	1.2859	2.8847
2,2,4-Trimethylpentane	114.23	6232	1.1654	0.0569	0.1456
Benzene	78.11	3751	1.594	0.1579	0.2761
Toluene	92.14	4484	5.538	0.1287	0.2656
Ethylbenzene	106.17	5222	0.4502	0.0030	0.0070
Xylenes (Total)	106.17	5230	5.4384	0.0315	0.0749
Octanes	114.23	6249	10.7282	0.1540	0.3937
Nonanes	128.26	6947	7.0690	0.0300	0.0862
Decanes	142.29	7711	13.3603	0.0176	0.0559
Total			100.0000	100.0000	100.0000

Liquid Bulk Temperature	40.00 F
Calculated True Vapor Pressure <sup>(d)</sup>	5.74 psia
Calculated Molecular Weight of Vapors <sup>(e)</sup>	44.67 lb/lb-mole
Calculated VOC Wt. % of Vapors	83.83 wt. %
Calculated HAP Wt. % of Vapors	2.60 wt. %
Calculated HHV of Vapors	2593.58 Btu/scf

Notes:

- (a) Stable oil composition from site-specific oil analysis taken at the Cabrillo 19F Pad on 2/26/2015 by Questar Applied Technology
- (b) Vapor Composition (Mole %) = (Constituent TVP, psia) \* (Constituent Mole Fraction in Stable Oil) / (Total Liquid TVP, psia)  
Vapor Composition (Wt %) = (Constituent MW, lb/lb-mole) / (Total Vapor MW, lb/lb-mole)
- (c) Although these constituents were detected in the samples they were not included in the calculations because a valid true vapor pressure at the bulk liquid temperature was not found in Mbbpwin v1.43
- (d) True Vapor Pressure of Liquid (psia) = z (Constituent TVP, psia) \* (Constituent Mole Fraction in Stable Oil). True vapor pressure of each constituent calculated using Mbbpwin v1.43.
- (e) Molecular Weight of Vapors calculated based on Equation 1-22 of AP 42 Chapter 7.1

**LINN OPERATING, INC.**  
Equipment Leak Emission Factors

Equipment Type	Equipment Service	Average Total HydroCarbon Emission Factors <sup>[1]</sup> (lb/component-day)	Speciated Fugitive Emission Factors (Estimated Weight Fractions) <sup>[2]</sup>						Total HydroCarbon Emissions		Total VOC Emissions <sup>[4]</sup>		Total HAP Emissions <sup>[4]</sup>						
			VOC	CO <sup>*</sup>	Benzene	Toluene	Ethylbenzene	Xylenes	Total HAP	Component Count	lb/day	lb/mo.	ton/yr	lb/day	lb/mo.	ton/yr			
Valves	Gas	0.2400	3.50E-02	3.38E-03	2.30E-04	3.90E-04	2.00E-05	1.00E-04	4.12E-03	127	30.5	927.1	5.6	1.067	32.4	0.195	3.8	0.023	
	Heavy Oil	0.0044	3.00E-02	7.52E-03	9.35E-03	3.44E-03	5.10E-04	3.72E-03	2.45E-02										
	Light Oil	0.1300	2.92E-01	2.43E-02	2.70E-04	7.50E-04	1.70E-04	3.60E-04	2.59E-02	31	4.03	122.6	0.7	1.177	35.8	0.215	0.104	0.019	
Pump Seals	Water/Oil	0.0052	N/A	N/A	6.24E-06	1.68E-06	5.20E-08	2.08E-07	8.16E-06	24	0.12	3.8	0.0	N/A			0.000	0.000	
	Gas	0.1300	3.50E-02	3.38E-03	2.30E-04	3.90E-04	2.00E-05	1.00E-04	4.12E-03										
	Heavy Oil	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A										
Others: pressure relief valves, compressors, instruments, diaphragms, drains, hatches, meters, and vents.	Light Oil	0.6900	2.92E-01	2.43E-02	2.70E-04	7.50E-04	1.70E-04	3.60E-04	2.59E-02										
	Water/Oil	0.0013	N/A	N/A	1.56E-06	4.18E-07	1.30E-08	5.20E-08	2.04E-06										
	Gas	0.4700	3.50E-02	3.38E-03	2.30E-04	3.90E-04	2.00E-05	1.00E-04	4.12E-03	51	24.0	729.1	4.4	0.839	25.5	0.153	0.099	3.0	0.018
Connectors	Heavy Oil	0.0017	3.00E-02	7.52E-03	9.35E-03	3.44E-03	5.10E-04	3.72E-03	2.45E-02	6	2.4	73.0	0.4	0.701	21.3	0.128	0.062	1.9	0.011
	Light Oil	0.0110	2.92E-01	2.43E-02	2.70E-04	7.50E-04	1.70E-04	3.60E-04	2.59E-02	4	3.0	90.0	0.5	N/A			0.003	0.1	0.001
	Water/Oil	0.0058	N/A	N/A	6.96E-06	1.86E-06	5.80E-08	2.32E-07	9.11E-06	835	9.2	279.4	1.7	0.321	9.8	0.059	0.038	1.2	0.007
Flanges	Gas	0.0210	3.50E-02	3.38E-03	2.30E-04	3.90E-04	2.00E-05	1.00E-04	4.12E-03	221	2.4	73.9	0.4	0.710	21.6	0.130	0.063	1.9	0.011
	Heavy Oil	0.0021	3.00E-02	7.52E-03	9.35E-03	3.44E-03	5.10E-04	3.72E-03	2.45E-02	67	0.4	11.8	0.1	N/A			0.000	0.0	0.000
	Light Oil	0.0058	2.92E-01	2.43E-02	2.70E-04	7.50E-04	1.70E-04	3.60E-04	2.59E-02	38	0.8	24.3	0.1	0.028	0.8	0.005	0.003	0.1	0.001
Open-Ended Lines	Water/Oil	0.0015	N/A	N/A	1.80E-07	4.90E-08	1.50E-09	6.00E-09	2.36E-07	6	0.0	1.1	0.0	0.010	0.3	0.002	0.001	0.0	0.000
	Gas	0.1100	3.50E-02	3.38E-03	2.30E-04	3.90E-04	2.00E-05	1.00E-04	4.12E-03	116	0.0	0.5	0.0	N/A			0.000	0.0	0.000
	Heavy Oil	0.0074	3.00E-02	7.52E-03	9.35E-03	3.44E-03	5.10E-04	3.72E-03	2.45E-02	28	3.1	93.7	0.6	0.108	3.3	0.020	0.013	0.4	0.002
Total	Light Oil	0.0740	2.92E-01	2.43E-02	2.70E-04	7.50E-04	1.70E-04	3.60E-04	2.59E-02	1	0.1	2.3	0.0	0.022	0.7	0.004	0.002	0.1	0.000
	Water/Oil	0.0130	N/A	N/A	1.56E-06	4.18E-07	1.30E-08	5.20E-08	2.04E-06	8	0.1	3.2	0.0				0.000	0.0	0.000
										Total	76.8	2336.1	14.0	4.982	151.5	0.91	0.613	15.6	0.09

**LINN OPERATING, INC.**  
Equipment Leak Emission Factors

Equipment Type	Equipment Service	Average Total HydroCarbon Emission Factors <sup>[1]</sup> (lb/component-day)	Speciated Fugitive Emission Factors (Estimated Weight Fractions) <sup>[2]</sup>						Total HydroCarbon Emissions		Total VOC Emissions <sup>[4]</sup>		Total HAP Emissions <sup>[4]</sup>						
			VOC	CO <sup>*</sup>	Benzene	Toluene	Ethylbenzene	Xylenes	Total HAP	Component Count	lb/day	lb/mo.	ton/yr	lb/day	lb/mo.	ton/yr			
Valves	Gas	0.2400	3.50E-02	3.38E-03	2.30E-04	3.90E-04	2.00E-05	1.00E-04	4.12E-03	127	30.5	927.1	5.6	1.067	32.4	0.195	3.8	0.023	
	Heavy Oil	0.0044	3.00E-02	7.52E-03	9.35E-03	3.44E-03	5.10E-04	3.72E-03	2.45E-02										
	Light Oil	0.1300	2.92E-01	2.43E-02	2.70E-04	7.50E-04	1.70E-04	3.60E-04	2.59E-02	31	4.03	122.6	0.7	1.177	35.8	0.215	0.104	0.019	
Pump Seals	Water/Oil	0.0052	N/A	N/A	6.24E-06	1.68E-06	5.20E-08	2.08E-07	8.16E-06	24	0.12	3.8	0.0	N/A			0.000	0.000	
	Gas	0.1300	3.50E-02	3.38E-03	2.30E-04	3.90E-04	2.00E-05	1.00E-04	4.12E-03										
	Heavy Oil	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A										
Others: pressure relief valves, compressors, instruments, diaphragms, drains, hatches, meters, and vents.	Light Oil	0.6900	2.92E-01	2.43E-02	2.70E-04	7.50E-04	1.70E-04	3.60E-04	2.59E-02										
	Water/Oil	0.0013	N/A	N/A	1.56E-06	4.18E-07	1.30E-08	5.20E-08	2.04E-06										
	Gas	0.4700	3.50E-02	3.38E-03	2.30E-04	3.90E-04	2.00E-05	1.00E-04	4.12E-03	51	24.0	729.1	4.4	0.839	25.5	0.153	0.099	3.0	0.018
Connectors	Heavy Oil	0.0017	3.00E-02	7.52E-03	9.35E-03	3.44E-03	5.10E-04	3.72E-03	2.45E-02	6	2.4	73.0	0.4	0.701	21.3	0.128	0.062	1.9	0.011
	Light Oil	0.0110	2.92E-01	2.43E-02	2.70E-04	7.50E-04	1.70E-04	3.60E-04	2.59E-02	4	3.0	90.0	0.5	N/A			0.003	0.1	0.001
	Water/Oil	0.0058	N/A	N/A	6.96E-06	1.86E-06	5.80E-08	2.32E-07	9.11E-06	835	9.2	279.4	1.7	0.321	9.8	0.059	0.038	1.2	0.007
Flanges	Gas	0.0210	3.50E-02	3.38E-03	2.30E-04	3.90E-04	2.00E-05	1.00E-04	4.12E-03	221	2.4	73.9	0.4	0.710	21.6	0.130	0.063	1.9	0.011
	Heavy Oil	0.0021	3.00E-02	7.52E-03	9.35E-03	3.44E-03	5.10E-04	3.72E-03	2.45E-02	67	0.4	11.8	0.1	N/A			0.000	0.0	0.000
	Light Oil	0.0058	2.92E-01	2.43E-02	2.70E-04	7.50E-04	1.70E-04	3.60E-04	2.59E-02	38	0.8	24.3	0.1	0.028	0.8	0.005	0.003	0.1	0.001
Open-Ended Lines	Water/Oil	0.0015	N/A	N/A	1.80E-07	4.90E-08	1.50E-09	6.00E-09	2.36E-07	6	0.0	1.1	0.0	0.010	0.3	0.002	0.001	0.0	0.000
	Gas	0.1100	3.50E-02	3.38E-03	2.30E-04	3.90E-04	2.00E-05	1.00E-04	4.12E-03	116	0.0	0.5	0.0	N/A			0.000	0.0	0.000
	Heavy Oil	0.0074	3.00E-02	7.52E-03	9.35E-03	3.44E-03	5.10E-04	3.72E-03	2.45E-02	28	3.1	93.7	0.6	0.108	3.3	0.020	0.013	0.4	0.002
Total	Light Oil	0.0740	2.92E-01	2.43E-02	2.70E-04	7.50E-04	1.70E-04	3.60E-04	2.59E-02	1	0.1	2.3	0.0	0.022	0.7	0.004	0.002	0.1	0.000
	Water/Oil	0.0130	N/A	N/A	1.56E-06	4.18E-07	1.30E-08	5.20E-08	2.04E-06	8	0.1	3.2	0.0				0.000	0.0	0.000
										Total	76.8	2336.1	14.0	4.982	151.5	0.91	0.613	15.6	0.09

**Speciated Fugitive Emission Factors**  
(Estimated weight fractions of THC emissions in each category)

Equipment Service	Methane	NMHC	VOC	Speciated Fugitive Emission Factors (Estimated weight fractions of THC emissions) <sup>[2]</sup>				Xylenes
				C6*	Benzene	Toluene	Ethylbenzene	
Gas Production	0.92		0.035	0.00338	0.00023	0.00039	0.0002	0.0001
Heavy Oil	0.942		0.03	0.00752	0.00535	0.00344	0.00051	0.00372
Light Oil	0.613		0.292	0.0243	0.00027	0.00075	0.00017	0.00036

**HAP (BTEX) Fugitive Emission Speciation Factors Used for Water/Oil**

Compound	Speciation Factor <sup>[3]</sup> (lb HAP/lb TOC)
Benzene	0.0012
Toluene	0.00032
Ethylbenzene	0.00001
Xylenes (m,p,o)	0.00004

**Sample Calculations:** TOC emissions (tpy) = (N, Component Count) \* [THC EF per equipment type and service category, (lb/component-day)] \* [365, (days in a year)] / [2000, (lbs/ton)]  
 VOC emissions (tpy) = [TOC emissions per equipment service, (tpy)] \* [VOC Speciated Fugitive EF per equipment service, (weight fraction)]  
 HAP emissions (tpy) = [TOC emissions per equipment service, (tpy)] \* [Sum of HAP speciated EF's per equipment service, (sum of weight fractions)]

**References:**  
 [1] EPA Protocol for Equipment Leak Emission Estimates, November 1995 (EPA-453/R-95-017), Table 2-4, Page 2-15.  
 [2] Oil and Gas Production Facilities, Chapter 6, section 2 Permitting Guidance, WDEQ, Air Quality Division, Fugitive Emissions Pg. 71 of 81  
 [3] Gas Research Institute (GRI) Technical Reference Manual for GRI-HAPCalc, Software for Estimating Emissions of Hazardous Air Pollutants from Natural Gas Industry Operations, GRI-95/0346  
 [4] Based on representative component count for each piece of equipment.

**LINN OPERATING, INC.**  
**Liquid Level Controllers (LLC)**

<b>(Low/No-Bleed):</b>	
Norriseal 1001A Snap Acting Controllers Rate:	0.282 scfh
Total Controllers:	6 LLCs
Hours of Operation/year:	8760 hours
Estimated Motive Gas Density:	0.047 lb/ft <sup>3</sup>
Gas Vented (tpy)	0.35
% VOC	9.61%
% HAPs	0.76%
VOC Emissions (tpy):	<b>0.03</b>
HAP Emissions (tpy):	<b>0.003</b>

**Linn Operating - SHB 10E Pad**  
**Estimated Stack Flow Rate For SCC1**  
**Dehy Control Device**

Fuel Gas Components	Moles of Component / 100 Moles Fuel @ 100% Total Air	Required for Combustion		Stack Diameter (Inches)
		O2	Dry Air	
O2	0.15			20
CO2	7.56			Stack Diameter (Feet)
CH4	0.63	1.27	6.04	1.7
C2H6	0.32	1.10	5.25	Stack Area (Square Feet)
C3H8	0.23	1.14	5.44	2.18
C4H10	0.10	0.65	3.09	Stack Velocity (Std.Ft/Sec)
C5H12	0.12	0.98	4.67	2.5
C6H14	0.04	0.37	1.76	Stack Velocity (Ft/Sec)
N2	9.14			2.5
SUM	18.1	5.5	26.3	Stack Velocity (Ft/Sec)
Less O2 in Fuel (deduct)		0.15	0.69	
Required @ 100% air		5.4	25.6	6.1
Fuel Gas Density	68.52	scf/mole fuel gas		
Calculated HHV	28.11	btu/scf		
Percent Excess Air (%)	Required for Combustion			
	O2	Dry Air		
100.00	5.37	25.56		
Excess Air	--	0.00		
Excess O2	0.00	--		
Stack Temp (°F)	1,200.00			
Flue Gas Components	Moles Air / 100 Moles Fuel @ Percent Excess Air	% by Volume Dry Basis		
CO2	10.8	26.8		
H2O	5.2			
N2	29.3	73.2		
O2	0.0	0.0		
Wet	45.3			
Dry	40.1	100.0		
Conditions:	Ambient	Standard	Units	
Temp	34.4	60.0	°F	
Pressure (Elevation)	11.3	14.7	psia	
Fuel Rate		Moles fuel Per Hour	Flue Gas Flow Rate	
Load (MMBtu / hr)	(scf / hr) @ calc. HHV btu/scf		Moles Dry Air Per Hour	dscf / min @ 60 degrees F
1.375	48,908	713.78	286	327
Fuel Usage:	428.43	MMSCFYR Fuel		Actual Flow Rate
				802.6

All calculations and constants are from Babcock & Wilcox "STEAM / it's generation and use"

**Linn Operating - SHB 10E Pad**  
**Estimated Stack Flow Rate For SCC2**  
**Tank Control Device**

Fuel Gas Components	Moles of Component / 100 Moles Fuel @ 100% Total Air	Required for Combustion		Stack Diameter (Inches)
		O2	Dry Air	
O2	0.00			48
CO2	0.72			Stack Diameter (Feet)
CH4	59.45	118.90	566.45	4.0
C2H6	17.37	60.80	289.68	Stack Area (Square Feet)
C3H8	11.47	57.34	273.19	12.56
C4H10	6.19	40.26	191.80	Stack Velocity (Std.Ft/Sec)
C5H12	2.06	16.46	78.41	1.4
C6H14	0.76	7.19	34.24	
N2	0.06			
SUM	98.1	301.0	1,433.8	Stack Velocity (Ft/Sec)
Less O2 in Fuel (deduct)		0.00	0.00	
Required @ 100% air		301.0	1,433.8	3.5
Fuel Gas Density	368.66	scf/mole fuel gas		
Calculated HHV	1537.78	btu/scf		
Percent Excess Air (%)	Required for Combustion			
	O2	Dry Air		
100.00	300.95	1,433.78		
Excess Air	--	0.00		
Excess O2	0.00	--		
Stack Temp (°F)	1,200.00			
Flue Gas Components	Moles Air / 100 Moles Fuel @ Percent Excess Air	% by Volume Dry Basis		
CO2	168.9	13.0		
H2O	295.5			
N2	1132.7	87.0		
O2	0.0	0.0		
Wet	1597.2			
Dry	1301.7	100.0		
Conditions:	Ambient	Standard	Units	
Temp	34.4	60.0	°F	
Pressure (Elevation)	11.3	14.7	psia	
Fuel Rate		Moles fuel Per Hour	Flue Gas Flow Rate	
Load (MMBtu / hr)	(scf / hr) @ calc. HHV btu/scf		Moles Dry Air Per Hour	dscf / min @ 60 degrees F
7.7	5,007	13.58	177	1,086
Fuel Usage:	43.86	MMSCF/YR Fuel		Actual Flow Rate
				2665.7

All calculations and constants are from Babcock & Wilcox "STEAM / its generation and use"

**Linn Operating - SHB 10E Pad**  
**Estimated Stack Flow Rate For Heaters**  
**One (1) - 0.125 MMBtu/hr Reboiler/EG heater**

Fuel Gas Components	Moles of Component / 100 Moles Fuel @ 100% Total Air	Required for Combustion		Stack Diameter (Inches)
		O2	Dry Air	
O2	0.00			6
CO2	0.52			Stack Diameter (Feet)
CH4	90.52	181.04	862.49	0.5
C2H6	5.30	18.56	88.42	Stack Area (Square Feet)
C3H8	1.79	8.95	42.62	0.20
C4H10	0.82	5.34	25.46	Stack Velocity (Std.Ft/Sec)
C5H12	0.28	2.20	10.49	1.5
C6H14	0.15	1.42	6.75	Stack Velocity (Ft/Sec)
N2	0.47			2.1
SUM	99.8	217.5	1,036.2	
Less O2 in Fuel (deduct)		0.00	0.00	
Required @ 100% air		217.5	1,036.2	
Fuel Gas Density	376.72	scf/mole fuel gas		
Calculated HHV	1104.36	btu/scf		
Percent Excess Air (%)	Required for Combustion			
	O2	Dry Air		
100.00	217.51	1,036.24		
Excess Air	--	0.00		
Excess O2	0.00	--		
Stack Temp (°F)	500.00			
Flue Gas Components	Moles Air / 100 Moles Fuel @ Percent Excess Air	% by Volume Dry Basis		
CO2	112.6	12.1		
H2O	232.6			
N2	819.1	87.9		
O2	0.0	0.0		
Wet	1164.3			
Dry	931.7	100.0		
Conditions:	Ambient	Standard	Units	
Temp	34.4	60.0	°F	
Pressure (Elevation)	11.3	14.7	psia	
Fuel Rate		Moles fuel Per Hour	Flue Gas Flow Rate	
Load (MMBtu / hr)	(scf / hr) @ calc. HHV btu/scf		Moles Dry Air Per Hour	dscf / min @ 60 degrees F
0.125	113	0.30	3	18
Fuel Usage:	0.99	MMSCF/YR Fuel		Actual Flow Rate
				24.9

All calculations and constants are from Babcock & Wilcox "STEAM / it's generation and use"

**Linn Operating - SHB 10E Pad**  
**Estimated Stack Flow Rate For Heaters**  
**One (1) - 0.25 MMBtu/hr EG Bath Heater**

Fuel Gas Components	Moles of Component / 100 Moles Fuel @ 100% Total Air	Required for Combustion		Stack Diameter (Inches)
		O2	Dry Air	
O2	0.00			6
CO2	0.52			Stack Diameter (Feet)
CH4	90.52	181.04	862.49	0.5
C2H6	5.30	18.56	88.42	Stack Area (Square Feet)
C3H8	1.79	8.95	42.62	0.20
C4H10	0.82	5.34	25.46	Stack Velocity (Std.Ft/Sec)
C5H12	0.28	2.20	10.49	3.0
C6H14	0.15	1.42	6.75	Stack Velocity (Ft/Sec)
N2	0.47			4.2
SUM	99.8	217.5	1,036.2	
Less O2 in Fuel (deduct)		0.00	0.00	
Required @ 100% air		217.5	1,036.2	
Fuel Gas Density	376.72	scf/mole fuel gas		
Calculated HHV	1104.36	btu/scf		
Percent Excess Air (%)	Required for Combustion			
	O2	Dry Air		
100.00	217.51	1,036.24		
Excess Air	--	0.00		
Excess O2	0.00	--		
Stack Temp (°F)	500.00			
Flue Gas Components	Moles Air / 100 Moles Fuel @ Percent Excess Air	% by Volume Dry Basis		
CO2	112.6	12.1		
H2O	232.6			
N2	819.1	87.9		
O2	0.0	0.0		
Wet	1164.3			
Dry	931.7	100.0		
Conditions:	Ambient	Standard	Units	
Temp	34.4	60.0	°F	
Pressure (Elevation)	11.3	14.7	psia	
Fuel Rate		Moles fuel Per Hour	Flue Gas Flow Rate	
Load (MMBtu / hr)	(scf / hr) @ calc. HHV btu/scf		Moles Dry Air Per Hour	dscf / min @ 60 degrees F
0.25	226	0.60	6	35
Fuel Usage:	1.98	MMSCF/YR Fuel		Actual Flow Rate
				49.9

All calculations and constants are from Babcock & Wilcox "STEAM / it's generation and use"